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A Review : Wi-Fi 6 Technology

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Abstract - *Wi-Fi 6 is a next generation technology which is based on the IEEE 802.11ax standard. This technology will enable the connectivity of next generation Wi-Fi. Wi-Fi 6 will deliver the capacity, coverage and performance to effectively meet the increasing and evolving use of the*

Wi-Fi technology. This paper will review the various key features and comparison between 5G and 6G.

Key Words: Wi-Fi 6,802.11ax,

1. INTRODUCTION

Wi-Fi is about to get faster. Faster internet is constantly in demand, especially as we consume more bandwidth-demanding apps, games, and videos with our laptops and phones. The next generation of Wi-Fi is being shepherded in now, with Wi-Fi 6 as the foundation and WPA3™ providing the latest in security. Wi-Fi 6 is based on the new IEEE 802.11ax standard, so you might see the two terms interchanged. It's still going to act like the Wi-Fi you know and love now, except with some added benefits.

1.1 WHAT IS 802.11AX?

This latest standard addresses today's biggest Wi-Fi challenges: performance and the increasing density of devices and diversity of applications. To handle these challenges, 802.11ax increases throughput capacity by up to four times that of 802.11ac. Additional improvements include the ability to use both the 2.4 gigahertz (GHz) and 5GHz bands for a number of use cases.

1.2 TECHNOLOGY

I. MULTI-USER PERFORMANCE

Arguably the most important new feature in the 802.11ax standard is an enhanced multi-user feature called OFDMA (Orthogonal Frequency Division Multiple Access). Multiple devices with varying bandwidth needs can be served simultaneously instead of the existing model where devices compete with one another to send data. With 802.11ax there is no contention as each device is simultaneously scheduled to transmit data in parallel. Handling data packets in this way improves performance, as a large number of packets – especially those that are latency sensitive such as voice traffic – can be transmitted simultaneously. In dense environments, instead of using a single vehicle to carry traffic, it's like using a carpool model. Traffic is pooled into a transport allowing for multiple conversations to happen at once. This allows access points to handle traffic from multiple 802.11ax devices more efficiently.

2. ARE WIRELESS 5G AND WI-FI 6 THE SAME THING?

No, these two technologies are not the same. Wireless 5G is a new cellular technology designed for mobile devices and Always-Connected laptops, while Wi-Fi 6 is a wireless LAN (WLAN) technology that expands on (and is compatible with) older standards. You'll find that wireless 5G is most commonly associated with cellular data, while Wi-Fi 6 is most commonly associated with your home or office network. Speed for 6G is 9.6Gbps but for 5G it is only 3.5 Gbps.

3. KEY FEATURES OF 6G

• New Spectrum : Due to increase in traffic demand and scarcity of spectrum resources THz (Terahertz) and Visible light bands have been introduced for communication in 6G mobile communication system.

• New channel coding has been introduced based on Turbo, LDPC, Polar, etc.

• Sparse theory (compressed sensing)

• Very large scale antenna processing for THz

• Advanced signal processing

• Flexible spectrum (Full (free) spectrum, Spectrum sharing)

• AI based wireless communication

• Space-Air-Ground-Sea integrated communication
• Wireless Tactile Network

• Higher data rates

4. WIFI VERSIONS

- **Wi-Fi 4** is 802.11n, released in 2009.
- **Wi-Fi 5** is 802.11ac, released in 2014.
- **Wi-Fi 6** is the new version, also known as 802.11ax. It was released in 2019.

5. COMPARISON BETWEEN 5G AND 6G

Feature	5G	6G
Frequency Bands	• Sub 6 GHz, • mmwave for fixed access	• Sub 6 GHz, • mmwave for mobile accessm exploration of THz bands (above 140 GHz), • Non-RF bands (e.g. optical, VLC) etc.
Data rate	1 Gbps to 20 Gbps (Downlink Data Rate - 20 Gbps, Uplink Data Rate - 10 Gbps)	1 Tbps
Architecture	• Dense sub 6 GHz smaller BSs with umbrella macro BSs • Mmwave small cells of about 100 meters (for fixed access)	• Cell free smart surfaces at high frequencies (mmwave tiny cells are used for fixed and mobile access) • Temporary hotspots served by drone mounted BSs or tethered Balloons. • Trials of tiny THz cells (under progress)
Device types	• Smartphones • Sensors • Drones	• Sensors & DLT devices • CRAS • XR and BCI equipment • Smart implants
Traffic Capacity	10 Mbps/m^2	1 to 10 Gbps/m^2
Reliability	10^{-5}	10^{-9}
Localization precision	10 cm on 2D	1 cm on 3D
User experience	50 Mbps 2D everywhere	10 Gbps 3D everywhere

Table -1: **Comparison between 5G and 6G**

6. CONCLUSION

This paper presented a review of new generation Wi-Fi technology, Wi-Fi6. W-Fi 6 will enable the users to easily understand and experience the high performance wifi technology. Table 1 presents the comparison between 5G and 6G. Wi-Fi 6 will also bring more capabilities to support smart homes, IoT (Internet of Things) and environment with large-scale deployment.

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