WiFi 6E and the 6 GHz Spectrum: Key Insights



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In January 2021, Ofcom, the UK's communications regulator, announced the expansion of the wireless spectrum to accommodate WiFi 6 technology, adding 500 MHz of spectrum known as WiFi 6E (for "extended"). This new frequency band, ranging from 5925 to 6425 MHz, represented a significant enhancement in wireless technology, providing a substantial increase in available channels for access points. This was considered the most significant advancement in WiFi technology at the time.

The New Frequency Band

The 6 GHz frequency band can be likened to adding an entirely new motorway parallel to existing ones. Devices now have access to the 2.4 GHz and 5 GHz bands, along with the 6 GHz band, allowing for improved performance and reduced congestion.

Available Channels for WiFi 6E Access Points

The channels available for WiFi 6E are as follows:

- **20 MHz Channels**: 24
- **40 MHz Channels**: 12
- **80 MHz Channels**: 6
- **160 MHz Channels**: 3

Device Compatibility

WiFi 6E on the 6 GHz band exclusively supports 802.11ax devices, meaning legacy devices must remain on the 2.4 GHz or 5 GHz bands. This is akin to the new motorway being reserved for high-performance vehicles, like Lamborghini's.

Enhanced Device Roaming

Unlike previous WiFi standards, where client devices chose when to roam between access points, WiFi 6E access points autonomously manage device roaming. This shift enables a more efficient and informed approach to device connectivity, leveraging a comprehensive understanding of the network environment. The practical implementation and efficacy of this feature have shown significant improvements in network performance over the past few years.

Tri-Band Access Points in 2024

Since their introduction in 2021, tri-band access points supporting 2.4 GHz, 5 GHz, and 6 GHz have become the standard in high-performance networking. These devices have enabled enhanced wireless performance and capacity, becoming widely available and integrated into various sectors.

Real-World Benefits

For enterprise deployments, WiFi 6E facilitates the use of 80 MHz channels, offering significantly higher bandwidths. The limited spectrum available in the 5 GHz band historically constrained deployments to 20/40 MHz channels. The addition of six 80 MHz channels enables network designers to plan for up to seven access points without channel reuse. This is particularly advantageous in large, open-plan office environments that typically deploy over a dozen access points per floor.

Application in Business-Critical Environments

Industries such as healthcare and manufacturing, which rely on business-critical devices, leverage the WiFi 6E 6 GHz band for dedicated connectivity. This ensures that vital devices, such as hospital patient monitoring systems, operate on an interference-free, uncontended band, while non-critical devices continue to utilize the 2.4 GHz and 5 GHz bands.

Benefits for Stadiums and Public Venues

With the combined 5 GHz and 6 GHz bands, there is sufficient spectrum to deliver robust WiFi solutions in stadiums and public venues. Historically, stadium WiFi suffered from co-channel interference, resulting in suboptimal performance. By utilizing both bands, up to 43 channels are available at 20 MHz channel widths (19 in 5 GHz and 24 in 6 GHz), allowing comprehensive coverage without frequency reuse. This supports enhanced user experiences, such as video playback, in-play betting, and food and beverage ordering directly from seats.

Impact on the Education Sector

The education sector benefits significantly from the increased bandwidth afforded by WiFi 6E. Students, as heavy WiFi users, experience improved connectivity in both classrooms and accommodation facilities. As eLearning and streaming demand continue to grow, WiFi 6E enables seamless content delivery that was previously unattainable.

Conclusion

The introduction of the 6 GHz band combined with the advantages of 802.11ax technology has offered an unparalleled opportunity for enhanced wireless connectivity. This standard allows for the creation of differentiated services and ensures optimal performance for business-critical applications, setting a new benchmark in WiFi technology. As we continue to integrate these advancements into networks, the future of wireless connectivity looks promising.

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