



Transforming the Built-Environment with WiFi:

Enabling the Technology Revolution with
6 GHz and WiFi 7



As a technology company with a rich history in the property technology industry, our many years in business and deep expertise solidify World Cinema and Hospitality WiFi as a credible source for technological commentary. Below are our predictions for wireless connectivity and emerging applications that will depend upon improved networks, as well as how these technologies will transform our future.



Developing technologies increasingly affect many areas of our lives - how we engage socially, relax individually, connect professionally, and progress financially. Advancements in wireless networking, smartphones, wearables, sensors, and connected building systems continue to occur at a rapid pace, and new ecosystems such as immersive augmented reality, blockchain-based asset management, and the metaverse are becoming more prevalent.

With these developments, modern life is becoming ever more reliant on secure, reliable, high-speed wireless connectivity, and WiFi solutions need to evolve to keep up. Although it is difficult to predict exactly how the next generations of technology will affect our use of WiFi, it is clear that most buildings are currently ill-equipped to manage the sheer volume of data and demand for reliable connections that future applications will require. Addressing the issue will require a major shift in WiFi technology.

We believe this technological revolution is here today. On April 23, 2020, the FCC opened 1200 MHz in the 6 GHz spectrum band (5.925-7.125 GHz) for unlicensed use, intended primarily for use of WiFi, marking the biggest technological leap for WiFi since its invention. The benefits will be realized in the next generation of WiFi standards, starting with WiFi 6E and closely followed by WiFi 7. From a consumer standpoint (e.g., hotel guests or apartment residents), this advance will finally allow for use cases that offer a complete replacement of wired networks, with the necessary speed, latency, and reliability to offer transformative, immersive experiences, including a greater ability to interact with one another globally and in real-time across financial, social, and physical boundaries.





What Is Changing and Why Is It a Big Deal?

To understand how WiFi works from a consumer perspective, we often use the metaphor of a highway. A wider highway with more lanes will result in less congestion, greater speeds, and a more enjoyable experience. WiFi 6E will enable devices to use the new spectrum released by the FCC, thus increasing the number of lanes, so to speak. However, WiFi 7 will go even further, not only allowing for more and wider lanes, but also adding the ability to use more than one lane at a time (or even more than one highway at a time) and boosting the capacity and speed of the car on the highway.

WiFi 7 is thus not merely an incremental improvement to existing connectivity infrastructure; instead, WiFi 7 creates an entirely different framework to enable future technological developments for a vastly different experience than what we are used to today.

Let us now consider some of the specific features and benefits of this new technology.

Additional Spectrum : Greater Capacity

Today's WiFi networks (excluding those with WiFi 6E capabilities) use two frequency bands: 2.4 GHz and 5 GHz. There are a number of differences between these two bands, but essentially, in the 2.4 GHz band, data travels farther at lower speeds, while the 5 GHz band provides faster speeds in a shorter range. Dual-band enabled WiFi devices allow users to connect to the band best suited for a particular application or device; this worked well, until these bands became overwhelmed with traffic. This is where 6 GHz enters the picture.

First implemented with the WiFi 6E standard in early 2021, the 6 GHz band supports significantly more channels than the 2.4 GHz and 5 GHz bands. The availability of more channels means the network can accommodate more data at faster speeds with less interruption and higher rates of throughput. With up to 59 channels of 20 MHz each, the 6 GHz band has more than 20 times the capacity of the 2.4 GHz band (3x20 MHz channels in the US) and 6.5 times the capacity of the 5 GHz band (9x20 MHz channels in the US). The greater throughput and reduced latency offered by this added spectrum enables applications such as immersive augmented reality that requires greater bandwidth.

Improved Modulation: Faster Transmission

WiFi 7 goes beyond simply adding channels to changing how those channels are used. All 802.11 WiFi standards rely on an approach known as Quadrature Amplitude Modulation (QAM) to arrange data for transmission. WiFi 7 uses a more advanced version called 4096 QAM to incorporate more data into each transmission, enabling far greater throughput and faster transmission speeds- in fact, a 20% data rate increase over WiFi 6.

Channel Bonding: Higher Throughput

Channel bonding is a customary practice today, especially for enterprise-grade WiFi systems, that enables adjacent channels to be combined for increased throughput. Essentially, traffic is split at the packet level across multiple channels and then recombined after transmission. Successive WiFi standards have allowed for the use of increasingly wider bonded channels, and this continues with WiFi 7, which will support up to 320 MHz of combined channel width, or twice the width currently available with WiFi 6. This will greatly improve the usability of WiFi networks, especially for data-heavy applications such as high-definition streaming and immersive augmented reality.

Multi-Link Operation: Faster Speeds, Lower Latency, and Higher Reliability

While WiFi 6E improves connectivity by adding use of the 6 GHz band, WiFi 6E routers are still limited, as users can only connect to one band at a time (either 2.4 GHz, 5 GHz, or 6 GHz). Thus, a device may not be using the fastest available band, while some bandwidth may go unused. WiFi 7 will further improve connectivity by enabling multi-link operation, wherein users can connect to multiple bands simultaneously. This potentially triples throughput, greatly improving network speed, latency, and reliability.

Multi-AP Coordination: Better Overall Performance

Historically, devices have selected a transmission band based on the needs of specific applications. WiFi 7, however, will allow access points (APs) to communicate and coordinate with one another, deciding which AP is best suited to support a particular application based on the current connectivity in each band. The APs will essentially support one another by assigning bandwidth to connected devices and associated applications for improved performance.

Joint Transmission: Faster Connections with Less Interference

Finally, to support improved communication using the next generation of WiFi devices, APs can now overlap their coverage instead of interfering with one another's data stream. For high-quantity or high-quality data transfers, multiple APs can broadcast the same information to one device without interference, improving transfer speed. This revolutionary practice will enable faster connections with little to no interference.





Exploring the Possibilities

Today's WiFi networks are overwhelmed with data, particularly in high-traffic environments such as apartment communities, hotels, and transportation hubs. WiFi 7 will alleviate most of today's connectivity woes with significantly more bandwidth and "smart WiFi" capabilities. These advances will allow data to move more intelligently, enabling new applications.

How will this affect high-traffic, many-user environments? Let us consider some key examples.

Hotels

Given business conditions over the past several years, hotels have had a hard time justifying investments in their WiFi networks beyond simply meeting brand standards. Modernizing the WiFi infrastructure and adding APs can be expensive, and it may not be seen as "worth it" when even upgraded WiFi technology cannot fully replace wired connections for phones, TVs, and security cameras. Also, most guests simply did not need the advancements in networking that WiFi 5 and WiFi 6 offered; although such improvements certainly support a better guest experience, they were not viewed as a must-have for hoteliers.

We believe that WiFi 7's advancements in both spectrum and network intelligence will truly change the way we use WiFi in hotels, providing a greater justification for infrastructure upgrades. Increased bandwidth and channel bonding will significantly improve hotel Internet connectivity, enabling WiFi 7 to accommodate thousands of devices - not just mobile phones and tablets, but also sensors and smart devices that can transform the hotel experience.

The ability to share data and converge networks with WiFi 7 will revolutionize how we use WiFi. In addition to expanded bandwidth and multi-AP coordination, we will see improved reliability, regardless of physical proximity to an access point. WiFi 7 will have the capacity and intelligence to decide how best to deliver fast, reliable internet to guests and staff alike, regardless of their location within a property, improving both hotel operations and the guest experience for a positive impact on the bottom line.

Multi-Dwelling Units

Only within the last few years have larger apartment and condominium communities begun to consider providing WiFi to individual units. Prior to this, most communities offered WiFi in their clubhouses or by the pool, but the units themselves were dominated by old-school technology designed for use in a single-family home environment. Cable providers would provide a set-up box and cable modem (sometimes with a built-in WiFi router) and bundle an old-school landline (just like Grandma and Grandpa used to use). When WiFi 5 arrived, this technology offered a simple, manageable, reasonably fast and reliable connection, and thus WiFi has become a sensible amenity for multi-dwelling community owners to offer their residents.

We believe that the transformative nature of WiFi 7 will make community-provided WiFi an industry standard in multi-dwelling environments. With the broader installation of smart building systems including cameras, sensors, environmental controls, and asset tracking systems as crucial amenities for an improved resident experience, residents will come to view community WiFi systems like they view roofs, common area access controls, and driveways and parking lots today. Owners that do not keep up with these developments will see the quality and capitalized value of their community suffer.



Schools, Universities and Student Housing

Today's students use the Internet more than ever before, and they rely on fast, accessible connections. Remote learning has changed the way classrooms function, and many students take classes and tests online rather than in person. Many professors and teachers live-stream their classes to increase accessibility. To ensure the same quality of education for remote and in-person students, schools and universities need to have superior WiFi coverage in classrooms and throughout their campuses. WiFi 7 will be able to accommodate far more devices and applications that require greater bandwidth, ensuring campus-wide Internet access to keep students connected at all times for many different educational uses.

Well-performing WiFi is a need for more than just students and faculty; for example, campus security needs connectivity for improved communications and monitoring of campus safety through surveillance cameras. To support newer devices that use artificial intelligence for proactive monitoring, it is crucial for the WiFi infrastructure to enable greater capacity, faster speed, and lower latency.



Timing and How To Prepare

WiFi 7 (802.11 be) is currently in draft status, with final approval expected in early 2024. Certain manufacturers have already begun to release WiFi 7-compatible devices based on the draft standard. Although several manufacturers have already released early versions of pre-certification WiFi 7 access points, we anticipate that more WiFi 7 devices will be announced in Jan 2023 at the Consumer Electronics Show. However, most environments should not expect to deploy an enterprise-grade WiFi 7 platform until late 2023 or early 2024.

Until then, property owners can prepare by improving their existing infrastructure. We recommend the installation of fiber optic cabling to telcom closets and Cat6 or better twisted pair structured wiring to provide both bandwidth and power to access points. Given the spectral properties, the regulated power limitations, and the network intelligence of WiFi 7, APs should be placed as close as possible to where guests and residents will use them. We recommend moving to a ratio of one AP per hotel room or apartment unit if possible. APs should also be secured to limit physical access by unauthorized persons and centrally powered via Power over Ethernet.



Conclusion

Our modern lives are increasingly dependent on Internet access; soon we will see a world where more devices are communicating with each other than there are people in the world. WiFi 7 will offer possibilities for transforming technology in ways we have yet to imagine. World Cinema and Hospitality WiFi are excited to be part of an industry that continues to have a profound influence on society, creating a future of infinite possibilities.



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