WI-FI 6: AN INSIDER'S GUIDE

By Brandon Vigliarolo

TechRepublic

INTRODUCTION

WI-Fi 6, due for release later this year, is supposed to make Wi-Fi networks faster, more reliable, and more energy efficient than ever, but what exactly does that mean?

Wi-Fi 6 is the Wi-Fi Alliance's name for 802.11ax under its new naming scheme, which is designed to make Wi-Fi generations easier to understand for the average computer user. Wi-Fi 6 will be replacing Wi-Fi 5 (802.11ac), which replaced Wi-Fi 4 (802.11n) as the standard for Wi-Fi speed in 2013.

It's easy to get confused about what Wi-Fi 6 is and how it will improve upon older Wi-Fi standards, especially with the coming release of 5G wireless technology. With Wi-Fi 6 and 5G emerging onto the market at roughly the same time, it would make sense that they're somehow related. But while both promise similar improvements, they're distinctly different technologies.

This ebook will help dispel the confusion surrounding Wi-Fi 6, its place in our modern wireless world, and how it will be used once it's rolled out in 2019.

WHAT IS WI-FI 6?

Wi-Fi 6 is the next evolution of wireless local area network (WLAN) technology. The name Wi-Fi 6 is part of a new naming convention the Wi-Fi Alliance introduced to Wi-Fi standards so they're more easily understood by Wi-Fi users, making it much like the 3G/4G/5G naming convention used by cellular data networks.

Behind the Wi-Fi 6 name is the latest version of the 802.11 wireless networking standard: 802.11ax. This new Wi-Fi standard is reportedly up to 30% faster than Wi-Fi 5, but speed hasn't been the main benefit touted by the Wi-Fi Alliance and other industry experts. Wi-Fi 6 also brings lower latency, more simultaneously deliverable data, and improved power efficiency. To provide these changes, Wi-Fi 6 is improving on existing technology and introducing new technology.

Wi-Fi 6 will be the first iteration of 802.11 to include orthogonal frequency division multiple access (OFDMA), which is an improvement on orthogonal frequency division multiplexing (OFDM).

OFDM is used by Wi-Fi 5, 4, and older standards to encode and transmit data. In essence, OFDM allows multiple clients or access points (APs) to contend for the ability to transmit data; once the network is idle, data can be transmitted. OFDM is a popular and reliable way to decentralize access, but it has a major problem: It can lead to serious latency.

Enter OFDMA, which makes a major change from OFDM: It puts transmission coordination in the hands of 802.11ax APs. The AP centrally schedules data transmission and can further divide frequencies to transmit data

to/from multiple clients at the same time. The goal behind OFDMA is to reduce latency and increase network efficiency—especially in high-demand environments like stadiums, conference halls, and other public spaces. Because OFDMA broadcasts multiple signals at the same time, it can also increase the unit interval, which means outdoor Wi-Fi deployments will be faster and more reliable as well.

Wi-Fi 6 will extend the capabilities of multi-user multi-input/multi-output (MU-MIMO). MU-MIMO was previously available only for downstream connections and allowed for a device to send data to multiple receivers at the same time. Wi-Fi 6 will add MU-MIMO capabilities to upstream connections, which will allow more simultaneous devices on one network.

Wi-Fi 6 will also:

- Increase the number of transmit beamforming streams to eight to increase network range and throughput.

- Use both the 2.4 GHz and 5GHz bands simultaneously to greatly improve performance.

- Use 1024 quadrature amplitude modulation (1024-QAM) to increase throughput for emerging use cases. (Wi-Fi 5 uses 256-QAM.)

- Implement individual target wake time (TWT) to improve battery life and reduce power consumption for Wi-Fi devices.

- Introduce spatial reuse technology that will allow devices to more easily access a Wi-Fi network to transmit data.

Check out the Wi-Fi Alliance's Wi-Fi 6 white paper for more technical details. (Registration is required for PDF download.)

Additional resources

- Wi-Fi 6 explained: Everything you need to know about the Galaxy S10's new wireless tech (CNET)
- FCC gives 5G and Wi-Fi a boost as you gobble up wireless (CNET)
- 5G, Wi-Fi 6, and nano-satellites: Cisco pushes total coverage (ZDNet)

WHAT IS THE DIFFERENCE BETWEEN WI-FI 6 AND 5G WIRELESS?

With two next-generation wireless technologies coming in 2019, it's understandable if you're a bit confused. Are Wi-Fi 6 and 5G mobile networks related? If so, why are they both coming out now? How, if in any way, are they similar?

5G and Wi-Fi 6 both promise faster speeds, less latency, and more capacity, and there's even some overlap in the technology they use, like MU-MIMO and beamforming. But those similarities aside, 5G and Wi-Fi 6 differ in two major ways: use cases and scope of operation.

Wi-Fi 6 is a wireless local area network (WLAN) technology that is meant to operate in an office, a home, or a conference center or some other crowded public space. 5G is a wide-area network (WAN) technology that is designed for cellular data, edge computing, IoT applications, and other non-interior connections.

Another important distinction is the difference in Wi-Fi 6 and 5G's definitions of "generation." Wi-Fi generational changes are additive—the older technology that made Wi-Fi 4 and Wi-Fi 5 possible still exists in Wi-Fi 6 routers, which means older devices that aren't Wi-Fi 6 compatible will still be able to use Wi-Fi 6 APs, albeit at lower Wi-Fi 5 or Wi-Fi 4 speeds.

5G is a completely new technology that isn't backward compatible, so new hardware will be needed to broadcast and receive 5G signals. Existing non-5G devices won't be able to connect to 5G networks, even at lower speeds.

According to Forbes, Wi-Fi 6 will also reportedly be up to four times faster than 5G in certain use cases, so 5G isn't likely to unseat Wi-Fi 6 as the preferred method of connecting to the internet when stationary.

As for use cases, 5G and Wi-Fi 6 will each have its niche, but analysts and industry experts have argued that the two will complement each other to create a larger, faster, and more accessible internet.

Additional resources

- 5G smartphones: A guide for business professionals (free PDF) (TechRepublic)
- Why 5G mobile handsets will drive global 5G adoption (TechRepublic)
- Verizon's 5G network launch was rocky at best, but it has a plan (CNET)
- Testing Verizon's early 5G speeds was a mess, but I'm still excited about our data future (CNET)
- 5G technology: A business leader's guide (Tech Pro Research)
- 5G Research Report 2019: The enterprise is eager to adopt, despite cost concerns and availability (Tech Pro Research)

WHAT ARE THE POTENTIAL APPLICATIONS OF WI-FI 6?

Wi-Fi 6's use cases are various and generally reflect existing Wi-Fi use cases, albeit with improvements. The Wi-Fi Alliance mentions several use cases for Wi-Fi 6, such as:

- IoT hardware will benefit from Wi-Fi 6 through improved battery performance, better outdoor operation, and improved range.

- Home Wi-Fi will be faster and more reliable thanks to increased throughput and superior coverage.

- In-vehicle Wi-Fi and A/V systems will be improved thanks to reduced latency that comes with OFDMA.

- Stadiums and other public venues with Wi-Fi will see increased performance, thanks to OFDMA's client transmission control and MU-MIMO's up/down capabilities.

- Environments with multiple APs belonging to different networks (malls, airports, etc.) will have less signal interference to worry about thanks to transmit beamforming.

- Wi-Fi 6 may also make wireless last-mile internet connections more feasible due to its superior speeds, ability to handle more users with less latency, and better outdoor performance.

Additional resources

- Think your Wi-Fi's faster than mobile internet? Not in these 33 countries (ZDNet)
- Half of security pros would rather walk barefoot in a public restroom than use public Wi-Fi (TechRepublic)
- Top 5 things to know about airplane Wi-Fi (TechRepublic)
- Top 5 riskiest airport Wi-Fi (TechRepublic)
- Why traveling CEOs and coffee shops are your company's greatest security risks (TechRepublic)
- How the NFL and its stadiums became leaders in Wi-Fi, monetizing apps, and customer experience (TechRepublic cover story)

HOW CAN BUSINESSES TAKE ADVANTAGE OF WI-FI 6?

The uses for Wi-Fi in the office and remote environments won't change much under Wi-Fi 6, outside of increased performance.

However, that doesn't mean that Wi-Fi 6 won't be a boon to businesses—on the contrary. Wi-Fi 6's new capabilities will be felt by employees and customers in multiple ways, including:

- 30% faster speeds will mean users are getting their content in less time.

- Increased throughput will allow more simultaneous users.

- Reduced latency will mean that an increase in users won't necessarily kill speeds.

- Wi-Fi 6 APs operating in areas with high signal congestion won't be as affected by it, so users will experience a more reliable connection even in crowded environments.

- Superior outdoor service and increased range means Wi-Fi 6 networks will have fewer dead spots that interfere with both professional and customer Wi-Fi use.

Business leaders, as well as home users, shouldn't assume that it's going to be fast or easy to get the benefits of Wi-Fi 6. APs and routers that support Wi-Fi 6 should begin appearing soon, but without Wi-Fi 6-compatible devices to take advantage of all the new features, the visible improvements will be minimal.

Additional resources

- How to fix coffee-shop Wi-Fi (ZDNet)

- New study finds 5 of every 6 routers are inadequately updated for security flaws (ZDNet)

- 5 popular home office network wireless routers: How do they stack up? (TechRepublic)

WHEN WILL WI-FI 6 BE AVAILABLE?

The Wi-Fi Alliance will begin offering Wi-Fi 6 certification for 802.11ax devices in the third quarter of 2019, but Wi-Fi 6 routers will be available sooner.

D-Link and Asus announced 802.11ax routers way back at CES 2018, and the Asus model is available for purchase now. But as mentioned above, the benefits from using a Wi-Fi 6 router will be minimal until Wi-Fi 6-compatible client devices are available.

Don't rush out and buy that Asus router either—802.11ax devices available now are part of Wi-Fi 6 wave one, which includes any devices released before the Wi-Fi Alliance starts its certification process. Uncertified Wi-Fi 6 devices may lack certain features that will be industry standard for certification. As long as that certification isn't available, you won't quite know what you're buying.

When will you be able to get your hands on a Wi-Fi 6-compatible smartphone or IoT device? You may have to wait even longer. Device manufacturers will need to acquire 802.11ax-ready chipsets like the Qualcomm WCN3998, which Qualcomm planned to start demoing to manufacturers in late 2018.

As of October 2018, the WCN3998 was still going through the certification process, so it could be a while before manufacturers can start building devices based around it. Don't expect to see a Wi-Fi 6-ready smartphone until later in 2019—possibly as late as Q3—when the Wi-Fi Alliance starts certifying devices.

Additional resources

- TP-Link is ready for next-gen Wi-Fi with a glut of new networking hardware at CES 2019 (CNET)

- Netgear Orbi mesh router gets a next-gen Wi-Fi 6 update at CES 2019 (CNET)

- Asus' super-fast RT-AX88U wireless router is coming mid-October (CNET)

- Samsung Galaxy S10 is likely to support next-gen Wi-Fi 6 (CNET)

- Happy World Wi-Fi Day: Here are 5 best practices for good home network hygiene (TechRepublic)

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