High-speed Wi-Fi 6 is here. Soon, Wi-Fi 6E is going to make it even better

Wi-Fi is expanding into the 6GHz band, paving the way for new connections that will be the fastest yet. Here's everything you need to know.

Speed is key with Wi-Fi, and the category has certainly been moving fast as of late. First came Wi-Fi 6, a brand-new, faster version of Wi-Fi that started hitting the market in 2019. Now, after a unanimous vote in April, the Federal Communications Commission is opening up an entire new band of spectrum to accommodate next-gen devices designed to tap into it.

The Wi-Fi Alliance, an industry group that manages Wi-Fi nomenclature, branded this new spectrum and the devices that can take advantage of it under a new name: Wi-Fi 6E. The first such devices are expected to begin hitting stores by the end of this year. One industry-funded report claims that, along with providing faster speeds and new room for growing internet traffic, the move will generate more than $180 billion in US revenue over the next five years.

In other words, it's been a very busy couple of years for Wi-Fi -- and the arrival of Wi-Fi 6E might be the most significant development yet. Here's some context to help you wrap your head around it.

Let's talk 6GHz

Last year, I wrote a post about Wi-Fi 6 that explains the new capabilities it brings to next-gen routers. In a nutshell, it's a faster, more efficient version of Wi-Fi that allows wireless access points like routers to better manage networks crowded with lots of users and client devices. My convoluted metaphor for all of that was to imagine your router as a bartender, and the devices on your network as the people trying to order drinks. A Wi-

Fi 6 router is like a four-armed bartender capable of efficiently serving drinks to several patrons at once.

Enter Wi-Fi 6E. It isn't a new version of Wi-Fi like Wi-Fi 6, but rather a term that identifies Wi-Fi 6 devices that are equipped with the chips and radios needed to operate in that new mass of spectrum the FCC just opened up. If a Wi-Fi 6 router is a better bartender, then a Wi-Fi 6E router is a better bartender with a brand new bar, one with an exclusive client list and lots of room to work.

That new spectrum sits in the 6GHz band, a band that wasn't previously allocated for unlicensed Wi-Fi use like the 2.4 and 5GHz bands already were. So what's so great about 6GHz?

All about bandwidth

Time for another metaphor!

Let's say that you've got a gallon of milk sitting on your kitchen counter representing the entire spectrum of radio frequencies. You take a needle, jab it into the side of the carton, and then pull it out. A very thin stream of milk begins to jet out several feet. Then, you take something a little thicker, like a nail, and poke another hole into the side of the container. More milk shoots out this time because the hole is wider -- but it doesn't go as far.

You can think of those two holes as the 2.4 and 5GHz bands. With a frequency range of just 70MHz, the 2.4GHz band is the narrower of the two. Like the needle-poked hole shooting milk across your kitchen, it can send data at a reasonable distance, but with such a small opening, there's a limit to how much it can send. With 500MHz of bandwidth, the 5GHz band represents a bigger-sized hole in the milk carton. It can pass more data at once -- but it can't send it quite as far.

That brings us to Wi-Fi 6E's 6GHz band and its 1,200MHz of additional bandwidth. It's like you've punched a hole in the milk carton the size of a quarter. Tons of milk comes gushing out, but it gushes downward and doesn't travel very far at all.

The takeaway is that the 6GHz band will be best suited for close-range connections, ideally between devices that are in the same room as one another. In situations like that, the two devices should be able to pass huge amounts of data back and forth with the full efficiency of Wi-Fi 6. We'll look forward to testing connections like those (and their range limitations) later this year, when Wi-Fi 6E-compatible devices start to arrive.

"With Wi-Fi 6E, you not only get more bandwidth but cleaner bandwidth -- meaning it is able to wirelessly provide the higher data rates required along with true mobility."
Perry Correll, Extreme Networks

Extreme Networks' Perry Correll, who sits on both the IEEE 11ax and Wi-Fi Alliance Wi-Fi 6 task groups, suggests that the short range of the 6GHz band and its greater number of channels is actually "a tremendous advantage" in dense, challenging environments like transportation hubs, apartment units, sports arenas and business complexes.

"If you're sitting in a packed stadium with 70,000 other people, the arrival of Wi-Fi 6E means you're not going to be competing for bandwidth in the same way you used to," Correll says. "It will be significantly easier to stream the event to friends, order concessions via app, or even to find out which bathroom has the shortest lines."

Wi-Fi's VIP section

"AR/VR and gaming is another great use case for the 6GHz band," Correll says. "Many don't realize the high-end VR sets that require the most bandwidth are actually tethered with cables. With Wi-Fi 6E, you not only get more bandwidth but cleaner bandwidth -- meaning it is able to wirelessly provide the higher data rates required along with true mobility."

Wi-Fi 6 is really the key to that cleaner bandwidth, because there won't be any earlier-gen Wi-Fi devices that are capable of tapping into the 6GHz band. That means that Wi-Fi 6E networks won't have any older-generation devices acting as weak links in the chain.

Let's go back to that analogy I sketched out earlier. Like I said, if Wi-Fi 6 makes your router into a better bartender that can serve lots of drinks at once, then Wi-Fi 6E is the bar itself -- and it's an exclusive, members-only kind of joint. The only patrons ordering cocktails are Wi-Fi 6E patrons that are capable of being there, and all of them support Wi-Fi 6.

In other words, nobody's casting any weird, confused looks at the four-armed bartender as he hands out drinks, because they've all got four arms, too. It isn't as crowded or as noisy as other bars, and everyone's equipped to take full advantage of the bartender's capabilities. It's the fastest, most efficient nightlife in town.

So, I'll need (another) new router?

There's the rub. Like that metaphorical bar's exclusivity might suggest, you'll need to be a member in order to enter. Specifically, you'll need Wi-Fi 6E devices equipped with new chipsets built to send signals in the 6GHz band.

Translation? Yes, you'll need a new router -- and new client devices like phones and laptops -- in order to enjoy the benefits of Wi-Fi 6E.

"We're expecting the first set of devices to come to market in the second half of this year," said Vijay Nagarajan, vice president of marketing for Broadcom's wireless communications and connectivity division. "You'll see a whole slew of devices, both on the infrastructure side and on the client side, and much more in a much more accelerated manner in 2021."

That's probably frustrating for anyone who jumped in early and bought a new Wi-Fi 6 router in the last year, but don't be too hard on yourself. It's still very early for Wi-Fi 6E, and the rollout will take some time. Wi-Fi 6 only recently penetrated the mainstream with public deployments and support from high-profile devices like the iPhone SE and the Samsung Galaxy S10. Devices like those that support Wi-Fi 6E might not become widely available until 2021.

In other words, that Wi-Fi 6 router that you bought on Black Friday will continue to be a top-of-the line access point for another year or so, and it will continue to be a very good router after that, thanks to everything that Wi-Fi 6 brings to the table. In fact, waiting to upgrade until Wi-Fi 6E is more widely implemented and polished might be the best approach. At that point, we'll have a better sense of the sort of users who stand to benefit the most from the upgrade, and they'll have an easier time doing so, too.

More good news: Your older-gen Wi-Fi gadgets will still work with routers that support Wi-Fi 6E, because Wi-Fi 6 is fully backwards compatible with earlier versions of Wi-Fi. They just won't be able to operate in that exclusive 6GHz band.