Advantages of New Wi-Fi Standards

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Wi-Fi technology and the routers and Wi-Fi adapters using it have advanced a lot in recent years. It is difficult to explain the nuances of Wi-Fi technology without getting geeky, so bear with me a little as I attempt to explain some of the terminologies as simply as I can.

The IEEE 802.11 standards for Wi-Fi have used letters to designate each new generation of design, with b, a, g, and n being the most well-known by consumers as the first four generations. The next generation to appear was ac, which was a confusing change in the naming sequence, so it is often referred to simply as Wi-Fi 5 or 5th generation Wi-Fi. The first generation is designed to take full advantage of new technology that was started but not fully implemented in the n or 4th generation. Both take advantage of 2.4GHz and 5GHz frequencies to provide more and faster channels.

Still, the capability of using multiple inputs and multiple outputs (MIMO) to communicate with a device for even faster or more reliable communications was only standardized under Wi-Fi 5. In addition, MIMO could be used to electronically change the antenna beam pattern of the router to focus the signal in the direction of the device it was communicating with. Wi-Fi 5 standardized the method of communication between the devices and the router to enable interoperability of the router with all brands of Wi-Fi 5 adapters that support this “beamforming” technology instead of proprietary designs that depended on buying matching equipment from one supplier.

To use beamforming technology (which may go by various names by different brands) with multiple devices simultaneously, multi-user MIMO (MU-MIMO) is required, with the number of antennas and radios supported designated as 2×2 or 3×3 or 4×4 for 2, 3, or 4 simultaneous data streams with Wi-Fi 5. Each MU-MIMO data stream can also be multiplexed (divided up) into up to 3 data streams to provide concurrent single data streams to a total of anywhere from 2 to 24 devices depending on the number of MU-MIMO data streams supported by the router. Non-MIMO communications can connect more total devices with the router, but they take turns, one at a time for each frequency, instead of having simultaneous access to the router.

The newest Wi-Fi standards for consumer products are designated with an ‘ax’ suffix (such as 801.11ax) and referred to as Wi-Fi 6 or 6th generation Wi-Fi and support up to 8 simultaneous MU-MIMO data streams. In addition, there is even an enhanced Wi-Fi 6 called Wi-Fi 6E that adds 6GHz frequency antennas and radios for even more and faster channels of communication. For more information on Wi-Fi 4 through 6E, see the following links:

What Is Wi-Fi 6E? | PCMag

WiFi standards explained: WiFi 4 vs WiFi 5 vs WiFi 6 (minim.com)

Buying a new router? Understand these Wi-Fi basics first – CNET

For links to articles on the best routers for 2021, see the following:

The Best Wireless Routers for 2021 | PCMag

The 8 Best Routers To Flood Your Home With Wi-Fi (popularmechanics.com)

With these new Wi-Fi standards, the question then is do you need a new router? If your current router is several years old; and you are planning to use a 4K or 8K smart television or streaming video device, or you have many different devices using your router at the same time (the average U.S. home has over ten devices that may be in use), or you are concerned about your router security, or if you or your grandkids are gamers or cryptocurrency miners, then you should probably consider buying a new Wi-Fi 6 router.

At this time, there are not many 6GHz devices utilizing 6E, and the routers and adapters can get expensive. Tests on 6E capable routers that are currently available do not show many advantages over Wi-Fi 6. You would probably benefit more from a router with two 5GHz antennas than a router with one 5GHz and one 6GHz. This may change in another year, or two and prices should become more reasonable as more 6E hardware becomes available.

Remember that to take full advantage of these new routers, you will need Wi-Fi adapters that use the same Wi-Fi standards and features, such as MU-MIMO as the router. Adapters are available for upgrading laptops and desktops to the new standards, but other devices without USB ports that can support Wi-Fi adapters, like phones, are not upgradeable. They will still work fine with the new routers. In addition, your internet service speed must be high enough to make a meaningful difference in performance with a faster router. You probably will not see much of a speed gain unless you have at least 300Mbps internet service, but speed alone may not be the reason to replace your old router.

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