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Wi-Fi 7 (802.11be) What's New in Data Rates and Latency

Wi-Fi Generations Comparison

The new generation of Wi-Fi will bring a wealth of improvements for all-new levels of responsiveness and consistency.

For more than 20 years, Wi-Fi technology has helped keep the world connected by meeting the growing needs of a constantly expanding user base.

Wi-Fi 7 features will expand upon the innovation of Wi-Fi 6 to not only enable faster speeds but dramatically improve responsiveness and reliability for future usages that demand extreme consistency and precision.
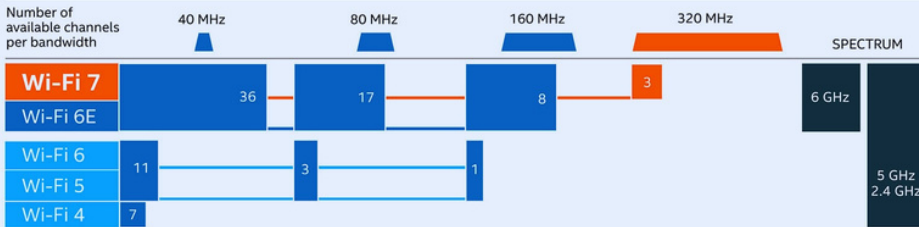
Specifications	Wi-Fi 5 (802.11ac)	Wi-F 6 (802.11ax)	Wi-Fi 7 (802.11be)
Frequency	5 GHz	Dual Band (2.4, 5 GHz)	Tri-Band (2.4, 5, 6 GHz)
Bandwidth (CH)	20, 40,80 MHz	20, 40, 80, 80+80, 160 MHz	20, 40, 80, 80+80, 160, 320 MHz
Access (Multiplexing)	OFDM	OFDMA	OFDMA
Modulation	256QAM	1024QAM	4096 (4K) QAM
Antenna	DL MU-MIMO (4 x 4)	DL + UL MU-MIMO (8 x 8)	DL + UL MU-MIMO (16x 16)
Security	WPA2	WPA3	WPA4
Key Innovations	40MHz mandatory	TWT, BSS coloring, Beamforming	Multi-Link Operation (MLO), Multi-RU, Puncturing
Max Data Rate	6.9 Gbps	9.6 Gbps	46 Gbps

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Key Features of Wi-Fi 7

320 MHz Channels & 4K QAM

intel **Wi-Fi 7** – More lanes and a wider VIP highway

Wi-Fi 7 **doubles available bandwidth** compared to Wi-Fi 6E, with three super-wide 320 MHz channels on the dedicated 6 GHz band, in addition to all of the channels on the legacy 5 GHz and 2.4 GHz bands.

Wi-Fi 7 enables significantly faster speeds by packing more data into each transmission. 320 MHz channels are twice the size of previous Wi-Fi generations—which is somewhat like using a semi-truck to move boxes, compared to a moving van.

4K QAM (Quadrature Amplitude Modulation) enables each signal to embed greater amounts of data than the 1K QAM with Wi-Fi 6, which, to continue the truck analogy, is like having professional movers optimize truck cargo space to pack the maximum number of boxes.

The benefit of a typical Wi-Fi 7 laptop is a potential maximum data rate of almost 5.8 Gbps. This is 2.4X faster than the 2.4 Gbps possible with Wi-Fi 6 and could easily enable high-quality 8K video streaming or reduce a massive 15 GB file download to roughly 25 seconds vs. the one minute it would take with the best legacy Wi-Fi technology.

Multi Resource Units (RU) and Puncturing

intel **Wi-Fi 7** – More efficient use of scarce channel spectrum
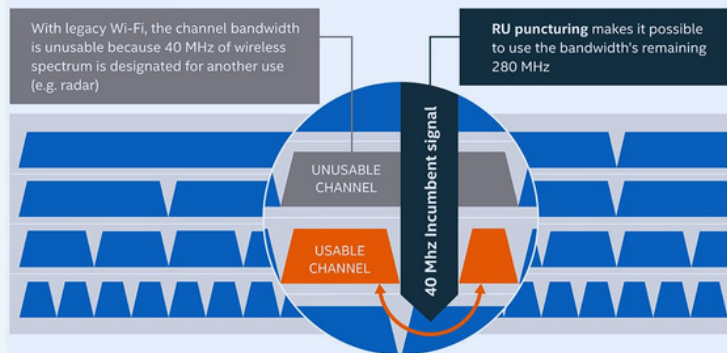
With legacy Wi-Fi 6, when another device uses any part of a large high-speed channel, the entire channel is unavailable and a different channel must be used. This is like the legacy Wi-Fi moving van not being able to access a particular multi-lane highway and having to find an alternate route because passenger cars are using one of the lanes.

With Multi-RU Puncturing, Wi-Fi 7 devices will be able to use other parts of the same high-speed channel not in use to enable very large channels (even if they are less than the maximum 320 MHz size.) This would be like the Wi-Fi 7 movers being able to re-pack most of the semi-truck contents into smaller trucks without having to avoid a partially used multi-lane highway so they can deliver boxes to the destination more quickly and reliability.

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Key Features of Wi-Fi 7

Multi-Link Operation MLO & Deterministic Latency

While legacy Wi-Fi provides access to multiple wireless bands, devices typically choose only one band to make transmissions—switching to another if conditions change. With MLO (Multi-Link Operation), Wi-Fi 7 devices can simultaneously connect on two bands. This enables faster speeds through aggregation. Or, both bands can be used concurrently to share redundant/unique data for improved reliability with ultra-low and precise latencies.

To return to the truck analogy: Think of the legacy Wi-Fi device as moving vans that can only take one highway at a time and choose alternate routes if they run into traffic. However, Wi-Fi 7 semi-trucks will simultaneously operate across two highways to get more boxes to their destination more quickly.

Alternatively, identical boxes can be loaded onto trucks on both highways to help ensure that at least one of each type arrives at the destination. Lastly, the most important boxes can be loaded onto the truck taking the fastest route—ensuring that potential delays do not impact the arrival of critical belongings.

intel. Wi-Fi 7 – More reliable connections for low latency applications

Multi-link Operation ensures high-priority data get transmitted without delay. Assign data flows based on application requirements, such as VR/AR or industrial IoT.

Enhanced Multi-Link Single-Radio (eMLSR)
Wi-Fi client is available on two channels. Access Point and Client can exchange packets on the free channel improving reliability and reducing latency even in signal-dense environments.

ACCESS POINT (Concurrent dual radio)   DEVICE (Single 2x2 radio)
CHANNEL 1
CHANNEL 2

OR

Multi-Link Multi-Radio (MLMR)
Connect simultaneously on two channels for higher speeds and reduced latency

ACCESS POINT (Concurrent dual radio)   DEVICE (Concurrent dual radio)
CHANNEL 1
CHANNEL 2

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