Wi-Fi 6 and beyond

Presented by James Scherz

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Wi-Fi 6

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Wi-Fi 6…..

…Is not about speed. Speed is relative to its environment. Its about reliable and sustained connectivity and the support of many connected devices.

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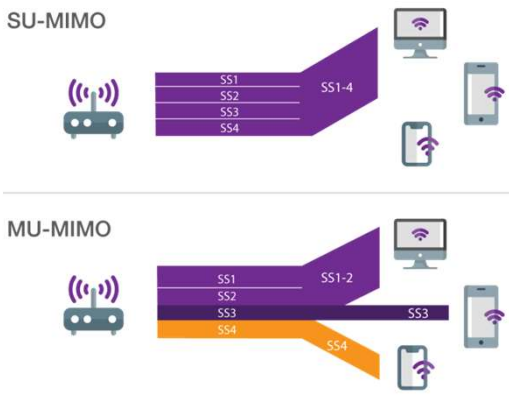
MU-MIMO (Multi-User Multiple Input Multiple Output)

- Leverages OFDMA to transport big chunks of data (multiple sessions) over a single channel.
- Simultaneous upstream and downstream data transmissions on the same frequency
- More efficient in higher-density environments



Courtesy of www.ray.life

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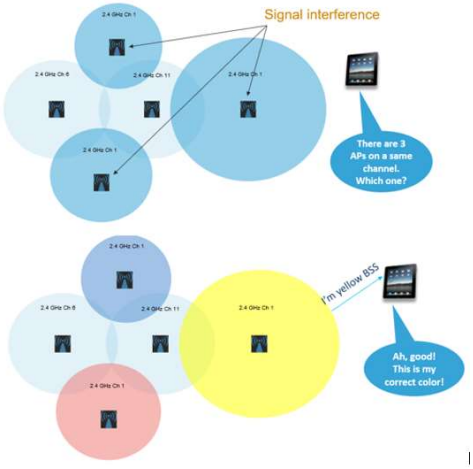
Basic Service Set (BSS) Coloring

- A method to differentiate between the BSS of access points and their clients on the same RF channel.
- Reduces Co-Channel Interference
- Super helpful in dense environments (add in OFDMA and MU-MIMO)



Courtesy of Linkedin

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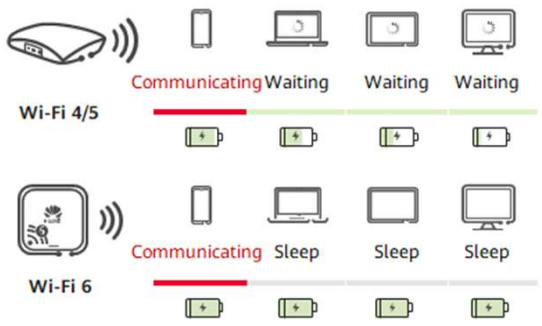
Target Wake Time (TWT)

- Allows an access point to define a specific time or set of times for devices to access the wireless network.
- Optimizes spectral efficiency by reducing congestion in an area with a lot of IoT devices.
- Saves battery life on connected devices.



Courtesy of Huawei

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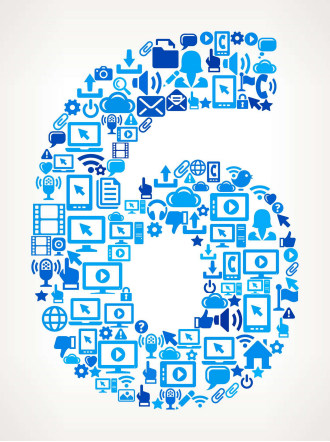
In a nutshell



- Wi-Fi 6 isn't all about speed. Its about improving the network when a bunch of devices are connected.
- In my opinion…Wi-Fi 6/6e are going to make way for Wi-Fi 7
- OFDMA and MU-MIMO is what makes Wi-Fi 6
- 6 GHz is exciting!!

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Wi-Fi Versions

IEEE	802.11b	802.11g	802.11n	802.11ac	802.11ax	802.11be
Wi Fi Alliance		Wi-Fi	Wi-Fi 4	Wi-Fi 5	Wi-Fi 6/6E	Wi-Fi 7 (?)

Release year	1999	2007	2009	2013	2020	2023 (?)
Frequency band	2.4 GHz	2.4 GHz	2.4 + 5 GHz	5 GHz	2.4 + 5 + 6 GHz (6E)	2.4 + 5 + 6 GHz
Bandwidth	20 MHz	20 MHz	40 MHz	80 MHz, 160 MHz	80 MHz, 160 MHz	240 MHz, 320 MHz

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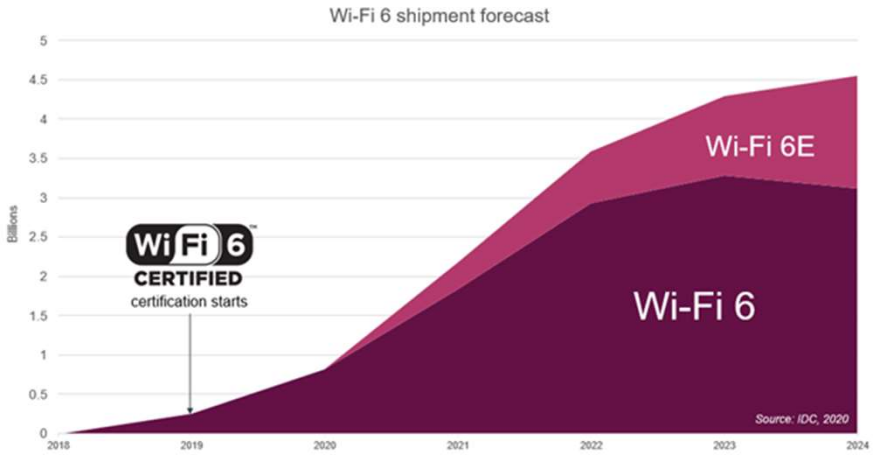
Wi-Fi 6 and 6e shipment forecast



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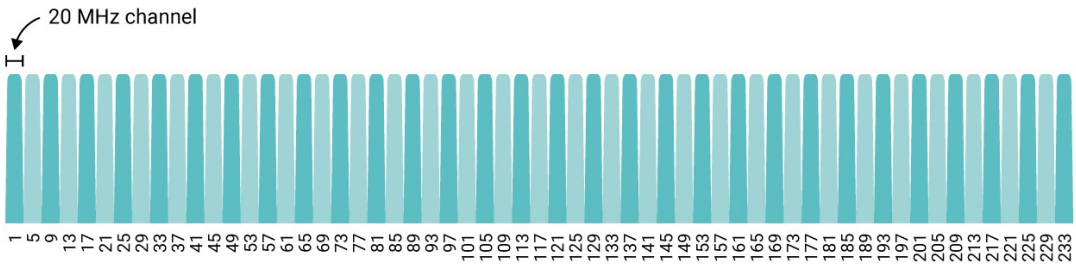
Reviewing 6 GHz Channels



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What about 6 GHz??

One of the many enhancements with Wi-Fi 6 is Wi-Fi 6e (extended), enabling the user to use the 6 GHz band (5935MHz – 7115 MHz).

Pros

- Channel bonding finally makes sense in Wi-Fi 6e. With Wi-Fi 6e, you can have 59 channels that are 20 MHz wide or 29 channels that are 40 MHz wide, or 14 channels that are 80 MHz wide. However, what makes the 6 GHz so special is having seven channels that are 160 MHz wide and don't contend with radar transmission as seen in the 5 GHz band.
- No DFS scanning required.
- The 6 GHz band is exclusive to Wi-Fi 6e devices. Wi-Fi 3/4/5/6 will not work in 6E.
- WPA 3 is mandatory for all Wi-Fi 6E devices.

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Wi Fi 6E
CERTIFIED

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What about 6 GHz??

Cons

- All devices (Access point, mesh extenders, and end devices) need to support Wi-Fi 6e to use the 6 GHz band.
- Range is an issue. Wi-Fi 6e extenders will need to be installed to use Wi-Fi 6e throughout a home.
- Wi-Fi 6e equipment is new, so it's expensive. Prices will drop as the equipment is certified and put on the market.

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What devices support it??

Phones

- Google Pixel 6 and 6 Pro
- Asus ROG Phone 5s
- Samsung Galaxy S21 Ultra
- Samsung Galaxy S22 Ultra & Plus
- Samsung Galaxy Z Fold 3
- Asus Zenfone 8
- Redmagic 6s Pro
- Motorola Edge (2021)
- iPad Pro 11 and 12.9 inch (Tablet)

Laptops

- Lenovo ThinkPad X1 Extreme Gen 4
- Acer Predator Triton 500 SE (PT516-52s)
- Acer Predator Helios 300 (PH315-55)
- Asus Zenbook Duo 14 UX482 (90NB0S51)
- HP Spectre x360 2-in-1 (16-f0033TX)
- Macbook Pro (14, 16-inch 2023)
- Mac Mini (2023)

Mesh

- Asus ZenWifi Pro ET12
- Netgear Orbi RBKE963
- Linksys Atlas Wifi 6e

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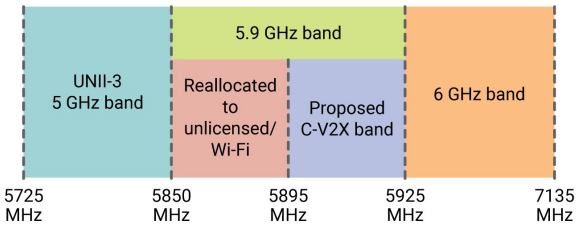
Honorable Mention: 5.9 GHz band

The 5.9 GHz band proposal



- In 2020, the FCC adopted new measures to utilize the 5.9 GHz band (5850-5925 MHz) for use in the Wi-Fi space and the C-V2X (Cellular Vehicle-to-Everything Technology). This new band designates the lower 45 MHz (5850-5895 MHz) for unlicensed use and the upper 30 MHz (5895-5926 MHz) for C-V2X use.
- Adding this additional space will allow for better channel bonding in the upper 5 GHz space.

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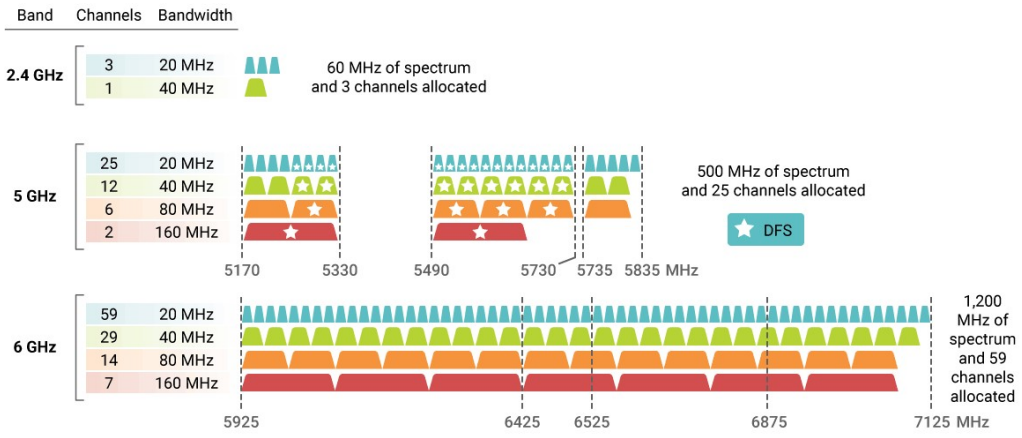
Channel Bonding



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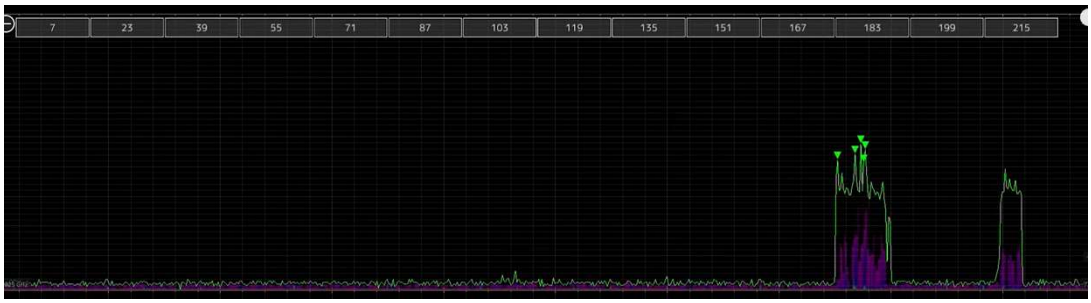
Non-Wi-Fi Interference (6 GHz)

- Existing utility microwave systems
- Potential 6 GHz devices utilizing the unlicensed band.



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Wi-Fi 7

We may see devices trickle in late 2023 with final rounds of certification starting around May 2024.

Wi-Fi generations					
	Wi-Fi 4	Wi-Fi 5	Wi-Fi 6	Wi-Fi 6E	Wi-Fi 7 (expected)
Launch date	2007	2013	2019	2021	2024
IEEE standard	802.11n	802.11ac	802.11ax		802.11be
Max data rate	1.2 Gbps	3.5 Gbps	9.6 Gbps		46 Gbps
Bands	2.4 GHz and 5 GHz	5 GHz	2.4 GHz and 5 GHz	6 GHz	1–7.25 GHz (including 2.4 GHz, 5 GHz, 6 GHz bands)
Security	WPA 2	WPA 2	WPA 3		WPA3
Channel size	20, 40 MHz	20, 40, 80, 80+80, 160 MHz	20, 40, 80, 80+80, 160 MHz	20, 40, 80, 80+80, 160 MHz	Up to 320 MHz
Modulation	64-QAM OFDM	256-QAM OFDM	1024-QAM OFDMA		4096-QAM OFDMA (with extensions)
MIMO	4x4 MIMO	4x4 MIMO, DL MU-MIMO	8x8 UL/DL MU-MIMO		16x16 MU-MIMO

Source: IEEE, Intel Corporation, Wi-Fi Alliance

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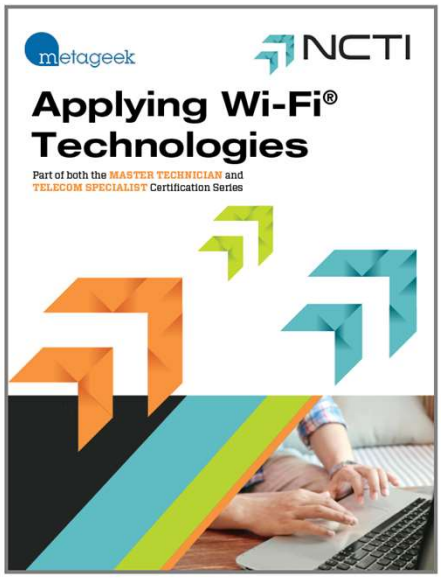
The presentation!

- Videos and content within this presentation can be found in our Applying Wi-Fi Technologies course.
- Additional videos such as the Wired Wisdom videos can be found on YouTube.



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Thank you!

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