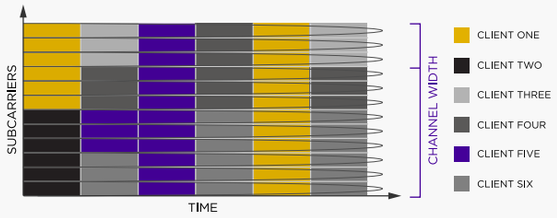
IEEE 802.11ax

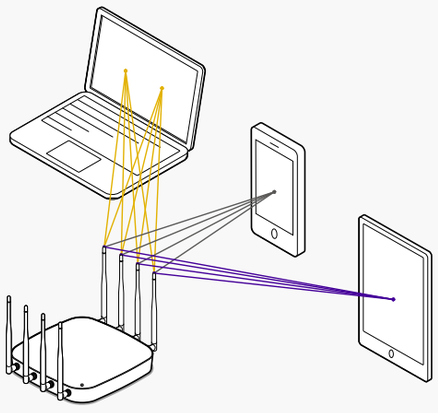
Reference Guide

OFDMA (ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS)



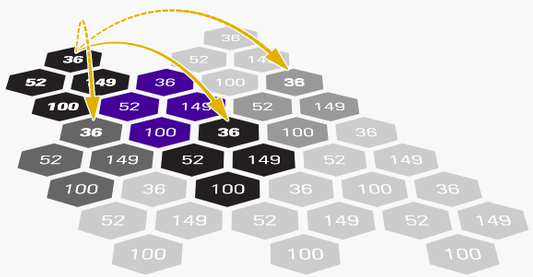
Multi-user version of OFDM enabling concurrent AP communication (Uplink/Downlink) with multiple clients by assigning subsets of subcarriers, called Resource Units (RUs) to the individual clients. Based on client traffic needs, the AP can allocate the whole channel to only one user or may partition it to serve multiple users simultaneously.

MU-MIMO (MULTI-USER MULTIPLE INPUT MULTIPLE OUTPUT)



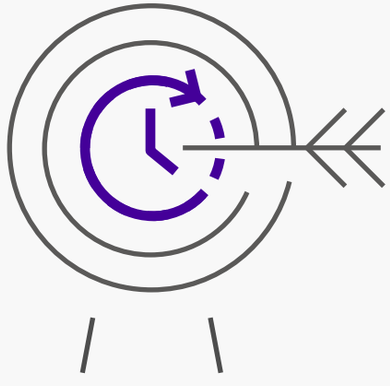
Introduced in 11ac, MU-MIMO technology allows the simultaneous transmitting of multiple frames to different receivers at the same time on the same channel using multiple RF streams to provide greater efficiency. 11ax adds 8x8 and Uplink MU-MIMO services to provide significantly higher data throughput.

OBSS (OVERLAPPING BASIC SERVICE SET)



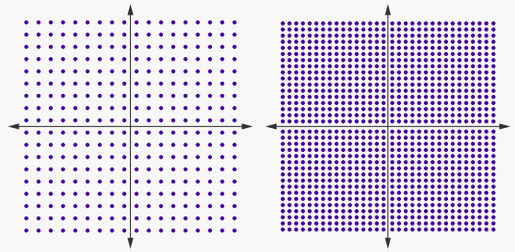
To improve spatial reuse efficiency and performance, 11ax adjusts the carrier sense operation based on the 'color' of the BSS. Depending on the BSS the traffic is generated from, the station can use different sensitivity thresholds to transmit or defer. This results in higher overall performance.

TARGET WAKE TIME



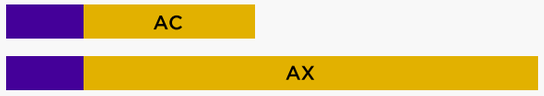
TWT allows the AP to schedule a series of times for a station to 'wake up' at scheduled intervals to exchange data frames. This allows the station to 'sleep' longer and reduces energy consumption. It's a key capability for IOT devices.

QAM 256 TO 1024



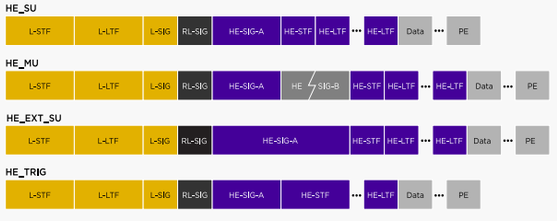
Modulation techniques are used to optimize throughput and range. The number of points in the modulation constellation determines the number of bits conveyed with each symbol. 802.11ac uses 256 QAM which transfers 8 bits/symbol. 802.11ax supports 1024 QAM, using 10 bits/symbol for a 25% increase in throughput.

LONGER OFDM SYMBOLS



4x larger OFDM symbol times increase efficiency and also improves robustness, especially for transmission in outdoor scenarios.

PREAMBLE UPDATES



Modified frame formats provide High Efficiency (HE) and legacy information to support new advanced capabilities as well as information required to support legacy stations and backward compatibility.

802.11AX OVERVIEW

The 802.11ax IEEE standard, essentially the sixth generation of Wi-Fi, addresses some of today's biggest Wi-Fi challenges – high density, and performance – by increasing capacity by up to 4x, and improving spectral efficiency to benefit both 2.4 GHz and 5 GHz bands in high density environments.

Components:

- OFDMA UL/DL
- MU-MIMO 8x8 & UL/DL
- 1024 – QAM modulation
- Long OFDMA Symbol
- New Frame Formats
- OBSS (BSS coloring)
- TWT – Power Saving
- Increased range
- 5 GHz & 2.4 GHz support

GLOSSARY

MU – Multi User (OFDMA or MIMO)
UL / DL – Uplink/Downlink
TWT –Target Wake Time
HE – High Efficiency
OBSS – Overlapping Basic Service Set
MIMO – Multiple-Input and Multiple-Output
OFDM – Orthogonal Frequency-Division Multiplexing

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