

# 802.11ax: Sixth Generation Wi-Fi Technology

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By 2021, Live TV streaming will be the equivalent of 10 billion hours of video

Cisco VNI, 2016

802.11ax will use each transmission time more efficiently than 802.11ac

## STREAMING VIDEO UP 4X BY 2021

Two years from now, streaming video will comprise 82% of all Internet traffic. In terms of bytes transmitted, this represents a 4x increase over 2016.

Streaming video will not be limited to primetime in North America; it is global and continuous. Live video – primarily sports but also news programs – will increase by 36x in the same time. And the quality of video in 2021 will also dramatically improve as more content providers push out 4k video.

## 802.11ac

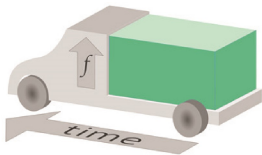
Since 2014, enterprise grade 802.11AC has been speeding up networks and increasing capacity. Today's second generation 802.11AC products are multi-user capable, with faster CPUs and more local processing power to increase edge intelligence.

In the next decade, the proliferation of both IOT devices and 4k and 8k streaming content will require a sixth generation of Wi-Fi technology.

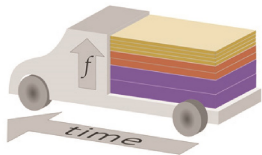
## 802.11ax

802.11ax Key Features:

- **Multi-user OFDMA** is more efficient for small to large packet sizes
- **8x8 MU-MIMO** offers targeted beam-steering and 2x capacity
- **Spectrum Reuse** allows multiple networks to overlap
- **Target Wait Time** schedules sleep and wake up time
- **Preamble 3dB boost** and **longer OFDM symbol** extend outdoor range
- **1024 QAM** and **2.4 GHz** band operation



802.11ac, 40 MHz channel  
One transmission



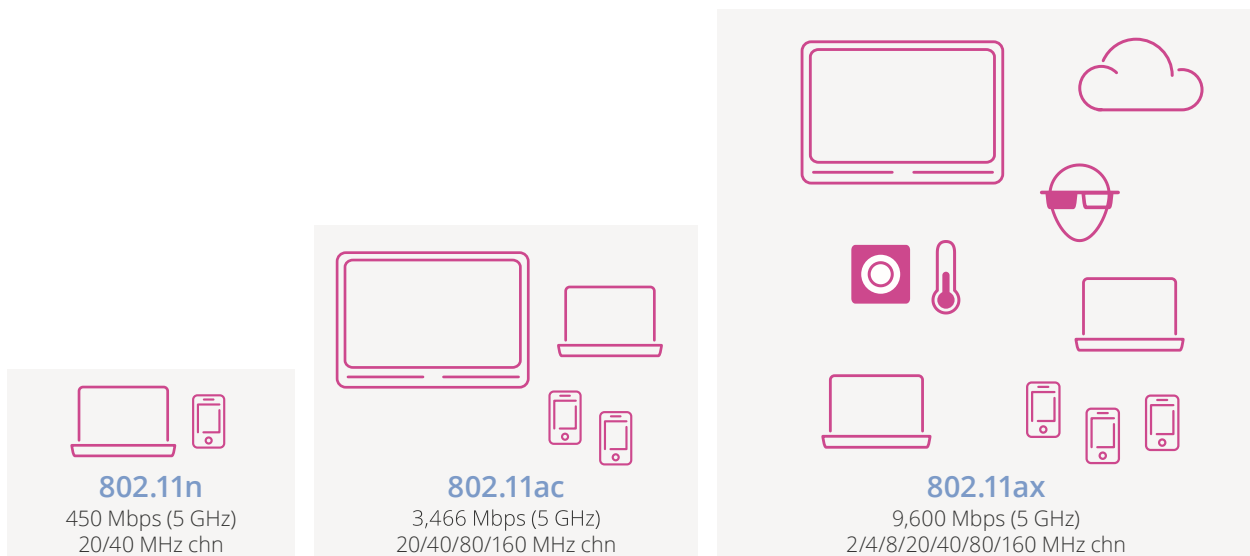
802.11ax, 40 MHz channel  
Divide transmission by frequency into  
242 sub-carriers in groups of 26.

The key technology behind 802.11ax, OFDMA, comes from 3GPP LTE cellular technology and 802.16e WiMax. OFDMA (orthogonal frequency division multiple access) supports higher density wireless networks by subdividing the carriers into groups of 26 sub-carriers, the smallest unit of which uses 2 MHz of frequency. For each transmission time, OFDMA dynamically selects the best combination of packet sizes to bundle together.

In the example shown at left, the access point transmits 2 MHz each to 4 clients, plus 4 MHz each to 2 clients, plus 8 MHz each to 2 clients. In total, all 40 MHz is used by 8 unique clients at the same time. In an OFDMA network, the access point schedules all transmissions uplink and downlink.

In 802.11ax, 8x8 Multi-user MIMO becomes more efficient, higher capacity, and features more targeted beam-steering. While Multi-user MIMO and Multi-user OFDMA are inherently incompatible for concurrent use, the 802.11ax standard supports both, directing the access point to determine the best technology to maximize each transmission opportunity.

**802.11ax is a deterministic network where the access point controls access, schedules transmissions, and selects the optimal way to fully utilize the RF spectrum.**



802.11ax standard will be ratified EOY 2019

## CAMBIUM NETWORKS VALUE

Cambium Networks is developing 802.11ax products to solve multiple issues:

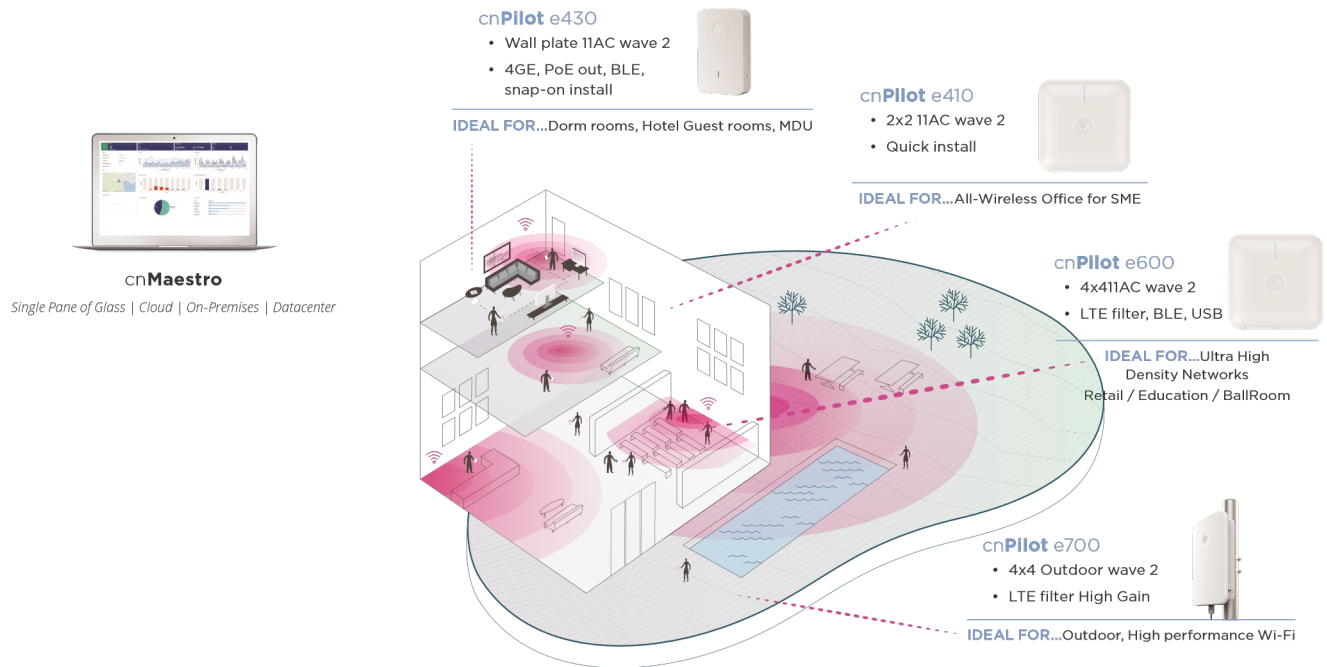
- The expected growth in streaming media coming in 2020 and 2021
- Massive growth in IOT devices in 2021 through 2023 using 802.11ax
- Adding layers of security and visibility to RF spectrum
- Deep visibility and control of applications and devices

When considering early release 802.11ax technology, service providers will need to note the state of the client and ecosystem support, interoperability, and high cost of pre- standard products.

By summer 2020, most mobile devices available will support 802.11ax – making it the standard for network upgrades to ensure fast, higher capacity networks that support mission critical applications.

## WIRELESS FABRIC FROM CAMBIUM

Cambium Networks delivers Enterprise grade Wi-Fi with Single Pane of Glass visibility to manage 802.11 Wi-Fi, Ethernet Switches, PTP, and PMP Wireless Broadband. Edge intelligent 802.11 access points are RF aware, provide Seamless roaming, and make intelligent decisions at the access point that is most impacted. Smarter networks support more devices and more content, at higher bit rates.



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