aruba
a Hewlett Packard
Enterprise company

WHAT IS 802.11AX (WI-FI 6)?

And why you need it

TABLE OF CONTENTS

INTRODUCTION

The demand for wireless access from users has shifted from a nice to have to a necessity. Due to this, network performance has become a business-critical requirement. Both workers and consumers have come to expect a reliable Wi-Fi connection – the absence of which can influence their decision to enter an establishment or to leave.

In order to attract and retain customers and employees, companies need to offer reliable Wi-Fi and an amazing experience, or risk losing business. And, to accommodate the growing number of mobile and IoT devices, improvements to the efficiency of a wireless network – and how it handles congestion and ever-increasing capacity demands has become a key factor of success.

SOLVING TODAY'S WI-FI CHALLENGES

A lot has changed in recent years. The growth and diversity of clients as well as the types of applications and traffic being generated meant wireless standards needed to evolve to keep pace. Latency sensitive voice and video traffic are sharing airspace with IoT devices that are sending small data packets – which will slow down a wireless network.

To solve this problem, wireless networks need to provide a more efficient way to handle this growing and diverse amount of traffic as well as bandwidth needs.

A NEW STANDARD IS NEEDED

The Institute of Electrical and Electronics Engineers (IEEE) and Wi-Fi Alliance have worked together to identify areas of improvement to the current standard (802.11ac). The conclusion was to focus on performance under "typical" conditions to holistically raise the performance of the entire network. This is a departure from the previous model – where the focus was to look at advanced peak data rates under "perfect" conditions.

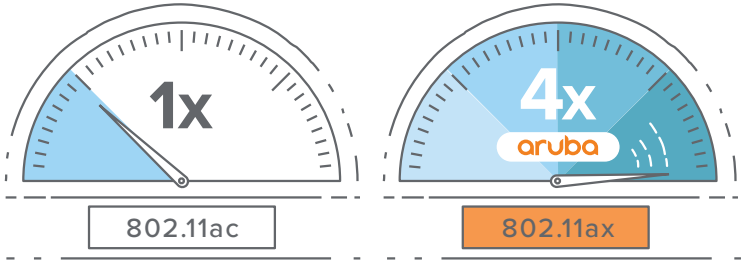
A new standard called 802.11ax was published in early 2018 and was recently renamed Wi-Fi 6 by the Wi-Fi Alliance. One of its main focus is to enhance the efficiency of how access points handle devices simultaneously. It's no longer about comparing Wi-Fi speeds; it's more about the capacity of the network to provide the optimal throughput for all clients.

Think of it as adding more lanes to a freeway, and each of these lanes is now an HOV lane. Using carpools or buses allows people to use the freeway more efficiently, and ultimately relieves congestion.

For the purpose of this document, we will use the 802.11ax nomenclature and illustrate how this new standard is most beneficial and what to consider in regards to short and long-term deployment timelines.

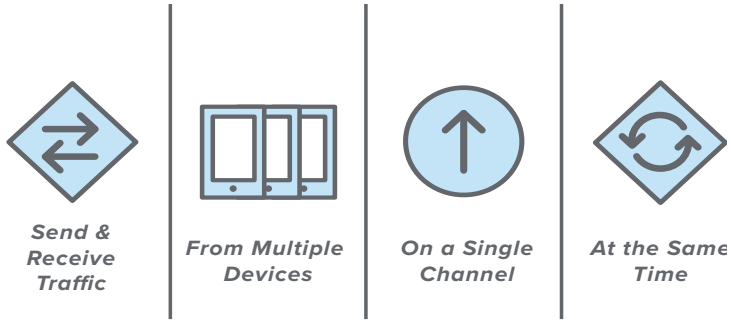
WHAT IS 802.11AX?

This latest standard addresses today's biggest Wi-Fi challenges: performance and the increasing density of devices and diversity of applications. To handle these challenges, 802.11ax increases throughput capacity by up to four times that of 802.11ac. Additional improvements include the ability to use both the 2.4 gigahertz (GHz) and 5GHz bands for a number of use cases.



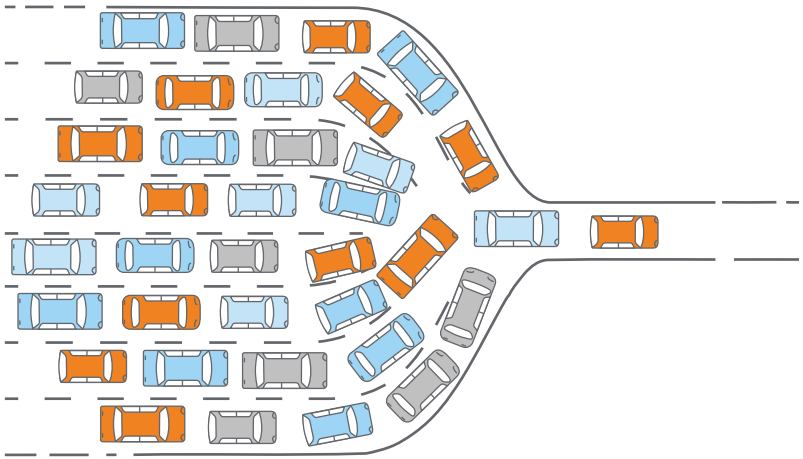
MULTI-USER PERFORMANCE

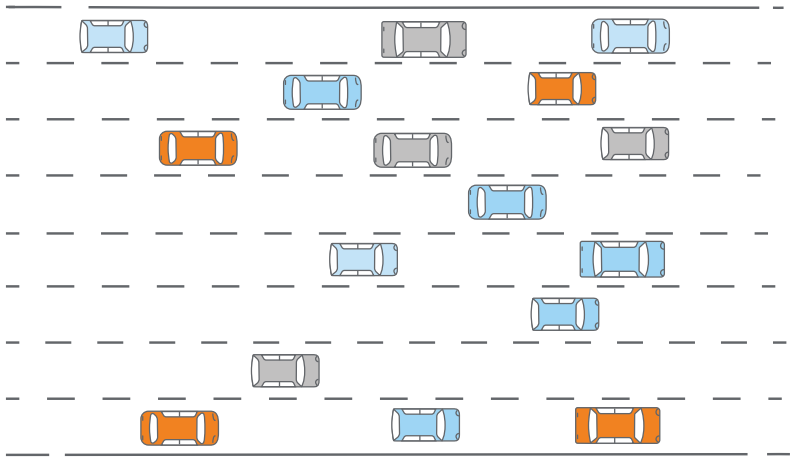
Arguably the most important new feature in the 802.11ax standard is an enhanced multi-user feature called **OFDMA (Orthogonal Frequency Division Multiple Access)**. Multiple devices with varying bandwidth needs can be served simultaneously instead of the existing model where devices compete with one another to send data. With 802.11ax there is no contention as each device is simultaneously scheduled to transmit data in parallel.



Handling data packets in this way improves performance, as a large number of packets – especially those that are latency sensitive such as voice traffic – can be transmitted simultaneously. In dense environments, instead of using a single vehicle to carry traffic, it's like using a carpool model. Traffic is pooled into a transport allowing for multiple conversations to happen at once. This allows access points to handle traffic from multiple 802.11ax devices more efficiently.

Multi-user Multiple Input/Multiple Output (MU MIMO) is another way to handle traffic from multiple devices that was originally introduced in 802.11ac. Within 802.11ax, this feature has been enhanced by allowing up to 8 devices to transmit simultaneously using a dedicated channel per device. This allows for large packets such as streaming HD video to be handled more efficiently, while shorter packets from IoT devices and voice traffic would be better handled using OFDMA.



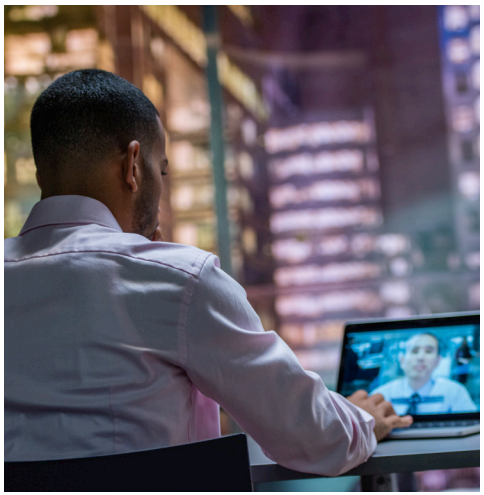


Device contention and the battery life of clients is enhanced by a feature called Target Wake Time (TWT), which lets devices remain inactive until it's their turn to transmit data using a scheduling scheme negotiated with the APs. Because devices can go into an inactive mode the battery life of smart phones, tablets and IoT devices is an underlying benefit. It's like parking a vehicle in the cell phone waiting area, rather than circling the airport for arrivals. There is less congestion, energy savings and an overall better experience.

IoT handling is also enhanced with an operating mode for low-power, low-bandwidth devices like sensors, automation and medical devices. This mode will separate these devices from an 802.11ax AP using a 20 MHz-only channel that works in either the 2.4 or 5GHz bands. Similar to providing a dedicated bike lane, but without the worry of low-bandwidth traffic interfering with latency sensitive traffic.

In summary, the efficiency improvements in 802.11ax amount to a faster performing network and enhanced user experience for all the clients on the network.

THE 802.11AX ADVANTAGE



Early in the development of 802.11ax, the primary use case was to enhance the efficiency of Wi-Fi in high-density environments, like large public venues. Unfortunately, so much of what was written to date is somewhat misleading. High density doesn't necessarily mean hundreds or thousands of Wi-Fi devices in a large auditorium, stadium or retail environment.

Depending on the devices and applications being used, twenty or more devices may be considered high density. While looking at offices, classrooms or warehouses, things to consider are:

- Types of devices and applications being used, especially video
- Responsiveness of applications over the current 802.11n or 802.11ac deployments
- Number of IoT devices that are visible and those that are not

In the past, video traffic was primarily wireless downlink traffic, but social, collaboration, telemedicine and eLearning applications are now generating enormous uplink traffic. Because streaming video requires low latency, IT must ensure that users are not seeing the dreaded "buffering" message, or worse. If the network is based on older 802.11n or 802.11ac standards, the introduction of 802.11ax comes at the perfect time – as it better utilizes both the 2.4 and 5Ghz Wi-Fi spectrums.

EVOLVING DIGITAL WORKSPACES AND SMART CLASSROOMS

The transition towards more seamless connections and integrated experiences in the workspace is happening at a pace that IT has never seen before. Mobility and BYOD are no longer a nice-to-have – they're a need to have. Users participating on conference calls are now competing for wireless bandwidth with temperature, lighting and location sensors, as well as surveillance cameras and audio-video equipment.

The increase in density, IoT devices, and smaller, time-sensitive packets is driving the need for more capacity. In fact, today many new IoT devices may only support 2.4Ghz connections due to cost sensitivity. Upgrading from older 802.11n and early versions of 802.11ac APs to 802.11ax APs provides the ability to enhance the performance of the network by the sheer nature of how it works. Devices will send and receive traffic simultaneously, and rules can be defined to ensure IoT traffic does not interfere with bandwidth intensive applications.

Examples of where 802.11ax provides an advantage:

Smart office spaces and manufacturing where 2.4GHz IoT devices will exist and authentication security is a concern

Healthcare environments where existing medical devices will remain 2.4GHz capable for the unforeseeable future

Environments like schools and technology organizations where mobility, voice and video traffic is more prevalent

Today in most organizations, users are more reliant on BYOD and IoT devices than ever before. Because of this, it's often difficult to optimize a network for just higher performing devices. The network must also accommodate older and newer devices. And with the increasing use of eLearning and collaboration applications, the Wi-Fi network must be able to handle large amounts of traffic to and from the cloud.

The number and type of IoT devices being brought into organizations may also affect network performance. Gaming consoles, TVs and medical devices must coexist with sensors and other IoT devices used to manage environmental controls, outdoor watering and power use. 802.11ax access points will allow these devices to fully utilize both the 2.4Ghz and 5Ghz Wi-Fi channels where appropriate.

QUESTIONS TO CONSIDER FOR 802.11AX

- Can you ensure all users have a good experience on your network across your entire campus?
- Are you implementing more applications that will support voice and video?
- As IoT devices are deployed, how prepared are you for their impact on business services?
- Because users connect from everywhere today, are you worried about network access security?
- Have you factored in future switching and PoE requirements?
- Are you ready for the density of Wi-Fi 6 and older devices that will be connecting to your network?

WHY ARUBA?

As organizations outfit new buildings or upgrade existing Wi-Fi deployments, the introduction of Aruba's 802.11ax access points will provide the performance and future proofing needed to deliver enhanced services for years to come. In addition to standards based 802.11ax features, the Aruba advantage includes AI and machine learning that automatically optimizes the network – regardless of user, IoT device or applications being used.

- **RF Optimization:** A unique feature within the Aruba wireless software called AirMatch uses machine learning to optimize channels, bandwidth and power needed to deliver a consistent user experience – no manual intervention needed.
- **Intelligent Traffic Control:** An additional feature within the wireless software called AppRF uses built-in deep packet inspection to allow IT to easily apply quality of service based on traffic, user and device type.
- **Intelligent Power Monitoring (IPM):** For environments where switches do not support PoE requirements of over 30 Watts per port, IPM allows 802.11ax APs to intelligently turn off preselected features until the switching environment can be updated.
- **Client Performance Optimization:** Aruba's patented ClientMatch feature automatically groups 802.11ax capable devices onto available 802.11ax AP radios, so that the performance to take full advantage of the benefits of OFDMA and multi-user capabilities.
- **Advanced Authentication Security:** While the 802.11ax standard does not specify any new security enhancements, Aruba's 802.11ax access points will include WPA3 and Enhanced Open, making open networks safer where guest access and shared passwords are used.

SUMMARY

If the density of mobile and IoT devices and video streaming apps are increasing within your organization, 802.11ax access points are what should be considered going forward. In addition to the 4X improvement gains compared to 802.11ac, backwards compatibility ensures that existing 802.11a/b/g/ac clients will be supported. And you'll be in position to support emerging 802.11ax (Wi-Fi 6) clients as they make their way onto your network.

This latest standard will not only deliver higher speeds, but will enable new business services and use cases, including:

- IT/IoT convergence and smart building deployments
- Real-time application support for enterprise-grade video collaboration and augmented or virtual reality
- Secure Wi-Fi within the enterprise and open networks

Aruba is changing the rules for delivering innovation-driven experiences by providing customers with a next generation network for today's new edge – one that's AI-driven, secure, and designed for mobile and IoT. It's the best of both worlds: amazing experiences with amazing simplicity.

Learn more at
arubanetworks.com/802.11ax

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