

Don't Let the New WLAN Standard Break the Bank or Your Wired Network

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Summary

The next generation of 802.11ac Wave 2 WLAN products will hit the market in 2015, but most enterprise environments don't warrant them yet. This research identifies what network decision makers should (and shouldn't) do to ready their networks and avoid unnecessary expenditures.

Overview

Impacts

In 2015, vendors will be releasing and promoting new 802.11ac Wave 2-capable products that will tout massive improvements in wireless LAN (WLAN) speed and capacity, but network decision makers should be wary of the hype.

Wave 2's increased capacity has a cascading impact on the wired switching infrastructure that network decision makers must plan for.

Wave 2 includes improved high-density WLAN capability via multiuser multiple input/multiple output (MU-MIMO) technology, which network architects can use to support highly transition-dense environments.

Recommendations

Enterprises running either 802.11n or 802.11ac Wave 1 should not take any action if their current solution is meeting business needs.

Avoid making premature, out-of-cycle wired switching or cabling upgrades, but do establish a long-term plan to support access interfaces beyond 1 Gbps.

In high-density WLAN environments, compare Wave 2 products with enhanced Wave 1 implementations that include client balancing across layered access points.

Strategic Planning Assumption

By the end of 2015, enterprises will be able to purchase 802.11ac Wave 2-capable access points from more than 65% of WLAN vendors, up from zero as of late 2014.

Analysis

The latest wave (Wave 2) of Institute of Electrical and Electronics Engineers (IEEE) 802.11ac WLAN products will begin showing up in enterprises in early 2015. Compared to Wave 1, new Wave 2 WLAN products provide organizations with two primary benefits:

Improved performance (see Table 1) with potential capability to support over 6 Gbps/user, up from 1.7 Gbps in 802.11ac Wave 1

Increased density to support simultaneous users per access point, enabled via MU-MIMO technology

Table 1. Wireless Standards, Availability and Bandwidth

Standard	Operating Spectrum	Products Generally Available	Theoretical Capacity
802.11g	2.4 GHz	2003	54 Mbps
802.11n	2.4, 5GHz	2009	450 Mbps to 600 Mbps
802.11ac Wave 1	5 GHz	2013	1.7 Gbps (2 X 2:1)
802.11ac Wave 2	5 GHz	2015 (Anticipated)	6.8 Gbps

Source: Gartner (January 2015)

Do I Need Wave 2?

In more than 1,000 enterprise client interactions with Gartner over the past 24 months, less than 1% of client environments needed more than an average of 5 Mbps/user of shared media access to adequately support business applications (see "Enterprises Should Optimize the Timing of 802.11ac Adoption" (<http://www.gartner.com/document/code/255400?ref=grbody&refval=2971817>)). Gartner currently encounters very few use cases where 802.11n or 802.11ac Wave 1 infrastructure would not provide adequate capacity in typical carpeted enterprise environments. The most common exceptions are for applications with large file transfers (i.e., medical images), graphics-oriented network printers, and high-transaction-density scenarios (e.g., stadiums and concert venues).

Improved Wireless Density

802.11ac Wave 2 addresses the aggregation of many users into a coverage area served by a single access point without requiring deployment of additional access points. In these highly dense environments, MU-MIMO allows the access point to communicate to up to four client devices simultaneously.

What About the Wired Network?

The introduction of 802.11ac Wave 2 is a watershed moment, representing the first time that WLAN signaling rates are faster than typical wired network connections. This creates a theoretical bottleneck in the wired infrastructure between Wave 2 access points (APs), their associated wired 10/100/1000 switches and the switches' associated uplinks. However, this mismatch typically doesn't result in any degradation for most enterprise use cases with common bandwidth oversubscription rates of up to 8:1.

The majority of deployed campus cabling runs do not support speeds beyond 1 Gbps. Thus, two vendor alliances have been formed to introduce standards that enable multigigabit transmission (2.5 Gbps and 5 Gbps) across existing Cat 5e and Cat 6 cabling infrastructure (See Note 1). However, due to the existence of two alliances and the timing of the standards process, it could be YE16 before these efforts produce commercially available, standards-based solutions.

Figure 1. Impacts and Top Recommendations for Network Designers

Impacts

Top Recommendations

<p>In 2015, vendors will be releasing and promoting new 802.11ac Wave 2-capable products that will tout massive improvements in WLAN speed and capacity, but network decision makers should be wary of the hype.</p>	<ul style="list-style-type: none"> • Enterprises running either 802.11n or 802.11ac Wave 1 should not take any action if their current solutions are meeting their business needs. • When purchasing WLAN solutions, focus on differentiation beyond "speeds and feeds," instead looking to management, network service applications, and price.
<p>Wave 2's increased capacity has a cascading impact on the wired switching infrastructure that network decision makers must plan for.</p>	<ul style="list-style-type: none"> • Avoid making premature, out-of-cycle wired or cabling upgrades simply to account for the capabilities of Wave 2 equipment. • If feasible, extend the life-span of currently deployed access switches while awaiting economically viable and standards-based 2.5 Gbps/5 Gbps access layer offerings. • At the next required refresh cycle, purchase wired switching products that can or will support access interfaces beyond 1 Gbps.
<p>Wave 2 includes improved high-density WLAN capability via MU-MIMO technology, which network architects can use to support highly transition-dense environments.</p>	<ul style="list-style-type: none"> • In high-density environments, compare Wave 2 products with enhanced Wave 1 implementations that include client balancing across layered access points.

Source: Gartner (January 2015)

Impacts and Recommendations

In 2015, WLAN vendors will be releasing and promoting new 802.11ac Wave 2-capable products that will tout massive improvements in WLAN speeds and capacity, but network decision makers should be wary of the hype

In early 2015, wireless LAN vendors will start shipping and promoting 802.11ac Wave 2 products. We anticipate vendors will price these products at a 20% to 30% premium over existing 802.11ac Wave 1 APs. While sheer throughput benefits are unique to Wave 2, most other enterprise requirements can be addressed without Wave 2 technology. Further, a very limited number of endpoints can currently leverage these technological improvements.

For most organizations that do not require the additional throughput, no action is required if existing 802.11n or Wave 1 APs are meeting current business requirements. However, that will not stop vendors from promoting Wave 2 products at the associated price premium. If your organization is planning a WLAN refresh or build-out, stress to potential WLAN vendors that there is no functional need within the next 24 to 36 months for the additional capability provided by Wave 2. Thus, as vendors aggressively promote Wave 2 technology, network architects should either purchase 802.11ac Wave 1 products or push their vendors to sell Wave 2 products as a future proofing option but with no price premium.

Due to limited enterprise usage scenarios, we anticipate that once Wave 2 products are out for six to 12 months, vendors will agree to provide their capability at Wave 1 costs, similar to the transition from 802.11n to Wave 1.

Further, instead of focusing on "speeds and feeds" as differentiators during product selection, organizations should look to management, provisioning and unified access when making WLAN investments (See "Critical Capabilities for Wired and Wireless Access Infrastructure" (<http://www.gartner.com/document/code/262826?ref=grbody&refval=2971817>)).

Recommendations:

Enterprises running either 802.11n or 802.11ac Wave 1 should not take any action if their current solutions are meeting their business needs.

When purchasing WLAN solutions, focus on differentiation beyond "speeds and feeds," instead looking to management, network service applications, and price.

Wave 2's increased capacity has a cascading impact on the wired switching infrastructure that network decision makers must plan for

The introduction of Wave 2 APs increases the potential for oversubscription between the Wireless Application Protocol (WAP) and wired infrastructure. Thus, we anticipate the following:

Networking vendors will promote and recommend campus access switches with multigigabit interfaces to provide AP connectivity, including 2.5 Gbps, 5 Gbps and 10 Gbps.

Cabling vendors will promote and recommend campus cabling upgrades.

However, because most enterprise users will not need the increased WLAN capacity associated with Wave 2, the wired network will not be overly stressed either. Although Wave 2 WAPs provide much more capacity to clients, users don't need it in most situations. Furthermore, although Wave 2 APs provide greater bandwidth, the radios in most existing smartphones, laptops, tablets or other clients still use earlier radios and/or don't support speeds anywhere near Wave 2's theoretical maximum. Finally, although many high-end smartphones introduced since late 2014 include 802.11ac Wave 1 capability, many do not support Wave 2 MU-MIMO.

Thus, oversubscription on the WAP to wired switching infrastructure should not be a concern for most enterprises prior to 2018. In addition, multiple vendor alliances are developing standards for 2.5 Gbps and 5 Gbps transmission over existing cabling. Thus, we do not recommend out-of-cycle access switching and/or cabling upgrades for the sole purpose of supporting Wave 2 WAPs.

However, the relatively long wired campus switching life cycle (i.e., six to 10 years; see "Know When It's Time to Replace Enterprise Network Equipment" (<http://www.gartner.com/document/code/235400?ref=grbody&refval=2971817>)) combined with ever-increasing bandwidth demands (See Note 2) does require planning. Organizations *should* establish long-term plans to support access speeds beyond 1 Gbps in their environments. This can be accommodated in several ways including (a) delaying wired campus refresh activities while the 2.5 Gbps and 5 Gbps standards evolve or (b) ensuring that wired switching products purchased in the near term are software-upgradable to 2.5 Gbps/5 Gbps.

Recommendations:

Avoid making premature, out-of-cycle wired or cabling upgrades simply to account for the capabilities of Wave 2 equipment.

If feasible, extend the life-span of currently deployed access switches while awaiting economically viable and standards-based 2.5 Gbps/5 Gbps access layer offerings.

At the next required refresh cycle, purchase wired switching products that can or will support access interfaces beyond 1 Gbps.

Wave 2 includes improved high-density WLAN capability via multiuser multiple input/multiple output (MU-MIMO) technology, which network architects can use to support highly transition-dense environments

Wave 2's MU-MIMO is a breakthrough in functionality, particularly in high-density environments. Historically, all WLAN standards have only allowed for one access point to communicate to one device at any one time. MU-MIMO allows up to four simultaneous communications, which effectively quadruples the communication throughput in the coverage area. The result is that MU-MIMO provides the largest benefit outside of typical carpeted enterprise, for high-density use cases, including:

Arenas and stadiums

Concert venues

Conferencing or convention centers

Areas such as auditoriums or lecture halls where hundreds of people will be in a small area

Nursing stations in hospitals where nurses and doctors could each potentially have two to three individual devices including patient point of care devices and voice over wireless LAN (VoWLAN), pagers, in addition to carts on wheels and IoT sensors or beacons

However, we advise caution to enterprises because the implementation of MU-MIMO functionality is vendor-specific and thus outside the purview of the IEEE's 802.11ac specification. Further, 802.11ac Wave 1 can address high-density requirements via the usage of client load-balancing across layered access points.

Recommendation:

In high-density environments, compare Wave 2 products with enhanced Wave 1 implementations that include client balancing across layered access points.

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Enterprises Should Optimize the Timing of 802.11ac Adoption" (<http://www.gartner.com/document/code/255400?ref=ggrec&refval=2971817>)

"Magic Quadrant for the Wired and Wireless LAN Access Infrastructure" (<http://www.gartner.com/document/code/261463?ref=ggrec&refval=2971817>)

"Critical Capabilities for Wired and Wireless LAN Access Infrastructure" (<http://www.gartner.com/document/code/262826?ref=ggrec&refval=2971817>)

"Market Share: Enterprise Network Equipment by Market Segment, Worldwide, 3Q14" (<http://www.gartner.com/document/code/270854?ref=ggrec&refval=2971817>)

"Toolkit: RFP Template for Wireless LAN" (<http://www.gartner.com/document/code/232678?ref=ggrec&refval=2971817>)

Evidence

Over 1,000 client interactions regarding WLAN within the past 18 months

Discussions with leading wired and WLAN vendors regarding their road maps for 802.11ac Wave 2-capable infrastructure

Reference surveys conducted for "Magic Quadrant for the Wired and Wireless LAN Access Infrastructure" (<http://www.gartner.com/document/code/261463?ref=grbody&refval=2971817>) (n=114)

IEEE 802.11ac Specification (<http://standards.ieee.org/getieee802/download/802.11ac-2013.pdf>)

MGBase-T Alliance (<http://www.mgbasetalliance.org/>)

Nbase-T Alliance (<http://www.nbaset.org/technology/what-is-nbase-t/>)

802.11ac-capable hardware (https://wikidevi.com/wiki/List_of_802.11ac_Hardware)

Note 1

Industry Alliances to Support 2.5 Gbps and 5 Gbps Connectivity Over Existing Cabling Runs (as of December 2014)

1 The MGBase-T Alliance (<http://www.mgbasetalliance.org/>) includes Brocade, Aruba, Avaya, Broadcom, Extreme Networks, Ruijie Networks and others.

2 The Nbase-T Alliance (<http://www.nbaset.org/technology/what-is-nbase-t/>) includes Aruba, Brocade, Ruckus, Cisco and others.

Note 2

Project Bandwidth Growth

We anticipate bandwidth utilization to increase an average of 28% CAGR thru 2017 (source: "How Cloud, Mobile and Video Will Increase Enterprise Bandwidth Needs Through 2017" (<http://www.gartner.com/document/code/247697?ref=grbody&refval=2971817>)).

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