

Enterprise Networking

The Future of Wireless: Preparing For 802.11ac While Optimizing Your Current WLAN

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■ Analytical Summary

Enterprise campus access technologies have been wired since the advent of personal terminal computing. With the advent of 802.11 and the advances in radio technologies over the last 10 years, solutions have emerged that provide wired like functionality via a wireless connection with the freedom to move about the campus. Since the introduction of 802.11a (54Mbps), evangelists have touted WLAN as a means to unlock efficiencies and worker productivity, provide a simpler support schema for IT, and ultimately reduce CapEx by eliminating the need to repeatedly upgrade access cabling every time an evolution in switch technologies occurs.

802.11n (up to 450Mbps) provided the first truly wired-like performance for users with throughputs equal to or exceeding 100Mb cabled performance. In addition, 11n provided radio range and coverage via MIMO (Multiple In, Multiple Out) which was frustratingly short in a/b/g, vastly simplifying access point radio coverage and providing users with a wired like experience which encouraged many to no longer tether their clients even when they were at their desk. This system capacity coupled with the volume of devices being brought into the enterprise today (smartphones, tablets, etc.) has created a WLAN demand that exceeds that of any predictions 5 years ago. Consider too that there is an expectation that like water or electricity, WLAN is becoming a utility that will simply be available everywhere.

Now enterprise IT and WLAN vendors alike are racing to increase WLAN system capacity, improve radio coverage, embed intelligent algorithms which mitigate radio interference (impacting experience and client throughput), and preparing for the future. With smartphones and tablets possessing only a wireless radio and more enterprises embracing a laptop or tablet-only support model (eliminating desktops all together) enterprises are faced with the near certain reality that the vast majority of campus access connectivity will be WLAN within the next couple of years. Consider the implications that potentially **all** traffic including video, client backups, voice, and much more will be running on the same shared airwaves and it becomes clear that if the proper consideration, planning, and investment is not made today in respect to the WLAN, tomorrow's congested network could impact everyone.

Armed with this knowledge enterprise IT today should continue to invest in 802.11n solutions and when 802.11ac begins to ship commercially customers can leverage and take advantage of the improved performance as clients and business needs dictate. The key will be to have a plan in place and know what traffic currently runs on WLAN today and what will be added tomorrow.



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■ Current Perspective

There is no question that the modern WLAN has grown into an indispensable service for businesses everywhere. With employees and customers alike using the WLAN for both business and personal use, it has become a service that could be equated to power or water in the sense that user expectations continue to rise and that it will simply be available wherever they are. Some studies recently have indicated that they'd rather lose power in fact than their network access. This has created quite a challenge for IT as the architecture for a business critical service (WLAN) is different than a best effort "nice to have" capability which doesn't need to be designed for resilience and performance. In addition, access to these networks must be simple, as users unable to connect either cannot perform or create trouble tickets which are costly and time consuming to address. Smart phones, tablets, laptops and more are connecting to corporate networks at a dizzying pace. With the average user possessing 1-3 devices today, projections are the average will increase to 3-5 within 5 years. The rate of change of these devices is also far more expeditious than that of the corporate laptops three year refresh cycle. Most of these devices possess no Ethernet port and therefore are going to further tax the WLAN. This is all the more reason to consider the current architecture and prepare for both additional capacities if it has not already been built in, and to look to the future and predict evolving needs.

The history of the enterprise network is directly correlated to the efficiencies of the workstation and richness of applications running upon it. From hundreds to a few kilobits initially on a shared network, to dedicated high speed connections clients become more and more capable due to advances in both network performance, server side processing evolution, and distributed applications. In the last decade workers have grown increasingly mobile and enjoyed significant productivity increases as a result. The key enabling technology within the enterprise for this has been the wireless local area network (WLAN.) The ability to connect securely from anywhere on campus whether you're an entitled employee or a guest just visiting opened a new way to look at worker efficiency and productivity. In addition, WLAN has solved several problems in other applications such as warehouse control and inventory systems to prevent shrinkage, and as a marketing tool for airports or coffee shops to improve the customer experience; enticing further purchases or visit frequency & length. However, this didn't happen overnight.

Early WLAN networks had connectivity challenges, significant radio interference, and other inhibitors which often frustrated and had users searching for a cabling drop. 802.11a (5Ghz only) never really gained the attention or respect it deserved due to cost and the lack of WLAN awareness in the enterprise. However, it ultimately provided a glimpse as to what this technology could offer. Enterprises began to seriously evaluate and invest in WLAN with the release of 802.11b/g (2.4GHz), which brought a reasonable price point, improved performance, and perhaps equally important was that during this time the most significant number of security enhancements were introduced by vendors. Now is the time to evaluate your wired and wireless systems and determine what investments are required and when the right timing is for that (this is not to say wired disappears tomorrow, or even next year, but over the next decade wireless access will become the de facto choice everywhere)

Specification

The design specification for 802.11ac may have begun before the storm of devices assaulted WLAN's everywhere, but it is clear that this is the first WLAN specification that is being developed with the insight of



device burdens clearly outlined. Distance, interference mitigation, connection resilience, roaming, system availability are all factors of consideration for 802.11ac. With the initial release including the ability to connect a client at rates up to 1.3Gbps eventually scaling up to 6.9 Gbps, this is the first WLAN specification built to exceed the performance of the desktop connectivity solutions in the market. Initial product availability for enterprise-class infrastructure devices like Access Points is slated for early 2013 though the standard itself is still floating from early to mid 2013. It is important to note that while the specification states that 1.3Gbps is the maximum throughput achievable at the physical layer (PHY) in the first iteration, actually seeing that occur is going to be next to impossible. In most cases, 850-900Mbps is the best case for clients, but more on that next.

Real Wireless Throughput

In a perfect world, the 1.3Gbps throughput would be what every client experiences and frankly would make system planning and design so much easier. However, in the real world there are interference sources ranging from phones to microwaves to fluorescent lights and even the sun. Each of these signal sources introduces WLAN “noise” which in turn affects both performance and range of the WLAN connection. It is because of this that several vendors have invested significantly in “signal clarity” or noise suppression technologies. With these, customers have fewer concerns about intermittent or permanent signal disrupters, as they run sophisticated algorithms in many cases which actively work to improve the client connections. What does this mean? While the specification states that 802.11ac is theoretically capable of 1.3Gbps, that is unlikely achievable even with the client adjacent to the AP. Not to worry though, as these suppression techniques will still yield significant (3 to 4x) performance increases over the existing 802.11n experience resulting in 600-900Mbps throughput as the most likely experienced of 802.11ac adapters.

The other benefit of 802.11ac is a significant improvement in battery life as a unit of data can be transmitted or received in a much shorter period of time, also freeing up airtime for other users.

Access Points

The access point (AP) is the most visible and most variable device in the WLAN system. With one or two radios, one to four antenna, cases that range from simple to hardened weatherproof ones, nearly all with the ability to be powered by a local power source (AC or DC) or via Power over Ethernet (PoE) customers have an array of options to fulfill any site need or system design criteria. Couple these with highly capable and specialized antenna and the flexibility increases even further. Additionally a new offering that may gain further traction is the ability to add modules which enhance the access point beyond the internal compute or embedded capabilities. The access point has evolved considerably since its introduction and continues to do so. Though 802.11ac brings nothing radically new initially, given its capability to support up to eight antennas it is possible to envision some interesting new AP’s and even deployment models emerging as a result. Another important element to note is that the 802.11ac runs solely within the 5Ghz band. As a result to maximize coverage and ease client transition most 802.11ac-capable APs will likely be dual radio as well (2.4GHz and 5GHz) in order to support the large installed base of older clients 802.11b/g/n (2.4GHz) and 802.11a/n/ac (5GHz).



What About Ethernet?

A common question that is raised for those more aware of the implications of a 1+ Gbps WiFi connection is what, if anything, do I need to do or be concerned about given my AP's all connect via 1Gb Ethernet links. There are no 10GBase-T access points today, nor is there likely to be for a while (if there ever will be). So how do you connect and handle the traffic which could hit 1.3Gbps in the first release, eventually reaching nearly 7Gb as the 11ac specification rolls out? The reality is that a well architected wired network will remain necessary for the foreseeable future as it won't make sense to try and support every device via wireless and indeed some would be challenging or impossible to connect anyway (e.g. printers that do not have WLAN adapters, nor drivers to support.) For the next two to three years at least a 1GbE connection is all that will be required for most 802.11ac AP's given the real world WLAN throughput experiences relative to the specification. However, even though a 1Gb connection will suffice for the AP, consider that in many scenarios several access points are aggregated through a single PoE switch in a closet. Clearly two, three, or four 1GbE ports will potentially be congested should the WLAN experience heavy loads. Thus, now is the time to consider a simpler architecture as well as a 10GbE aggregation model from the access edge to the core if it's not already in place to accommodate both the increasing traffic demands being placed on networks as well as to prepare for the future.

What About My 802.11n Investment?

Customers need not pause their existing 802.11n WLAN deployments as 802.11ac isn't available yet, and many will find 802.11n sufficient to support their immediate access throughput and capability needs for the foreseeable future. 11ac won't disrupt 11n as significantly as 11n disrupted 11g which is very good news for customers and the market alike. In addition, customers should be planning higher densities for AP deployments, moving from the AP every 10,000 square feet model to one every 2500 square feet to maximize both network capacity and location accuracy.

Mobile Security Remains a Concern

WLAN does not expose an environment in and of itself anymore than the wired environment did previously. However, recall the number of devices which are solely connecting via wireless, and the fact that many of those devices are not owned, managed or supported by corporate IT departments and it becomes easy to see how the environment may be exposed to malicious agents or tools that were inadvertently installed by the user and may not be riding the WLAN airwaves inside the corporate environment. Couple this with the fact that these smart devices possess computing power equal to or exceeding that of laptops just a couple years ago and you can see the growing threat presented. This is the basis for the Mobile Device Management (MDM) industry movement and has become a hot topic of discussion over the past year. It is important to note though that 802.11ac does not change this battlefield and that the risk has been ever present since the introduction of consumer devices onto the corporate network. This is further compounded by the fact that these devices run many different versions of operating systems and therefore requires a broader, more comprehensive approach than one in which an all Windows environment is managed. One method is to treat these devices as any other guest device with a segregated segment that is exclusively internet access. Another is to administer and distribute devices to the users only allowing approved; supported devices access the secure environment.



However, the increasingly popular and likely long term winner is to employ a set of tools which either runs a shell on the device isolating user data from corporate data, or a remediation toolkit which is in essence a corporate agent running on the smart device offering both security and other factors of convenience such as remote locate and remote wipe. Suffice to say, in the increasingly inevitable all mobile world, device security will become more and more critical.

The Future

802.11ac brings solutions to some remaining WLAN hurdles (highly dense client environments, performance, and even more granular location controls.) There is no time like the present to assess and plan for wired infrastructure improvements where necessary to optimize the inevitable wireless access model. 802.11n remains a great WLAN technology and will for years in most use cases, therefore no reason to tap the brakes on investments in 11n upgrades today, but plan for higher densities of access points for both capacity and location accuracy. 1GbE links will suffice for connecting first generation 11ac AP's, no need to re-cable yet, though if new cabling is being considered it would be wise to consider multiple links or Category 6a cabling to the AP location to prepare for this eventuality.

Use cases

Imagine shopping at a mall where, when you walk into a particular store, you're provided with a great competitive deal at a similar shop across the hall saving you 20-30% on an item you were committed to buying. This is a use case where location accuracy will pay business dividends. The implication is that in the backend, big data processing determined through your buying habits, loyalty cards, or other means what you were seeking and acted in real time to change your behavior. High density WLAN coupled with location based services will enable that.

Standing in line at an event ticketing vendor for hours eventually results in priority queuing when you frequent a particular venue, often further encouraging more frequent visits and rewarding loyalty (adding the time element measure to the loyalty weighting.)

Bookstore competitive response where customers walk into a store to get hands on a book, but perhaps then price shop online which results in an instant competitive price match without the hassle of requesting store management engagement.

■ Near-Term Drivers

- As more and more users employ multiple devices in their workday, each of these new devices demand connectivity of some type. The most manageable, economical, and secure of these is WLAN (3G/4G provides security too, but the economics are prohibitive to support everyone in an enterprise). Many enterprises had not designed their WLAN systems for more than a 1:1 device/employee ratio and therefore as these devices exceed that ratio, ultimately increasing perhaps as high as 5:1, the WLAN systems must expand to keep pace and be designed for capacity vs. coverage.
- With the first release of 802.11ac a client with a single radio, in an ideal scenario, could achieve as much as 1.3Gbps throughput. This is well beyond the average users performance needs and is close enough to



the gigabit links many power users have at their desk to offer those users an alternative too. Bearing in mind that this is merely the first release of 802.11ac and that with the successive enhancements 802.11ac is capable of nearing 7Gbps of throughput. Multi-user MIMO will provide further enhancements where multiple clients can be served simultaneously, vs. one at a time with 802.11n and the first generation of 802.11ac.

- Virtual Desktop Infrastructure (VDI) is a natural complement to these smart devices and provides access to a robust, secure, repeatable user experience whether users access their workspace via phone, tablet, or laptop. VDI adoption rates grow as management and economic models prove out VDI's simplicity and ease of deployment. This places additional demands on the WLAN if you can envision a login storm at 8:00am when employees first arrive. Couple this with video delivered via VDI and you can see that the burden could easily drive an enterprise to consider WLAN investments.

■ Competitor Response & Recommendations

- Cisco's 3600AP is the first commercial access point to provide dual radio .11n connectivity today with an upgrade path to .11ac. This offers Cisco the unique and attractive story to provide customers who want the assurance that their investments today will still be of value once .11ac arrives (and beyond).
- Every vendor should consider taking a position and begin courting their installed base in addition to generating interest in respect to the next generation WLAN access solutions. Where wired environments interoperate fairly nicely in many cases, WLAN does not and therefore a multi-vendor WLAN is not an option. Therefore, whoever wins the initial 11ac bid will likely retain account control for the next several years barring any significant issues.
- MDM is as much a device strategy as a toolset which requires guidance from thought leaders in the industry. WLAN system vendors would be wise to either accelerate their "MDM-Like" capabilities or articulate their own vision for this management issue as those who do not will find themselves at a disadvantage vs. those competitors who have a more robust message – that will resonate with enterprise buying centers.

■ Recommended Buyer Actions

- 802.11n capable of meeting client performance needs for additional 2-3 years in most cases, no need to rip and replace or even pause investment, but do plan for capacity vs. coverage and consider the opportunity for location based services enable by WiFi. In addition, only the most demanding power users will see a noticeable improvement with the first release of 11ac as the device support will ramp over the next twenty four months with legacy devices having an estimated working life of 4 years.
- Location based services embedded within WLAN will evolve our architecture consumption from one of merely utility access to one of services enablement, perhaps even revenue opportunity in some instances. This capability changes the IT mindset from one of being a cost center to that of enabling customer retention / account management at minimum or even profit center potentially.



- Wireless “noise” suppression technologies are becoming crucial when considering WLAN solutions as the interference in today’s enterprise and commercial workplaces has increased to a point that performance and productivity are impacted. Coupled with the volume of devices connecting simultaneously and it creates a scenario where user performance suffers.
- Wireless architecture advances in the last two years provides for “wired-like” performance, including resilience. Ensure the system possesses the ability to do fast fail-over in the event of a controller or peer AP failure to minimize connectivity disruption.

