

802.11n

Challenge

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Produced by
Layland Consulting, Joanie M. Wexler &
Associates, and Webtorials



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THE CHALLENGE SERIES

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The Case for Draft 802.11n

Criteria to Consider When Evaluating Suppliers

Why Is 'N' Hot?

Wi-Fi networks have grown indispensable. Many workers are away from their desks more often than not, and Wi-Fi is the glue that connects them to their corporate networks. The glue is only going to become more important as smart phones and other devices increasingly ship with Wi-Fi connections. Workers have come to consider reliable Wi-Fi access a right and a necessity.

Capacity is one challenge network managers face in continuing to deliver robust Wi-Fi connectivity. New bandwidth-hungry multimedia applications running on laptops and slick new smart phones, combined with general growth in overall wireless usage, will soon cause legacy 802.11a/g networks with 54Mbps connect rates to run out of steam. The strategy of putting more access points (APs) into the building is also running on empty when it comes to widely deployed 802.11g networks. Having just three non-overlapping channels available in 802.11g's 2.4GHz frequency band severely limits the ability to add APs to gain capacity, because co-channel interference quickly arises.

The challenge grows as voice joins the Wi-Fi network, thanks to the rise in availability of both dual-mode Wi-Fi/cellular and single-mode Wi-Fi phones. Using Wi-Fi for voice within the building is desirable to some companies for routing calls over the existing telephone infrastructure and reducing cellular charges. The problem is that most legacy Wi-Fi networks were not built with voice in mind. A high-performance Wi-Fi network that can prioritize voice is needed to make voice-over-Wi-Fi applications work. Greater capacity is required not because voice calls inherently take up a lot of bandwidth but because they persistently consume airtime while calls are underway. This gives data clients fewer opportunities to transmit across the shared medium.

Compounding the problem is the rise of video. Video collaboration is finally coming to the corporate workplace. Travel budgets are being slashed and with it the face-to-face meetings needed for optimum productivity. Video collaboration is the solution, and once workers get used to it, there is no going back. Once people realize that many of the collaborative and conferencing applications work over the Wi-Fi network, they are going to use it.

All these conditions begin to build a case for deploying the latest emerging Wi-Fi standard: Draft 2.0 802.11n. Draft N, as it is commonly called, provides a big boost in performance. Generally, it provides up to 300Mbps data connect rates per radio in a given AP. Most APs have two radios, and some vendors have added a third. Some architectures even feature an array of many radios offering aggregated connect rates of multiple gigabits per second. So, although it uses a shared, rather than a switched access medium, Draft N is capable of meeting the needs of users whose wired connections are typically 100Mbps today.

By Robin Layland
President
Layland Consulting



By Joanie Wexler
Analyst/Editor
Joanie M. Wexler
& Associates



Technology Basics and Background

Both enterprise- and consumer-class products on the market at the time of this writing are based on Draft 2.0 of the 802.11n standard. On paper, the standard has reached Draft 7.0. However, most equipment makers believe that the substantive standards work has been incorporated into Draft 2.0, which they consider stable enough for enterprise deployment. A number of organizations with 802.11n's bandwidth requirements – most notably, universities and healthcare organizations – have already made business cases for the Draft 2.0 N products and have deployed them.

While it works both in the 2.4GHz and 5GHz bands (for backward compatibility with earlier networks), 802.11n's focus is on the 5GHz band for achieving maximum throughput. The 5GHz band contains many more non-overlapping channels than the 2.4GHz band; up to 12 in the U.S. and 23 worldwide. The 5GHz band can thus support a Draft N standard called channel bonding, which involves combining two 20MHz channels for 40MHz capacity. Channel bonding is a key contributor to 802.11n's greater bandwidth potential. Draft N can also support denser deployments for additional capacity in the 5GHz range because of the greater number of channels.

In Greenfield, remodeled and transitory deployments, Draft 802.11n is beginning to replace wired access infrastructure entirely. Its high speed means that it can provide wired-like response time. Its throughput supports common applications such as email with large attachments and collaborative applications, including conferencing.

Enterprises can save money by removing wired connections at user workstations and letting employees use Wi-Fi all the time. Doing so not only eliminates the wiring but the cost of the computer's cabled port on the switch. Note that each Wi-Fi AP will require at least one port switch in a traditional, non-mesh Wi-Fi network; two ports are needed if dual homing is used as a high-availability technique. A given AP, however, supports upwards of 20 users, so the cabling is reduced by a ratio of at least 20:1. In Wi-Fi mesh networks, even fewer AP switch ports are required because most APs communicate directly with one another over the air.

Our Challenge to the Industry

To help you evaluate which potential 802.11n vendor is the right fit for your organization, we have brought together a number of leading enterprise-class Wi-Fi vendors: Cisco, Enterasys (formerly Siemens), Trapeze, Proxim Wireless, Xirrus and Motorola. All these companies sell Draft 2.0 802.11n products, and we have challenged them to explain to you why they should be your 802.11n vendor. Obviously, every network has a unique set of problems, and the vendor responses here can't address every possible nuance. But the responses to this challenge should save you time and work by providing you with each vendor's direction, strengths and primary value proposition.

We did not ask the vendors to justify why 802.11n should be deployed. We hope we have given you a flavor for that already. Instead we have asked them to explain what sets their solution apart from their competitors'. While we asked each vendor to highlight their strengths and differences, there are key issues that you should be aware of. We did not ask the vendors to address all the issues, because space would not have allowed it. But it is important that you know about them. We have outlined many of them below.

Part 2 of this challenge will involve a series of multivendor panel discussions among the participating vendors that we will moderate. These will be available at no charge in Webcast (audio) format at the Webtorials site in March 2009. A number of the evaluation issues outlined below will be discussed in more depth during these sessions.

Key Evaluation Criteria

There are a number of issues to consider when evaluating and selecting a Draft N Wi-Fi vendor:

- **Architecture.** Depending on your perspective, a vendor's architecture might be a deal-breaker or not very important at all. In general, Wi-Fi architecture – how the system is designed to work – is what enables vendors to supply you with the performance and scalability that they advertise. For some, so long as the products perform in accordance with vendor claims, how they work is less important. For others, belief in a given architecture as being perhaps the most scalable, secure, highly available or incurring the least amount of delay and congestion might land a given vendor on their RFP short list.

Several years ago, the large scale of looming enterprise deployments drove most of the industry to move from distributed, individually managed APs to an intelligent centralized controller with “thinner” (less intelligent) APs for simpler management and provisioning. However, now that Ethernet-like speeds are available and businesses plan to replace wired links with wireless, the distributed vs. centralized issue has again reared its head.

One worry is that backhauling all management information and data through a centralized controller might clog high-bandwidth Draft N networks at the controller. It might also create delays as users roam from one AP to another – particularly if the APs are connected to different back-end controllers that don’t share user authentication information. As such, equipment suppliers are coming out with various balances of fully distributed or partially distributed solutions.

With a distributed solution, each AP has the ability to directly hand the call over to the next AP, cutting out the step of going to the controller. A distributed approach also eliminates the problem of a single controller failure since each AP contains its own built-in controller.

The 802.11n vendors supporting a centralized approach also make good arguments. One of the problems with a distributed approach is the size of the VLANs. Seamless roaming with a distributed approach requires the VLAN to cover the entire Wi-Fi network, complicating implementation and management. Controllers ease this issue.

Regardless of their balance of distributed and centralized functions, all vendors agree that management and provisioning of APs must remain centralized for wireless LANs to scale. Otherwise, each AP would have to be touched individually every time there was a patch or management update. And several vendors now offer a hybrid approach, whereby certain functions and traffic are distributed, while others are centralized.

- **Throughput.** While Draft 802.11n generally offers 300Mbps connect rates per radio, vendor products differ in the actual throughput they deliver. The number of radios and how they are deployed are considerations, though most vendors base their equipment on the same chipset and reference design from a common supplier (Atheros). To create more predictable, Ethernet-like consistency in transmissions, some vendors offer so-called airtime fairness algorithms or any of a number of types of beamforming to manage a mix of client types. Throughput between 150Mbps and 170Mbps per radio is currently considered respectable.
- **Power Requirements.** Can the Draft N AP work with the power provided by 802.3af, today’s power-over-Ethernet (POE) standard? This is not entirely a yes-or-no question. All the Draft N APs on the market work to some degree with 802.3af. With some, however, you need to turn off certain features or operate just one radio. Or you can use alternative power sources (including pre-standard 802.3at power injectors) to get the full functionality of the AP. It’s best to know the score going in.
- **Frequencies.** Consider whether the products operate in all available 5GHz frequency bands allowed in the U.S. and elsewhere. If optimum channel support and worldwide deployment are important to you, you’ll need to check that the products have been approved by the Federal Communications Commission and other world regulatory bodies for use in frequency bands also used by military radar in each country.
- **Voice and Video.** Does the gear support any particular schemes beyond the 802.11e quality of service (QoS) standards to optimize real-time voice and video sessions?
- **Security.** Beyond 802.11i authentication and encryption standards, does the system have any additional security features, such as built-in firewalls or wireless intrusion prevention systems? How are policies and user profiles set and do they interface with your existing policy engine?

Top ‘N’ Considerations

- **Architecture (Distributed, Centralized, Hybrid)**
- **Throughput Consistency**
- **Power Requirements**
- **No. of 5GHz Frequency Bands Supported**
- **Integrated Security Beyond 802.11i**
- **Sophistication of Site Survey and RF Tools**
- **Airtime Management/Quality of Service**
- **High Availability Alternatives**
- **TCO**

- **Site Survey and Management Tools/Service Platform.** Does the system automate site survey tasks for planning your network design? How does it handle RF management to avoid interference? Does it support APIs for add-on Wi-Fi services, such as security, asset tracking, unified communications, wireless 911 or other as yet unidentified applications?
- **TCO.** The total cost of ownership, of course, is a factor in every enterprise IT decision. Among capex costs to consider: APs, controllers, management and site survey software, user licenses, special security sensors, power requirements. Opex considerations include the sophistication and degree of automation inherent in the tools available with the system, and how much time and resources they will save you in network design, provisioning, RF management, security policy enforcement and troubleshooting.

This is just a sampling of issues to consider when comparing Draft 2.0 802.11n solutions. Again, we did not ask the vendors to address all the issues but instead asked them to concentrate on what they think are the most important ones and where they excel compared with their competition. The next step for you is to contact the vendors for more information and to ask them about issues you consider important that they didn't mention.

The Cisco Unified Wireless Network



The Industry's Leading 802.11n Infrastructure

By Chris Kozup
Senior Manager
Mobility Solutions
Cisco



Companies all over the world are looking towards mobility as a way to empower their business. Laptops have begun to outpace desktop shipments and mobile devices are clearly positioned to become the dominant personal computing platform. 802.11n is well on its way to becoming the industry's dominant Wi-Fi technology with over 450 products certified by the Wi-Fi Alliance as interoperable. With the explosive growth in 802.11n and the improvements it provides in throughput, reliability and predictability, businesses have begun to ask: When is the right time to adopt 802.11n and, more importantly, which provider should I choose?

Since the introduction of enterprise-class 802.11n products, Cisco has proven itself the clear choice. Over 95% of the Fortune 1000 have deployed Cisco wireless infrastructure, and Cisco has led the way in market share of both 802.11n and existing 802.11a/g infrastructure. In addition to delivering the first Wi-Fi-CERTIFIED™, enterprise-class Draft 802.11n access point, Cisco has engineered exclusive technological innovations to improve 802.11n performance and provide superior investment protection. Cisco offers the industry's most scalable and flexible WLAN architecture, supports the broadest portfolio of 802.11n access points and has extensive industry partnerships that deliver superior performance and interoperability. Combined with both implementation services and financing that assist with the adoption of 802.11n, Cisco is the clear choice for high-performance enterprise wireless networks.

A Heritage of Technological Innovation

Since 1999 with its acquisition of Aironet, Cisco has been a leader in the development of robust wireless products that help businesses leverage the power of mobility using enterprise-scale wireless networks. Cisco's leadership in RF design and engineering has continued as we lead the industry in developing 802.11n solutions.

Cisco was the first company to release an enterprise-class, Wi-Fi-CERTIFIED 802.11n access point in September 2007. The Cisco Aironet 1250 Series access point provided best-in-class performance with support for two spatial streams and dual 2.4GHz and 5GHz radios. While alternative 802.11n solutions rely on consumer-grade silicon, the Cisco Aironet 1250 Series access point was built with silicon designed for enterprises and provided enhancements like Dynamic Frequency Selection (DFS), a feature that allows organizations to use the entire 5GHz spectrum for more scalable 802.11n deployments.

Cisco expanded its 802.11n portfolio with the Aironet 1140 Series access point in January 2009. The 1140 Series is designed to meet the deployment simplicity needs of the mainstream office environment. The platform is one of the industry's first to deliver full 802.11n performance with dual radios, two spatial streams and full security using only standard 802.3af Power over Ethernet (PoE). When relying on standard PoE, alternative solutions are forced to make performance trade-offs by decreasing either access point coverage or throughput. Additionally, the 1140 Series uses the mounting brackets of existing access points for simple swap-out and is delivered in an Eco-Pack of 10 units to reduce packaging by 50% and lower installation time. It is designed to blend seamlessly into any office environment.

In addition to the Aironet 1140 and 1250 series access points, Cisco offers the 880 series Integrated Services Router, providing an effective 802.11n solution for teleworkers and remote offices. Cisco offers the broadest array of 802.11n access points and controllers to fit any business environment including campus, branch office and home office.

To improve the performance and simplify the adoption of 802.11n, Cisco has introduced an innovative set of features called Cisco M-Drive technology. Cisco M-Drive enhances the performance of the RF layer to ensure a consistent, reliable and high-performance wireless platform designed to support mission-critical applications. This set of features has the net effect of increasing coverage and capacity, optimizing client connections and simplifying ongoing management.

Cisco M-Drive ensures true performance fairness for environments with a mix of devices supporting 802.11a/g and 802.11n using innovative features like ClientLink. Cisco ClientLink uses beamforming technology to focus a Wi-Fi signal toward existing 802.11a/g devices. This focused signal augments the throughput of 802.11a/g clients by up to 65% when connected to Cisco 802.11n access points. Alternative approaches can only share "talk-time" based on the existing spectrum, often resulting in poor performance for existing 802.11a/g devices. With ClientLink, Cisco is able to increase the throughput for existing 802.11a/g devices, thereby opening more talk-time for new 802.11n devices as well. Independent tests show that ClientLink increased capacity for both 802.11n and 802.11a/g devices by 27%.

Additionally, Cisco M-Drive helps to further optimize 802.11n performance through client load balancing, which optimizes client connections both on an application basis across access points and on a client basis across the RF spectrum. For instance, if an access point is already operating at the maximum capacity for voice over Wi-Fi calls, Cisco M-Drive can load balance a voice call to a neighboring access point that has available capacity.

Finally, Cisco M-Drive helps with simplified RF management for 802.11n. RF performance is dynamic and organizations require the insight and tools to manage the medium effectively. Cisco M-Drive provides automated RF management to dynamically adjust power and channel settings to maintain superior RF performance. Cisco M-Drive also detects sources of 802.11 and non-802.11 interference, allowing network administrators to mitigate the effects of RF interference.

Superior 802.11n Architecture and Scale

Many wireless LAN providers have held an almost religious view over WLAN architecture, arguing that only their approach is the correct way to deploy 802.11n. Cisco believes that to meet the diverse topology requirements businesses have, a flexible architecture is best.

Companies need to support a variety of network topologies in large campus environments, branch offices and home offices. Each topology has a different architectural requirement, which makes a one-size-fits-all approach problematic. For instance, in campus deployments, the ability to seamlessly roam from building to building while maintaining a secure connection is crucial for application performance, particularly for real-time applications like voice. In the branch, the challenge is determining how to deploy mobility services while maintaining central control. For teleworkers, organizations must determine how to deliver mobility services and access to resources while maintaining corporate security. Regardless of topology, the ability to scale the network to meet application demands is critical.

Cisco has developed a flexible architecture to meet these challenges. The Cisco Unified Wireless Network provides industry-leading scale for 802.11n. It supports up to 36,000 access points within a mobility domain, which provides seamless Layer 3 roaming from access point to access point. Customers can confidently add 802.11n access points to existing wireless controllers without the need for additional specialized equipment or new controllers. Customers can take a scale-as-you-grow approach by simply adding controller capacity as needed.



**Mainstream: Cisco
Aironet 1140 Series
Access Point**



**Challenging RF
Environments: Cisco
Aironet 1250 Series
Access Point**



**Teleworking: Cisco 880
Series Integrated
Services Router**

Cisco offers the flexibility of both centralized and decentralized 802.11n architectures to meet different customer requirements. Both scenarios deliver the network capacity required to support scalable 802.11n performance. In the centralized model, traffic is tunneled back to a controller. Individuals can maintain a secure connection to the WLAN as they roam. This seamless roaming is important for real-time applications, like voice and video, or for single sign-on applications. With a centralized architecture, organizations can also implement secure guest access services. Guest traffic, too, is tunneled to a controller within the DMZ, ensuring that guests can't access sensitive corporate information.

Decentralized architectures are valuable in cases where there is a need to provide WLAN services remotely, but control of the WLAN infrastructure needs to be maintained centrally. With a decentralized architecture, data is offloaded to a switch at the remote site, instead of being tunneled to a central controller. The WLAN controller still handles network provisioning and management. Meshing technology can be used to extend WLAN services to areas where it is difficult to cable for access points.

Whether an organization chooses a Cisco centralized, decentralized, or mixed approach to their WLAN implementation, it can be assured that all of these designs can meet the needs for high performance 802.11n deployments.

Enhanced Interoperability

The Cisco Unified Wireless Network is Wi-Fi-CERTIFIED to guarantee interoperability. Cisco is the only enterprise provider with an access point in the Wi-Fi Alliance 802.11n Draft 2.0 test bed. This means that every product certified by the Wi-Fi Alliance is by default validated with Cisco 802.11n technology. The Cisco Compatible Extensions (CCX) program builds on the Wi-Fi Alliance testing and standards process by working with 802.11n silicon vendors like Atheros, Broadcom and Intel to provide assured compatibility with Cisco 802.11n infrastructure as well as providing differentiated services to the marketplace.

Cisco also conducts extensive interoperability and performance testing with laptop Wi-Fi chipset leader Intel, through Intel's Connect with Centrino program, and with other vendors. This interoperability and performance testing is designed to optimize application performance and roaming between device manufacturers and Cisco access points including the Aironet 1140 Series and Aironet 1250 Series access points. This means that customers using wireless devices like Intel's Centrino will experience enhanced performance when connecting to Cisco 802.11n access points.

The Choice Is Clear

Only Cisco provides the engineering excellence, technological innovation, architectural flexibility and broad portfolio to meet the demands of any 802.11n deployment. Cisco's M-Drive technology and RF excellence provide superior 802.11n performance while simplifying deployment. The Cisco Unified Wireless Network offers the flexibility to support a variety of deployment scenarios across campus, branch offices and teleworker environments.

To further simplify the adoption of 802.11n, Cisco provides consulting and support services based on over a decade of experience in deploying wired and wireless networks. Additionally, Cisco offers flexible financing through Cisco Capital, along with attractive technology trade-in options to lower the capital expense of deploying 802.11n.

For more information about Cisco's 802.11n solutions, please visit:

<http://www.cisco.com/go/802.11n>

Full Speed Ahead

At the lowest TCO!



By Luc Roy
VP, Wireless Strategy
Enterasys / Siemens



Enterprises have an insatiable appetite for wireless. Although 802.11n delivers technical advantages related to capacity, bandwidth, coverage and quality, expensive 802.11n upgrades have been challenged by the perceived expense and disruption of 802.11n upgrades to both wired and wireless infrastructure.

The HiPath Wireless 802.11n solution cost-effectively delivers what you need, when and where you need it on the device that is most convenient for you. Listen, watch or read information securely on your laptop or mobile device to be more efficient and effective. Here's our Top 10 list of our unique advantages:

- 1) "The best combination of power and performance" as tested by *Network World*
- 2) Wireless that is purpose-built to support voice, collaboration, FMC and HD video applications
- 3) Full featured 3x3 MIMO dual radio 802.11n APs powered by a standard 802.3af PoE switch port
- 4) Cost-effective, enterprise-class 3x3 MIMO dual radio PoE compliant 802.11n AP for \$995
- 5) The most adaptive WLAN architecture – delivering both centralized and distributed switching capacity based on user and application business requirements
- 6) Integrated wired and wireless network access control with embedded security protections
- 7) Identity-based networking to ensure only the right users have access to the right information from the right place at the right time
- 8) Linear scalability from 1 to 1,000+ APs to enable room, building, campus and global deployments
- 9) Advanced management software automation for centralized visibility and control that reduces resource requirements while assuring confidentiality, integrity and availability
- 10) An experienced, innovative and visionary partner that has spent 25 years delivering standards-based, open-architecture solutions backed by industry leading global support and services.

Power and Performance

In November 2008, *Network World* recognized HiPath Wireless as having the "best combination of power and performance." With its 3x3 Statistical Diverse Transmit Function, the HiPath 802.11n AP has the best performance compared to beamforming technology, which is prone to reduced performance when the receive path is different than the transmit path. This is the case when a device is mobile.

Dual-Radio APs Operate at Low-Power 802.3af

HiPath Wireless 802.11n APs operate at full 3x3 MIMO with both radios enabled while consuming less than 11W of power. This means that HiPath 802.11n APs do not require any costly switch forklift to pre-standard, higher-power 802.3at PoE switches. Similarly, enterprises don't have to pull extra Ethernet cables for additional power or limit the performance of the AP by falling back to 2x3 or 2x2 MIMO operation or even disabling a radio.

In addition, HiPath Wireless APs are DFS2 compliant, which means that all HiPath APs can support up to 24 non-overlapping channels (instead of only 8). The 802.11n AP's performance gains are best achieved in the 5 GHz band where more non-overlapping channels are available. This is because to achieve 300Mbps data-connect rates, the 802.11n AP requires the aggregate bandwidth of two 20MHz channels (40MHz), an 802.11n standard technique called channel bonding. Without DFS2, only 4 non-overlapping bonded channels can be used, resulting in sub-optimal performance across the WLAN due to RF interference.

Price

The HiPath Wireless 802.11n enterprise-class 3x3 MIMO dual-radio, PoE-compliant AP3610 is priced at an industry leading \$995. From most competitors, the price is in the neighborhood of \$1300 per AP for less functionality! We're driving down costs and improving scalability to accelerate adoption on a global basis without disrupting an organization's current communications infrastructure.

The Most Adaptive WLAN Architecture

Most WLAN vendors force you to choose an architecture: centralized or distributed. With HiPath Wireless, you don't need to select because with the HiPath 802.11n AP, you get both simultaneously. Usage can be based on the business requirements of your users and applications.

A centralized architecture requires you to backhaul all traffic to a centralized controller. Multiple 802.11n APs can produce a significantly higher load on your LAN than legacy 802.11a/b/g APs. Depending on the size of the WLAN deployment and how much data is forwarded to the centralized controller, significant congestion may occur. The last thing any CFO wants to do is to build out a Gigabit Ethernet LAN – or 10 Gigabit network core – just to support a new 802.11n WLAN.

On the other hand, while a fully distributed deployment will eliminate backhauling traffic to a controller, it will increase the complexity for real-time mobile applications such as VoWLAN. This is because roaming across multiple subnets must be allowed. IT managers will be forced to create a large broadcast domain or apply many VLANs. Neither option scales.

With HiPath Wireless, a Virtual Network Service (VNS) has two options for controlling traffic flow:

- a) Bridging locally at the AP. The AP is managed by the controller, but data is not backhauled to the controller.
or
- b) Backhauling the data traffic to the controller (see Figure 1) and providing role-based user policies (security, NAC, mobility, QoS priority). An 802.11n AP can assign multiple VNSs to a single SSID while supporting up to 16 SSIDs per AP.

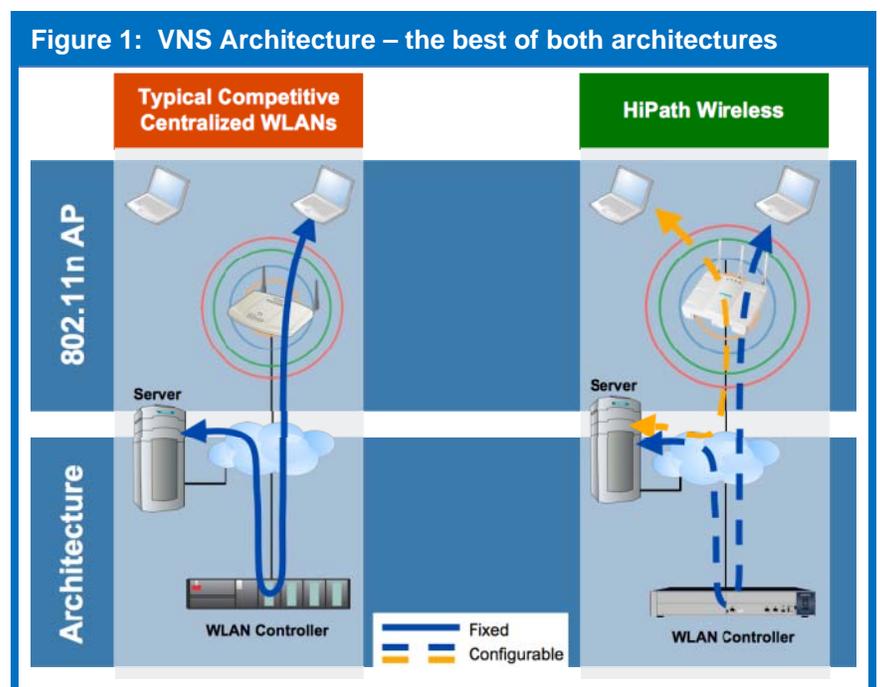
Research firm Frost & Sullivan has demonstrated that architecture and PoE support can save over 33% of capital costs.

The Highest Scalability

The Enterasys wireless portfolio supports from a single AP to more than 1000 APs per controller, providing linear scalability from small to large wireless deployments. In addition, every controller can deliver real-time session-availability services without requiring the purchase of additional AP licenses for redundancy. We've even integrated the wireless controller into our LAN switching platform so you can save on power, space and cooling costs.

Integrated Wired and Wireless NAC

Enterasys provides an integrated wired-wireless network access control (NAC) solution with identity-based user and application roles. Who you are determines your priority, bandwidth and security privileges. The Enterasys distributed intrusion prevention solution delivers full packet inspection, adaptive signature pattern matching, protocol analysis and behavioral



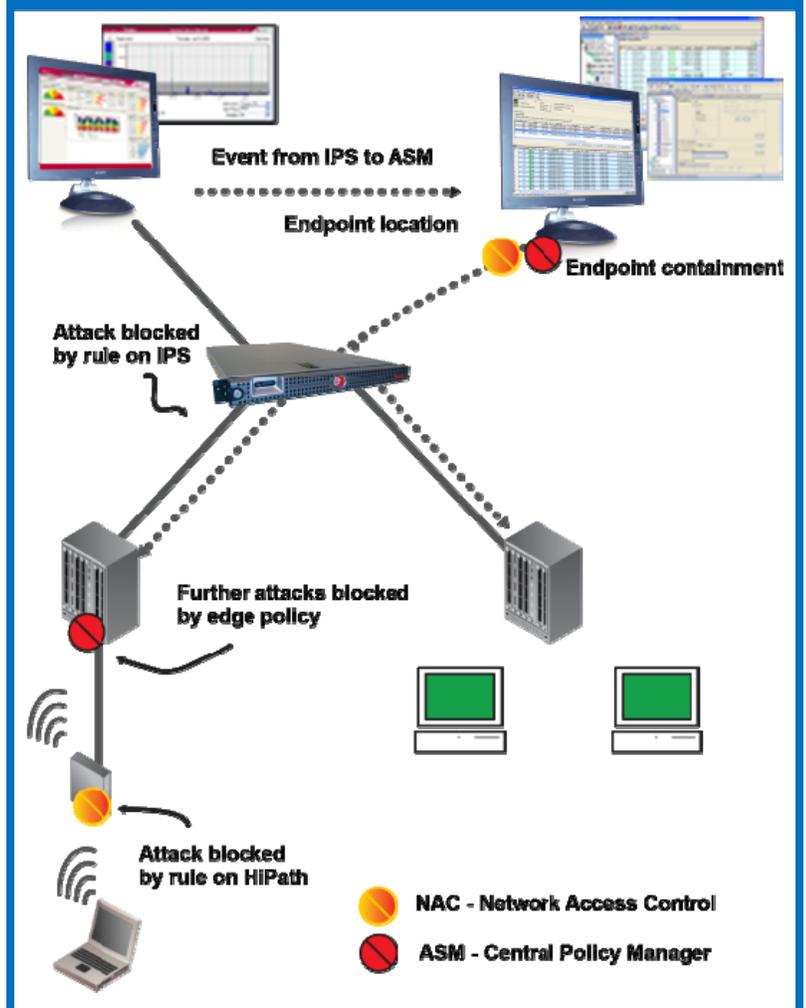
anomaly detection for both wired and wireless users. This enables the networked infrastructure to automatically sense and respond to threats and vulnerabilities such as external intrusions, insider attacks, network misuse, system exploits and virus/worm propagations. See Figure 2.

Advanced WLAN Features

HiPath Wireless delivers an extensive list of wireless features that are critical to WLAN deployments.

- Session availability – stateful preservation of sessions including VoWLAN during any controller, network and AP failure.
- Dynamic Radio Management – a fully distributed system managing channels and transmit power against RF interference (802.11 and others), channel utilization and AP failures.
- Per-user rate limiting – bandwidth control over a user or application role and policy.
- Wireless backhauling for extended areas on the campus or where an Ethernet jack is not accessible.
- Voice and video over WLAN, which require more than just QoS. We also offer a solution that extends seamless roaming from WLAN to cellular networks with the HiPath MobileConnect product line.
- Integrated guest access with a dedicated administrator account for tickets creation and edition.
- Outdoor and industrial applications.

Figure 2: Integrated Wired and Wireless NAC



An Experienced and Innovative Partner with Strong Vision

Enterasys has 25 years of networking experience with thousands of deployments in over 70 countries worldwide. Gartner has positioned HiPath Wireless in the "Visionaries" quadrant in the Gartner Magic Quadrant for Wireless LAN Infrastructure 2008 report (Gartner ID Number G00163188). Published 26 November 2008, the Gartner report stated, "While all vendors continue to support basic end-user connectivity, additional requirements for security, management, voice capabilities, and integration with management or security appliances continue to drive vendor selections."

Summary

Consider both capital and operational expenditures before making your 802.11n purchase or upgrade. We believe tightly integrated wireless offerings help customers efficiently deploy unified communications that are mobile and secure. The standards-based, open-architecture solutions are backed by industry-leading global support and services. The open communications approach means that customers can leverage existing investments and avoid forklift upgrades – making wireless mobility more practical, achievable and cost-effective.

For more information about Enterasys solutions described here, please visit: <http://www.enterasys.com> or call 877-801-7082.

NonStop Wireless for the Always-on Enterprise



Is 802.11n up to the task of enabling unwired enterprises?

By Mark Cowtan
Director of Marketing
Communications
Trapeze Networks



To understand Trapeze Networks' advantages for 802.11n networks, it helps to first realize that Trapeze has a much more flexible mobility architecture than most other vendors. Trapeze's approach enhances the traditional model of centralized WLAN controllers and "thin" APs. The architecture does this by allowing functions such as traffic forwarding (switching) and security policy enforcement to be distributed to the APs at the customer's discretion instead of forcing it to route through centralized WLAN controllers. The distributed capabilities are in addition to, rather than in lieu of, the centralized approach, affording users the best attributes of both types of architectures. We call this architecture Smart Mobile.

Smart Mobile Delivers NonStop Wireless

The hybrid centralized/distributed Smart Mobile architecture improves performance and scalability, because it leverages the additive processing power of each AP. It also has important implications for reliability and roaming efficacy. In fact, this highly distributed architecture allows a level of system reliability that is not matched by any other vendor. One that delivers NonStop session availability – nothing less than uninterrupted voice calls even when a controller fails. Unlike other systems that offer N:1 redundancy, Trapeze has used innovative controller virtualization techniques – akin to server farm virtualization – to deliver N:N redundancy. The result: hitless failover with zero downtime. This claim was tested and verified by the Tolly Group in December 2008. No other vendor today can preserve voice calls or other real-time sessions during the failover and recovery of one or more WLAN controllers. Not even those deployed in a so-called "resilient" configuration.

"The company's NonStop Wireless is more than a slogan. Its use of virtual controller cluster functionality is highly innovative," according to Stan Schatt of ABI Research, who ranked Trapeze #1 in resiliency in ABI's July 2008 "802.11n Vendor Matrix" report. Current Analysis and Frost and Sullivan have drawn equally positive conclusions.

Even more noteworthy, some vendors' centralized architectures – specifically those that force encryption at the controller – actually preclude any possibility of session-level persistence under controller failure conditions. Using those systems, it is simply impossible to maintain session continuity when a controller fails, if the data passing between the AP and controller is encrypted.

The highly distributed Smart Mobile architecture also solves the problem of roaming between APs managed by different controllers, which is a major mobility barrier for WLANs that rely solely upon a centralized architecture. This makes indoor and outdoor wireless networks seem as one homogenous mobility domain. Not so for other vendors.

Trapeze 802.11n AP Features

Trapeze's Draft N MP-432 is deployed in thousands at the University of Minnesota, which likely represents the largest 802.11n installation in the US. It is a full 3x3 MIMO dual-radio AP, featuring built-in internal antennas, and two gigabit uplinks. With only one POE (802.3af) injector, both radios may be powered in 2x3 MIMO mode; with POE on both ports, both radios can support full 3x3 MIMO. Alternatively, POE Plus on only one port will power both radios in full 3x3 mode.

The MP-432 is backwards compatible with legacy 802.11a/b/g clients in the 2.4 GHz and 5 GHz bands. The dual uplinks provide both power and link-level redundancy by dual homing to different LAN switches. The AP's plenum-rated enclosure design resembles a smoke detector to appear innocuous and minimize attention, making it less likely to be tampered with or stolen, while also featuring a built-in Kensington lock system for added physical security.

The MP-432 uses the same Mobility System Software as all other Trapeze APs and is fully supported by ALL Trapeze WLAN controllers available today, including the installed base. How's that for investment protection?

Discreet Tamper-proof Design

With the exception of Xirrus, only Trapeze has a discreet tamper-proof design with hidden internal antennas and no moving parts. These attributes make it easy and inconspicuous to install without upsetting the aesthetics of your building interior. Trapeze began the trend of internal antennas in 2004 on its a/b/g product line and now other manufacturers are beginning to follow. It makes sense: without rabbit ear antennas, the AP is less likely to get noticed by users, minimizing the chance it will get tampered with or stolen. In hospital applications Trapeze's discreet design has the advantage of being easier to clean and, because it has no sharp edges, it is also JHACO (Joint Commission on Accreditation of Healthcare Organizations) compliant.

Scalable Performance and Bandwidth

Despite the rapid adoption of 802.11n APs and 11n-ready notebooks, it's important to recognize the wealth of legacy and new wireless devices that do not support 802.11n and will not do so for years to come. A main reason for this is the increased power demands of 11n chipsets. Therefore backward compatibility and performance should not be overlooked.

While Smart Mobile distributed switching improves scalability and optimizes traffic flows for latency-sensitive applications such as voice, Trapeze has many other innovations designed to maximize bandwidth availability and control utilization. For example: QoS profiles and bandwidth-consumption limits can be set on a per-SSID or per-user basis. In addition, Trapeze's patent-pending band-steering transparently makes 802.11a-capable devices use the 5 GHz band, and recovers 30-40% more usable capacity. In addition, Smart Mobile also delivers client load balancing, not just VLAN load balancing, even between APs on different controllers. This again helps prevent congestion and maximize per-user bandwidth.

Combined, these features increase per-user bandwidth availability for users when they initially connect and throughout the duration of their session as they roam from AP to AP. This ensures higher aggregate throughput for both Greenfield 802.11n deployments and mixed a/b/g/n deployments and does so at much lower total cost than other systems. The reason is that fewer and less powerful controllers are needed than with the other vendors who rely on centralized forwarding and security enforcement, and do not offer the same traffic and load management sophistication.

Even without utilizing the distributed forwarding capabilities, Trapeze Networks still has the most powerful WLAN controller on the market: with its 28Gbps forwarding capacity, the MX-2800 offers four times the throughput at about half the price of its nearest rival.

Identity-based Security with Dynamic Authorization

All Trapeze APs including the 802.11n product line support the highest levels of security for both voice and data including IEEE 802.11i, WPA/WPA2 and AES encryption. But in a highly mobile environment, there is much more to security than simply allowing or disallowing access to an SSID and providing certain user-centric privileges or application-centric QoS and bandwidth profiles. On phones, PDAs, laptops and other devices, access security and service profiles need to dovetail into physical building security; e.g., users need to be physically inside the building to gain network access. Failure to address the holistic security considerations compromises the integrity of the network and available resources.



Trapeze MP-432 Draft 802.11n AP

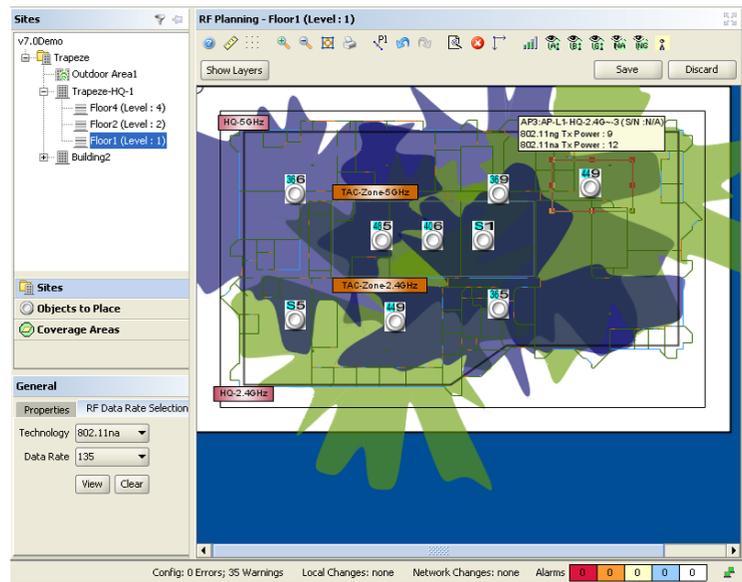
As users roam around, especially as they move in and out of restricted areas, their privileges should be adjusted, not remain static. In fact, other factors such as time of day and what they are doing should also be taken into consideration. For example, it should be possible to prevent access even for authorized users, once they step outside the building. Or, it should be possible to throttle a user's bandwidth, if that user is continuously generating high loads for extended periods. Even though 802.11n is much faster than a/b/g, let's not forget it is still a shared medium. Imagine, for instance, a bandwidth-hogging user who likes to download HD videos, while sitting in tiresome meetings. During busy periods, that user could easily prevent others from getting wireless dial-tone on their Wi-Fi handsets. In a wired world, where bandwidth is not so scarce, it is not only easier to detect bandwidth abusers, but also far easier to throttle them down, because you know which switch port they are on. On wireless networks, it's much harder, because the user can move to a different AP.

Among the WLAN vendors, only Trapeze offers a practical solution to dynamically adjust access profiles based on time, location and activity without forcing re-authentication. These on-the-fly adjustments are made automatically according to pre-defined rules, triggers and policies using Trapeze Networks' advanced access control software called SmartPass.

Other than Cisco, Trapeze is the only WLAN vendor with a complete solution for Real Time Location Services (RTLS) and has begun to weave location-awareness into security policy administration and network management. Since acquiring Newbury Networks, the leader in Wi-Fi based RTLS, Trapeze Networks now has the most complete WLAN solution portfolio on the market inclusive of asset tracking applications and asset tags.

Award-Winning Management Software

Trapeze delivers the easiest deployment in the industry, without resorting to gimmicks such as "virtual cell" that only ease deployment at the expense of performance. Unlike other vendors who added RF planning and network management as an after-thought or bought a third-party product and are now trying to adapt it to support their architecture, Trapeze Networks led with advanced WLAN planning and management capabilities from day one. Now in its seventh generation, RingMaster is a world class, award-winning management platform that makes it extremely easy for a network manager to plan, deploy, configure and monitor multi-site networks completely remotely, all from a single console. RingMaster was the first WLAN management platform to provide complete planning, configuration and provisioning of security and services for 802.11n. RingMaster is available either as software or as a hardened management appliance.



In conclusion, Trapeze Networks 802.11n solution IS up to the task of enabling unwired enterprises. It offers the scalable performance, stringent security, advanced management capabilities and, above all, the system-level reliability needed, if enterprises are to become dependent on wireless as the primary network access medium.

For more information about Trapeze Networks solutions described here, please visit:
<http://www.trapezenetworks.com/solutions/> or call Trapeze Networks at 1.888.768.6625

The Industry's Highest 802.11n Performance at Half the Cost



By Geoff Smith
Vice President of Product
Management
Proxim Wireless



Proxim Wireless continues its tradition of innovation and value with the industry's highest performance 802.11n solutions on the market today. Proxim's 802.11n solutions are the industry's first products to achieve 320Mbps of throughput with a dual-radio solution and greater than 170Mbps with a single-radio solution. In addition, Proxim's new 802.11n products have been designed to be customer-friendly and overcome the barriers of cost and complexity faced by competing products to deliver 802.11n networks at half the price of existing WLANs.

With the greatly increased performance of 802.11n networks, today's controller-based WLAN architectures not only cost significantly more to implement, but they create a huge performance bottleneck in the network. Existing WLAN controllers were not designed to handle the increased throughput of 802.11n networks, and thus require very costly controller upgrades in order to handle this increased performance. Proxim's 802.11n solutions utilize a distributed architecture where independent access points (APs) with distributed intelligence can be managed centrally without a costly controller.

As a result, with Proxim's ORiNOCO® AP-8000 and AP-800 802.11n APs, organizations of all sizes can achieve higher performance than their existing 10/100 wired and wireless LANs while avoiding the costly controller upgrades, deployment challenges and additional network planning that have deterred enterprises from upgrading to 802.11n.

Realizing the Truly Unwired Enterprise

With the advent of 802.11n technology, the truly unwired enterprise is possible – yet many organizations cite the complexity of deployment as a primary barrier to moving to 802.11n. Proxim's ORiNOCO AP-8000 dual-radio and AP-800 single-radio APs overcome the challenges hindering adoption by achieving numerous key industry firsts:

- First 802.11n solution to achieve greater than 300Mbps throughput performance, with dual-radio throughput rates tested at 320Mbps
- First 802.11n solution to work within the 802.3af (POE) power requirements in both single- and dual-radio 3x3 MIMO 11n configurations, while achieving twice the range with the highest throughput in the industry. The solution eliminates the cost and hassle of additional wires and power injectors to each AP that are typically required with competitive 802.11n products.
- First solution to support Dynamic Frequency Selection (DFS) globally in all 5 GHz bands, which eliminates the worry of network interoperability and interference and provides 10 times the number of channels available at 2.4 GHz
- First solution to support both 2.4 GHz and 5 GHz operation on each 802.11n radio, providing the flexibility for deployment in various environments
- First 802.11n solution that utilizes the same mounting hardware as existing Proxim 802.11a/b/g APs, greatly simplifying upgrades. Competitive 802.11n products often require new mounting hardware.

Eliminating the Cost and Complexity of Upgrading to 802.11n

Competitors' controller-based systems require substantial investment in additional infrastructure before they can be installed, due to both the performance bottleneck they present in the network as well as overall power issues. The performance bottleneck of competitors' solutions is introduced by the dependence on a centralized WLAN controller. Existing WLAN controllers are not designed for the increased throughput of 802.11n, and by requiring all traffic to flow back through a centralized controller, a significant performance bottleneck is created. To avoid this bottleneck, competitors require their customers to upgrade to newer, more expensive controllers – which will again be at risk of becoming a bottleneck in the future as the industry moves to gigabit Wi-Fi in a few years.

In addition to these costs, competitors' solutions also require customers to upgrade their power infrastructure, as their solutions are not completely 802.3af (POE) compliant for all configurations. Though some competitors claim to be 802.3af compliant, this is often only true when an AP is not operating at full 3x3 MIMO. Requiring an upgrade of the power infrastructure to still pre-standard 802.3at is time-intensive, costly and potentially risky.

These real-world costs can quickly deter enterprises from upgrading to enjoy the benefits offered by 802.11n products. Proxim's AP-8000 and AP-800 provide an 802.11n solution that gives customers higher performance than both existing wireless and wired networks without the need for a costly centralized controller or any power upgrades. This significantly reduces the cost and complexity of upgrading and scaling the WLAN.

Higher Performance than Existing Wired LANs/WLANs

Proxim's ORiNOCO 802.11n products enable enterprises of all sizes to finally unwire the wired LAN by providing greater performance than existing Ethernet networks. When tested using standard Ixia Chariot and an Intel 4965 3x3 MIMO client in real over-the-air tests, our APs delivered single-radio rates of over 170Mbps and dual-radio rates of over 320Mbps! That's more than four times the 80Mbps measured over a 100Mbps wired connection using the same test protocol – and more than any competing 802.11n product available today. Not only are these the fastest 802.11n solutions available, but with these performance levels, Proxim's solutions also provide substantially higher throughput than typical 10/100 wired LANs.



Proxim ORiNOCO AP-8000

More importantly, by providing the industry's first solution that offers both dual 2.4 GHz and dual 5 GHz operation – meaning customers can deploy each radio with either two 2.4 GHz radios, two 5 GHz radios, or one of each – as well as the first solution that is certified to work in the entire 5 GHz spectrum worldwide, the ORiNOCO AP-800 and AP-8000 provide the most radio configurations available. As a result, customers get the most available radio configurations and the ultimate in deployment flexibility.

Proxim's ORiNOCO 802.11n solutions are also the first to receive DFS certification from both the FCC and ETSI. This means Proxim's 802.11n solutions offer the most complete coverage of the 5 GHz spectrum worldwide – from 5.15 to 5.85 GHz. This enables simple deployment anywhere in the world, regardless of the 5 GHz range used in that country. Proxim's products also have the industry's highest radio output power for 802.11n solutions, giving you significant range benefits over the competition. And when you combine the greater range with the increase in available channels (10 times more than the 2.4 GHz spectrum), this greatly simplifies your RF deployment.

Half the Cost of Existing WLANs

Proxim's 802.11n solution drastically reduces the cost of WLAN deployments using 802.11a/b/g products. With the added range and throughput, ORiNOCO 802.11n deployments cost only half of today's 802.11a/b/g networks when deployed to achieve the same capacity. In addition, Proxim's 802.11n solution provides two times the range of standard 802.11a/b/g APs to ensure enhanced signal strength to hard-to-reach clients in the office, which simplifies deployment.

Reduced Cost of Upgrading to 802.11n

Proxim's ORiNOCO 802.11n products are the first to overcome the deployment challenges and the associated costs of competitive 802.11n products by eliminating the need for forklift controller upgrades, additional wiring, or additional network planning. Because Proxim does not require WLAN controllers – which are both costly and provide a significant performance bottleneck – Proxim 802.11n networks can cost-effectively scale to meet increasing bandwidth demands in the future.

Cost-Effective Scalability

ORiNOCO 802.11n APs are the only APs on the market that are completely 802.3af compliant in all configurations, which avoids the cost of additional wiring or power injectors as required by 802.3at compliant APs. High throughput and transmit power are good, but only if they can both be accomplished by using standard POE. Competing 802.11n products often claim 802.3af compliance, but that is only applicable for a subset of the functionality of their products. When deployed in full dual-radio 802.11n at 3x3 MIMO configurations with three spatial streams, though, many competing products require 802.3at power – which requires costly upgrades to the power infrastructure. Proxim, however, delivers the highest throughput and highest transmit power, all while staying completely 802.3af compliant in all configurations. Proxim's 802.11n APs also utilize the same mounting hardware as existing Proxim 802.11a/b/g APs, enabling simple swap out of old APs and making upgrades a snap.

Distributed WLANs with Centralized Management

With the advent of 802.11n technology, and as the performance of wireless networks increases in the future (with Gigabit Wi-Fi already in the works), it is clear that a distributed WLAN architecture is necessary to avoid performance bottlenecks and prohibitive upgrade costs. But while a distributed architecture is certainly the future of WLANs, the one component that must remain centralized is management.

To provide centralized management of Proxim 802.11n networks, the ProximVision ES network management system supports the ORiNOCO AP-8000 and AP-800 products. The ProximVision ES network management system provides rapid network deployment and mobile configuration – providing a complete view of the wireless network and comprehensive device configuration. The product installs on Windows XP, Windows 2003 and Windows Vista and supports SNMPv1, SNMPv2 and SNMPv3.

ProximVision ES automates configuration processes for faster, more efficient deployment of Proxim Wireless networks. It also provides network managers a mobile option for exhaustive device configuration with a software-based tool. And because ProximVision ES can support a greater number of APs than competitively priced solutions, it provides the simplest path to configuration and upgrade.

For more information about Proxim Wireless' 802.11n solutions, please visit:

http://proxim.com/products/ap_8000/ or call Proxim at 1-800-229-1630.

Xirrus 802.11abg+n Wi-Fi Arrays

Switching Without Wires



By John Merrill
Director of Marketing
Xirrus



Only Xirrus Planned for the Success of Wi-Fi

The trend towards mobile communications among workers, students, and guests has pressed for the rapid migration from Wi-Fi hot spots for a handful of casual users to Wi-Fi networks for high performance users. Only Xirrus planned for the success of Wi-Fi by developing an architecture powerful and intelligent enough to replace Ethernet switching to the desktop.

Our Wi-Fi Array architecture integrates 4, 8, 12, 16 or 24 802.11abg+n radios coupled to a high-gain directional antenna system into a single device along with an onboard multi-gigabit switch, Wi-Fi controller, firewall, dedicated Wi-Fi threat sensor, and an embedded spectrum analyzer. Xirrus' focus on RF innovation (specifically RF isolation, management, and shaping) has enabled us to develop the Wi-Fi Array based architecture that delivers more coverage, bandwidth, throughput, and user density on a per device and per system basis that is far and above any other offering.

Rolling out a high performance Wi-Fi network has never been easier than with Xirrus...

- **More Bandwidth** – delivers 8X (up to 7.2Gbps) the bandwidth of any competitive solution
- **Fewer Devices** – requires fewer devices, cabling, switch ports, and installation time
- **Free Site Survey** – provides free site surveys using real products
- **Guarantee** – provides signal strength guarantee
- **Warranty** – provides 5-year hardware and 90-day software warranties

The Xirrus Wi-Fi Array platform obsoletes all other Wi-Fi offerings and is the only Wi-Fi device capable of replacing Ethernet switching to the desktop. It's time to replace your overlay Wi-Fi networks and switched Ethernet to the desktop with Wi-Fi as the primary network connection.



Xirrus Wi-Fi Array



APs + Controller



Desktop Switch

Making Wi-Fi Your Primary Connection

Organizations are continuously searching for and relying on technological advances to increase productivity and decrease costs. One of the most promising technologies today is Wi-Fi -- all-wireless networks. Using Wi-Fi to unfetter employees, students, and guests will allow for more collaboration and reduce the costs associated with network moves, adds, and changes.

However, for Wi-Fi to become the primary connection it must deliver enough bandwidth for large groups of users with the same coverage, bandwidth, and intelligence as the wired network without breaking the bank.

Coverage and Bandwidth Boosts

Multiple radios are co-located in a circular configuration to create a radio "Array" that provides significant range, capacity, and RF management advantages. Each Integrated Access Point (IAP) uses a high gain, directional Antenna System to deliver increased transmit gain and receive sensitivity in all directions, resulting in up to 4x the coverage area of traditional AP/Wi-Fi controller architectures.



The Xirrus 802.11n Array uses 3x3 MIMO technology to support data-connect rates up to 300 Mbps per radio. The Array has three built in antennas per IAP integrating up to 60 antennas into a single device. The Array's unique architecture provides an easy to install, aesthetically pleasing solution with no need for external cables or antennas.

Xirrus provides the most powerful Wi-Fi solution in the industry with the performance to replace switched Ethernet to the desktop—ideal for offices, cubicles, conference rooms, auditoriums, campuses, warehouses, remote users, emergency response, etc.

The Wi-Fi Array's design of integrated components, security, and intelligence results in a solution that requires 75% fewer devices, cabling, switch ports, space, energy, and installation time compared with any other offering.

Bandwidth becomes increasingly more important as the success of Wi-Fi grows—as the number of Wi-Fi users and applications grow, so does the need for more radios across more channels. The problem is that traditional Wi-Fi architectures, such as thin access points with centralized closet controllers, backhaul all data to a central point before re-distributing back out, creating unsecure bottlenecks and decreasing the overall performance of the network.

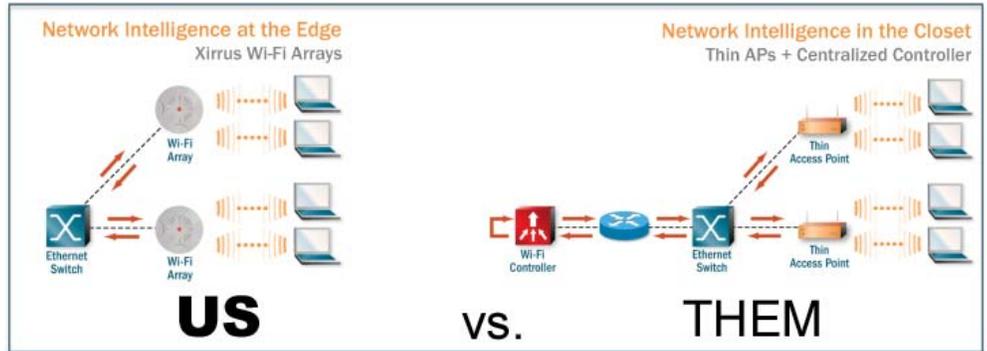
Xirrus has several 802.11n Wi-Fi Arrays to fit your wireless need with 1.2Gbps to 7.8Gbps of bandwidth per device.

| Xirrus 802.11abg+n Wi-Fi Array Specifications | | | | | |
|---|---|-------------|-------------|-------------|-------------|
| | Wi-Fi Management | XN4 | XN8 | XN12 | XN16 |
| RF Specifications | Maximum Wi-Fi Bandwidth | 1.2Gbps | 2.4Gbps | 3.6Gbps | 4.8Gbps |
| | Typical Coverage Area (Indoor) | 75,000sqft | 125,000sqft | 125,000sqft | 125,000sqft |
| | Integrated 802.11a/b/g+n Access Points | 4 | 4 | 4 | 4 |
| | Integrated 802.11a+n Access Points | - | 4 | 8 | 12 |
| | Dedicated Wi-Fi Threat Sensor | Yes | Yes | Yes | Yes |
| | Maximum Wi-Fi Backhaul Link | 900Mbps | 900Mbps | 900Mbps | 900Mbps |
| | RPTNC Connectors | 1 | 3 | 3 | 3 |
| Sectored Antenna Specifications | 802.11b/g/n | 3dBi (180°) | 3dBi (180°) | 3dBi (180°) | 3dBi (180°) |
| | 802.11a/n | 3dBi (180°) | 6dBi (90°) | 6dBi (90°) | 6dBi (60°) |
| | RF Monitor | 2dBi (360°) | 2dBi (360°) | 2dBi (360°) | 2dBi (360°) |
| Wi-Fi Switch Specifications | Integrated Wi-Fi Switch Ports | 4 | 8 | 12 | 16 |
| | Gigabit Uplink Ports | 1 | 2 | 2 | 2 |
| | 10/100 Management Port | - | 1 | 1 | 1 |
| | Maximum Associated Users | 256 | 512 | 768 | 1024 |
| Xirrus Management System | Layer 3 Centralized Management for up to hundreds of Arrays | | | | |

Intelligence at the Edge

A quarter century of research and testing by the switching industry has concluded that data switching decisions belong at the network edge. As a result, all wired switches are engineered with distributed intelligence to perform security, QoS, VLAN tagging, etc. when packets first access the network.

Wi-Fi is no different – when deploying Wi-Fi as the primary network access it's critical to distribute the switching intelligence to the edge rather than centralize it like a hub or router. Distributed architectures, like Xirrus, encrypts data at the edge while Central architectures encrypt at the controller, leaving the data unprotected from the access point to the controller.



Unlike other vendors, our Wi-Fi Arrays can replace Ethernet workgroup switches at the edge with things like:

- Traffic Switching Decisions
- QoS and VLAN Tagging
- Voice Detection/Classification
- Security (encryption processing, firewall/ACL policies, traffic filtering, and threat monitoring and mitigation)

Cost Savings

Xirrus not only saves you money due to the fewer devices, switch ports, and cabling involved with our simplified solution, but we also don't charge for services like site surveys, security scans, installation and configurations, training, or signal strength guarantees. Compare us to the competition...

| SERVICES | OTHER VENDORS | XIRRUS |
|----------------------------|------------------------|-------------|
| Site Survey | \$10K to \$50K+ | FREE |
| Security Scans | \$3K to \$10K+ | FREE |
| Installation/Configuration | \$3K to \$10K+ /day | FREE |
| Training | \$2K to \$5K+ /class | FREE |
| Signal Strength Guarantee | No | Yes |
| TOTAL | \$18K to \$75K+ | FREE |

Conclusion

Unlike traditional Wi-Fi vendors pushing seas of access points tied to closet controllers, Xirrus planned for the success of Wi-Fi. By learning valuable lessons from the cellular and Ethernet industries our architecture can deliver 2X more range, 4X more coverage, 8X more bandwidth, 4X more throughput—using 75% fewer devices, cables, and switch ports over any other offering.

“Xirrus’ 802.11n Wi-Fi Arrays are drastically different from traditional access points, which are chained to distant closet controllers,” said Kevin Halgren, Assistant Director of Systems and Services at Washburn University, a Xirrus customer.

“The Xirrus 802.11n Arrays put the power and intelligence where it should be – at the edge of the network. By integrating 4, 8, 12, 16, and 24 radios with a multi-Gigabit switch into a single device, the Xirrus Arrays allow us to efficiently deploy more radios to cover more users than access points from other vendors,” says Halgren. For example, we recently installed nine Xirrus 802.11n Wi-Fi Arrays covering all five floors of the Living Learning Center, delivering over 16Gbps of high speed Wi-Fi bandwidth for 400 students. That’s 56 radios with only seven cable drops – impressive.”

For more information about Xirrus solutions described here, please visit:

www.xirrus.com or call Xirrus at 800-947-7871.

Wireless Networks for Business Mobility

Tri-Radio 11n AP Delivers Gap-Free Security and 24x7 Reliability



By Dr. Amit Sinha
Fellow & Chief
Technologist
Motorola Enterprise
Wireless LAN



In 2008, Motorola launched two innovative 802.11n solutions – the AP-7131, an 802.11a/b/g/n smart, adaptive mesh access point (AP), and the RFS6000 wireless switch, the newest member of Motorola's highly scalable 802.11n switch family. The AP-7131's design has been recognized as the industry's first tri-radio 802.11n access point, featuring Motorola's adaptive AP architecture. The unique tri-radio design integrates three 11n radios that simultaneously support high-speed client access, mesh backhaul and dedicated dual-band intrusion protection. Using an expansion slot, the third radio can be field-upgraded to enable 3G/4G technologies for primary or redundant WAN connectivity.

When people think of 11n technology, enhanced wireless network speeds like 300Mbps or 600Mbps come to mind. Enterprise 11n equipment vendors all have products that achieve similar speeds because these solutions are based on an industry specification. To compare 11n products accurately, you have to examine the feature set. In addition to basic comparisons, like throughput and range, Motorola also recommends that enterprises review what vendors are providing regarding network security, reliability, total cost of ownership and management – from planning to troubleshooting.

Motorola Delivers Gap-Free Wireless Security

Motorola's AP-7131 addresses the security need by allowing an enterprise to convert one of its three radios into a 24x7 Wireless Intrusion Prevention System (WIPS) sensor. The AP-7131 leverages Motorola's band-unlocked radios, which enable dual-band scanning, in the 2.4 and 5 GHz bands, from just a single radio. Competing solutions use radios that are band locked, requiring two radios or the entire AP to support dual-band scanning. Network administrators can configure an AP-7131 for access, dedicated sensing and mesh. As a result, enterprises don't incur the extra cost associated with purchasing standalone sensors and installation.

Over the last three years, Motorola has been combining its wireless LAN (WLAN) intellectual property with the industry-leading AirDefense WIPS into a single platform to deliver significantly improved security compared to legacy time-slicing WIPS approaches and to minimize hardware and wiring costs. Because the AP-7131 utilizes a dedicated radio for sensing, it avoids the performance-challenged, time-slicing technique currently available from other vendors.

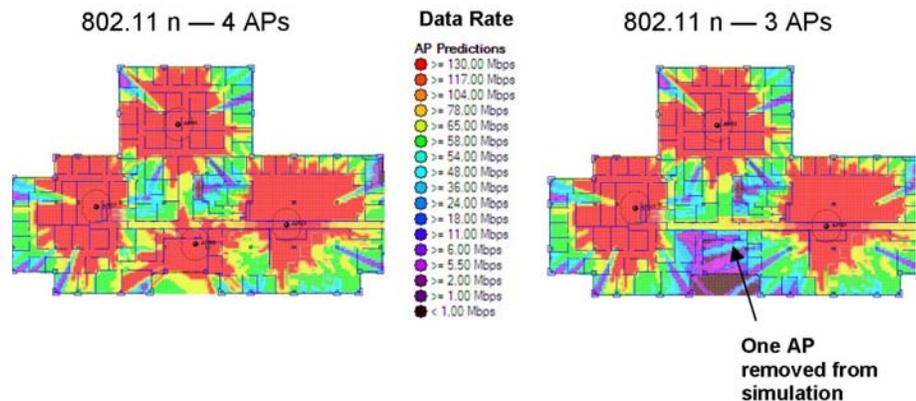
In conjunction with WIPS, the AP-7131 includes a built-in layer 2-7 wireless firewall capable of blocking several types of attacks, such as DHCP spoofing and ARP cache poisoning, which cannot be detected by traditional layer 3 firewalls, right at the edge of the WLAN. The Motorola wireless firewall contains sophisticated, distributed, stateful packet inspection technology, protecting users as they roam across the enterprise, while avoiding performance bottlenecks that arise when all traffic is funneled to a central choke point for inspection. The wireless firewall integrates with leading enterprise authentication systems, including LDAP and Active Directory, and can leverage a built-in location tracking engine to enforce user identity, role and location-based security policies.



**RFS6000 Wireless Switch and AP-7131
(802.11a/b/g/n Access Point)**

Motorola Helps Enterprises Plan their 11n Networks

Establishing a solid foundation for any network requires proper planning prior to installing new equipment. The more planning that can be completed up front, the more cost-effective the network will be. To address this critical need, Motorola offers LANPlanner. This valuable planning tool enables network administrator to get a picture of 11n performance prior to deploying even a single AP. The network administrator imports AutoCAD drawings of their building and answers a few questions. Then Motorola's patented LANPlanner suite analyzes and predicts the performance.



With LANPlanner v11.0, it's easy to evaluate the impact of adding and removing 11n equipment.

LANPlanner makes 11n planning easy with an advanced network migration wizard that addresses the three most popular 11n deployment scenarios. The new building/new deployment scenario provides predicted performance based on installing an 11n network in a clean-slate environment. The "rip and replace" deployment scenario provides predicted performance based on replacing legacy APs with new 11n APs in an existing enterprise WLAN. The mixed deployment scenario provides predicted performance of mixed 11n and legacy networks in the same environment.

After deployment, LANPlanner's site survey capabilities can measure network performance and detect issues that may impact the wireless user experience.

Motorola Eases Enterprise Deployment Decisions

The AP-7131 has been engineered for flexibility and ease-of-use for wireless enterprise deployments. It can be used as a stand-alone AP within small-to-medium businesses. In adaptive mode, the AP-7131 combines the benefits of central management and site-survivability to help reduce the complexity of deployments in remote offices. In a campus WLAN switch environment using the thin AP mode, the AP-7131 can be centrally managed for large-scale deployments. This unique multi-mode operation is supported by the same firmware version to greatly simplify the task of building a large-scale multi-site wireless enterprise.

Motorola's AP-7131 leverages Smart RF technology, which automatically picks the channel with the least amount of interference and sets the power-level according to the location of the AP. Additionally, the AP-7131 is ready out-of-the-box – requiring no configuration. This means a network administrator can send an AP-7131 to a remote office and have a local worker install the AP in a few minutes. Enterprises benefit from not having to support costly truck rolls.

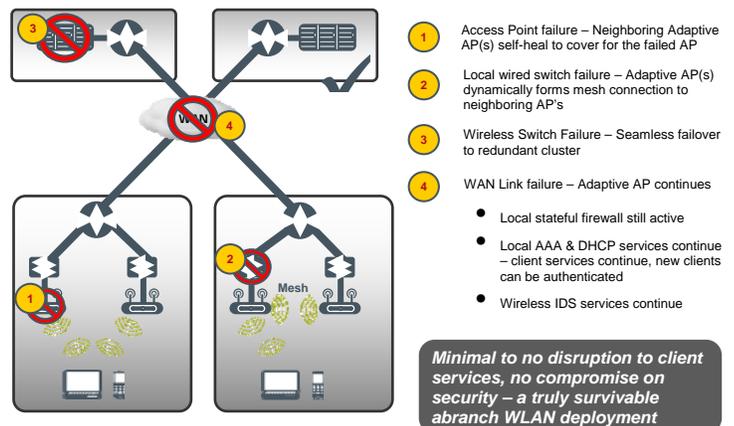
Motorola's RF Management Suite enables network administrators to take control of their WLAN and more. This complete management solution provides network and security control throughout the complete lifecycle of the WLAN — from planning and deployment through day-to-day monitoring and troubleshooting. Motorola is the only company to offer vendor-agnostic troubleshooting with its Advanced Troubleshooting tool, which proactively identifies wireless network configuration issues. Reducing or eliminating bottlenecks in wireless connectivity results in less down time across the network, which in turn reduces helpdesk support costs and related onsite troubleshooting expenses by remotely identifying and fixing network configuration issues. Additionally, tight integration with Motorola's WIPS provides around-the-clock protection against unauthorized access as well as cost-effective compliance with HIPAA and other government and industry regulations.

Motorola Provides Unprecedented Level of Network Resilience

RFS6000 features built-in support for adaptive AP, mesh, and 3G/4G wireless WAN backhaul service and clustering, which offers enterprises an unprecedented level of resilience. Motorola's innovative WLAN architecture can withstand multiple points of failure to provide site survivability.

Motorola's 11n Solution Is 'Greener' than Competitor Solutions

ABI Research ranked Motorola the 'Greenest' Wi-Fi vendor in its 2008 Green Wi-Fi Matrix. Enterprises can leverage one or two radios of the AP-7131 for mesh backhauling, which reduces some of the need for wired distribution equipment. Additionally, Motorola's wireless switches eliminate the need for several appliances by providing integrated firewall, VPN, WIPS, voice and locationing capabilities in a single box.



RFS6000 resilient deployment scenario

Motorola Is Best Positioned to Enable the All-Wireless Enterprise

Motorola's wireless switches, in conjunction with Motorola's AP-7131 11n adaptive APs, enable an all-wireless enterprise in the following manner:

- *Wireless Access Layer:* 11n with toll-quality voice eliminates the need to run separate voice and data cables to each user/workstation and eliminates the need for access-layer wired switches.
- *Wireless Distribution Layer:* Enterprise-class mesh eliminates the need for distribution-layer wired switches. Additionally, Motorola's wireless switches integrate with Motorola's point-to-multipoint solution, eliminating the need to run cables between buildings within the campus.
- *Wireless Backhaul:* Integrated 3G/4G wireless WAN backhaul, coupled with Motorola's point-to-point solution, makes end-to-end wireless a reality
- *Security:* Integrated stateful inspection firewall, VPN, AAA server, IDS/IPS along with NAC solutions eliminates need for separate security appliances.
- *Mobility services:* Services such as asset tracking across Wi-Fi, RFID and UWB, and fixed mobile convergence help realize the full potential of the mobile workforce.

Motorola's 11n Solution Delivers the Most Comprehensive Feature Set at the Lowest TCO

Motorola helps network administrators save time and money planning their 11n network. Motorola provides intelligent RF management tools to continuously optimize the wireless network. The Motorola AP-7131's tri-radio design makes it extremely flexible for any environment. It delivers full 600Mbps connection speeds (two radios at 300Mbps each), while simultaneously providing enterprise-class security using the third radio. In conjunction with Motorola's WLAN switches, an enterprise can upgrade its network to 11n without having to upgrade its wired infrastructure equipment. Motorola's enterprise customers are not only realizing the enhanced performance of 11n, but are also benefitting from its gap-free wireless security, industry-leading RF management, integrated mobility features such as voice, locationing and asset tracking all at a significantly lower total cost of ownership (TCO).

Further reducing TCO, Motorola's wireless switches integrate, without charging a licensing fee, security features such as stateful inspection firewall, VPN, IDS/IPS, AAA Server along with NAC solutions. Motorola also offers its customers zero-port licensing with cluster license aggregation, which cuts cost of redundancy in half compared to competing solutions.

For more information please visit www.motorola.com or call (866) 416-8545.

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