Analyst Insight

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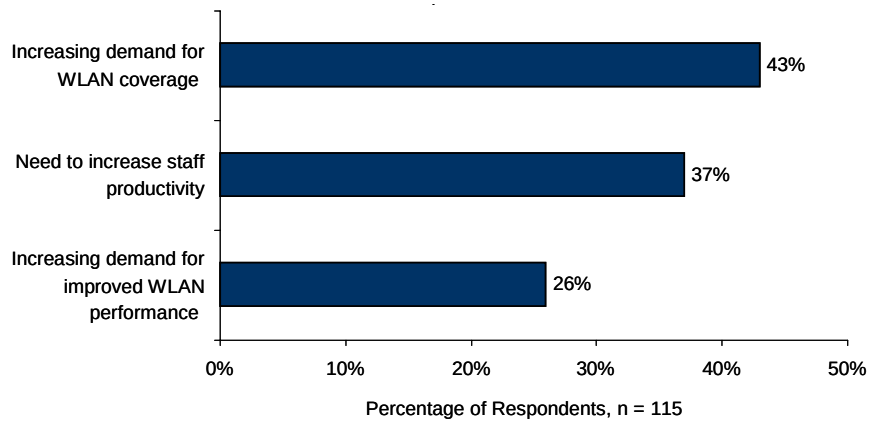
Is Now the Time Come to Upgrade Your Wireless LAN to 802.11n?

Wireless LAN's (WLAN's) popularity has spread rapidly, driven in large part by the growing demand for the increased productivity, work-team collaboration, and workflow flexibility enabled by wireless mobility. In the December 2008 Aberdeen benchmark report *Beyond Wireless - The State of WLAN 2009*, 87% of the 292 responding organizations already had a WiFi WLAN in place, and 86% of them had done so two years ago or earlier. Survey respondents were actively using the first generation of WLAN technology (e.g. 802.11a, 802.11b, and 802.11g), as well as the recently ratified WiFi standard - 802.11n. Clearly, adoption of WLANs in the enterprise is already widespread and growing.

Growing WLAN Performance Demands

Frustration at the inability of the WLAN to keep pace with growing demand for more bandwidth is growing, driven in part by increased network traffic and new rich media applications. 43% of all respondents identified the performance degradation caused by increasing usage of the wireless network as their top pain point The August 2009 report *Multi-Site and Campus-Area Wireless LANs: Benefits of the Centralized Approach*, reported that the pressure to increase staff productivity was driving the need for increased WLAN coverage and improved performance, as seen in Figure 1.

Figure 1: Top Pressures



Source: Aberdeen Group, August 2009

These pressures are the direct result of a fundamental shift in mobility's role in information access: no longer a casual 'nice-to-have' with little business

Fast Facts

The 802.11 Wi-Fi Standards:

- √ **802.11b**: the first Wi-Fi standard; operates in the 2.4GHz radio spectrum and offers speeds of up to 11Mbps
- √ **802.11a:** A successor to 802.11b; operates in the 5GHz radio spectrum and offers speeds of up to 54Mbps, with a range of ~115ft.
- √ **802.11g**: Uses the same 2.4GHz radio frequencies as the popular 802.11b, is backwards compatible with 11b, and is almost 5-times faster at 54 Mbps, with a range of ~125ft.
- √ **802.11n**: Able to operate at both 2.4GHz and 5GHz; due to improved antenna technology (MIMO - Multiple Input - Multiple Output) and many other advancements, theoretically capable of speeds up to 540Mbps and a range of 230ft - 10-times the speed of 802.11g. Field upgradeability ensures future compatibility; already in widespread use.

justification outside of executive suite mobile email and field force automation, mobility has proven its value as core IT infrastructure.

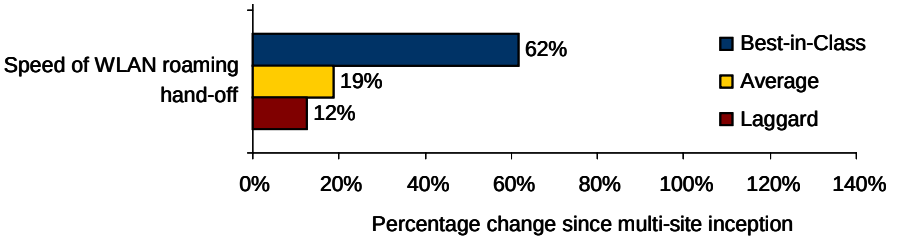
Meanwhile, end-user expectations of WLAN throughput are also ever-increasing. In part driven by the widespread experience of broadband access provided by both home and workplace wireline networks, mobile workers now expect the full broadband experience in the palm of their hand or when on the move, requiring ever-greater bandwidth and signal reach.

Broadband Applications Turn up the Heat

The May 2009 report *Wireless LAN 2009: From Network of Convenience to Business-Critical Infrastructure* also found that performance degraded by growing usage was a top pressure, rising from 44% to 52% over the prior 12 months. Of those citing performance degradation as the top pressure, just over half ascribed that degradation to increased use of data-heavy video or voice-enabled applications, and the rest to increased usage of the WLAN overall.

The August 2009 report *Multi-Site and Campus-Area Wireless LANs: Benefits of the Centralized Approach* found that the Best-in-Class (the top performers across multiple performance metrics) had significantly improved the speed of WLAN roaming hand-off (Figure 3).

Figure 3: Performance Improvements



Source: Aberdeen Group, August 2009

This performance advantage minimizes the potential for introducing the latency created when a device moves from coverage by one WLAN Access Point (AP) to another, as the device and/or user must typically be re-authenticated and approved by the system before being reconnected to the adjoining AP.

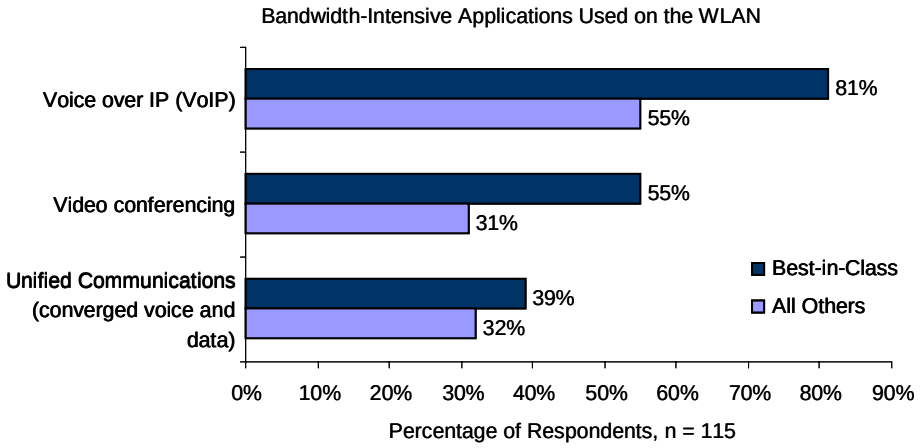
Due to their centrally-managed systems approach, the Best-in-Class improved their roaming hand-off speed by 62%, 3.5-times the Industry Average and 5.2-times the Laggards. This factor is particularly important for some of the more data and time-intensive mobile applications such as mobile Voice-over-IP (VoIP) and wireless streaming video and video-conferencing (Figure 4).

Best-in-Class Criteria

The following were used to determine Best-in-Class in the Multi-Site WLAN study, with top performers achieving impressive results:

- √ A 153% increase in Multi-Location WLAN throughput
- √ A 153% increase in the number of employees using the Multi-Location WLAN
- √ A 103% increase in the availability (uptime) of the Multi-Location WLAN

Figure 4: Bandwidth-Intensive WLAN Applications

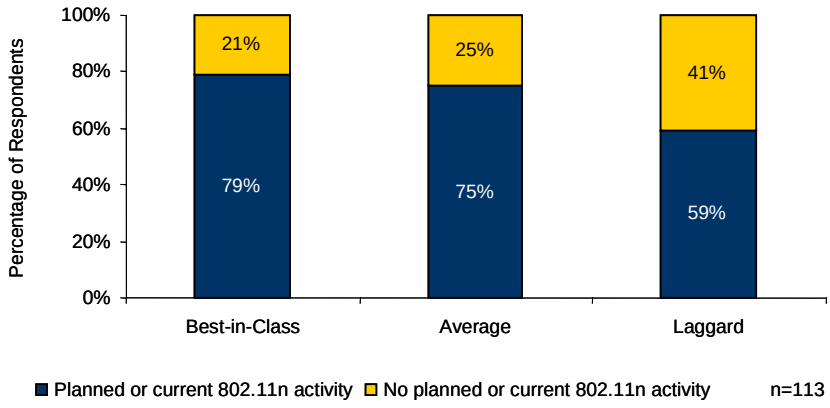


Source: Aberdeen Group, August 2009

802.11n to the Rescue

With the market's insatiable appetite for bandwidth and greater need for reliable performance, end-user adoption of Wi-Fi 802.11n has begun to accelerate. Figure 2 illustrates that 79% of Best-in-Class and 75% of Industry Average respondents either have current or planned 802.11n implementations, whereas the Laggards trail the Industry Average by 27%.

Figure 2: 802.11n Activity



Source: Aberdeen Group, May 2008

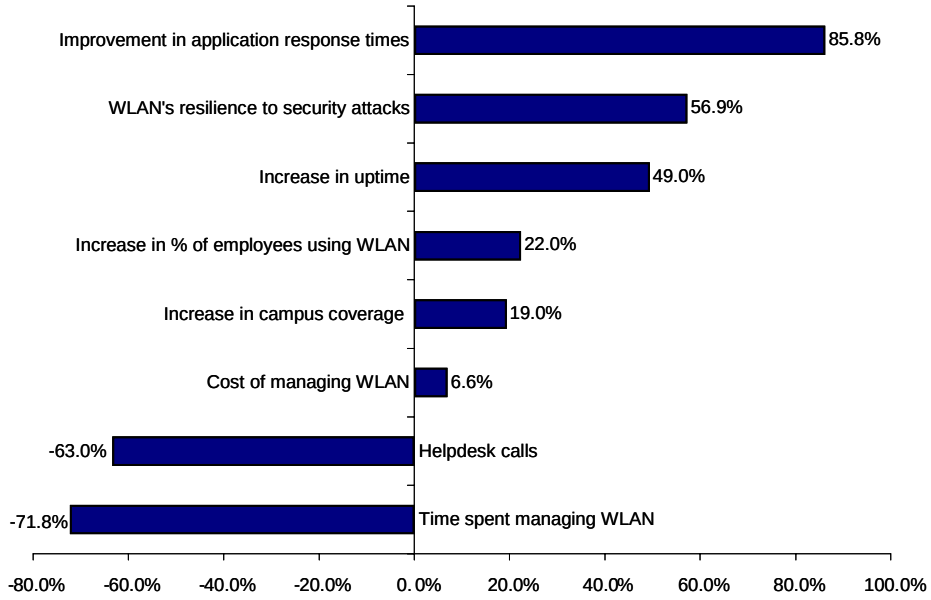
"We see the need for speed. With 802.11n, a few access points reduce the number of wire line drops. It's a lot less expensive and much more efficient."

~ Director, IT Outsourcing and Integration Services

This accelerated adoption can be attributed to the fact that 802.11n directly addresses the top three pressures described in Figure 1: 802.11n is designed to deliver up to five-times the speed of prior versions of 802.11. Its increased bandwidth addresses the performance issue. The combination of increased speed, performance, and reliability delivers the anytime/anywhere access to information that gives productivity the bump that the organization seeks.

The *Beyond Wireless - The State of WLAN 2009* report identified concrete performance advantages for users of 802.11n-based WLANs, versus those who had not yet adopted 802.11n, as shown in Figure 4.

Figure 4: Users of 802.11n Versus All Others



Source: Aberdeen Group, December 2008

"We are looking at the ratification of 802.11n as a good time to look at a campus refresh of our WLAN infrastructure. There is an approaching inflection point in the market regarding 11n replacing the existing a|b|g networks"

~ Director of networks and systems; large research university

The respondents that were currently using 802.11n experienced more than an 85% improvement in application response times over those that had not yet migrated. 802.11n adopters reported 57% more resilience to security attacks, indicating that many of them improved their security solutions at the same time that they upgraded or installed their 11n network. Aberdeen's research also revealed that with a migration to 802.11n, organizations also moved more business-critical applications onto the WLAN, making invulnerability to attack a higher priority.

They achieved a 49% increase in network uptime over all others, 22% growth in the percentage of employees using the WLAN, and 19% increase in campus coverage, coinciding with the greater range of 802.11n-based APs. Note that these advantages are not without cost; 11n users paid more than 6% more to manage their networks than non-11n users. Some of this cost is associated with the purchase of the 802.11n-specific hardware and software itself.

However, they attained significant cost savings in other areas (63% fewer helpdesk calls for example) that are likely due to the improved bandwidth and range leading to fewer dropped data and voice sessions, and therefore fewer end-user complaints. Almost 72% less time was required to manage the WLAN, indicating that at least some of the strategic action to reduce complexity through WLAN / wireline convergence had been achieved. They

also saved 15% on their telecommunications costs, as fixed mobile convergence solutions helped to reduce carrier service billings.

The Vertical Market View: One Size Does Not Fit All

As in the idiom "different strokes for different folks", one size does not fit all when it comes to understanding the primary drivers in 11n adoption. The key to understanding market sector differentials lies in identifying the fundamental behavioral distinctions among each of the market sector constituencies.

There is an inherent logic to the higher level of interest in improving WLANs performance by certain sector end-users:

- **Higher Education**. The (ever-changing) demographics of the student population are creating a demand for full-speed wireless access throughout every corner of the institution, both indoors and out. Every mobile device, smartphone, game machine, and media player is a potential consumer of mobile broadband access.
- **Healthcare** (Health / Medical): Hospitals and medical campuses have quickly adopted wireless technology to keep critical personnel in constant touch, and to track the location of valuable equipment. The move to digital medical records places new security demands and compliance requirements on mobile access to healthcare data.
- **Hospitality / Retail**. Although these two sectors do have differentiated needs, they share certain attributes: both are typically commercial chain or franchise business models that were relatively early adopters of WLAN - hospitality for guest services purposes, retail for mobile point-of-sale and store inventory devices - and both are ripe for system upgrades because of their system longevity. Both are also typically light in local IT support resources at remote locations.

Once the current network's capacity is optimized, a logical next step would be to upgrade the wireless network hardware to 802.11n. When we look at the top strategic actions by each of these sectors, we see this is the one strategy that all sector respondents agree upon (Table 1).

Table 1: Top Benefits of 802.11n by Industry Sector

	All Respondents	Higher Education	Health / Medical	Hospitality / Retail
Increase WLAN coverage	34%	36%	47%	14%
Improve utilization of existing network capacity	29%	20%	7%	14%
Upgrade hardware (e.g. to 802.11n)	25%	24%	47%	29%
Support more end-users with fewer IT Staff	20%	20%	7%	29%
Identify areas of inadequate coverage	15%	24%	20%	43%

Source: Aberdeen Group, September 2009

The higher priority given the 802.11n upgrade among Healthcare respondents speaks both to the critical role of wireless communications combined with the bandwidth-intensive applications being used within the industry, such as wireless VoIP, streaming video, and large graphics files from CT scans and digital x-rays.

In the case of Higher Education, the high-bandwidth wireless connectivity expectations of the student population are driving the need for speed and coverage. Students are demanding wireless broadband connectivity throughout campus, as their video viewing habits migrate from cable TV to on-demand video from websites such as hulu.com and youtube.com.

Hospitality and Retail are responding to different pressures. Their aging 'first-generation' wireless infrastructure is underperforming, and straining their limited on-site IT resources. In Hospitality, they also need to address mounting complaints among hotel guests for faster and better wireless access.

Case in Point: Purdue University

Purdue University is one of the nation's leading research and academic institutions. Committed to providing the highest quality academic experience to its students, Purdue decided to upgrade its Cisco Wireless LAN in 2009, to provide pervasive mobility to students and faculty alike. "Initially we had 1,500 access points in place, but they only covered public gathering areas. We wanted to provide mobile access everywhere on our 20-million-square foot-campus," says Scott Ksander, executive director of IT networks and security at Purdue.

"Our Cisco high-capacity 802.11n wireless network enables us to create the most innovative academic experience possible, improving students' learning today and ensuring their professional success in the future."

~ Scott Ksander, executive director of IT networks and security, Purdue University

Facing the exponential growth of mobile devices from its student population, as well as new bandwidth-intensive educational applications, the university needed a significant increase in network capacity. "Since many students now carry multiple Wi-Fi-enabled devices, a classroom of 150 students typically uses more than 200 clients," according to Ksander.

Today, Purdue is well into its plan to deploy 6000 Cisco 802.11n access points within an 18-month period, making it one of the largest 11n installations in higher education. They use Cisco's centralized WLAN management system Wireless Control System (WCS) to facilitate a simplified and fast deployment. "It helps us minimize costs by enabling a team of only three IT network managers to centrally monitor access points located throughout our 255 buildings," says Ksander.

The 802.11n network runs at 300 Mbps, far greater than Purdue's previous 802.11a/g 54 Mbps WLAN. This high-density, high-bandwidth capability has provided the university with the ability to transform its campus into a more collaborative learning environment. "Our engineering class of 120 students can now connect simultaneously to the wireless network and work together on engineering simulations using tablet PCs," says Ksander. "The performance of the 802.11n network is outstanding, and student learning is improving."

Key Takeaway: Get Ready to Make the Move to 802.11n

The recent ratification of the 802.11n standard is likely to unleash pent-up demand for the higher performance and reliability that it delivers. Consider taking the plunge if you haven't already; get ready to make the move to 802.11n.

- Develop and deploy a migration plan that is rational, well-tested, and phased in its approach.
- Take advantage of the 802.11n technology refresh cycle to develop a thorough site plan and site security assessment before beginning implementation (see *WLAN Security Checklist* sidebar).
- Establish an implementation timeline with milestone-complete dates, and mobilize the personnel and resources necessary to achieve it.
- Protect the stability of the current WLAN infrastructure when introducing new technologies such as 802.11n by developing a pilot program, to simultaneously test the efficacy of the new platform while isolating it from the main network.
- Follow with an objectified evaluation of technology solutions and service providers; incorporate operator and end-user training,
- Include thorough documentation of the best practices as they're developed in the pilot program; then publish them internally or otherwise disseminate the key findings.
- Finally, deploy the solution organization-wide in a phased and orderly fashion.

Although applicable to most organizational use of WLANs, the business case for migration to 802.11n is most clear in cases where the performance of the existing WLAN has degraded due to levels of usage which exceed its current bandwidth capacity. This may also be caused by greater adoption of bandwidth-hungry applications such as video and voice. 802.11n is also clearly indicated in 'greenfield' installations, where no prior WLAN installation exists, even if it is solely as a 'future-proofing' hedge, knowing that the number of 802.11n-compatible mobile devices will increase dramatically over time.

For more information on this or other research topics, please visit www.aberdeen.com

WLAN Security Checklist

When approaching 802.11n deployment, take the opportunity to reassess your organization's existing wireless security infrastructure:

- √ Execute a comprehensive site security assessment
- √ Identify and resolve potential security leaks and trap doors
- √ Acquire rogue access or attack simulation software to torture-test the network under severe stress levels
- √ Establish the scheduled use of a WLAN sniffer to smoke out rogue devices and/or Access Points (APs), or any other type of unauthorized use
- √ Expand this capability with a comprehensive Wireless Intrusion Protection System (WIPS)

Related Research

Different Strokes: Multi-Site Wireless LANs in Higher Education, Healthcare, Hospitality, and Retail, September 2009

Multi-Site and Campus-Area Wireless LANs: Advantages of the Centralized Approach, August 2009

Wireless LAN 2009: From Network of Convenience to Business-Critical Infrastructure, May 2009

More Mobility – Less Budget: Enterprise Strategies for the Current Economic Downturn, March 2009

Beyond Wireless: The State of WLAN 2008, December 2008

Deploying Applications on the WLAN: The Next Step Towards Ubiquitous Enterprise Mobility, January 2008

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