Wi-Fi Now Synonymous With 802.11n

Executive Summary

In October and November 2009, the Webtorials Editorial/Analyst Division surveyed the Webtorials subscriber base for the sixth consecutive year concerning enterprise wireless LAN (WLAN) deployment plans, attitudes and experiences. This report summarizes the major findings, gathered from a Web-based response pool of 272 geographically diverse Webtorials subscribers throughout the world. Only responses from individuals who said they are actively involved with their companies' WLANs have been included in the results.

Many of the trends revealed by this year's study relate to 802.11n, the IEEE WLAN standard amendment that was finally ratified in September 2009 after seven years in the making. Now that 802.11n is a formal standard, new enterprise investments in older 802.11a/b/g technologies will drop off. The reason is that 802.11n is backward compatible with those networks and offers up to nearly six times the throughput of the earlier technologies, depending on implementation and the client device(s) used. In addition, some enterprise-class 802.11n access points (APs) have come onto the market in the $600-$800 price range delivering 802.11n benefits at 802.11g prices. Going forward, then, Wi-Fi is synonymous with 802.11n until 802.11n is usurped by something bigger and better.

What follows are the key findings of the survey. For additional results and information on demographics of the respondents to this year's survey, see the appendix to this document.

Key Findings

- **The recent ratification of the 802.11n standard will drive Wi-Fi deployment expansions.** The majority of respondents (60%) said they would expand their wireless LAN as a result of the ratification of 802.11n. Their primary interest in 802.11n is – and remains, year over year – a close race between needing additional wireless capacity to accommodate increasing network data loads and to accommodate new voice over IP (VoIP) traffic loads on the network.

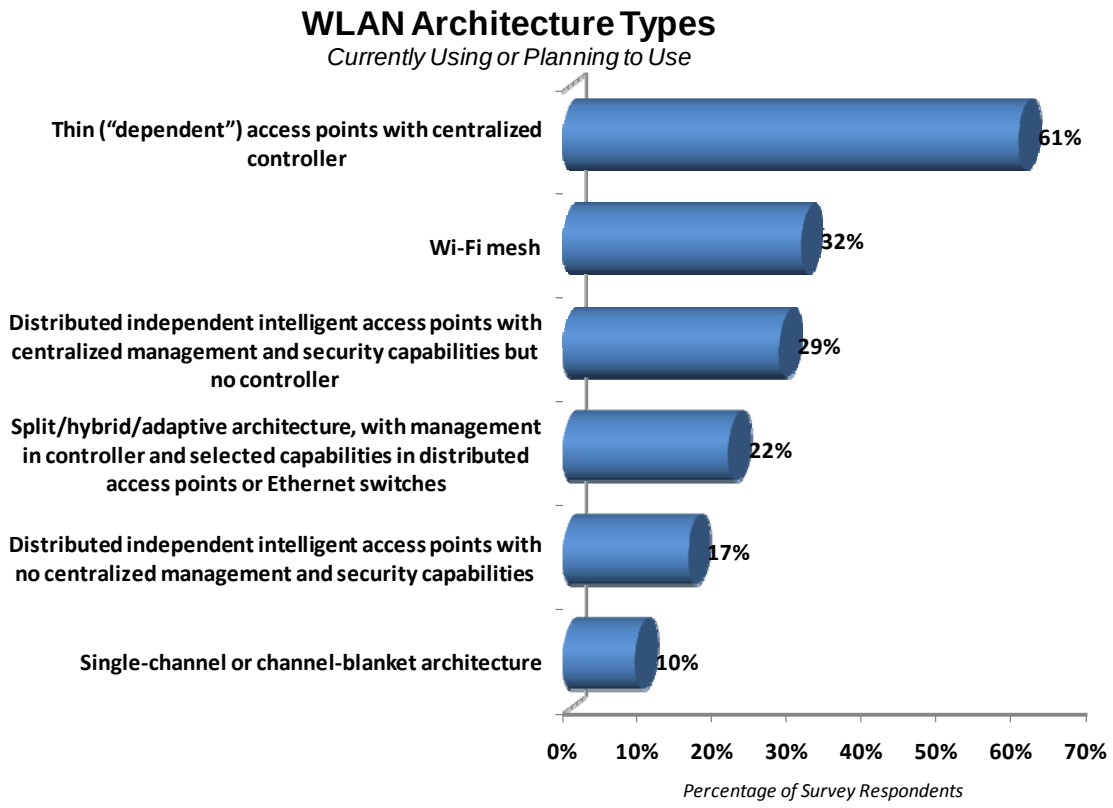
- **"All-wireless" networks are far from mainstream.** Those who said they would expand their wireless LANs did so with the caveat that they are not moving to an "all-wireless" network in their foreseeable futures. Rather, they said they would always keep some wired access infrastructure in place.

- **Enterprises are unsure about which optional 802.11n-standard features they need**. A whopping 43% said they simply "don't know" which of the optional 802.11n-standard features they will require in the new WLAN products they buy. This is probably because they don't understand them well yet, as these features have largely taken a back seat in pre-standard

802.11n discussions. The reduced-overhead efficiencies of packet aggregation seemed best understood, with 26% of respondents saying they would require that feature option.

- **Enterprises are open to embracing new architectures, particularly mesh**. Most respondents (60%) are using and plan to continue using thin (dependent) APs with a centralized controller for the immediate future. Still, enterprises seem open to considering alternative and/or complementary architectures, with nearly a third, for example, planning to use Wi-Fi mesh (see **Figure 1**) with or without controllers. All told, 77% of respondents said that mesh capabilities are essential, very important or somewhat important (see Figure A1 in the appendix.)

Figure 1: WLAN Architecture Types



Impact of 802.11n Ratification

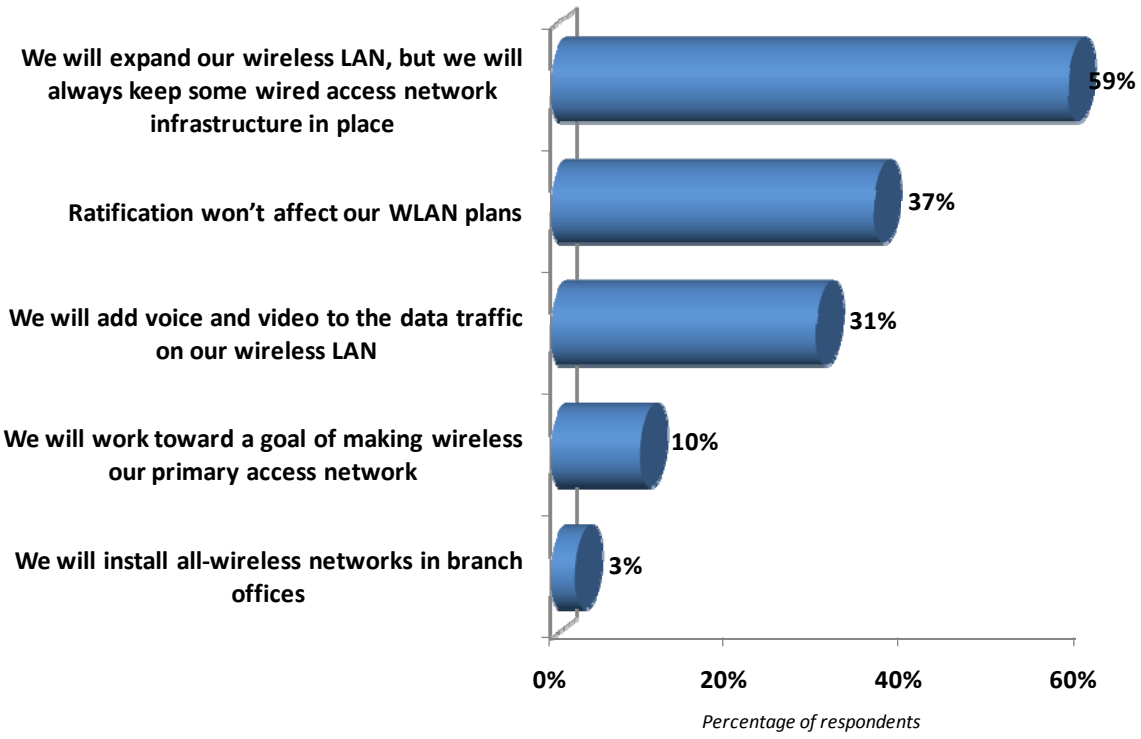
According to 59% of enterprise respondents, 802.11n ratification will encourage greater deployment of 802.11n equipment (see **Figure 2**), primarily to accommodate rapidly increasing data loads and secondly to add voice over IP (VoIP), as noted. Last year, 57% said that they'd

either wait for 802.11n standards to deploy at all or would deploy the emerging technology only in limited controlled pilots ahead of standards.

Even with the standard now ratified, plans to create an all-wireless access network remain nascent at this juncture: Just 10% said that 11n ratification would spur them toward a goal of making wireless their organization's primary network. And only 3% said the new standard would prompt them to build all-wireless networks in branch offices, a plum spot for this activity due to the expense and labor associated with building wired LANs across many scattered locations.

And respondents continue to worry about the cost of upgrading both the Wi-Fi infrastructure to 802.11n and the back-end wired infrastructure that supports it to gigabit Ethernet speeds. More than three quarters (78%) cited upgrading wireless or wired infrastructures to support 802.11n as a top barrier to deploying it in their organizations.

Figure 2: 802.11n Standard Ratification Impact



When enterprises are ready for 802.11n, many will be able to make a clean break. The smattering of pre-standard 802.11n usage out there has a ways to go to become pervasive: all told, while 68% of respondents said they have some pre-standard 802.11n installed, most of it's accessible by only a very small percentage of their users. About a third (32%) of respondents have no users at all using the pre-standard 802.11n equipment available today, and about another third (34%) have deployed it for just 10% or fewer of their users.

This situation should provide an opportunity for enterprises to examine the latest technologies and architectures as they transition from their legacy WLANs onto now-standard 802.11n, rather than feeling roped in by extensive pre-standard deployments with a particular vendor.

Year-over-Year Trends

Growth

In general, Wi-Fi continues on a steady growth path. At least half the employee populations in 56% of respondents' companies are equipped with a Wi-Fi-enabled device, for example. This reflects a healthy jump from last year, when 47% of respondent companies said at least half their user populations had a Wi-Fi device.

In addition, 85% of respondents have covered the common areas of their office buildings with Wi-Fi (compared to 82% last year), and 59% also have WLAN access points covering work cubicles, offices and other business work areas, compared to 54% last year. The increase is only slight, but still positive given the recessive state of the 2009 economy.

Traditional Wi-Fi applications continue to grow, though this year's survey reflected a slight decline in users who were already deploying VoIP, videoconferencing, streaming media and other newer applications for wireless (see table below).

Top Wi-Fi Applications

Application	Already Deploying (2009)	Already Deploying (2008)
E-mail	87%	82%
Core business (CRM, ERP, SFA, etc.)	59%	47%
Guest intranet/ Internet access	76%	71%
Employee intranet/Internet access	83%	81%
VoIP	30%	37%

Use of traditional enterprise Wi-Fi applications, except for voice, is growing steadily.

Drivers

This year, 41% said aggregating growing data traffic loads was the top motivator behind 802.11n implementation, while "adding VoIP to data loads" came in second as the primary driver (35%). Last year, however, while a consistent 40% said anticipated growing data loads was the primary driver behind anticipated 802.11n deployments, 49% said that adding VoIP to data loads was the primary driver. These figures represent a 14% drop from 2008 to 2009 in voice-over-WLAN (VoWLAN) plans.

One reason could be that the Wi-Fi Alliance, the industry consortium that certifies products for interoperability, will not roll out its Voice-Enterprise certification program until 2010, giving enterprises pause about investing in VoWLAN yet. It's also possible some enterprises are rethinking their internal VoIP strategies as new in-building cellular products and technologies emerge.

Challenges

As noted, device upgrades and support costs were cited as the top inhibitor to deploying 802.11n by 54% of respondents. The same issue presented the top challenge last year (55%), but was followed very quickly by concerns about deploying equipment in the absence of a ratified standard (49%), an issue that is now moot.

The second top concern was a related one: the wired infrastructure upgrade costs needed to support 802.11n. These costs come about in the form of potential upgrades of LAN switch ports to 1Gbps and potential power infrastructure upgrades. This year, 25% of respondents cited this as a barrier, and 23%, similarly, cited this issue as a top barrier in 2008.

Security

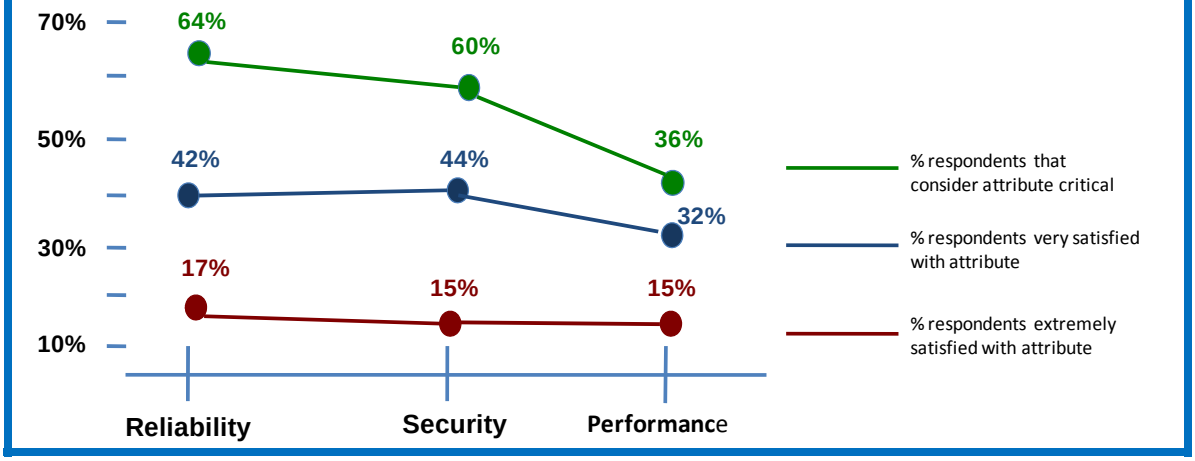
Security, as always, remains top of mind in IT when it comes to wireless. Nearly two-thirds (61%) cited security as the second most important WLAN characteristic after reliability (64%) and nearly half (49%) described the ability to simplify WLAN security deployment as "very important."

With worry comes action, apparently, as 63% have deployed WPA2/802.11i, the strongest authentication and access mechanism in the 802.11 standard. In addition, 45% have deployed wireless virtual LANs (VLANs), and 42% have deployed wireless intrusion detection/prevention systems (WIPS), procured either from their primary WLAN vendor or from a third-party specialist.

User Satisfaction Levels

The top characteristics that users value as critical are reliability (64%), security (61%) and performance (36%). There is a chasm between what users value and their current level of satisfaction with these attributes, with less than 20% saying they were "extremely satisfied" with any of these three attributes. However, expectations and experiences best align in the area of performance, where 32% of users said they were "very" satisfied (see **Figure 3**) compared to the 36% who consider performance a critical attribute.

Figure 3: Importance and Satisfaction

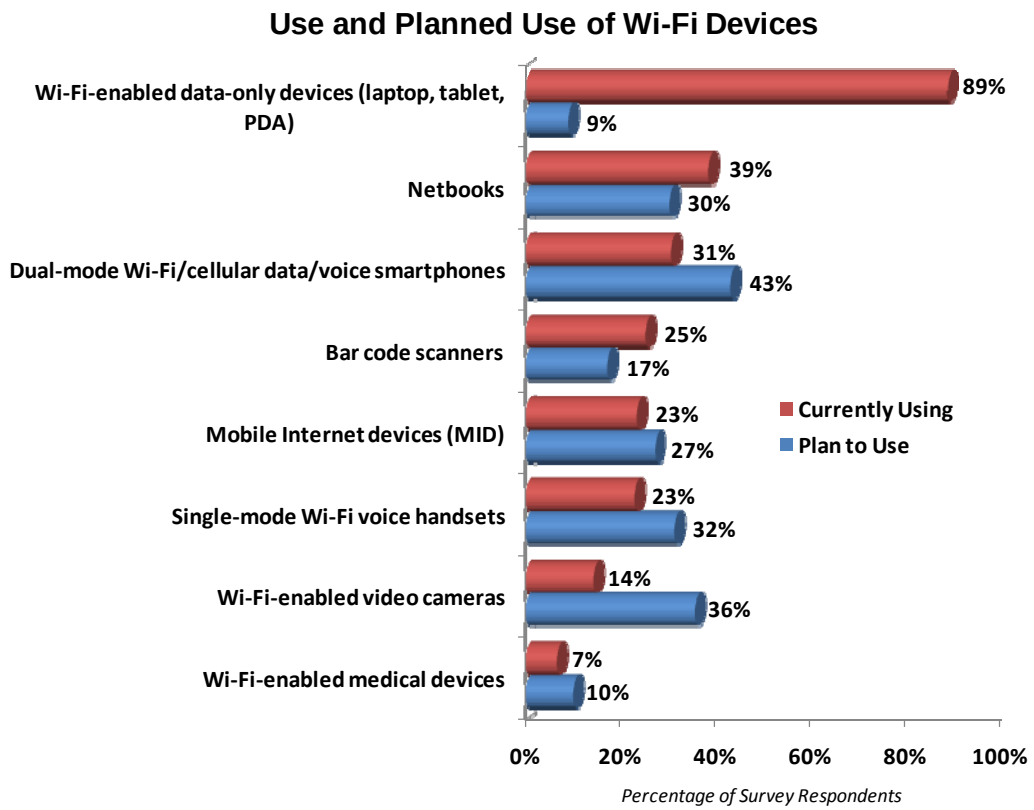


Client Devices

Surprisingly, current netbook usage (38%) outpaces dual-mode smartphone usage, which nevertheless grew slightly to 31% this year from 27% last year. And in the future, more enterprises have plans to use smartphones (43%) than netbooks (31%).

The emergence of netbooks onto the Wi-Fi scene might account for a slight drop in laptop use. Last year, 94% were currently using traditional laptops as Wi-Fi client devices, while this year, the figure dropped slightly to 89% (see **Figure 4**).

Figure 4: Use and Planned Use of Wi-Fi Devices



Conclusions

Despite a dismal 2009 economy and the very recent ratification of the IEEE 802.11n high-throughput standard, the Wi-Fi market held its own in 2009 and is likely poised for a growth spurt in 2010. Enterprise-class vendors are making 11n products available at 11g prices, and those products should soon be certified for interoperability by the Wi-Fi Alliance.

Users value reliability, security and performance above all else in WLANs, yet their satisfaction levels with these attributes remain relatively low. Part of this phenomenon is simply user reluctance to acknowledge high satisfaction levels in general, in fear that the industry might get a big head. Other concerns, however, such as security, have to do less with the state of the technology than with the complexity of it, lowering users' confidence about whether they are truly protected or not.

A Word from the Sponsor:

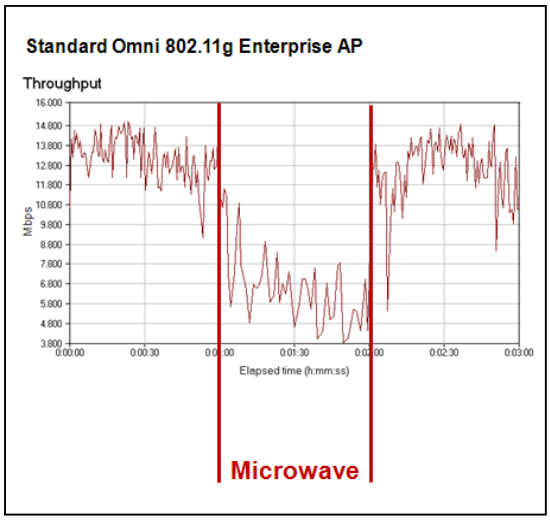
Ruckus WIRELESS

Bolstering 802.11n Reliability with Intelligent Antenna Arrays

By Lily Barletta

Product Manager, Ruckus Wireless

The vast majority of wireless LAN systems focus on how to manage and secure users once they access the WLAN. However for many network and IT managers, just getting users on the network and keeping them connected is an even bigger challenge. In fact, 64 percent of respondents to this year's Webtorials WLAN survey cited "reliability" as the WLAN attribute they value the most, outpacing any other Wi-Fi characteristic. Yet interference, obstacles, spotty signal coverage, high-density usage and contention for the Wi-Fi spectrum continue to challenge Wi-Fi's reliability; only 17 percent of survey takers said they were "extremely satisfied" with the reliability of their Wi-Fi networks.



That's because one of the most essential elements of any Wi-Fi system in solving these problems is the most often overlooked and underappreciated: the antennas.

For years access points have been built with omnidirectional (so-called "rubber duck") antennas that transmit and receive data equally in all directions, regardless of where the client is physically located.

While this is adequate for providing blanket Wi-Fi coverage, these systems do nothing to combat changes in the Wi-Fi environment that cause packet loss and signal degradation, resulting in poor performance for all users sharing the medium. Consequently, as more and more Wi-Fi-enabled devices demand airtime, providing reliable, wired-like Wi-Fi connections, complete coverage and consistent performance has become a huge challenge for network administrators.

Performance Fluctuations in Changing Environments

The only constant in Wi-Fi networks is change. Close a door, move a cabinet, turn on a Bluetooth headset or simply change the orientation of a laptop, and Wi-Fi performance can change dramatically.

Most existing access points have no way to cope with such changes and are highly inefficient in delivering Wi-Fi signals to clients. If there is interference or increasing packet loss, traditional Wi-Fi access points lower their physical data rate until the client receives an acceptable level of service. This is a knife in the back to multimedia applications that have strict latency requirements.

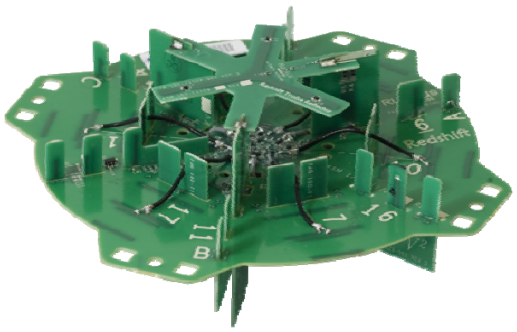
Additionally, to ensure that users experience good coverage, it's often necessary to add access points to a given area to blanket it with signal. This causes RF channel planning problems and co-channel interference.

802.11n only exacerbates this issue. Predicated on a technique called spatial multiplexing, 802.11n was developed to increase the capacity of Wi-Fi networks by using multiple Wi-Fi radios and antennas to broadcast signals simultaneously, which the receiving device must "correlate" to gain higher data rates.

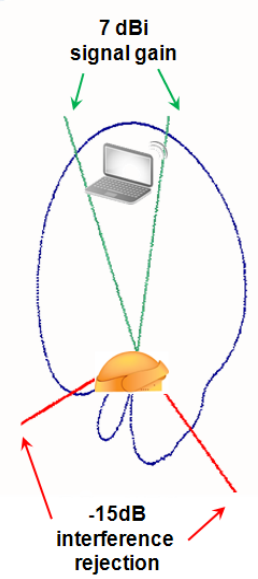
But with the increased use of the RF spectrum, most 802.11n systems cannot control the integrity of the paths that these Wi-Fi signals take. Interference or obstacles that inhibit the propagation of Wi-Fi transmissions compromise spatial multiplexing. So, with 802.11n there's much more to lose, literally.

Because each client is in a different location, the best way to communicate with any given client varies and changes as the client moves. Traditional access points have no way to control how to best get a signal to that client or to monitor AP-to-client communications constantly. However, Ruckus APs are able to do this, which ensures that they are using the highest data rate with the least amount of dropped packets.

Dynamic Path Selection Optimizes Connections



Recent breakthroughs in Wi-Fi technology by Ruckus Wireless combine miniaturized intelligent antenna arrays and new techniques such as beamforming and beamsteering help solve these problems. Ruckus Wireless developed and patented this innovative "Smart Wi-Fi" technology.



Dynamic beamforming is the newest Wi-Fi innovation that forms and directs Wi-Fi signals to each client, using standard 802.11 client MAC acknowledgements to determine if it is

achieving the highest data rate. Ruckus APs transmit Wi-Fi signals directly to the client only when they need it over the highest performing signal path without network administrators having to position access points or antennas. This reduces the number of access points needed and allows the Wi-Fi system to adapt automatically to client performance issues in real-time.

Adaptable to any standard 802.11a/b/g/n chipset, smart antennas comprise a compact, high-gain antenna array with multiple, dual-polarized antenna elements capable of forming 2^N (N being the number of antenna elements) unique antenna patterns, and expert system software that continuously learns and selects the optimum antenna pattern for each packet transmission.

By steering each transmission over the highest quality signal path, dynamic beamforming enables Ruckus smart access points to avoid interference, maximize transmit speeds and minimize transmit errors. This results in better signal range, higher performance and more reliable coverage.

Unlike omnidirectional antenna systems, the Ruckus dynamic beamforming antenna array directs all transmit energy toward the receiving device, maximizing reach while minimizing noise to neighbor Wi-Fi devices that are not on the signal path.

And, unlike fixed-position directional antennas, the expert antenna control software forms “beams” on a per-destination, per-packet basis by combining one or more antenna elements. With literally thousands of unique “beams” covering all directions and all signal polarities, beamforming antenna arrays are flexible and adaptive in order to optimize every connection every time.

For more information, visit http://www.ruckuswireless.com/.

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APPENDIX: Figures A1 – A6

Figure A1. Importance of Mesh Capabilities in APs

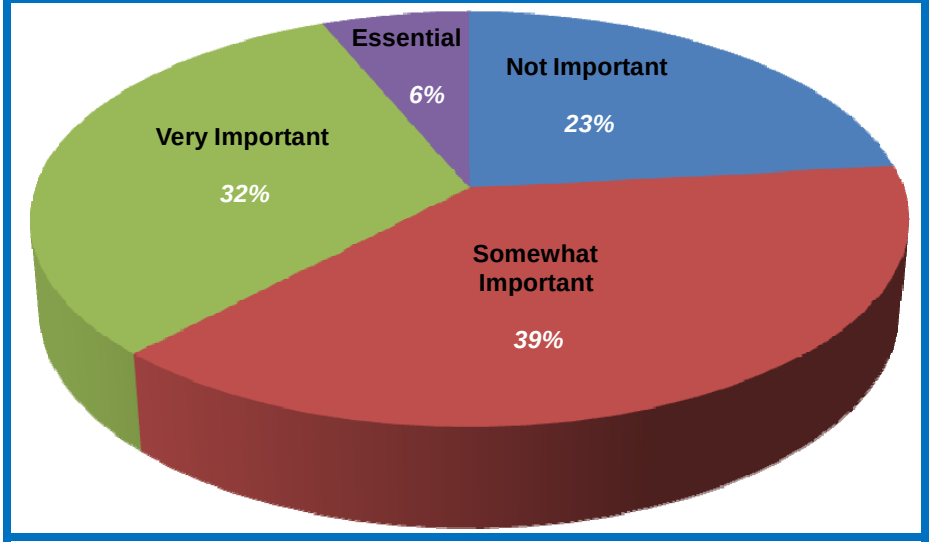

Figure A2. Outdoor Wi-Fi Network Status in the Enterprise

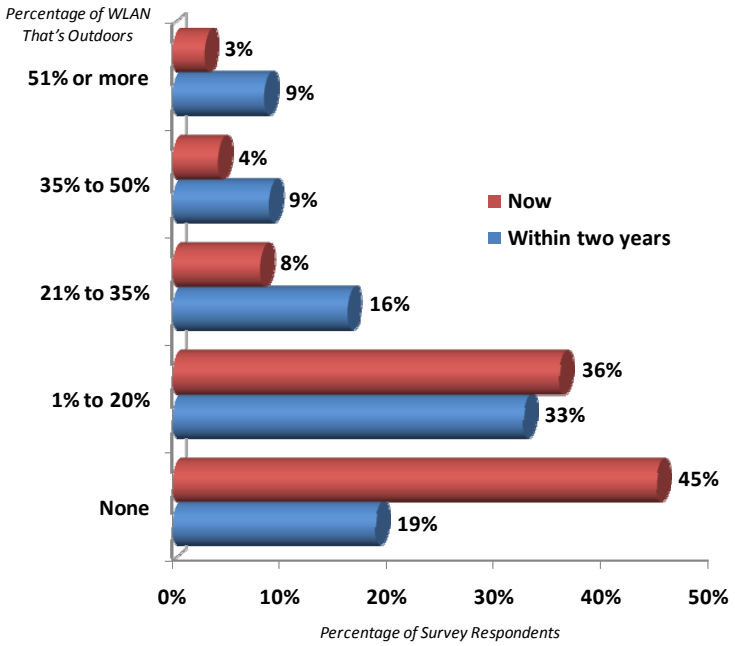

Figure A3. Respondents' Roles in Enterprise WLAN Implementation

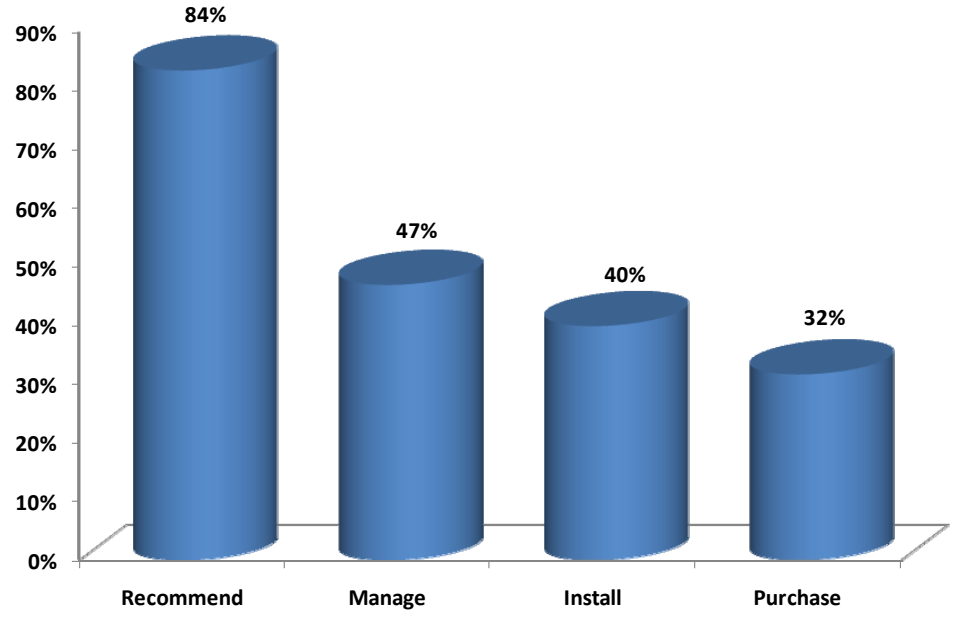

Figure A4. No. of Employees in Respondent Organizations

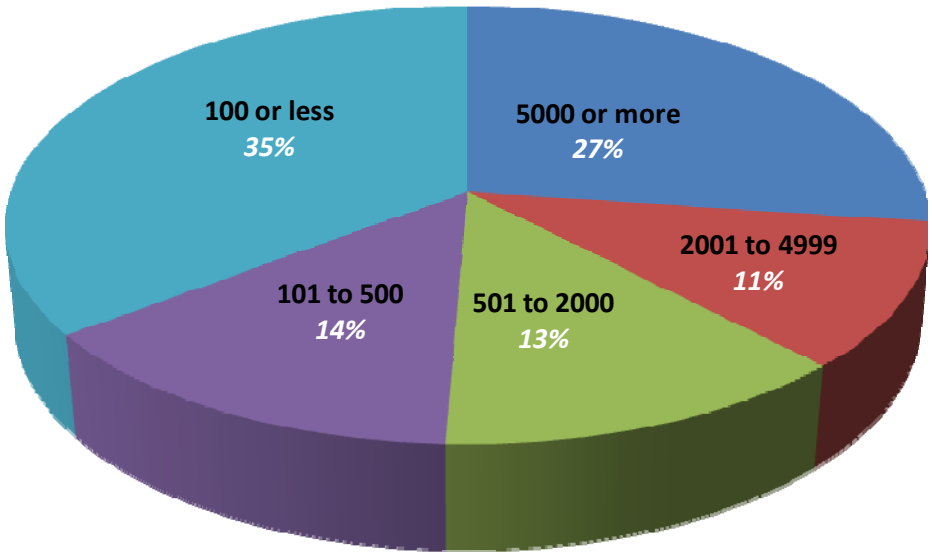

Figure A5. Industry Breakdown of Respondents

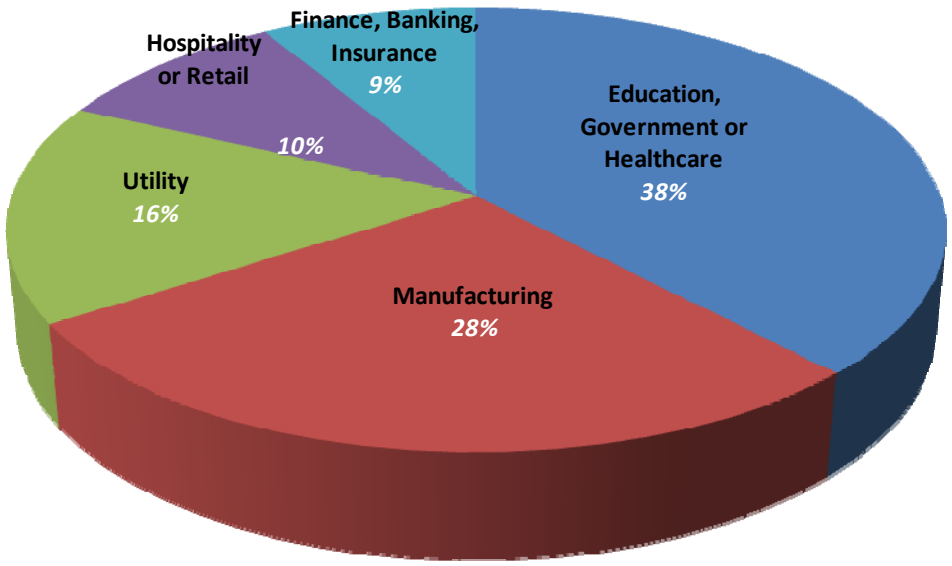

Figure A6. Geographic Breakdown of Respondents