Advances in Wireless LAN Systems:
Meeting the Needs of Midmarket Firms

A Farpoint Group White Paper

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Farpoint Group

W hile the journey is far from over, the ongoing evolution of wireless LAN (WLAN) technologies and systems has brought us to the point where such connectivity has simply become an expectation – *everywhere*. Early wireless LAN systems (which we worked on at the time of our founding more than two decades ago) could at best be described as curiosities, with high prices, very limited performance in terms of both range and throughput, and no industry standards. And yet, to us and a few others, the potential was very clear indeed: *mobile people with mobile computers need mobile networks*, and it was also clear that advances in basic radio technologies, very large scale integrated (VLSI) circuit technology (lower power consumption, lower cost, and smaller form factors) and other radio components, network and wireless protocols, standards, reliability, security, management, and, of course, total cost of ownership (TCO), would eventually yield the sophisticated, capable, high-performance, and broadly-applied WLAN technologies and systems of today. These advances, in turn, spawned equally-remarkable end-user demand that continues to accelerate even today. We have thus moved well past WLANs as suitable only for specialized and vertical-market applications (which, of course, remain as key sources of demand for WLAN connectivity) to the wireless LAN as *primary* or *default* access in all key venues – businesses and organizations of all forms, the residence, and public spaces. And, of course, such connectivity is more than appropriate for all applications and all forms of traffic, including time-bounded voice telephony and streaming video. The key challenge to date has been increasing both capacity and coverage as users demand ever-higher levels of service with an ever-growing arsenal of wireless devices.

The WLAN is thus today the new edge of the enterprise network, with connectivity provisioned across floors, buildings, campuses, and even to remote locations like branch offices and into the residence for telework applications. Indeed, we would go so far as to argue that the wireless LAN is now the *primary* access vehicle for the majority of users everywhere, and, in fact, *essential* – a "must have" as opposed to a "nice to have" capability that converts convenience into productivity. And the success of any network today must be judged in terms just how productive the users of that network are.

Businesses of all forms are consequently embracing the wireless LAN at a perpetually-remarkable pace. And, given the advances in the field noted above, firms of all sizes and types can today realize a cost-effective path to wireless-LAN success. It's important to point out, however, that wireless LANs are not, and in fact never have been, a one-size-fits-all proposition. And it's not just a matter of the differences in scale required across the range from small to large firms; indeed, today we're seeing meaningful if not *vital* product differentiation that is making it easier than ever for firms of all sizes to obtain, manage, and grow with WLAN solutions that are most appropriate to a broad range of considerations and conditions – the subject of this Farpoint Group White Paper.

Understanding Wireless LANs: The Special Needs of Midmarket Firms

The basic element of any wireless-LAN solution is, of course, the access point (AP), which performs the vital task of provisioning access for wireless users to the remainder of

a given network infrastructure. While an AP can be conceptually reduced to antennas on one side, an Ethernet jack on the other, and an array of processing implementing standards-based requirements in the middle, vendor-specific enhanced functionality available in some business-oriented APs available today, primarily related to management and control and often aimed at the needs of specific market segments, is providing meaningful differentiation that is in fact redefining traditional WLAN market segmentation.

Apart from those products aimed at carriers and operators, there are three broad classes of wireless LAN system (WLS) products on the market today (see Figure 1):

- *Residential (RWLS)* – These APs are typically packaged as routers and in general implement all functionality necessary to connect home users to a broadband link. Configuration and management are usually implemented via a simple HTTPS (Web) interface, although this capability is sometimes provisioned via a cloud-based service. While it's often possible to configure multiple residential-class APs to support user roaming, and thus open the door to installations that might be appropriate for very small businesses, these products are inherently limited by a reduced feature set - and often reduced performance - and are therefore inappropriate for all but the smallest firms.

Figure 1 – Midmarket firms are especially challenged by fewer IT resources and greater cost sensitivity than larger organizations. *Source:* Farpoint Group.

- *Enterprise (EWLS)* – Enterprise-class wireless LANs, at the other end of the scale, embody features and performance appropriate to IT shops in large to very-large firms. Management consoles here are designed for use by IT professionals and feature elaborate and comprehensive functionality. Enterprise-class APs are designed for very high throughput and to handle the high-capacity demands of diverse users across large venues and geographies. High-performance WLAN controllers are also frequently part of an enterprise-class solution. Enterprise-class

WLAN systems focus on reliability, scalability, and performance, and, while never just a minor concern, the price of an individual AP is less of an issue.

- *Midmarket (MWLS)* – And this brings us to the special needs of midmarket firms, those with (nominally) up to about 1,000 simultaneous users, and potentially two to three times that number of devices (the *bring your own device*, or *BYOD*, trend is a powerful driver here). In general, networks at these firms are less technically sophisticated than their enterprise counterparts, and these companies often have limited (or even no) IT staffs with less specialized knowledge of wireless and IT overall. There is thus a fundamental requirement for *simplicity* and *ease-of-use* across all elements of the WLAN life cycle – requirements definition, solution evaluation, systems selection and deployment, ongoing operations, and upgrades. We'll look at the special requirements of midmarket firms in more detail below, but for now it's important to note that these mid-sized firms have the same need for reliability as larger organizations, with an enhanced requirement for IT staff (such as it may be) productivity via simplified operations. Thus the core objectives for WLAN systems in this class are ease of use and cost-effective scalability as the midmarket firm's network grows along with the business itself, and minimal (if any) compromise in AP-based functionality.

As it turns out, however, addressing these requirements is more difficult than it seems, as we'll further explore below.

Wireless LANs for the Midmarket: Key Requirements

For most of the history of the wireless-LAN industry, midmarket firms have been forced to make do with either residential/small-business products that are clearly inappropriate based on a lack of scalability, AP capabilities, and management (including security) features, or enterprise-class systems that, while more than capable, have presented these firms with a degree of complexity that many are ill-equipped to deal with. Digging a little deeper into the WLAN needs of midmarket firms, we find that several criteria demand special attention from WLAN system vendors:

- *Ease-of-use* – While this term is most often associated with the quality of experience realized by end-users, in this context we mean the ease with which local IT/operations staff can understand, install, configure, manage, upgrade, and otherwise operate the WLAN system. Midmarket firms often have a "computer person" or "network person" or two, but only rarely have full-time network-operations staffs. This situation demands solutions that are easy to use, particularly with respect to troubleshooting and obtaining a quick view of network status. While this element of operations is sometimes outsourced, ease-of-use, as we'll explore next, is regardless a critical factor in containing costs.

- *Cost-effectiveness* – Ease-of-use is, then, a key contributing factor in minimizing the *total cost of ownership (TCO)* of a WLAN system. But there are of course

additional considerations here: the price of the system (*capital expense*, or *CapEx*), performance (in terms of throughput, capacity, range where required, rate vs. range, and other related features), price/performance (or, in other words, *value*), and the availability of enterprise-class, "big-system" AP and management features with smaller-system convenience, ease-of-use, and pricing.

- *A focus on operating expense* – It is, however, not just CapEx that should be considered in a cost analysis here. Of greater importance, as we implied above, is the minimization of *operating expense*, or *OpEx*, which incldues all costs related to keeping the system up and running after it is initially powered on. Ease of use is critical here for just that reason – while TCO is a function of both CapEx and OpEx, OpEx will usually be the far larger component due to the labor-intensive nature of this element. We generally recommend substituting CapEx for OpEx via the selection of more capable solutions as a key optimization in the TCO calculation – in other words, spend a bit more on solutions that save money across the operational life of the system. We can thus maximize operations-staff productivity in midmarket settings via, again, ease-of-use.

- *Scalability* – Growth is guaranteed in any networking environment, as the number of users, devices, and applications (and their corresponding traffic demands) all increase. While an key element of ease of use is the automatic configuration and re-configuration of radio parameters such as channel assignments and RF transmit power levels, at some point additional APs will be required, and advanced technologies embodied in new products (see the sidebar, "What about 802.11ac?" for more on this) will offer advantages in throughput and thus capacity. All of this implies that non-disruptive growth must be a core element of any solution addressing midmarket needs, again with operational ease-of-use and cost minimization as primary goals.

So all of this begs a key question: what features should midmarket firms look for in WLAN systems so as to accomplish all of the above?

The Evolution of Midmarket WLAN Systems: Meeting the Key Requirements

The answer to this question involves an analysis – and successful implementation – of two key components of a WLAN system solution: the access points under consideration, and, especially, the system's management console. Management functionality (see Figure 2) has become so important in all of the above that we frequently list it as the first item in requests for proposal (RFPs) that we frequently prepare on behalf of clients. But, of course, the capabilities implemented in APs also go a long way towards meeting these objectives, so a careful analysis of their feature set is also in order.

As we noted above, midmarket firms require the same WLAN functionality as larger enterprises. Among the key AP and other WLAN system features required are:

What about 802.11ac?

The upcoming IEEE 802.11ac standard is complicating the WLAN planning of many IT shops today. After all, 802.11ac promises throughput of up to 1.3 Gbps in initial three-stream implementations, roughly three times that of today's common three-stream 802.11n products. Some .11ac products are already appearing, although we don't expect to see many enterprise-class APs until the middle of 2013. Nonetheless, we're often asked today if it might be best to wait for 802.11ac systems rather than to proceed with an 802.11n deployment or upgrade today. Perhaps surprisingly, our answer in every case to date has been no.

While there's little doubt that 802.11ac will ultimately replace 802.11n (and that backwards compatibility to 802.11n will of course be critical), we are expecting that it will be at least mid-2015 before a majority of wireless clients ship with this technology. We're also concerned about the requirement for 80-MHz. radio channels, as interference and limited range may become challenges here. Add in the fact that the official IEEE standard won't be finished until the end of 2013, and that the Wi-Fi Alliance won't begin its compatibility work until early 2013 as well, and 802.11n appears to be at little, if any, disadvantage for the time being.

It's also important, as we mentioned in this White Paper, that architectural and other upper-layer implementation details will continue to have a significant impact on the ultimate performance of any given product – while faster radio technology is always welcome, such by itself is no guarantee of success. Our general rule has always been that if a business case can be built for a deployment today, then that deployment should proceed. The relative maturity and sophistication of today's 802.11n-based solutions, then, present us with no particular issues in realizing both ROI and especially improved end-user productivity, and we thus expect .11n to be the preferred WLAN technology in most midmarket shops for at least a few more years.

- *Rogue AP and wireless intrusion detection* – While this activity has historically been the province of aftermarket Wi-Fi assurance systems, we're beginning to see leading vendors incorporate this capability as an easy-to-use element of the management console. A quick glance at the management console is all that's required to determine status here, and the consolidation of function lowers costs especially for midmarket firms.

- *Beamforming* – It's possible to use multiple antennas to direct the energy of a transmission from the AP is a particular direction for improved throughput, range, reliability, and even client battery life. Ideally, this can be done without any involvement on the part of a specific client device, and can minimize the number of APs required, holding down CapEx.

- *Bandsteering* – While both the 2.4 and 5 GHz. bands must be supported, load-balancing techniques can be applied to move traffic to relatively unused bands in 5 GHz. spectrum. This can be implemented so as to also be automatic and transparent. The benefit here is, once again, minimizing the required investment in APs, along with improved WLAN capacity.

- *Branch and remote operations* – A vital facility is the ability to incorporate, with minimal effort, APs located at branch and even residential locations into the WLAN with no additional hardware or software requirements. Simplified

installation minimizes IT expense, and assures secure and manageable communications anywhere.

- *Spectral analysis and interference mitigation* – The ability to detect and diagnose problematic traffic at the physical (PHY) layer is also vital today. Advanced techniques can be used to mitigate such interference in some cases. We highly recommend such capabilities in businesses of all sizes as there is no substitute technology or method for verifying the PHY environment.

Figure 2 – Operational ease of use is primarily a function of the WLAN system's management console, which must provide a broad range of information and functionality easily accessible and appropriate to the IT staffs of midmarket firms. *Source:* Cisco Systems.

- *Traffic optimization* – Whether handling ordinary data traffic or more demanding time-bounded voice and video, the ability to properly prioritize traffic is critical. Automation can be applied here in order to further minimize OpEx. Note this becomes a vital capability as high-demand traffic such as streaming video consumes an increasing percentage of network capacity.

- *Automation* – And, of course, limitations on IT staffs at most midsized firms demand management facilities that in general automate the configuration, monitoring, and corrective actions required as a result of troubleshooting, with a minimum of operator intervention.

Farpoint Group always recommends installing APs based on 802.11n; there is no reason today to use an older Wi-Fi technology. Note, however, that 802.11n products are available both with three spatial streams, for up to 450 Mbps of throughput, and two streams, for 300 Mbps. Three streams will usually provide improved performance over two-steam designs even when used with two-stream clients. Two-stream APs, however, are still quite viable especially in light of their lower prices, and will be right at home in

many midmarket venues. Vendors that offer a broad range of APs covering a wide spectrum of price/performance combinations also provide a smoother path to long-term growth, as improvements in basic technologies enable additional advances in the product domain (see the Sidebar, "Cisco's New Midmarket Access Points" for more on this).

Conclusions and Strategies for Success

As we have been saying for years, wireless LANs are so important to businesses today that they will continue to grow to the point of pervasiveness – and, at some firms, they already have. While we will continue to recommend wired connections for stationary devices (as long as they can be physically serviced by wire, of course) and user communities that perform their jobs only from fixed locations, the wireless LAN will evolve from primary and default to preferred and, yes, even the *only* access in many organizations. In fact, a broad range of mobile devices today, particularly handsets and tablets, have no default way to plug in – and this trend will continue with Ethernet ports on client devices becoming rare indeed over the next few years. Demands on the WLAN, then, will continue to grow at a rapid rate.

While we do expect the upcoming IEEE 802.11ac standard to have an increasing impact on the corporate wireless LAN (again, see the sidebar, "What about 802.11ac?" for more on this), we expect that 802.11n-based installations have a long and happy life ahead of them. As we have discussed above, advances in the feature sets and related capabilities of access points (already present, as we have discussed, in some 802.11n products) and increasing AP density, along with powerful and yet easy-to-use management systems, will serve most midmarket organizations well into the foreseeable future. We are certainly not recommending that anyone place current 802.11n plans on hold in anticipation of next-generation products; these will, as is always the case, take some time to mature. As we have seen, even leading firms like Cisco, who already offer 802.11ac products (the add-on module for the 3600 series of APs, for example), are continuing to advance their .11n product lines. If an opportunity for return on investment exists, primarily in the form of improved user productivity, it certainly behooves any organization to take advantage of that now.

And advances in WLAN systems technology and products are making it easier than ever for midmarket firms to do so. The price and ease-of-use sensitivities that define this market segment are being addressed elegantly and efficiently today, with the provisioning of "big system" features and benefits with "small system" price points and ease-of-use. And the continuing innovation in 802.11n from major vendors is an important indication that today's investments will indeed be protected for many years to come.

Cisco's New Midmarket Access Points

Apart from our many years of history of working with a large number of firms across essentially every application of wireless LANs and our own sensitivity to the issues raised in this White Paper, a key motivation in producing this document was the recent announcement by market leader Cisco Systems of two new access points aimed, as we were told by the company during a recent briefing, specifically at the midmarket opportunity. Suffice it to say that, despite the points we've raised herein, it's unusual for a WLAN systems vendor to specifically address the needs of the "middle" so to speak, of the WLAN market – albeit a middle representing billions of dollars in potential sales. So, while this announcement is unusual, we expect that many potential customers will take note.

Cisco Aironet 1600i

This announcement focuses on the new Aironet 1600 and 2600 APs. The 1600 is a 3x3:2 (three transmit antennas, three receive antennas, and two 802.11n spatial streams, for up to 300 Mbps) configuration, and the 2600 is 3x4:3, for up to 450 Mbps. Both support essentially the same feature set, with ClientLink 2.0 enhanced beamforming, BandSelect bandsteering, VideoStream video transport optimization, rogue AP detection, Adaptive Wireless Intrusion Detection (wIPS), OfficeExtend for telework applications, FlexConnect/Autonomous for simplified branch operations, gigabit-Ethernet wired connectivity, and operation on 802.11af power over Ethernet. The only real difference, apart from the fundamentally higher performance of the 2600, is support for Cisco's CleanAir interference mitigation in the 2600, and spectral analysis in the 1600. Still, we were impressed that such modestly-priced APs, aimed at the midmarket, have so many enterprise-class features. By the way, the photos of the products to the right show models with internal antennas; versions with external antennas are also available.

Cisco Aironet 2600i

We were concerned about ease-of-use, though, given this broad range of functionality. As it turns out, the Cisco Prime Network Management System (NMS) is designed for use even by those who are not network management professionals, and provides simple interfaces for all of the functionality noted above. Cisco mentions in its marketing materials that the 2600 could also be quite at home in larger venues as well, making it an excellent choice for firms that have growth and scalability as core WLAN objectives.

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