White Paper |

The End of the Wire: Rightsizing the Enterprise LAN

January 2009

Chris Harget
Peter Thornycroft | Aruba Networks

ARUBA® networks

1 Introduction

The migration to wireless LAN is already well under way: many users already make Wi-Fi their primary connection to the corporate network. Indeed, user demand is a strong driver: where there is a choice between a wired and wireless connection, wireless is preferred. Users will migrate to the WLAN, and away from the wired LAN whenever offered the choice.

Universities are early examples of this trend: a new cohort of tech-aware users arrives each year, armed with state-of-the-art notebook PCs and numerous Wi-Fi enabled devices, fresh from a home experience based on wireless networking. They expect Wi-Fi and a state-of-the-art WLAN has become a differentiator in university recruiting. University IT departments are already measuring the effect on their networks. An Ivy League university reported this year that following a new WLAN build-out over the summer vacation, the first semester of the new academic year saw an overall traffic increase of 25%. But traffic on wired LAN ports decreased by 10% and is continuing to decline, a trend that is set to continue.

The same drivers affect the business world. Consumers of corporate IT services are now accustomed to Wi-Fi networking at home, and with 802.11n, the dominant consumer Wi-Fi technology, wireless performance is already indistinguishable from wired. PC refresh cycles have ensured that 30% of corporate computers are already 802.11n capable at the end of 2008, a figure that is set to increase by 25% per year. Yankee Group, an analyst, predicts that in 2009 wired enterprise switch sales will decline for the first time in history due to wireless substitution.

From the IT group's perspective, then, the terminal equipment is already deployed and users want to move to wireless. End-user benefits of convenience and productivity are well-established. Centralized WLANs automate the inter-access point coordination required for seamless, pervasive coverage across a building, simplifying network management. And perhaps most importantly, the widespread adoption of WPA2/802.1X equipment has removed lingering concerns about the shortcomings of earlier wireless security protocols. The remaining issue is the budget.

While Wi-Fi infrastructure is not expensive compared to many other types of IT equipment, the current economic climate requires every expense to be closely scrutinized. This paper offers a methodology for incrementally reducing wired LAN infrastructure by identifying and retiring unused ports and switches, and allowing the savings realized to fund a build-out of the WLAN.

In a telling sign, some CEOs are now directing their IT groups to investigate All-Wireless Office techniques when moving to new office buildings, cutting the cord altogether to most workstations. As we shall see later in this paper, this now presents a clear-cut business case, but it is a jump that only a few companies are able to take, as already-installed LAN equipment and cabling is a sunk cost and a fraction of terminal equipment is not Wi-Fi enabled, or has special needs for wired connections. Our methodology is applicable to the vast majority of enterprises where the migration to a pervasive WLAN is desired but must be cost-justified.

1.1 Right-sizing the LAN

Most enterprises will require wired LAN ports for several years to come. But, under pressure from users and executives, the IT department needs a migration path to building out a pervasive, high-performance Wi-Fi network. We propose a phased migration strategy where cost savings are identified and realized from consolidation of the wired LAN, allowing that part of the IT budget to be redirected to incremental WLAN build-out.

1.1.1 Auditing LAN ports

Most LAN installations are overbuilt and include many unused ports. LAN edge switches were originally procured based on a 2:1 or 3:1 ratio of edge ports to workstations, particularly when installations date from the early days of VoIP adoption. Since Ethernet terminations are fixed and users move around, there are sometimes considerably more edge ports than users - a survey of Aruba's customers indicates a ratio of ports to users of between 2.5 and 4.0.

Even without available Wi-Fi connections, the high end of this range represents a considerable excess of ports. As user populations have moved, many ports are now unused, or are stranded, wired to outlets that are no longer used.

The first step in our strategy is to audit and document unused edge ports. There are two methods. The first is to inspect workstations and wiring closets, to determine which edge switch ports are not connected and which are wired to an outlet that is no longer used.

Alternatively, large organizations in particular can use a software monitoring application. 'StatSeeker' is one such application, where a central monitoring server can track individual port usage. One Aruba customer, a State university system, monitored their network with StatSeeker and found that over a period of 3 months, 40% of edge ports had zero actual bandwidth usage.

1.1.2 Consolidating ports to switches

Once unused ports are identified, they must be consolidated to free up LAN switches. This may require some changes to distribution wiring, representing an expense, but switches that can be powered-down and removed from the network allow considerable savings, even if they are left in place in the wiring closet.

There are several sources of savings. Annual maintenance contracts tend to cost 15% of the switch's original list price. Common 48-port enterprise-class switches list for more than $10,500, so annual maintenance often exceeds $1575 per switch. As soon as a redundant switch is identified, it can be deleted from the maintenance contract, representing substantial recurring annual savings.

Further savings follow. Fewer managed devices in the network allows more efficient, lower cost network management operations. For a typical organization, each employee changes desks about once per year. Whenever a user needs a move, add or change, IT must ensure new ports are activated and old ports deactivated. Sometimes this requires laborious troubleshooting. Many organizations outsource moves, adds and changes, paying a contractor a flat fee per port moved. While labor rates vary, $35-75 per port is within the typical range. Every 48-port switch removed potentially eliminates $1,680 to $3,360 per year of IT costs if contractors are used.

Less power is consumed. A 48-port 10/100 edge switch even without PoE consumes around 143W continuously, and generates 609BTU of heat per hour, which must be offset by cooling. At $0.10 per kWh, each switch costs $284 per year for power and cooling, all of which is saved if the switch is decommissioned.

Most companies have a policy that when users move, distribution cabling is checked to liberate the freed port – but this is not always achieved in practice. An aggressive switch retirement program will require more attention to such policies, as there will be a smaller excess of ports over users, but this offers opportunities to identify more redundant switches as the user population moves. In any event, the savings from retiring unused ports are significant enough that a periodic audit and consolidation will prove cost-effective for many organizations.

The measures above are useful for every LAN that has excess port capacity, but savings can be significantly increased by shifting a substantial percentage of users to 'primarily wireless' network access. When a reliable WLAN is available as an alternative, users will choose to migrate away from wired to wireless. One Aruba customer, a large technology

company with pervasive Wi-Fi, surveyed employees and found that 72% said they no longer needed Ethernet at all for network connectivity.

1.1.3 Deploying a pervasive WLAN

Most enterprises today have some form of Wi-Fi coverage, but many do not yet have a pervasive WLAN although the technology is now mature, terminal equipment is deployed, performance rivals 10/100 Ethernet and IT security and management issues have been overcome. The strategy above to consolidate and retire unused LAN switches can provide the budgetary lever to justify investing in pervasive Wi-Fi coverage over part or all of the organization. But, deploying a WLAN requires resources, and any discussion of 'right-sizing', balancing the LAN and WLAN, would not be complete without a discussion of those costs.

WLANs consume a number of edge ports. Each access point requires a port, but whereas a wired LAN will provision one or more ports per workstation, each access point typically covers 15 to 25 user workstations. While today's 'Draft-2.0' 802.11n access points barely exceed a full-duplex 100 Base-T Ethernet connection, future 802.11 technology will require Gigabit Ethernet ports to avoid making the edge connection a performance bottleneck.

Access points require power. This can be PoE from the closet switch, or from a local power supply. State-of-the-art access points consume 8-16W each, depending on the technology and the number of radios.

Various installation methods present differing degrees of complexity. The most challenging would be mounting in the ceiling space, while many 'carpeted offices' find a desktop or bookshelf mounting is sufficient. But because there are far fewer access points than wired Ethernet outlets, the cost of cabling and mounting WLAN access points is much less than the equivalent wired edge network, a factor that is particularly significant for 'greenfield' sites.

1.1.4 WLAN migration examples

The State university system noted above surveyed their wired Ethernet ports using StatSeeker over a period of three months. They were able to identify 40% of ports as unused. This allowed 90% of closets to shrink by at least one edge switch, reducing switch refresh costs and freeing up budget to fund a pervasive WLAN.

A large Internet technology company provides Gigabit Ethernet to every desktop, but finds that the cost per Mbps of bandwidth used on wireless is far superior, as a single access point is shared by a number of users and carries a higher sustained traffic rate. This is leading them to prefer 802.11n to wired Gigabit Ethernet for new network build-out.

Another university is equipping a new dormitory and science building with pervasive WLAN, but including a mix of wired ports for special needs. Even a limited WLAN component allows fewer wiring closets, 40% less cabling and avoided 5 relay points where distances exceed the maximum Ethernet range. The savings in the wired network more than paid for the WLAN.

1.2 Greenfield installations and the All-Wireless Office

As noted above, many organizations are now contemplating an 'All-Wireless Office' where there is no Ethernet wiring to cubicles or offices. This is already a viable concept, but some aspects are still at the early-adopter stage.

The wiring closet for the All-Wireless Office is much smaller than for a traditional LAN. Ports can be reduced by 90-95%, but there may be more PoE and perhaps more Gigabit Ethernet than before. Switches will support fewer ports but more end-devices, and ultimately more usable bandwidth. They will not require the plethora of complex features marketed today, so a lower-featured, lower-cost switch will be sufficient to support the pervasive WLAN.

Cabling costs are much reduced: instead of a bundle of 2 or 4 cables per workstation, only one Ethernet cable is required per access point, covering 5-10 workstations. While cabling is a sunk cost for existing office space, it is a very significant saving for greenfield sites.

Whereas the 100 metre reach of Ethernet is sometimes a limiting factor, driving the need for more wiring closets or for repeater equipment, Wi-Fi provides inherent range extension beyond 100 metres, even when the access point is served by Ethernet. For longer distances, wireless mesh features offered by WLAN vendors mean that the number of wiring closets can be reduced, offering further savings in the IT budget and more productive use of real-estate.

A true All-Wireless Office uses wireless connections for voice terminals. Of course, many business people now use a cellphone for all business voice communications, but a large number are PBX-connected, and these can be provided with either a Wi-Fi connected deskphone or a dual-mode Wi-Fi/cellular handset.

Most offices include servers, printers or other devices that are not Wi-Fi enabled, and there must be provision for these in the wiring plan. Whereas even one or two years ago it was important to provide conference rooms and public areas with wired Ethernet ports, visitors now expect a guest Wi-Fi network instead of a wired connection.

Although WLANs are inherently more complex than wired LANs, state-of-the-art architectures take care of RF planning, security and quality of service, creating a self-healing network and shielding the network manager from the complexity. Fewer network devices to manage, and more uniform configuration across the network mean that the amount of expertise necessary to manage a WLAN will be no more than for an equivalent LAN.

1.3 Conclusion

WLAN technology is in an enviable position where the benefits are clearly understood, users demonstrate that they will take advantage of it where available, terminal equipment is already deployed and infrastructure-side objections have been overcome. The remaining obstacle is budgetary.

This note has identified a strategy of ‘right-sizing’ the network by identifying and retiring stranded wired edge ports. Powering-down unused LAN switches represents real, hard-dollar savings for the IT budget which can be directed towards building out the WLAN… and as the WLAN becomes more pervasive and more users’ PCs are refreshed, even more wired ports will be abandoned.

Iterated over just a few annual cycles, this strategy offers a path to a more mobile, productive workforce powered by a lower IT budget.

1344 Crossman Ave. Sunnyvale, CA 94089-1113
Tel. 408.227.4500 | Fax. 408.227.4550 | info@arubanetworks.com
http://www.arubanetworks.com

WP_RIGHTSIZE_US_090306