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News

New Wi-Fi Technology Racing Past Standards Process

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While the IEEE Task Group for the 802.11n network standard stalls on ratification, successful network deployments proceed apace, especially in universities.

The IEEE 802.11n Task Group keeps pushing back the date for full ratification of the latest edition of the popular wireless network standard. The market, however, isn't waiting. Spearheaded by universities, the 802.11n technology has recently entered "enterprise" architectures with a flourish. In fact, a recent survey conducted by BT Professional Services (www.ins.com/WorkArea/showcontent.aspx?id=2772) indicates that the prestandard 802.11n technology might be nearly ubiquitous by the time the Task Group gets around to finishing the standard, now slated for November 2009 (www.ieee802.org/11/Reports/tgn_update.htm). According to the BT survey,

> While many new technologies take years to be adopted, 802.11n appears to be exceeding the typical adoption curve. In fact, nearly one-third (31 percent) of respondents plan to migrate to 802.11n within the next 12 months, and another 20 percent plan to do so sometime beyond this timeframe. For an unproven and not-yet-standardized technology, these plans signal that 802.11n's benefits are urgently needed, enough for a large number of IT organizations to take a leap of faith in adopting it.

Although the IEEE might not be ready to ratify its standard, the Wi-Fi Alliance—an umbrella group of 802.11 technology vendors—has been certifying the interoperability of the new gear's Draft 2.0 version since June 2007. Alliance executive director Edgar Figueroa says the 11n technology is booming in the marketplace.

"802.11n Draft 2.0, which is our certification program, has exceeded anything we can benchmark against it," Figueroa says. "I think we were tracking the first six to nine months of the program and we were seeing double the rates of products certified through our program that we saw with 802.11g."

The Alliance's certification program for the earlier 11g standard had been very successful—"a high water mark," Figueroa said. "And n just shattered that."

New and improved, but also time to change

The State University of New York at Morrisville deployed the world's first all-encompassing 802.11n enterprise network in October 2007. For Jean Boland, SUNY Morrisville's vice president of technology services, installing the 11n network was a calculated risk well worth taking. The college's IT staff began planning for an 11n network even before the Alliance began certifying products.

Even though Wi-Fi and laptop integrators were telling Boland that the final standard might include some software modifications, she says they needed the speed enough that they moved forward with the new standard, anyway. "It was a bigger risk for us to sink our money into 802.11a, b, or g technology, which we viewed as being at the end of its life, anyway."

SUNY Morrisville was replacing a circa-1999 802.11 frequency-hopping, spread-spectrum technology that pre-dated Wi-Fi. Not only was it slow by Wi-Fi standards, but it also wouldn't work with the Microsoft Vista operating system installed on incoming students' laptops.

The new network was also critical because Morrisville's wired campus network doesn't extend to the college's dorm rooms. "It's our production network," Boland says. "We had to be production-ready when we went live because our students live or die with it. This had to work."

In the year since the network went live, Boland says the decision still sits comfortably. "Since we made our decision, the Alliance decision to certify products told us we made the right decision," she says. "There's no reason to feel uncomfortable moving ahead. It doesn't make good fiscal sense to spend the money on b or g at this point."

If Morrisville can take pride in being the first 802.11n network, Duke University was, albeit briefly, home of the world's largest 11n deployment. Rather than replacing a grossly obsolete network, Duke was replacing a two-year-old 802.11g network. It announced the new network in February, featuring Cisco Aironet access points (APs). It currently has 2,400 APs running campus-wide.

"We have a highly mobile campus and have done a lot of innovative work to support both mobility and the use of digital media," says Duke chief information officer Tracy Futhey. "For example, we issued iPods for incoming freshmen and challenged faculty to find innovative uses of recording and repurposing digital content. Being able to do that for students in an increasingly mobile and collaborative environment has necessitated we stay a little further out on the edge in terms of speed."

In fact, the Duke wireless network is becoming the network of choice for the university's users. Although Duke's wired network was much larger and more accessible than SUNY-Morrisville's, Bob Johnson, Duke's senior director of communications infrastructure, says network usage reports show that WLAN connections now account for about 50 percent of overall campus connections.

"We've also taken look at utilization of wired ports, and right now we're using only 60 percent of our wired ports," Jonson says. "So we see a real opportunity for cost avoidance."

To realize that, however, Futhey says the wireless network must provide enough bandwidth for users to be able to call up rich digital media such as video and voice over Wi-Fi, hence the decision to go with 802.11n now.

How it differs, how to proceed

An 802.11n network offers up to five times the throughput of its predecessors (better than 100 Mbps maximum) and twice the range. This is largely due to MIMO (multiple input, multiple output) technology that uses *spatial multiplexing*, a technique that employs multiple data streams in the same channel to multiply a single stream's throughput. As the Wi-Fi Alliance explains in its reference material, this is similar to having two FM radios tuned to the same channel at the same time—the signal becomes louder and clearer. This multiplies the Wi-Fi signal performance, which is reflected in the two, three, or even more antennas found on some 802.11n APs or routers.

Channel bonding also increases 802.11n performance (http://www.cisco.com/en/US/prod/collateral/wireless/ps5678/ps6973/ps8382/prod_brochure0900aecd806b8a92_ns767_Networking_Solutions_Brochure.html). This technology simultaneously uses two separate, nonoverlapping channels to transmit data (thereby theoretically doubling throughput at the PHY [physical] network layer). Channel bonding can greatly reduce interference from other devices, especially if deployed in the 5 GHz band. This interference is a particular problem in the 2.4 GHz range used by legacy 802.11 technologies because Bluetooth headsets and wireless landline phones also operate in that range.

BT consultant Greg Taylor says these capabilities make the 11n technology a perfect fit for university networks. "Higher education tends to be a little more advanced in risk-taking," Taylor says. "They're looking at their client base essentially as students connecting to their network. If they're going to have lecture halls with everybody connecting, you need that increased capacity. They may also have reduced security risk compared to corporate enterprises, where there could be some reluctance rolling it out without knowing what security risks may be inherent with this new protocol."

However, Matt Barber, SUNY-Morrisville's wireless network analyst, says the 11n security mechanism is the same WPA2 (Wi-Fi Protected Access) technology featured in 11g. The WPA2 mechanism has become fairly standard across large enterprises, Barber says. "They pretty much got it right then, and they've stuck with it."

Barber notes that, because Morrisville's "first-ever" network started from a blank slate, the college's networking staff and its consultants began planning for its 11n network as if they were going to deploy a 5GHz 802.11a network. "We really didn't know what the range improvement would be," he says. "So we put the APs in all the same places. It turns out the range is much improved, twice as far in some cases."

"The coverage was so much greater than we thought on paper," his colleague Boland says. "We originally thought we'd need 900 APs to give us what we wanted, and we ended up with 724. And we have more area covered than we originally planned." The unexpected coverage extends off-campus, she says, including part of the village of Morrisville, where the university now offers guest accounts.

An ancillary benefit of the new network, Boland says, is improved performance for legacy Wi-Fi gear users, probably because of the increased transmission range of the 11n APs, manufactured by Meru.

On the other hand, Duke decided to do a 1-for-1 swap of its 11g network for the new 11n equipment. "For us, the ability to do the rich media transfers is compelling enough that the marginal cost you save by not deploying those APs would be a diminishing return," Futhey says.

What's next

Vendor data seems to confirm the BT survey results. Chris Kozup, senior manager of mobility solutions for Cisco, says 1,000 participants in a recent video seminar indicated a robust interest in 802.11n, with 40 percent saying they were moving ahead with pre-standard networks.

"Twenty percent of those viewers indicated they had already deployed 11n, 20 percent indicated they were in pilot phase, and 27 percent indicated they would wait for the IEEE standard," Kozup says. The remaining 33 percent was split between those who lacked a business justification for it and those for whom the costs were just too great.

Kozup says the predicted worldwide explosion of new Wi-Fi enabled devices, together with the ascent of WLANs as the primary connections for most of those devices, will mandate the greater capabilities of 11n sooner rather than later.

The Wi-Fi Alliance's Figueroa says the world's familiarity with previous versions of Wi-Fi has made the transition from 11g to 11n relatively painless thus far. "They know Wi-Fi, and n is Wi-Fi," he says. "So they look at it as just another version of something they know and like. Our test program assures interoperability, and the Alliance is doing what it can to assure the changes are future-proof. The numbers are compelling and it seems the industry in general has turned the corner." Figueroa notes that half of all Wi-Fi chipsets shipped in 2008 will be 802.11n.

Duke's Futhey says the de facto widespread acceptance of 11n doesn't mean standards makers, vendors, and users should become complacent. "There's the expectation that once things are on the market, they're fully baked," she says. The pressure and need for higher bandwidth can add to IT managers' sense that they're facing a nondecision, because IEEE 802.11n is the only alternative that will provide the bandwidth their clients and customers want.

"At the end of the day, there are some times where technologies, and the adoption of them, have a will of their own," Futhey says. "So, the sooner this gets ratified and everybody's moving in the same direction, the better able we'll be to avoid future difficulties with something that hasn't quite made it to a full standard—even though the adoption is so widespread it has turned into a de facto one."

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