Wireless technology has been part of the office environment for a decade. During this time, small business has been reliant on aging wireless standards that provided some level of reliability, speed and security.

Still, firms have known for some time that the current standards — notably 802.11 variants a/b/g, all approved by both the IEEE standards body and the Wi-Fi alliance — just weren’t good enough for today’s fast-paced, get-it-there-yesterday mentality.

“Coverage is a big issue for small businesses,” says David Tucker, vice president of the small business technology group at Cisco Systems Inc. of San Jose, Calif. “And the problem has traditionally been that there can be dead spots — areas where coverage just isn’t reliable, like in the break room or the conference room.

“That has caused a lot of smaller businesses to shy away from wireless networks in the past,” he adds. “The Wireless-N standard changes these dynamics and provides the confidence for small businesses to easily deploy an affordable, high-performance solution.”

Wireless-N is a much-improved, recently ratified wireless connectivity standard. Formally called 802.11n, this standard is a giant step up from its predecessor, 802.11g.

The technical improvements are significant and in important areas — speed, reliable connectivity, centralized management and security. And vendors are more than up to the challenge, with fully featured and competitively priced controllers and access points (APs), many geared to the small business market.

**Major Improvements**

The most noticeable improvement for most organizations will see with 802.11n is in throughput. According to the experts, it will be between three and six times faster than 802.11g, depending on implementation.

That’s because the technology allows for more bits of data per unit of spectrum and time, explains Craig Mathias, a principal at Farpoint Group of Ashland, Mass. The 802.11n specification allows up to four radios by four radios, which can deliver up to 600 megabits per second (Mbps), compared to the 54Mbps limit with 802.11g.

Today, speeds top out at about 300Mbps, Mathias says. Products will have the potential to offer up to 600Mbps connectivity speed in about a year, he adds.

One reason for the speed boost in Wireless-N is a technology called MIMO (Multiple-Input/Multiple-Output). It offers the ability to carry multiple streams using techniques to increase the bit rate of the radio.

With MIMO, rather than comparing and taking the strongest signal, the technology processes signals from multiple antennae by using a mathematical algorithm that yields a better signal than the sum of its parts, explains Joe Melfi, associate director of business solutions marketing for D-Link Systems Inc. of Fountain Valley, Calif.

Another reason for the massive increase in throughput is the ability to support multiple antennae. In addition, multiple antennae can be used to provide what is known as “diversity,” allowing the antenna with the strongest signal to be used at any point in time.

Capacity also improves with Wireless-N. “Even if all you’re doing is surfing the web or printing, you’ll find that there is a much larger capacity in the network to support a large number of users and their applications,” Mathias says.

The new specification is also much more reliable. According to end users, this is something that wireless networks have been lacking for some time.
“This is the first time companies are experiencing Ethernet-like network connectivity in terms of speed and reliability via a wireless connection,” says Saleh Nassar, product line manager for SMB Wireless at NETGEAR of San Jose, Calif.

“As a result of Wireless-N, companies have the foundation to run business applications over the wireless network with wireless connectivity that is as reliable and secure as Ethernet,” he adds. “They can even get up and walk around their building without losing connectivity.”

The type of reliability and stability provided by 802.11n will also support the eventual move of many small- and medium-sized businesses (SMBs) to cloud-based service, something analysts predict will grow exponentially over time. Wireless 802.11n technology provides the level of connectivity needed for a business to run its cloud-based applications while still giving their employees the ability to roam throughout the office, Nassar says.

Wireless-N products also provide much more mature centralized management capabilities than previous generations of wireless networks and devices. These centralized management software products are often bundled with every vendor’s Wireless-N solution.

This can help deliver a high degree of availability (five or six nines) that every business network requires. It also allows for functions like rogue access point detection and radio quality monitoring.

Bottom line for small business: portability equals productivity. “If you have people waiting because the network is slow, that’s lost productivity,” Mathias says. “In some cases, they don’t know if they should stay at their seat or get up and get a cup of coffee.”

**Getting Started**

It’s possible to replace an entire legacy wireless network or even a wired network, along with endpoints like notebook computers, in one fell swoop. But for companies focusing on the bottom line, that’s an unlikely scenario.

More often, small firms are likely to take a staged approach, which is less disruptive and easier on the budget. That means investing in 802.11n access points and controllers, but replacing notebook computers and other peripherals as they reach end of life or are needed for a specific project.

At the very least, to get started, a company will need new 802.11n access points, a new controller and Fast Ethernet or Gigabit Ethernet for the backhaul — to connect the access points. Most companies already have the necessary wired Ethernet infrastructure.

When it comes to access points, there are two kinds. Thin access points have little intelligence and rely on the controller for most functions. Thick access points are more adaptive and feature intelligence based on the load.

Whether the access points were thick or thin used to be an issue until very recently, when the newest Power over Ethernet (PoE) standard was ratified. The earlier version of the standard, 802.3af, was capable of only a paltry 12.95 watts — enough for legacy wireless access points, but not enough to power 802.11n access points.

But the new standard, 802.3at, is capable of transmitting up to about 25 watts, which will power most available access points today. For companies using the older PoE standard but upgrading to Wireless-N, there are inexpensive power injectors from vendors like Symbol, TRENDnet, PowerDsine and ZyXEL that help bridge the gap.

**Vendor Offerings**

Most vendors today have created 802.11n-based offerings geared to the needs of small and midsized businesses. Some, like Aruba’s 600 Controller Series, an all-in-one unit, combine a controller and built-in access point with the capability of adding more.

The firm’s 651 units allow users to take home an access point. Staff members then plug it into an Ethernet connection, and using its remote access point technology, set up a secure tunnel back to the company to allow working from home.

Other SMB-based solutions pair controllers with access points. However, they do this at a lower price point and with centralized management functions.
The idea is this: A basic SMB-based wireless solution consists of access points that are simply connected to a standard switch. However, as the number of access points increase, installation and management become more challenging, necessitating the need for a built-in, centralized management solution.

One such example is D-Link's recently introduced DWS-4026 wireless switch. When coupled with the firm's DWL-8600AP 802.11n access point, it creates a centrally managed wireless system.

NETGEAR, which caters all of its offerings to the SMB market, has the ProSafe Smart Wireless Controller that centrally manages 16 access points and up to 256 users. Its companions are the ProSafe Wireless-N Access Point, the ProSafe Dual Band Access Point or the ProSafe 802.11n Dual Band Wireless-N Access Point.

Cisco has taken a somewhat unique approach to its Wireless-N offerings for the SMB market. Like most vendors, it has a stand-alone access point, the WAP44120N Wireless-N Access Point.

However, the firm has also recently introduced a Wireless-N clustering technology that eliminates the need for a controller. The Cisco 541N Wireless Access Point has the capability to cluster with other 541N access points, automatically sharing configuration data and other information.

**The Road to Wireless-N**

Even companies that take the Wireless-N plunge and implement one of these technologies probably still have legacy equipment. The result of all of this is a hybrid network, probably consisting of a mix of 802.11n plus a/b/g equipment.

This can be a cost-efficient way to move toward a Wireless-N environment. Still, it also means that often, the new equipment can’t run at full speed. Because when an 802.11n network senses the presence of legacy devices, it automatically slows down to match those devices.

But there are workarounds. Aruba Networks, for example, has incorporated something it calls "airtime fairness" into its 802.11n devices. It uses a weighted ratio to allocate transmission time among 802.11a/b/g/n devices.

Older 802.11b devices (the slowest), get the least airtime while 802.11n devices get the most, explains Michael Tennefoss, director of strategic marketing at Aruba Networks Inc. of Sunnyvale, Calif. Aruba also uses a technique called "band steering" that determines which devices are capable of running at high speeds and forces them into the faster, quieter 5GHz frequency band.

Other vendors optimize hybrid networks in different ways. Cisco, for example, uses something it calls ClientLink. This is free software that uses beam-forming technology to increase the strength of the signal going from legacy forms of wireless technology to 802.11n.

No matter what technology you end up using, Aruba's Tennefoss recommends designing your wireless network for capacity rather than coverage.

"Don’t just look at how far you can transmit with the fewest number of access points under the best conditions,” he says. “Look at the demand you expect over the next three to four years in terms of throughput requirements and applications.

“For example, do you plan to implement wireless voice? Streaming video? Electronic whiteboards? Doing so might well change what infrastructure you use and how you deploy it. “

**Future of Wireless**

According to the experts, wireless networking will just get better and better. In addition to products capable of 600Mbps being widely available by the end of 2010, Farpoint's Mathias expects to see gigabit wireless LANs as early as 2011, although a standard for this technology will likely take until 2012.

It won’t be unusual in three or four years to see wireless LANs capable of 10 gigabits per second or even more, he predicts.

All of these advances, in combination with the expected ubiquity of smartphones and other leading-edge wireless devices in smaller companies, might just be what it takes for SMBs to make the leap to all-wireless networks, Cisco's Tucker believes.
“In the next few years, SMBs might eventually choose just to use a Wi-Fi network as their primary network inside their building,” he says. “The technology will be easy to deploy and will provide mobility and flexibility to the business.”

Wireless-N: A Boon to Voice and Video

There is nothing worse than a phone call where one party can’t hear the other because the sound is choppy, or watching a video where the picture freezes intermittently. These problems, caused by latency and jitter, can be largely solved by implementing 802.11n.

“Delay and jitter are the enemy of multimedia,” says Joe Melfi of D-Link Systems Inc. “If a packet is missing because it’s delayed, the previous packet will repeat. But because 802.11n is faster and more robust, it allows you to share the bandwidth and provide sufficient throughput to deliver data, voice and video.”

There are also many more options for prioritization of traffic with Wireless-N — something that greatly helps multimedia applications. If a company is conducting a video conference, for example, that traffic can be given higher priority on the wireless network.

The same is true of streaming video. Because streaming video is time-bounded and large, there is no slack.

“Traditionally, businesses used less resolution and held back on quality,” says Craig Mathias of Farpoint Group. “But with 802.11n, that’s not necessary.

“With Wireless-N, it’s more about capacity than throughput,” he adds. “So if you need more capacity to support more video conferencing users, you have it. It’s like the difference between using a dial-up modem and a cable modem connection. There are a lot more possibilities with broadband. Just think of Wireless-N as a broadband wireless LAN.”

Tips for 802.11n Migration

802.11n offers the potential to bring revolutionary advances in bandwidth, throughput, security and reliability to wireless LANs. Some even say it will place the WLAN on the same performance level as a wired LAN.

Here are some things to consider when upgrading:

Q. How do 802.11n APs interface with existing switches?

A. To get the full speed out of clients connected to an 802.11n wireless network, a gigabit switching infrastructure is needed.

Q. How are 802.11n APs powered?

A. They can be powered by a traditional AC adapter or via Power over Ethernet (PoE). Keep in mind, because of power requirements, some 802.11n APs require the 803.3at PoE standard, PoE switch or power injector.

Q. What is the impact to the network backbone?

A. Adding an 802.11n AP will most likely add more traffic to the network infrastructure.

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