

The Next Generation of Wireless: 802.11n for the Business

Overview

Wireless local area networks (WLANs) have evolved over the last decade from casual hotspots, to centrally controlled enterprise networks, to business-critical platforms that deliver critical services such as interactive multimedia traffic. There are several market transitions driving the need for more bandwidth over the wireless network, as well as the need for a more reliable and consistent experience.

It is projected that over the next three years, more than 1.3 billion wireless-enabled networked mobile devices will enter the marketplace. These mobile devices include net books, smart phones, notebook computers, tablet computers, and other devices. This explosion of wireless devices places more demand on the wireless network, which, in turn makes it essential to upgrade the network.

New services and applications, such as video conferencing, add to these bandwidth demands. Video-over-wireless devices, once perceived as consumer applications, have become established in the business environment as a way to reduce travel and training costs.

The adoption of mobile devices and video within the workplace exemplifies the change in the way IT resources are being consumed, a trend that shows no sign of slowing down. In a bi-annual security research survey conducted by Cisco in 2010, IT security professionals indicated that 40 percent of employees currently use unsupported devices, and 7 percent of organizations allow personal devices on the network. Of the organizations surveyed, 53 percent indicated that they were likely to allow personal devices on the network within the next year.

The Evolving Need for 802.11n in the Enterprise

To meet these new and upcoming demands, Cisco has focused on solutions that use 802.11n technology. Cisco® Unified Wireless Network delivers a highly scalable platform for business communications by combining the mobility of wireless technology with the power and performance commonly associated with the wired networks.

To understand the need for next-generation wireless based on 802.11n, it is helpful to look at the evolution of wireless networks. While wireless technology began as a convenient way for mobile workers to stay connected while traveling, it has quickly become a “must have” for organizations and a critical part of their overall network strategy. As wireless technology has improved in critical areas such as security, enterprises are deploying wireless throughout their organizations - not simply for business travelers or in-building mobile workers, but for the entire organization. Pervasive networks supporting a greater number of users and applications require a wireless network that can scale in performance by providing increased throughput, while at the same time delivering greater reliability and predictability.

The primary drivers for 802.11n adoption include the following:

- **An increasing number of users with varying needs require wireless connectivity.** Organizations use their wireless networks to serve a wide variety of users with diverse needs. Employees in remote offices want to remain connected to their corporate networks. Employees who were previously bound to their desktops now want the ability to move throughout a building or across an enterprise campus during their workday and remain connected. Factory workers, hospital employees, and students on university campuses all need to remain connected and access critical information without sacrificing mobility. The increasing number of users is placing a greater demand on wireless networks, resulting in a need for higher throughput, along with greater reliability and predictability.

- **A greater number of mission-critical applications are being placed on the wireless network.** The convenience of mobility, coupled with the availability of robust wireless security, has led organizations in a variety of industries to use their wireless networks for more than just email and Internet access. Hospitals use their wireless networks to access patient records and send radiology images. Universities use WLANs to administer tests, and manufacturing facilities use them to track inventory. Stock exchanges use wireless networks to conduct financial transactions in real time, requiring the utmost in availability. The wireless network is now considered just as mission-critical as the wired network. For this reason, reliability and predictability are paramount.
- **Businesses must support an explosion of new mobile devices.** With the increasing number of users from all areas of the organization, it's inevitable that businesses will have a wider variety of client devices that require connectivity to the wireless network. In addition to laptops, wireless networks must now support net books, smart phones, and tablet computers. To realize the full capabilities of many of these new devices, businesses are looking for a next-generation wireless network that can provide the security and scalability to successfully support the mobile devices that users bring to work.
- **Voice, data, and video are now converging on the wireless network.** Businesses have recognized the benefits of using their WLANs for video and voice applications. As the technology for voice and video over WLAN has improved, the cost benefits of combining voice and video with data over one network has proved to be compelling for many enterprises. The WLAN must be designed to handle latency-sensitive multimedia applications, such as voice and video, while delivering reliable and predictable coverage.
- **Wireless technology is being used in more challenging RF environments.** Wireless technology is deployed in a broad variety of environments, including those that present significant challenges for RF communications. Among these are factory floors, retail warehouses, hospitals, and university campuses. These environments require more reliable RF coverage to combat interference and multipath challenges. More than ever, IT managers need to have visibility into their wireless spectrum to manage RF interference and prevent unexpected downtime.

All of these factors have contributed to the development of 802.11n. 802.11n delivers many of the attributes necessary to address the increasing number of users, the proliferation of various client devices, the convergence of voice, data and video on the WLAN, the increase in mission-critical applications over the wireless network, and the trend toward deploying wireless in more challenging environments. With its improved performance when compared with previous generations of wireless networks, it's no wonder that enterprises and the industry at large have been deeply interested in 802.11n.

Building a Better WLAN with 802.11n

The 802.11n standard delivers the bandwidth and reliability needed in today's most demanding enterprise environments. Its support for interactive multimedia applications provides up to six times the performance of 802.11 a/g networks. Added to the power and performance of 802.11n, Cisco delivers true enterprise-class RF technology designed to maximize 802.11n performance. Cisco technologies such as CleanAir, Client Link and Video Stream, plus optimized access point radio and antennas, improve performance regardless of device location.

It is this combined technology that allows Cisco solutions to outperform the competition by an average of 169 percent in the 2.4-GHz spectrum and by 64 percent in the 5-GHz spectrum when tested at four different distances between the client and access point.

Enhanced Throughput

The most noted improvement made possible through 802.11n is its ability to increase the throughput on a wireless network. For pure 802.11n environments, testing has shown performance enhancements that deliver transmission rates of up to 300 Mbps of bandwidth per radio. Dual-band radios, operating in both 2.4-GHz and 5-GHz bands, can

deliver an aggregate of 600 Mbps. In a typical deployment, businesses will see a noticeable increase in the amount of bandwidth available per client. Testing has shown a single client could experience an increase of three to five times in the average amount of dedicated bandwidth. 802.11n has also shown the ability support the distribution of up to seven times more video streams.

This improved video stream support has improved the way that organizations can take advantage of streaming video applications. As an example, healthcare providers are able to perform a greater number of simultaneous mobile diagnostics. Greatly improving staff productivity, resource allocations, profitability, and most importantly, the way they treat their patients.

Reliability and Predictability

As the throughput enhancements of 802.11n enable organizations to implement voice and video to improve and meet operational goals, reliability and predictability become more important. Network latency can have a noticeable impact on the quality of voice and video as it traverses the network. Reliability is also a concern for financial trading institutions, as delays in data reaching its destination can result in millions of dollars of lost opportunity. For healthcare providers, who need to transmit patient records, reliability can impact how effectively patients are treated.

This is an area where 802.11n can truly offer breakthroughs in wireless networking. 802.11n uses multiple-input multiple-output (MIMO) signal processing that relies on multiple antennas and receivers to improve the reliability of the wireless link, decreasing the likelihood that packets will be dropped or lost. Reducing dropped packets improves the link's reliability, and a more consistent throughput helps ensure predictable coverage at any point in the facility.

An added benefit of 802.11n is that it's enhanced reliability and predictability extends to existing 802.11a/b/g clients in addition to new 802.11n clients. Thus, 802.11n delivers substantial improvements, regardless of the type of devices or the speed with which the business conducts a device refresh. Furthermore, the advantages of MIMO extend to both the client and the access point.

To combat interference, a common cause of latency, Cisco solutions use CleanAir technology that delivers highly accurate interference detection, and mitigation. Cisco CleanAir technology delivers:

- **CleanAir Application-Specific Integrated Circuit (ASIC)**, system-level intelligence to detect, classify, locate, and mitigate the impact of wireless interference
- **High-definition spectrum intelligence** that enables the collection and analysis of detailed interference information
- **Systemwide integration** that extends throughout the Cisco Unified Wireless Network to optimize performance, speed troubleshooting, enhance wireless security, and enforce wireless device policies

CleanAir technology enables the Cisco Unified Wireless Network to correlate sources of interference across the network, supporting intelligent decisions and policies for faster troubleshooting and automatic RF interference avoidance.

The Cisco Unified Wireless Network

Cisco delivers a modular architecture designed to be extensible so that it can easily incorporate today's most advanced wireless standards and technology. The Cisco Unified Wireless Network is designed with flexibility, modularity, and investment protection in mind. The Cisco Unified Wireless Network offers next-generation wireless networking with greater throughput, reliability, and predictability for pervasive wireless networks.

The Cisco solutions enabling 802.11n include:

- **Cisco Aironet® access points:** Cisco delivers a number of access point options for indoor use in corporate offices and for more challenging environments. Cisco Aironet 3500i and 3500e Access Points deliver

CleanAir technology to intelligently avoid RF interference, optimizing 802.11n coverage and assuring reliability.

- **Cisco Wireless LAN Controllers**, which simplify the deployment and operation of wireless networks, helping to ensure smooth performance, enhanced security, and maximum network availability.
- **Cisco Wireless Control System**, allowing IT organizations to successfully plan, deploy, monitor, troubleshoot and report on indoor and outdoor wireless networks.
- **Cisco Mobility Services Engine**, providing a practical approach for the delivery of mobility services and applications. This open-platform appliance supports a suite of software, including location tracking, that makes it possible to cost-effectively deploy mobile services in any organization.

Delivering a comprehensive 802.11n unified solution, Cisco provides the power, reliability and flexibility needed to fully support business-driving applications and mobile devices today and tomorrow.

Summary

802.11n has enabled several organizations that span multiple industries to meet the growing demand on enterprise networks. These demands include an explosion in the number of wireless users, who are using a wide variety of client devices to access an increasing number of mission-critical and multimedia applications. No matter whether the wireless solution is being deployed in a standard office environment or a more challenging RF environment, 802.11n delivers powerful and reliable wireless connectivity. However, to gain optimal performance from the wireless environment, IT organizations need to be able to identify and mitigate RF interference and deliver a consistent user experience. The Cisco Unified Wireless Solution uses a modular and flexible approach to deliver industry-leading wireless connectivity and a smooth migration path that improves performance and lowers the total cost of ownership (TCO).



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