

University Moves to New Wireless Network for Improved Student Life

Duke University adopts 802.11n technology to expand its wireless capabilities.

EXECUTIVE SUMMARY

DUKE UNIVERSITY

- Higher Education
- Durham, North Carolina, United States
- 12,000+ students
- 2,600+ faculty
- 30,000+ employees (including Duke University Health System)

BUSINESS CHALLENGE

- Use the wireless network to expand educational applications in the classroom, while improving all aspects of student and faculty life
- Continue to attract new students to the university with its reputation for technological innovation and progressiveness
- Help ensure that the bandwidth of the wireless network can accommodate new applications
- Reduce operations and support costs by replacing wired network ports with wireless access where feasible

NETWORK SOLUTION

- A Cisco Unified Wireless Network provides centralized management and troubleshooting
- Cisco Access Points and Wireless LAN Controller with support for 802.11n Draft 2.0 provide predictable, high-speed access for multimedia applications
- Intel Centrino Wireless-N integrated into laptops enable high-performance access to the wireless network and compatibility with Cisco 802.11n wireless infrastructure

BUSINESS RESULTS

- Continue to attract prospective students by providing technology that improves student life.
- Support for a wide range of high-bandwidth, multimedia applications that students and faculty will use to enhance the learning environment.
- Reduce the use of wired networking and expand the wireless network, lowering support and maintenance costs for Duke's Network Services group.
- Help implement Duke's long-term vision of using the wireless network to enhance all aspects of Duke University life.

Business Challenge

Duke University has long been acknowledged for its innovative use of technology to enhance campus life. Since 2004, the university has made extensive use of its wireless network, which covers approximately 70 percent of its campus presently, including classroom buildings, libraries, common areas and residence halls. Duke students use the wireless network for a variety of applications such as downloading lecture podcasts, viewing recorded and live video, and collaborating on projects and activities. In 2005, Duke began a pilot program in its Bell Tower residence hall, enabling students to use wireless not only for Internet access and e-mail, but also to watch a selection of cable TV channels. The high-density wireless deployment, which has since been expanded to many other locations, is seen as an enabling technology for next-generation uses, such as for voice over Wi-Fi phones.

According to Kevin Miller, assistant director with Duke's Communications Infrastructure group, the primary driver for Duke's technological innovation is the quality of campus life. "We do not deploy technology for technology's sake," Miller says. "We examine where technology fits best into all pursuits—academic, research, administration, and student life. It is important that we continue to explore new ways to enhance our work in all of these areas."

It is this pursuit to continually improve the effective use of technology in all aspects of campus life that led Duke to embark on a long-term project called the Duke Digital Initiative (DDI). An important piece

of this initiative, the expansion of Duke's wireless capabilities, enables research and experimentation with a variety of applications and settings. A key example of this is 802.11n technology, which is being planned for a multimodal facility that bridges classroom, library, and collaboration spaces. Current tests of 802.11n in a campus residence hall are allowing Duke to

prepare for these upcoming deployments. “Increasingly, our wireless network is being used for new, high-bandwidth digital applications such as streaming audio/video for the classroom, library research, foreign language laboratories, and the creation, collaboration, and editing of films for our annual student film festival,” Miller says. “The underlying network infrastructure must evolve to address our users’ needs, and 802.11n is an obvious choice to support the growth in high-bandwidth applications.”

Indeed, Duke has found that its wireless network is gaining usage throughout the campus, and in some locations is being used as the primary network. Two years ago, Duke completed a major expansion of its library facilities and designed kiosks, providing both wired and wireless connectivity, thereby enabling students to access the network using either method. In a recent examination of port utilization, Duke’s Communications Infrastructure group was surprised to find that the wired ports went unused—even with the shared nature and more limited bandwidth of the wireless network. Says Miller, “This showed us that wireless is already the primary network for many students, and, therefore, it is important that we look to the next generation of wireless technology to provide greater reliability and consistency to support this growth.”

Network Solution

Given the increased usage and importance placed on Duke’s wireless network, the growing portfolio of high-bandwidth applications on the network, and the continued focus on technology in all facets of the university, the decision to look to a next-generation 802.11n network was natural.

Duke had previously deployed its wireless network using a Cisco® wireless infrastructure with approximately 1500 Cisco Aironet® 1242 access points (APs), 11 Cisco Catalyst® 6500 Series Wireless Services Modules (WiSM), and Cisco’s Wireless Control System (WCS) for network management. According to Kevin Miller, Duke has continued to expand its Cisco Unified Wireless Network since its initial deployment in 2005; the latest expansion with 802.11n was a natural extension of ongoing efforts to expand the wireless infrastructure. “Cisco and Duke worked together closely over the last two years to help ensure that we were prepared for the arrival of 802.11n technology,” he says.

Duke began testing 802.11n in 2007. Initial testing was conducted in a multimodal library facility, and in August, a production pilot was installed in a residence hall. The facility houses 60 students and faculty. The site previously had limited wireless coverage, so Duke installed additional infrastructure including eight Cisco Aironet 1250 Series access points, Cisco Catalyst 3750G switches to interconnect the APs, and a Cisco 4400 Series Wireless LAN Controller to cover the 18,000 square foot area. The university is testing the infrastructure using Intel Centrino Wireless-N 802.11n modules, supporting the wide array of laptops and other mobile devices connecting to the network. With the collaboration between Cisco and Intel, Duke can conduct a broad range of performance and interoperability tests, as well.

Miller is pleased with the early results of the deployment, which is enabling users at the test site to utilize a wide range of high-bandwidth applications including streaming audio and video. Students are further able to access large data sets and other course materials much more rapidly using this infrastructure.

According to Miller, this 802.11n test site is being carefully evaluated in anticipation of a broader upgrade of the campus wireless network. “Beyond the necessary replacement of the existing access points with the new 802.11n APs, the move to our next-generation wireless network should

be easy,” he says. “The core components are software upgradeable and we do not anticipate substantial changes to this infrastructure.”

Business Results

Although Duke’s 802.11n deployment is still in its infancy, the university foresees numerous benefits to the students, faculty, and staff who use the network every day. Further, the wireless network may enable cost savings on wired network technology.

Beyond the improvements in bandwidth, 802.11n’s added reliability and predictability will support the use of the wireless network as a primary means of connectivity. Today, the most common uses include e-mail and Web browsing, but the university looks to establish the wireless networks as a platform for more mission-critical applications over the next few years. As a result, nearly everyone on the Duke campus will experience greater mobility—and the productivity that comes along with it—as they are able to reliably use a wider range of applications from anywhere on campus.

PRODUCT LIST
<p>Wireless</p> <ul style="list-style-type: none"> • Cisco Aironet 1242 and 1250 Series Access Points • Cisco 4400 Series Wireless LAN Controller • Cisco Catalyst 6500 Series Wireless Services Module (WiSM) • Cisco Wireless Control System (WCS) <p>Voice over Wi-Fi</p> <ul style="list-style-type: none"> • Cisco Unified CallManager • Cisco Wireless IP Phone 7921 <p>Routing and Switching</p> <ul style="list-style-type: none"> • Cisco Catalyst 3750G Gigabit Ethernet Switches • Cisco Catalyst 6500 Routers

For Duke’s Communications Infrastructure group, 802.11n deployment is very likely to continue the growth that they have already seen in the use of Duke’s wireless network and a gradual decline in the use of wired ports around campus. Over the next four years, the group will continually reassess Duke’s wired network. Gradual decline in the use of the wired network will have a positive impact on support costs. Says Kevin Miller, “With the wired network, there are substantial costs associated with truck rolls and support for new data ports, and it takes a significant amount of time to add new outlets. With wireless, we can deliver access to the network quickly and easily, as well as

reduce the cost of supporting and maintaining those connections.”

Next Steps

With its first 802.11n site operational, Duke can assess and prepare for future expansion of the technology in other areas of the university. In particular, Duke plans to use 802.11n in next-generation teaching and learning spaces on campus. 802.11n will play a role in helping ensure that this new area is available and reliable around the clock for a wide range of multimedia, collaboration, and research applications. “The wireless network is visible and discussed at all levels of the university,” says Miller. “We are continually being asked how the wireless network can be used for next-generation needs.”

Looking farther down the road, Duke is evaluating the mix of wireless and wired connectivity in a major redevelopment project under way for the next five years. This project will create a variety of residential, academic, and collaborative areas that will make use of next-generation technology, coupling the mobility offered by wireless with the capacity and reliability of 802.11n.

Beyond these projects, Miller says that Duke faculty are now looking towards the “classrooms of tomorrow”, integrating wireless technology with laptops and tablet PCs to create an enhanced learning environment. For example, some courses are using electronic library reserves to make full-screen video available to students, while others encourage the use of student-created audio

