



Cleveland State's WoWnet Gives Faculty and Students Convenient Access to Web and Courseware

Cleveland State University

- Opened in 1965
- Enrollment is nearly 16,000, which includes more than 5,600 graduate students
- The University ranks first in Ohio in four categories:
 - African Americans in Law
 - African American master's degrees in Education
 - African Americans in all master's disciplines combined
 - African American baccalaureate degrees in Mathematics

Nationally, the university is among the top 100 producers of minority student graduates in various degree categories (source: Black Issues in Higher Education, 11th Annual Special Report 2002)

Cisco® Aironet® access points are at the core of an extensive, campus-wide wireless network designed to give Cleveland State University students and faculty ubiquitous access to courseware, e-mail and the Internet. The university's decision to use Cisco Aironet technology was based largely on security considerations and on compatibility with other Cisco products, including Cisco Catalyst® Intelligent Ethernet switches, that are part of a broad infrastructure upgrade.

Background

Cleveland State University (CSU) is a public, coeducational institution offering undergraduate, graduate and professional degrees. Established by the Ohio state legislature in 1964 and located in downtown Cleveland, Ohio, the university admitted its first student class in 1965.

The university's total enrollment approaches 16,000, with more than 5,600 enrolled as graduate students. This is the largest percentage of graduate students of any of the state universities in Ohio. More, Cleveland State ranks first in the state in graduating minorities with masters degrees, and is among the top 100 producers in the United States of minority student graduates in various degree categories.

Challenge

Despite having installed a new wired infrastructure in 1999 throughout the campus, university officials soon recognized that a growing proportion of students—and faculty—were using portable computing systems. "It's understandable," says Mimi Porter, manager of CSU's Network and Telecommunications Services. "Everybody likes the flexibility and mobility that laptops provide."

"But the implication was that we would have to think about whether a wireless network made sense," she continues. "Would it facilitate the educational experience, enabling our students to access the Internet and Web-based coursework more easily? Clearly, it would."

The institution would benefit in another way, Porter adds. "Although our Ethernet system was extensive, there were always people asking us to install yet another port in this part of the room and then another one over there." While Porter's department wanted to accommodate these requests, they soon became overwhelming.

"This looked like it would never end."



However, a solution presented itself that was both affordable and efficient. Porter explains: “If we overlaid wireless on top of the Ethernet system, we’d solve that problem and save the expense of adding additional ports endlessly.”

In 2001, the Network and Telecommunications Services department commissioned NeTeam, an authorized Cisco partner, to conduct a campus-wide survey that would determine how much wireless equipment would be required. The next step was to decide which wireless network to adopt.

Solution

“We looked at various players in the market,” Porter explains. “The university hadn’t had much experience with Cisco equipment, but our research kept pointing toward Cisco Aironet for wireless. We were especially interested in its security architecture. Finally, we decided to run a pilot program during which we could run some independent tests.”

The tests, run on Cisco Aironet access points and client adapter cards, were conducted within the Network and Telecommunications Services facility. The tested products support IEEE 802.11b, a direct sequence spread spectrum (DSSS) technology that operates in the 2.4-GHz band and provides a top data rate of up to 11 megabits per second (Mbps). All Cisco Aironet access points and client adapters are Wi-Fi certified by the Wi-Fi Alliance.

802.11b radios in Cisco Aironet access points and client adapters feature a high-performance, 100-milliwatt (mW) radio design that includes a variety of power management capabilities. An access point can draw operating power from a powered Ethernet port. This in-line power configuration works with all Cisco in-line power-enabled devices, such as Catalyst switches, in-line power patch panels, and in-line power injectors. The university uses Cisco Catalyst 6500 Intelligent Ethernet switches to draw power from Catalyst 10/100BASE-T Ethernet modules, which provided a good fit for the Cisco Aironet access points.

“The security capability is what clinched it for us,” Porter explains. “We are very pleased with Cisco LEAP”—an acronym that stands for Cisco Extensible Authentication Protocol, a Cisco-developed IEEE 802.1X authentication type. “We already had a database of user names and IDs, and the Cisco ACS (Cisco Secure Access Control Server) simply authenticates those names for us.”

Cisco LEAP provides dynamic, session-specific wireless encryption keys, central user administration, and mutual authentication between clients and access points. Cisco ACS is a high-performance, highly scalable, centralized user access control framework that offers centralized command and control for all user authentication, authorization, and accounting from a Web-based, graphical interface, and distributes those controls to hundreds or thousands of access gateways within a network.

Confirmed in its choice of Cisco Aironet through in-house testing, CSU opted for a partial rollout of its wireless network, covering about 25 percent of the campus. In January 2002, NeTeam configured and installed 80 Cisco Aironet 350 Series access points.

“Initial response from the faculty was so positive that the university administration soon released funding for the balance of the campus,” says Porter. The second and final phase began in March 2003 and is scheduled for completion by the first academic term in late 2003. It will cover all 31 buildings, including the university’s one dormitory, and the majority of green space in between the buildings.

“ The goal is to make **mobile computing** so easy that it will encourage people to access the university’s resources at any time and from anywhere... ” We believe this will significantly **facilitate educational and research processes** and will **enhance** the overall academic experience at Cleveland State.”

—Mimi Porter, Manager of CSU’s Network and Telecommunications Services

Between completion of the first phase and commencement of the second, Cisco Aironet introduced its 1200 Series access point. Cleveland State decided on this new series for the balance of the campus. NeTeam is configuring and installing approximately 350 of the 1200 Series access points.

Students and faculty can purchase Cisco Aironet 350 Series client adapter cards for their laptops at the campus bookstore.

“What stood out most significantly in the 1200 Series,” Porter says, “was that it supports the IEEE 802.11b standard and is upgradeable to the new IEEE 802.11a standard and eventually to the IEEE 802.11g standard. The ‘g’ standard is the one we are thinking most seriously about, and it’s comforting to know that our 1200 Series access points won’t be obsolete by the time ‘g’ is approved.”

“We are now starting to take full advantage of the in-line power capability. We couldn’t really do so during the first phase, because our basic infrastructure wasn’t fully compatible. However, along with the 1200 Series access points, during Phase Two, we are upgrading our LAN with the addition of a whole series of up-to-date Cisco switches, routers, and other products, which afford us in-line power capability,” Porter explains. “The ability of Cisco Aironet access points and Cisco switches to provide in-line power over Ethernet (PoE) saves us the expense and effort of installing separate power units to get the access points up and running.”

Cisco Catalyst Intelligent Ethernet switches also feature advanced quality of service (QoS) for prioritizing traffic to ensure that time-sensitive traffic, such as voice and video, is handled first. Intelligent switching increases bandwidth availability at the network edge, where users are connected to the network. Extending network intelligence to the edge makes it possible for data traffic to be classified at the source—permitting prioritization of both upstream and downstream traffic—to minimize congestion and enable network administrators to establish policies on a per-user basis, which frees up router processing power.

The Cisco Catalyst 3550 Series switches include security access control lists (ACLs), which protect the networks from internal and external threats by authenticating users, restricting access, and isolating traffic en route to its destination. Cisco Cluster Management Suite (CMS) software, embedded in both series of switches, simplifies the time-consuming task of deploying intelligent services.

“We were quite intrigued by how the Cisco Catalyst switches can handle traffic. We expect this to be a significant factor in helping us avoid network congestion, which is always a concern at a user-intensive institution like a university,” Porter says.

The upgraded WLAN includes Cisco Catalyst 4000 in access closets and Cisco Catalyst 6500 and 6513 switches in the core, distribution, and server-farm layer. Cisco PIX® 535 firewalls were installed as well.



Results

Cleveland State has named its new wireless network WoWnet—short for WithoutWires network. Students, faculty, and university staff now have the ability to check e-mail, reach the Internet and access Web-based courseware—called WebCT—from their laptops anywhere on campus.

Faculty members can now roll laptop-equipped mobile carts into classrooms to run WebTV. In addition, many of the university's individual colleges—some of which began their own wireless programs prior to development of the campus-wide WoWnet—also are exploring ways to use wireless. The CSU Cleveland-Marshall College of Law is in the second of a three-year pilot project whereby students take exams on laptops: when the student has completed the exam, the exam is saved through the college's wireless network to a secure portion of the main university server. The College of Law built its wireless network around Cisco Aironet access points and 25 laptops, each equipped with a Cisco Aironet client adapter card.

“Student and faculty reaction to this project has been very positive,” says David Genzen, assistant director of academic technology in the College of Law. “With just twenty-five laptops, we have limited the pilot to classes of twenty-five or fewer students, and it's optional for students in those classes. They can write their tests by hand if they prefer, but few do so since most students do all their course-related writing on computers now anyway. They are much more comfortable with a keyboard than a pencil. As for the faculty, I've heard many of them mention how much easier it is to read type-written papers than to struggle with longhand.”

After the pilot's third year, the College of Law will decide whether to expand the program to all law students, and will consider the future of its own wireless network. “We will probably piggyback onto the larger network, shutting ours down,” explains Genzen. However, wireless will still be an important part of the college's network capabilities. “Whatever we do, I'm quite sure we'll keep using wireless,” he says. One option under consideration is to “expand the program so that students can use their own laptops for exams and save their work through the university's wireless network and onto our own network drive,” he explains.

“Wireless is important to our students for more than just tests, of course,” Genzen continues. “Law students rely on computerized legal research into databases like Westlaw and Lexis, and they really have to have Internet access. Their options have been to do their computer research at home on a PC or in a computer lab but now, with wireless, they can access these sources from anywhere on campus. Wireless will make a world of difference for them,” he says.

It also is having an impact in the classroom. For example, one professor of environmental law has put her electronic case books on line so that students can pull them up, using wireless laptops, during classroom discussions and presentations.

Maureen McQuestion, director of technology and a part-time instructor at the Maxine Goodman Levin College of Urban Affairs, recently taught an upper-division class on urban public policy. She brought her own wireless laptop to class, which she hooked up to an LCD projector, and handed out wireless laptops from a cart to her students.

Wireless, she says, substantially expanded her pedagogical toolbox. “I could pose a problem statement like ‘Cuts in Medicaid are causing new problems for poor people’ and instruct the class to go to the Internet and find two Websites that prove or disprove this statement. Then I could take my laptop over to a student, type in the URL that he or she had come up with, and ask the student to explain how these particular Websites supported or disproved the problem statement. It's a very dynamic learning activity that takes place in class in real time. It helps students learn about public policy, about the biases of various Websites, and about using the Internet for research.”

Ranging in age from 19 to 50, students had different backgrounds in terms of education, race, and experiences.



“Their academic and technological backgrounds varied widely, and wireless helped me mitigate those variances because wireless enables you to run a democratic classroom. Putting a laptop computer in the hands of students empowered them to learn and me to teach. If some students indicate they don’t understand a point or a procedure, I can switch my instruction on a dime to respond to those needs. If we are working on development of a PowerPoint presentation and somebody says he doesn’t understand how PowerPoint works, I can tell them to watch the screen and to do what I do. Nobody is tethered to a desk or an outlet. We can move around to form and reform study groups, making the experience very flexible and very democratic,” she says. “This was the most fabulous and rewarding teaching experience I’ve ever enjoyed.”

The campus library also is exploring ways to take advantage of wireless. “Our most ambitious effort was to purchase twenty-six laptops, install Cisco Aironet client adapter cards in each one, and store them on a cart that can be conveyed virtually anywhere in the facility,” says Bruce Jeppesen, head of CSU library systems. “The most frequent use is by professors who want to use one of our two large presentation facilities. They wheel in the cart, distribute laptops and help students get on the web or into some course material. Alternatively, we can have two classes going simultaneously by dividing up the laptops between each presentation room.”

The uses are infinite, he contends: “One of our history professors does a periodic workshop for Cleveland public school teachers using the wireless laptops. He teaches them all about databases and the resources they can tap into. Nursing classes use the laptops for much the same thing, introducing nursing students to research techniques and databases. Our staff librarians also use the laptops to show new or inexperienced faculty how they can access library data for their particular disciplines.”

The library will partner with the university registrar’s office for a unique freshman registration event in the summer. Wireless laptops will be set up at a series of stations on the spacious fourth floor, where incoming students can confer with advisors and instantly sign up online for classes.

“The flexibility is the best part. Once the registration event is over, we simply pack up the laptops and put them away. In the same way, we can create temporary classrooms and, when a session is finished, break everything down easily and quickly. Using wireless means we aren’t locked into wired outlets and we don’t have to acquire permanent furniture,” says Jeppesen. “Laptops are so small we can get by very easily with folding lecture tables.”

Individual students have begun bringing their laptops into the library and accessing WoWnet. Access points on all five floors make the WLAN available throughout the building.

“We even used some of the library’s laptops to conduct a student survey. We sent four student employees with laptops and candy to the Student Center so they could find students willing to fill out a questionnaire about library services. The candy was a bribe. The surveys were filled out and submitted to our database via the LAN instantly,” he says.

“The goal is to make mobile computing so easy that it will encourage people to access the university’s resources at any time and from anywhere,” adds Porter. “We believe this will significantly facilitate educational and research processes and will enhance the overall academic experience at Cleveland State.”

Next Steps

Additional uses for WoWnet are still in the discussion stage. Uses being considered include setting up coded wireless access to the campus parking lot, and using wireless for stock-keeping inventory.

For management of the WLAN infrastructure, Cleveland State is considering the CiscoWorks Wireless LAN Solution Engine (WLSE). Because it provides centralized, template-based configuration with hierarchical, customer-defined grouping, the WLSE can help an administrator efficiently manage large numbers of access points and bridges.

“Plug-and-play” configuration allows newly deployed access points to be automatically configured. The WLSE monitors Cisco ACS authentication servers, both Cisco LEAP and generic RADIUS, and further enhances network security management by detecting misconfigurations on access points. The capability within CiscoWorks WLSE includes proactive monitoring, troubleshooting, notification of performance degradation, and reports for improving capacity planning.



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