Moundridge Unified School District (USD) 423 has had a wireless network for several years ... sort of. While resourceful educators made good use of the access they had, there were black holes in the coverage at the elementary school. And a middle school teacher remembers the oft-repeated scene in her classroom as students scrambled for notebooks that had in the past booted onto the network a few minutes faster than the other available machines.

All that has changed, however, with the installation over this past summer of USD 423’s new Aruba 802.11n wireless system, says Technology Coordinator Brandon Friesen.

“The Aruba system has been great,” says Friesen, who is the entire technology staff for Moundridge’s three-school system, which serves about 450 students in the central Kansas community. “Coverage and throughput are up, and the dead spots have been eliminated.”

The need for a wireless upgrade to improve coverage and bandwidth had been apparent to the district’s Tech Committee — the superintendent, principals, computer skills instructors, selected core teachers and the technology coordinator — for some time, says Friesen. The number of notebooks, interactive whiteboards and video projectors was multiplying quickly at Moundridge USD’s two campuses (the middle and high schools share a facility). On top of that, teachers and students were bringing in an increasing number of personal wireless devices. But tight budgets and other pressing projects left the new wireless network on the back burner. Last year, however, new Superintendent Chad Higgins provided the push that made the wireless upgrade a reality.

“Connectivity is important. Having a robust wireless network creates the foundation for the technologies in the future,” says Higgins. “You can only go so far with technology in schools without one. Students are used to the sense of immediate feedback and constant communication that technology provides. Without it, school is less exciting and interesting, and it’s tougher for students to learn.”

**SELECTION AND INSTALLATION**

While Friesen was researching the district’s options for the upgrade, the capacity for central management of the wireless network was “first and foremost” among his selection criteria. Wireless security, which had never been enabled over the old network, was also a major concern, he says.

“We were going from 18 to 50 access points when we upgraded,” Friesen explains. “More than ever, I needed control over the devices that were allowed on our network and wanted the ability to monitor and manage the RF [radio frequency] space.”

After evaluating various manufacturer offerings and gathering advice from friends and colleagues around the country, Friesen selected the Aruba MMC-3600 MultiService Mobility Controller and Aruba AP-105 Access Points to build the new 802.11n network. (The existing network was based on the b/g version of 802.11.) The district also invested in ArubaCare Next-Day Support and an extended service agreement.

The MMC-3600 is designed to be the hub of the wireless network, providing central provisioning and configuration monitoring of access points. The controller presents Friesen with live visualization and RF heat maps of the network, so he can monitor the wireless coverage in real time. A web-based user interface makes it possible for him to monitor the network from remote locations, as long as there is Internet access. Some of the security features of the MMC-3600 include centralized authentication and access control, firewall monitoring, intrusion prevention and rogue AP detection.

The Aruba AP-105 is an 802.11n access point that supports data rates of up to 300Mbps, at least five times faster than the old b/g wireless technology that Moundridge USD 423 had been using. The 802.11n access points also have twice the range of those based on earlier versions of the protocol. The extended range of the access points, along with the automated management provided by the controller, makes for smooth handoffs between APs and uninterrupted connectivity for a user carrying a device through the network.
After the school year ended last spring, Friesen and student volunteer Clayton Hodson began the process of implementing the new network by ripping out the old access points. They then began to place and install the new APs, which was more time-consuming than the technology coordinator had expected because the operation involved pulling 2.3 miles of new cabling. The only other problem arose when Friesen discovered that there were not enough available switch ports with Power over Ethernet (PoE) capability in the school buildings, requiring him to shift some equipment and buy more switches.

“The cable wasn’t difficult to put in; there was just a lot of it,” Friesen notes. “All in all, the initial installation went more smoothly than I expected.”

The investment in Aruba support services paid off, says Friesen. When school opened in September, he relied on the manufacturer’s technicians to help him implement new features and security technologies. Aruba’s tech support services also assisted Friesen as he worked to integrate the 802.11n network with the district’s wired network, which is based on HP ProCurve switches connected with multimode fiber and LANmark-1000 CAT 6 cable. The physical servers run the standard version of Microsoft’s Windows Server 2008.

EARLY RETURNS
The Aruba MMC-3600 controller and the new access points came in just under $35,000, says Friesen, and there were some additional costs for the cabling and switches. The project was almost entirely funded by a federal Small Rural Schools grant.

“If we had had to rely on our general funds or operating budget, we wouldn’t have been able to afford the network, at least not now,” says Superintendent Higgins.

The investment in the upgraded wireless network is reaping immediate benefits in the form of streamlined access to teaching and learning tools, according to staff members like middle school language arts teacher Connie Olson.

“Even in my preparation for the year, I noticed that the wireless was way better,” says Olson, a self-described technology buff. “You have to be able to use the technology and the content students know and care about. For example, I have used a YouTube clip to introduce parts of speech or a good story or writing prompt. The beauty of that is you capture the students’ attention right away.”

Olson may be ahead of some of her colleagues in her enthusiasm for new technologies, but teachers are generally much more willing to embrace the potential of the new network than they might have been just a few years ago, says Higgins.

“Teachers, regardless of their experience, are feeling much more comfortable with the technology than I would have expected even five years ago,” he says. “They understand this is the direction we’re all going in, so we might as well have the best we can have.”

In conjunction with the new wireless network, USD 423 also augmented the hardware for its computing labs and classrooms, says Friesen. The notebooks in the middle school lab were replaced by new NComputing X550 thin client devices. The notebooks from the lab were moved to a cart, so they can be transported together for classroom use. USD 423 also purchased 50 NComputing L300 thin clients, which are scattered throughout the district and connected to the wired network. Other new hardware includes four NEC NP905 projectors and 10 Promethean interactive whiteboard systems with integrated projectors and wireless capabilities.

Besides improving the educational experience for students and teachers, the new network will bolster the district’s security systems, says Friesen.

“We plan to link our wireless parking lot cameras to the Aruba wireless access points instead of to the single outdoor access point we had been relying on,” he says. “That one AP was overloaded and not able to link reliably to a couple of our cameras.”

With the increased capabilities of the upgraded network, administrators and teachers at Moundridge USD are now able to consider initiating a one-to-one computing program in the district, says Higgins.
“I began a one-to-one program in my last district and thought it worked well for the students,” he says. “We have to figure out if it’s financially feasible and if it’s the right fit for us right now, but we’ll have the network in place to do it.”

The wireless network is also one of the technology elements that could eventually make the facilities of USD 423 a resource for the entire community, one that offers online learning and Internet access to adults as well as young people, says Higgins.

**SPEEDY WIRELESS IS FUNDAMENTAL**

Even in a small K-12 district like USD 423, having a fast wireless network has become “table stakes” rather than a luxury, says IDC Analyst Rohit Mehra.

“In some ways, you need the speed and throughput more in education than in business because there’s more use of multimedia applications,” he says.

The move to 802.11n offers significant performance upgrades over b/g networks. “Wireless-N will provide better wireless coverage, much more bandwidth and better reliability for the devices on the network,” Mehra explains.

There are some specific challenges that could arise in the switch to 802.11n. Because Wireless-N operates at both 2.4 and 5GHz frequencies, network administrators should explore ways they can make use of both parts of the RF spectrum or they will lose some of the value of the upgrade, Mehra says. Compatibility with the wired network should also be a major consideration during any wireless installation or overhaul.

Another challenge, as Friesen found out at Moundridge USD, is making sure PoE switches support the power requirements of the new wireless infrastructure. But the challenges are manageable and have not slowed the adoption of 802.11n.

“Now and for the foreseeable future, Wireless-N has become the standard,” Mehra says. “You want something robust in place to deliver your application, especially if you have limited resources. You want a wireless network that doesn’t give you sleepless nights.”

The educators at USD 423 are concerned about exploiting the potential of the new wireless network, not about its performance.

“With technology, students are so often able to leave their neighborhood without leaving their living rooms, and we have to be able to provide that sense of connection in school,” says Higgins. “We have to get their hands on the tools they can use now and in the future.”

For her part, Olson is eager for her students to get going on the high-speed airwaves. “With the old wireless, it sometimes seemed to take 20 minutes to boot up, and we still did an awful lot with technology,” she says. “I see great things ahead this year.”

**Implementation Considerations**

Technology Coordinator Brandon Friesen took on the installation of the new 802.11n wireless network at Moundridge USD 423 with the help of a student volunteer and advice from Aruba. The implementation went smoothly, but Friesen offers some advice so that others can avoid the glitches he encountered.

- Cabling is important. If your cabling isn’t up to specifications, network devices won’t perform to their fullest potential.

- Installing a wireless network is harder than you might expect because access points often need to be placed in odd places where you wouldn’t put any other sort of network device.

- Remember that 802.11n access points require gigabitPoE ports. Upgrade all switches at the same time or before you upgrade the wireless network.
• To fully utilize the Aruba MMC-3600 controller and implement 802.1x authentication, you will need a Remote Authentication Dial-In User Service (RADIUS) server. Windows Server 2003 had an easy-to-install RADIUS server, but in Windows Server 2008 it is cleverly disguised inside of the Network Policy and Access Services role. This consideration relates specifically to the Aruba technology used by Moundridge USD 423, but similar issues arise in almost any wireless implementation.

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