HOW WIRELESS NETWORKS ARE TRANSFORMING E-LEARNING



OVERVIEW: THE INCREASING USE OF WIRELESS NETWORKS IN K-12 AND HIGHER EDUCATION ENVIRONMENTS

As the e-learning revolution continues to gain momentum, wireless networks are becoming increasingly important in virtually every type of educational environment. What's behind this growing reliance on wireless technology? If we posed a multiple-choice question, the choices would be something like: exceptional cost-effectiveness in light of reduced budgets and resources; high-speed performance to enable innovative e-learning initiatives; ease of use; and fast deployment. The correct answer? All of the above.

Wireless technology is proving to be an optimum solution for the education industry's expanding need for reliable high-speed connectivity in the classroom and other indoor locations. WLANs based on bandwidth-rich 802.11b/g/n technologies provide reliable, high-performance access for IP-enabled devices such as school and student laptops, smartphones, tablet computers, IP video cameras and others. Wireless solutions also offer the benefit of being faster and easier to deploy and less costly to manage and maintain than wired solutions.

Most important, high-speed wireless solutions are key to universities, colleges, school districts and individual schools enhancing student performance through innovative new e-learning initiatives. Wireless network technology is becoming essential to forward-looking programs like 1:1 classrooms, school day and classroom extension, streaming video to individual student devices in dense environments, learning management systems and a growing number of new e-learning applications.

The Motorola Wireless Networks Barometer Study focuses on indoor WLANs and how your peers in a variety of institutions are using them to deliver bandwidth-intensive applications to students, faculty and administrators.

EXECUTIVE SUMMARY

In July 2010, Motorola conducted a study on the use of wireless computing technology in K-12 and higher education institutions. The e-mail survey's goal was to discover how and why education professionals are using — and are thinking of using — indoor wireless communications technology in the near future. We asked a cross section of professionals at a variety of institutions to provide their thoughts on — and plans for — using next generation wireless solutions in their environments. The results of the survey are shown and discussed in this report.

Overall, the survey shows that the use of wireless indoor networks on campus is already widespread. More than 75 percent of respondents have a system deployed, either in a full campus-wide or district-wide rollout or in a limited rollout. Less than 10 percent have no plan at all. Over 80 percent of respondents' networks utilize 802.11b/g/n technology.

Respondents also reported on what they consider their most difficult challenges, with security, reliability and costs of deployment and management dominating responses. When asked which applications are most important to their own particular institutions, respondents provided a range of answers. Although the provision of digital video to the classroom was the leading response, the variety of other applications — including video surveillance, online assessment and many others — show the versatility of wireless solutions in preparing institutions for the e-learning future.



WHO RESPONDED TO THE SURVEY?

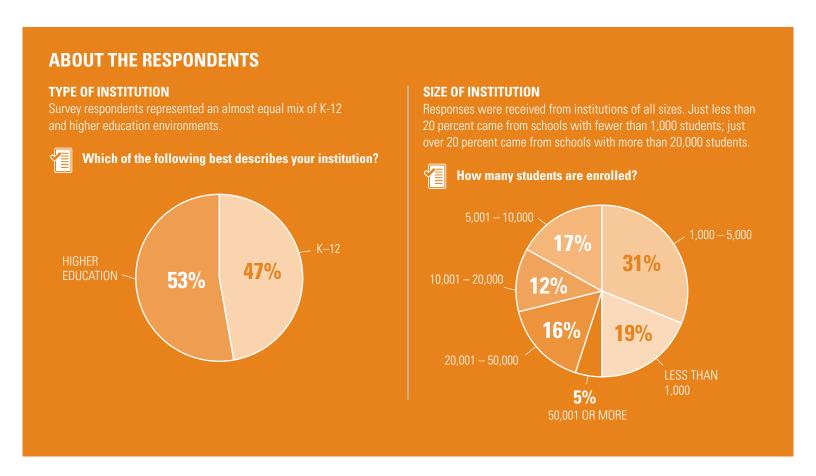
Respondents to our Wireless Networks Barometer Study included educational professionals holding a variety of titles in both K-12 and higher education environments of various sizes, including:

- President
- CIO/CITO/CTO
- Director of IT, IT Manager
- Director of Facilities
- Chief/Director of Security
- Administrator
- Dean of Students
- Principal/Assistant Principal
- Superintendent
- School Board

SURVEY HIGHLIGHTS

The results of this online survey offer a snapshot of an education marketplace in the midst of moving quickly into wireless technology for a variety of reasons. In general, respondents are looking for high-speed wireless networks to be a cost-effective means of increasing student and teacher performance while, at the same time, increasing operational security and productivity. Although faced with the same reduced budgets and resources as other industries, most educational institutions are nevertheless planning to add new wireless network technology in the next five years.

Delving deeper into the survey, we have highlighted some of the most important questions and how your peers in education answered them.



CURRENT WIRELESS NETWORK SOLUTIONS



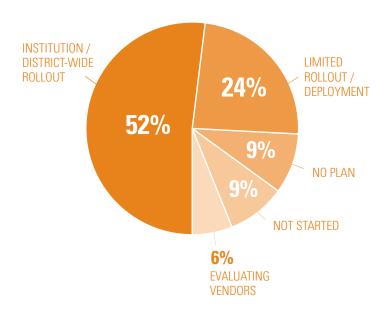
One of the state of Texas' fastest-growing school districts needed to implement a high-speed network as the backbone of its long-term strategic plan to improve student performance system-wide. The network would facilitate the district's move to a digital curriculum in support of 1:1 instructional objectives and a more personalized learning experience. The district chose to implement a system-wide rollout of an 802.11n wireless LAN infrastructure. The network is now successfully delivering digital content to most of the district's 36 locations — including streaming video, interactive applications, collaborative environments and peer-to-peer connections — as well as virtually eliminating quality and stability issues.

The preponderance of survey respondents reported that they already have invested in a wireless LAN deployment. Over half of the professionals in the survey noted that they have a current institution-wide or district-wide wireless system

rollout. Another 24 percent said they have a more limited deployment. Significantly, less than 10 percent reported that they had no plan for a wireless LAN deployment.



What is the stage of wireless LAN deployment in your organization?



WIRELESS NETWORK TECHNOLOGY USAGE



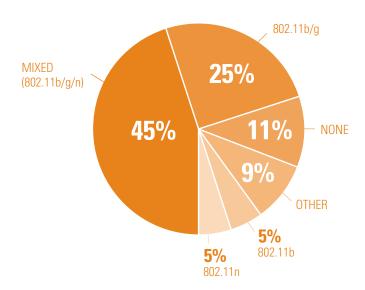
An award-winning high school in California needed to replace its LAN because it could not provide enough throughput to ensure their vision of the future. The school's strategy called for high-speed WLAN connectivity, campus-wide mobility and multi-user streaming multimedia capabilities. The district chose an 802.11n WLAN for multiple reasons. First and foremost, it provides throughputs of up to 100 Mbps that enable the campus-wide use of multimedia-driven e-learning applications. Another reason the school opted for the 802.11n standard was the fact that a growing number of the most popular student and faculty mobile computing devices are 802.11n compliant. The system is receiving exceptional reviews from students and faculty alike, providing high performance even in dense classroom environments of 30 or more devices working simultaneously.

An 80 percent majority of survey respondents are currently using 802.11 WLAN technology for their school or district systems. Close to half are using a mixed network of 802.11b/g/n, and another 25 percent have mixed

802.11b/g solutions. Although the powerful 802.11n standard is newer, it is already beginning to play a significant role in both K-12 and higher education environments.



What wireless LAN technology are you currently using?



WIRELESS NETWORK CHALLENGES



A rapidly growing Midwest university's existing campus-wide wireless system, installed to supplement and extend its legacy wired system, was experiencing major reliability and coverage problems. Students and faculty alike virtually stopped using the network because they simply couldn't rely on it. The school redesigned the network, installing an 802.11n system that restored confidence by providing reliable, high-performance connectivity wherever users wanted it — in classrooms, in the library, in dormitories, in common areas and in faculty offices. With high-speed performance and increased reliability, the university's network usage quadrupled in just a year.

Which wireless network benefits do respondents consider most important? Respondents were asked to rank on a scale of one (most important) to five (least important), a list of eight specific benefits. Although the top two were, not surprisingly, security and reliability, cost issues were also high on most lists, specifically the costs of deployment and ongoing management costs.



When considering a wireless network solution:

	1 = EXTREMELY IMPORTANT 5 = NOT AT ALL IMPORTANT				
	1	2	3	4	5
Ease of deployment	31%	30 %	19%	13%	7 %
Speed throughput	36%	27%	13%	15%	9%
Recommendation of peers	16%	27%	37%	15%	5%
Cost of deployment	46%	22%	9%	10%	13%
Security	52 %	18%	5%	9%	16%
Reliability	60%	12%	2%	7%	19%
Reputation of vendors	27%	30%	22%	14%	7%
Ongoing management costs	36%	30%	10%	15%	9%

MOTOROLA WIRELESS NETWORKS BAROMETER STUDY

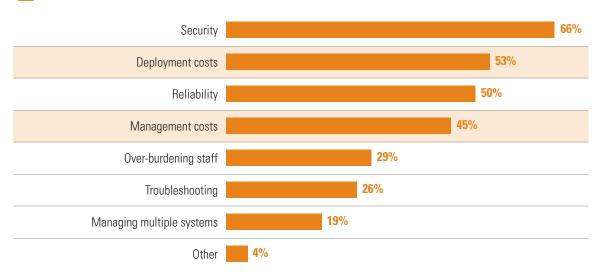
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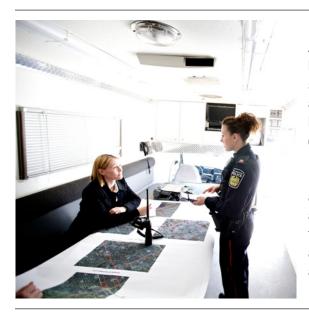
When respondents were asked to rank the biggest challenges they face in the implementation and operation of their wireless networks, they responded similarly. Deployment and management costs again shared the top

four slots, although in a slightly different order. Overall, it's clear that security, reliability and cost and are uppermost on the minds of most educational institutions.



What are your biggest challenges when it comes to operating a wireless network?





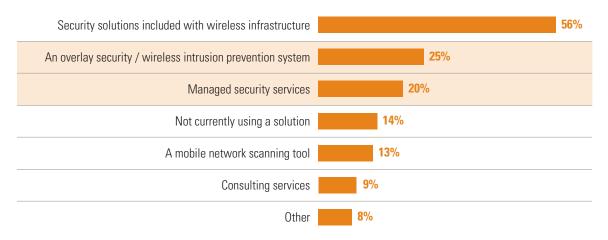
A K-12 school district of more than 30 schools has deployed a system-wide WLAN network in support of its commitment to e-learning technology and applications. Crucial to maximizing the benefits of the network is security. The district chose a solution for 24/7 wireless security that includes proactive monitoring, troubleshooting and intrusion protection. The solution remotely identifies, analyzes and tests performance and reliability issues across the district's multiple campuses. In addition, the system can automatically detect and disable any rogue devices attempting to access the network, and provides network assurance.

Although security is consistently mentioned as a top priority by most respondents, their organizations are not as consistent in their current security solutions. Although slightly more than half of respondents are using the security solutions included with their wireless systems, other respondents prefer a variety of alternative solutions, including third-party system overlays and managed security services.

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What type of security solution(s) are you currently using?



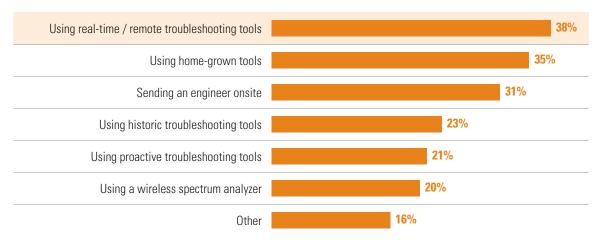


Three of nine locations on a rural school district's system-wide network suddenly experience a sharp dropoff in performance. Because the district uses a centralized network management system, technicians are able to use powerful remote trouble-shooting tools to identify and remedy the issue in seconds, before network downtime can significantly affect students and teachers. And without the cost of having to send an engineer onsite.

A majority of respondents identified the ongoing cost of network management as an important challenge. When asked what network management tools their organizations currently use, almost 40 percent of respondents reported that they are using real-time, remote troubleshooting tools. That number is sure to grow in the coming months and years. In contrast, almost one-third of respondents are still absorbing the costs of sending engineers onsite.



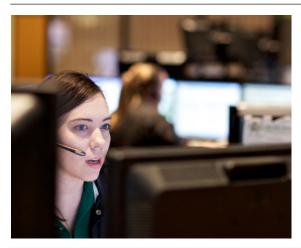
How do you currently troubleshoot and remediate wireless issues on your network?



E-LEARNING APPLICATION PREFERENCES



A K-12 School District in the state of Wyoming needed to expand system connectivity. First, to support its advanced interactive e-learning efforts. Second, to provide a reliable platform for administering statemandated testing, including the critical Proficiency Assessments for Wyoming Students (PAWS). With wired systems proving to be too cumbersome and expensive, the district turned to wireless. The district chose a WLAN solution with the reliability to ensure that educators no longer have to be concerned about the system failing mid-test. In addition, the network offers secure connectivity for interactive and collaborative learning and centralized network management and control, as well as a lower overall total cost of ownership.



On a sprawling multi-acre campus during the last of night courses, a team of thieves enters a remote parking lot searching for vehicles to loot. Video surveillance cameras on light poles capture the scene and provide real-time images to a central network control center. Management personnel immediately dispatch campus security and local police, streaming the video into their in-vehicle computers. Security personnel and police arrive in time to arrest the thieves and keep multiple vehicles from being burglarized.



On a crowded student recruiting weekend at a mid-size university, demand for wireless access skyrockets as prospective students and their families converge on campus. With the university's campus-wide wireless broadband network providing coverage both in buildings and outdoor areas, users of smartphones and other devices are able to get the voice and data service they need — whenever and wherever they need it. At the same time, campus security, administrative staff and student guides can effectively coordinate activities to provide an exceptional experience for all.

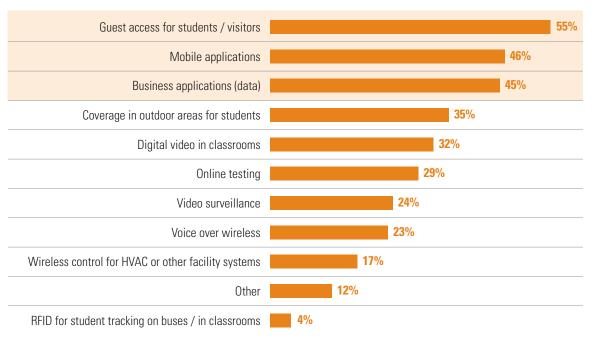
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Survey respondents were asked which applications they were currently using on their network. They were then asked which applications not currently available on the network were they most interested in using. Among current network

applications, more than half reported using the network for guest access, with mobile applications and data-driven business applications following in a virtual dead heat for second place.



Applications already using /currently run on your wireless network?

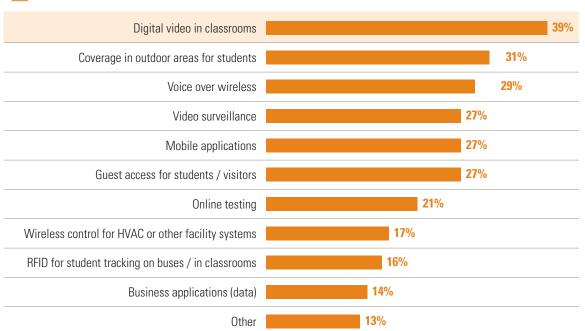


When asked which currently unavailable applications they would like to use, responses were different, reflecting respondents' interest in a variety of applications. A strong

first was the capability of providing digital video in classrooms, while other desired applications included VoIP, video surveillance and online testing.



What applications would you like to use on the network that you currently don't / can't?



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We designed the Motorola Wireless Networks Barometer Study to give you an update on how K-12 and higher education environments like yours are using and planning to use wireless network solutions to empower students and teachers. If you have questions about your own plans and strategies for deploying a wireless network solution, talk with your Motorola representative, visit us on the web at **motorola.com/education**, or call us at (877) 220-8301.

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