SOLUTION BRIEF

Higher Education and K-12:

Delivering the campus of tomorrow…today…with Motorola's indoor/outdoor wireless network solutions

Challenges in today's educational institutions

Professors in universities and teachers in K-12 schools are leveraging the power of the Internet to enrich the learning experience for today's students. Online tests are common. Webinars and podcasts enable professors to disseminate additional information on virtually any subject. On-line posting of assignments, grades, study guides and more helps teachers and administrators ensure student success.

In addition, today's students — the earliest of technology adopters — are growing up in a wireless world, expecting 'anywhere anytime' access to whatever information they need, on whatever device is in their hands. The new generation of tech-savvy students might want to watch a Professor's webinar on a laptop or as a podcast on a mobile device virtually anywhere on campus — from a dormitory room to the library or an outdoor area. Since each graduating class creates a 25 percent turnover in the student body, every year the number of students with 802.11n-enabled laptops increases, along with students' wireless expectations. Furthermore, the increasing emphasis on campus safety is forcing security personnel to rely on new wireless technologies, from video surveillance to crisis notification systems, to extend their reach and work more efficiently.

As a result, universities, colleges and private K-12 institutions must determine how to cost-effectively provide the high-speed wireless access and applications required to enable anywhere, anytime access to the latest tools to not only meet student expectations, but to also improve registration and student safety.

The all-wireless campus

By leveraging today's best-in-class wireless networking technologies, colleges, universities and K-12 institutions can address today's challenges by enabling the all-wireless campus. Today's high-performance 802.11n wireless LAN and wireless broadband networks allow the delivery of reliable high-speed wireless voice, video and data inside buildings as well as throughout the campus grounds, providing support for applications that greatly improve the learning environment, campus security and the overall productivity of faculty and staff — while providing value added services that strengthen relationships with students and their parents. Applications include:

Real-time faculty and administrative applications

A wireless network can provide a wealth of applications that help teachers spend more time on teaching instead of administrative tasks, helping to improve the overall quality of the education. K-12 wireless attendance applications can eliminate paper forms, saving time, eliminating errors and enabling rapid identification of missing students. The ability to send wireless work orders to maintenance staff not only improves productivity, but also enables faster repair — from a leaky faucet or faulty heating unit to the removal of broken glass in the parking lot — helping to maintain a safer and cleaner environment for all.

Voice over WLAN (VoWLAN)

The same wireless network that provides access to the Internet, video and back-end business applications can also enable the delivery of wireless voice services. Voice over WLAN (VoWLAN) handsets provide cost-effective connectivity for teachers and administrators throughout campus, effectively eliminating monthly cell phone service fees as well as the need and cost associated with running cabling to classrooms. Smartphone-style handsets provide a virtual and mobile extension of the desk phone, complete with the desk phone feature set — including abbreviated 4-digit extension dialing, one-number reach, one voicemail box, call forwarding, conference calling and more — without replacing the PBX. This same device can provide push-to-talk private calls and group calls for immediate connectivity, and can even communicate with two-way radios on existing radio systems. With access to email, messaging, the Internet, and Windows Mobile based enterprise applications, you can finally have all of your communications converged in a cost-effective mobile device.

Emergency communications

An 802.11n wireless network provides the highly reliable and pervasive backbone required to support a broad range of emergency communications. For example, a wireless electronic message board can be utilized to advise students of a gas leak that requires the evacuation of a section of the campus. The ability to reach all faculty and administrators simultaneously through a group push-to-talk walkie-talkie style call to Voice over WLAN (VoWLAN) handsets allows administrators, campus security and more to rapidly 'spread the word' during emergencies. An email or text message can be sent to any wireless device — on the network or off-campus.

Video surveillance

The ability to wirelessly connect video cameras both indoors and outdoors eliminates the high cost of wiring, enabling educational institutions to blanket the campus with video cameras. The result is real time streaming video, providing visibility into every inch of the campus, enabling security personnel to immediately discover and respond to virtually any type of on-campus incident. The digital video is easy to archive and retrieve, sophisticated analytics proactively identify potential problems and the wireless network allows personnel anywhere on campus to watch the video.

e-Citations and Automatic License Plate Recognition

Mobility allows campus police to carry a mobile handheld computer that provides access to student information as well as the ability to electronically issue a citation. Now, campus police can quickly verify vehicle stickers and check for any other outstanding citations — for example, to help identify a repeat offender who parks in areas designated for faculty or emergency vehicles. Auto-fill fields, drop-down and checkboxes ensure citation accuracy. Additionally, the ability to deploy a cost-effective ALPR solution enables educational organizations to easily and automatically monitor vehicles that are entering the campus. When a vehicle that is wanted or stolen, or associated with outstanding violations enters the grounds, campus police are instantly notified, enabling the swift action required to help better protect students and faculty.

The many applications in the all-wireless campus

- Fixed mobile convergence
- Emergency communications
- Video surveillance
- e-Citations and Automatic License Plate Recognition
- Distance learning
- Live coverage of sporting events
- Automated asset tracking

Anytime, anywhere voice and data access…for anyone

Distance learning

A high-speed wireless network provides a vehicle to enhance and extend the learning environment. In higher education, students can access learning portals, course information and online libraries as well as collaborate with classmates and professors on other campuses. K-12 facilities can give students online access to class and individual lessons as well as homework assignments, library services and more.

Live coverage of sporting events

Sporting events are an important aspect of every school. The wireless network allows schools and universities to enable easy and cost-effective viewing of the event — live or streamed at a later date. In addition, the National Collegiate Athletic Association (NCAA) in the U.S. requires colleges and universities in certain divisions to provide Internet access in the press boxes. A wireless network eliminates the high cost of cabling these often hard-to-wire areas and provides the flexibility to move press areas as needed. Says Dan Schumacher, Director of Athletics at Lewis University, "It's more cost effective for us to have wireless than to hard wire a press box 300 yards away from the nearest building. Wireless is the answer."

Automated asset tracking

Wi-Fi locationing technology enables the automatic tracking of assets — from laptop computers in K-12 to expensive medical equipment in a university. Now, assets can be easily located when needed, potentially reducing inventory requirements. Stolen assets are instantly visible, providing a theft deterrent that protects against equipment loss — and the resulting negative impact on your budget.

Anytime, anywhere voice and data access…for anyone

The ability to deliver truly resilient wireless voice and data services to every corner of your campus serves the needs of the student body as well as the educational institution. Provide anytime anywhere access to class registration systems, grades, learning portals and student services as well as personal services, such as VoIP and video services, meeting the demands of your students and faculty. With the real-time access to student transcripts, online testing and grading applications as well as online knowledge bases, your faculty has the tools required to deliver an enriched learning experience as well as improve productivity. You can even extend wireless access to guests — from visiting professors to the families of your students — without compromising network security.

Motorola: making the truly wireless campus a reality

Motorola's 802.11n wireless networks are helping higher education and K-12 institutions of all sizes around the world to realize the promise of the truly wireless campus. With speeds up to six times the bandwidth of 802.11a/g, our indoor/outdoor 802.11n wireless networks offer the throughput, coverage, resiliency and security required to enable cost effective delivery of some of the most demanding applications.

In Greene County, North Carolina, just three years after the deployment of a countywide high-speed broadband wireless network throughout the entire school district, composite SAT scores improved more than 40 points and high school proficiency scores increased from 53% to over 78%.

Motorola's Wireless K-12 Education Solutions; 2007

Motorola offers the unmatched reliability and gap-free security required for successful deployment in educational environments. When you choose Motorola to enable your wireless campus, you choose an industry leader that can deliver the breadth of experience, patented features and proven products you need to maximize the success of your wireless solution:

Expansive reach with indoor and outdoor coverage
Motorola's wireless LAN portfolio seamlessly integrates with our wireless broadband and mesh solutions, enabling the extension of secure and ubiquitous wireless access to every corner of your campus — including in and between remote buildings, in sports arenas and even off-campus housing. The pervasive campus-wide connection provides students with the omnipresent high-speed access they expect; process automation for teachers, maintenance staff and more to improve productivity and efficiency; and the constant video connection required to improve campus security as well as situational awareness.

Superior WLAN performance with 802.11n
Motorola's wireless LAN product family is loaded with features that deliver mobile voice and data with a difference. Enterprise class Quality of Service (QoS), pre-emptive roaming, load balancing, WMM Admission Control and seamless Layer 3 mobility combine to provide users with toll quality voice and a resilient connection as they roam throughout your environment — from classroom to dormitory halls to outdoor common areas, sporting arenas and more — ensuring continuity of service for phone calls and data applications. Virtual AP enables broadcast domain separation for secure hotspot enablement.

Role-based differentiated access for students, staff, faculty and guests
In addition to high student turnover, educational institutions need to provide different levels of network access to different classes of users — from students and staff to faculty and guests — while still ensuring quality of service and security. Motorola wireless switches provide the features required for seamless and secure network operation, despite a constantly changing base of users, including a built-in Real-Time Location Solution (RTLS) engine; a role-based firewall to to enforce user identity-, role- and location-based security policies; user bandwidth contracts; and Quality of service (QoS) defined by traffic type — for example, allowing voice packets to receive the prioritization required to enable a toll-quality voice experience.

Gap-free security
Motorola offers comprehensive best-in-class wireless security that rivals that of the wired network. A tiered approach protects and secures every point in your network — wired and wireless. This complete suite of tools includes a role-based wired/wireless firewall that provides protection against attacks and unauthorized access right at the wireless edge — including Layer 2 and Layer 3, advanced encryption and authentication technologies.

Optimizations for dense deployments in indoor areas
Conference rooms and lecture halls require support for high bandwidth applications in a small area. Motorola SMART RF technology increases capacity in dense areas such as conference rooms and lecture halls, allowing architects to simply plug-in new access points and allow SMART RF to automatically self tune the network for optimal performance. In addition, Motorola adaptive architecture allows local traffic such as video streams for the teacher's computer to students to be bridged locally, eliminating potential network bottlenecks that can occur in deployment requiring all the data to be routed via a centralized controller.

Interoperability
In education, preserving precious budget is crucial. Motorola's standards-based wireless broadband networks easily integrate into your existing technology environment, allowing you to preserve any existing wired and wireless networking infrastructure. In addition, the ability to integrate your PBX and two-way radio systems to enable fixed mobile convergence (FMC) solutions allows you to further extend the value of your existing technology investments.

The benefits of the wireless campus

- Enhanced learning for improved test scores
- Improved productivity for faculty and staff
- Improved safety and security
- Better competitive positioning
- Reduced capital and operational costs
- A low total cost of ownership (TCO)
- Increased revenues
- Improved parent collaboration

Easy to design, deploy and manage
Motorola's One Point Wireless Suite provides a common platform for an integrated set of tools that enables centralized and remote management of all your wireless infrastructure — from the wireless LAN to wireless broadband mesh, point-to-point and point-to-multipoint products. Whether you are installing a wireless network in a single building or throughout an entire county, robust design tools remove the guesswork from the planning stage, enabling the creation and deployment of a network that delivers maximum performance from day one — no expensive re-work required. When comprehensive reporting and analysis tools are combined with network visualization of a single or multiple campus environment via Google mapping technology, you get the macro and micro network views required to spot and resolve network issues more quickly — before service levels are impacted.

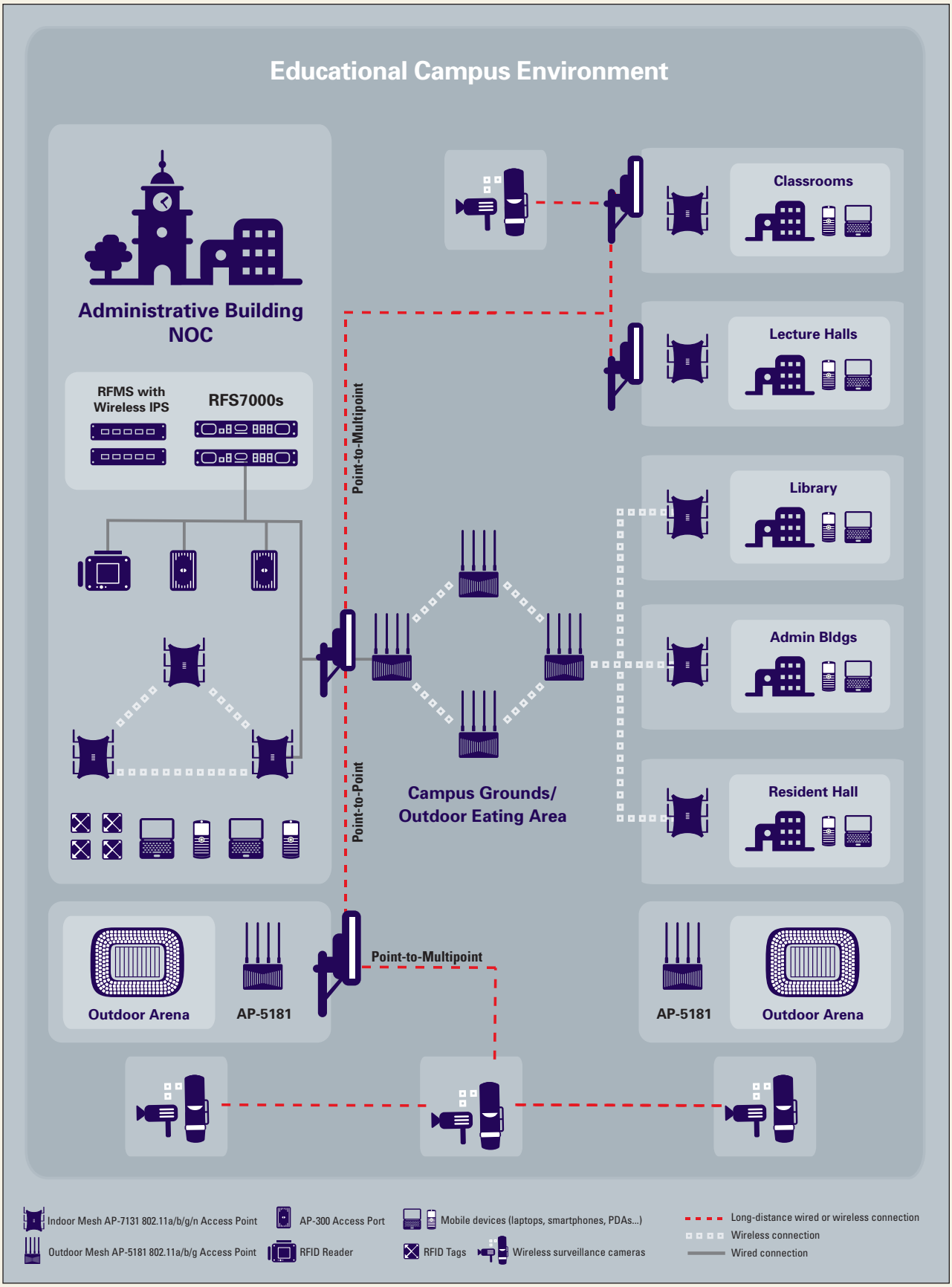
In addition, Motorola AirDefense Advanced Troubleshooting module allows helpdesk staff and wireless LAN administrators to remotely and cost-effectively isolate and resolve wireless client and network performance issues across multiple campuses. With advanced and easy-to-use tools, even first-level helpdesk staff will be able to perform remote expert analysis of wireless LAN network issues — frequently eliminating the high cost of an on-site technician visit.

True RF resilience
As the backbone for your entire campus, your wireless broadband network will enable nearly all of your communications — in the classroom, dormitories, library and open spaces for students, faculty, administrative staff and guests. Self-healing mesh, redundant cluster support and Adaptive AP technology — all Motorola innovations for the Wireless LAN — work together to seamlessly re-route traffic around any malfunctioning equipment in your network. In the event that an access port should fail, our SMART RF Management feature automatically adjusts the power and channels of neighboring access ports to eliminate any gaps in coverage, providing next generation self-healing — no monitoring required. And with Motorola's unique Adaptive AP, our Remote Site Survivability (RSS) mesh access points will continue to deliver secure uninterrupted wireless service, even in the event of a network outage on your wired network. The result is unmatched network reliability.

The best return on investment (ROI) and the lowest total cost of ownership (TCO)

A Motorola all-wireless campus is easy to cost justify. Our technology delivers unmatched reliability and security and is second-to-none in features, quality, reach and manageability, yet is sensibly priced. You get the peace of mind that only comes with well-proven technology — every day, Motorola wireless networks provide dependable mission critical performance for customers all across the globe, in some of the harshest environments and most challenging RF conditions.

The many benefits of wireless connectivity, a substantial decrease in capital costs and the low operational costs of a Motorola wireless network combine to deliver superior value. Wireless benefits include increased staff productivity, which in turn improves staff utilization, helping to control spiraling employee costs. Video surveillance reduces vandalism and theft, reducing insurance costs — and the need for expensive fencing.


Educational Campus Environment
Administrative Building
NOC
RFMS with
Wireless IPS
RFS7000s
Point-to-Multipoint
Point-to-Point
Campus Grounds/
Outdoor Eating Area
Classrooms
Lecture Halls
Library
Admin Bldgs
Resident Hall
Outdoor Arena
AP-5181
Point-to-Multipoint
AP-5181
Outdoor Arena
Indoor Mesh AP-7131 802.11a/b/g/n Access Point
Outdoor Mesh AP-5181 802.11a/b/g Access Point
AP-300 Access Port
RFID Reader
Mobile devices (laptops, smartphones, PDAs...)
RFID Tags
Wireless surveillance cameras
Long-distance wired or wireless connection
Wireless connection
Wired connection

Award winning wireless LAN technology...

...from an award winning company.

ABIresearch®

"Motorola has the greenest Wi-Fi equipment"

- Integrated security features — stateful firewall, VPN, IDS/IPS, AAA Server at no additional cost
- Zero port license switch with cluster license aggregation lowers cost of redundancy
- Integrated mesh, location/asset tracking further reduces the cost/complexity of mobilizing the enterprise

ABI research
2008 ABI Green Report,
#1 Green Wireless Vendor

Gartner

2008 Magic Quadrant Leader

Motorola strengths as noted in Gartner's 2008 Magic Quadrant Research Report:

"The integration of indoor and outdoor management products, best of breed from a planning and ease of use perspective provides a WLAN product family that few can match."

Source: Magic Quadrant for Wireless LAN Infrastructure; Michael L. King/Tim Zimmerman; Gartner, Inc.; Nov 26, 2008

Capital outlay is reduced. Deployment costs for a wireless network are less than one fifth of the wired equivalent — there are no trenches to dig and no monthly charges for multiple expensive leased T1 lines. In addition, Motorola wireless LANs provide more value per budget dollar. You enjoy more features, investment protection, rapid and cost-effective deployment and easy day-to-day management. Our standard feature set includes advanced functionality that is frequently an option in competitive products — such as mesh, clustering, locationing and RFID. Our wireless networks integrate easily with your existing wired network and PBX systems, allowing educational institutions to more fully leverage existing technology investments. Unlike the wired network, wireless freedom enables learning institutions to reconfigure or add classrooms and buildings — without incurring wiring or re-wiring costs.

Operational costs are reduced. Motorola's wireless LAN infrastructure is loaded with features that simplify and automate WLAN management, substantially reducing day-to-day management requirements for your entire wireless solution. For example, the Wireless Next Generation (Wi-NG) architecture of Motorola's RFS Series Wireless Switches takes self-healing to the next level by enabling the WLAN to intelligently and automatically adapt as needed to eliminate gaps in coverage due to equipment failure or a change in the RF environment that affect coverage. Motorola also offers a best-in-class toolset, including robust planning tools that prevent expensive network re-work as well as centralized and remote management capabilities that further reduce the time required to manage, monitor and troubleshoot the entire wireless solution — including wireless infrastructure as well as your mobile devices — freeing your IT staff to focus on more crucial projects.

Motorola's comprehensive wireless LAN and wireless broadband portfolio

Wireless Switches

Motorola Wireless Switches deliver on the promise of the wireless enterprise, providing the performance, security, resiliency, scalability and manageability required to deliver cost-effective centralized wireless voice and data in any size campus — single building K-12 schools to large university campuses spanning hundreds of acres to entire school districts spanning many miles.

	**RFS7000:** Designed for large buildings and campuses, the RFS7000 offers a comprehensive feature set based on Motorola's Wireless Next Generation (Wi-NG) platform. The RFS7000 supports 8,000 to 96,000 mobile devices/users, and up to 256 802.11a/b/g access ports or Adaptive 802.11 a/b/g and a/b/g/n access points.
	**RFS6000:** Designed for mid-sized facilities, the RFS6000 offers a multicore multithreaded architecture with all of the advanced features of Motorola's Wi-NG platform. The RFS6000 supports 2,000 to 20,000 mobile devices and up to 48 dual radio 802.11a/b/g access ports or Adaptive 802.11 a/b/g and 802.11 a/b/g/n access points.
	**WS2000:** Designed for smaller schools and remote offices, the WS2000 is a powerful all-in-one wired and wireless switch and router that simplifies and reduces the costs of managing wired and wireless networks. Ideal for smaller locations, each WS2000 offers support for up to 6 802.11a/b/g access ports and mesh capabilities.

Access Ports and Points

Motorola Access Ports and Access Points offer flexible deployment options, whether you are deploying a single cell site, a mesh network or a large installation.

	**AP300:** A key component in Motorola's Wireless Switch systems, the AP300 dual radio 802.11a/b/g access port provides the point of connection between your mobile devices and the wireless LAN. A thin, low cost zero-configuration device, the AP300 is centrally managed from the Motorola Wireless Switch, and does not require manual maintenance. The AP300 can also function as a dedicated sensor to provide 24x7 wireless security.
	**AP-7131:** An industry first, Motorola's AP-7131 802.11a/b/g/n flagship Access Point offers the throughput, coverage and resiliency required to enable the truly wireless educational environment. The AP-7131's tri-radio design can enable always-on wireless intrusion protection as well as mesh networking. As an Adaptive AP, the AP-7131 can be centrally managed by a switch or act independently.
	**AP-5131 and AP-5181:** The AP-5131 provides enterprise-class wireless networking for standalone locations, and mesh networking for cost-effective extension of the network in difficult-to-cable areas. As an Adaptive AP, the AP-5131 can be centrally managed by a switch or act independently. The related AP-5181 provides similar functionality for rugged, outdoor environments.

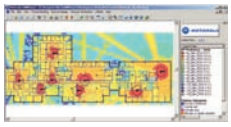
Wireless Broadband

The Motorola Wireless Broadband Portfolio helps customers build wireless networks that span large areas, enabling the sharing of data, voice and video across a geographically dispersed multi-building educational environment.

	**Point-to-Point (PTP):** Whether you need to connect many buildings on a single university campus or schools and administrative offices in an entire school district, PTP offers cost-effective, high throughput bridges that provide long distance and remote connectivity in challenging, non-line-of-sight environments.
	**Point-to-Multipoint Access Networks:** Reduce the cost of moving information from one point to multiple locations reliably and security with PMP solutions. With industry leading interference tolerance and low field failure rates, network operators can lower their total cost of ownership. GPS synchronization provides an additional benefit of PMP.
	**Mesh Networks:** Motorola's MOTOMESH portfolio leverages best-in-class mesh networking technology to provide connectivity to mobile devices in the large outdoor spaces frequently found in large campus environments. Designed to meet the challenges of demanding multi-use networks, MOTOMESH Duo provides the bandwidth to support video as well as voice-over-IP, while providing the end-to-end security required to comply with government regulations. Its small size and low power consumption provide superior mounting location flexibility — and deployment simplicity.

Management and Security Solutions

The Motorola Wireless Broadband Portfolio helps customers to design, deploy and manage wireless networks over large areas to share data, voice and video across a geographically dispersed multi-facility organization.



One Point Wireless Management Suite: The Motorola One Point Wireless Suite is a powerful set of software solutions that help customers design, deploy, manage and secure their indoor and outdoor Motorola wireless networks. Powerful planning tools including LANPLanner, MeshPlanner and PTP LINKPlanner take the guesswork out of network design. And Wireless Manager and RF Management Suite enable centralized and remote day-to-day management, monitoring and troubleshooting of all wireless infrastructure, ensuring maximum network performance — and uptime.

Motorola AirDefense Solution: Proactively protect your wireless network, mobile devices and traffic from attacks and unauthorized access with Motorola AirDefense Enterprise, Motorola's industry leading wireless intrusion prevention system. This dedicated scanning solution provides gap-free indoor and outdoor protection for your wireless LAN users, with 24x7 monitoring of any 802.11 network in local and distributed environments. And Advanced Troubleshooting proactively identifies wireless LAN configuration issues that affect business-critical applications, providing IT departments with the ability to remotely address network configuration issues before they impact WLAN performance and availability.

Voice over WLAN (VoWLAN) Solutions

Motorola's VoWLAN solutions allow schools and universities to deliver highly cost-effective voice services over the WLAN. The ability to deliver voice and data over the same network simplifies the deployment and management of mobility solutions — and drives a faster return on investment (ROI).

Total Enterprise Access & Mobility (TEAM) Solution: The TEAM VoWLAN solution turns the desktop into a pocketable virtual office. This standards-based solution integrates as a non-intrusive overlay to existing PBX and WLAN infrastructure, providing a unified platform with enterprise-class performance, unmatched scalability and common management and security for voice and data services. The TEAM VoWLAN solution delivers cost-effective mobile access to PBX-based telephony, PTT, text messaging, email/PIM, Internet/Intranet and business applications — all through a single device.

Additional products: Motorola also offers a wide variety of associated WLAN products, from Power-over-Ethernet injectors to wireless bridges and client adapters to wirelessly enable a variety of devices.

One company…everything you need to go wireless

Motorola is the only company that can offer everything you need to extend the reach of your voice and data network throughout your entire campus. When you choose Motorola, you choose a wireless expert with a long history of proven, innovative technology. The inventor of the wireless switch, we also hold over 100 key wireless LAN patents that enable unique Motorola-only features that work together to provide 'wired' performance levels on the wireless LAN. Our mesh product portfolio provides connectivity to users in large outdoor spaces. With our point-to-point and point-to-multipoint solutions, schools can connect to multiple buildings on a single campus as well as connect remote buildings and facilities that are long distances away — even across water or in environments that are dense with buildings or foliage.

Motorola's unmatched mobility portfolio and world-class partnerships enable us to offer true end-to-end educational solutions that offer the simplicity of a single accountable source. In addition to wireless infrastructure, our comprehensive product offering includes a wide variety of rugged handheld mobile computers, bar code scanners and business smartphones; fixed, handheld and mobile RFID readers; a world-class partner eco-system offering best-in-class applications; software solutions for centralize and remote management of every aspect of your mobility solution; and a complete range of pre- and post-deployment services.

Motorola: everything you need to get and keep your education solution running at peak performance.

For more information

For more information on how you can change the lives of your students and your staff with Motorola's wireless network solutions, please visit us on the web at www.motorola.com/Education or access our global contact directory at www.motorola.com/enterprisemobility/contactus

Motorola, Inc.
1301 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.
www.motorola.com/education
1-800-367-2346

RO-99-2198