



Getting an **A+** in WiFi:

Keys to Successful Management of Wireless Networks in the K-12 Environment

Introduction

K-12 computer use has skyrocketed in the past decade, as dedicated computer labs have given way to mobile notebook PC carts. Teachers now routinely carry their own laptops into the classroom and some districts have begun to equip each student with their own notebook. Thanks to the flexibility offered by their portability, laptop computers will be used in an ever-increasing number of ways and locations in the school environment. And, the number of devices connected to a school district's network will grow exponentially in the upcoming years.

With the classroom computing revolution underway, the old strategy of pulling cable to a single computer lab or equipping each classroom with one network port is no longer viable. And installing an Ethernet port at each student desk is prohibitively expensive and lacks the flexibility needed in a rapidly changing environment with unpredictable usage patterns. The result is that WiFi is the only viable and reliable networking technology on the market for delivering economical broadband connectivity to so many locations. WiFi delivers a low-cost solution that can be installed quickly in new and old buildings alike, from classrooms to libraries to administrative areas.

It is a major challenge for any IT organization to securely and reliably support any new networking technology. To support these new networks and to address the special challenges which wireless networks bring, without breaking the IT budget, calls for a robust centralized wireless network management solution is an absolute requirement.

EXECUTIVE SUMMARY

The need for WiFi networks in the K-12 environment is clear: In most cases there is no other affordable way to deliver network connectivity to classrooms and administrative areas.

Yet, for the IT staff responsible for supporting the WiFi network, the K-12 environment poses many unique challenges that can only be addressed with a specialized wireless network management solution like the AirWave Wireless Management Suite. These challenges include:

- Tight installation time constraints dictated by school schedules
- Rapid trouble-shooting requirements
- Highly variable network usage patterns
- Small IT staffs and limited budgets
- After-hours operational support requirements (without after-hours staff)
- Complex networks with legacy equipment and multiple vendors' hardware

By helping IT overcome these obstacles, the AirWave Wireless Management Suite gives IT the level of control it needs and makes reliable, secure wireless networking not only possible, but a positive addition, to K-12 schools and school districts.



School Districts' Top WiFi Concerns

When he or she thinks about a WiFi network, the CIO in a typical school district has to answer many hard questions:

How will we get the wireless network installed or the upgrade completed before the school year starts?

How will we manage this large, new, second network which is deployed in dozens of locations, without adding more IT staff?

When problems arise, can we resolve them fast enough so they won't interfere with classroom activities?

How can we ensure that our wireless network has the capacity to accommodate changes and growth in our computer use over the coming months and years?

Will we be able to operate our wireless network efficiently in the future, while our infrastructure grows and evolves?

How are we going to support all the different types of uses and users of a wireless network?

The answer to these questions lies in accurate planning and having the ability to centrally see and manage everything in the wireless network, down to the level of the individual user. It is available in any comprehensive wireless network management system (WNMS) which enables engineers and Help Desk staff to efficiently and easily shoulder the additional burden of supporting this new network. Such a WNMS must provide certain core functions, particularly:

- **Network Discovery**, to allow IT to quickly find, identify and track all new wireless access points and controllers on the network
- **Central configuration and firmware management**, to help IT efficiently manage hundreds or even thousands of wireless APs and network devices from one location
- **User and device monitoring**, so IT can locate and track each network user live, and understand what they are doing and how the network is performing

- **Rogue access point detection**, to quickly identify any unauthorized APs connected to the district's network, typically by students or teachers
- **Automated diagnostics and alerts**, to tell IT when network problems occur
- **Trend reporting**, to facilitate long-term network planning and troubleshooting
- **Location tracking and visualization**, so to IT can see where users are, and analyze the RF environment in that area

These core capabilities are desirable for *any* organization installing and managing a WiFi network. But while a private corporation has the staff, resources and budget to commit itself to a proprietary management solution relying on present and future commitment to using the wireless hardware products of a single vendor, most schools do not. To confront and address unique mix of wireless issues in the educational IT environment, they need a management solution designed with and tailored for K-12 users.

The AirWave Wireless Management Suite is vendor-independent and gives IT a single console from which to plan, provision, and support a diverse WiFi network, now and into the future. It is in use by large school districts with thousands of wireless access points as well as by smaller districts with only a few school buildings and wireless hotspots. By partnering closely with the IT staffs in these districts, AirWave Wireless has developed a unique technical solution to address their most pressing WiFi management concerns.

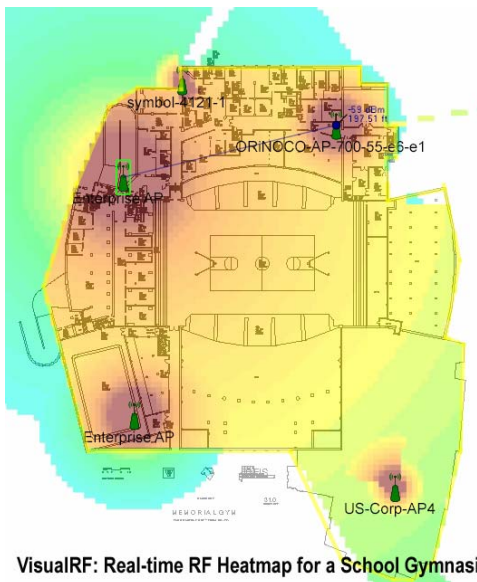
This remainder of this whitepaper illustrates the most pressing wireless issues faced by a school district and highlights the ways in which the AirWave Wireless Management Suite helps IT overcome these obstacles.

Tight Installation Time Constraints

Challenge: In a typical school district, significant network installation activities must be completed during the summer or school holiday periods. When school is in session, IT often has limited or no access to school facilities – and even if they did, their other responsibilities might not leave them sufficient time to complete a major network deployment. Thus, K-12 IT



departments need to implement very large WiFi installations in just a few months per year. While the process must be completed quickly, accuracy is also highly important. If devices are not properly installed and configured, network performance will suffer, security will be compromised, and IT will spend hour upon hour investigating, diagnosing and correcting the resulting problems. In fact, it is not unusual for organizations to discover that more than half of their wireless access points are improperly configured, and that vendor default configurations compromise network security.



VisualRF: Real-time RF Heatmap for a School Gymnasium

Solution: The AirWave Wireless Management Suite helps to plan, provision and configure a WiFi network quickly and securely. Network planners use the AirWave Wireless Site Plan software to determine roughly where wireless access points should be placed for the desired coverage and throughput in each school building and room. IT then uses the AirWave Management Platform's (AMP) intuitive web-based user interface to define the network and security configuration policies to be applied to each wireless access point or controller. When the wireless APs are installed and connected to the network, AMP automatically discovers each device and configures it to match the district's policies. By automating configuration and automatically optimizing RF settings, AMP dramatically reduces installation time and eliminates human error, enabling IT to install and configure hundreds of wireless access points within a few weeks.

CASE STUDY:

Fairfax County (VA) Public Schools

School Buildings:	228
Students:	163,534 <i>(12th largest in the U.S.)</i>
Total Users:	185,000
Wireless APs:	6,465
WiFi Hardware:	Cisco 1120/1121 Cisco 1131 Cisco 1300/1500

"From the very outset, AirWave treated Fairfax County Public Schools as a valued partner. AirWave made sure the software would meet our needs and is extremely responsive to our requests. I wish all our vendors were as committed to customer support. We definitely made the right choice when we selected AirWave."

John Bayliss
Network Engineering & Support Manager

Rapid Trouble-shooting Requirements

Challenge: In most school districts, class periods last an hour or less, and a teacher may have access to one of the schools' notebook carts for only a few periods per week. If any problem takes more than a few minutes to diagnose and correct, the entire class period has been lost. Reliable network access is thus a mission-critical requirement – and if a problem occurs, the teacher needs to be able to call IT on the phone and have them resolve the issue immediately.

To make matters more difficult, teachers and students often do not have the technical background to provide useful input to the IT staff in diagnosing and trouble-shooting problems. In



most cases, all the IT support desk can expect is a hurried description of the symptom: 'I cannot connect to the wireless network' or 'The network is really slow today.' Only in rare cases does the user have the knowledge to assist in determining the root cause of the problem.

Solution: The AirWave Wireless Management Suite gives the remote IT staff instant access to real-time user information with a few clicks of the mouse. The support staff can quickly locate the user on the network (identifying him or her by username rather than MAC address or IP), assess the signal quality received by the user, measure the bandwidth usage on the access point, and even call up a real-time RF map showing the location of all users in that area. The support staff can even call up real-time information on packet loss, transmission errors, and other data to better understand the RF environment.

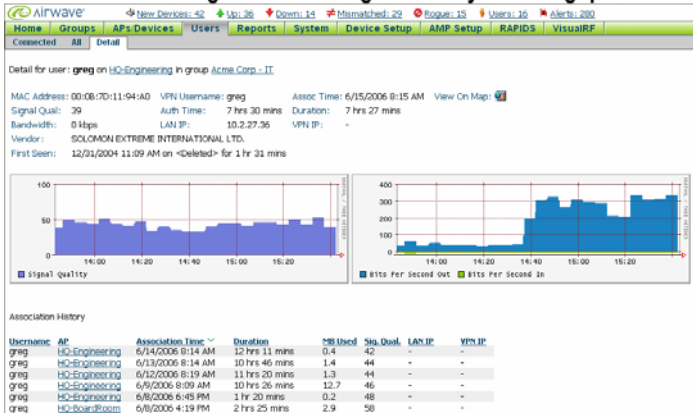
few minutes, from zero users at the start of a class period to dozens of simultaneous users when the teacher reaches the portion of his lesson plan requiring network access. Similarly, usage patterns can change dramatically by time of year, from little to no usage during summer months to constant usage during the school year. Network administrators thus need to monitor usage patterns closely to ensure that capacity and performance meet user requirements, and must use historical trend reports to track changing usage patterns over time.

With rapid projected increases in both student and faculty use of computers in the next several years, accurate tracking of usage statistics and performance will become more and more critical all the time.

Solution: The AirWave Management Platform monitors the network continuously and generates priority alerts when any individual wireless AP appears to be overloaded. With this information, network administrators can take immediate, short-term corrective actions, such as altering RF transmission power or other AP settings to better handle the network load. AMP also supports new 802.11e (Quality of Service) settings on leading access points to ensure that high-priority traffic gets through even at peak usage times.

AMP also provides detailed usage reports so administrators can track usage patterns in each school and on every access point, with trend information dating back two years or more. IT can thus determine peak usage by time of day and year, helping them identify the precise locations where additional capacity may be required. IT can drill down to individual user data to determine precisely which teachers or classes are using the most bandwidth at specific times. Even if wireless network capacity cannot be increased in the short-term, this information can be used to help change user behaviors, by scheduling high-bandwidth applications to be used when network utilization is lowest.

AMP User Monitoring Screen: RF Signal Quality & Throughput

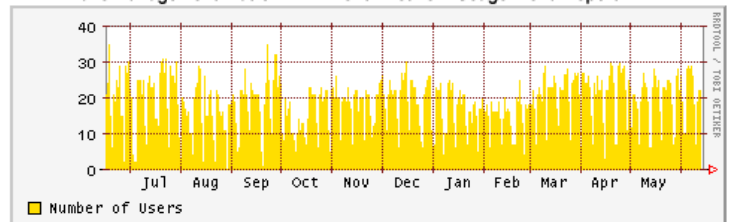


With this information, the remote IT staff can quickly assess whether the issue appears to be a network problem affecting multiple users or a client issue. Using AMP's web-based interface, the remote administrator can instantly apply any network configuration changes required to address the problem. As a result, AirWave customers are able to reduce wireless LAN problem resolution time by 40%, on average.

Highly Variable Usage Patterns by Time of Day and Year

Challenge: Planning wireless network capacity in a school environment can be extraordinarily challenging. Usage of an individual wireless access point can swing rapidly within just a

AirWave Management Platform: 12-month Network Usage Trend Report





Large Networks with Small IT Staffs

Challenge: Compared to their corporate colleagues, IT in a K-12 school district often has to operate on a shoestring budget. This typically means that a very small IT staff has to support a large (and growing) number of users. To make matters worse, schools are highly geographically distributed and are often located many miles from the district headquarters, making site visits time-consuming and impractical. Without expert full-time IT support staff onsite in each school, the district staff must have remote management capabilities.

Solution: The only way for a small team to manage a large remote network is to have effective tools at their disposal. The AirWave Management Platform software's web-based user interface provides complete real-time visibility to wireless network performance. Whether they are in their office, at home, or onsite the IT staff can access historical trend reports; receive and investigate alerts; and view current data on each user and device on the network.

As important, AMP automates many time-consuming management tasks, greatly reducing the WLAN support burden. AMP automatically configures each device, manages firmware upgrades, and monitors performance around the clock. AMP eliminates the need for manual network audits for configuration compliance by automating the audit process and instantly repairing any device configurations that do not match policies. Intelligent automation and diagnostics can save hundreds or thousands of man-hours over the course of a school year, freeing the IT staff to focus on other, more pressing priorities. In fact, 70% of AirWave customers report that the AMP software saves them from having to hire at least one – and often more – new employees to manage the wireless network.

24x7 Network Requirements without a 24x7 IT Staff

Challenge: It is virtually unheard of for a school district to be able to afford a 24x7 network operations center. In fact, most districts are under constant pressure to cut staff, furthering reducing support hours. Yet, districts' WiFi networks often need to operate after school hours, on weekends, and during school vacations. Indeed, in some towns, school buildings

and their WiFi networks are viewed as a type of community resource, to be used for meetings, events, and other public activities. Usage of the network may thus need to be supported after hours, when there is no on-duty IT staff. As a result, the district has several unappealing options: (1) pay to staff an after-hours NOC; (2) provide no support to after-hours users, or (3) put IT staff on-call to report to work onsite if problems are reported.

Even if the district policy states that the WiFi network is not to be used or supported outside school hours, the IT staff must be able to monitor the network to ensure that policy is enforced and that no one uses the wireless network to access secure district resources.

Solution: AMP helps districts solve this support dilemma cost-effectively. Using AMP's web-based interface, a network administrator can fully manage the network and respond to support calls from his home or anywhere he has Internet access – turning his PC into a 'virtual wireless NOC' and greatly reducing support costs for the district.

If the WiFi network should not be available after hours to minimize security concerns and support costs, the safest policy is often to shut down the entire wireless network. With AMP, all radios can be scheduled to shut off at a specified time and to turn on again at the appropriate time – guaranteeing that no intruder will be able to use the WiFi network as a door through which to access the district network.

Heterogeneous Networks and Legacy Hardware

Challenge: Very few large school districts have the budget or the staff to install WiFi access district-wide in a single deployment. Instead, most districts adopt phased installation plans – often starting with high schools and junior high schools and then progressing to elementary schools -- that may stretch over several years. School districts also face budgetary pressures that force them to extend the life of their network hardware far longer than their peers in for-profit organizations.

As a natural result of these pressures, school districts generally end up with a heterogeneous network infrastructure with several generations of wireless products operating side



by side. In some cases, especially where district procurement processed require open competitive bids, districts may end up using equipment from different hardware vendors over the years. Even in districts with a single-source vendor, however, rapid evolution of that vendors' wireless product lines might mean that even a "single-vendor" network is quite heterogeneous, with products that cannot be managed in the same fashion. These districts often experience increased support and training costs because they have to sub-divide their wireless network, using separate solutions to manage each type of infrastructure. Worst case, districts sometimes have to accelerate the replacement of still-functional hardware because these products are no longer supported by the manufacturer's newest management solution.

Solution: The AirWave Wireless Management Suite is specifically designed to make it easy for the IT staff to manage even the most complex, heterogeneous wireless networks. The AirWave software supports hardware from most leading wireless vendors, including Cisco (Aironet and Airespace product lines), Aruba, Proxim, HP ProCurve, Symbol, Enterasys, Colubris Networks, Avaya, and many more. AirWave support dates back to the earliest WiFi product lines for many of these vendors.

As a result, school districts using the AirWave Management Platform can monitor and manage even a diverse network infrastructure from the same console, reducing costs and providing full visibility into the network from a single console.

WLAN Fact: 70% of education customers plan to evaluate new WLAN vendors within 18-24 months.

(Source: AirWave Customer Survey)

By providing ongoing support for both new and legacy product lines, the AirWave Management Platform helps school districts dramatically increase the useful life of their existing Wi-Fi infrastructure, allowing them to postpone costly network upgrades. In fact, more than half of AirWave's customers report that using AMP will allowing them to extend the life of their existing equipment by two years or more.

Conclusion

WiFi is arguably the most significant networking innovation for the K-12 market in decades. It promises to deliver what has never before been possible: affordable broadband connectivity for every student and classroom. Within the next few years, schools without WiFi access will be a small minority.

For IT, this revolutionary change poses unique challenges. With limited staff and resources, IT departments in school districts desperately need tools to help manage and secure these rapidly growing wireless networks. The AirWave Wireless Management Suite is used by school districts throughout the world to manage their WiFi networks. Through close partnerships with these districts, AirWave Wireless has developed special features to address the most pressing needs of the K-12 market, making the AirWave Management Platform an indispensable tool for school districts with 25 to 25,000 wireless access points.

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