WIRELESS SOLUTIONS FOR

Interactive Learning

XIRRUS®
High Performance Wireless Networks

The digital classroom, does your wireless get good enough grades?

Interactive learning (also known as the digital classroom) involves creating an educational environment that leverages social media, distance learning, and Web 2.0 resources as opposed to the more traditional forms of passive instruction.

Imagine a German language class where, instead of just reading a book, you are video conferencing to a peer classroom in Germany. Or a math class that uses live images of the pyramids on the Giza Plateau to help demonstrate polyhedrons. This is what interactive learning enables. To make it a reality, the technology underlying it must be at the head of the class.

Technology to support the digital classroom encompasses identifying appropriate educational applications and software, selecting the right mobile devices (laptop, netbook, tablet, etc.), and building a wireless infrastructure that provides the high performance required by this form of learning — all while delivering that performance with a level reliability equal to that of a wired classroom.

Design for performance, not just mobility.

Building a wireless infrastructure for the digital classroom that not only meets today's demands but also those of the coming years' presents several significant challenging requirements for network administrators in education:

1. Pervasive high-performance wireless coverage
2. The highest level of reliability in infrastructure and applications
3. Scalability to meet future expanding needs

Pervasive coverage

Most educational facilities offer some level of wireless service on campus. Oftentimes this is location specific. However, true interactive learning requires high performance wireless that is available anywhere the educator may want to teach. This includes the classroom, the gym for large demonstrations, and outdoors where earth sciences are better taught.

Reliability

Historically, wireless networks merely offered the advantage of convenience to schools and educators; however in an interactive classroom, the wireless network becomes the primary conduit for delivering learning. No longer can educators "teach around" network failures. Yesterday's chalkboards are now smartboards, and streaming video in the classroom is becoming the norm. Today's educational tools are delivered via the network, making reliability of the wireless service a number one priority.

Scalable architecture

In the past, conventional wireless networks have been designed as an overlay network to the wired infrastructure and not intended to support large numbers of users and devices. Wireless networking is a shared medium. So, the more devices on the network, the higher performing the network needs to be. The design of the wireless network today must consider the scale needed to handle growing demands several years down the road to avoid full-scale equipment swap outs.

Key benefits:

- Highest performing wireless networks
- Interactive classrooms with no limits
- More engaged students and instructors

Key features:

- Multi-radio Array design for high performance
- Highly resilient design for dependable wireless
- Modularity for scalability and future upgrades

Recommended actions:

- Design for coverage and performance (it's not a choice)
- Design for reliability
- Design for scalability

Engineering campus-class wireless

When developing your wireless networking strategy for the digital classroom, you need an inclusive approach where all stakeholders are engaged and have the ability to offer input. This includes educators defining teaching requirements, application managers identifying software requirements, and the IT support team defining the client types to be supported.

Once these factors are clearly understood and defined, the IT wireless architect can define the wireless infrastructure required to support the interactive learning environment. Important infrastructure components include the following:

1. Design for ubiquitous coverage
2. Design for performance
3. Design for reliability
4. Design for scalability

Design for coverage.

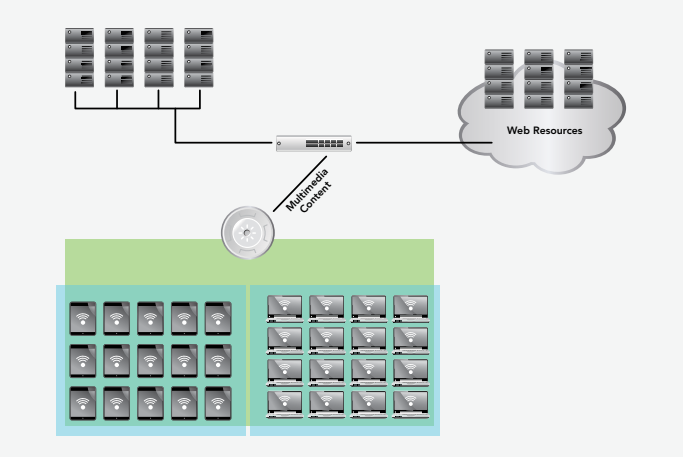
Ubiquitous wireless coverage enables digital educational resources to reach the students anywhere vs. having to move students to a static location (computer labs). Beyond just the ability to connect, it is also of fundamental importance that appropriate wireless signal level is available to provide a "wired-like" experience. Wireless signal levels are defined by an RSSI (received signal strength indicator) value. The recommended level for most networks supporting tablets and smartphones today is 67dBm or better throughout the coverage area.

Design for performance.

The number of wireless clients on campus has escalated to 3+ devices per student in only a few years. To handle these increasing densities, the fundamentals of wireless connectivity must be understood and taken into consideration.

Consider the following when designing for high-performance wireless:

- **Radio spectrum** — 802.11 operates in both 2.4GHZ and 5GHz unlicensed spectrum. The 2.4GHz spectrum supports only three distinct channels for wireless and it is typically congested with other non-wireless devices. The 5GHz spectrum offers up to 24 channels (depending on region) and a much cleaner RF environment. The 5GHz spectrum should be utilized as much as possible for laptop, tablets, and other high-bandwidth devices.
- **Data rates** — 802.11n supports data rates up to 450Mbps. To achieve the highest rates, and therefore highest network performance, purchase equipment that supports these rates and design the network with strong signal level (RSSI) throughout.
- **Users per radio** — Limiting the number of users per radio is an important consideration for best performance since wireless is a shared medium. It is recommended you design for no more than 15 users per radio for good performance, and less if the application requires it.



Wireless campus

Design for reliability.

Network reliability is a concern of all IT administrators. With interactive learning, failures become highly visible and extremely disruptive. Considerations for high reliability include:

- **Coverage resiliency** — Wireless networks should be designed with coverage available from multiple radios at any given physical location. Xirrus recommends one 2.4GHz radio and two 5GHz radios at sufficient signal level for this purpose. This ensures primary and backup options for users at all locations.

CASE STUDY — MONASH UNIVERSITY

Monash University is Australia's largest university with 58,000 students and 17,000 staff spread across eight campuses around the world, including six in Victoria, Australia, one in Malaysia, and one in South Africa along with a research center in Prato, Italy, and a graduate research school in India. Today's students are highly social and digitally connected learners. They are used to highly interactive real-time collaboration. Monash University required a solution to support their MeTL software, designed to enable shared learning experiences between the instructor and student as well as among student subgroups.

Requirements

- Wired-like performance and reliability
- High bandwidth to support 100s of concurrent users
- Ability to support interactive collaboration between students and staff
- Provide needed wireless bandwidth for voice, video, and data applications
- Simple installation and manageability

Solution

- Xirrus 802.11n deployment
- 75% less wireless equipment
- 75% fewer cables
- 75% fewer switch ports
- 75% less time to install
- Green solution with as few devices as possible

"At one point during our testing, we emulated 900 MeTL users across three Xirrus Arrays and still had plenty of headroom — this gave us the confidence to move ahead with a fully wireless solution."

CHRIS HAGAN — eEducation Centre Software Manager

- **Equipment resiliency** — Single points of failure in the network design must be eliminated to avoid widespread outages. The central controller of legacy wireless network architectures presents such a failure point — unless redundant equipment is purchased. The distributed intelligence design of today's high performance architectures eliminates such failure points and need for costly redundant equipment.
- **Uplink resiliency** — As with wired switch topologies, providing multiple uplinks from wireless access devices eliminates the failure points of a cable or switch port.
- **Proactive monitoring** — Network components can fail so proactive detection to alert and mitigate these occurrences ensures the highest level of network resiliency. Such functionality includes self testing of radio operational status, monitoring the status of network resources (DHCP, DNS, etc.), and detecting/alerting on client connectivity problems before the user does.

Design for scalability.

The Xirrus Array was engineered to provide the most modular and scalable wireless solution in the industry. While traditional APs have two fixed radios and are restricted by a central controller, the Xirrus Array is able to scale to meet any capacity requirements, without the need to rip and replace products. When additional capacity is required, pluggable radio modules enable upgrades from 300Mbps to 450Mbps, or in the future to 802.11ac or 802.11ad technologies. When more capacity is required, additional radio modules can be plugged in to existing Arrays to add capacity without requiring additional cable to be pulled or additional switch ports to be connected.

Summary

The requirements of interactive learning will no doubt impact wireless networks not designed to handle them. Networks must be designed for 100% pervasive coverage, wired-equivalent reliability, and performance that not only meets today's demands, but can seamlessly scale as your requirements do without replacing the network.

For more information

For more details on how Xirrus can help you solve the capacity and performance challenges caused by the influx of Wi-Fi devices, visit us at www.xirrus.com or send us an email at info@xirrus.com.

About Xirrus

Xirrus provides unique, high-performance, array-based wireless solutions that perform under the most demanding conditions, while delivering wired-like reliability, superior security, and less infrastructure requirements. Xirrus is a privately held company headquartered in Thousand Oaks, CA.

XIRRUS®
High Performance Wireless Networks

1.800.947.7871 Toll Free in the US
+1.805.262.1600 Sales
+1.805.262.1601 Fax
2101 Corporate Center Drive
Thousand Oaks, CA 91320, USA

To learn more visit:
xirrus.com or
email info@xirrus.com