EDUCATION GUIDE

SMARTER SOLUTIONS FOR EDUCATION: INTELLIGENT NETWORKING 101

Primary, secondary, and higher education: From kindergarten to college, intelligent networks are in a class by themselves.

These are wondrous times in education: students and faculty are using technology to break down barriers, bring people together, and fire the imagination.

Intelligent networks are erasing the physical boundaries of the classroom, allowing learning to continue anywhere wired or wireless connections exist. They are linking people, buildings, campuses, and institutions as never before, allowing resources to be shared and ideas exchanged across any distance. And they are reinforcing lessons with rich, interactive content that engages the mind in powerful and memorable ways.

"We saw wireless as the next logical step for our network, since 25 percent of students have a laptop and that number will probably grow. We wanted to provide wireless service and have it up and running before the demand started, so we wouldn't be playing catch-up."

—Rusty Smith, Network Engineer, University of Wisconsin, Madison

Best of all, advancements in technology have made these and other benefits available to schools of every size and stature. Today's networks are simple and cost-effective to manage and own, so even organizations with limited expertise and resources can deploy sophisticated solutions to the challenges they face.

As this guide illustrates, colleges, universities, and primary and secondary schools around the world are using technologies such as intelligent switching, Gigabit Ethernet, wireless connectivity, and IP telephony to invigorate lessons, improve communications, automate administrative processes, safeguard important resources, and enhance the learning process in countless other ways.

Cisco Systems has helped numerous schools, school districts, colleges, and universities develop standards to deploy networking solutions tailored to their needs. Cisco offers end-to-end solutions that are designed to expand and evolve, allowing organizations to incrementally grow their networks as requirements change or new technologies emerge. Nowhere is this future-proof approach to networking more evident than in the Cisco Catalyst® fixed configuration and modular switch platforms. Offering basic connectivity or the power of Gigabit Ethernet, they can instantly boost network capacity to accommodate today's bandwidth-hungry applications, with plenty of room to grow tomorrow. That means any network, whether it's based on old copper telephone wires or the latest fiber-optic lines, can deliver the productivity and efficiency enjoyed by leading corporations.

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“We relocated our offices in about 15 minutes (following a bomb threat) utilizing the Cisco IP phone technology, where we just literally unplugged our phones, brought them over here, and put a switch in place. Fifteen minutes later, all of our phones were operational, as if we were still in the central office. The technology was invaluable and allowed us to communicate with our schools and keep our business operations running smoothly.”

—Mike Vasquenza, IT Director, Hartford, Connecticut public schools

Yet Cisco Catalyst switches offer more than raw speed—they extend intelligent services from the core of the network to the edge, where the students, teachers, and administrators are. This provides the advanced quality of service (QoS), high availability, and enhanced security needed to ensure everything operates efficiently, reliably, and securely as the network grows. These industry-leading features clear the way for new opportunities, such as wireless networking and IP telephony, further empowering students, faculty, and staff.

WITH CISCO SYSTEMS, IT’S EASY AND AFFORDABLE TO MAKE THE MOVE…

…From Hubs to Switches

To accommodate today’s applications and demand for bandwidth, it’s critical to replace any 10 megabits per second (Mbps) hub in the wiring closet with 100 Mbps Fast Ethernet or 1000 Mbps Gigabit Ethernet switches.

Unlike a hub, which forwards data packets to all connected ports, a switch forwards packets only to the port that matters—the one leading to their final destination. This reduces the overall volume of traffic on the network and enhances security, because packets are restricted to their designated ports.

Besides offering more bandwidth, Cisco Catalyst switches deliver intelligent services that enhance security and maximize network uptime. They also provide QoS features that identify types of traffic and prioritize how each packet is handled. This ensures that time-critical applications like voice and video transmissions—where delays can seriously affect quality—function properly.

Depending on the infrastructure in place, migrating from hubs to switches may be as simple as unplugging one and plugging in the other. Cisco Catalyst switches can integrate broadband into any network infrastructure, whether it uses Category 1, 2, or 3 copper telephone wire, Category 5 copper cabling, or fiber.

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…To Gigabit Ethernet

The performance advantages of full Gigabit Ethernet switching are becoming increasingly essential for schools, districts, and campuses on the cutting edge of technology. The reason is simple. Today's bandwidth-hungry, time sensitive applications like video conferencing, real-time collaboration, and distance learning are putting greater stress on networks.

At speeds of 1000 Mbps, Gigabit Ethernet provides the bandwidth that networks need to evolve and meet new demands, alleviating bottlenecks, boosting performance, and increasing the return on existing investments in infrastructure.

As the industry leader in LAN switching, Cisco makes the transition to Gigabit Ethernet faster and easier with standards-based solutions for both fiber-optic and copper cabling. Cisco products can also be deployed in stages for a more gradual migration to Gigabit Ethernet, starting at the core and moving on to the wiring closet.

Schools and universities can use Cisco Catalyst switches to extend Gigabit Ethernet to the desktop, simply and affordably, to support today's powerful computers, sophisticated applications, and high traffic volumes. Delivering up to 10 gigabits per second (Gbps), the range of solutions offered by Cisco will satisfy even the most bandwidth-intensive requirements, including campus- and district-wide connectivity.

…To Converged Networks

Maintaining separate networks for voice, video, and data is no longer necessary—and is just plain inefficient. Merging all three services over a single network—known as convergence—is the obvious answer. And it is widely accepted and acknowledged by the communications industry and analysts that the Internet Protocol (IP) will become the standard way of delivering them.

Supporting everything from Web and e-mail access to telephone calls and videoconferencing, converged networks offer several benefits, including simplified administration, increased reliability and redundancy, and significant cost savings in terms of both IT resources and long-distance telephone charges.

The greatest demand today is for IP telephony, also known as voice over IP, an application that allows telephone calls to be carried over networks originally designed for data. The cost benefits of merging voice and data services onto one network can be dramatic. This is particularly true in education, since even the largest school districts and universities are often forced to hire outside contractors to manage separate networks.

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Cisco Catalyst switches provide the advanced QoS features needed to support IP telephony, and are available with Power Over Ethernet (PoE) support. This PoE inline power mechanism adds network flexibility and scale by eliminating the need to rewire the infrastructure as separate power outlets are no longer needed to support network devices such as Cisco IP phones.

Cisco Systems is a recognized leader in network convergence. When appropriate, Cisco AVVID (Architecture for Voice, Video and Integrated Data) provides an open, standards-based foundation that makes it makes it easy to roll out IP telephony services and other Internet-based applications.

…To Wireless

Though much has been made of the freedom and mobility of wireless connectivity, its benefits go well beyond the basic luxury of "anytime, anywhere" network access. In some situations, this technology offers a simpler and more cost-effective alternative to traditional wired connections. In other cases, such as in historic buildings or areas where asbestos poses an environmental hazard, it may be the only viable means of extending high-speed network access. Even a fully wired campus can benefit from a wireless network, giving staff and students additional mobility and flexibility to teach and learn in new ways.

The Cisco Integrated Wireless Network sets the standard for reliable, secure, high-speed wireless connectivity. A range of equipment is available to meet different needs, including access points, controllers, management tools and client adapters for indoor wireless connectivity, and wireless bridges for long-range outdoor links between buildings. Wireless bridges deliver several times greater throughput than T1/E1 lines, eliminating the need to install fiber-optic cable or pay for leased line services.

"We were constantly reinstalling the fiber connections to keep the desktops and laptops in these classrooms connected with the campus LAN. With wireless, there's no need, since the mobile classrooms are always connected. We save a lot of money by not having to make these adjustments every year."

—Vass Johnson, Director of Networking, North Carolina's Wake County Public School System

Within buildings, Cisco Aironet access points provide constant access to network resources virtually anywhere these products are deployed. This not only gives network users the ability to roam freely throughout an extended area while maintaining uninterrupted network access, but saves organizations the time and expense of rewiring. Changes in the size or location of workgroups can be accommodated simply by adding or moving access points, further lowering facilities costs.

Cisco wireless technology is Wi-Fi™ compliant, making it ideal for a multivendor client environment. Advanced security features, scalability, and manageability allow network managers to easily deploy a wireless LAN within a complex campus environment.

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Cisco Integrated Wireless Networks are designed for simple, rapid deployment. PoE support, for example, enables the access points to draw their operating power from Cisco Catalyst switches via Ethernet ports. Where no switch is available, inline power can be provided via a power injector. This eliminates the need for separate power sources, such as a wall outlet, greatly reducing the cost of installation.

THE CISCO CATALYST FAMILY

- **The Cisco® Catalyst® 3560 Series** is a line of fixed-configuration, enterprise-class switches that include IEEE 802.3af and Cisco prestandard Power over Ethernet (PoE) functionality in Fast Ethernet and Gigabit Ethernet configurations. The Cisco Catalyst 3560 is an ideal access layer switch for small enterprise LAN access or branch-office environments, combining both 10/100/1000 and PoE configurations for maximum productivity and investment protection while enabling the deployment of new applications such as IP telephony, wireless access, video surveillance, building management systems, and remote video kiosks.

- **The Cisco® Catalyst® 3750 Series Switch** is an innovative product for midsize organizations and enterprise branch offices. Featuring Cisco StackWise technology, the switch improves LAN operating efficiency by combining ease of use and the highest resiliency available for stackable switches. Cisco StackWise technology is a revolutionary stacking architecture that brings high levels of resiliency, automation, and performance to stackable switches. With Cisco StackWise technology, customers can create a single, 32-Gbps switching unit with up to nine Cisco Catalyst 3750 Series switches.

- **Cisco Catalyst 4500 Series Switches** extend control from the backbone to the network edge with intelligent network services and other features, including advanced QoS, scalable performance, comprehensive security, and simplified management. Their modular, high-density, high-performance design supports 10/100/1000 switching in the LAN, packet telephony, enhanced security, and integrated WAN capabilities for converged networks.

- **Cisco Catalyst 6500 Series Switches** offer industry-leading scalability, flexibility, and performance, supporting the industry's widest range of interface densities and services modules. They are designed to address the growing need for security, gigabit scalability, high availability, rich services, and multilayer switching in backbone, distribution, and wiring closet topologies as well as data center environments, including support for 10 Gigabit Ethernet interfaces and WAN connectivity up to OC-48 speeds.

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WIRELESS NETWORKING PRODUCTS

Office Access Points

- The **Cisco Aironet® 1130AG Series IEEE 802.11a/b/g Access Point** packages high-capacity, high security and enterprise-class features delivering wireless LAN access for a low total cost of ownership. Designed for wireless LAN coverage in offices and similar RF environments, this unobtrusive access point features integrated antennas and dual IEEE 802.11a and 802.11g radios for robust and predictable coverage delivering a combined capacity of 108 Mbps. The competitively-priced Cisco Aironet 1130AG Series is ready to install and easy to manage, reducing the cost of deployment and ongoing maintenance.
- The **Cisco Aironet 1100 Series Access Points** offer customers an affordable, easy-to-install singleband access point. Legacy Cisco Aironet 1100 Series Access Points have an 802.11b radio that may be field upgraded to 802.11g, or the Cisco Aironet 1100 Series may currently be ordered with a single 802.11g radio that is backwards compatible to 802.11b.The Cisco Aironet 1100 Series is ideal for customers that want an affordable, easy to deploy, single band access point, that offers enterprise-class management, security, and scalability. The Cisco Aironet 1100 Series can also operate in workgroup bridge mode to provide wired client devices access to the wireless LAN.

Indoor Access Points for Challenging RF Environments

- The **Cisco Aironet 1230AG Series IEEE 802.11a/b/g Access Point** delivers the versatility, high-capacity, security, and enterprise-class features required in more challenging RF environments. It is designed for wireless LANs in rugged environments or installations that require antenna versatility, and features dual antenna connectors for extended range, coverage versatility, and more flexible installation options. The 1230AG Series combines antenna versatility with industry leading transmit power, receive sensitivity, and delay spread for high multipath and indoor environments to provide reliable performance and throughput for the most demanding requirements.
- The **Cisco Aironet 1200 Series Access Point** offers the same versatility, high-capacity, security, and enterprise-class features demanded by rugged environments, but when configured as a single-band IEEE 802.11g access point, it provides a cost-effective single-band solution. The 1200 Series provides the flexibility to change capabilities as customer requirements and technologies evolve. Customers can confidently deploy 802.11b/g networks now, and have the option to upgrade to a dual band 802.11a/b/g network in the future. CardBus-based 802.11a upgrade modules can be easily installed into Cisco Aironet 1200 Series Access Points originally configured for 802.11b/g. Both access points are designed for challenging indoor WLAN applications, support a similar set of enterprise-class Cisco IOS software features and are components of the Cisco Integrated Wired and Wireless LAN Solution. Both support interoperable WPA and 802.11i/WPA2 enhanced wireless LAN security.

Cisco 1000 Series Lightweight Access Points

- The **Cisco 1000 Series Lightweight Access Points** provide industry-leading RF capabilities with the widest breadth of deployment options for maximum wireless LAN performance, security, reliability, and ease of use. This makes the Cisco wireless LAN solution ideally suited for any enterprise environment.

Outdoor Access Points/Bridges

- The **Cisco Aironet® 1300 Series Outdoor Access Point/Bridge** is an IEEE 802.11g wireless product that provides access point, bridge, and workgroup bridge functionality with enhanced WLAN security. For high speed and cost effective wireless connectivity between multiple fixed or mobile networks and clients, this ruggedized platform is ideal for network access in outdoor areas, network connections within a campus area, or outdoor infrastructure for mobile networks and users. Engineered specifically for harsh outdoor environments, The Cisco Aironet 1300 Series is also capable in indoor deployments. Product information can be located at http://www.cisco.com/en/US/products/ps5861/index.html.

Outdoor Wireless Bridges

- The **Cisco Aironet 1400 Series Wireless Bridges** set a new benchmark for wireless bridging by providing a high-performance and feature-rich solution for connecting multiple LANs in a metropolitan area. Designed to be a cost-effective alternative to leased lines, it is engineered specifically for harsh outdoor environments. Supporting data rates up to 54 Mbps and operating in the 5 GHz band, the bridges can be configured to support point-to-point or point-to-multipoint applications up to 23 miles (37 km).

Cisco Client Adapters

- The **Cisco Aironet IEEE 802.11a/b/g CardBus Wireless LAN Client Adapters** quickly connect desktop and mobile computing devices to the wireless LAN IEEE 802.11a/b/g compliant networks. Ideal for laptops and tablet PCs, this multimode CardBus adapter complements Cisco Aironet 1100 Series and 1200 Series Access Points.
- The **Cisco Aironet IEEE 802.11a/b/g PCI Wireless LAN Client Adapters** are ideal for low-profile slim desktop and point-of-sale devices and complement Cisco Aironet 1100 Series and 1200 Series Access Points.

Cisco Compatible Client Adapters

- The **Cisco Compatible Client Adapters** complement Cisco wireless infrastructure products. The Cisco Compatible Extensions Program for wireless LAN client devices provides tested compatibility with licensed Cisco infrastructure innovations. Compatibility is assured through extensive, independent testing of third-party devices and can be found by looking for products displaying the Cisco Compatible logo. The Cisco Compatible Extensions Program enables the widespread availability of wireless client devices that take advantage of the Cisco wireless network, accelerating the availability of innovative features while maintaining interoperability.

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Cisco Wireless Antennas and Accessories

- The **Cisco Aironet Antennas and Accessories** are available for client adapters, access points, and bridges to support customized wireless solutions. With the industry's widest selection of directional and omnidirectional antennas (2.4 GHz or 5 GHz), low-loss cable, mounting hardware, and other accessories, installers can create a wireless solution that meets the requirements of the most challenging applications.

Note: The Cisco 1020 and 1030 lightweight access points support external antenna connection via RP-TNC connectors on both 2.4 GHz and 5 GHz. Cisco antennas can be with the 1000 Series connectorized Access Points with a recommended maximum gain limit of 6dBi.

Cisco Wireless LAN Controllers and Location Appliance

- The **Cisco® Wireless LAN Controllers** are responsible for system wide wireless LAN functions, such as security policies, intrusion prevention, RF management, Quality of Service (QoS), and mobility. They work in conjunction with Cisco 1000 Series Lightweight Access Points and the Cisco Wireless Control System (WCS) to support business-critical wireless applications. From voice and data services to location tracking, Cisco Wireless LAN Controllers provide the control, scalability, security, and reliability that network managers need to build secure, enterprise-scale wireless networks—from branch offices to main campuses.

Cisco 4400 Wireless LAN Controllers

- The **Cisco 4400 Series** is designed for medium-sized and large enterprise facilities. The Cisco 4400 Series is available in two models-the 4402 with two Gigabit Ethernet ports comes in configurations that support 12, 25, and 50 access points, and the 4404 with four Gigabit Ethernet ports supports 100 access points.

Cisco 4100 Series Wireless LAN Controllers

- The **Cisco 4100 Series Wireless LAN Controllers** is designed for medium-to-large enterprise deployments, this controller provides the control, scalability, and reliability that IT managers need to build secure, enterprise-scale wireless networks. A data sheet for the Cisco 4100 Wireless LAN Controllers is located at: http://www.cisco.com/en/US/products/ps6307/products_data_sheet0900aecd802570b0.html

Cisco 2000 Series Wireless LAN Controllers

- The **Cisco 2000 Series Wireless LAN Controllers** is ideal for small to medium sized enterprise deployments, this controller provides the control and reliability that IT managers need to build secure, enterprise wireless networks.

Cisco 2700 Wireless Location Appliance

- The **Cisco 2700 Wireless Location Appliance** is the industry's first location solution that simultaneously tracks thousands of devices from directly within the WLAN infrastructure—bringing the power of a cost effective, high-resolution location solution to critical application such as high-value asset tracking, IT management and location-based security. When deployed, the Cisco Wireless Location Appliance uses Cisco WLAN controllers and Cisco lightweight access points to track the physical location of wireless devices to within a few meters. Set up is fast and intuitive via the Cisco Wireless Control System.

Wireless Network Management

- The **Cisco Wireless Control System (WCS)** Cisco WCS provides a powerful foundation for WLAN systems management. Cisco WCS allows IT managers to design, control, and monitor enterprise wireless networks consisting of Cisco lightweight access points and controllers from a centralized location, simplifying operations and reducing total cost of ownership.
- The **CiscoWorks Wireless LAN Solution Engine (WLSE)** is a centralized, systems-level management console for managing the entire Cisco Aironet wireless LAN infrastructure and a core component of the Cisco Integrated Wireless Network. The advanced radio frequency (RF) and device management features of the CiscoWorks WLSE simplify the everyday operation of wireless LANs, ensure smooth deployment, enhance security, and maximize network availability, while reducing deployment and operating costs. The CiscoWorks WLSE enables administrators to detect, locate, and mitigate rogue access points; detect ad-hoc networks; detect RF interference, perform assisted site surveys, compensate for disabled or failed access points with self-healing and automatically configure access points and bridges.
- The **CiscoWorks Wireless LAN Solution Engine EXPRESS (WLSE Express)** combines a complete management solution and an integrated AAA server to deliver a simplified, cost-effective wireless networking solution for small and medium business and enterprise branch office WLAN deployments using Cisco Aironet autonomous access points. CiscoWorks WLSE Express fits the budget of smaller organizations and the needs of enterprise branch offices seeking manageability, security and control packaged in a comprehensive solution.
- The **CiscoWorks Wireless LAN Solution Engine (WLSE) and CiscoWorks WLSE Express** both provide comprehensive air/radio frequency (RF) and device management capabilities in ways that simplify deployment, reduce operational complexity, and provide administrators visibility into the WLAN. By automating several RF and device management tasks, CiscoWorks WLSE Express reduces the costs and time needed for WLAN deployment, management, and security. Wireless Networking Products.

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- The **Wireless LAN Services Module (WLSM) for the Cisco® Catalyst® 6500 Series** of multilayer switches enables the industry's most scalable wireless LAN network deployments while reducing the total cost of network ownership. As a key component of the Cisco Integrated Wired and Wireless LAN Solution, it enables the industry's fastest, most secure campus-wide Layer 3 roaming and simplifies wireless network management and deployment. The module supports up to 6000 wireless LAN users and 300 Cisco Aironet® Series access points and extends Cisco Catalyst 6500 Series rich intelligent network services including denial of service (DoS) prevention, access control lists (ACLs), .firewall, networkbased intrusion detection, and VPN services, to the wireless edge.

CISCO IP TELEPHONY SOLUTIONS

- **Cisco IP Telephones** are next-generation intelligent communication devices, providing toll-quality audio anywhere on a local- or wide-area network, without requiring companion PCs. The latest models of Cisco IP phones are fully programmable to support changing needs and preferences. When used in conjunction with inline power models of Cisco Catalyst switches, Cisco IP phones can draw their power from the network, eliminating the need for separate outlets. Models include Cisco IP phone 7910G/7910G+SW, 79406, 7960G, IP expansion model 7914, and IP Conference Station 7935.

- **Cisco IP SoftPhone** is a Windows-based application that takes voice-and-data convergence to the next level. With Cisco IP SoftPhone running on a laptop you can receive calls wherever you are connected to the corporate network. Even dial-up connections can be used to check voicemail and place calls. Integrated directories and drag-and-drop controls can simplify any call. Conference call participants, for example, can be invited by dragging and dropping directory entries onto the user interface to create a virtual conference room. Once a voice conference is established, you can share applications running on your desktop with others by selecting them from a list or dragging documents into the virtual conference room.

- **Cisco CallManager** is the software-based call-processing component of the Cisco IP telephony solution. This software extends enterprise telephony features and functions to packet telephony network devices such as IP phones, media processing devices, voice-over-IP (VoIP) gateways, and multimedia applications. Additional data, voice, and video services such as unified messaging, multimedia videoconferencing, collaborative contact centers, and interactive multimedia response systems interact with the IP telephony solution through Cisco CallManager's open telephony application programming interface (API). Cisco CallManager is installed on the Cisco Media Convergence Server 7800 series and the Cisco Integrated Communication System 7750.

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LEADING THE WAY

Primary, secondary, and higher education professionals turn to Cisco Systems for efficient, reliable, secure networking solutions. Here are a few reasons why:

- **Increased productivity**—Cisco solutions make it easy for schools and universities to enhance network access and deploy leading productivity applications, improving communication, streamlining operations, and extending the reach of network resources so students, faculty, and staff can accomplish more.
- **End-to-end solutions**—Cisco offers end-to-end solutions for a variety of applications, from basic connectivity to high-speed wireless access and edge-to-core IP telephony.
- **Greater return on investment**—Cisco has a record of protecting customer investments by supporting new features across several generations of Catalyst switches, Cisco Integrated Wireless Network solutions, and IP telephony products.
- **Simplified management** Cisco Catalyst switches provide tools that simplify all aspects of network management, from deploying new devices to configuring edge-to-core intelligent services. The CiscoWorks2000 family of Web-based tools offers a proactive approach to network planning, monitoring, and troubleshooting, including support for Simple Network Management Protocol (SNMP) and Remote Monitoring (RMON).
- **Gigabit Ethernet connectivity**—Cisco Catalyst 3560, 3750, 4500 and 6500 Series switches provide a complete Gigabit Ethernet switching solution, from the core of the network to the edge.
- **Unparalleled performance**—The Cisco Catalyst family provides industry-leading performance, functionality, scalability, and flexibility, which delivers valuable enhancements to your network operations.
- **Cisco IOS® Software**—Cisco Catalyst network platforms run on the Cisco IOS Software, which creates a unified system and provides a solid foundation for building Internet applications. Extending common services and interfaces across the network also reduces training, management, and troubleshooting costs.

ADVANCED FEATURES TO SUPPORT A RANGE OF NEEDS

Cisco Systems offers solutions to the challenges confronting education professionals. Common scenarios include:

Situation 1: *Class sizes and room assignments are always changing—which means classroom networking requirements are too.*

Solution: Wireless access can be quickly integrated into any environment, eliminating the time and expense associated with rewiring classrooms and labs as requirements change. Cisco Aironet access points let you instantly extend wireless connectivity to everyone in the room, or even beyond the room, allowing teachers and professors to take classes outside while maintaining network access. Many schools and colleges have set up carts with Cisco Aironet access points and wireless notebook computers using Cisco Aironet client cards, creating “mobile wireless classrooms” that can be used to extend network resources whenever and wherever they’re needed, so classes aren’t disrupted by moving students to a computer lab. Cisco Catalyst switches support wireless networking with inline power options, which enable Cisco Aironet access points to draw operating power from the network connection, eliminating the need for separate power sources. Wireless technology can also be used to connect remote classrooms or offices, eliminating the need for leased lines or cabling. Cisco Aironet 350 Series Wireless Bridges provide high-speed links between buildings up to 25 miles (40.2 km) apart.

Situation 2: *There aren’t enough phone lines to go around. But the setup costs for expanding the existing PBX phone system are extremely high.*

Solution: Converging voice and data onto a single network offers dramatic cost benefits, eliminating the need for services and equipment needed to maintain a separate phone system. Cisco IP telephony makes it affordable for each teacher to have a phone with voice mail, improving communication with colleagues and parents, while also ensuring help can immediately be summoned in the event of an emergency. Cisco IP phones dramatically simplify location changes as well, since they can be moved anywhere on the network and their extensions remain the same. Converged networking also enables IP phones to be used for other things, such as attendance tracking and announcements over the school’s public-address system. Meanwhile, Cisco Catalyst switches can be used to provide network-based inline power for Cisco IP phones, eliminating the need for separate power sources.

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Situation 3: *There's so much great educational software and multimedia content available these days, it would be great to incorporate it into lesson plans. The trick is distributing it to students, and keeping different classes in sync.*

Solution: Cisco Catalyst switches make it easy to implement and manage video multicasts, providing the advanced QoS and multicast features needed to support broadcast-quality video. Educational content can be stored on a Cisco IP/TV® server, so it's always available on demand. Cisco video-over-IP technology also supports videoconferencing for enhanced communication and collaboration.

Situation 4: *Warranted or not, there are growing concerns about personal safety on campus. But major expenditures on staff or equipment are out of the question.*

Solution: The same multiservice network that supports video-conferencing and e-learning applications also supports a potent, yet inexpensive security measure: IP video surveillance. IP video cameras plug directly into the local- or wide-area network, eliminating the need to rewire a building or campus. Yet they are just as much a deterrent to crime as a conventional surveillance system—and just as reassuring to students and staff.

Situation 5: *Heavy network traffic during peak times of the school day decrease network response times. This hinders network performance for important applications, such as delivering bandwidth-intensive e-learning content.*

Solution: Cisco Catalyst switches offer extensive network monitoring capabilities, making it easy to track granular traffic details on the network at all times. Advanced QoS and rate-limiting features allow traffic to be prioritized and controlled, so critical applications and staff are given the bandwidth they need, without starving other users.

Situation 6: *The unauthorized use of network resources is a major concern. In some cases, the problem is as simple as students wasting precious bandwidth downloading large music and video files. In others, the threat is much more serious, involving deliberate attempts to access or damage sensitive data and other resources.*

Solution: Cisco Catalyst switches provide an array of security and management features to safeguard the network from internal and external threats. Access control lists, for example, can be easily configured to repel unwanted visitors, monitor communications, and filter content, ensuring the network is used appropriately. Meanwhile, rate limiting provides desktop-level control over the amount of bandwidth available to users, helping to ensure network resources are not being used inappropriately.

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SAMPLE NETWORK DESIGNS

Figure 1. Sample High-Function Network Diagram for Primary and Secondary Schools

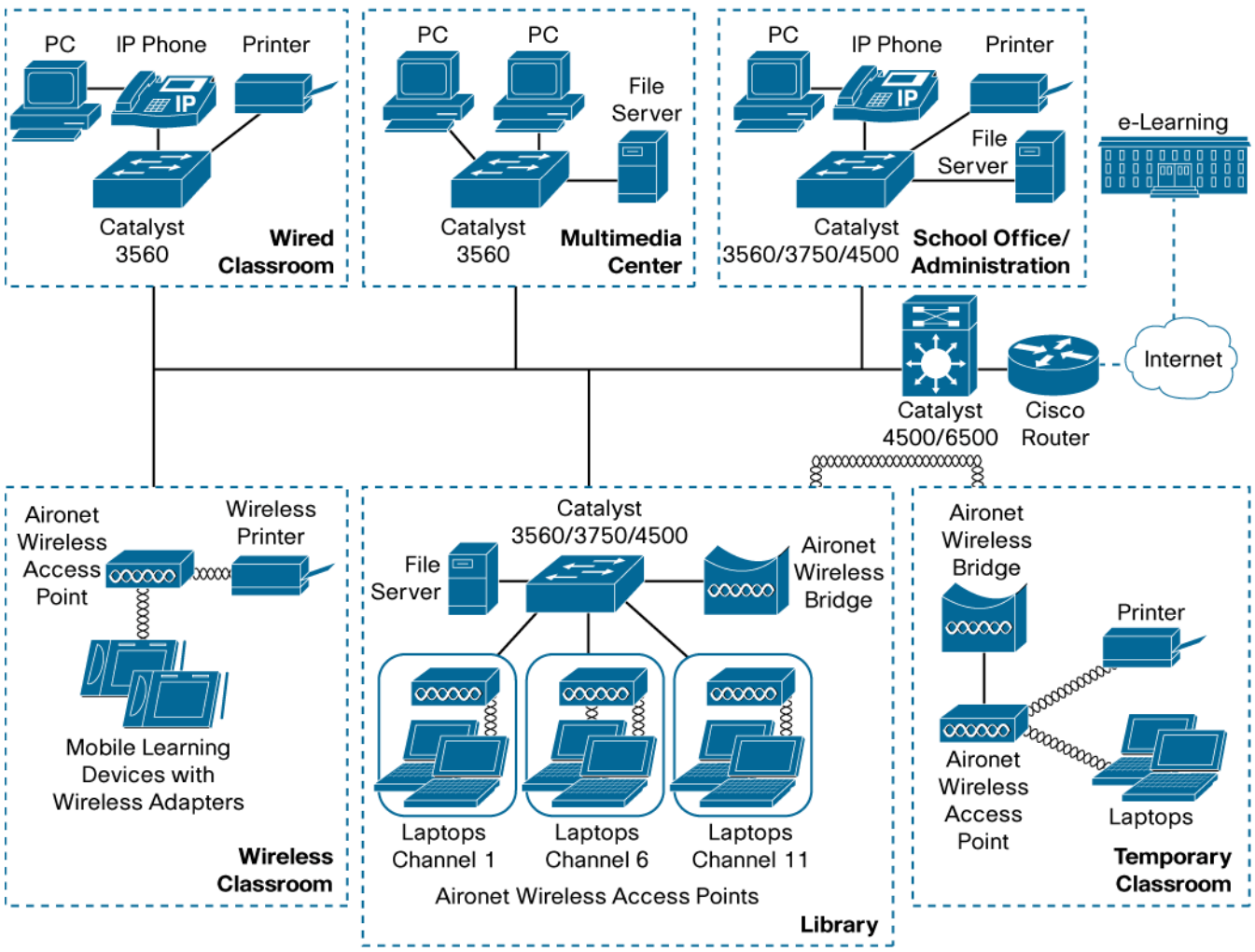

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Figure 2. Sample High-Function Network Diagram for Primary and Secondary School Districts

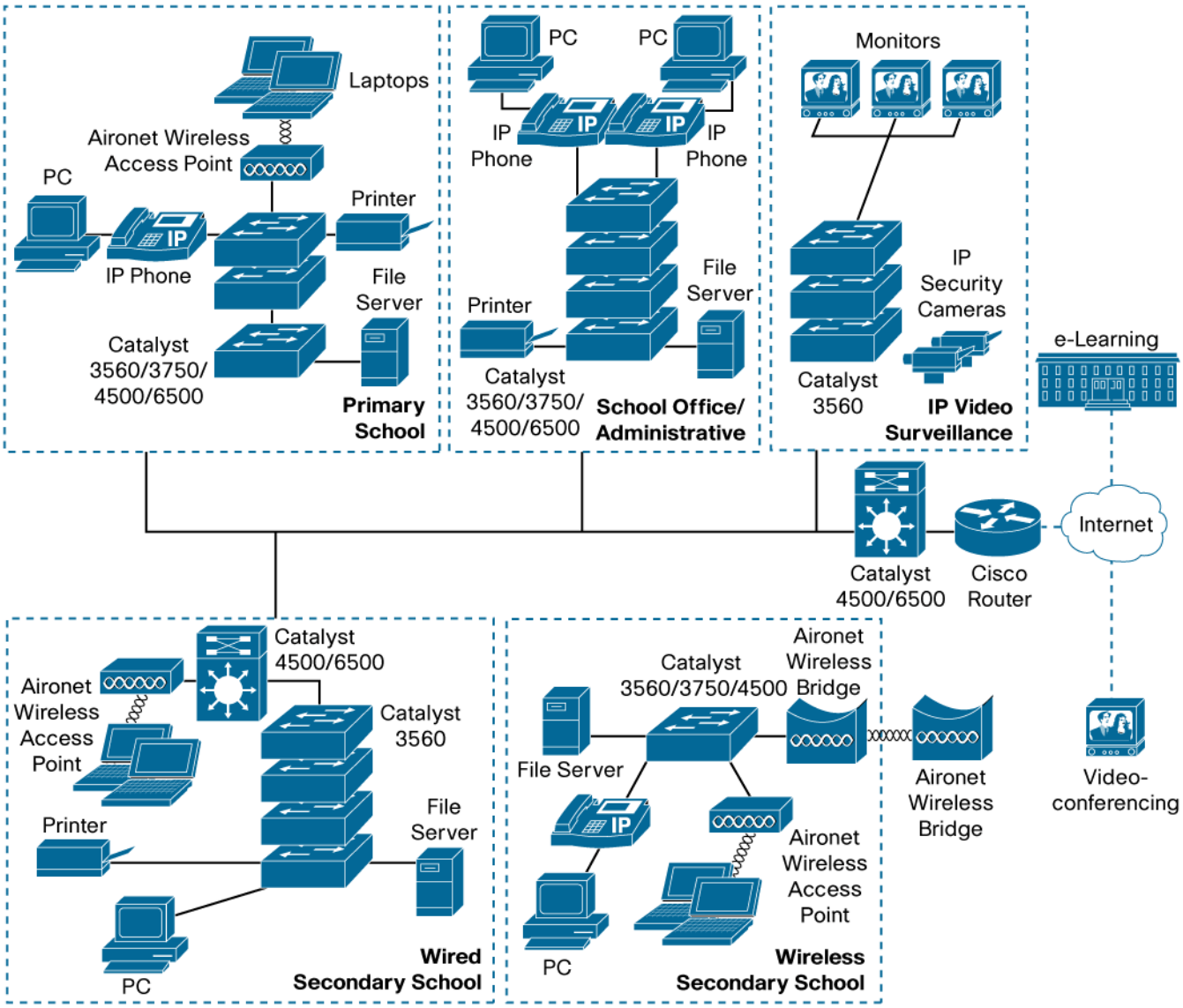

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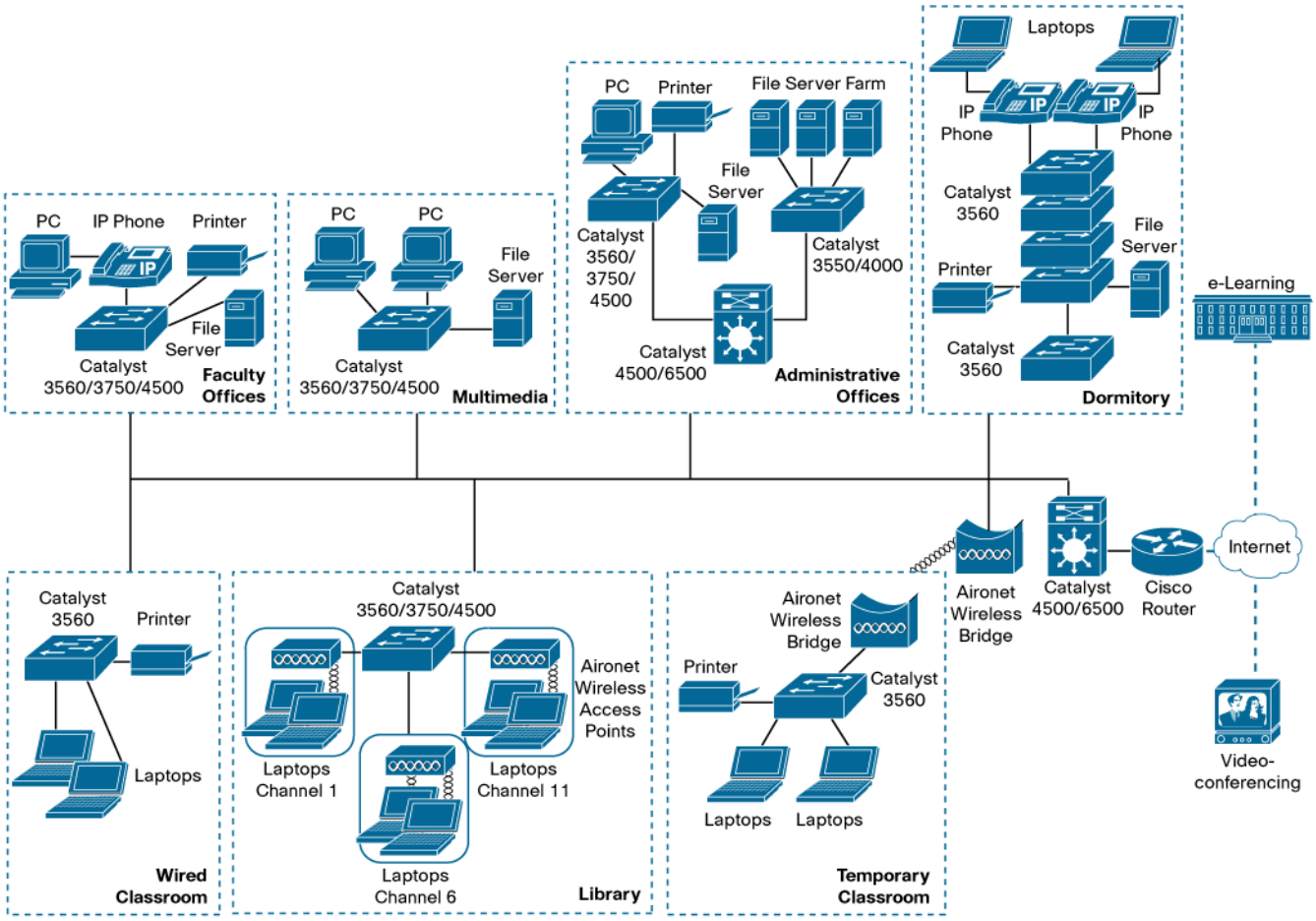
Figure 3. Sample University Diagram



"The technology-savvy generation of students at the college did not have any problems adopting the use of [high-performance networks],and their learning has been transformed as a result of better and easier access to online resources and tools."

—Walter Chieng, IT Director, Saint Kentigern College, New Zealand

FOR MORE INFORMATION

- http://www.cisco.com/en/US/products/hw/switches/ps5528/index.html for Catalyst 3560
- http://www.cisco.com/en/US/products/hw/switches/ps5023/index.html for Catalyst 3750
- http://www.cisco.com/en/US/products/hw/switches/ps4324/index.html for Catalyst 4500
- http://www.cisco.com/en/US/products/hw/switches/ps708/index.html for Catalyst 6500
- http://www.cisco.com/en/US/products/hw/wireless/index.html for Wireless Solutions
- http://www.cisco.com/en/US/products/sw/voicesw/index.html for IP Telephony Solutions

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