

# Cisco WLAN and IP Telephony Technology Help Indiana Heart Hospital Set Standards for Patient Care and Staff

## Efficiency

By switching to Internet Protocol (IP) telephony from its traditional telephony system, and deploying a facility-wide wireless local area network (WLAN) to supplement its wired system, the Indiana Heart Hospital has developed a paperless and film-less operation that facilitates patient care and staff efficiency. The hospital's WLAN features Cisco® Aironet® 1200 Series access points, and the underlying architecture includes Cisco Catalyst® 6500 Series switches.

### Background

The Indiana Heart Hospital, which opened in February 2003, is a 210,000-square-foot facility in northeast Indianapolis, Indiana. The facility was built from the ground up to deliver the highest possible level of cardiovascular care. Its full-service Heart Emergency department, with cardiologists on site, is operational 24 hours a day, 365 days a year. The three-floor facility, which was designed with the structural capability to grow to six floors, currently includes 88 patient beds, 32 of which are day or outpatient beds. There are four surgery suites and six cardiac catheterization labs at the hospital.

The Indiana Heart Hospital is a joint venture involving the Community Health Network and nationally recognized central Indiana cardiologists and cardiovascular surgeons. Community Health Network includes Community Hospital East, Community Hospital South, Community Hospital North, and Community Anderson—located 60 miles north of Indianapolis. The Indiana Heart Hospital is a freestanding facility located on Community Health Network's north campus.

Many of Community Health Network's cardiovascular services, including open-heart surgery, are centralized at the new heart hospital, although cardiac catheterization labs and related support services are being enhanced at Community Hospital South.

### Challenge

In designing the new heart hospital, Community Health Network sought to create a completely film-less and paperless facility, which would facilitate workflow and enhance patient care by deploying modern technologies such as Internet Protocol (IP) telephony and wireless networking. The intention was to build this profile in full at the heart hospital while rolling it out gradually to the other hospitals in the network.

### Indiana Heart Hospital

- Part of the Community Health Network, an Indianapolis-based integrated delivery network comprised of four full-service hospitals and over 1,100 affiliated physicians
- 210,000 square feet
- 88 patient beds
- Provides 24-hour, full-service cardiovascular services
- Entirely film-less and paperless, employing Cisco IP Telephony throughout (This pattern is gradually being duplicated at other network hospitals)
- Services provided include:
  - screenings, wellness and prevention
  - research and education
  - acute care (including open heart and vascular surgery)
  - disease management (such as congestive heart failure)
  - cardiac rehabilitation
  - outpatient testing (complete heart catheterization, labs, and diagnostic capabilities)
  - complete ancillary services (such as radiology, lab, and pharmacy)



Replacing traditional telephone services for computer-based telephony requires a scalable, reliable computing infrastructure that provides absolute redundancy in the networking core and distribution layers. While such high availability would be important for any enterprise, it is absolutely essential in a hospital whose primary mission is cardiac care.

Cost savings were anticipated during the planning and budgeting stages for the Indiana Heart Hospital, where an initial capital savings of US\$300,000 would be realized because the hospital would not have to purchase or lease a traditional public branch exchange (PBX) system. This figure, however, represents savings in hardware costs alone, and does not reflect the costs the hospital would have incurred for a separate wiring infrastructure.

### Solution

Community Health Network standardized on Cisco equipment more than three years ago for the entire infrastructure at all of the hospitals. The wireless network in the Indiana Heart Hospital uses Cisco Aironet 1200 Series access points and Cisco Aironet client adapter cards. Cisco Catalyst switches were installed in the core and distribution closets, and there are two Cisco PIX® firewalls for redundancy, located elsewhere in the enterprise (Community Hospital East) for Internet connectivity.

“Community Health Network standardized on Cisco because Cisco equipment is reliable, Cisco support is always available and accurate, and the equipment is scalable,” says Chris Cerny, manager of Community Health Network’s Enterprise Networking team. “We have found that Cisco is a company that takes great care in making sure it is thinking like a customer thinks, and Cisco invests in and develops those technologies that will benefit the enterprise customer. We will always choose Cisco equipment first.”

For IP telephony, the heart hospital has installed nearly 350 Cisco 7960, 7940, and 7910 IP phones. They can accept in-line power from a card integrated with a Cisco Catalyst switch or a Catalyst in-line power patch panel. In-line power produces significant cost-savings because it precludes the need to install separate power cables. Analog services for the Indiana Heart Hospital come via three Cisco VG-248 analog gateways.

Cisco CallManager is the software-based call-processing component of the Cisco IP Telephony solution. The Cisco IP Telephony solution is integrated with the traditional PBX installed in the other hospitals. There is seamless communication between the systems. CallManager has been installed at Community North, Community East, and Community South as well. All new telephones being added in the hospital network are Cisco IP Telephony stations.

A Cisco VPN 3030 concentrator was added to provide data security for the 802.11a wireless local area network (WLAN). VPNs use advanced encryption and tunneling to permit organizations to establish secure, end-to-end, private network connections over third-party networks, such as the Internet.

For wireless IP phones, Community Health selected SpectraLink IP handsets because Cisco “hadn’t released its line of wireless IP phones at the time we were working up our purchase plans,” Cerny adds. “SpectraLink is a Cisco partner, and we knew their equipment would integrate well with the rest of the system. Now that Cisco’s wireless line is available, we are likely to move in that direction as we roll out wireless IP telephony to our other hospitals,” she says.

Cisco Aironet 1200 Series access points support the IEEE 802.11b standard, which has an 11-Mbps data rate and operates in an unlicensed portion of the 2.4-GHz radio frequency spectrum. This relatively narrow band provides for just three operating channels. Additionally, Cisco Aironet 1200 Series also provides a migration path to the new IEEE 802.11a and IEEE 802.11g standards—a feature that adds scalability and investment protection. The new 802.11a standard, with a data rate of up to 54 Mbps, offers greatly enhanced performance and eight distinct channels for



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—*Chris Cerny, Manager Enterprise Networking, Community Health Network*

enhanced scalability. Although this standard is not compatible with 802.11b devices, it is immune to interference from devices that operate in the 2.4-GHz band, such as cordless phones, Bluetooth devices, microwave ovens, and hand-held barcode scanners.

The other new standard, IEEE 802.11g, provides backward compatibility with IEEE 802.11b equipment, preserving users' investment in their existing WLAN infrastructure. However, because 802.11g is limited to the same three channels as 802.11b, scalability may become a factor as WLAN user density increases.

To get the most out of the new high-performance standards, many organizations are designing their WLANs using two or three bands. This influenced the Community Health Network's selection of the Cisco Aironet 1200 Series access point, which is capable of single-band or dual-band operation to simultaneously accommodate one radio for 802.11b or future 802.11g clients and another for high-speed 802.11a clients. The Cisco Aironet 1200 Series can be upgraded in the field —customers can order it with the 802.11b radio, for instance, and then add or swap out radios to the new standards as their application and bandwidth requirements evolve.

“We are very impressed with the Cisco Aironet 1200's dual-band capability,” says Cerny. “It is exactly what we need. We use the 802.11a band for data and the 802.11b band for wireless IP telephony.

“The design-planning phase for the hospital completed two years ago. Because an accurate site survey could not be performed without the physical building being completed, we purchased 35 of the 1200s to support 802.11b, and 35 1200s to support 802.11a. This allowed us flexibility to set the 1200s in different locations for different coverage areas if it was required,” she continues. “We know now that this wasn't strictly necessary, and as we expand to the other floors and into the other hospitals, we will won't duplicate the access points. We'll let the 1200s dual-task for us, as they were designed to do.”

As for the other hospitals, 25 Cisco Aironet 340 Series access points are now in place at Community Hospital North, used primarily in the post-operation wing; eight have been installed at Community Hospital East's Emergency department. “These have been installed and operational for a couple of years. We have learned a lot about WLANs and we plan to upgrade the existing 340s to 1200s in the coming year,” Cerny says.

The new cardiac care wing attached to Community Hospital South, which opened in April 2003, was built from the ground up utilizing Cisco 1200 access points. WLAN rollout to the Anderson campus has not yet begun but is on the radar screen for early 2004.

The Cisco Aironet 1200 Series supports all 802.1X authentication types, including Extensible Authentication Protocol (EAP) Cisco Wireless (LEAP), Extensible Authentication Protocol Transport Layer Security (EAP-TLS), and types that take advantage of EAP-TLS. When coupled with a RADIUS that supports the same authentication types, such as the Cisco Secure Access Control Server (ACS), the result is a scalable, centrally managed security solution.



This solution includes strong, mutual authentication to ensure that only legitimate clients associate with legitimate and authorized wireless access points. Dynamic per-user, per-session encryption keys can be set to automatically change on a regular basis to protect the privacy of transmitted data.

To secure the 802.11b WLAN, used exclusively for wireless IP telephony, the Community Health Network uses Media Access Control (MAC) address authentication. “We secure access to the 802.11b WLAN using four tools. They are MAC address authentication to our Cisco Secure ACS, enabling 128-bit encryption with WEP [Wired Equivalent Privacy], unique SSIDs [Service Set Identifications], and disabling broadcast of the SSIDs,” Cerny says.

The hospital’s Cisco VPN 3030 concentrator provides security for 802.11a band data transmissions. The VPN concentrator is positioned between the 802.11a WLAN and the enterprise network. The only services that are available to an 802.11a client are a Dynamic Host Configuration Protocol (DHCP) server and the VPN concentrator. All staff laptops have the Cisco VPN software client on them, thereby protecting the 802.11a WLAN from unauthorized access.

The Cisco VPN 3000 Concentrator Series is a remote-access VPN solution that enables organizations to easily install, configure, and monitor their remote-access VPNs. It is the only scalable platform to offer components that are swappable in the field, and can be upgraded by the customer. The Cisco VPN 3030 concentrator is designed for medium-sized and large organizations with up to 1,500 simultaneous sessions.

Cisco CB20A client adapter cards are installed in laptops used by staff physicians and in laptops on mobile carts, which are used primarily by nurses making their rounds of patient beds, or while assisting in surgery or cardiac catheterization lab procedures.

The security offerings in Cisco technologies have been implemented to meet requirements enumerated by the Health Insurance Portability and Accountability Act (HIPAA) of 1996, according to Rick Copple, chief technology officer for the Community Health Network. In addition to mandating changes in federal regulations governing the provision of health benefits and the delivery of and payment for health care services, HIPAA requires the security and confidentiality of patient health information. “The individual sign-on requirements within Cisco Secure ACS and the VPN client enable us to fully meet HIPAA standards,” he says.

The Cisco switches that Community Health Network selected include Catalyst 6513 switches in eight closets at the Indiana Heart Hospital and Catalyst 6509 switches at the other campuses. “We were interested in the 6500 Series because of its ability to support Layer 3 routing and the port density, and scalability. We need all thirteen slots, especially near the surgery rooms and the day bed areas. The nine slots in the 6509s work well in the other hospitals but not at the heart hospital,” Cerny explains.

Another reason for selecting the Catalyst 6500 Series was its active quality-of-service (QoS) support. QoS classifies, prioritizes, and controls network traffic so that time-sensitive traffic such as voice and video are handled first without depriving other traffic of necessary bandwidth.

“QoS definitely was a consideration for us, although more for voice than for video. Our plan is to progressively replace traditional telephony with IP telephony as our PBX leases expire at each campus. It’s with that in mind that we wanted switches with solid QoS support since our voice traffic is going to increase enormously,” Cerny says.



The Catalyst 6500 Series also provides in-line power capability for the IP phones. “IP phones require power, which can come through the Ethernet port or a power cube that I can plug into the wall. But if I have a power outage, the power cubes are affected and the phones fail,” Cerny explains. “The 6500’s in-line power capability lets me bring power through the Ethernet cable from the closet, and the closet is protected from power outages, so the phones keep working. Can you imagine a hospital where the phones are out of order? Unthinkable,” she says.

Redundancy, assuring high availability, is built into the architecture. There are two main distribution frames in the Indiana Heart Hospital, and each Catalyst 6513 switch has dual, Layer-3 routing capability. “In essence, this gives me a total of four routers in the heart hospital, which assures high availability to all my closets,” says Cerny.

## Results

Staff physicians use wireless laptops when visiting with patients, retrieving patient data from the hospital applications and inputting updates. Clinical staff members use laptops from mobile carts to record vital statistics during their rounds. Wired PCs are available inside and outside each in-patient room as well, Cerny points out. Other staff members in the non-clinical areas, such as registration and the concierge desks, largely prefer the convenience afforded by the laptops.

“Convenience is certainly a high priority, but it is the accuracy and efficiency that results from information being typed rather than handwritten that is paramount,” says Cerny. “That data is more legible and is instantly available from the database. All of this inevitably will pay dividends in patient care, which is our overriding concern.

“As recently as one year ago, clinical staff could spend upwards of one hour a day searching for the correct paper chart for any given patient,” she continues. “Now, that time is reduced to simply logging on and scanning the patient’s wristband—usually less than 15 seconds. Additional time is saved because doctors’ handwritten orders are now easily legible, and the doctors need not be contacted to confirm them.”

To date, 130 wireless SpectraLink IP phones are on the Indiana Heart Hospital network. Some are at the main desks and nursing stations. The hospital also makes IP phones available to family members waiting for patients.

The wireless phones have been integrated into the hospital’s “nurse call” system. By pressing a button on the pillow, a patient can contact and converse, via a pillow speaker, with the nurse on duty, who is carrying a wireless SpectraLink phone.

This is an enormous leap forward in responsiveness to patient needs and saves significant time for the busy nursing staff. Clinical staff efficiency is increased as well, because the hospital does not have to dedicate a nurse to stay at the central nursing station to monitor patient calls. In addition, noise disturbance has been reduced as overhead paging is virtually eliminated. Finally, the system has saved the hospital money, as this wireless capability also makes use of the hospital’s existing investment in nurse-call systems.

“Making the nurse-call system wireless helps to unify the entire communications network, and it’s no exaggeration to say that quick communication is a critical element in enhanced patient care,” Cerny says.

The combination of wireless technology with IP telephony will help the Community Health Network realize a significant cost savings over traditional telephony from hardware and cabling costs alone, according to Kevin Hartzburg, manager of Enterprise Voice Services for the Community Health Network. “We haven’t even tried to



calculate the soft cost savings of man-hour efficiencies and support personnel, because Community Health Network is fortunate to have a very talented voice staff that is anxious to learn and support IP telephony. As our services roll toward IP-based telephony, our staff is ready, willing, and able to acquire the necessary new skills as well," he says. "The hospital was designed with the intention of going entirely to IP telephony," Cerny says. There are no traditional telephone services here at all. We were laughed at by some providers, but the system works wonderfully, and the critics' silence is delightfully deafening."

### Next Steps

Additional applications for the wireless network are under consideration. Keeping track of inventory is one strong possibility. "With bar-coding and with just-in-time shipping for equipment to the operating room, I can definitely envision using the 802.11b band in the process of building tool trays for surgery so we would always be sure we have these trays available as needed," Cerny says.

For management of the WLAN, the Community Health Network will investigate the CiscoWorks Wireless LAN Solution Engine (WLSE). The WLSE manages an entire Cisco Aironet WLAN infrastructure. A turnkey daily operational solution, it provides centralized, template-based configuration with hierarchical, customer-defined grouping to efficiently manage large numbers of access points and wireless bridges from a central location.

"Going to IP telephony has been a major contributor to staff efficiency and to patient welfare, not to mention a huge cost savings for Community Health Network. By the end of the year, we expect to have the same WLAN system that is installed at the Indiana Heart Hospital in place at the North and East campuses. South's WLAN will be added by early 2004, and its design will mirror the other campuses," Cerny says.



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