

New Roles for Unified Communications over WLAN: The Evolution of Paging in Healthcare



Cisco's wireless networking products have the exclusive endorsement of the American Hospital Association (AHA)

Prepared for Cisco Systems by Farpoint Group.

Executive Summary

One of the most mission-critical applications for wireless communications is the delivery of healthcare. With the quality of patient care and safety paramount in this environment, operational constraints, such as the need for enhanced staff productivity in the face of ever-increasing workloads and frequent staffing shortages, combined with the need to implement cost-effective networking and IT solutions, demand creative strategies solutions. These strategies must enhance the efficiency and the competitive edge of healthcare organizations while delivering the best possible service to patients and staff alike. Keeping current with the latest communications and networking strategies can yield significant returns on investment for hospital IT and the entire organization.

Of course, it's not always easy to introduce new networking technologies and communications capabilities into the healthcare environment, and upgrades must always be carefully planned, staged, and deployed to minimize disruption. The difficulty of making changes often results in the continued use of technologies that may no longer be appropriate to the fundamental mission of the organization such as the use of traditional paging systems. This white paper presents the concept and implementation of *unified communications on the hospital's wireless LAN*, which we believe will provide a powerful incentive for the healthcare industry to move beyond traditional (and very limited) communications technologies that do too little to address today's healthcare priorities.

Challenges in Healthcare Information Communications: Wireless Paging

Paging—sending messages and other notifications to individuals and groups—is critical in every healthcare facility. While public-address (“overhead”) paging is of course also important, we will use paging here in the context of **wireless premises paging**, which is installed in many healthcare facilities today. Premises paging systems are designed for the delivery of notifications and (in a few implementations) short text messages. They operate on unlicensed frequency bands, and are completely owned and operated by the hospital.

The biggest problem with premises paging solutions is their lack of integration with other hospital communications and networking systems. Many users, however, point to the small size of pagers, their excellent battery life and durability, and good in-building (and sometimes campus) coverage as reasons why paging is so culturally and operationally accepted.

Increasingly though, the inherent limitations of paging are being felt by those who rely on this approach to messaging in critical environments like healthcare. The limitations of premises paging include:

- **Expense:** Assuming users carry a handset for voice and other communications as well a pager, associated costs such as the purchase price of the pager unit and required infrastructure for premises paging must also be taken in to account. And, of course, a pager is yet another unit to carry, power, and track.
- **Limited bandwidth:** Pagers are designed for sending one-way short messages only, and have no capability for broadband or multimedia (rich media) communications. Another subscriber unit, usually a phone of some form, is required to close the loop.
- **Limited security:** End users and IT staff have no control over the end-to-end security of their messages. This could potentially raise Health Information Portability and Accountability Act (HIPAA) or other regulatory-compliance issues if information is compromised because of a lost or misplaced pager or a hacked paging network.

- **Shrinking opportunity:** The installed base of paging users continues to decline. Many consider paging systems obsolete, and there is certainly no real innovation in this industry. A limited technology unable to keep up with contemporary IT demands, premises paging is more likely to be found in restaurants today.

The fundamentally integrated nature of healthcare information management demands a similarly integrated approach to information communications within the facility. This is where mobile unified communications is transforming healthcare environments.



Wi-Fi-Based Paging and Beyond

Premises paging suffers from a number of problems, including its fundamentally narrowband nature and its lack of integration with other hospital communications systems. These limitations constitute a critical motivation for moving to a single, mobile, unified communications solution based on the facility's wireless LAN.

The first question to be answered, however, is whether paging and messaging functions can be implemented on a wireless LAN. The answer here is indeed yes, and the greater capacity and flexibility inherent in a WLAN adds new value to paging in the bargain.

One company providing such functionality is Radianta, through their Beacon Healthcare offering. Beacon Healthcare makes it possible to send pages over the Wi-Fi network to a Cisco Unified Wireless IP Phone 7925G handset, as well as to desktop phones, traditional paging speakers, and IP-based speakers. Similarly, staff can use their Cisco Unified Wireless IP Phone 7925G to send individual or group pages to a personal or institutional list of contacts. Push-to-talk (PTT) is supported, along with the ability to send text and text-to-speech messages, as well as prerecorded messages (such as indicating the end of visiting hours) at prearranged times. Applications such as accessing medical records are also part of the solution. The idea is to enable rich-media, unified communications aligned with the mission-critical nature of healthcare environments.

Berbee Information Networks Corp. also offers hospital notification systems that work over a Wi-Fi network. Users of their InformaCast system can send pages to specific locations (a wireless or wired handset, or a loudspeaker, for example), and can selectively address buildings, floors, or specific areas, like nursing stations. The tracking of high-value items, such as patient monitors and infusion pumps, via RFID tags can be added, alerting selected individuals or staff groups when one of these items is being improperly moved. Specialized alerts, from the need for a "code blue" team to less-critical notifications, can be prerecorded and sent with a touch of a handset button. The entire system is software-based, making it easily customizable and extensible to meet the specific requirements of a given healthcare facility.

Trends in Healthcare Communications Today: Wireless LANs as the Backbone

The most important direction in networking today, regardless of the industry or application, is toward the use of broadband as a prerequisite for application and service deployment. In addition to providing much better throughput and responsiveness, broadband also means that time-bounded traffic, like voice and video, can be handled on the same infrastructure used for data networking. Separate phone, paging, and data networks, which are difficult to manage in any case, thus become an unnecessary expense.

With the recent availability of products based on the nearly complete 802.11n standard, the performance of wireless LANs has essentially matched the capabilities of wired networks. Increases in throughput as well as range, reliability, coverage and support for time-bounded traffic enable users to access network and communications resources without being tied to a specific location. Wireless LANs are thus becoming the preferred backbone-network solution in many environments, and indeed have already become the primary or default access in many healthcare institutions. Furthermore, wireless LANs are also remarkably cost-effective, especially when compared to the installation and ongoing costs of maintaining a wired physical plant. Wireless LANs are easy to install, thanks to modern system architectures and management platforms, and are non-disruptive to critical facilities like emergency rooms, laboratories, and operating rooms.

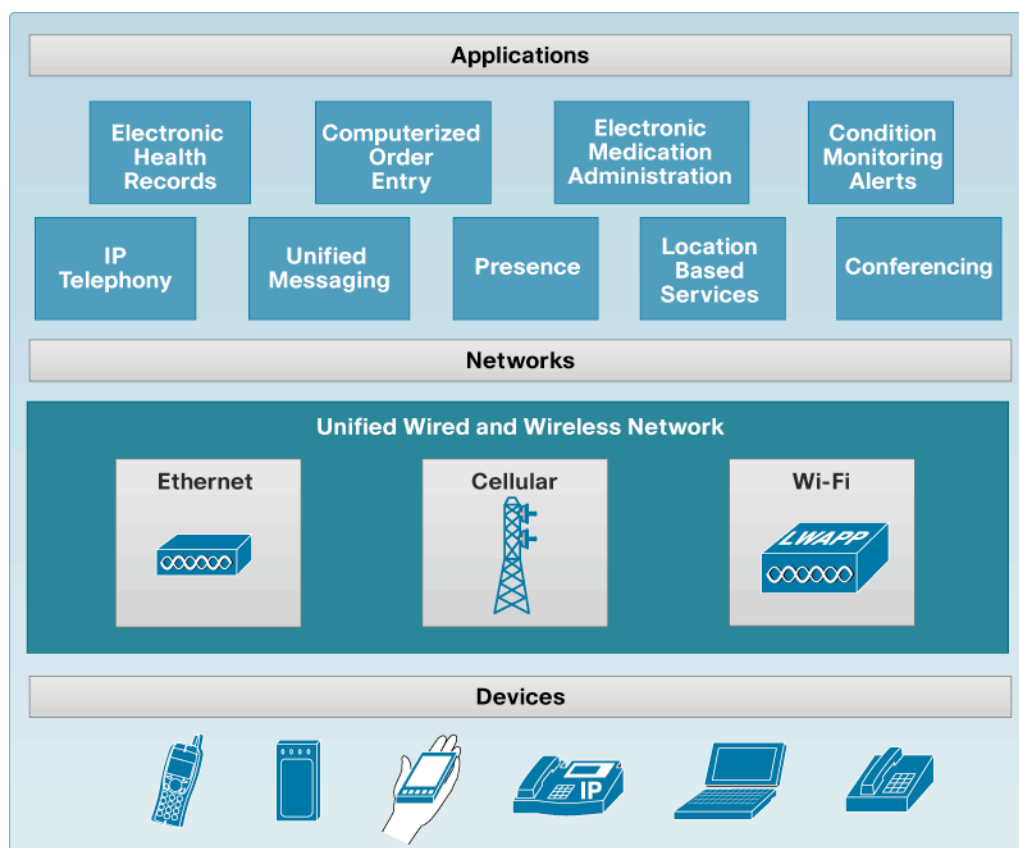
In short, modern wireless-LAN communications technology is extremely well-suited to healthcare applications. WLANs have the bandwidth to support essentially any application, provide excellent in-building coverage, have the security required to meet regulatory (and simply good-practice) demands, and the ability to support instant, reliable, pervasive communications for messaging and even for voice and video on the same infrastructure. And wireless LANs can provide the capacity headroom and traffic prioritization required in healthcare settings.

From an IT management perspective, wireless LANs represent the core vehicle for the unification of communications and networking in the hospital. Rather than carrying a pager, cell phone, a PDA, and often other information tools as well, we can at this point think about reducing the number of devices for many staff down to one: a Wi-Fi or converged cellular/Wi-Fi handset that provides access to all hospital services in a highly cost-effective and convenient manner. By unifying devices and services, we can take advantage of broadband networks, increased reliability via the essential redundancy in WLAN infrastructure and other fault-tolerance features (such as overlapping access-point coverage and automatic failover of other critical infrastructure), and improved security, both within the wireless LAN itself and also provisioned as upper-layer encryption and authentication capabilities. And at the same time, we can benefit from the improved manageability inherent in a unified solution.

The Rise of Unified Communications on the Wireless LAN

A successful deployment of unified communications on the wireless LAN will accommodate a wide variety of information and communications services while providing a common platform for applications and management tools. This simplifies the effort required from the IT department to keep the solution running while broadening service reach within the healthcare organization. Equally important, unified communications replaces proprietary point products and services with open solutions that use a common infrastructure. It goes without saying that unified communications solutions are based on the IP family of protocols, applying open standards, utilizing existing infrastructure, and taking advantage of essential interoperability and proven solutions for network integrity and security. Similarly, end users benefit from the convenience, uniformity, and great range of capabilities inherent in unified communications. And given that hospital workers are inherently mobile, it's important that all of the facilities of a unified communications solution be made available to them wherever they might be within the facility.

No matter what definition is applied, unified communications solutions need to include device, network and application elements, as shown in Figure 1, that can provide the following capabilities:

Figure 1. Mobile Unified Communications over the Wireless LAN Solution Elements

- IP telephony:** Today's wireless LANs are well-suited to voice telephony, with a wide variety of mobile devices and call manager software products now available. Wi-Fi handsets incorporating voice and other unified communications features are readily available and perfect for staff members who work only onsite. Equally important, IP telephony services can be provisioned on the wireless LAN clients now embedded in many cell phone handsets, often called "dual-mode" phones. This enables mobile-to-mobile convergence, allowing the bidirectional handoff of both voice and data connections between the WLAN and the cellular network, and even to land lines (fixed-mobile convergence). This capability provides the continuity and flexibility that are essential in healthcare today.
- Unified messaging:** While paging represents a very limited path to sending a time-critical message, unified messaging integrates short message service, instant messaging, voice, fax, and email into a single inbox and allows individuals (or groups) to be reached by the most appropriate channel at any given moment. Centralized messaging tracking helps to ensure that messages are delivered.
- Presence:** Users are able to specify their availability with respect to given forms of communication. Those attending to urgent matters might wish, for example, to receive text messages while directing voice calls to voicemail. Users in critical-care conferences or shift-change status reviews might want to receive only urgent messages; users who are off-duty can similarly indicate that they are unavailable.

- **Location-based services:** Wireless LANs make it possible for specific services to be enabled by user identity, location, device, and time of day. For example, just being in the proximity of a given patient can allow specific context-sensitive information to be automatically displayed on a given staff-member's mobile device, assuming they are authorized for this function.
- **Conferencing:** Group productivity is critical in most healthcare settings, and being able to tie in required individuals—no matter where they might be within the facility, or beyond—streamlines information flow and decision making, resulting in greater overall efficiency and a reduction in possibilities for error. Surgeons can reach specialists and other members of the healthcare team for immediate consultation, and staff need not be in the same physical space to participate in productive meetings.
- **Information-sharing applications:** Collaboration includes access to shared files, applications, and network services, allowing users to share, manage, and interact with information in real time on a wide variety of devices and platforms—whatever is most available, convenient, and appropriate.

Because mobile unified communications leverages the wireless LAN that is already installed for data applications (including administrative use, guest and visitor access, patient monitoring, telemedicine, and many others), making the business case for unified communications is easy in most situations. Total cost of ownership is reduced as services are amortized across infrastructure that already exists (or will be installed in any case), and other costs, such as those for paging services, are eliminated.

Properly designed and implemented, a mobile unified communications solution provides hospitals and other healthcare facilities with an efficient, cost-effective set of network based services that improve responsiveness, increase visibility, and provide rapid access to information, people, and services. These mobile solutions help make an enormous difference in meeting today's healthcare challenges and provide a more practical option than narrowband implementations like paging.

Unified Communications over the Wireless LAN: Cisco Solutions

Unified communications on the wireless LAN is key to realizing the convenience, productivity, and responsiveness of a mobile infrastructure, providing a greater range of services and flexibility to users throughout the hospital than would otherwise be possible. Point solutions like paging, while clearly useful in the past, are no longer required or even appropriate given today's healthcare communication requirements.

Cisco has made a strong commitment to both wireless LANs and mobile unified communications, with a broad platform of products and applications that meet the needs of healthcare organizations today with Cisco Mobile Collaborative Care. As the global leader in networking, Cisco has built a framework for both basic network services and capabilities and the unified communications services that depend on this infrastructure. Cisco Mobile Collaborative Care enables efficient and rich-media communications among caregivers (physicians, nurses, other professionals, and even administrators) while meeting regulatory requirements (like HIPAA), reducing costs and opportunities for error, and increasing employee satisfaction. The Cisco mobile unified communications over WLAN product portfolio includes:

- **Cisco Unified Wireless Network:** Cisco's WLAN controllers, access points, and management system can address the requirements of even the largest multisite healthcare facilities.



Cisco Unified Wireless Network

- **Cisco 3300 Series Mobility Services Engine (MSE):** The Cisco MSE moves applications into the network, making them available on a broader range of devices and platforms than would otherwise be possible with traditional software-implementation techniques. In addition, the Cisco 3300 Series MSE allows medical applications such as medication administration to become context-aware (for example, taking into account the location of a patient or medical device, or the temperature of a medication,) and to offer intelligent roaming between cellular and Wi-Fi networks.



Cisco Mobility Services Engine

- **Cisco Unified Wireless IP Phone 7925G:** This handset is hermetically sealed making it well suited for healthcare environments and it features a color display, XML extensibility, and suitability to a broad range of voice applications (including push-to-talk), as well as data and messaging applications. The 7925G can also be used in Wi-Fi-based paging applications over 802.11 a/b/g WLANs.

Cisco Unified Wireless
IP Phone 7925G

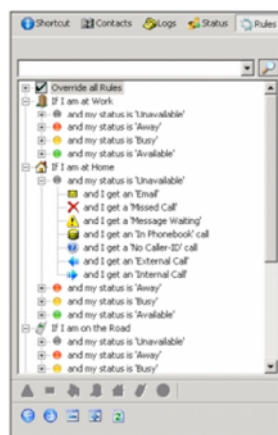
- **Cisco Unified Mobility:** Cisco Unified Mobility offers single-number reach, giving users the ability to redirect incoming IP calls to up to four different designated client devices such as cellular phones or IP phones.

Cisco Unified Mobility



- **Cisco Unified CallConnector Mobility:** This application enables the forwarding of incoming IP calls to other phones, according to rules set by network management or users directly.

Cisco Unified Call Connector Mobility



Recommendations for Hospital Networks

A platform based on unified communications represents the most important direction for hospital and other healthcare networks today. In preparation for deployment, the following are strongly advised:

- **Review the wired network:** As the wireless network begins to take on expanded roles, including unified communications, it's a good idea to review traffic loads and patterns on the wired networks. In addition, Gigabit Ethernet will be required for peak performance of 802.11n-based wireless LANs.
- **Provide pervasive wireless LAN coverage:** Hospitals can be challenging environments for radio. A site survey, especially for voice, is usually desirable in healthcare settings. The Cisco VoWLAN Network Readiness Tool can be used to evaluate coverage and capacity for voice on an operating WLAN.
- **Implement a voice-ready network:** Class of service and quality of service (CoS/QoS) network-management settings are critical to the success of mobile unified communications, assuring that high-priority, time-bounded traffic is forwarded ahead of ordinary data traffic where required. The objective is predictable performance.

- **Build a multiservice network:** Think not just in terms of traditional data applications, but also voice, messaging, and even sensor-based traffic. The wireless LAN is becoming a mission-critical element of the hospital's IT infrastructure. It's important to implement and enable services designed for high availability through fault-tolerance built into the WLAN system and careful coverage and capacity planning.
- **Remember spectrum monitoring and management:** While wireless LANs use unlicensed radio spectrum, it's still possible to keep a handle on what's happening in these bands, checking for and locating any sources of interference, rogue access points, or other threats. The Cisco Spectrum Expert Wi-Fi and related tools in the Cisco Wireless Control System (WCS) are great for this task.
- **Review your security policy, plan, and implementation:** Today's wireless LANs offer excellent airlink security via 802.11i and Wi-Fi Protected Access 2 (WPA2), but it's also a good idea to review your strategy for and implementation of data encryption, user authentication, and end-to-end network (VPN) encryption.
- **Open solutions:** A network designed for open applications will provide both cost-effective performance and the extensibility required for future applications, whatever they may be.

Conclusions

Implementing mobile unified communications over the wireless LAN is the key to addressing the broad and increasing range of demands placed on healthcare providers today. It's essential to have access to all of the information and applications required while using the hospital's wireless network infrastructure and to provide whatever is needed by mobile staff wherever they happen to be in the most efficient and cost-effective way possible. Today, all of this is available through unified communications products and services.

Mobile unified communications over the WLAN simplifies infrastructure while expanding services. It eliminates expensive, limited-function services, reduces costs, and ultimately creates a platform for the next phase in the evolution of healthcare IT. Productivity and results in today's healthcare environment depend upon communications—and the more unified those communications are, the better.



The American Hospital Association (AHA) awarded an exclusive, three-year wireless endorsement of Cisco's wireless networking products. The following products are included in the Cisco® Unified Wireless Network:

- Cisco Aironet® Access Points
- Cisco WLAN controllers
- Cisco Wireless Control System
- Cisco Mobility Services Engine

The Cisco Unified Wireless Network was ultimately selected for its exceptional security, reliability, customer support, and overall strategic fit for hospitals. Other business reasons why Cisco was selected include:

- **Industry-leading recognition:** Cisco is the leader in the wireless LAN market, with more than 63 percent of market share. In healthcare, Cisco is even more successful, with market share of more than 73 percent.
- **Support for hospitals of all sizes:** This includes rural and community hospitals.
- **Extensive product portfolio:** Cisco has a large range of access points, controllers, and management software, all of which support innovative mobility solutions.
- **Excellent customer support:** Award-winning, 24-hour, global access to a team of expert engineers and customer support staff.



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