

Converged wireless saves \$2m: wireless VoIP system provides seamless roaming and improves staff productivity.

Gretchen Niehaus, manager of IT and telecom at [St. John's Hospital](#) **St. John's Hospital** may refer to:

In the **United Kingdom**:

- St. John's Hospital — Chelmsford, Essex, England
- St John's Hospital at Howden — Howden, Livingston, Scotland

In the **United States**:

- St.

..... **Click the link for more information.** in Springfield, Ill., knew the advantages wireless mobility could provide to caregivers and other hospital staff. After all, the regional healthcare center had made an investment several years ago in 802.11b that allowed case managers to enter patient information into the electronic medical record system.

Using laptops, patient information could be entered directly, providing immediate updates to the patient record for other medical staff; as well as reducing errors formerly due to transcription of written records. After seeing the dramatic improvement in just this one area, Niehaus realized that a more pervasive [wireless LAN](#) A local area network that transmits over the air typically in the 2.4 GHz or 5 GHz unlicensed frequency band. It does not require line of sight between sender and receiver. Wireless base stations (access points) are wired to an Ethernet network and transmit a radio frequency over an area that could support not just data, but also voice applications, would provide even greater benefits.

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To provide voice mobility inside the hospital, St. John's also had a wireless voice system that operated in the 1.9-GHz band. Newer, more advanced voice systems and the possibility of using a dualmode cellular/Wi-Fi phone led the team to look at new wireless LAN solutions, including those that supported 802.11a.

Founded in 1875 by the Hospital Sisters of the Third Order of St. Francis, St. John's Hospital serves central and southern Illinois. The hospital is licensed for more than 700 beds, making it the largest hospital in [downstate](#)down-state

n.

The southerly section of a state in the United States.

adv. & adj.

To, from, or in the southerly section of a state.

down

..... **Click the link for more information.** Illinois, and one of the largest Catholic [hospitals in the United States](#) **Lists of hospitals** for each U.S. state:

- Alabama
- Alaska
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- Florida
- Georgia

- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
-

Niehaus' task was to combine multiple data and voice applications onto a single network without degrading the quality of service for those using the phones. St. John's selected [Meru Networks](#) Meru Networks is a privately-owned company wireless networking company catering to medium and large enterprises. Meru's products include wireless access points, controllers, and management software. after a lengthy and comprehensive evaluation process of multiple vendors. The initial rollout has worked so well, plans to expand the wireless LAN to cover the entire 12 floors of the hospital have been put in place. A return-on-investment analysis was completed and the resulting economic advantages were compelling.

"The system is working so well, we are regularly receiving unsolicited requests to expand it to additional areas and applications," says Niehaus. "It hasn't been hard to justify either. Using only selected nurses saving 30 minutes per day, we expect the system to save us \$2 million dollars in just its first year. That doesn't even include the additional savings we expect for respiratory therapists, lab technicians and dieticians when they come online."

At completion, more than 400 access points will be deployed, as well as additional applications, such as a more extensive electronic medical record system, barcode scanning for accurate inventory control and care delivery, guest and patient [Internet access](#) See how to access the Internet. **Click the link for more information.**, and [RFID](#) (Radio Frequency IDentification) A data collection technology that uses electronic tags for storing data. The tag, also known as an "electronic label," "transponder" or "code plate," is made up of an RFID chip attached to an antenna. for asset tracking.

To evaluate the wireless LAN systems, a lab was set up to provide a separate environment for testing the different applications. Products from multiple vendors were tested against two main criteria:

* support for multiple virtual LANs ([VLAN](#) See virtual LAN).

VLAN - Virtual Local Area Network) with multiple security settings for the different applications and users; and

* support for seamless roaming of voice clients across access points and subnets, with no degradation of voice quality.

"When we brought other wireless LAN systems into the test lab, we noticed they dropped the voice-over-Wi-Fi calls as they roamed," says Niehaus. "As voice clients roamed, they had to reauthenticate with the access points, which would drop the call. Even centrally managed wireless switch systems

that claimed support for seamless roaming across the access points dropped the call if the client roamed from one switch to another.

"The Meru wireless LAN system was the only one that provided seamless roaming for voice clients, with no loss in quality or dropped calls. And, it supports up to 64 separate VLANs with individual security settings, so it was no problem to deploy multiple applications and users on the same infrastructure."

The wireless LAN is currently installed on the first four floors of St. John's Hospital, with 120 access points providing mobile connectivity for voice and data applications, and a redundant controller in place to ensure the highest availability. One of the key attributes that attracted St. John's to the system was that no site survey was required. Meru accomplishes this process with virtual cell technology, which eliminates co- and cross-channel interference.

With the issue of [co-channel interference](#) The confusion in the tuning circuit of a wireless receiver due to a second wireless signal being detected with the same frequency. Due to weather conditions, wireless communications systems (radio, TV, etc. resolved, the access points are placed in the best locations to ensure complete coverage. Complex three-dimensional site plans to ensure that access points on the floor above or below are on different channels are no longer necessary.

For voice communications, St. John's has chosen Vocera Communications Badges, which deliver quick, easy communications among caregivers and other hospital staff. Niehaus plans to expand to 300 Vocera Badges.

In addition to the voice and case-management applications, the hospital has also moved its surgery information system to the wireless network. Prior to that, [operating room](#) operating room
n. Abbr. OR

A room equipped for performing surgical operations. nurses would do pre-operative checks on the patient and then move to another area to [transcribe](#) To copy data from one medium to another; for example, from one source document to another, or from a source document to the computer. It often implies a change of format or codes. the information into the system. Now, carts with laptops can be wheeled right into the operating room and the information can be entered directly, saving valuable time and reducing mistakes.

THE SOLUTION

THE ST. JOHN'S HOSPITAL WIRELESS SOLUTION:

- * Meru Networks wireless LAN controller and AP 200s;
- * multiple VLANs with different security settings; and
- * air traffic control technology enables zero handoff of voice clients.

BENEFITS:

- * estimated \$2,000,000 cost savings in first year after deployment;
- * only system tested to provide high voice quality with no dropped connections, even while roaming;
- * quickly enabled multiple applications, including voice, secure data and guest access, using multiple VLANs;
- * eliminated site survey using virtual cell capability; and
- * compatible with Vocera and SIP-based [wireless VoIP](#) See voice over Wi-Fi.
..... **Click the link for more information.** phones.

For more information from Meru Networks: rsleads.com/605cn-255

RELATED ARTICLE: Interoperability in question.

by Phillip D. Shade

The widespread adoption of [IEEE](#) (Institute of Electrical and Electronics Engineers, New York, www.ieee.org) A membership organization that includes engineers, scientists and students in electronics and allied fields. 802.11b/g wireless LAN ([WLAN](#) See wireless LAN.

WLAN - wireless local area network) technology within the medical community has been a key factor in the integration of patient care and information technology. Touted as an inexpensive alternative to conventional hard-wired networking, it relies on utilizing the unlicensed 2.4-GHz industrial, scientific and medicine ([ISM](#) See ISM band.) band in combination with [direct-sequence spread spectrum](#) In telecommunications, **direct-sequence spread spectrum** (DSSS) is a modulation technique. As with other spread spectrum technologies, the transmitted signal takes up more bandwidth than the information signal that is being modulated. ([DSSS](#) (**D**irect **S**equence **S**pread **S**pectrum) See spread spectrum.) technology to free the user from cumbersome cables while increasing mobility.

A comparative newcomer to the WLAN environment, IEEE 802.15-more commonly known as Bluetooth (BT)technology--also shares the 2.4-GHz ISM band. While traditionally associated with extremely short-range or personal-area networks (PANs) and using the [frequency-hopping spread spectrum](#) **Frequency-hopping spread spectrum** (FHSS) is a method of transmitting radio signals by rapidly switching a carrier among many frequency channels, using a pseudorandom sequence known to both transmitter and receiver. ([FHSS](#) (**F**requency **H**opping **S**pread **S**pectrum) See spread spectrum.) technology, the new generation of higher-powered BT-enabled equipment is capable of extended range communications, with much higher power levels.

The randomness of problem events, however, make traditional short-term troubleshooting captures using a standard WLAN network analyzer challenging. In one example, a company made multiple, long-term packet captures over the course of several days from several points within its WLAN. The network engineer deployed a distributed analyzer with long-term capture and storage capabilities and strategically placed 802.11 capture probes in multiple locations.

The captured data revealed that while normal WLAN data speed was 11 Mbps immediately preceding the random outages, user-perceived network slowdowns, combined with AP/client rate-shifting from 11 Mbps to 5.5 Mbps to 2 Mbps, were observed. Network errors and WLAN [cyclic redundancy check](#) (algorithm) **cyclic redundancy check** - (CRC or "cyclic redundancy code") A number derived from, and stored or transmitted with, a block of data in order to detect corruption. errors were observed to significantly increase from a baseline of less than 5% to well above 60% immediately prior to the workstations losing connectivity to the network.

In addition, an evaluation of the analyzer's corresponding expert system events revealed numerous instances of WLAN interference, wireless physical errors, excessive client [retries](#) re-tries
v.

Third person singular present tense of retry. and numerous wireless data rate changes. The network engineer observed that the users complaining of WLAN disconnects were also using the new Bluetooth headsets, and that disconnects seemed to occur when the user was more than 10 feet away from the workstation.

A previously undiscovered interference source was suspected but where the interference was coming from was not clear until the Bluetooth headsets were evaluated. While the two WLAN technologies utilize completely differing technologies (DSSS vs. FHSS), they both occupy the same 2.4 GHz ISM band.

Under the new IEEE 802.15 rules, Bluetooth has been modified to allow for three separate power levels. This capability is employed in many of the new generation Bluetooth-enabled office devices, including the users' headsets in question.

Additional captures showed that as a user was actively using the headset and moved more than 10 feet away from the base station, the power level changed from 1 [milliwatt](#) mil-li-watt

n. Abbr. mW

A unit of power equal to one thousandth (10^{-3}) of a watt.

Noun 1. milliwatt - a unit of power equal to one thousandth of a watt to more than 2.5 milliwatt.

Although a low power level will not affect 802.11b performance, when the headset power shifts into high, it can and does disrupt 802.11b signals. This near tripling of the radiated FHSS power level, combined with the location of the base-station almost directly adjacent to the DSSS workstation [NIC](#) **(1) (Network Interface Card)** See network adapter. See also InterNIC.

(2) (New Internet Computer) An earlier Linux-based computer from The New Internet Computer Company (NICC), Palo Alto, CA. card, plus the overlap in the RF spectrum, manifested itself in seemingly random device or network failures.

Both short- and long-term solutions were available. The network engineer moved the 802.15 Bluetooth headset base stations as far away from the 802.11b NIC cards as possible. A long-term solution was to deploy non-overlapping IEEE 802.11a equipment wherever the Bluetooth devices were located.

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..... **Click the link for more information.** for WildPackets, Walnut Creek. Calif.

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