WHITEPAPER

7SIGNAL®

THE WI-FI PERFORMANCE COMPANY

ENHANCING PATIENT CARE THROUGH RELIABLE, HIGH-PERFORMANCE WI-FI

How Wi-Fi performance assurance and optimization systems can help hospitals manage risk and reduce operational expenses while improving productivity and enhancing patient outcomes.

Executive Summary

Healthcare organizations continue to undergo dramatic change throughout all areas of their operations. Adoption and “meaningful use” of electronic health record (EHR) technology is proceeding against the backdrop of new financial models, regulatory mandates, personnel shortages and increased demand for services.

From an IT perspective, many of these changes are manifested in the increasing demand for wireless connectivity. Hospital CIOs are faced with the challenge of delivering pervasive, high-performance Wi-Fi and supporting an ever-growing array of mobile and biomedical devices, all while keeping an eye on the bottom line. “Medical-grade” Wi-Fi increases productivity, improves operational efficiency and enhances patient outcomes by providing access to EHRs and other applications at the point of care and by enabling doctors, nurses and staff to communicate more effectively. Patients, their families and other visitors use mobile devices inside the facility for communication, information access and entertainment.

Traditional IT performance management systems — designed for a relatively static wired infrastructure — are largely ineffective in this new paradigm. The physical environment of a hospital is notoriously hostile toward wireless signals, and poorly engineered WLANs do not provide the coverage, reliability and service-level adherence the hospital environment demands. In many instances, Wi-Fi issues originate with the endpoint device, but IT teams lack the data they need to pinpoint and address those problems. Security and regulatory requirements create additional hurdles.

Without a Wi-Fi-focused performance management system, many hospital CIOs are struggling to provide a medical-grade WLAN. Skills gaps and budgetary constraints exacerbate the problem. CIOs need new tools that can help them meet wireless demands and resolve connectivity problems more quickly. But while all IT investments require a tangible return and financial justification in the form of labor savings and efficiency gains, most CIOs agree that the user experience is of paramount importance in hospital operations.

This whitepaper was developed based upon interviews with CIOs at large hospitals regarding the role of Wi-Fi in their organizations and the challenges they face in meeting growing demand for Wi-Fi. It further analyzes what hospitals stand to gain from pervasive wireless connectivity and how Wi-Fi performance assurance and optimization systems can help IT teams isolate and troubleshoot problems, respond proactively to changes within the network, and ensure the high-availability of a medical-grade WLAN that meets the demands of their organizations.

Why Wi-Fi Is Critical in Today's Hospitals

Robust, reliable and secure wireless connectivity is no longer a "nice-to-have" service but rather a mission-critical component of the IT infrastructure. Hospitals are relying upon their Wi-Fi infrastructure to serve thousands of doctors, employees, patients and guests and to support critical applications and biomedical devices. Wi-Fi brings devices, applications and data to the patient's bedside, and enables communication and collaboration tools that enhance productivity and patient care. In this section, we will discuss the primary applications for Wi-Fi cited by the hospital CIOs interviewed for this study.

Bring Your Own Device (BYOD). Support for physician- and employee-owned mobile devices is a primary requirement for Wi-Fi in today's hospital. Physicians and other personnel expect to bring their own devices into the hospital and to have reliable connectivity to clinical systems. Initially, many CIOs limited BYOD access to a finite set of approved devices and operating systems (typically Apple products). Over time, however, it became clear that such limitations were neither practical nor desirable:

> We allow all sorts of wireless devices to access our systems. You have to these days. Everybody who's walking through the hospital tends to have some sort of a smart device on them, sometimes two or three, that automatically link to the network. — Paul Jones, CTO, Sisters of Charity Health System

Mobile Point of Care (MPOC). Hospitals see cost savings and efficiency gains in wireless access to EHRs and other applications and data, whether from physician- and staff-owned devices or hospital-owned devices. MPOC solutions provide doctors and nurses with instant access to the information needed to make clinical decisions at the point of care, and eliminate the error-prone process of manually transferring information from paper-based to computerized systems. Studies have shown that MPOC solutions increase productivity, reduce errors and risk, and improve patient outcomes.

Biomedical Device Support. The hospital Wi-Fi infrastructure must support a growing array of wireless-enabled biomedical devices, including medical monitors and telemetry alarms. These tools increase the flexibility and efficiency of the hospital environment, enabling assets to be moved where they are needed. Wireless transfer of X-rays and other high-resolution diagnostic images is increasingly important.

Voice over WLAN (VoWLAN) and Mobile Collaboration. Voice and data communication tools are enabling hospitals to reduce reliance on legacy pagers and intercom systems and provide real-time collaboration capabilities. A recent study found that the continued use of outmoded technologies such as pagers costs hospitals more than $8.3 billion annually due to decreased clinician productivity and increased patient discharge times. As a result, today's CIOs view VoWLAN and mobile collaboration as mission-critical.

Guest Access. Patients, their families and other visitors also expect Wi-Fi connectivity within the hospital. In addition to enhancing the hospital's image and brand, guest Wi-Fi access enables patients and visitors to enjoy games and entertainment. A CIO of a children's hospital said that Wi-Fi connectivity was particularly important for the patients in his facility — kids who grew up with mobile devices.

Wi-Fi Challenges in the Hospital Environment

While hospital CIOs view Wi-Fi as essential to operations, not just any Wi-Fi will do. The healthcare environment demands a "medical-grade" WLAN with the availability and performance required for critical communications and biomedical devices. IT leaders must also be able to deliver pervasive connectivity and support high levels of roaming while managing the security, regulatory and other issues that come with BYOD.

Unfortunately, a number of persistent problems have made it difficult for hospital CIOs to achieve the necessary service levels. This section will examine some of the Wi-Fi challenges hospital CIOs must overcome in order to realize a return on investment in the form of reduced costs, increased operational efficiency and improved staff productivity.

Inadequate Design. Some hospitals have implemented Wi-Fi incrementally to support specific applications or areas within the facility — designs once were sufficient but now contribute to a fragmented WLAN infrastructure. Many other hospitals have poorly designed WLANs that are simply incapable of meeting the demands of the medical environment.

Challenging Physical Environment. While developing a medical-grade WLAN is difficult in and of itself, hospitals in particular face a number of unique challenges. Masonry, concrete and other building materials block radio frequency (RF) signals, as do the thousands of highly mobile metal objects constantly moving throughout the facility. New issues are introduced continually in this dynamic environment as new medical devices and equipment create interference on the same 2.4GHz spectrum used by Wi-Fi.

Quantity and Diversity of Devices. There are also problems with the devices themselves — CIOs report serious issues with hardware and device drivers that prevent devices from connecting to the WLAN. Keeping pace with the vast variety of devices and all of the manufacturer's updates is a time-consuming chore. Device density is also a challenge, as growing numbers of wireless-enabled biomedical devices compete with smartphones and tablets for wireless network access. Many hospitals struggle to scale their WLANs effectively to meet escalating bandwidth requirements.

VoWLAN Issues. The WLAN often is unable to provide the seamless handoffs between access points (APs) that are necessary to prevent dropped calls as doctors, nurses and staff roam throughout the facility. In addition, jittery voice connections and overall poor voice quality due to bottlenecks and other WLAN throughput issues prevent doctors and staff from communicating effectively.

Security and Regulatory Compliance. Many CIOs report that security and regulatory compliance requirements exacerbate WLAN challenges. Hospitals must implement an integrated policy enforcement strategy to ensure that user-owned devices accessing the network meet HIPAA standards for protecting sensitive patient data. The IEC 80001 standard has even more exacting requirements for reducing the risks associated with medical devices and systems dependent upon Wi-Fi networks. In addition, the U.S. Food and Drug Administration (FDA) recently issued guidelines for wireless medical device security, warning that devices are vulnerable to data theft or, worse, hackers seeking to harm patients. While the FDA guidance was aimed at device manufacturers, hospital CIOs must consider threats to wireless biomedical devices in their risk management strategies.

How Wi-Fi Performance Assurance and Optimization Relieves These Pain Points

Resolving the challenges associated with Wi-Fi in healthcare is not easy. Traditional network monitoring tools measure performance from the inside out to the APs and stop short of measuring the "last hop" to client devices. Most WLAN management software focuses on the effective operation of the APs themselves. Missing from the equation is the end-user's perspective, or how doctors and staff actually experience the Wi-Fi network.

Network administrators rely upon end-user complaints to troubleshoot connectivity and performance problems. This approach is, of course, highly reactive and provides little insight into the root cause of problems. Ultimately, chronic problems result in end-user dissatisfaction and frustration with the Wi-Fi infrastructure, in addition to losses in worker productivity that may impact patient care.

WLAN performance assurance and optimization systems provide end-to-end Quality of Service (QoS) testing, continually analyzing the capabilities and measuring the performance of the network from the perspective of the APs, applications and client devices.

IEC 80001

The risks wireless networks pose to medical device performance has been recognized by the International Standards Organization (ISO), which has issued the IEC 80001 standard to help ensure the accuracy, security and privacy of patient data shared by medical devices and information systems across the network. The identified risks include loss or corruption of data, unauthorized access to data, and problems with data interchange.

The base standard sets forth strategies, responsibilities and controls for managing risk in medical IT networks. In addition, the standards committee has introduced a technical report that addresses the fundamentals of risk management for Wi-Fi networks. The committee focused on Wi-Fi because almost every hospital has a Wi-Fi network and connecting medical devices via Wi-Fi is a high priority for hospitals. Therefore, risk-reducing strategies that specifically address Wi-Fi assurance are of paramount importance.

These types of systems simulate real Wi-Fi network traffic, including Voice over IP (VoIP) calls and data file transfers. CIOs report that these systems enable them to get the WLAN working well, keep it working well and provide faster, more accurate support when issues arise.

With WLAN performance assurance and optimization systems in place, hospitals are able to rectify design flaws, modernize topology and remediate configuration errors within the wireless infrastructure. They can address IEC80001 patient safety matters, adequately prepare for BYOD initiatives and continually monitor, measure and improve the network to meet the needs of a dynamic environment and more stringent SLAs. By gathering performance data around the clock, these systems also help identify coverage gaps and "ghost" issues caused by sporadic interference and noise. Manually collecting such data with the traditional walk-around tools would require an enormous amount of manpower, if it were possible at all.

Once initial problems with the WLAN are resolved, the system identifies issues that clients may be experiencing on the network and provide the analytics network administrators need to prove that the problem lies with client devices rather than the network. According to one CIO, this helped end the "finger-pointing" that once stymied efforts to rectify problems:

> In the past, I've had people working for six months trying to resolve problems that turned out to be the vendor's issue. Now we have data that we can push back to the vendor with a lot more confidence. — Tom Ogg, CIO, Akron Children's Hospital

The performance data can also be used to prove to end-users that the WLAN is working optimally and that troubleshooting needs to begin with the client device rather than the network. CIOs report that, over time, a cultural shift occurs in which end-users gain confidence in the performance of the Wi-Fi network as problems diminish. The impact of improvements to the WLAN infrastructure are measured and verified immediately with the Wi-Fi management system in place. When new problems arise, network administrators don't presume that the issue lies with the infrastructure since overall network performance is captured every day by the system. This offers IT managers the ability to track and trend network performance on a daily, weekly and monthly basis.

Most importantly, WLAN performance assurance and optimization systems enable IT teams to maintain a medical-grade Wi-Fi infrastructure capable of supporting mission-critical equipment and applications. Network administrators can set service-level thresholds so that they are proactively alerted about potential issues before they become "drop-everything" patient-impacting issues that cause waste and additional expense. One CIO indicated that the proactive nature of the solution increased his department's productivity to the point where it negated the need to add a full-time employee focused on Wi-Fi issues. Other CIOs who have deployed WLAN performance assurance and optimization systems report improved VoWLAN call quality, more reliable connections and a better end-user experience — increasing efficiency, decreasing costs and improving the overall morale of physicians, nurses and staff.

Conclusion

Healthcare organizations need to become more efficient and agile in order to meet new business and operational demands while controlling costs and continuing to provide exceptional patient care. Wi-Fi and the devices that run on it, can enhance communication and improve decision-making by bringing applications and data to the point of care. However, the difficulty of designing and maintaining a medical-grade WLAN with the necessary performance, coverage, capacity, security and regulatory compliance has limited the ability of hospitals to gain maximum value from their investments in Wi-Fi.

WLAN performance assurance and optimization solutions transcend the limitations of traditional network and Wi-Fi monitoring tools, providing CIOs and their staff with the data they need to resolve WLAN issues, boost network throughput and assure the network continues to perform optimally on an ongoing basis with proactive monitoring and measuring. These solutions enable IT teams to be more productive as they assure the hospital staff stays productive. With the right systems, hospital CIOs can deliver reliable, high-performance Wi-Fi that supports BYOD policies as well as the growing number of biomedical devices in the environment. Most importantly, Wi-Fi performance assurance and optimization systems help improve the Wi-Fi experience for doctors, staff, patients and their families.

About 7signal

7SIGNAL® is a leader in enterprise Wireless Network Monitoring (WNM). The 7SIGNAL platform is a cloud-based WNM solution that continuously tests wireless networks and identifies elusive performance issues. By "living on the edge" of a Wi-Fi network where complex device interaction exists and user experience matters most, the solution maximizes employee productivity, operational efficiency and network ROI. Designed for the world's most innovative organizations, educational institutions, healthcare systems and government agencies, the platform is currently deployed at Fortune 500 companies, hospitals and large venues globally—continuously monitoring the connectivity of more than 4 million devices. Learn more at www.7signal.com.

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