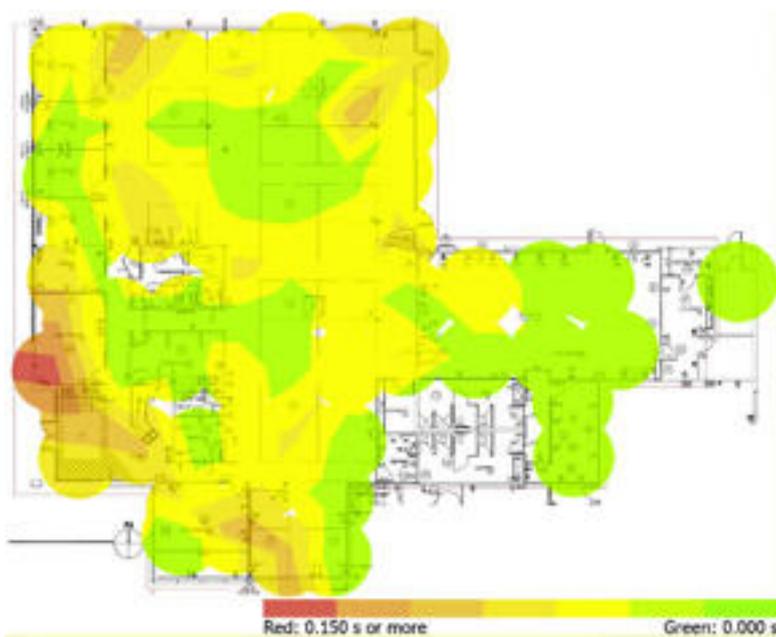


Bringing Wi-Fi to Healthcare

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Evolving best practices for developing and deploying mobile healthcare devices.



Today's medical staffs increasingly rely upon wireless networks and devices to conduct critical-care applications, access electronic medical records and test results, and to share information throughout facilities. At the same time, Wi-Fi networks in healthcare facilities are being pushed to the limits by the Bring Your Own Device (BYOD) trend among patients and guests.

The emergence of Wi-Fi as a mission-critical network technology poses dual challenges to the two critical groups involved in ensuring the quality of healthcare:

- **Manufacturers:** Makers of heart monitors, infusion pumps, medical imaging systems, and other specialized medical equipment going mobile for the first time need to make sure devices can maintain wireless connectivity in challenging healthcare environments, as well as under diverse traffic and environmental scenarios. Manufacturers of mobile medical devices must also ensure that devices meet user and regulatory expectations for intended use, or risk having adverse events occur; for example, as missed alerts resulting in a delay in patients receiving critical care, which can lead to financial loss, liability, regulatory recalls, and the like.
- **Users:** For hospital IT departments and their integrator partners, the pressure to achieve hospital grade Wi-Fi connectivity translates into a need to assess environments and measure the impact of a new medical device on existing hospital wireless LANs (WLANs) and vice versa.

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In both cases, new strategies are essential for evaluating performance prior to releasing and deploying new products and applications. Even with strict compliance to standards and routine certification by the Wi-Fi Alliance, deployments in healthcare facilities face unique complexities and challenges. As the volume and diversity of mobile devices continues to grow, manufacturers and healthcare facility IT teams must adopt evolving best practices in test and site assessment.

Bringing the Hospital to the Lab

Today's hospitals must deliver ubiquitous WLAN coverage in order to meet mobility requirements. Modern networks must be designed to support the data requirements of 802.11n clients, voice, video, and hundreds if not thousands of Wi-Fi-enabled medical devices.

Ensuring performance in these changing environments pose rapidly-changing challenges that include:

- Changing use models with devices that are becoming increasingly mobile in use.
- Unique challenges in medical environments such as lead-lined walls and reflective metal surfaces.
- RF radio misconceptions such as the selection of low-cost, low-performance radios and how they can limit the performance of high-cost devices used in real-time healthcare procedures.
- Meeting FDA 510K requirements that devices perform to certain criteria for "intended use" in specific medical applications.
- BYOD and the stresses that unpredictable volumes and mixes of wireless traffic can have on device performance.

Device manufacturers must bring the hospital to the lab the same way WLAN infrastructure manufacturers have been doing for years. They must simulate real-world conditions using traffic generators and a mix of actual devices to assess interoperability, performance, roaming, and more.

- Proven test methodologies developed by Wi-Fi test experts include:
- Baseline network performance using "golden" clients to obtain a "best-case" picture.
- Baseline device performance under ideal network conditions where it's the only client communicating with APs under optimal conditions.
- Assessing range and roaming capabilities by varying RF signal attenuation to prompt devices under test (DUTs) to move away from and between specific APs.
- Assessing real-world performance and security by simulating live network conditions, generating high traffic loads and interference.
- Measuring interoperability with multiple APs and mobile clients and mobile devices.
- Quantifying application performance and quality of experience (QoE) from

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the user perspective.

- Reproducing field conditions and modeling “what if” scenarios.

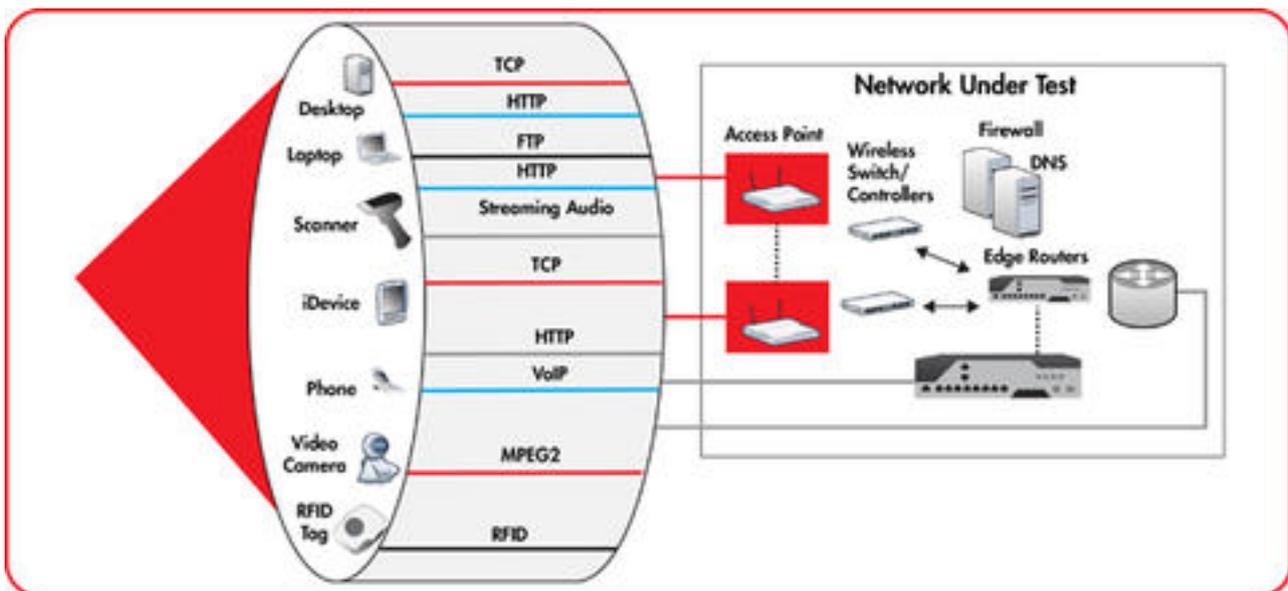
Powerful analytics are needed to harden and optimize new product designs, reduce cost, and speed identification of potential problems early on in the development and QA cycles. Actionable insight from state-of-the-art test systems and services helps speed time-to-market and mitigate risk while securing the delivery of high-performing devices, applications, networks, and services.

The ability to generate realistic voice, video, and data traffic proves essential, along with a high degree of test automation enabling hundreds of tests to run quickly and cost-effectively, and often even unattended. While this all may sound intimidating to those new to wireless, test solutions have evolved to compensate for a lower level of resident Wi-Fi expertise.

Site Assessments and Replicating Real-World Traffic

Traditionally, Wi-Fi deployment for medical facilities was conducted through site surveys, using tools that measured radio frequency (RF) power levels and co-channel interference to determine the optimal placement of access points (APs). However, site surveys fail to consider the dynamics of the network operating behind the APs, and the impact of varying client and traffic mixes. Although they are still important for predicting performance and optimal placement, true site assessment needs to be tested with real-world traffic.

Today’s best practices move beyond traditional site surveys toward comprehensive site assessments that ensure value throughout the wireless LAN (WLAN) deployment lifecycle. This next-generation approach to planning, deploying, and optimizing performance often begins with a single sweep through a healthcare facility and produces insight that was previously unattainable.



Evolving best practices for site assessment in healthcare include:

Focusing on Capacity vs. Coverage: When wireless access was introduced into

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healthcare environments, any connectivity was considered better than none, because any level of application performance was deemed acceptable. The mere fact that devices could detect a radio signal from a wireless access point was considered assurance the service should work just fine.

Focusing on RF power and attempting to minimize installation costs by using too few APs results in an unsatisfactory user experience where it appears that there is a strong signal available, yet a user is unable to connect. APs may continue to advertise their presence even when they cannot accept more users or effectively route traffic due to limited backhaul bandwidth, broken backhaul connections, or misconfigured equipment.

Modern healthcare networks must deliver a satisfactory experience to many users concurrently in high-density, heavily trafficked locations. Site assessments must use real application traffic to measure the quality of the customer experience directly, instead of inferring it from signal strength as is done with site survey.

Device Selection and Interoperability: During network design and vendor/device selection, site assessments should be conducted using actual devices to measure their impact on one another and the existing or intended network and applications. Those designing Wi-Fi networks can quickly determine the best choices for both WLAN infrastructure equipment and specialized wireless medical devices.

Optimizing Roaming: Since people and devices are constantly on the move, roaming tests should be conducted during site assessments using actual traffic and devices to benchmark the impact of various roaming procedures on users and applications.

Target Rates and Service Level Agreements (SLAs): Conducting a site assessment during the planning stages and post-deployment follow-up testing also helps in setting and evaluating performance against target rate and Service Level Agreements (SLAs) for each traffic type.

Here again, conducting baseline measurements before commencing a full-scale site assessment is recommended. Evolving best practices dictate that the equipment installation should be connected and powered up in sections with each new section tested for capacity, SLA compliance, coverage, and performance.

Looking Ahead: Healthcare Going Wireless

Medical equipment manufacturers and healthcare facilities cannot risk the liability inherent in delivering unreliable Wi-Fi. Comprehensive pre- and post-deployment testing must be conducted to proactively address and ensure the quality of the end-user experience. Fortunately, this can be done quickly and cost-effectively, equipping manufacturers and healthcare facility IT teams alike to secure the performance of networks and mobile devices upon which revenues, reputations, and lives increasingly rely.

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