CASE STUDY

7SIGNAL®

THE WI-FI PERFORMANCE COMPANY

Community Hospitals and Wellness Centers

Sapphire leads to Wi-Fi visibility and improved performance

CHWC

Serving Northwest Ohio, Community Hospitals and Wellness Centers (CHWC) offers a wide array of healthcare services in its three campus communities. In 2015 Bryan Hospital earned the Women's Choice Award as one of North America's Best Hospitals for Emergency Care.

Situation

CHWC has had a WLAN / Wi-Fi network for many years, with over 120 access points deployed throughout its facilities. Initially, its main purpose was to provide access to medical records for clinicians. Over time, traffic has grown significantly as more users, devices and applications utilized the network.

As the network loads increased, Greg Slattery, CHWC's CIO, realized his IT team had very little visibility into the end-user quality of experience. Greg tasked his team with finding a solution that enable them to monitor and analyze the WLAN on a continuous basis so they could take proactive steps to better understand their network performance issue and resolve them quickly before users complained.

Challenge

Hospitals are notoriously difficult facilities for successful high-performance wireless LAN deployment. Devices of all types use Wi-Fi and other wireless technologies to communicate. Different traffic types need to be supported – data, voice and telemetry from medical devices. The users of the network will also vary – doctors, nurses, administrators, patients and guests. Add to that, the facilities are constantly being repurposed to adopt new processes and workflow.

Complicating matters further, users often described a problem or issue in vague terms – "the Wi-Fi is down," or "my connection dropped." Often times the IT team suspected an issue to be specific to a particular device or to something else in the network besides Wi-Fi, yet they had no way of proving that to themselves or others.

Community Health and Wellness Centers

Multiple facilities serving Northwest Ohio

Mobile communications critical to staff productivity and patient experience

Benefits Realized from the Sapphire Wi-Fi Performance Management System

- Gained the visibility to manage the Wi-Fi experience proactively
- Dramatically improved attach rates and throughputs for WLAN users
- Raised worst Wi-Fi download and upload throughput by over 200%
- Positioned network to handle more applications and devices

Solution

CHWC deployed twenty six Sapphire Eye 2000 sensors throughout their facilities. Once installed, the Sapphire Eye sensors connected to the APs around them, and continuously ran a series of passive and active tests. The active tests emulated client experience – attaching to each AP, authenticating, receiving an IP address and running background tests to measure performance metrics such as upload and download throughput, delay, packet loss, jitter and voice quality (MOS). This quantified the network's ability to deliver the Wi-Fi service. The passive tests sampled all the other client to AP interactions, tracking key metrics such as connection data rate and retransmissions, thus quantifying each client's ability to use the Wi-Fi service.

Sapphire Eye test results are then analyzed by the Sapphire Analytics Engine and presented in a browser dashboard as Key Performance Indicators (KPIs) which make it easy to identify the areas of potential concern. CHWC also asked 7signal to perform an Optimization project to baseline the initial performance, suggest improvements and then track the effect of changes.

Results

After a week of data collection, the Sapphire system had a good baseline of the CHWC performance. This could be shown in the Service Level Agreement (SLA) View where red, yellow and green is used to indicate compliance against target values for KPIs. The baseline SLA View (see Figure 1) showed there were issues with attach rates and throughput in both the 2.4GHz and 5GHz bands.

DAY	Beacon availability in managed AP scan	Radio attach success rate	IP address retrieval success rate	Ping success rate	TCP test success rate	VoIP test success rate	Ping RTT	TCP DL throughput	TCP UL throughput	VoIP MOS downlink (listening)	VoIP MOS uplink (talking)	AP radio retransmission rate	Client radio retransmission rate
2015-03-09	98.3%	100.0%	100.0%	96.6%	97.8%	98.9%	97.9%	45.5%	77.4%	94.9%	100.0%	62.8%	53.1%
2015-03-08	99.4%	100.0%	100.0%	98.9%	98.1%	98.9%	98.4%	55.4%	85.5%	94.5%	99.4%	76.1%	95.0%
2015-03-07	100.0%	100.0%	100.0%	100.0%	99.2%	98.7%	99.5%	52.7%	85.3%	99.5%	100.0%	77.3%	52.7%
2015-03-06	99.4%	100.0%	100.0%	97.5%	99.5%	99.2%	96.4%	49.5%	85.9%	98.4%	99.5%	63.6%	65.8%
2015-03-05	100.0%	98.9%	100.0%	99.0%	97.8%	97.8%	97.9%	52.6%	84.3%	97.7%	99.4%	63.8%	58.3%
2015-03-04	98.8%	100.0%	100.0%	99.5%	99.5%	97.9%	100.0%	49.5%	84.3%	97.3%	100.0%	75.3%	60.3%
2015-03-03	100.0%	100.0%	100.0%	97.0%	100.0%	98.2%	100.0%	52.1%	86.3%	99.5%	97.9%	72.9%	81.2%
2015-03-02	100.0%	100.0%	100.0%	96.8%	99.1%	98.3%	100.0%	55.6%	83.6%	93.1%	100.0%	91.2%	82.2%

Fig 1: Initial SLA View – Bryan Hospital (2.4GHz)

This provided the level of visibility into the end-user experience that CHWC wanted to see. Using the Sapphire software, CHWC and 7signal worked together to identify a series of steps to improve performance, including adjusting the channel plan and AP power levels. After each step, the team could see the impact of the changes and assess the performance improvement. The SLA view after optimization (Fig 2) showed significant improvement in all metrics.

DAY	Beacon availability in managed AP scan	Radio attach success rate	IP address retrieval success rate	Ping success rate	TCP test success rate	VoIP test success rate	Ping RTT	TCP DL throughput	TCP UL throughput	VoIP MOS downlink (listening)	VoIP MOS uplink (talking)	AP radio retransmission rate	Client radio retransmission rate
2015-10-31	96.6%	99.3%	100.0%	98.0%	99.3%	99.3%	100.0%	93.9%	95.9%	100.0%	98.6%	100.0%	100.0%
2015-10-30	98.2%	98.2%	100.0%	95.7%	100.0%	99.1%	99.6%	85.6%	90.5%	98.6%	99.5%	86.3%	81.1%
2015-10-29	97.7%	99.3%	100.0%	96.9%	99.3%	98.9%	100.0%	88.2%	95.0%	99.5%	99.1%	78.8%	79.6%
2015-10-28	98.6%	98.4%	100.0%	94.9%	100.0%	98.6%	99.1%	90.7%	92.0%	100.0%	99.0%	82.3%	75.0%
2015-10-27	98.2%	99.5%	100.0%	96.1%	99.1%	98.2%	99.1%	92.1%	95.4%	100.0%	100.0%	82.0%	80.4%
2015-10-26	98.6%	99.8%	100.0%	97.4%	100.0%	98.9%	100.0%	91.3%	90.4%	99.5%	100.0%	87.2%	76.4%
2015-10-25	98.2%	100.0%	100.0%	99.5%	100.0%	99.1%	100.0%	95.0%	96.4%	100.0%	99.1%	83.3%	68.5%
2015-10-24	100.0%	100.0%	100.0%	100.0%	99.2%	98.5%	100.0%	92.4%	90.8%	100.0%	100.0%	92.3%	73.3%

Fig 2: Optimized SLA View – Bryan Hospital (2.4GHz)

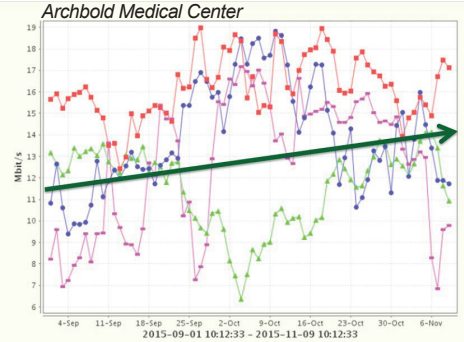

Fig 3: TCP Uplink throughput improved 60%

Another helpful way to examine performance is to look at a key performance indicator such as throughput over time. Not only can one see the impact of performance on certain days of the week or hours of the day, but also one can view the impact of the changes. Figure 3 shows uplink throughput for the Archbold Medical Center -- the result after several configuration adjustments was a 60% improvement in some areas. In parts of Bryan Hospital, the improvement in worst case performance was even more dramatic at 200%!

> ***"We're not running blind anymore. Now we can tackle performance issues proactively, before users feel it, not after the fact."***
>
> Greg Slattery, CIO

The system also provided visibility of the Wi-Fi experience for individual clients. Figure 4 shows how the retransmission rates of individual clients were reduced dramatically over the course of the optimization project. Declining retransmissions are indicative of more airtime available to transmit and receive more data in shorter times, which makes a positive impact on the user experience.

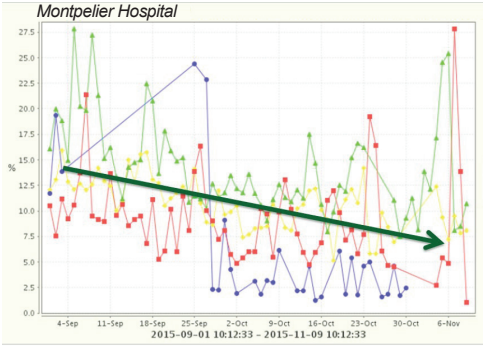

Fig 4: Client retransmission rates, cut by 50%

Setting up for Proactive Performance Management

The CHWC team now has the visibility it needs to proactively manage its wireless environment. In addition to the intuitive dashboards and graphs available from Sapphire, the system has been set up to generate automatic performance reports in pdf form that are automatically emailed to the IT management team. The team has also enabled alarms which generate automatic alert whenever certain KPIs fall below an acceptable threshold. In this way, the IT team is confident they will always be ahead of any issues that may arise as the environment changes, new applications are introduced or new devices join the network.

> ***"Being able to automatically measure and analyze the user experience at multiple facilities on a continuous basis, saves me lots of time."***
>
> Doug Shininger, Network Engineer