



Cambium Networks & STANLEY AeroScout Solution Paper



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Introduction

A well-performing Wi-Fi network is critical as hospitals are using Wi-Fi for many different applications. A Wi-Fi network must be high performing, secure, easy to deploy, easy to manage, and available 24x7x365. Wi-Fi traffic will include financial & human resource systems, EMR, HIS, IoT devices, RTLS, VoWiFi phones, a staff network, and a guest network, to name a few. Managing and prioritizing the Wi-Fi traffic will be critical to the overall performance and success of mission-critical systems.

The fastest-growing area on the hospital Wi-Fi network in terms of the number of devices is the Real-Time Locating System (RTLS). STANLEY AeroScout is the world's leading Wi-Fi-based solution for monitoring the real-time location and status of people, assets, and the environment.

STANLEY AeroScout is an RTLS system that provides solutions for:

- Asset management – drives cost savings (asset efficiency), caregiver efficiency, improved patient care
- Temperature monitoring and environmental monitoring
- Patient flow
- Staff workflow
- Hand hygiene compliance monitoring

Cambium Networks provides the high-performing Wi-Fi network necessary to feed RTLS information to the STANLEY AeroScout RTLS servers.

For more information on STANLEY AeroScout solutions, visit their website at <https://www.stanleyhealthcare.com/>.

Wireless Network Requirements for Hospitals

Wi-Fi networks play a critical role in a hospital's network infrastructure. Clinicians and staff have become reliant on the Wi-Fi network as they use hospital-issued devices and personal devices to securely gain access to the hospital's systems located on the LAN. VoWiFi phone systems and many IoT devices will not function unless they are connected to a Wi-Fi network.

Other purposes the network must support include:

- More than 85% of hospitals are using an EMR and a HIS system
- RTLS devices
- IoT devices
- Handheld devices
- Portable devices
- VoWiFi phones
- BYOB – smartphones, tablets and wearables

- Staff internet services
- Guest internet services

Performance

As you can see from the list above, there are many different areas and functions a Wi-Fi network must support, some of which are critical to patient care, so it must always perform at a high level. Not only must the network support the client bandwidth requirements, but it must also separate traffic so that medical devices and functions always have preference over less important traffic. With the XV series of Wi-Fi access points (AP), Cambium access points perform at a very high level and at the same time, prioritize traffic and ensure critical systems have preference over other devices on the network.

Reliability

Hospitals never shut down, so the Wi-Fi network must be reliable and operate 24x7. Any network outages will certainly impact the administrative functions, but more importantly, they could affect patient care and safety. The Wi-Fi network must always perform at a high level to support your performance and reliability requirements. Cambium Networks offers several different access point product lines which are engineered to be reliable and meet your network needs.

Security

Just as important to the performance and reliability of a Wi-Fi network is secure. Security is a little more challenging because of the mobile nature of Wi-Fi technology. Therefore, Wi-Fi networks address security with numerous capabilities to improve cybersecurity. WPA2 and WPA3 encrypt authentication communications, protecting the client login credentials. Known users and devices can log in to the network using the same 802.1x RADIUS authentication servers as clients on the wired network. Additional security is implemented by using access control lists to further restrict client and device access to certain parts of the network. Guests must also be able to connect to the network in a secure fashion and be placed in a network setup for public access only. The Wi-Fi network will also have WIPS/WIDS systems to provide rogue device detection and security measures against outside attacks such as DoS and man-in-the-middle attacks. To meet these requirements, Cambium Networks' solutions provide multi-layered security with integrated device onboarding and guest services.

Wi-Fi Network Planning

Coverage

IT departments are tasked with providing Wi-Fi coverage with sufficient bandwidth to meet today's demand and have the remaining capacity for tomorrow's growth. Planning for proper coverage in the Wi-Fi network should be a top priority, however, there are many considerations when planning Wi-Fi coverage for a hospital environment.

Hospitals are very challenging environments to deploy and manage a Wi-Fi network. Building construction materials, especially in older hospitals, will affect the Wi-Fi signal. For instance, radiology rooms have steel walls, completely blocking the Wi-Fi signal while office/patient walls could have insulation or a double layer of sheetrock to dampen surrounding noise. Some hospitals do not allow Wi-Fi access points to be placed in patient rooms.

When considering the SSID signal strength, design the network to provide an RSSI strength of -62 to -65 dBm with a signal-to-noise ratio of 25 to 30 dBm in all areas. A strong, clean RF environment results in higher data rates and gets client devices on and off the network faster.

Another consideration when planning for coverage is that a hospital is a very “mobile” environment. Clinicians and staff are constantly on the move. They may be carrying VoWiFi phones, a tablet, or wearable devices while moving between halls and floors. Wi-Fi coverage should extend to areas not normally covered in commercial buildings such as stairwells, closets, outside areas, and parking lots as they all may require Wi-Fi coverage.

Medical devices will come in many different shapes and sizes. An IoT device can be as small as a little tag and can be placed just about anywhere – in a room, on a patient, or moving around in a medical cart. A tablet or laptop may also be a medical device that moves with a clinician from room to room and floor to floor.

Many medical devices require an RTLS-capable network, which requires that APs are installed within and at the perimeters of the coverage area to form a triangulation pattern. A client device must be heard by at least three nearby APs to calculate an accurate location. The more APs hear a client, the better it is for accuracy and redundancy purposes.

Cell overlap should also be considered. Cell overlap is useful in a couple of different ways. First, if an access point happens to go down, then with sufficient cell overlap, the neighboring access points will pick up the client devices that were connected to the downed access point without the client devices losing network connectivity. The second way cell overlap is useful is when mobile communications devices such as a VoWiFi phones are moving from one cell to the next. The roaming communications between the two access points can start earlier, reducing the chance of dropped packets during the actual roaming handoff between access points.

Some of the different areas requiring Wi-Fi include:

- Public areas
- Administrative offices
- Exam rooms
- Operating rooms
- Radiology rooms (steel walls)
- Patient rooms
- Stairwells
- Outside areas and parking lots

Capacity

Planning for capacity is just as important as coverage because device density will vary in different areas. You will not get a lot of traffic in a stairwell but will have numerous client devices connecting in public areas. Over the past several years, there has been an explosion in the usage of IoT and medical devices in healthcare. IoT sensors are used everywhere – biomedical devices, physiological monitors, mobile medical devices, and facilities infrastructure such as thermostats, just to name a few.

There will be an average of 15 to 20 IoT devices in each hospital room. When you consider that hospital rooms are close to each other and there might be 20 rooms in a typical ward, that equates to a lot of devices in a relatively small area. Now, add in all of the mobile devices such as monitors, patient wearables, computers, tablets, and phones, some of which will be downloading large files such as radiology images, and the bandwidth requirements start to get very large. This can put a massive strain on the existing Wi-Fi network.

After determining the number of client devices connecting and how much bandwidth each device requires, you can calculate the number of access points that will be required in each area.

An active on-site survey can identify challenging areas and is recommended to accurately determine the number of access points required and where to place them.

Cambium Networks offers access points with two-, three- and four-client servicing radios which can scale to meet the most demanding capacity requirements.

Access Points

Wi-Fi access points are the heart and soul of a Wi-Fi network. They provide connectivity for client devices to the wired network. They also provide a toolset that features automatic RF tuning and corrections, security, QoS, client device roaming, and integration with third-party applications such as the STANLEY AeroScout RTLS system.

You can have plenty of access points covering an area. However, if they are not configured properly, they will not function efficiently, causing poor quality of experience for the end-users and, in some cases, the Wi-Fi network will not function at all. A good channel plan and power plan are critical to the overall performance of Wi-Fi access points. Fortunately, access points provide tools to automate these settings.

When an access point is booting up, it can use a feature called “auto channel”. The access point will scan the surrounding RF environment and select the best available channel to avoid co-channel interference and perform optimally. At the same time, the access point will apply the proper power setting to match the surrounding environment.

There will be times when changes in the RF environment will occur, which could negatively affect the performance of the Wi-Fi network. When this happens, the access point has tools to automatically react to changes in the RF environment. Automatic Channel Select allows the access point to scan the RF environment at configured intervals and, if necessary, move to a cleaner channel. If an immediate correction is necessary, interference avoidance allows the AP to change channels if certain thresholds are exceeded. Auto RF allows the access point to lower the radio’s power if it detects another radio operating on the same channel or will raise the radio’s power if the spectrum is clean.

Cambium Networks access points are designed with healthcare environments in mind. The auto environmental configuration and self-correction features are standard in all of our access points, allowing for maximum Wi-Fi network efficiency.

The access points also conform to and are certified to meet or exceed the very stringent healthcare equipment standard, IEC 60601-1-2. IEC 60601 is a widely accepted benchmark for medical electrical equipment. Obtaining this certification has become a requirement in many countries.

Wi-Fi Traffic Prioritization

The Wi-Fi network will be used for many different purposes as mentioned above. Not all Wi-Fi traffic is equal. Hospital systems and clinician traffic are much more important than guest traffic. It will be imperative to prioritize all Wi-Fi traffic to ensure critical systems are receiving sufficient bandwidth. There are several ways to prioritize Wi-Fi traffic, and there will be times when you use multiple options. You can prioritize by SSID, VLAN, and/or application. Application control, which is integrated into the access point system, allows the management of over 2,400 applications. You select an application and assign a QoS or DSCP value. You can also block applications from ever entering the network, or you can assign a bandwidth rate limit to an application.

Management

An effective management system is key to the success of the Wi-Fi network. Management systems provide many tools for the network administrator to utilize while managing the network. Cambium Networks' access points and management systems offer a very simple way to onboard new network devices using a zero-touch, automatic configuration of new devices.

More and more hospitals are analyzing device and client data collected by the Wi-Fi management system to better manage the Wi-Fi network infrastructure both in terms of configuration and planning for future upgrades and expansion.

The management system will also provide information on application usage. The network administrator can review Wi-Fi traffic to ensure mission-critical applications get top priority and have access to the necessary bandwidth, while less important applications have a lower priority. Patient and guest networks receive a "best-effort" bandwidth experience. If traffic gets misaligned, the administrator will use the management system to create policies to give applications a higher or lower priority.

The management system will also provide extensive reporting, logging, and audit capabilities as these functions are necessary for both internal use in monitoring, troubleshooting, and planning as they are required for compliance purposes.

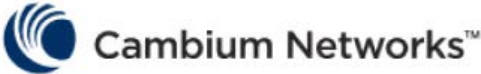
Summary

Hospital Wi-Fi networks must perform well and are expected to be available 24x7x365 as they provide client devices connected to the LAN and hospital and medical systems. Applications such as the STANLEY AeroScouts RTLS system provide real-time information on assets, personnel, and environments. Cambium Networks provides access points and management systems that perform superbly in these demanding environments.

Cambium Networks

Cambium Networks delivers wireless communications that work for businesses, communities, and cities worldwide. Millions of our radios are deployed to connect people, places and things with a unified wireless fabric that spans multiple standards and frequencies of fixed wireless and Wi-Fi, all managed centrally via the cloud. Our multi-gigabit wireless fabric offers a compelling value proposition over traditional fiber and alternative wireless solutions. We work with our Cambium certified ConnectedPartners to deliver purposebuilt networks for service provider, enterprise, industrial, and government connectivity solutions in urban, suburban, and rural environments, with wireless that just works.

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