Arista and Pole Star

Location and Tracking Services for Healthcare

Wireless powered smart healthcare solutions can deliver greater operational efficiencies and increase patient satisfaction by leveraging the real-time location of assets and people.

Improving efficiency is a critical component to improve access to high quality of care in healthcare facilities[1]. Additionally, it is estimated that the cost to patients of travel and wait times for doctor's appointments in the United States is $89 billion annually; more than any other service category[2]. The faster that equipment, people and places can be located, the faster services can be provided. Saving time finding equipment, finding places and finding people are seemingly simple ways to improve efficiency in a healthcare setting, but implementation of technology to actually save this time can be a daunting task. Additionally, healthcare institutions invest heavily in advanced medical equipment and costly inventory that needs to be easily and accurately tracked within a facility.

Location and tracking services can provide many benefits to healthcare institutions including saving time locating assets, places and people, saving money by accurately tracking inventory, and increasing overall efficiency to improve the quality of healthcare for patients. Wireless powered smart healthcare solutions can deliver greater operational efficiencies and increase patient satisfaction by leveraging the real-time location of assets and people.

Asset Tracking

Fast access to critical assets such as wheelchairs, beds, biometric monitors, IV pumps and scanners is essential for delivering timely care to patients. Tagged assets can be tracked easily, minimizing search time and saving costs of excess re-ordering due to misplacement. In addition to material assets, asset tracking can guide hospital staff and doctors to the nearest location where their assistance is needed, reducing the waiting time for the patients.

Patient Tracking

Ensuring safety and security of patients is of paramount importance in healthcare facilities. Tracking wandering patients or preventing child abduction requires smart, non-intrusive, and low cost solutions. Small wearable wireless tags provide real-time location information of the patient to a centralized monitoring system which alerts staff if the patient wanders into risky areas.

Geofencing

Geofencing creates virtual geographical boundaries that trigger an alert or action upon detection of specified tags. This is very effective for being able to see what equipment or what individual is in a specific area as well as helping to prevent unauthorized entry into restricted zones.

Wayfinding

Navigating through large healthcare facilities can be confusing for patients, visitors and new hospital staff. Simple, easy to use information delivered directly to the individual's mobile device provides easy to follow directions and alleviates anxiety for the patients/staff finding their way to a desired destination within the facility, quickly.

Nurse Duress

Nurses are at a high risk of assault from distressed patients and visitors. This risk can be reduced with a wearable wireless device that can be activated easily in the event of a threatening situation and alert security personnel almost instantly.

Figure 1: *Location and tracking use cases in Healthcare*

Locationing Technologies

Locationing technologies track the real-time location of assets/people leveraging different wireless technologies depending on whether the tracking is required indoors or outdoors. In indoor facilities, technologies such as Bluetooth Low Energy (BLE), Ultra Wide Band (UWB), and Wi-Fi are deployed, whereas outdoor locationing can use satellite based navigation technologies such as the Global Positioning System (GPS).

Bluetooth Low Energy

Bluetooth Low Energy (BLE) refers to the low energy (LE) mode of operation of Bluetooth designed to support location, positioning and advertising applications. BLE supports multiple communication topologies at a low data rate and has established itself as the most predominant technology for a wide variety of indoor location finding applications. BLE devices can be configured as beacons, scanners or both, depending on the application they are intended to serve.

BLE Beaconing

A BLE beacon continuously transmits data through advertising packets which contain useful information for other BLE devices within its range. Typical uses of beacons are:

- **Asset tags**
  - Tags attached to assets to be tracked
- **Infrastructure reference points**
  - Points of interest in wayfinding
  - Advertisers of push notifications in proximity marketing

In wayfinding and asset tracking, the distance between a BLE scanner device (e.g., a smart phone) and a beacon (e.g., an asset tag) is estimated from the received signal strength from the beacon. The most commonly used beacon standards are Apple's iBeacon and Google's Eddystone.

BLE Scanning

A scanner device passively listens to BLE beacons within its range and processes the data from the advertising packets it receives. Mobile phones and Wi-Fi Access Points are good examples of scanning devices. Scanners are useful in locating other BLE devices within their range and enable a host of space analytics applications.

Wi-Fi scanning

Wi-Fi scanners can scan and locate Wi-Fi devices within their range. The distance is estimated by the scanner from the signal strength received from the Wi-Fi device. In this case, the tags attached to the assets are Wi-Fi enabled.

GPS based locationing

In the outdoors, assets can be tracked using GPS trackers attached to the assets. GPS tracking works via the use of at least three satellites from the Global Navigation Satellite System (GNSS) network for trilateration of the asset. The need for access to satellite signals limits the use of this technology for outdoor use cases.

Arista and Pole Star Together

POLESTAR
TRACING THE WAY

Arista's Wi-Fi Access Points (APs) have the capability to function as BLE scanners, beacons or dual mode where they support both scanning and beaconing. In the scanning mode, the APs scan all BLE devices within their range. The APs can be configured to export the BLE device analytics to any third party server at a desired interval via CloudVision Cognitive Unified Edge (CV-CUE), Arista's cloud based monitoring application. In the beaconing mode, the APs can be configured to broadcast iBeacon advertising packets. The UUID, Major and Minor can be set in CV-CUE according to the hospital's use case requirements.

Pole Star's NAO® Suite offers a wide range of innovative location based services to get maximum value from a hospital's infrastructure. Pole Star's BLE tags for indoors (NAO® Bluespot V4 Indoor) and outdoors (NAO® Bluespot V4 Rugged) are compatible with Bluetooth® 5 and have up to 10 years of battery life. The BLE tags, Arista AP's, and Pole Star's NAO® Cloud fit in together perfectly to offer seamless locationing, wayfinding and tracking solutions both indoors and outdoors of a healthcare facility

Solution Architecture

The use cases to be serviced in a healthcare institution fall under two categories:

- Mobile location services
- Tracking services

The dual mode capability of Arista APs coupled with Pole Star's powerful indoor positioning platform, NAO® Cloud, provides a comprehensive framework for offering both location and tracking services that are accurate and scalable.

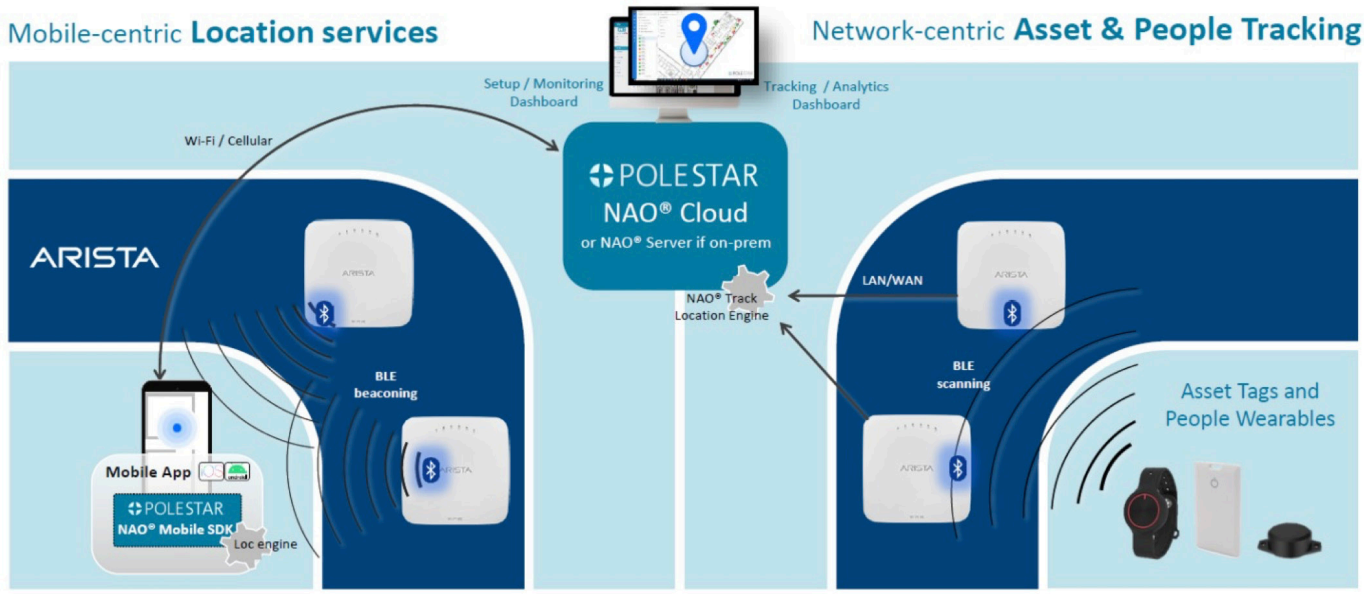

Figure 2: *Arista - Pole Star solution for location services and tracking*

The Arista-Pole Star integrated locationing solution encompasses both hardware and software product offerings of Arista and Pole Star.

	Arista	Pole Star
Hardware	Access Points with BLE scanning/beaconing	NAO® Bluespot V4 Indoor NAO® Bluespot V4 Rugged
Software	CloudVision Cognitive Unified Edge	NAO® Cloud NAO® Track NAO® Viewer NAO® mobile SDK for Android and iOS

Mobile location Services

Mobile location services encompasses all use-cases that require smartphones to be "location aware" regardless of whether they are outdoor or inside a venue, in order to be addressed. Examples include "blue-dot" wayfinding, Mobile duress (virtual SOS button on security applications), and security guards location monitoring. The components required include the user's mobile device, BLE beaconing capable APs, and Pole Star's NAO® mapping SDK.

There are many locationing methodologies that exist on the market today, including GPS, WiFi RSSI, Geomagnetism, BLE proximity, and BLE RSSI fingerprinting. Pole Star's advanced SDK embeds a powerful sensor fusion algorithm that ingest the phone's motion sensors data along with GPS information. This helps delivering seamlessly accurate positioning with smooth indoor/outdoor and floor transitions, with a high level of fidelity, nearing 100% room and floor discrimination.*

The figure below includes all necessary steps to set-up Pole Star's mobile location services solution.

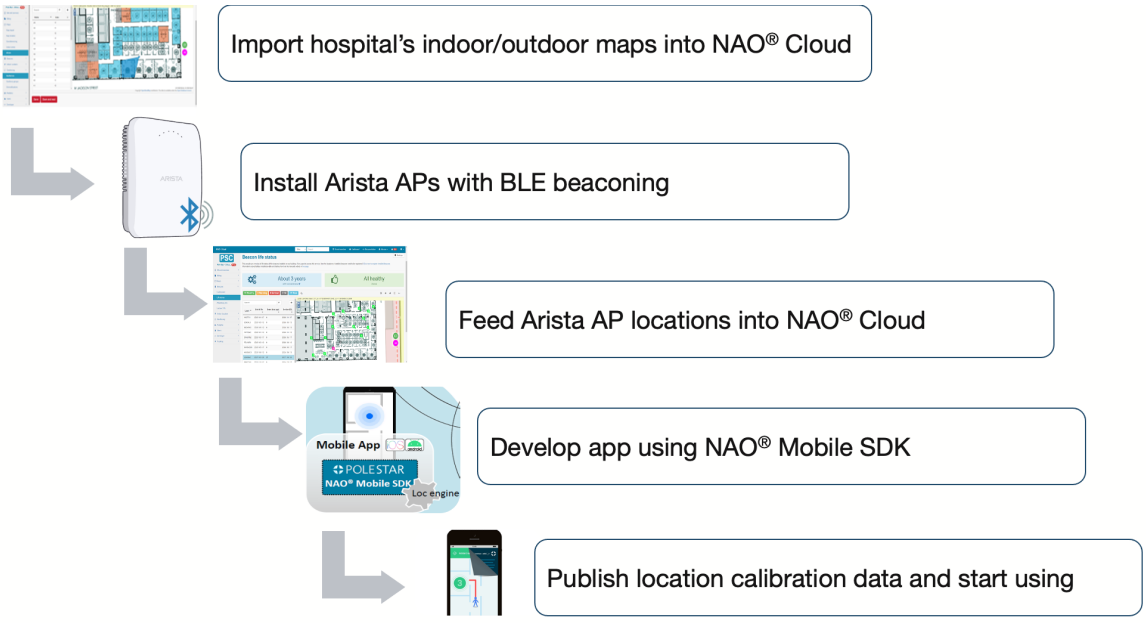

Figure 3: *Deploying wayfinding solution with Arista APs and Pole Star NAO® Cloud*

**Achievable when deployment guidelines are respected.*

Pole Star's NAO® Mobile SDK allows easy development of innovative mobile based positioning applications. Arista APs deployed at strategic locations within the hospital rooms, corridors and walkways function as location anchors by advertising iBeacons tailor made for the facility. The UUID, Major and Minor fields of the iBeacons can be easily customized in Arista's CV-CUE remotely. The locations of the APs are registered on the hospital's digital map imported into NAO® Cloud. Real time synchronization between the mobile app and NAO® Cloud offers seamless locationing services that enable hospital staff, patients and visitors to be located through the facility effortlessly.

Figure 4: *Arista - Pole Star technology integration for mobile location services*

Tracking Services

Assets/people to be tracked are tagged with Pole Star's BLE tags which can be configured and monitored remotely via NAO® Cloud. The asset tags are scanned by all Arista APs in sight which push the key metrics of the tags (received signal strength, data rate, uptime, etc.) to NAO® Cloud, enabling real-time tracking of the assets and people carrying configured BLE wearables. Arista's CV-CUE enables remote configuration of the APs connectivity to NAO® Cloud and push interval of the metrics. The NAO® Track application uses these metrics to provide real-time tracking of the hospital's assets. The metrics also enable NAO® Track to offer powerful location analytics of the assets providing data insights for streamlining hospital operations.

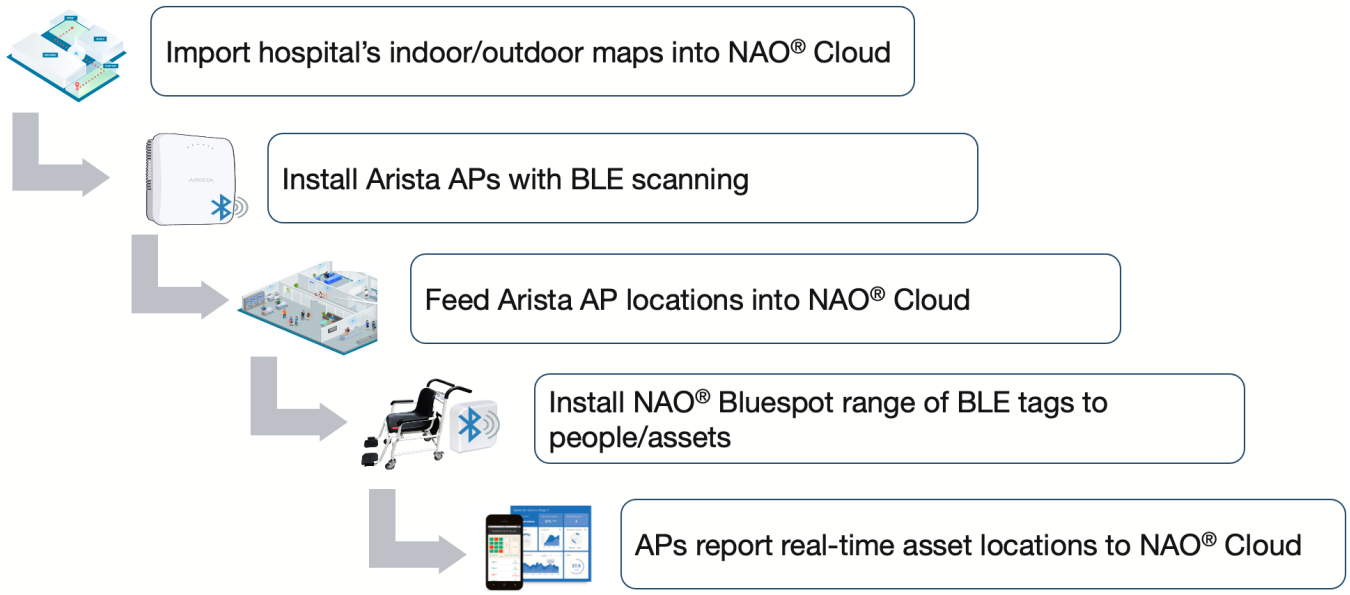

Figure 5: *Asset and people tracking with Arista APs (scanning) and NAO® Cloud, NAO® Track*

Figure 6: *Arista-Pole Star technology integration for asset tracking*

Benefits to customers

The benefits of the joint solution offered by Arista and Pole Star include:

Seamless integration

The integration of Pole Star's BLE tags, Arista APs and NAO® Cloud is made easy and seamless by Arista and Pole Star's powerful cloud platforms - CV-CUE and NAO® Cloud respectively.

Fast deployment

The deployment of Arista APs and NAO® Bluespot tags is fully automated, thanks to the backend cloud platforms supporting the deployment. The NAO® Maps SDK makes it possible to import the hospital's maps on the NAO Cloud platform, and to easily integrate it into any mobile application before deployment. These capabilities enable fast and easy to maintain deployment.

Scalable solution

The integrated solution is highly scalable, which can be deployed in small as well as large healthcare facilities with the same ease. Arista's CV-CUE and Pole Star's NAO® Cloud leverage the flexibility of their respective cloud native architectures to scale the deployment as required.

Real-time tracking

Arista APs provide the flexibility to export the asset tag analytics at any desired time interval ranging from 5 seconds to 3600 seconds. This fine time granularity facilitates real-time tracking of tagged assets, thus helping the hospital staff to address emergencies quickly.

Control and Visibility

NAO® Cloud and CV-CUE offer complete control over the configuration of BLE tags and AP's BLE beaconing and scanning functionality. The end-to-end visibility delivers actionable location data enabling invaluable insights into the assets usage and tracking thereby improving operational efficiency.

References

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