

Deliver Amazing Mobile Experiences with
Enterprise-Grade BLE Location Services



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The world is at an inflection point, where Smart Devices (phones, tablets and laptops) are taking over as the predominant computing platform. While this can present various challenges from a wireless operations and management standpoint, it also opens up huge opportunities for business. That is because Smart Devices are location-aware, and location is a strategic attribute for engaging with customers/employees and tracking high value mobile resources.

Companies that can take advantage of indoor location have a leg up on the competition. They can elevate the mobile experience, resulting in improved service, better user satisfaction, streamlined operations, and more. So, how can you best capitalize on this opportunity by offering high accuracy wireless indoor location services in a simple, seamless, and cost effective way? Mist Systems' Intelligent Wireless Cloud (IWC) platform with Enterprise-Grade BLE Location services is the answer.

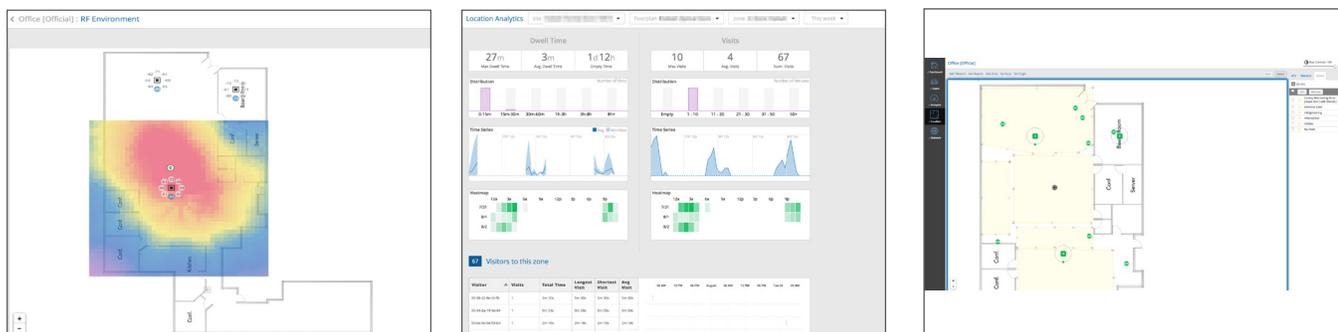
The New World Order

In the past few years, Bluetooth Low Energy (BLE) has become a default standard on most Smart Devices (primarily thanks to iBeacon and Eddystone). This means that the vast majority of mobile computing platforms are location-ready. The challenge comes, however, on the infrastructure side – i.e. how can the wireless network leverage BLE in a scalable, reliable and cost effective way? It traditionally has been very time consuming and expensive to deploy and manage physical beacons for BLE. Installation often requires comprehensive site surveys, which have to be redone whenever beacon placement changes (or the RF environment is altered). In addition, batteries in the beacons are expensive to replace, and the beacons themselves can be lost or stolen which creates additional headaches. Furthermore, wireless networks lack the scale to handle a large amount of BLE devices, making performance and management of BLE networks difficult.

Mist solves the above problems with the new Intelligent Wireless Cloud (IWC) platform, which combines cloud intelligence with on-premise access points to simplify wireless operations and deliver high value location services. The same award-winning Mist platform used for business critical Wi-Fi can also be used to deliver enterprise grade BLE, with the following unique attributes:

Virtual beacons – Mist's patented virtual BLE (vBLE) technology that enables an unlimited amount of virtual beacons to be deployed in a physical environment with the simple click of a mouse to move and add virtual beacons. Mists's vBLE solution offers numerous advantages over traditional physical beacons, which include:

- No batteries.
- Beacons are easy setup and moved via software (no on-site visits required).
- No risk of loss or theft or movement from a beacon's original position
- Building aesthetics are not affected by the deployment of physical devices.
- Virtual beacons are stackable so different applications and tenants can get different messages.
- No site surveys or ongoing calibration required.
- vBLE beacons co-exist with existing BLE deployments, so you can leverage your existing investment.



Mist provides high accuracy location services with sub second latency using innovative virtual beacon technology

Highest accuracy location – Mist offers the best location accuracy in the business, with 1 to 3 meter accuracy with sub second latency based. Machine learning eliminates the need for BLE site surveys and provides the best user experience across different mobile devices.

Microservices cloud architecture – The foundation of the vBLE architecture is a real-time, distributed microservices cloud architecture (built on Storm and Kafka), which provides extreme low latency location estimates at very high scale. This is critical for use cases such as wayfinding, where real-time updates are necessary for a positive user experience.

Proactive insights using Machine learning – The Mist platform examines Received Signal Strength Indication (RSSI) observations coming from the user's mobile devices and continuously updates the Radio Frequency (RF) model for each different mobile device type, such as iPhones, iPads, and Android smartphones. This ensures that the RF model adapts to the RF environment as it changes and accounts for differences between device types, providing a consistent user experience across mobile devices.

As a result, unsupervised machine learning can solve problems that can't be described with a simple set of rules, such as the need to determine the always-changing characteristics of an RF environment. Adding a chair or a new partition to an environment changes that environment's RF characteristics. Even the number of people in a room can change the room's RF characteristics.

Mist Systems' machine learning takes location estimates from everyday use, examines them, detects the RF characteristics based on the input, and adapts the path loss formula. Machine learning operates across distinct end-user devices, constructing specifically tailored path loss formulae—which is necessary, as different devices have different RF

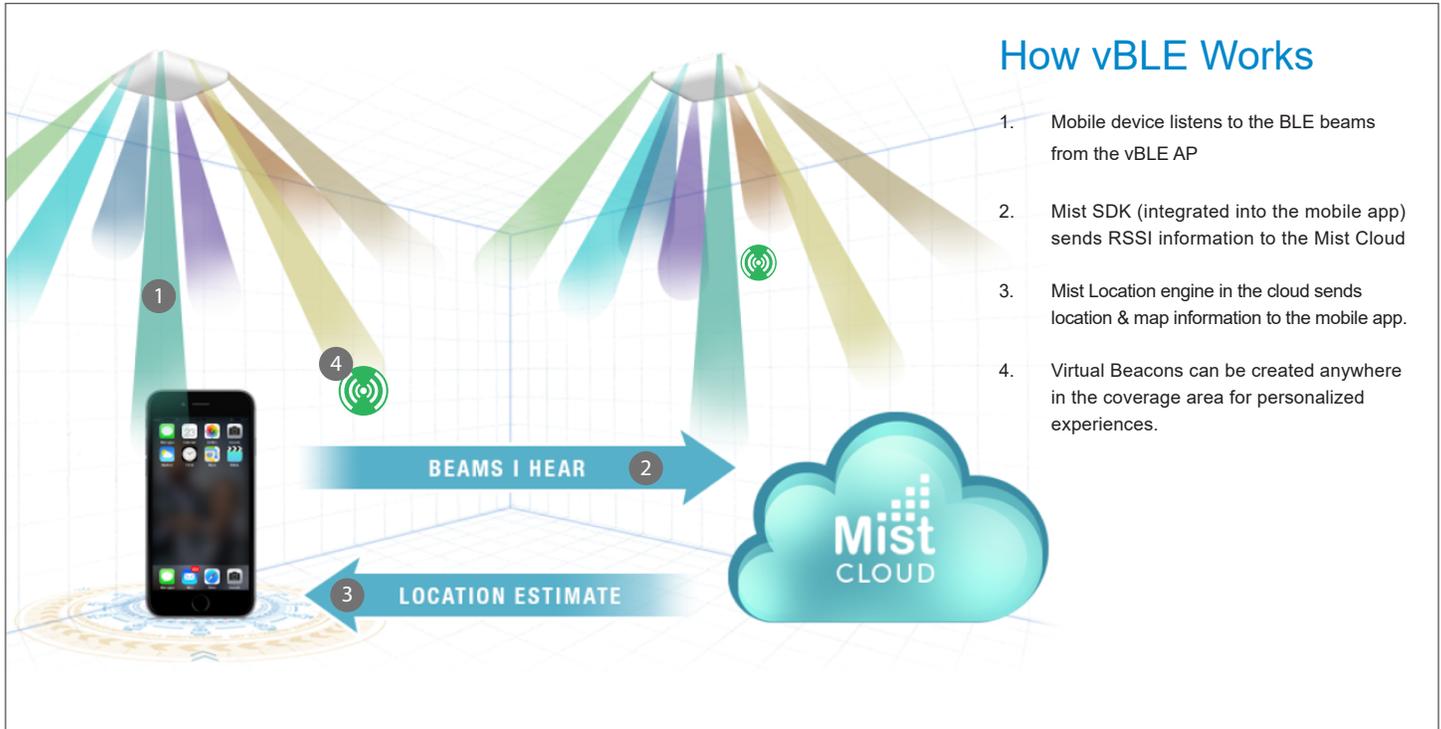
characteristics. The Mist Systems machine learning system continuously and automatically adapts to different devices and RF environments, as well as to changing RF environments, without the need for site surveys.

Best-in-class Access Points – All Mist Access Points provide the highest quality location services. Currently, the following AP models are available:

- **AP41 (WiFi and BLE)** – The AP41 is an enterprise-grade Wi-Fi/BLE Access Point (AP) with Location services built-in. The AP41 features our industry-first vBLE array, a 16 directional antenna and 1 omni-directional element array for Bluetooth Low Energy. Thanks to the vBLE array, enterprises no longer have to deploy two separate wireless networks—802.11ac Wave 2 Wi-Fi and a parallel set of BLE beacons—to enable location-aware applications. Venues can deploy, move and manage virtual beacons via the cloud. The technology provides the location granularity needed for demanding location-based services, such as wayfinding.
- **BT11 (BLE)** – The BT11 is an industry-first virtual Bluetooth Low Energy (version 4.2) Access Point, with a 16 antenna element steerable directional antenna and 1 omni-directional element array. Mist BT11 supports daisy chaining of up to 5 Access Points when connected to 802.3at power. The Mist BT11 supports beaconing in Apple iBeacon, Google Eddystone and AltBeacon advertising formats.

Mobile SDK. The Mist Systems mobile SDK is available on both iOS and Android platforms and provides the mobile app developer three types of APIs to the mobile application: a virtual beacon API; indoor location API; and zone analytics API.

The Mist Systems mobile SDK receives the BLE beacon signals and gathers data from the mobile device sensors, such as accelerometers, then sends the data back to the cloud location engine. In turn, the location engine returns the location estimates.



Elevate the Value of your Wireless Network

Mist provides the first enterprise-grade BLE technology to make location-aware experiences deployable and manageable at scale. Enterprises can add or move beacons anywhere in their venues with a click of a button. Marketers can create new campaigns overnight that leverage the following functionality:

Identification and personalization – Identify your user, whether it's an employee, hotel guest, student, patient, or passenger, as he or she arrives on site. Provide a personalized experience and tailor services and information specific to their interests.

High accuracy location/navigation – Enable users to easily locate items, such as in-store merchandise, or resources, including conference

rooms, patient rooms, and hospital wheelchairs, and then navigate to those items and resources via turn-by-turn directions. Allow users, such as sales associates, to quickly locate other users, such as customers asking for help, while both are on the premises.

Push notifications – Provide location-aware push notifications, such as special promotions, personalized to your users or customers.

Analytics – Gather zone-based user analytics, such as the average number of customers in store and number of passersbys, as well as the amount of time customers dwell in a certain retail aisle or department, to help improve marketing and sales efforts. Use analytics to give users helpful information, such as real-time security checkpoint line wait-times at airports.

Use Cases: From Airports to Enterprises, Healthcare to Hotels, Schools to Casinos

Here's how Enterprise-Grade BLE Location Services deliver exceptional customer experiences in nine different verticals.

Airports

Allow passengers to navigate to their departure gate, find the closest restaurants and restrooms, and locate nearby retailers. Travelers can opt to automatically receive location-aware alerts, including coupons and special promotions, from airport retailers and restaurants. The airport app can alert passengers when it's time to get to the boarding gate. Through analytics, give app users information on the shortest security lines.

Enterprises

Enable users to find open conference rooms and quiet rooms; locate a colleague's office; and find printers and other resources. Security notifications can be sent to employees on a particular building or floor. Office occupancy analytics can help you understand the utilization of a physical space. And Internet of Things (IoT) support can enable energy controls based on room occupancy, saving both electricity and money.

Healthcare

Using a mobile app as a personal concierge, patients (and their visitors) can check into a hospital as they enter and navigate to an assigned room. Deliver a personalized in-room experience and offer information about doctors and treatments. Provide a location-aware nurse-call system. Enable patients and visitors to navigate to the cafeteria, radiology, pharmacy, or other areas, and make it possible for healthcare workers to find each other easily in a large medical facility. With analytics, hospitals can track patients and assets (such as expensive wheelchairs), monitor room temperatures, and understand how much time a doctor or nurse spent with a specific patient in his or her room.

Hotels and Hospitality

Provide hotel guests with seamless, fast check-in. Identify your most loyal guests and automatically send a greeting to their smartphone as they arrive or thank them for their stay as they depart. Guests can easily navigate to their rooms, the hotel restaurant, fitness center, or swimming pool, as well as locate nearby stores and restaurants. Offer coupons and special promotions. Gamify a guest's stay with location-aware rewards. Use analytics to help guests find the shortest check-in or other lines.

Retailers

Notify shoppers when items purchased are ready for pickup. Provide location-aware coupons and notifications, such as greeting loyal customers

as they arrive at a store with a special offer. Deliver relevant product information, such as a short video, while a customer is looking at the product in the store. Enable customers to navigate to a specific department or find an aisle or product in a large store, ask to have a sales associate dispatched to help them, and easily find the shortest checkout line. Use analytics to learn how many customers came into the store at a given time, where they spent the most time, and more.

Restaurants

Identify customers by name as they arrive and ask if they'd like to order menu items they've previously purchased. Allow diners to place an order from anywhere and pick it up in the restaurant or the drive-through window. Offer incentives to encourage previous customers in proximity to return to your restaurant. Use analytics to understand how many previous customers have passed by the restaurant, how many placed an order, and how one restaurant location's traffic compares to another in the brand.

Museums

As a visitor nears, automatically deliver relevant information about a specific exhibit, through text, video, or other content, to provide a more immersive experience. Guided tours enable visitors to walk through the museum on their own while learning about its exhibits. Navigation allows visitors to find a particular exhibit, food stand, or restroom or ask for a museum staff member to help them. With analytics, you can enable visitors to locate the least-crowded exhibits and see real-time exhibit wait times.

Education

Enable users to find open labs, conference rooms, and quiet rooms across campus; navigate to their next class; and find out how long it will take to get there. Guided campus tours enable new students and parents to find their way around; locate the closest restaurant, store, or bar; and provide navigation specifically for disabled students. Analytics can help educational organizations understand traffic flows at on-campus facilities and provide user information, such as real-time cafeteria line wait times.

Casinos

Identify high rollers as they enter the casino floor and offer them special deals and coupons. Allow users to navigate to the closest restaurants, bars, and restrooms. Give visitors information about queue lengths; even provide location-aware augmented reality apps to make the casino experience more immersive.

Create Amazing Wireless Experiences

Mist provides the premier wireless platform for Enterprise-Grade BLE Location services. It is easy to deploy, easy to manage, and enables a wealth of new mobile experiences in a seamless and cost effective way.

To learn more, please visit www.mist.com, email sales@mist.com, and/or follow [@MistSystems](https://twitter.com/MistSystems) on Twitter.

About Mist

Mist built the first wireless platform for the Smart Device era. By taking a user-first approach to networking, the Mist Intelligent Wireless Cloud (IWC) eliminates the operational burdens of legacy wireless architectures by replacing human interaction with machine learning and proactive automation. In addition, Mist takes unique advantage of user location and behavior to deliver a superior experience for wireless users.

The Mist team consists of leading experts in wireless, machine learning, and cloud, who are responsible for building the largest and most advanced networks in the world. Founded in June 2014, the company is based in Cupertino, CA. For more information, visit mist.com