



## ExtremeWireless<sup>™</sup> Locationing: ExtremeLocation

A new look at location-based solutions.

Businesses are using location-based services to know where customers are, their location and better understand their context via analytics to improve the customer's experience. This scenario drives towards Contextual Location Policy (CLP) application. Enterprises such as healthcare and transportation or logistics companies might be more interested in asset tracking and workflow to improve efficiencies, but would also benefit with CLP.

To implement these mobile strategies, the technologies needed to interact with the customer, employees, or to track items will vary. The analytics will need to be powerful to create the right level of interaction for the ultimate customer experience, while the analytics for understanding workflow and material tracking might be more flow oriented, looking at dwell times.

### Elements of Locationing System

The location-based solutions used for indoor applications today are based on Wi-Fi, RTLS, and Bluetooth. With the pervasive deployments of Wi-Fi throughout enterprises for employee and customer use, these systems can be used to provide a level of accuracy to 5-10 meters. In recent years, the use of another common wireless technology, Bluetooth (BLE) has been used to improve the accuracy even further, down to a meter.



## Presence

The goal of presence is to just detect that a Wi-Fi signal is within range of the access point. Since it may be just one access point, the client could be anywhere within range. The client does not even have to be connected, just on and transmitting a beacon. Even if the mobile device is inactive, it would be enough to sense a device in the area. The access point will see the transmission and report it. If the user/device is known within the system, via a MAC registration which associated a user with the client MAC address, then the store or hotel would know the customer is on the grounds or in the facility, such as entering the lobby.

**Precense** - Indicates whether a device is present or not, based on management or data frames.

- Typical analytics collected:
- Inside vs Outside
- Peak and Off-Peak Hours
- Footfall Trends
- Loyalty - Repeat vs New
- Engagement - Dwell Time Trending
- Device location

## Zone Tracking

Using a single access point detects and locates device based on a pre-configured RSSI threshold. The software of the locationing system will collect the information from the various Access Points, and calculate approximately where the client might be within the "Zone". With careful planning and setup, these systems have proven to be as accurate as 7-10 meters. A retailer could know if a shopper is in a department, while a hotel may know if the guest is in the lounge, near the pool, etc.

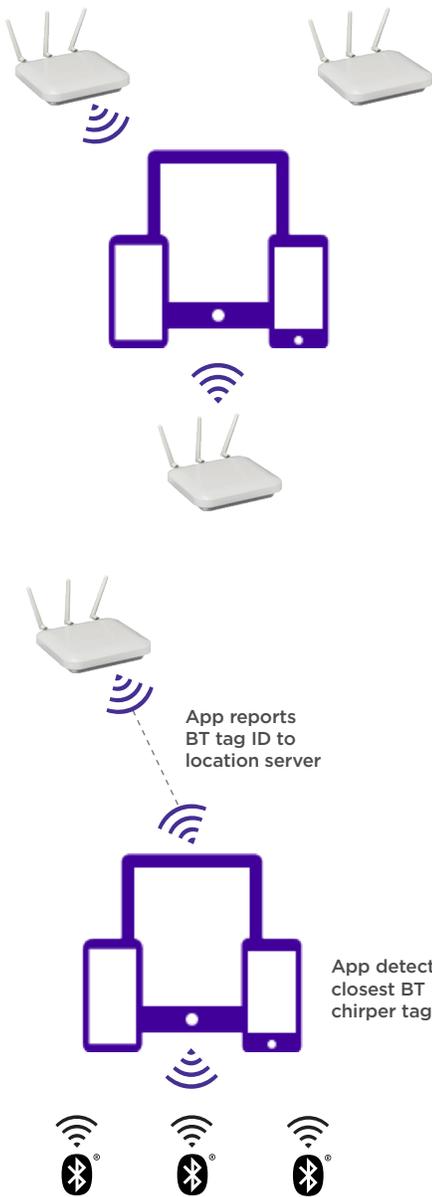
**Zone Tracking** - Detects and locates a device based on pre-configured RSSI threshold - aka Zone Tracking Threshold.

Ideal for the following use cases:

- Department-level accuracy
- Popular zones in the venue
  - Device density heat maps
  - Dwell time heat maps
  - Real-time and Historical
- Movement of device from one zone to another
- 7 - 10M accuracy

## Position Tracking

The third level of accuracy can use Wi-Fi triangulation, RF Fingerprinting or Bluetooth. With Wi-Fi, the mobile device does not have to have an application on it. The location engine uses either triangulation based on RSSI feeds from APs and sensors, or uses RF fingerprinting to estimate the location of the device. With careful AP placement and measurements, tracking accuracy of up to 5M has been achieved.



**Position Tracking uses triangulations and/or RF fingerprinting for computing locations.**

- 5M accuracy

Bluetooth BLE is used because it is a common wireless technology used on most, if not all, mobile devices. BLE location tracking is enabled with Apple iBeacon or Google Eddystone technology.

**Position Tracking also uses Bluetooth tags (chirpers) and an app on the mobile device.**

- 1 - 5M accuracy

Whereas Wi-Fi does not actually require an application on the device to know the device was in the area, the use of Bluetooth Low Energy (BLE) requires that an application be installed on the mobile device and connected, to the backend location server via Wi-Fi or through 4G. The way to think about this use case is that the mobile phone becomes a BLE detector, 'Geiger counter' looking for BLE tags which will be strategically mounted throughout the facility. These tags will be calibrated with the site map. As the user travels close to the tag, the application on the mobile device sees the BLE beacon and reports the beacon's MAC address to the location server, so it now knows the user is within a particular area, within close proximity to the tag.

This information could be updated on a displayed map on the users mobile device, it could be used to push a coupon to the user since they may be near a lounge or restaurant, or within range of the sports department, notifying the shopper that the product they had on their Wish List is now on sale.

Both Apple and Google have developed their own approach for using BLE. Apple has iBeacon, while Google uses Google Eddystone, and then there are others as well. Extreme offers a number of access points that have integrated BLE supporting both iBeacon and Eddystone location based services.

## Wi-Fi RTLS - Real-Time Location System

Wi-Fi RTLS technology uses vendor tags that transmit a Wi-Fi signal to access points throughout the building. Using differential-time-of-arrival methods, the third party software uses calibration and triangulation algorithms to estimate where the tags (equipment) are located. As opposed to BLE tags which are stationary, RTLS Wi-Fi tags are mobile, moving throughout the facility, while the third party software tracks the location of the tags.

## Analytics

Depending on the vertical and the goals, the analytics required will vary, with verticals like retail and hospitality being customer oriented, with the desire to collect customer demographics, preferences, and location, and then improving their 'brand' experience to personally tuned offers which meet their needs.

The types of analytics would vary for vertical, but as an example for retail they may be comprised of the following:

- Total visitors
- Repeat visitors
- Dwell time
- Heat maps
- Zonal comparison
- Site ranking

## Contextual Location Policy Use Cases

ExtremeControl would be an excellent aggregation engine to implement Contextual Location Policies, collecting location information from the infrastructure, along with the analytics, identifying the user and applying the appropriate policy.

Let's take a look at a few examples of how these could be implemented.

### Education

With the adoption of digital education and on-line testing, both K12 and higher ed are using wireless LAN pervasively throughout the schools to provide simple sign-on and network access for students, via either school issued mobile devices or BYOD programs.

Contextual location policies can be applied during testing, identifying the student, their device, the time of day and their location. If they are in a classroom where there is on-line testing taking place, their network policies could be changed to only allow access to the testing resource, prioritizing their traffic and bandwidth depending on the test needs. It may also be able to restrict their access to surrounding access points in the next rooms.

### Healthcare

Hospitals are probably one of the most demanding and challenging wireless environments and one of the verticals most focused on leveraging location services for both people and machines. Many different types of users, different types of applications, and different types of equipment, all having different needs, but most are critical.

By knowing the devices, users, and location, and time of day, Contextual Location Policies can be setup to protect patient data. As an example, a clinician may have a smartphone which does not allow access to social media when on patient floors but available when in public spaces such as the cafeteria. Another example is with infusion pumps. When clinical engineering needs to perform a maintenance patch on a series of infusion pumps they must find all of them as efficiently as possible. It is not uncommon for these devices to be stashed away for clinical use and the time spent tracking down missing devices creates patient risk.

### Retail and Hospitality

Both retail and hospitality are focused on improving their customer experience through mobile engagement. Knowing who your guest is, what loyalty member level they are would allow a hotel to welcome the guest to the property when they enter the lobby, tell them which room they are in, or

offer a coupon to use in their lounge while the room is services. If the hotel has a tiered network service, the guests wireless service could automatically be adjusted provide the corresponding level of service.

In retail, knowing your loyalty shopper is in the store and which department they are in, if they are browsing a certain aisle, price shopping a particular product, would allow the retailer to make a special offer to that shopper for the product of interest to capture that impulsive purchase.

## Extreme Networks Locationing Support

The following table provides an overview of locationing technology and the level of support provided by Extreme products.

Description		ExtremeWireless	ExtremeWireless WiNG
Verticals		Education, Healthcare, Manufacturing, Stadiums	Retail, Hospitality, Transportation and Logistics
Presence	Within range of AP	YES	YES
Zone Tracking	7-10 meters	YES	YES
Position Tracking	RF Finger Printing and Wi-Fi Triangulation: 5 meters	YES	YES
RTLS	Uses 3rd party RTLS Wi-Fi tags and software that performs location tracking	Aeroscout, Centrak, Ekahau	Third Party
Integrated BLE	3-10 meters	AP3912, AP3916ic	AP 7602, AP 7622, AP 8533, AP 8432
Autonomous BLE Tags	1+ meter accuracy	Third party tags and software	Third party tags and software
Third Party Analytics API Support	Application/vertical specific analytics and wayfinding	YES	YES

## Summary

Just about every vertical industry can benefit from contextual location analytics. Along with the examples provided, manufacturing, as well as transportation and logistics, have valuable ways to benefit from this technology. Extreme Networks solutions including wireless LAN, locationing, analytics and policy control make a powerful combination and solution.