

LOCATION TECHNOLOGY 101



You've probably heard of technologies like bluetooth, blue dot or beacons—and you may have heard the term location-based services (LBS).

If you're not exactly sure what these things mean or how they work together, you're not alone. According to the Gartner IT Glossary, location-aware technology includes “sensors and methods for detecting or calculating the geographical position of a person, a mobile device or other moving objects.”¹

With the rise of smartphone adoption, consumers have become accustomed to having location-based technologies such as GPS at their fingertips. As the general public has become more reliant on smartphones for gathering information, shopping and socializing—and as new location technologies emerge—companies must find innovative ways to use this technology to provide value to their customers.

Types of Location Technology (and How They Can Work Together)



GPS

You're probably already familiar with GPS. To pinpoint your location, a GPS receiver first locates at least three satellites above you. Essentially, the receiver draws a sphere around each of those satellites, and your location is the spot on the ground where those three spheres intersect. Most US adults are used to navigating with GPS on their iPhone or Android device. In fact, 67% of smartphone owners use their phones for turn-by-turn navigation while driving (at least occasionally.)²

GPS technology is great—when you're outside. Indoors, GPS doesn't work so well because the satellite signals are blocked by the building(s), and GPS was never designed to operate with the accuracy required for small indoor spaces. That's where beacons and Bluetooth come in.



BEACONS

Beacons are small devices (about the size of a business card) that send low-energy Bluetooth signals to estimate the proximity of another Bluetooth-enabled device (such as your smartphone). Like a geo-fence (more on those later), a beacon doesn't pinpoint your location on a map. It just identifies whether you are in range of its signal and, if so, how close. The signal range is usually up to 25 or 30 meters from the beacon, which can be installed anywhere. This signal range can also be dialed down to a very short distance, which allows for precise location detection—but only in relation to the beacon itself. Outside of the beacon's range, devices are invisible.

With multiple beacons, however, a user's position can be determined at distances anywhere from 30 meters down to just a few inches. This "micro-location" happens constantly and quietly in the background on the user's smartphone, providing seamless, accurate indoor navigation similar to the way GPS provides navigation outdoors.

One of the main advantages of beacons is that even if no Wi-Fi or phone signal is present, beacons will still work, allowing users to route in areas that don't typically have Wi-Fi access like a basement or parking lot.

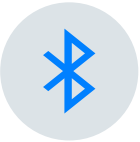
How many beacons do I need?

- If you want to try using beacons for location-based marketing or notifications, you can start with a single beacon (provided you also have the back-end software required to send and manage location-based communications).
- For indoor navigation, the number of beacons your facility needs will depend on its size and the desired level of navigation interactions. Typically, beacons are installed in areas that are accessible to the general public such as hallways and reception areas. In some cases, this only accounts for 10% of a venue's overall square footage.

Did you know?

- ▶ Beacons are powered by batteries. Each battery has a lifespan of about 3-5 years.
- ▶ Beacons do not interfere with other machines, technology or software.

Recent advancements in beacon technology mean that beacons have become inexpensive and widely available. Multiple manufacturers and beacon-enabled technologies are entering the market. Beacons represent a step closer to a truly intelligent internet of things, in which our devices can talk to each other as well as the world around us—without us initiating that contact.



BLUETOOTH (BLE / LOW ENERGY BLUETOOTH)

Bluetooth technology is the global wireless standard enabling convenient, secure connectivity for an expanding range of devices and services. Bluetooth technology exchanges data over short distances using radio transmissions. Sometimes you'll hear Bluetooth LE or BLE. The "LE" simply stands for "Low Energy," and represents a battery-preservation advancement in Bluetooth technology that allows it to be used for location services without draining users' batteries.

Where does the name "Bluetooth" come from?

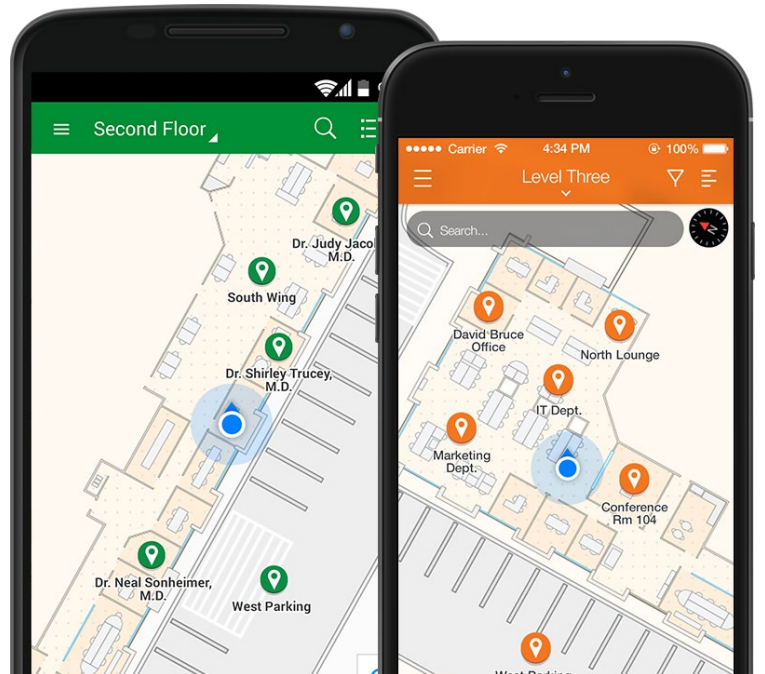
The 10th-century Danish King Harald Blåtand (translation: Harold Bluetooth) helped unite warring factions in parts of what are now Norway, Sweden and Denmark. Similarly, Bluetooth technology was created to unite disparate products and industries with connectivity and collaboration.



INDOOR POSITIONING (BLUE DOT)

With indoor blue dot positioning, the blue dot on a smartphone map follows you wherever you go and is an indication of your real-time location—just like the blue dot that follows you in Google or Apple Maps.

For outdoor navigation, the blue dot usually indicates a position provided by GPS satellites. Indoors, on the other hand, signals from beacons can be triangulated to show a user's location on a map with accuracy of 2-3 meters and a refresh rate of multiple times a second as the user moves along the route (in Phunware's blue dot solution, anyway).





WI-FI TRIANGULATION

The same wireless networks we use to surf the web indoors send signals throughout the building and extend their potential toward location-enabled applications. Here's how: when a device on a Wi-Fi network comes within range of at least three Wi-Fi access points, its location can be triangulated. That means you can use the Wi-Fi infrastructure that likely already exists at your physical venue to enable indoor mapping, wayfinding, location-triggered marketing and more—without a lot of added time and cost for implementation.

A wireless access point is a device that allows mobile devices to connect to a network using Wi-Fi.

When selecting a location technology provider, pay close attention to the location accuracy they offer, the update frequency and their product's latency (obviously you want as close to zero latency and real-time frequency as possible—you want users to be able to see their location in real time, not lagging or bouncing all over the map). The typical signal range of a Wi-Fi access point varies from 20 to 50 meters.

It's up to the owner of the Wi-Fi network to decide whether they want devices within its coverage range to be able to engage with location-based interactions, and up to app users to do the actual engaging. The communication between devices will depend upon Wi-Fi network permissions and how app users configure their devices' location settings.

Indoor Wi-Fi's ability to allow for precise navigation and analytics is somewhat limited due to the wide signal ranges. As high levels of accuracy and movement are required for navigation, the number of access points and data services required may become very complex (and expensive!).

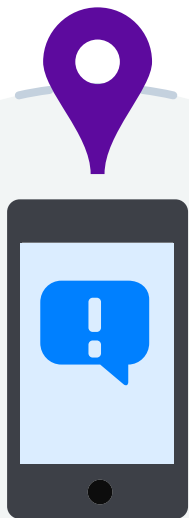


GEO-FENCING

Geo-fencing is a tool in a software program that uses GPS coordinates to draw a virtual boundary around a physical space. Geo-fences can be any size and shape.

When a device with the relevant software installed (like your brand's app) crosses a geo-fence, it recognizes that it has breached the geo-fence and displays the message that has been associated with that geo-fence's campaign. In this scenario, these would be messages your team creates to send to users based on location, click placement strategies and demographic and behavioral profiles. For example, a restaurant might send promotions to user devices that come within a few hundred yards of its location (assuming these users have opted in to the service).

The geo-fence is not an active participant in this messaging process. All of the intelligence resides within the mobile device, which recognizes when it has crossed through the geo-fence.





GEO-CONQUESTING

Geo-conquesting refers to using location-based technologies to target customers who are near a competitor's location in an attempt to attract them away with a compelling, real-time message based on their location. Generally, geo-conquesting starts when a business draws a geo-fence around a competitor. When an ABC Store app holder visits a competitor location that has been geo-fenced, they might receive a message saying "Shopping for X? Head into the ABC Store for 20% off today only."

How Does This Tech Work with Phunware (and Vice Versa)?

Phunware is location tech-agnostic: our platform modules provide accurate and real-time location-based services that integrate easily with GPS, Wi-Fi or beacons from any technology provider (or several). Our customers are already taking advantage of Wi-Fi enabled location-based services in their applications.

Phunware transitions between location technologies seamlessly. For example, if you need to navigate from the inside of one building (using beacons or indoor Wi-Fi), through an outdoor courtyard (using GPS), and into another building (using beacons or indoor Wi-Fi), an app using Phunware's blue dot will stay locked to your route the entire time, providing an effective and accurate wayfinding experience.

Want to know more? Read our new eBook on how location-aware technologies can bring new life to an app, complete with location marketing use cases and tips.

GET THE eBOOK

Button not working?

Go to <http://bit.ly/1O4LWgX>

¹ <http://www.gartner.com/it-glossary/location-aware-technology>

² <http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/>



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