Proximity versus Positioning… What's the Difference?

As location-based technologies take off, there's lots of hype about proximity and beacons versus positioning and sensors. **Is there a difference, and if so, which is better?**

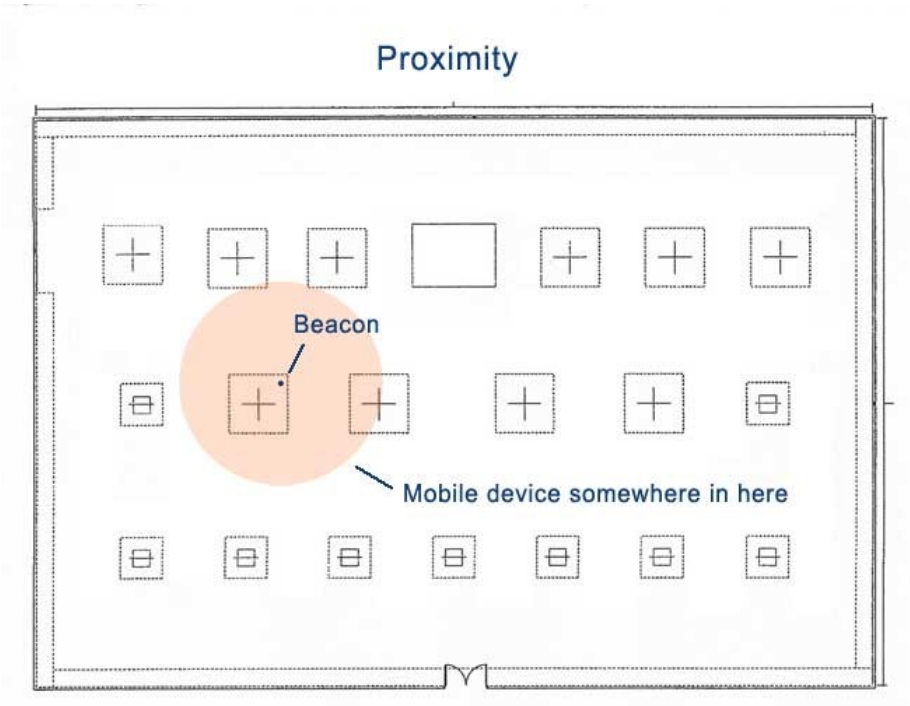
There's little doubt that location-based technologies are the new hot kid. These days it seems you can't turn a corner without bumping into a pundit expounding on how the location revolution is going to change the way we work, live and play. Thanks to the surging tsunami of Internet gadgets and smart things, pretty soon your mobile will not only serve up hamburger coupons while you're in the food court, it'll also nag you about the calorie in your double cheeseburger and direct the ambulance to your motionless body after you choke down the fourth one.

Along with the deluge of excitement around the possibilities of technology that shapes itself based on where we are, we're also being treated to a raft of new buzzwords to describe how and what makes location-based stuff possible. Chief among these are a couple of terms, beacon proximity and sensor positioning, which both are often described as key to enabling the location-based future. So what are they and what's the difference?

Proximity and those blinkin' beacons

The word "beacon" popped into locationing vernacular around the middle of last year. You can thank Apple for that. Preceding the launch of its iPhone 5, word leaked that the phone would include something called an "iBeacon" on it which would enable it to communicate with other iBeacons in its general area. As a technology, the iBeacon wasn't all that new. Underneath it was an implementation of a portion of the Bluetooth wireless standard called "Bluetooth Low Energy" (BLE) or Bluetooth Smart, and several other companies were already doing it under different names. It was Apple's marketing of it as a type of "beacon" built into its phones that kicked the door open on the term.

In simple terms, a "beacon" is a proximity technology; a low power transmitter (via BLE) that broadcasts its presence to other devices without actually "knowing" its own or the listening device's location. When another BLE-enabled device (e.g. a smartphone) enters its range, a mobile app on the phone that recognizes the beacon can trigger specific behaviors (e.g., push a coupon, check-in on social media, get a notification, etc.). Small, inexpensive, and available in a number of form factors — coin cell battery operated, USB, software, etc. — beacons can easily be carried with you (a la on your phone) or placed throughout and moved around a building or area.



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Looking under the hood, a beacon doesn't do much more than sit there and blink "hello, hello" to anything within its broadcast radius. If another device comes within range, is listening and has an app that knows what to do when within range of that beacon, then something happens (e.g., a coupon is pushed to the phone).

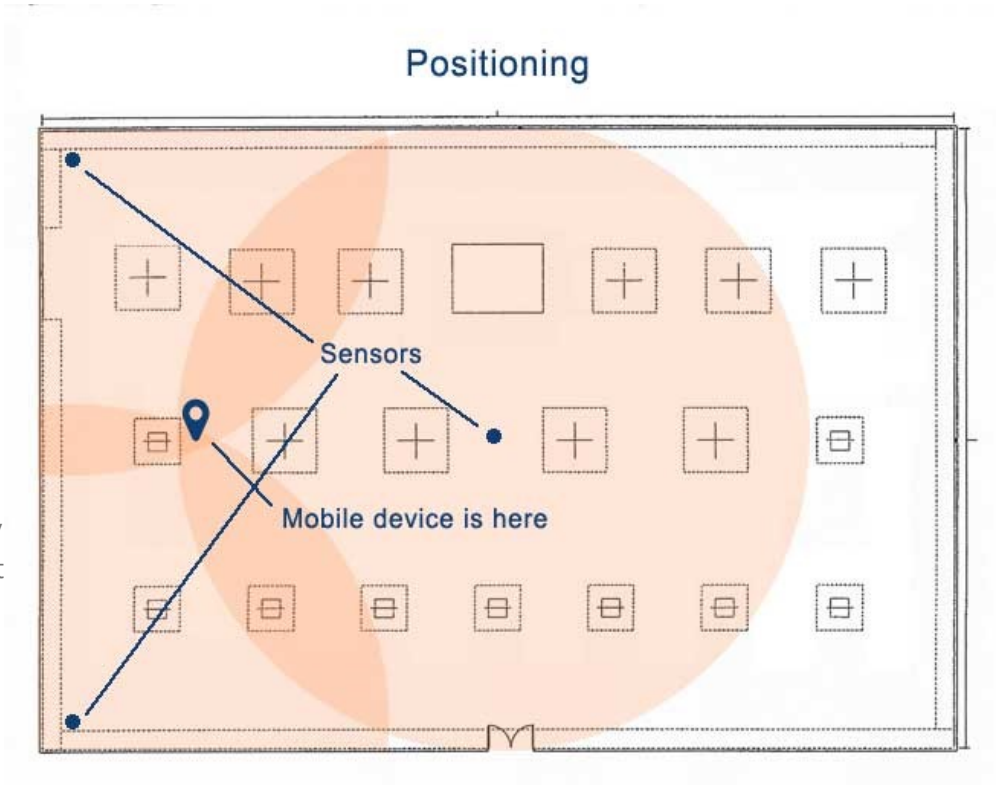
The upside to beacons is they're small, cheap, easy to deploy and can run for years on a single battery, so deploying a whole array of them in a place isn't a major task or expense. Additionally, the broadcast radius on a beacon can be tuned to anything from a few inches to several dozen feet so there's a great deal of control over how close another device has to be in order to trigger an action.

The downsides include the fact that BLE isn't fully implemented on the vast majority of smartphones (even some that support it only support pieces), meaning that at least for the next five years or so only fraction of devices will be able to interact with beacons. Additionally, while BLE has a theoretical range of 50 meters or so, in actual application it is much smaller — generally less than 10 meters — because physical structures and obstructions (walls, racks, large objects, etc.) can interfere with the signal.

Positioning: Deploy the Sensors

While proximity is all about triggering an action based on its distance relative to a beacon, positioning is about determining a device's absolute physical location and triggering an action (providing directions, pushing zone-based notifications, etc.) based on that. For positioning, we use sensors — a broad category of devices used to take a physical measure (e.g. "sense" something) and convert it into a signal that can be used by another machine, software system or person. In location-based applications, sensors are used in an array to detect a signal (e.g., cellular radio, Wi-Fi, Bluetooth, light, sound, etc.), trilaterate the device's actual location and trigger an action based on that.

Positioning technologies include geo-location and geo-fencing which are tied to specific latitude / longitude coordinates, and indoor locationing and zone technologies which are tied to x-y coordinates within a specific area such as a building floorplan, property boundary, public square etc. Geo technologies are usually GPS-based and are therefore most useful outdoors where they can accurately locate a device within 100 – 300 feet on average. Indoor locationing provides the same functions in areas where GPS is less efficient and can provide positioning in the 50 to sub-10 foot range.



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The advantages to location-based services with positioning include near-universal device support (all cell phones emit a cellular signal and a significant percentage are also Wi-Fi enabled) and the ability to deliver a broad range of services — wayfinding, geo-fencing, traffic analytics, zone-based security and content delivery, etc. — from the same platform. This also means that a few sensors can cover a large area (for example, five of our Zone sensors can provide full locationing coverage for a 10,000 square foot area).

The drawbacks to sensor positioning are cost, and a more complicated deployment. Multi-spectrum and hybrid sensors (ones that detect Cellular, Wi-Fi, and/or Bluetooth signals) can cost five or 10-times that of a beacon. Additionally, the sensors consume far more power than BLE beacons, so they either need to be re-charged on a regular basis or physically wired to a power source.

So which is better, beacon-based proximity or sensor-based positioning?

The answer is, of course, it depends.

For location-based applications where costs are a major consideration, "in the area of" is good enough (e.g., a restaurant entrance), where objects are mobile (merchandising displays), or where location services coverage needs are limited to a couple of spots rather than an entire building, beacons and proximity technology are going to be well-suited. The trade-off is relatively few devices will be able to take advantage of it, it's not well-suited for applications that require being in a specific location (e.g., in front of a digital sign), and features will be limited rather binary on/off, yes/no sort of behaviors. Additional location features, especially unrelated ones, will likely require additional beacons and additional software to manage it.

For location applications where being able to reach a majority of mobile device users, offering full coverage over large areas, indoor/outdoor transitions applications, providing specific location features like directions with real time updates, or delivering multiple location-based functions from the same platform (e.g., coupons, notifications, location-based content, security alerts, etc.), sensor positioning will prove itself a good fit. However, in gaining these abilities, one also adds significant costs as well as installation and maintenance requirements.

Ultimately, beacon-based proximity and sensor-based positioning are complementary rather than competing technologies and in the coming years we'll probably see hybrid implementations that include components of both to provide a context-aware experience that interacts with us in the manner that's most appropriate at that time and place.