

UNDERSTANDING BEACONS

A GUIDE TO BEACON TECHNOLOGIES

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Introduction

This short document is intended to answer basic questions about how Bluetooth Low Energy (BLE) beacons work, as well as their capabilities and limitations. The technology behind these devices is also referred to as “Bluetooth Smart” or “Bluetooth 4.0.”

Beacons are sometimes misunderstood as instruments of “surveillance,” capable of tracking smartphone owners’ movements without their awareness. This is incorrect.

Beacons transmit a low-power signal that can be picked up by nearby Bluetooth-enabled mobile devices, including smartphones. Beacons themselves don’t collect data. They broadcast short-range signals that can be detected by apps on mobile devices in close proximity to a beacon.

Beacons positioned near an airport security checkpoint, for example, might trigger an airline app to display a boarding pass. A beacon next to a painting in a museum might signal the museum’s app to show information about the artist. Retail-store beacons can help users locate products or indicate on-sale items. Library beacons can be used to remind users about overdue books.

Beacon signals won’t be received unless users have installed apps that are associated with those beacons (i.e., the airline app, a museum app, a retail store app, a library app, etc.). Device owners must also have enabled use of Bluetooth.

What Is Bluetooth?

“Roughly 90 percent of all mobile phones sold today are Bluetooth enabled...”

Bluetooth is a wireless technology that was invented by Swedish company Ericsson in 1994. In 1998 a number of companies (Intel, IBM, Nokia and Toshiba) joined Ericsson and formed the Bluetooth Special Interest Group (SIG) to promote Bluetooth. The not-for-profit Bluetooth SIG has more than 24,000 member companies today.

Bluetooth is widely used in cars, computers, smartphones, audio equipment and other devices for transmitting information up to roughly 100 meters (328 feet). In addition to their smartphones many people own other Bluetooth devices, such as a wireless computer keyboard or mouse, Bluetooth speakers or headphones.

Roughly 90 percent of all mobile phones sold today are Bluetooth enabled, according to Bluetooth SIG.

What Is “Bluetooth Low Energy”?

Unlike traditional Bluetooth, which can transmit large quantities of data (e.g., music or video streaming), the purpose of BLE is to deliver small amounts of data using very little power. This is designed to minimize the impact on device battery life.

What Are Beacons?

Beacons consist of a chip and other electronic components (e.g., antenna) on a small circuit board. A beacon is essentially a radio transmitter that sends out a one-way signal to devices equipped to receive it. There are numerous beacon makers around the world. Beacons come in various sizes but are generally small and inexpensive. Prices vary but they can be purchased for less than \$30 per beacon.

Beacons can be as small as a quarter and usually fit in the palm of a hand. The graphic below illustrates some of the beacon providers in the market, though there are many others.

Examples of Beacons



What is iBeacon?

Apple’s iBeacon technology is a type of packet that a BLE beacon transmits – essentially a proprietary beacon standard. Apple introduced iBeacon at the company’s June 2013 developer conference in San Francisco. The term “iBeacon” is an Apple trademark; however the underlying technology is similar to other BLE beacons.

Why Are Beacons Popular?

“...they can offer an enhanced or more personalized user experience.”

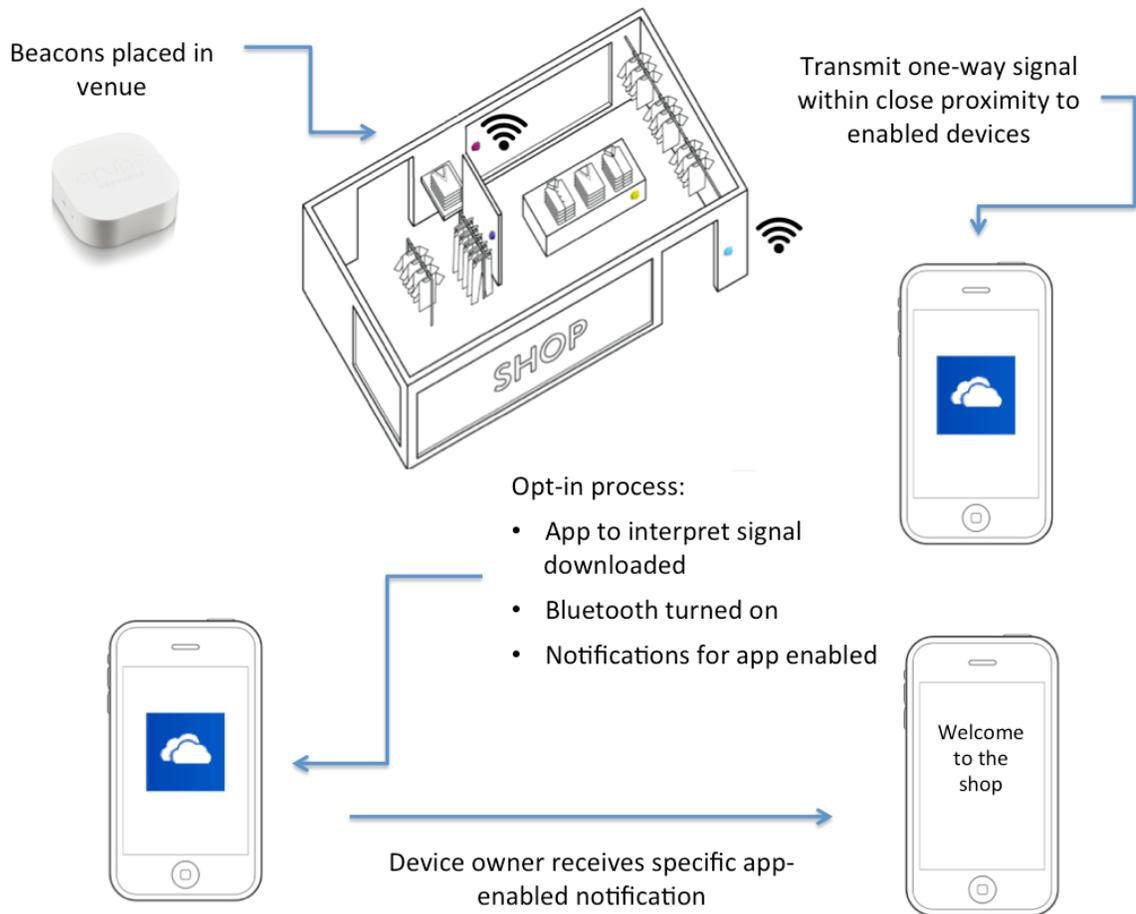
Numerous retailers, shopping malls, museums, airports, hospitals and sports complexes are experimenting with or deploying beacons for a variety of purposes depending on the context. Beacons are growing in popularity because they can offer an enhanced or more personalized user experience. They're also inexpensive, simple to deploy and are supported by most mobile operating systems (i.e., Apple, Android, Microsoft).

Apps Required for Message Reception

Beacon signals are transmitted in a limited “region” or “zone,” within 100 or so feet typically. But without a relevant app (airline, sports team, retailer) to listen for and translate the beacon’s signal, its message will not reach an end user. Mobile devices must also have Bluetooth turned on to receive the signal. Roughly 30% to 50% of US smartphones have Bluetooth on by default according to various industry sources. The beacon and its “messages” or content will be invisible unless these conditions are met.

With a corresponding app installed, beacons can help deliver an improved indoor experience. The NBA’s Golden State Warriors, for example, used its team app and beacons to inform fans at the game about the availability of better seats. There are many such examples. And while beacon coverage has focused on marketing, there are many non-commercial uses such as airports providing indoor guidance to visually impaired travelers.

How Beacons Work



Do Beacons Capture User Data?

By themselves, beacons can only detect that a Bluetooth-enabled device has entered its zone. Unless the device owner has downloaded an associated app, the beacon knows nothing about that individual and cannot pull or capture any information about the device or that person.

An app associated with specific beacons (e.g., airline app, airport beacons) can determine a user's proximity. This allows the app to open a boarding pass when a user nears the airport gate or enables a retailer to send offers to people inside their stores. Yet users have control through settings and user choices over whether they receive these notifications and offers. Roughly half of US users today routinely allow apps to send them notifications.

Can Beacons Track People?

A beacon can help an app determine how far away a smartphone is within its zone or range (e.g., 25 feet). An emerging process called “trilateration” can also be used for beacon-guided indoor navigation. This, again, requires an app download and Bluetooth “opt-in.” Beacons themselves cannot pinpoint smartphone position and do not track smartphone owner movements.

Users Are in Control

“...there are multiple controls device owners currently have over beacons.”

Consumers are starting to learn about and have experiences with beacon-enabled apps. Early survey and behavioral data reflect those experiences are largely positive. To make the market work for everyone, consumers must be given a clear understanding of how beacon-enabled apps operate and how they use mobile data. This is the intention of the app stores and beacon providers.

As indicated, there are multiple controls device owners currently have over beacons. On the iPhone, for example, they can disable location services for specific apps. Users can also turn off notifications and Bluetooth or delete apps entirely.

Yet as they learn more and gain an understanding that they’re in control, most device owners will likely opt-in to beacon-enabled apps because of the potential benefits they offer – in hotels, airports, museums, stores, sports stadiums and range of other venues.

Additional Resources

On the difference between Mobile Location Analytics and Beacons: <http://bit.ly/15Y3IHg>

For the Bluetooth SIG: <https://www.bluetooth.org>

For information about the Future of Privacy Forum: www.futureofprivacy.org

For information about the Local Search Association: www.localsearchassociation.org

Contributors

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Greg Sterling is VP of Strategy and Insights for the Local Search Association (LSA). He is also a contributing editor at leading tech blogs Search Engine Land and Marketing Land. He writes a personal blog, Screenwerk, about connecting the dots between digital media and real-world consumer behavior. Previously Sterling worked as a senior analyst for Opus Research and The Kelsey Group (now BIA/Kelsey). He was also founding editor at Allbusiness.com and a producer for TechTV. Sterling has a law degree and practiced litigation in San Francisco and Los Angeles for roughly 10 years.

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Jules serves as Executive Director and Co-chair of the Future of Privacy Forum, a Washington, D.C.-based think tank that seeks to advance responsible data practices. Jules previous roles have included serving as Chief Privacy Officer at AOL and before that at DoubleClick, as Consumer Affairs Commissioner for New York City, as an elected New York State Legislator and as a congressional staffer, and as an attorney. Jules currently chairs the privacy advisory board of Gigya, and serves on the Advisory Boards of the Cookie Clearinghouse, Frankly and the Center for Copyright Information. He has served on the boards of a number of privacy and consumer protection organizations including TRUSTe, the International Association of Privacy Professionals, and the Network Advertising Initiative.

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Stephany Fan serves as Legal and Policy Fellow at the Future of Privacy Forum. At FPF, Stephany's project portfolio focuses on mobile location and application privacy. She is a graduate of the Georgetown University Law Center, where she was an online editor of the Georgetown Journal of International Law and a winner of the Iron Tech Lawyer competition.

About the Local Search Association

The LSA is the largest trade organization representing companies engaged in location-based advertising and marketing. LSA has more than 300 members in 30 countries. Members include listing management companies, digital agencies, mobile and social media companies, print and online directory publishers, video service providers and web design and hosting firms. The LSA provides thought-leadership, advocacy, research and insights to its members and the broader marketplace.

About the Future of Privacy Forum

The Future of Privacy Forum is a Washington, D.C.-based think tank that seeks to advance responsible data practices. Founded five years ago, FPF is supported by more than 80 leading companies, as well as an advisory board of comprised of the country's leading academics and advocates. FPF's current projects focus on online data use, smart grid, mobile data, big data, apps and social media.