



## CONNECTING TO PASSENGERS – ARE BEACONS THE BREAKTHROUGH?

### BEACON TECHNOLOGY – IMPROVING THE CUSTOMER SERVICE EXPERIENCE

**If the hype is to be believed, the customer service experience is about to undergo a fundamental change. Beacons emitting a Bluetooth signal are starting to appear in shops to guide customers around the store, provide additional product information, and even to pay without the need to join a checkout queue – improving the overall shopping experience!**

Airlines are also starting to see the potential of beacons and are teaming up with SITA's strategic technology research team, [SITA Lab](#), to open the door to new groundbreaking services that could enhance the passenger experience at the airport.

Simply put, beacon technology is a way of providing proximity and context information to mobile devices. It is already a crowded space with Wi-Fi, QR codes, and the much talked about NFC.

So what makes beacons different and what can they do for the air transport industry?

### BEACON BASICS

The beacon devices are an indoor proximity system available in various shapes and sizes but can be as small as a USB stick or larger and more visible. They transmit a signal using Bluetooth Low Energy, or BLE for short – the signal contains a unique identifier for that beacon. When a BLE-enabled device, such as a smartphone, moves within range of the beacon's signal it can trigger an action, such as displaying a contextually relevant message on the phone. Beacons make possible a new range of user interactions.

In a real world scenario, the beacon could trigger an app on your smartphone to send notifications or promotional coupons as you entered a specific zone, such as a shop, cafe or airport lounge. It could also direct you to areas of interest and provide additional information on specific items, making museums and art galleries another potential user of the technology.

## BEACONS ENABLE INNOVATIVE APPLICATIONS IN A MOBILE CONNECTED WORLD

Beacon technology is part of the 'here and now'. BLE is based on Bluetooth 4.0, which is a standard feature in current mobile devices. That includes iPhones from 4s onwards and Android 4.3 phones. Practically anyone with a recent smartphone device will be able to receive the signal from the beacon – and therefore the notifications. (See [full list](#)).

BLE-based beacons also have a number of other useful characteristics.

- **Low cost:** The beacons are relatively low cost. For example, beacon manufacturer, Estimote, is currently offering three beacons for US\$99. They can send a signal to any BLE-enabled device up to 70 meters away by specifying a broadcast range. This can make covering a large floor space a much cheaper proposition than other connectivity solutions, such as Wi-Fi or using a multitude of NFC tags.
- **Energy efficient:** The BLE technology in beacons requires only a miniscule amount of energy to work. That means they don't need to be plugged in and can run off a coin-battery for long periods of time. Some reports suggest up to three years. Maintenance is therefore largely hassle-free.
- **Distance sensitive:** When a smart phone detects a beacon, it can determine the distance to the beacon down to the nearest meter, if deployed correctly. GPS is also accurate to within a short distance, but it does not work well indoors. So while your phone can know that you're standing right outside a particular shop, it loses track of you as soon as you go inside. That makes beacons more useful for location sensing on mobile devices than GPS and potentially more accurate than other indoor location-sensing technologies, such as Wi-Fi and cellular triangulation. This indoor proximity capability opens up a wide variety of navigation and contextual-aware possibilities inside buildings.

## RETAIL IS THE DRIVING FORCE

Not surprisingly beacons are gaining interest in the retail world.

Apple made a passing mention to what it calls iBeacon as part of the iOS 7 presentation at its Worldwide Developers Conference in 2013. By December, it had deployed them throughout its 254 U.S. stores. Apple can send people messages about products and other information, tailored to where they are inside the store, as long as they have downloaded the Apple Store app and given permission to receive notices based on location.

A number of other U.S. retail outlets are also deploying beacons, including Macy's with its Shopkick app and more recently InMarket launched the rollout of beacon technology to more than 150 food stores in three major US cities, based on Apple's iBeacon system.

The first implementations are mainly around contextual marketing, but the retail opportunities for beacons lie well beyond basic in-store location-based vouchering.

PayPal plans to take beacon technology further with a hands-free payment solution. The PayPal Beacon uses BLE to communicate between the point-of-sale (POS) and the customer's mobile device loaded with the PayPal app. In a restaurant scenario, the customer is 'checked in' as they enter the premises and can just get up and leave at the end of the meal with a beacon triggering the payment of a digital bill as they exit, without waiting to hand over a credit card.

## WHAT'S THE DIFFERENCE BETWEEN BEACON TECHNOLOGY AND NEAR FIELD COMMUNICATION (NFC)?

With the possibility to turn beacons into a POS the technology is inevitably drawing comparisons to NFC, with commentators saying Apple's iBeacons are an NFC killer. The reality is that the two technologies address separate use cases and concerns. NFC works well when two devices are very close to each other, but is useless for larger areas.

Beacons provide a proximity-based alerting system that can trigger an app on a smartphone at a much greater distance. One travel example could be to display a boarding pass stored in mobile wallet like Passbook. The beacon is not used to exchange any data between the phone and boarding pass reader, unlike NFC, which does transfer the data.

In addition, the PayPal beacon system is not as straightforward as it sounds. It requires a number of components coming together including the PayPal app on the phone, a customized beacon (with dedicated payment security), a user with a PayPal account and a merchant accepting PayPal. While it is a secure payment system, it is not a solution that will easily scale.

## WHAT IS BLUETOOTH LOW ENERGY (BLE)?

BLE was released under the brand name of Bluetooth Smart as part of Bluetooth 4.0. It is an ultra-low power network that operates in the 2.4GHz spectrum, which is license-free around the world. It is a standard feature in both iOS 7 and Android 4.3.

BLE is designed for transferring small amounts of data at low data rates. The principal benefit is that it consumes very small amounts of energy, which means device batteries have a long life.

BLE comes fully loaded with AES128 encryption featuring a robust connection that has cyclical redundancy checks and adaptive frequency hopping.

Overall, it is secure, very power efficient and relatively cheap to deploy due to its range.

## AIRPORTS ARE PRIME LOCATIONS FOR BEACON TECHNOLOGY

Deployment of beacons in airports could open up a range of low cost possibilities for interacting with passengers, such as:

- **Passenger location:** Airlines in particular, with their apps stored on a passenger's phone, will be able to combine the app's knowledge of the passenger, such as who they are, where they are going, and their class of travel, with accurate knowledge of their location in the airport derived from detecting the nearest beacon. This can be useful not just for sending relevant information to the passenger, but also for locating them in the airport if they are late to the gate.
- **Triggering mobile boarding passes:** Beacons placed at passenger touch points including check-in, bag drop, passport control and departure gates could be used to 'pull' mobile boarding passes onto the display of a passenger's smartphone just as they arrive.  

SITA is working with a leading airline to trial the use of beacons in an airport environment for this purpose. The airline has placed six beacons around a major international airport. The initial deployment integrates Apple's iBeacon with Passbook so a personalized welcome message can be displayed to passengers as they pass the different zones that require a boarding pass to be shown (security, lounge area, boarding gate).
- **Navigating the airport:** Beacons could provide a more precise and lower cost way for airport apps to guide passengers around the terminal and find the correct gate. There are alternatives for indoor mapping using triangulation technologies, such as Wi-Fi and cellular signals, but when deployed correctly, BLE-based beacons are claimed to be far more accurate and require less complex infrastructure. For example, a passenger carrying a BLE-enabled smartphone can obtain a GPS location from any beacon in range and use the data in a mapping app to navigate through an airport.
- **Promotions at retail outlets:** The beacons can trigger contextually relevant messages to passengers who are in, or nearby, participating stores. These messages may tell passengers to redeem coupons, earn points or pick-up duty-free items before heading to the gate.
- **Baggage reclaim:** A beacon in baggage reclaim could trigger a message to arriving passengers telling them which carousel their baggage will arrive on and how long they will need to wait.

## SHINING A LIGHT ON BEACONS

The concept of beacons sounds straightforward enough and clearly some of the benefits being touted for the technology, such as low cost and wide range, have a strong appeal for anyone wanting to connect directly with customers. But do they work as advertised in the real world?

To separate tech hype from reality SITA Lab is putting beacons through their paces in an airport environment to find out the benefits and limitations of the technology. The tests were conducted with the iPhone 5s and Estimote beacons. Key findings so far are:

- **Installation:** Deployment of beacons is straightforward. The Estimote beacons have a sticky surface and can be placed on most surfaces and remain permanently switched on. The beacon ID values can be set with a companion app. This simplicity and mobility can also be a drawback. In a large deployment, it will be necessary to carefully track where your beacons are.
- **Range:** The range can be set in the beacons, and while advertised at up to 70 meters, the reality is that in a crowded airport environment, the maximum range will be about half this.
- **Detection time:** The smartphone app was able to detect the presence of beacons in approximately one second.
- **Proximity accuracy:** This varied considerably with a typical inaccuracy of +/-5 meters. However, this is still sufficient for most use cases and many beacon vendors have proximity calibration capabilities.

## SHARED CONCERNS

The fact that airports are shared environments with many different businesses using the facilities raises a number of questions with beacons. Not least is who is responsible for deploying the beacons - airport, airline, ground handler, retail operators? If an airport deploys a set of beacons how can the airline make use of them?

Many gates, for example, are shared by different airlines. It is not practical for each airline using the same gate to deploy its own beacon. The question of whether multiple beacons will cause wireless interference with each other and other wireless systems at the airport will need answering and one major international airport is working with SITA Lab to research this issue. (See blue pull out box)

The beacons SITA Lab has deployed at this airport are for only the one airline. But if other airlines start deploying beacons at airports across their route network it is clear that the complexity of managing beacons throughout the global air transport system will grow exponentially.

## ANOTHER RADIO EMITTING DEVICE IN AN ALREADY CROWDED SPACE?

Airports operate in a heavily regulated environment containing relatively dense wireless infrastructure. With both Bluetooth and WiFi using the 2.4GHz range, what is the impact of adding another technology that shares this space?

To find out SITA Radio Engineer, Tobias Food has been investigating potential wireless interference as part of beacon deployment at a major international airport.

“Our initial research indicates that deploying only a handful of beacons around an airport will not impact existing Wi-Fi signals. However, there is a clear relationship between the number of beacon deployments (density), the power setting (which controls the range) and the advertising interval (frequency of emission). Too many beacons deployed at the wrong settings will disrupt each other’s signals, and existing Wi-Fi infrastructure. The evidence is that airports will need to have clear visibility of where beacons are being deployed and how.”

## HOW CAN THE INDUSTRY BEST USE BEACON TECHNOLOGY?

SITA’s Chief Technology Officer, and the head of SITA Lab, Jim Peters, believes the relatively low cost of beacons makes them an attractive option for airports, but he cautions a gold rush approach to deploying them.

“It is clear from our initial research that beacons should be treated as a common-use piece of infrastructure. Airports serve multiple airlines, and airlines travel to multiple airports. It is a very complex network - too complex for everyone to manage their own deployments. It will need careful management and I’ve directed SITA Lab to setup a common use registry for the industry,” Says Peters.

At airports where an airline does not have dedicated gates or other infrastructure, a common-use approach to beacon technology makes sense. Shared beacons that different airlines could associate their own mobile apps to as and when required would be far more efficient and effective than each airline managing a set of beacons at each airport. It is already

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a model used effectively for other shared services at airports, such as check-in, bag drop and gate infrastructure.

Based on the outcome of their initial research, SITA Lab is setting up a registry of air transport industry beacons. Any airline will have a single point of contact to go to use any beacon deployed by airports around the world.

Airports can deploy a set of beacons and share the beacon-specific data (known as the meta-data) with all stakeholders at the airport. The airport would have the ability to set and modify the meta-data. This would include longitude/latitude, as well as scenario specific data such as terminal and gate info, flight boarding times, baggage carousel information, or retail offers. App developers will be able to register on [developer.aero](http://developer.aero) and get access to the list of beacons at an airport, and the meta-data for those beacons.

If airlines choose to deploy their own beacons, such as in business class lounge areas, these can be added to the registry giving the airport visibility of the beacon deployment and enabling it to manage Wi-Fi and Bluetooth radio space

The registry would not limit, direct or control any of the possible use cases for beacon technology. In fact, defining a set of industry standards to provide data sets in a common way would provide the necessary basis to stimulate further innovation among the developer community.

## A BRIGHT FUTURE

The exciting part is that in the retail arena beacon technology is coming of age. This will accelerate adoption across the air transport industry with customer service-driven travel providers eager to provide the right information to the right passengers at the right time.

The early indications, based on work by SITA Lab, suggest airports around the world could become a prime user of the technology. However, unless an industry registry is embraced, the risk is that deployments of beacons will be piecemeal and proprietary, limiting the potential of the technology.

For further information, please visit [www.sita.aero](http://www.sita.aero)



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