Bluetooth Beacons

What is a Beacon?

A beacon is a Bluetooth radio transmitter which comes in various shapes and sizes particularly very small and discreet. It is often an inexpensive battery powered hardware with a battery life of about few months to years, depending on its configuration. Some smartphones can also be configured to act as beacons.

Image Courtesy: Aislelabs

A beacon's main purpose is to attract attention to a specific location. It doesn't do anything except sending out repeated signals to nearby devices. It's similar to the analogy of a lighthouse; it's just there to emit light to visible ships.

It uses Bluetooth Low energy (BLE) to transmit signals to devices in range. Once a device sees the signal, they know their location.

How does Beacons works?

Beacons communicate with our smartphone applications and are integrated in the cloud in order to function. Below is an example demonstrating how it functions:

1. Suppose beacons are deployed at the entrance of a retail store
2. These beacons transmit signals in its range. The range of beacons vary from 20m to 300m. (Know more about the range of beacons)
3. Smartphones in the range of beacons is itself indicating that the smartphones are nearby.
4. The smartphone then sends the ID number attached to the signal to the cloud server
5. The server responds with the action linked to the beacon ID. It could be a notification introducing a new sale offer or a feedback form!
6. These notifications drive customers to a web-page, a form, a phone number or whatever you plan to do.
7. At the end when customer will be server at counter, and after finalizing the sale can be presented with a discount voucher for next you customer's next visit.

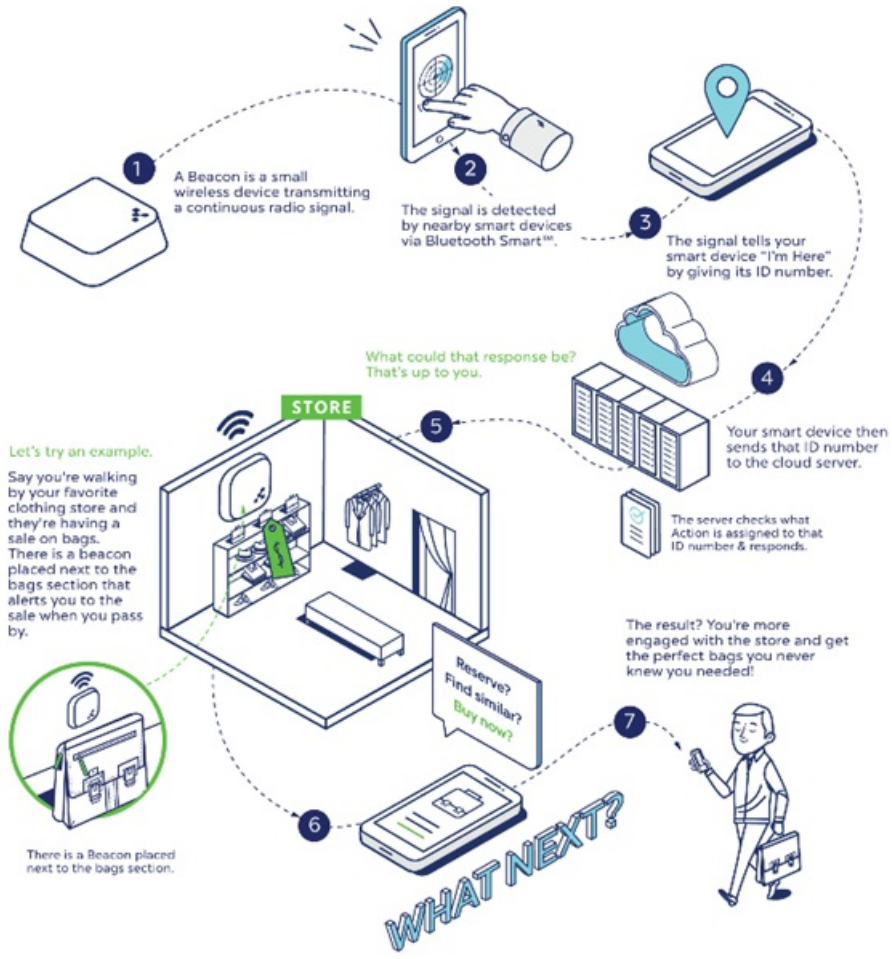

Image Courtesy: How does Bluetooth beacon Works: BeaconStac

Types of Beacons

Although there are different aspects that can be considered when categorizing beacons, the most important aspects to consider in beacons are the kind of Beacon Protocol being used and the type of location technology being used.

Beacon Protocols

iBeacon: This protocol was developed by Apple in 2013 and was the first beacon protocol in the market. A beacon that uses this protocol transmits a Universally Unique Identifier (UUID) of 32 hexadecimal digits that can communicate with an app that is installed on a device. Additionally, the Major and Minor parameters also help the effectiveness of the functionality of the beacons by allowing grouping and categorization to suit the purpose. iBeacon works well with both iOS and Android.

Eddystone: Eddystone was an open communication protocol introduced by Google in 2015 and similar to the iBeacon protocol, works with both iOS and Android. Eddystone payload can may include a UID, URL, TLM and EID. One of the main advantages of Eddystone over iOS is that it allows the transmission of a URL, which allows a device to directly access the contents of the URL without having the need for any app to be installed in the device.

AltBeacon: Introduced in 2014 by Radius Networks as an open source protocol, this was designed to support other mobile operating platforms allowing more flexibility and customizable source code. AltBeacon advertisements consists mainly of 5 fields, ID1, ID2, ID3, power calibration value and the data field. The first 3 fields, known as the Beacon Identifier fields allows AltBeacons to be inter-operable with the iBeacon protocol as well.

Location Technology

Beacons can be classified based on the location technology being used as well. Although the most common location technology being used is Bluetooth, some other technologies listed below or even a combination of technologies can be used with beacons.

Bluetooth Low Energy (BLE): Most beacon location devices uses BLE. BLE technology consumes less power when compared it the classic Bluetooth technology and has a lower range of operation. This is mainly designed to support the periodic transfer of low amounts of data.

WiFi Aware: Introduced in 2015, WiFi Aware is a location technology that also allows a lower level of power consumption when compared to regular WiFi. When compared to the BLE technology WiFi Aware has a longer range but it also has a comparatively higher power consumption than BLE.

Ultrasound: Ultrasound location technologies are considered to be more robust and accurate when compared to other wireless transmissions due to the lower susceptibility to interference as the ultrasound wavelengths have a comparatively shorter reach. Ultrasound beacons are especially considered for use in locations such as hospitals as ultrasounds generally don't interfere with medical equipment.

Applications of Beacons

Beacons have recently grabbed attention from industries and are used for multiple applications such as retail, restaurants, airports etc. Below are some of the popular areas where beacons are employed:

1. **Retail**: Beacons coupled with the Bluetooth enabled smartphones is changing the face of retail in Current times. Beacons devices in as well as outside the store can attract customers once they come to the store proximity, Help them see the product on their smartphones when they get closer, get the latest coupons for the store on their smartphones to the product as well as checkout from the store.
   For more details visit:
   "Next Big Thing - Beacons: What they'll do for retail - YouTube"

Image Courtesy: Proximity Marketing: What Every Retail CMO Should Know About

One example is the European retail giant "Carrefour" which has installed 600 onyx beacon in its retails stores in Romania employing i Beacon technology and is benefiting from it

2. **Airports:** Beacons powered mobile apps are able to identify the passengers, guide them inside the Airports even without requiring a GPS(Global Positioning System), notify them of gate changes as well as inform them about the concessions in the Airport restaurants and eateries.

Image Courtesy: Airlines Look to Beacons to Improve Their Internet of...

Virgin Atlantic started using i Beacon technology at Heathrow airport with Apple Passbook in 2015 to notify passengers to have their boarding pass ready as well as giving them concessions on exchanging currency.

3. **Restaurants**: Beacons in restaurants are a great way of avoiding lines and wait time at the counters. Customers can download a supported app, order and can get the order once they approach the restaurants beacon's range. Moreover, they can make the payments as well as earn loyalty points on each restaurants visit without the need to manually enter their details each time.

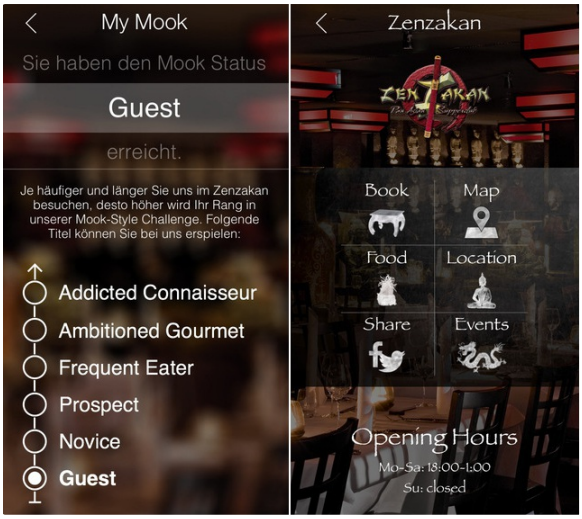

Image Courtesy: How beacons can enhance experiences at restaurants | Beaconstac

Mook , for example, which is a German Restaurant uses this technology to promote an improved experience for its customers by giving points to loyal customers, record their time spent at the restaurant.

4. **Sports**: Beacons can be used in sports for the sports fans in stadiums by communicating the customers the seat availability in the stadium, advertising and selling merchandise as well as notification of the future matches and special discounts for loyal visitors by just a smartphone app and beacon technology. Major league baseball stadium in United States has installed beacon in partnership with iOS 7 'At the ballpark' app and is helping the customers scan their tickets as well as locate their seats via the app and beacon technology.

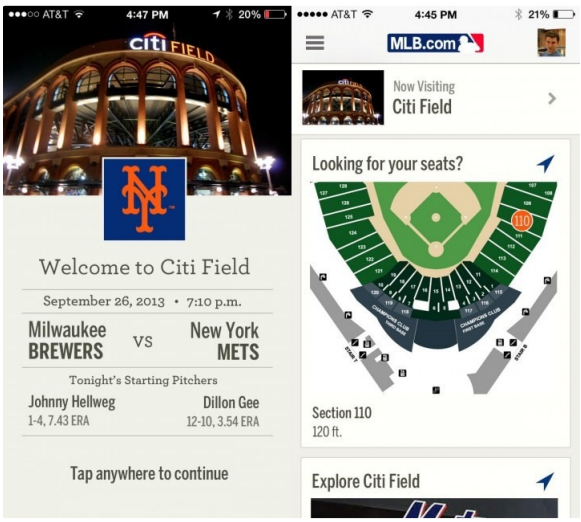

Image courtesy: How Stadiums can use Beacons to Enhance Experiences | Beaconstac

Because of its ease of use and smartphone app integration, beacon is becoming widely popular in the areas mentioned above as well as in sectors such as the hospitals, museums, and advertising along with many others.

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