

# Clean India Mission: Beacon Technology

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**Abstract** - Along with some of the spectacularly innovative schemes proposed by PM Mr. Narendra Modi like Digital India, Make In India, the idea of a clean India was launched on 2<sup>nd</sup> Oct, 2014. It's been four years since the Indian PM inaugurated the Swachh Bharat Abhiyan (SBA) [1] and notwithstanding the fact that the campaign has garnered massive support, it has failed to be efficacious in certain aspects. This research paper aims at integrating the incredible technology behind beacons with the motive of enhancing effectiveness of the campaign. The paper will also demonstrate the many technical applications of the proximity sensing device.

**Keywords:** Clean India, Digital India, Beacons, Swachh Bharat Abhiyan, Proximity Sensing

## 1. INTRODUCTION

Before going into the technical concepts of proximity sensing, let's first answer the simple question.

### 1.1 WHAT ARE BEACONS?

In simple words, a Beacon is a device which being wireless and compact in size, broadcasts signals based on proximity sensing based on a given set of conditions. The working of Beacons is dependent upon the concept of BLE (Bluetooth Low Energy) [2]. Briefly, the Beacons which are installed in a specific location senses the presence of user devices present inside the specified radius coded into the device and triggers alerts or notifications in the devices which translates to data.

The signals therein emitted by the Beacon should be handled by the device in such a way that they are able to listen or receive those notifications on the user side. Mobile applications can be easily integrated with Beacons present in the real world. Mobile devices need a pre-installed application which is going to receive signals emitted from the beacons and notify the user with information or data in the form of offers coupons, videos, URLs, etc. These notifications present themselves to the users when they set foot inside the specific region of the particular Beacon. This region of each beacon is stated as Range of that Beacon. It has always been a tendency to gravitate towards technology for worldly problems in order to subdue them.

### 1.2 OUR MOTIVE

This paper aims at providing a technical boost to the Swachh Bharat Abhiyan, officially launched on 2<sup>nd</sup> October, 2014, by Mr. Narendra Modi, the current Prime

Minister of India. The aim is to make India clean within a span of five years i.e. until 2<sup>nd</sup> October of 2019 which will be the 150<sup>th</sup> birth anniversary of Mohandas Karamchand Gandhi [3]. The motive behind using Beacons in the campaign is to increase the awareness of the public and to keep them up to date with the information regarding the specific locations. The best way to do it will be integrating it with a piece of technology which reaches out to all the people.

### 1.3 HOW EXACTLY DOES A BEACON WORKS?

Although the traditional technologies of GPS (Global Positioning System), NFC (Near Field Communication) and QR code are also location based technologies, they do not give the position as accurately as a Beacon. NFC, though relatively popular has failed to gain much momentum in the market and also it requires a NFC chip built in into the device. GPS needs latitude and longitude of the device to navigate across and is very popular but it doesn't map indoor locations precisely. Intercommunication of beacons is also possible and this will, in turn, increase the range of the functional area.

The price of Beacons ranges between \$1-50 USD and comes equipped with a battery, a processor chip, a Bluetooth radio for radio transmissions and a case surrounding it.

## 2. BEACONS AND ITS TYPES

Beacons, using Bluetooth Low Energy (BLE), transmit radio signals with a unique identifier to nearby mobile devices. The devices should have Bluetooth enabled in them so as to be able to receive the proximity Universally Unique Identifier (UUID) sent from the beacons. A pre-installed application then interprets the data from it and showcases to the user the necessary details.

There are three major types of beacons, the earliest one being the iBeacons by Apple [2013] which works for both IOS and Android devices given that an application is before handedly installed. Many iBeacon protocol based beacons have been deployed since then for use in mobile commerce, mobile marketing, push notifications etc. The kind of data presented depends on the nature of the application involved in the process.

Radius Networks came up with Altbeacons in 2014. It was an open source beacon based protocol which has flexibility in customizable source codes and was compatible with various mobile OS.

Eddystone (formerly UriBeacon) was announced by Google in 2015 compatible with both Android and IOS devices. Unlike others, it can transmit multiple frameworks. Eddystone-UID works like iBeacons requiring a specific application to be installed in the mobile device. Eddystone-URL eliminates the need to have a pre-installed application rather it requires just one application- Physical Web. It broadcasts a website link secured using SSL which displays a notification in android devices and necessitates the need of Google Chrome browser to be present in IOS devices. Eddystone-TLM broadcasts telemetry information about the beacon such as temperature of the beacon, its battery level, the sensor data and other relevant information required for the process. Eddystone-EID much like Eddystone-UID broadcasts an identifier but with enhanced security features.



**Fig -1: SBA results**

**3. SU SUCCESS OF SWACHH BHARAT ABHIYAN(SBB)**

In the months after it was launched, the Swachh Bharat campaign gained momentum with many celebrities, politicians and academic institutions organizing cleanliness drives across the country. As a reminder of how seriously his government takes this mission, the prime minister brought up the issue during his Independence Day speech as well.

The ambitious campaign has its fair share of challenges too. This campaign as well as the “Make in India” [4] project have not been able to emulate the success that PM Modi had envisaged. The fact is that people have to be made aware of the rising problems. In this paper, we aim to introduce a technology which has already gained a huge popularity among the enthusiasts. Beacons are being used by a number of industries, more so by the retail sectors with major brands.

This paper will also list the various real world applications of Beacons in matters of making this world a better place to live in.

**4. BA BACKGROUND**

When it comes to Beacons, most people think that it has just one simple use case: push notifications. But the value of this technology is far more than depicted. There are several real world use cases of Beacons that are currently proving why it is amongst the hottest tech in the world right now.

Large number of newcomers arrives at an airport each day which makes it very important that they find their way across to the various services and facilities available. Orlando International Airport have built a network of beacons to guide them to numerable destinations within

the airport. On the top of it, the Beacons also transmit the arrival and departure information directly to the customer’s smart phones.

Nivea came up with a unique solution to promote child safety in beaches and malls. It distributed beacon bracelets to parents so that they could keep track of their children through their phones. Barclays uses beacons in its branches to alert its staff when disabled customers enter the bank so as to provide extra assistance.



**Fig -2: Shopping behaviour influenced by beacons**

Beacons have also been deployed in stadiums to make it easier for the fans to check in, to claim game offers, to order food online and to find better parking spaces. The technology is also being used for effective delivery of freight packages as each beacon can be preset with a code identifying the particular delivery.

Libraries have also started using the Beacon technology to connect more effectively to their communities. Orlando’s Orange County Library System checks in the customer’s frequent libraries he/she visits and provides details to events being conducted in those areas. The Boston Athenaeum in Massachusetts uses Beacons to connect its patrons to additional information about various items. It can be used to provide the readers with personalized notifications as they move through the library as it integrates with the library’s Integrated Library System.

Beacons have had a huge impact in the medical field as well. Dutch healthcare provider LUMC have designed a beacon based array which keeps track of people who have had heart attacks so that it can expedite the process of them undergoing a potentially lifesaving balloon angioplasty treatment. It has proven so successful that there are plans to introduce the technology in other departments to improve the overall efficiency of the medical system.

Snapchat, on having more than 200 million active users, also integrated the beacon technology with their application by building hyper local filters for its snaps. The company allows advertisers and event organizers to build

their own filters with a radius limit of 20ft. Beacons can be used to promote movies like 20<sup>th</sup> Century Fox who provided moviegoers with exclusive content and games to promote X-Men: Days of Future Past. It could also be used to check whether the phones are switched off before the movie starts.

Privacy is one of the main concerns of Beacons since it can be used to manipulate the user’s device data, but beacons can actually add an extra security layer and make access codes and pin codes unnecessary. Even touch sensitive devices can be used with beacons to enhance data privacy.

**5. AP APPLICATIONS**

Since Eddystone Beacon protocol involves the transmission of URLs and doesn’t necessitate the need for a pre-installed application, it will be our chosen beacon for all purposes.



Fig -3: Beacons infographics data

**5.1 First Point of View:**

Beacons could be deployed just to spread awareness. The people should realize that actions need to be initiated for the betterment of the nation. Beacons could also be used to educate people on certain matters such as cleanliness, proper hygiene, preventing open defecation etc.

Beacons could be installed to take people to the nearest garbage disposals, stalls etc. for ease of travel. “Status Update” URLs should also be sent on a regular basis. Complete graphical representation of the various factors should be displayed such as degree of cleanliness, number of volunteers, number of staff etc. This will keep the public regularly updated about their locality.

Beacon devices needs to be installed in strategic places at fixed intervals for ease of access. The area where the beacon is being installed needs to be analyzed beforehand to calculate the average number of days it takes for a particular area to get dirty. The beacon is then made to transmit “Clean Up” signals by presetting the beacons to send URLs to the Physical Web application on the nearby user’s devices to participate in a cleanup drive. Suppose a beacon has been installed in a part of Marine Drive and the area needs a cleanup drive every 7 days. The beacon is then preset to transmit URLs every 7 days.

The Physical Web application then receives the URL and opens on the browser urging people to participate in the drive. The advantage is that regular transmissions make the public more aware of the environment they live in. Increasing awareness is one of the main goals that this research paper proposes by using beacon technology. Apart from the “Clean Up” URLs being transmitted from the beacon, it can transmit a daily “Area Assessment” URL. The website that is being opened needs to be developed in such a way that it takes data input from a hosted database. The webpage could contain a button panel asking the user the degree to which that place is dirty. T Else it could also ask a basic set of questions that a user may or may not wish to answer. These questions may include: “Do you feel that the area is dirty?”, “How often does this area look clean to you?” etc. People should be shown in graphical representations how the answer varies and then initiate proper steps to meet those demands by shifting regular schedules. Also for proper functioning, each area should have a specific team of officials assigned to it with the addition of volunteers.

**5.2 Second Point of View**

Beacon Technology should be implemented not only in Swachh Bharat Abhiyan but also in many other campaigns that are aimed at making India clean. We should aim to spread awareness in a way that reaches out to everyone. Beacons could be deployed just to spread awareness. The people should realize that actions need to be initiated for the betterment of the nation. Beacons could also be used to educate people on certain matters such as cleanliness, proper hygiene, preventing open defecation etc.

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**5.3 T Third Point of View:**

Since the Eddystone beacons can send out URLs, a number of applications arise that will be helpful. The website can be configured to send out weather reports for an area. The location where the beacon is installed is integrated to the website it transmits. By doing this, the weather situation currently for that particular location can be received by the public.

Certain Beacons come with inbuilt temperature sensor. Again let’s take example of Marine Drive. Beacon is made so capable to estimate temperature of the location where it is installed. Along with proximity sensing, it can be made to sense the temperature. The webpage can also be developed to show temperature of that particular location.

Even traffic in a particular area can be approximated by the number of users who view the webpage. This could be useful for some users who would then choose to take a different route. Hotels and restaurants could check pre-bookings made by the customers and get them early assistance.

## 6. CONCLUSION

Use of tremendously useful technology in the organizations that are working for cleaning our country, can make use of this technology, and not only organization but all the people can get benefitted. Temperature sensing, traffic sensing, proximity sensing, status sensing is all possible with the help of beacons. The mission of "clean India" can be made successful by using this technology in all possible ways.

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