

Location Based and Contextual Services Using Bluetooth Beacons: New Way to Enhance Customer Experience

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Abstract—Location based services and context enables innovative models of running business by adding tremendous value to the customers “in-location” experience and can extend the company’s digital interactions with the consumers. Indoor spaces often block cell signals and also make it nearly impossible to track customer’s indoor activities via existing technologies like GPS, RFID and Cellular tower triangulation etc. All these limitations in the existing technologies can be addressed using Bluetooth Beacons. Using beacons, retailers can optimize customer experiences, improve business processes and generate more revenue. Retailers and telecommunication service providers can do the partnerships with each other to rationalize customer experience and loyalty providing personalized offers and suggestions to loyal customers, empower sales associates and enhance in-store shopping experience of customer. Beacons have the ability to engage customers in the right place at the right time while offering utility and value. In this paper, authors have proposed, how Bluetooth beacons can be beneficial to retailers in terms of customer analytics, operational analytics and revenue improvement along with partnering with service providers to enhance customer experience and loyalty.

Index Terms—bluetooth beacons, bluetooth low energy 4.0(ble), enhance customer experience and loyalty, customer analytics, operational analytics, location based and contextual services

I. INTRODUCTION

Today Mobile device is not just a communication device or a way to use an application on mobile, but it drives and provides completely a new way of reaching out to the customers and hence a new channel for loyalty. Location based services can add remarkable value to the consumers and can enhance company’s interactions with the consumers [1].

Smartphone apps have long used location data to try to improve the mobile experience; however, there have always been limitations to what they can do. Today’s modern smart phone users spend most of their time indoors. Unfortunately, indoor spaces sometimes block cell signals and can make it difficult to locate devices using GPS. Also GPS can’t track the exact location of the device at a minute level [2], [3]

Beacons provide a solution to this problem by using Bluetooth Low Energy (BLE) to allow sensors to detect – within inches – how close a smartphone is. Beacons are small enough to attach to a countertop or wall, rely on battery-friendly, low-energy Bluetooth connections to transmit prompts or messages directly to a tablet or smartphone [4]. It’s a big step ahead that could open the door for groundbreaking services, which could enhance people’s lives. Likewise, it may also create a new market for retailers who could use the technology to better target consumers.

Bluetooth beacons are transmitters that use Bluetooth Low Energy 4.0(BLE) to broadcast signals that can be heard by compatible or smart devices. These transmitters can be powered by batteries or a fixed power source such as a USB adapter. When a smart device is in a beacon’s proximity, the beacon will automatically recognize it and will be able to interact with that device. Bluetooth Low Energy is a wireless personal area network technology used for transmitting data over short distances [5]. It is designed for low energy consumption and cost, while maintaining a communication range similar to that of its predecessor, Bluetooth. They’re also inexpensive, simple to deploy and are supported by most mobile operating systems [4].

BLE communication consists primarily of “Advertisements”, or small packets of data, broadcast at a regular interval by Beacons or other BLE enabled devices via radio waves. BLE Advertising is a one-way communication method. Beacons that want to be “discovered” can broadcast, or “Advertise” self-contained packets of data in set intervals. These packets are meant to be collected by devices like 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. 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.

II. HOW BEACON WORKS

Beacons can only detect the devices which are coming in its range. 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.

It has two major components: one is beacon placed in the venue and the other one is the app installed on the customer's smart phone.



Figure 1. How beacon works in retail store [4]

III. HOW RETAILERS CAN STREAMLINE CUSTOMER AND OPERATIONAL EXPERIENCE WITH BEACONS

Now a day, use of indoor positioning systems has become increasingly feasible. Rather than using satellites, these systems can use low-energy Bluetooth beacons to locate a mobile device's location inside a building, with accuracies in the centimeter range. [6] Support within newer mobile devices for indoor positioning systems will enable location information for targeted ads and messages, as well as real-time mapping to lead customers to store locations and to specific products themselves.

Bluetooth Beacons provide businesses with endless opportunities to collect massive amounts of untapped

data, such as the number of beacon hits and customer dwell time at a particular location within a specified time and date range, busiest hours throughout the day or week, number of people who walk by a location each day, etc. This data then allows retailers to accordingly make improvements to products, staff allocation in various departments and services, and so on. Beacons helps to understand customer's shopping behavior by providing in-store and in-app behavior, favorite products, demographics, micro location etc.

As consumers become more comfortable sharing information with retailers, an opportunity to improve sales, margins, satisfaction and frequency of visits in store has increased using of indoor positioning system and targeted offers. By combining real-time, contextual information and advanced analytics, retailers can determine the "best offer" to deliver in real time to the customer or customer segments. [7]

Gartner predicts that by 2017, seven of the 10 largest retailers will use indoor positioning systems, combined with mobile apps, to aid shoppers in quickly locating departments and products [8].

Retailers should not attempt to supply customers with real-time, customized offers in context-aware situations until they are confident that they have adequate segmentation and behavioral analysis. Offer execution in line with basic customer expectation also plays an important role. Retailers must selectively identify the right consumers as candidates for receiving these offers, while ensuring consistent execution from the delivery of the offer to the POS.

Gartner predicts that by 2020, retail businesses that use targeted messaging in combination with indoor positioning systems will see a 5% increase in sales. [8]

Benefits of the retail industry revolve around customer experience, operational efficiency and revenue improvement as shown in Table I.

TABLE I. BENEFITS TO THE RETAIL INDUSTRY

Customer Analytics	Operational Analytics	Revenue Improvement
<ul style="list-style-type: none"> ✓ Identify and trigger real time offers ✓ Identify and offer various loyalty programs. ✓ Identify personalized alerts and high-value rewards ✓ Redeem rewards ✓ Identify customized coupons. ✓ Optimized in-store customer experience. ✓ Purchase a product in real time in-store via a mobile device. ✓ Pay without the need to join a checkout queue 	<ul style="list-style-type: none"> ✓ Engage with customers in real time using their mobile phone and an app ✓ Follow-up with the shopper after the shopping experience to provide additional information or receive offers based on the beacons they were near during their store visit ✓ Optimize store layouts and product placement based on navigational patterns ✓ Optimize website, merchandising zones on desktop and mobile ✓ Help customers locate items in-store ✓ Offer better in-store customer service ✓ Inventory planning ✓ Fraud detection :Loss prevention — both internal and external ✓ Improve Store traffic patterns to eliminate choke points. 	<ul style="list-style-type: none"> ✓ Empower sales associates ✓ Improve business processes and generate more revenue ✓ Identify peak traffic times, checkout line length, number of associates presently in-store and product location ✓ Improve campaign management

Beacons can also be used in various areas apart from retail industry like transportation, sports stadiums, airports, restaurants and museums. Beacons can be placed at various streets and an advance traffic monitoring

system can help to push various alerts and messages to the commuters. A public transportation app can be shared with people that utilizes beacon technology, which can regularly update bus's location in real-time.

TABLE II. BENEFITS TO THE OTHER INDUSTRIES

Healthcare	Restaurant	Automotive	Stadium	Transport
✓ Blood monitoring	✓ Customer welcome	✓ Tier pressure monitoring	✓ Directions and Information	✓ Real time updates of public transport
✓ Glucose monitoring	✓ Table wait management	✓ Parking assistance	✓ Prepayment at concession	✓ Traffic and route updates
✓ Position guidance to blind people	✓ Pay order and payment	✓ Service log upload	✓ Mobile marketing	
	✓ Ingredient information			

Using beacons you can study a restaurant's menu, pre-select what you want to eat and have your order shipped directly to the kitchen once you sit near a vacant beacon. At airports beacons can be used to alert customers to have their electronic boarding passes ready when they were close to a private security check, and to send tailored offers like commission-free currency exchange deals to passengers in the departures section of the airport. Table II can give idea about various benefits in other industries. [9]

IV. HOW BLUETOOTH BEACONS CAN BENEFIT THE TELECOMMUNICATION INDUSTRY

With the ever-increasing adoption of smart phones across the world, the sphere of influence of LBS is expanding and it is no longer limited to navigation, tracking and information services. It now encompasses targeted campaigns, entertainment, mobile advertising, social media, emergency services, workforce management and much more.

Challenge in front of Communication Service Providers is capturing accurate location itself but now with Bluetooth Beacon it is relatively easier. CSPs can create value for the customer by providing useful information, offers etc. CSPs can monetize the location information without infringing the privacy of the customer.

CSPs can find out customers micro location, what customers looking at, how long they are looking at it, and maybe what decided to buy at the last second instead. That way, CSPs can send personalized messages and deals when they enter the store so customers will have a better idea of what to buy and/or can utilize coupons or other deals more effectively.

CSPs can use the Analytics framework to capture and analyze location data after applying the privacy and anonymisation policies. Various algorithms can be applied to the data and best match for nearby offers can be generated. Offers then can be sent to customers according to user preferences. A notification also can be sent to the retailer.

Benefits of the CSPs revolve around improving customer satisfaction, reduce customer churn, create Revenue streams and increase campaign efficiency. CSPs can measure the benefit using Location Based Services revenue and campaign efficiency.

V. CHALLENGES

Privacy and security is another area that is of huge concern to consumers and something which all retailers must take into account when deploying a location-based

mobile strategy. "Retailers need to provide the ability for customers to opt out, they need to be transparent on how they are using the data, and retailers need to provide real value in exchange for that data. [10]

The retailer can send information in the form of a push alert to a person in the store. It's direct and it's a real-time communication mechanism, but the question is going to be: Can retailers deliver enough value in that exchange that consumers are going to like it?"

In order to consumers accepting beacon technology, retailers need to promote the anticipated value. Delivering relevant offers and creating a fun and engaging shopping experience are two ways merchants can deliver this value.

Although Beacon can prove a boon in near future, as with any new technology that uses data, especially location-based data, there is always a question of how individual privacy is handled.

VI. CONCLUSION

Emergence of Bluetooth beacons as a new location technology has given rise to new applications and services to address both consumer and enterprise needs. Bluetooth beacons resolve the problem of in-door localization and they are very inexpensive therefore, it is practicable to deploy them in large numbers in an indoor environment. They have a range of only a few meters; therefore, the simple visibility of a beacon can be used effectively for localization. Various industries can get benefited by using this technology. By combining real-time, contextual information and advanced analytics, retailers can determine the "best offer" to deliver in real time to the customer or customer segments

Many businesses and developers are realizing the potential of Bluetooth beacon technology and are already taking advantage of it to deliver relevant and contextual interactions to their customers. The versatility of the technology makes the uses of the beacons countless and up to the imagination of the business.

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