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# Bluetooth Beacon Mapping Website

## Problem Introduction

Bluetooth beacons can track users by sending their smart phone, or other devices with Bluetooth Low Energy capabilities, messages that are received by respective smart phone applications that then take some action[1]. An action could range anywhere from sending a push-notification to the user to posting on social media on behalf of the user. To avoid Bluetooth beacons a user must either:

1. Turn off Bluetooth on their smart device
2. Remove the smart phone application from their device
3. Restrict the smart phone application's privileges to user the device's Bluetooth (available on iOS 13+[2])

Option 1 is extremely restrictive because it means that the device can no longer use any Bluetooth capabilities including wireless headphones, wireless file transfer, WiFi tethering, etc. Option 2 is not as restrictive as option 1 but still forces the user to avoid using an application that they may want. For example, a Walmart application that the user wants to use to look up the location of some product in Walmart but does not want to be tracked or checked-in to a particular Walmart. Option 3 is the least restrictive option as it still allows a user to use the application, just not the Bluetooth parts. However, this requires the user to geographically know which applications are used where by Bluetooth beacons.

## Proposal

I propose the creation of a website in which users can report geographical locations of Bluetooth beacons, which applications communicate with them, and how to remain private. My project specifically would be a prototype of this website showing Bluetooth beacons (and their smartphone apps) just around Providence, RI area. It would also allow for users to add Bluetooth beacons (much like Open Street Maps with admin-like data approval) and allow for API requests of JSON-like data dumps for future research endeavors. It would also contain a quick guide on how to restrict app Bluetooth privileges[2].

## Implementation

The project could be broken into the following steps:

1. Bluetooth beacon research and data collection
2. Website scoping
3. Website Proof-of-Concept development

4. Website hosting
5. Website stretch goals development

**Bluetooth beacon research and data collection**
Involves downloading an app like Locate Beacon[3] then walking around the College Hill, Downtown (including the Providence Mall), and Federal Hill to find Bluetooth beacon locations. Then researching for a *best-practice* way of †finding which applications are digesting the beacon's messages.

**Website scoping**
Includes scoping the development of the website and a timeline of development using Ruby on Rails (because I have the most experience with this framework).

**Website Proof-of-Concept development**
Includes development of the website at which a map (either Google maps API[4] or leaflet[5]) is displayed with markers that a user can click on to see beacon data. Users can also add their own beacon data. Locally hosted.

**Website hosting**
Migrating the website to something like AWS and exposing it to the world.

**Website stretch goals development**
Includes things like sorting/searching for app beacons in a particular area, account-based app sorting, and APIs for downloading beacon data.

# References

[1] *Bluetooth low energy beacon.* [*Bluetooth beacons are hardware transmitters [...]*].
`https://en.wikipedia.org/wiki/Bluetooth_low_energy_beacon`
Wikipedia.org

[2] Apple Inc. *If an app would like to use Bluetooth on your device.*
`https://support.apple.com/en-us/HT210578`
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[3] Radius Networks *Locate Beacon*
`https://apps.apple.com/us/app/locate-beacon/id738709014`

[4] Paulo Belo via Medium.com *Using Google Maps API (v3) with Rails (5.2)*
`https://medium.com/@pjbelo/using-google-maps-api-v3-with-rails-5-2-b066a4b2cf14`
September 22, 2018

[5] axyjo via Github.com *This gem provides the leaflet.js map display library for your Rails 5 application*
`https://github.com/axyjo/leaflet-rails` July 4, 2019