

Tinkering with Bluetooth



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16/10/2019

The Internet-of-Things thing



Air Pollution

Control of CO₂ emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection

Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing

Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care

Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care

Vital signs monitoring in high performance centers and fields.

Structural Health

Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions

Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection

Detect iPhone and Android devices and in general any device which works with WiFi or Bluetooth interfaces.

Perimeter Access Control

Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels

Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels

Measurement of the energy radiated by cell stations and WiFi routers.

Traffic Congestion

Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Smart Roads

Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting

Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping

Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps

Sound monitoring in bar areas and centric zones in real time.

Water Leakages

Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis

Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location

Search of individual items in big surfaces like warehouses or harbours.

Waste Management

Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking

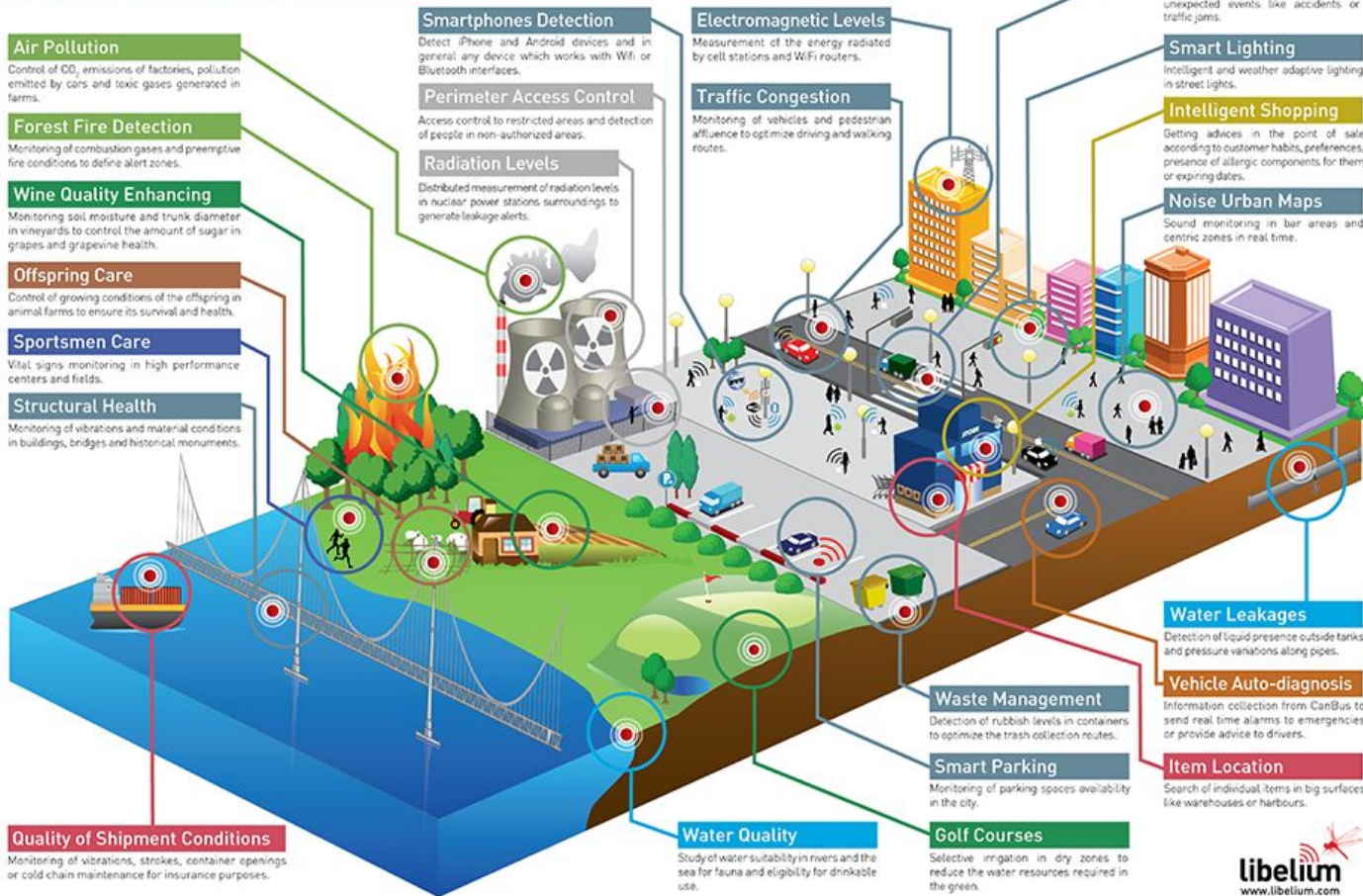
Monitoring of parking spaces availability in the city.

Golf Courses

Selective irrigation in dry zones to reduce the water resources required in the green.

Water Quality

Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.



Bluetooth

“Bluetooth is a **wireless** technology standard for exchanging data **between fixed and mobile devices over short distances** using short-wavelength UHF radio waves in the industrial, scientific and medical radio bands, from 2.400 to 2.485 GHz, and building **personal area networks (PANs)**.”

From Bluetooth to BLE



(classic or BR/EDR)

SPP

RFCOMM

L2CAP

Link Manager

BR/EDR PHY



(dual mode or BR/EDR/LE)

SPP

GAP

GATT

RFCOMM

SMP

ATT

L2CAP

Link Manager

Link Layer

BR/EDR + LE PHY



(single mode or BLE)

GAP

GATT

SMP

ATT

L2CAP

Link Layer

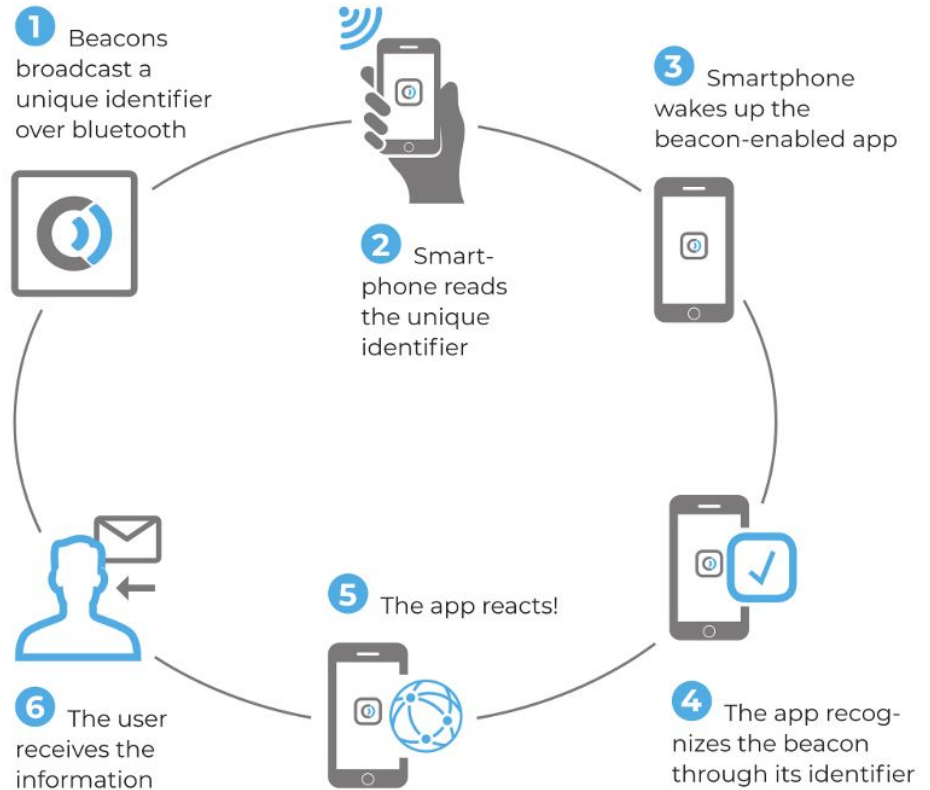
LE PHY



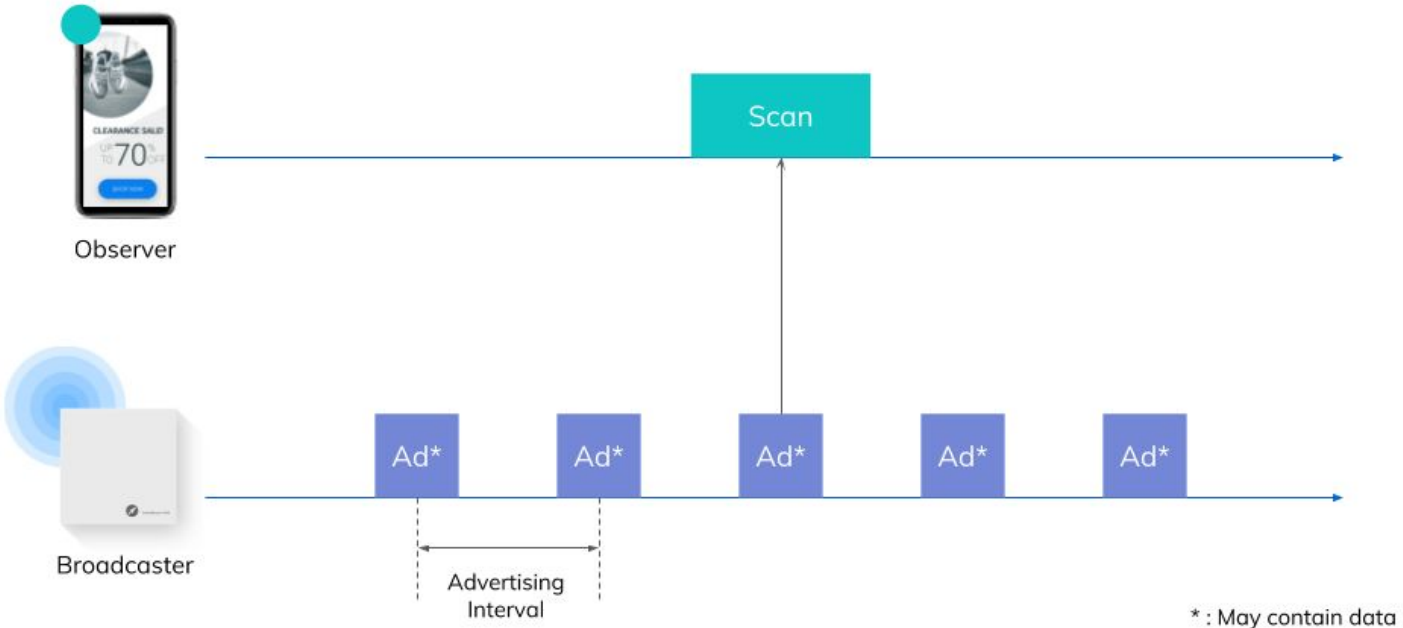
BLE Beacons

“(…) **hardware transmitters** - a class of Bluetooth low energy (LE) **devices that broadcast their identifier to nearby portable electronic devices**”

From Wikipedia,
https://en.wikipedia.org/wiki/Bluetooth_low_energy_beacon



How beacons broadcast information?



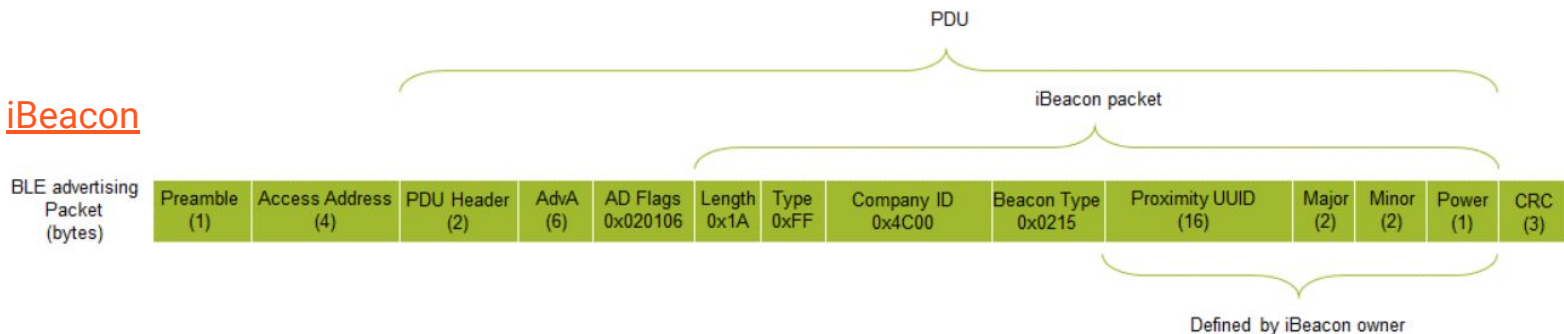
BLE Beacon Protocols

- iBeacon (Apple)
 - Transmits an UUID (string of 24 numbers)
- Eddystone (Google) former UriBeacon
 - Can transmit from one to three frametypes simultaneously:
 - URL (Physical Web, <https://google.github.io/physical-web/>)
 - UID (similar to Apple's UUID) (string of 16 characters)
 - TLM: **sensor** and **administrative data** from the beacon itself is communicated through telemetry (e.g. battery level, temperature)
- AltBeacon (Radius Networks): Open-source solution.
- GeoBeacon (Tecno-World): Adapted to transmit geographical positions.

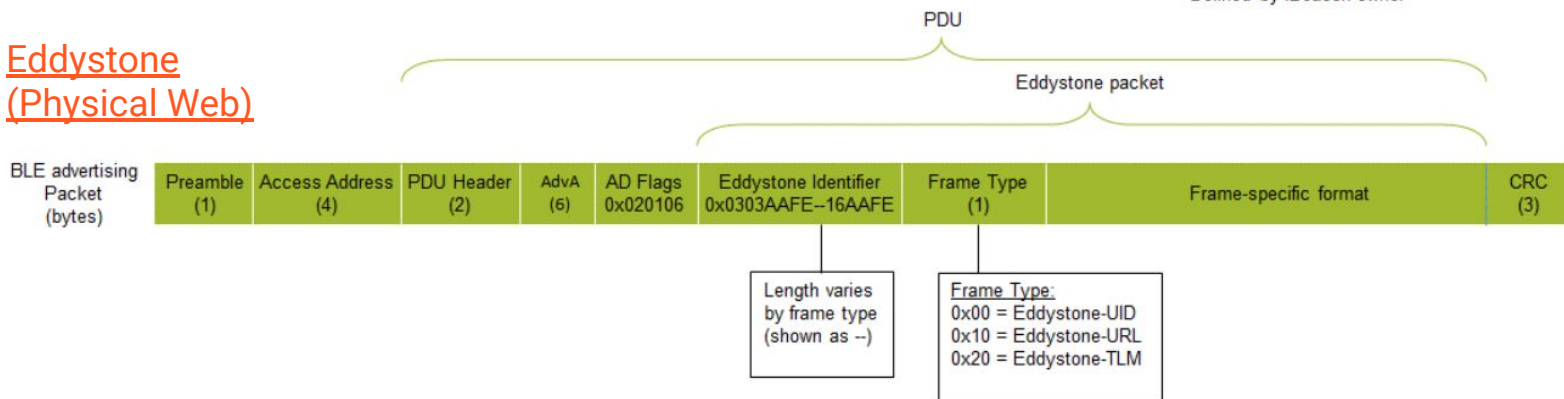


Beacon Frame Structure

iBeacon



Eddystone (Physical Web)



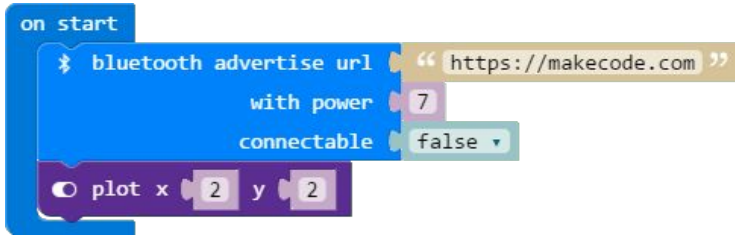
Silicon Labs, Developing Beacons with Bluetooth® Low Energy (BLE) Technology,

<http://pages.silabs.com/rs/634-SLU-379/images/Whitepaper-Developing-Beacons-with-Bluetooth-Low-Energy-Technology.pdf>

BBC micro:bit beacon



```
bluetooth.advertiseUrl("https://fe.up.pt", 7, false)  
led.plot(2, 2)
```



Name

eddystone

- Unsecure: Anyone can connect via Bluetooth.
- JustWorks pairing (default): Button press to pair.
- Passkey pairing: Button press and 6 digit key to pair.

Save

Edit Settings As text

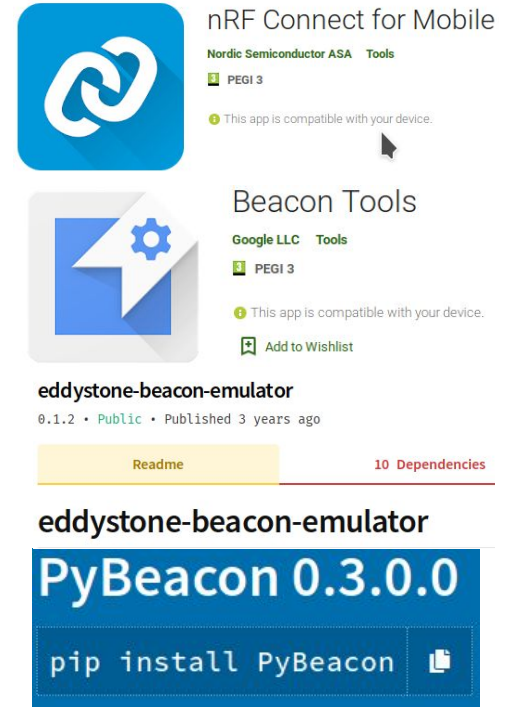


Simulating a Beacon

```
1. ragingwind (tmux)
~/Workspace/eddystone-emulator [master] ragingwind@rw-mbprt 4.0332s
> DEBUG=eddystone node cli.js --uri=http://goo.gl/eddystone
```

1: zsh*Z 2: zsh-Z 3: node

Exploring the Physical Web (Without Buying Beacons),
<https://medium.com/@urish/exploring-the-physical-web-without-buying-beacons-efae51e36c2e>



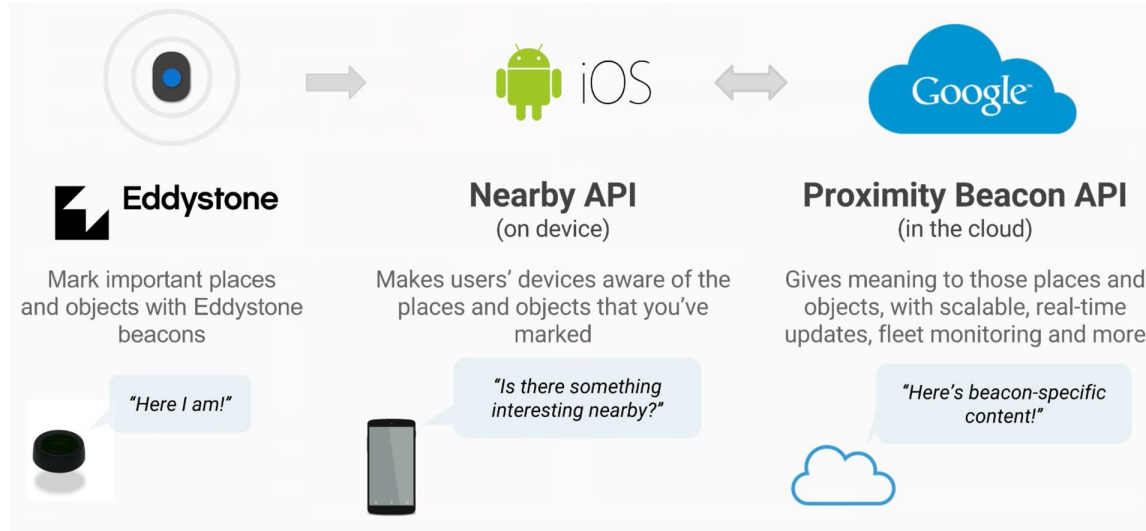
nRF Connect for Mobile
Nordic Semiconductor ASA Tools
PEGI 3
This app is compatible with your device.

Beacon Tools
Google LLC Tools
PEGI 3
This app is compatible with your device.
Add to Wishlist

eddystone-beacon-emulator
0.1.2 • Public • Published 3 years ago
Readme 10 Dependencies

eddystone-beacon-emulator
PyBeacon 0.3.0.0
pip install PyBeacon

Google Services



Get Started with Beacons: <https://developers.google.com/beacons/get-started>

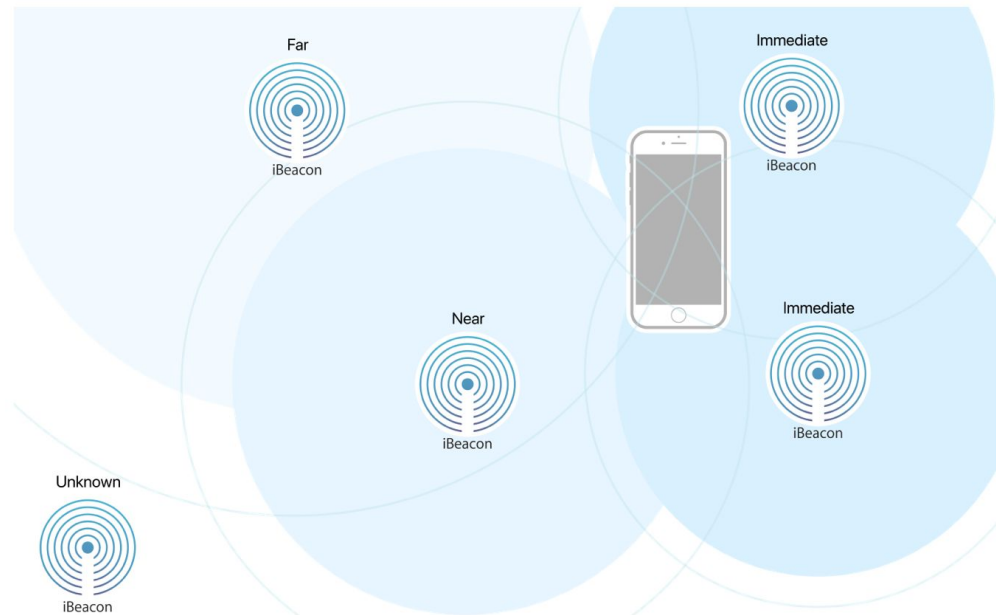
Nearby API: <https://developers.google.com/nearby>

Proximity Beacon API: <https://developers.google.com/beacons/proximity/guides>

How to do a BLE localization service?

Open-source projects in the wild:

- <https://github.com/neXenio/BLE-Indoor-Positioning>
- <https://github.com/IndoorLocation/basic-beacon-indoor-location-provider-android>





“walk up and use anything”
--The Physical Web

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