IOT: IMPACT OF THE PHYSICAL WEB AND BEACONS

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The “Internet of Things” is exploding. It’s made up of billions of “smart” devices – from miniscule chips to mammoth machines – that use wireless technology to talk to each other (and to us). Our IoT world is growing at a breathtaking pace – from 2 billion objects in 2006 to a projected 200 billion by 2020.

By the way, that will be around 26 SMART OBJECTS for every human being on Earth.

SOURCES: IDC, Intel, United Nations
Beacon Scan 4+

Do you work with beacons with iBeacon Technology or Physical Web Beacons? Then download Beacon Scan, and see all the information you need about nearby beacons.

Feature Set:
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See nearby beacons!
Supports both iBeacons and Physical Web Beacons!
Copy hard to type UUID and other beacon identifiers!
Works great with the best beacons on the market, Bleu Beacons from Twocanoes Labs...

...More

iBeacon & Eddystone Scanner

This app is compatible with some of your devices.

Add to Wishlist  Install
The Physical Web

• Everyday objects with ability to interact with the Internet, mobile devices
  – Smart TVs, Refrigerators, Microwaves etc.
  – Provides information, status etc.

• Bluetooth Low Energy (BLE)
  – New protocol to transmit information
  – Low power, short distance

• Beacons!
  – Many Vendors: Estimote, Radius Networks, BKON
What is this?

The Physical Web is an open source approach to unleash the core superpower of the web: interaction on demand. People should be able to walk up to any smart device - a vending machine, a poster, a toy, a bus stop, a rental car - and not have to download an app first. Everything should be just a tap away.
What is a Beacon?!

• Small transmitter device
  – Sold by many small/large companies
  – Uses Bluetooth Low Energy (BLE)
  – Uses batteries (cell, AAA etc.)
  – Long battery life (years)
  – Price ranges from $10-$30
  – Advertises itself on a regular basis
  – Recognized by mobile phone apps
  – Transmits when a receiver is close (proximity)
  – Small size data transfers
  – Unique Beacon ID, can be managed remotely
Edit Beacon

Beacon ID
xmnkgjr

Alias
My Beacon Name

Default URL
http://www.mobils.com/recreationwellness

Notes
This beacon is near the entrance, above the door and to the left of the exit sign.

Default Proximity
- [ ] Immediate
- [ ] Close
- [ ] Far
- [ ] Off

* Only users with the BKON Browser app will currently benefit from your Proximity settings.

SAVE SETTINGS
CANCEL

Remove this Beacon ID

Beacon ID
xmnkgjr

Alias
Recreation and Wellness

Default URL
http://www.mobils.com/recreationwellness

Notes
This beacon is near the entrance, above the door and to the left of the exit sign.

Default Proximity
- [ ] Immediate
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* Only users with the BKON Browser app will currently benefit from your Proximity settings

SAVE SETTINGS
CANCEL
How does it work?

• Apple – iBeacon Protocol
  – Original iBeacon protocol
  – Transmits Beacon UID and Short Text

• Google – Eddystone Protocol
  – UID – Unique ID + Text
  – URL – Unique ID + URL + Text
  – TLM – Telemetry Data, for management
  – EID – Ephemeral ID, secure access (new!)

• Smartphone – iOS and Android
iBeacon for Developers

From welcoming people as they arrive at a sporting event to providing information about a nearby museum exhibit, iBeacon opens a new world of possibilities for location awareness, and countless opportunities for interactivity between iOS devices and iBeacon hardware. To learn more, read Getting Started with iBeacon.
Beacons

A platform for marking up the world to make your apps and devices work smarter by providing timely, contextual information.

LEARN MORE
GET EDDYSTONE

Mark up the world using beacons

Give your users better location and proximity experiences by providing a strong context signal for their devices in the form of Bluetooth low energy (BLE) beacons with Eddystone™, the open beacon format from Google.
So, how does it work?

- **Beacon Advertisement**
  - Regular transmissions of UID etc.

- **Receiver in Proximity (Range)**
  - Typically a smartphone with app
  - Many vendors have beacon apps
  - Google Play: The Physical Web
  - iTunes: The Physical Web

- **Beacon Transmits Data**
  - Ex. Eddystone URL resolves URL on mobile app
How does it work?
OK, so what?

- Beacons provide proximity info
  - Beacons are not connected to the Internet
  - They provide ”nearby” information
  - Receiver does [will] not need any app
    - Google in integrating beacon info in Android
    - Somewhat similar to searching for Wi-Fi
  - Beacons can be associated with objects
  - Or, locations, people, animals etc. etc.
  - Beacons = Physical things + Web
Issues and Concerns

• Remote Management
  – Locations need to be mapped
    • Somewhat similar to deployment of WAPs
  – Need to be managed
    • Weather, battery life, status
  – Transmittal URL information
    • Needs to be current and updated

• Costs
  – $10-$30 per beacon can get expensive
  – Time and cost for IT to manage beacons and content
More Issues and Concerns

- Current State of Beacon Security
  - Nothing!

- Unauthorized Tracking
  - Any receiver can track a beacon UID and Location

- Forgery
  - Adversary can forge the advertisement UID

- Showrooming
  - Adversary can insert competing info in beacon data
Security Mitigation

• Google’s new Eddystone Ephemeral ID
  – Every beacon has a private symmetric key
    • Known only to the owner of the beacon
  – Unique Beacon Ephemeral ID (EID)
    • Symmetric key + pseudo-random function of Beacon clock
  – Unique Beacon EID needs registration
    • Global online trusted resolver of Beacon IDs
    • Sharing permission policy allows other to connect
  – Receiver securely connects to a Beacon when...
    • Smartphone receives Beacon EID
    • Sends EID to the cloud/global resolver service
    • Cloud/global service matches EID with registered keys
Case Study: Tracking Luggage

How does Track&Go work?

Accent Systems has built the Bluetooth Low Energy beacon inside the suitcase which use the new open Eddystone frame type, the Ephemeral Identifier (EID), recently released by Google. In a traveling context, this will help you to quickly recover your luggage without taking the risk of being identified by malicious third parties. All that the traveller has to do is register as the owner of the luggage on the Travlr app from Samsonite, allowing it to start sending encrypted and rotating IDs.

You can easily understand how Track&Go works in the following video.

http://accent-systems.com/blog/accent-systems-eddystone-eid-case-study-trackgo-samsonite/
Beacons on College Campus

• Guided tour of campus
  – Each major object on campus has a beacon!

• Classroom
  – Classroom beacon provides current status, schedule

• Cafeteria
  – Daily hours, specials, prices, other info.

• Stadium
  – Current scores, ticket information, events etc.

• Faculty Office
  – Office hours, appointment schedule etc.
Case Studies

**Retail**
Attract, engage and understand your customers. Deliver exact information, not mass messaging.

**Tours**
Provide visitors with customized guided tours, including food and entertainment ideas.

**Trade Shows**
Provide interactive maps, seamless check-in, attendance details and relevant schedule updates.

**Healthcare**
Improve efficiency and generate data as proof of compliance. Engage families and staff relative to proximity.

**Real Estate**
Enrich house hunting experiences. Provide far greater detail, serve up listing content, boost realtor efficiency.

**Events**
Improve experience and increase engagement by analyzing traffic and making real-time campaign changes.
Case Studies

• Retail
  – Beacons identify various store locations
    • As customers approach, provides info, sales etc.

• Hospitals/Hotels
  – Beacons can identify a patient/guest, location info.

• Any Physical Location of Interest
  – Museum, Conventions, Stadiums, Tourist Location

• Education
  – Beacons can identify classroom info, cafeteria etc.
Conclusion

• Current Web
  – Cloud based
  – URL describes content in cloud
    • Related to people, places, things etc.

• Physical Web
  – Proximity content, near micro location
  – Context is a physical object and/or location
  – Does not require any app or downloads
  – IoT: Beacons allow Things to have Info via Internet