

# BLE by example

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Polidea

# BLE by example

- Core Location
  - iBeacons
- Core Bluetooth
  - BLE peripherals communication

# Examples

- Estimote's Beacons
  - Knoll's *r/evolution workplace<sup>TM</sup>* project with *Bounce by Knoll<sup>TM</sup>* app
- Texas Instruments' SensorTags
  - MCE Jitter's Prototyping fun with TI's SensorTag Workshop

# iBeacons

- What is inside?
- What have we faced?
- What have we delivered?

What is inside?

# What is inside?

- Core Location
- Regions identification with:
  - proximity UUID
  - major
  - minor

# What is inside?

- Registering:

```
CLBeaconRegion *region = [[CLBeaconRegion alloc]
initWithProximityUUID:@“39EF98AA-3100-515B-842D-9E218FE143E5”
identifier:@“eu.tgrf.beacons”];

[locationManager startMonitoringForRegion:region];
```

# What is inside?

- Getting location:

```
- (void)locationManager:(CLLocationManager *)manager
    didRangeBeacons:(NSArray *)beacons
        inRegion:(CLBeaconRegion *)region {
    if (CLProximityNear == [beacons.firstObject proximity]) {
        // we're in!
    }
}
```

What have we faced?

# What have we faced?

- Provide an app for the NeoCon conference for Knoll, utilising iBeacon technology
- Contextual information, ready to be modified from backend
- Estimote Beacons surrounded by large number of people

# What have we faced?

- NeoCon event, June 9th, 2014
- North America's largest design exposition and conference for commercial interiors
- attended by over 40,000 architecture and design professionals

# What have we faced?

- Knoll's *r/evolution workplace<sup>TM</sup>* project
  - measuring office space utilisation
- *Bounce by Knoll<sup>TM</sup>*
  - a part of *r/evolution workplace<sup>TM</sup>*
  - contextual information
  - user location tracking

# What have we faced?

- Polidea's office as a testing ground
  - testing in similar area
  - interoperating with other BLE devices
  - fewer people than on NeoCon

# What have we faced?



# What have we faced?

- Testing in the wild
  - even one person could be a problem
  - exit notification could be received after a long time
  - estimated number of Beacons will be different than used in practice

# What have we faced?

- Testing in the wild
  - Proximity estimated correctly (almost) only in perfect conditions
  - Zones (far, near, immediate) as a good compromise
  - Phantom notifications about being in range

What have we  
delivered?

# What have we delivered?

App Store > Business > Knoll, Inc

The screenshot shows the App Store listing for 'Bounce by Knoll™' by Knoll, Inc. The page includes the app icon, title, developer information, price (Free), rating (4+), and a copyright notice (© Knoll 2014). Below the main info are three iPhone screenshots demonstrating the app's interface, which includes a navigation bar, a grid-based planning tool, and a modern office interior.

**Bounce by Knoll™** 4+

Knoll, Inc. >

Details Ratings and Reviews Related

iPhone Screenshots

Free

★★★★★ (9)  
Rating: 4+

© Knoll 2014

**Bounce by Knoll**

**Adaptive Planning**

Don't just "tear down the walls" to spark collaboration. Adaptive planning uses moveable and reconfigurable elements to define a variety of work settings and adjustable furnishings within them. The benefits:

- A flexible work environment where people

**Modern always®**

Celebrating over 75 years of iconic design for the home and office

Knoll uses modern design to connect people to their work, their lives, their world. Since 1938, Knoll has been recognized internationally for creating workplace and residential furnishings that inspire, evolve, and

## Description

Bounce by Knoll™ invites you to discover Knoll. As you tour our showroom, location specific notifications offer context to what you are seeing, creating an interactive, multi-layered experience.

Bounce provides interactive information and notification based on a user's micro-location, while also monitoring, measuring and analyzing space utilization and the social dynamic of the office. The app employs a wireless, "beacon" technology that operates in tandem with smartphones to exchange data and information.

# What have we delivered?

- Tricks and findings
  - Merging Beacons into groups with the same ID
  - Triggering actions after second or third “in range” notification
  - Placing Beacons over people’s heads

# What have we delivered?

- Results:
  - <http://www.knoll.com/knollnewsdetail/revolution-workplace-knoll-at-neocon-2014>
  - <http://techcrunch.com/2014/06/17/estimote-knoll-partner-to-bring-ibeacons-into-office-space-planning/>
  - <https://itunes.apple.com/us/app/bounce-by-knoll/id882507990>



# BLE peripheral

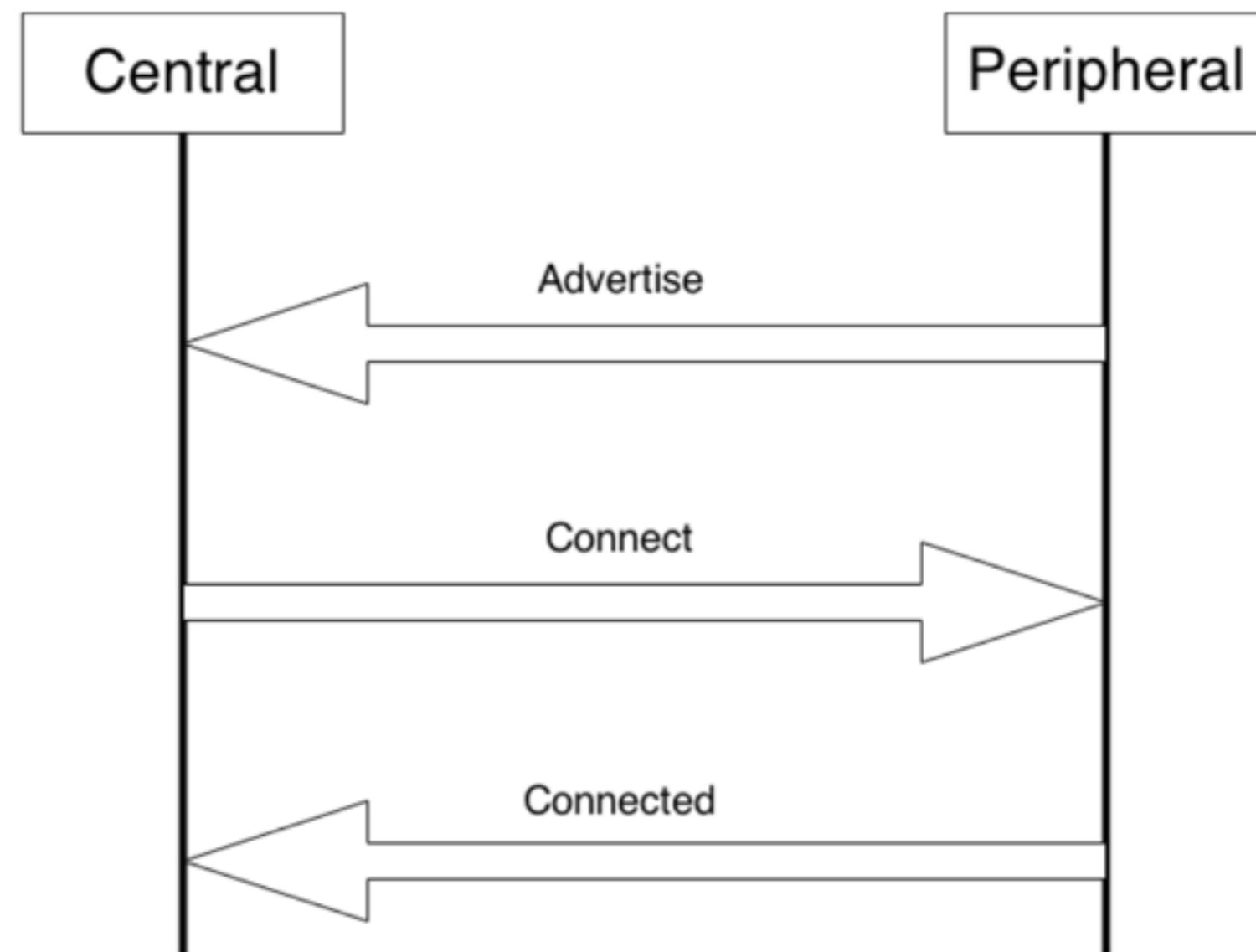
# BLE peripheral

- What is inside?
- What have we faced?
- What have we delivered?
- How have we done it?

What is inside?

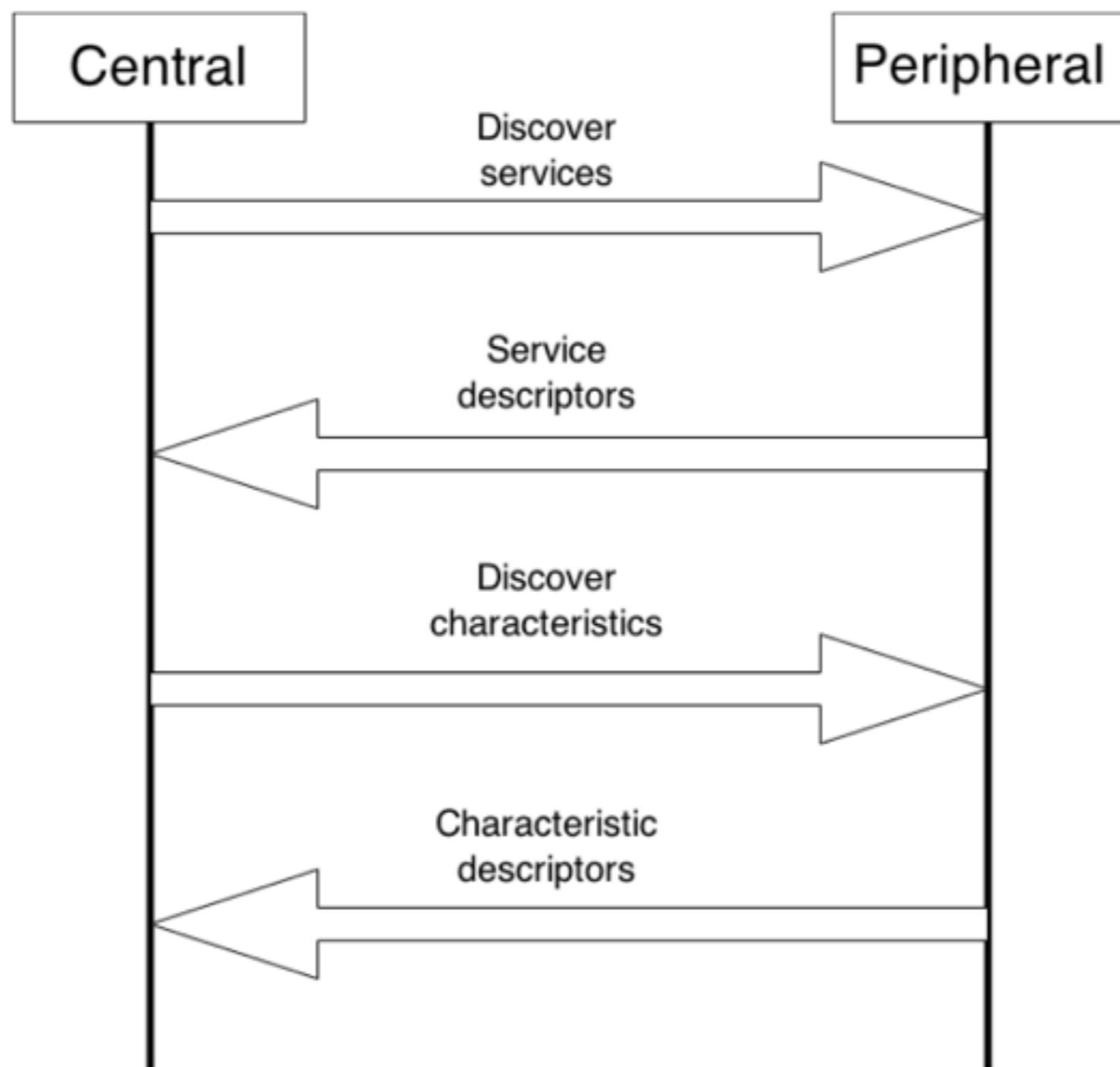
# What is inside?

- BLE Stack - connecting



# What is inside?

- BLE Stack - discovering



# What is inside?

- Core Bluetooth
- iOS Bluetooth Stack
  - CBCentral
  - CBPeripheral

# What is inside?

- CBCentral
  - scanning
  - establishing connection with peripheral
- CBPeripheral

# What is inside?

- CBCentral
- CBPeripheral
  - discovering services and characteristics for them
  - reading and writing values to/from characteristics

What have we faced?

# What have we faced?

- MCE Jitter's Prototyping fun with TI's SensorTag
  - over 40 people
  - developing their ideas into a working prototypes with TI ST
  - teaching basis of BLE and peripheral integration

# What have we faced?



What have we  
delivered?

What have we has  
been delivered?

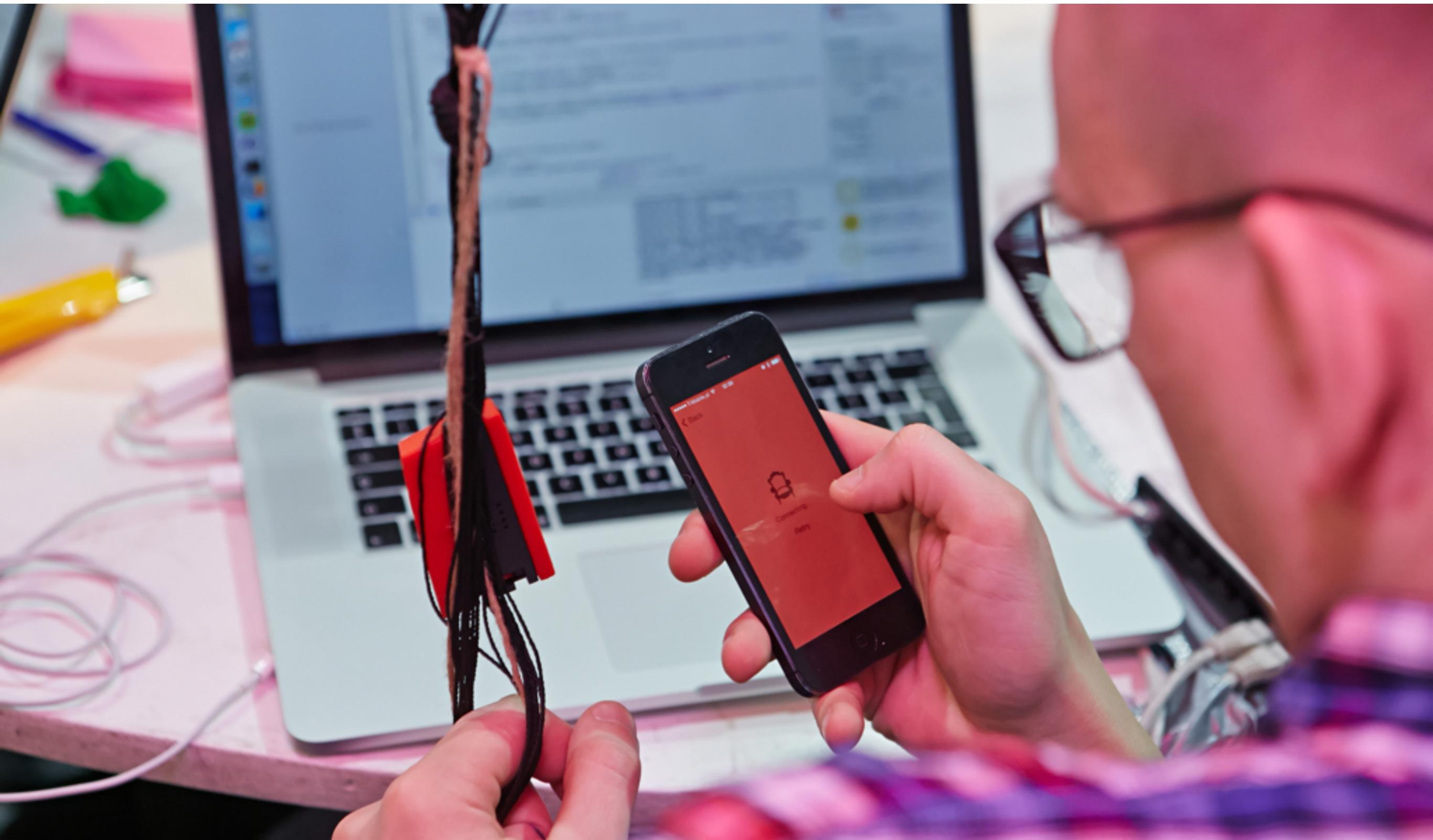
# What has been delivered?



# What has been delivered?



# What has been delivered?



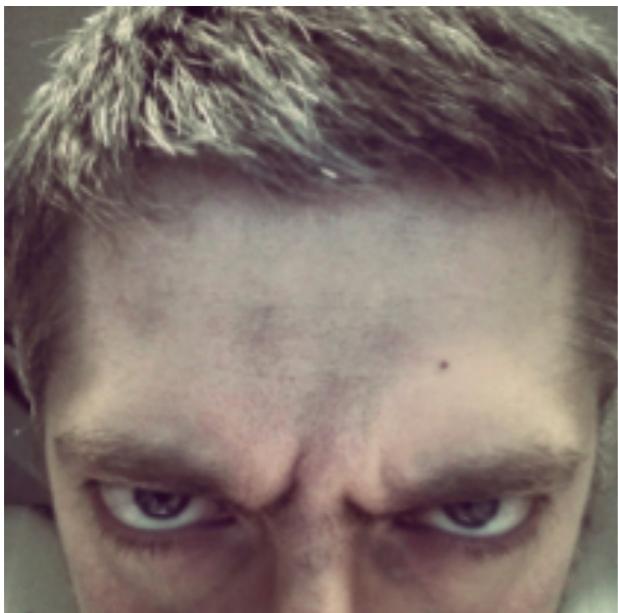
How have we done it?

# How have we done it?

- Findings:
  - it's easy:
    - if you have tested it before
    - with app skeleton
  - batteries will run out of power just exactly during your show after over a year

# How have we done it?

- With a great team!



# Kudos

- Błażej Marcinkiewicz, @blazejmar
- Krzysiek Wróbel, @MrChrisWrobel
- Alek Piotrowski, @pelotasplus
- Przemek Pomaski

# Tech details

# Tech details

- <https://github.com/tgrf/TISensorTag>
- <https://developer.apple.com/ibeacon/Getting-Started-with-iBeacon.pdf>
- [https://developer.apple.com/library/mac/documentation/NetworkingInternetWeb/Conceptual/CoreBluetooth\\_concepts/AboutCoreBluetooth/Introduction.html](https://developer.apple.com/library/mac/documentation/NetworkingInternetWeb/Conceptual/CoreBluetooth_concepts/AboutCoreBluetooth/Introduction.html)
- <http://www.raywenderlich.com/52080/introduction-core-bluetooth-building-heart-rate-monitor>

# Q&A

# Thanks!

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