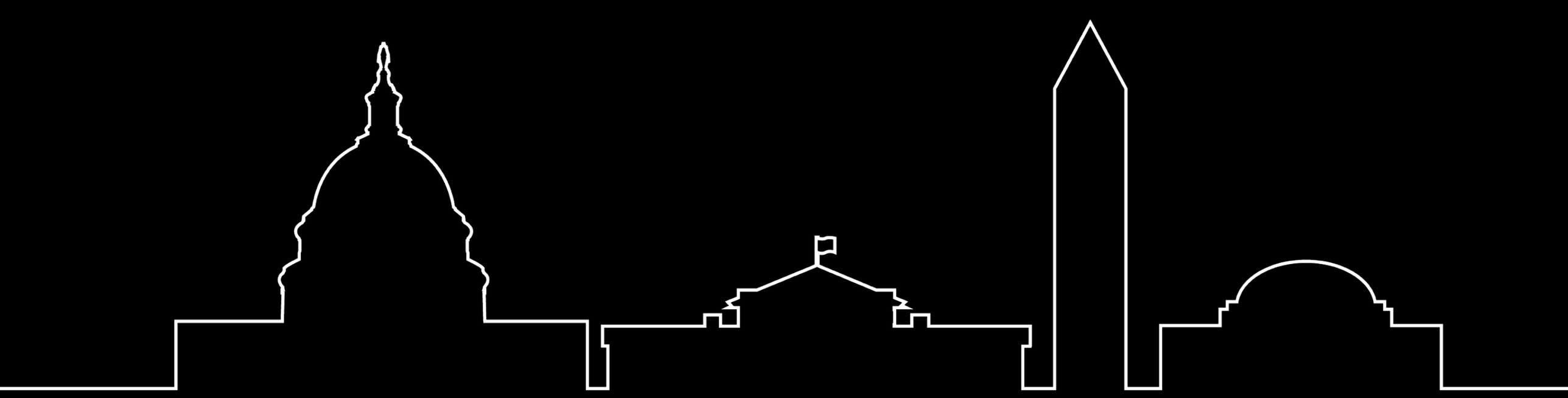
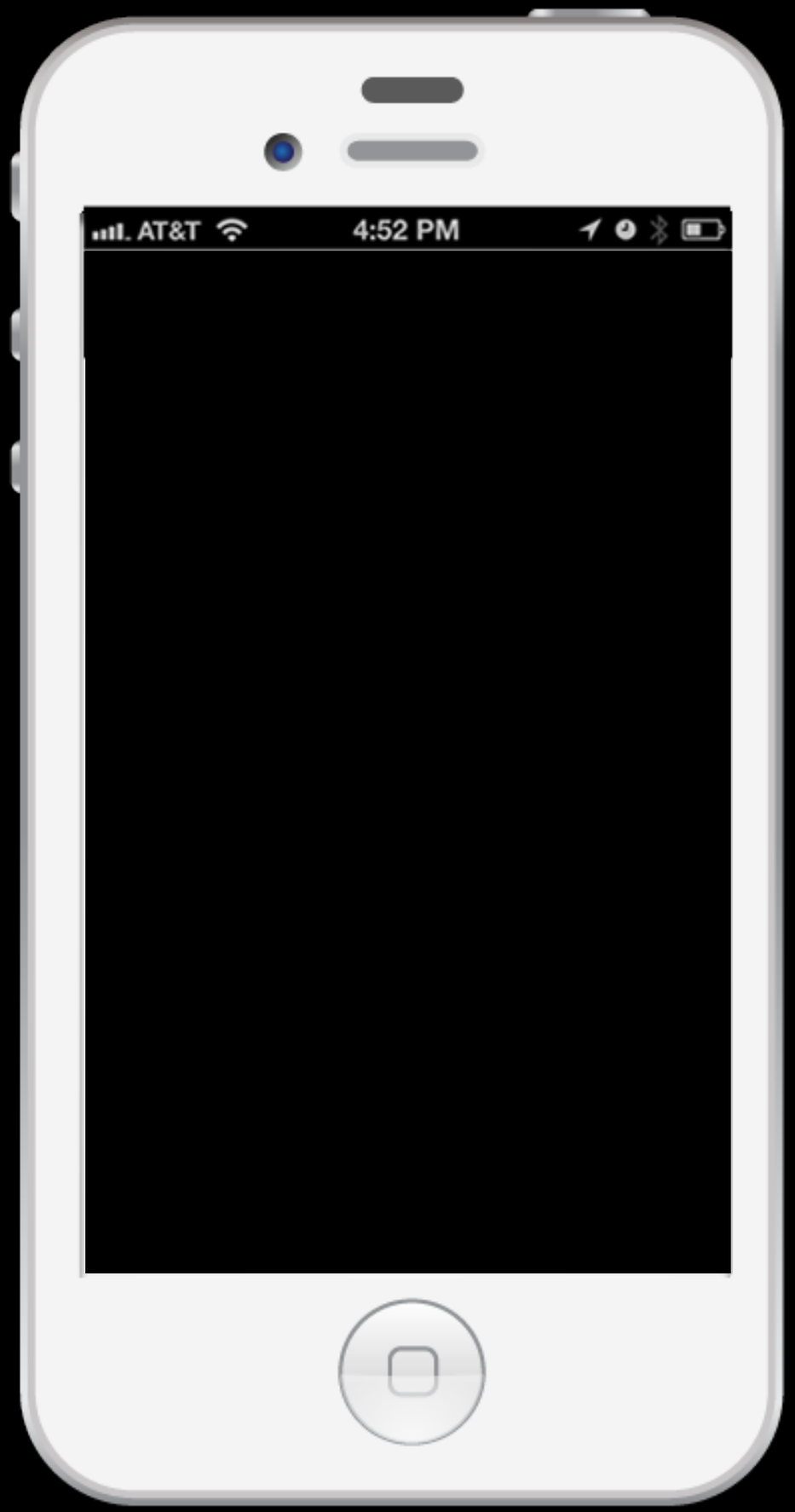
iBeacon Essentials

Radius Networks

Washington DC 2015
(the near future)




AT&T
4:52 PM

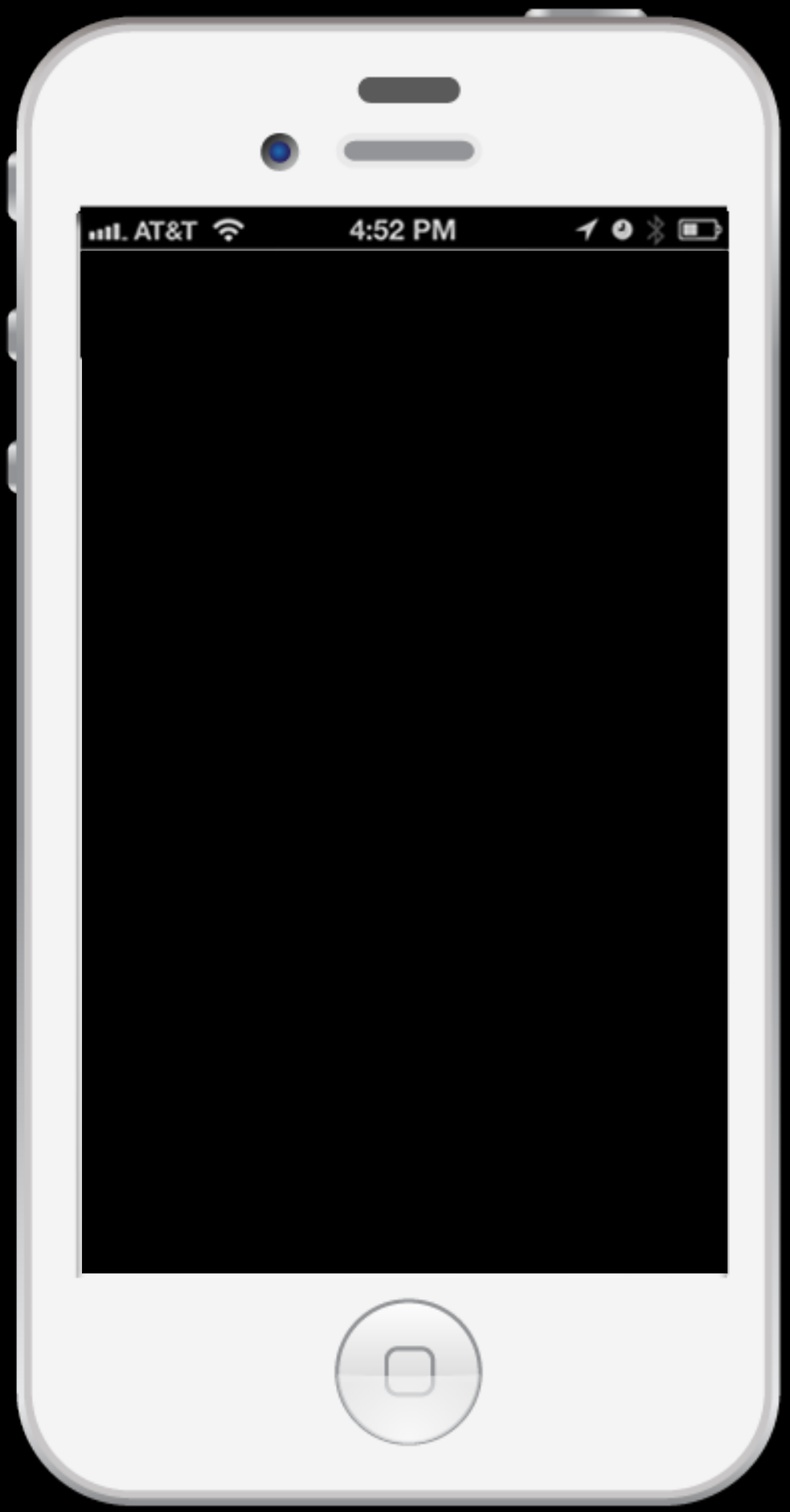
AT&T 4:52 PM

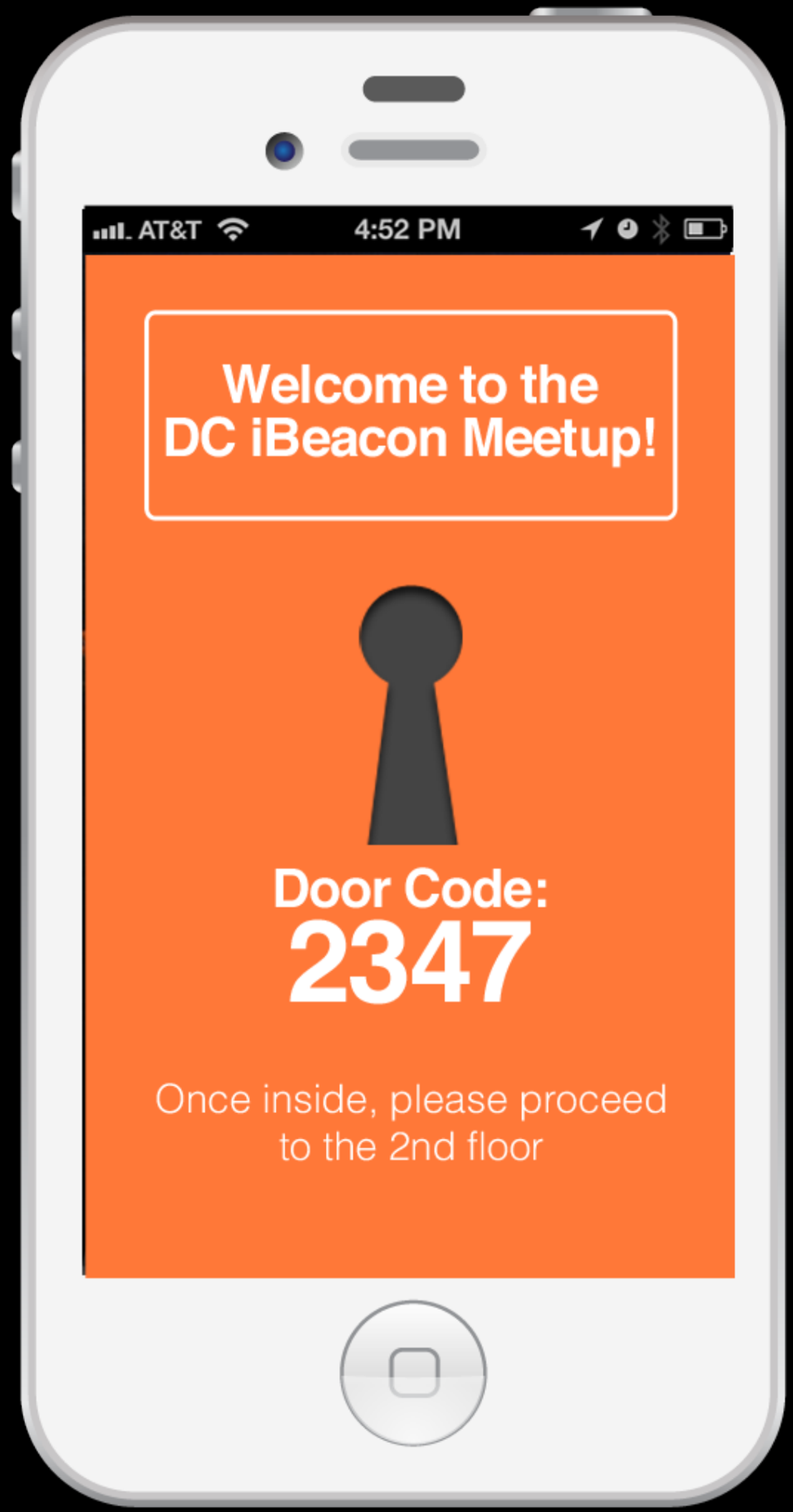
DELAY ADVISORY

Expect Major Delays

ALTERNATE ROUTE

38B Bus
230 N Moore St.
Departs in 3 minutes


AT&T
4:52 PM


AT&T
4:52 PM
Welcome to the
DC iBeacon Meetup!
Door Code:
2347
Once inside, please proceed
to the 2nd floor

Introduction: What you'll see

- See iBeacon varieties
- Learn how iBeacons work
- Demos of iBeacons in action - you can participate!

Radius Networks

Introduction: About Radius Networks

- Proximity Services Company
- iBeacon Sales
- Rich iBeacon web service provicer
- Dev tools for iBeacons, many free
- Open-source Android iBeacon Library development

Radius Networks

Introduction: About David Young

- Chief Engineer at Radius Networks
- Android iBeacon Library author
- Rev-engineered iBeacon profile
- iOS/Android App Developer

Radius Networks

Introduction: Get the App

- iOS 7 users with iPhone 4S+, iPad 3+

Available on the App Store **Locate for iBeacon**

- Android 4.3 users w/ phone < 1yr old

ANDROID APP ON Google play **iBeacon Locate**

- Make sure Bluetooth is turned on!

Radius Networks

iBeacon Essentials

What are iBeacons?

How they work

Using iBeacons

Radius Networks

What are iBeacons?

What are iBeacons?

- Extremely simple radio device
- Transmits Bluetooth LE signal
- Connectionless / transmit only

Radius Networks

What are iBeacons? - Bluetooth LE

- Low Energy Bluetooth (BLE)
  - Bluetooth 4.0 / “Bluetooth Smart”
  - Peripheral Role (transmit), Central Role (listen)
- iPhone 4S, iPad 3, Android 2013+
- Less power, more reliable
- Range of about 50 meters

Radius Networks

What are iBeacons? - OS Support

iOS 7+

- Detect iBeacons, act as iBeacons

Android 4.3+

- Detect iBeacons
- Most Android phones will be capable by the end of the year, CANNOT act as iBeacons

Mac, Linux, Windows

- Detect iBeacons, act as iBeacons

Radius Networks

What are iBeacons? - Form factors

- Battery powered
- USB Nub (USB power or A/C power adapter)
- iOS (iPhone or iPad)
- Specialized computer (e.g. Raspberry Pi)
- Laptop Software (Mac, Linux, Windows)

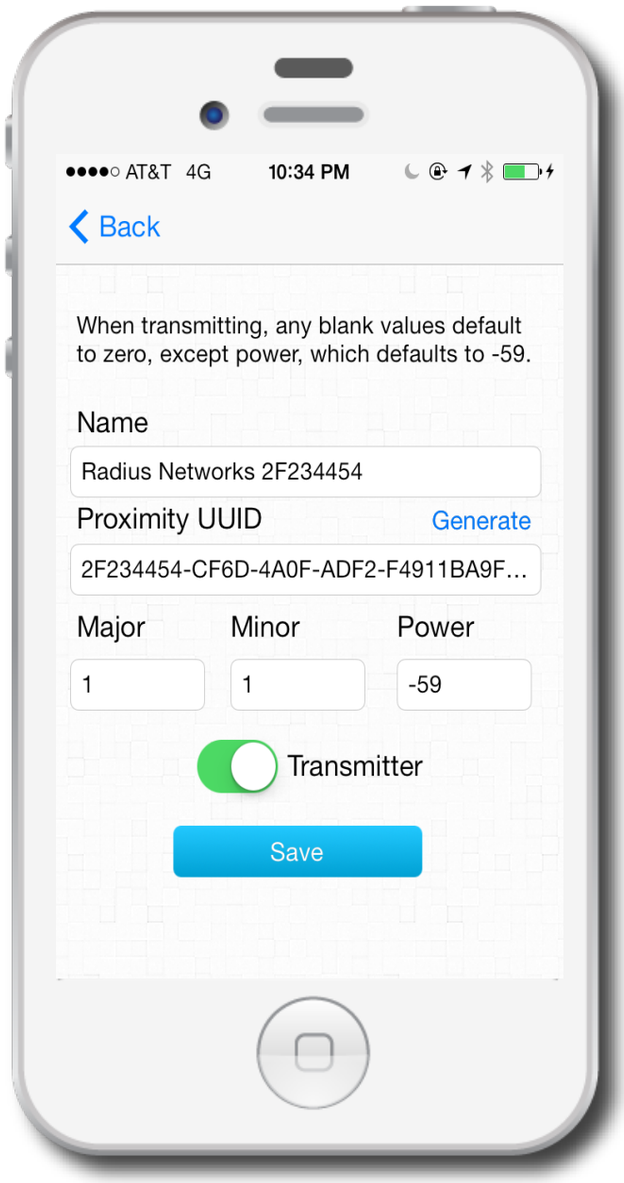
Radius Networks

What are iBeacons? - iOS form

- PRO: Lowest cost, if iOS device present
  - Locate for iBeacon App (FREE)
- CON: iBeacon **must be in foreground**
- CON: must keep iPad/iPhone powered

Radius Networks

What are iBeacons? - iOS form



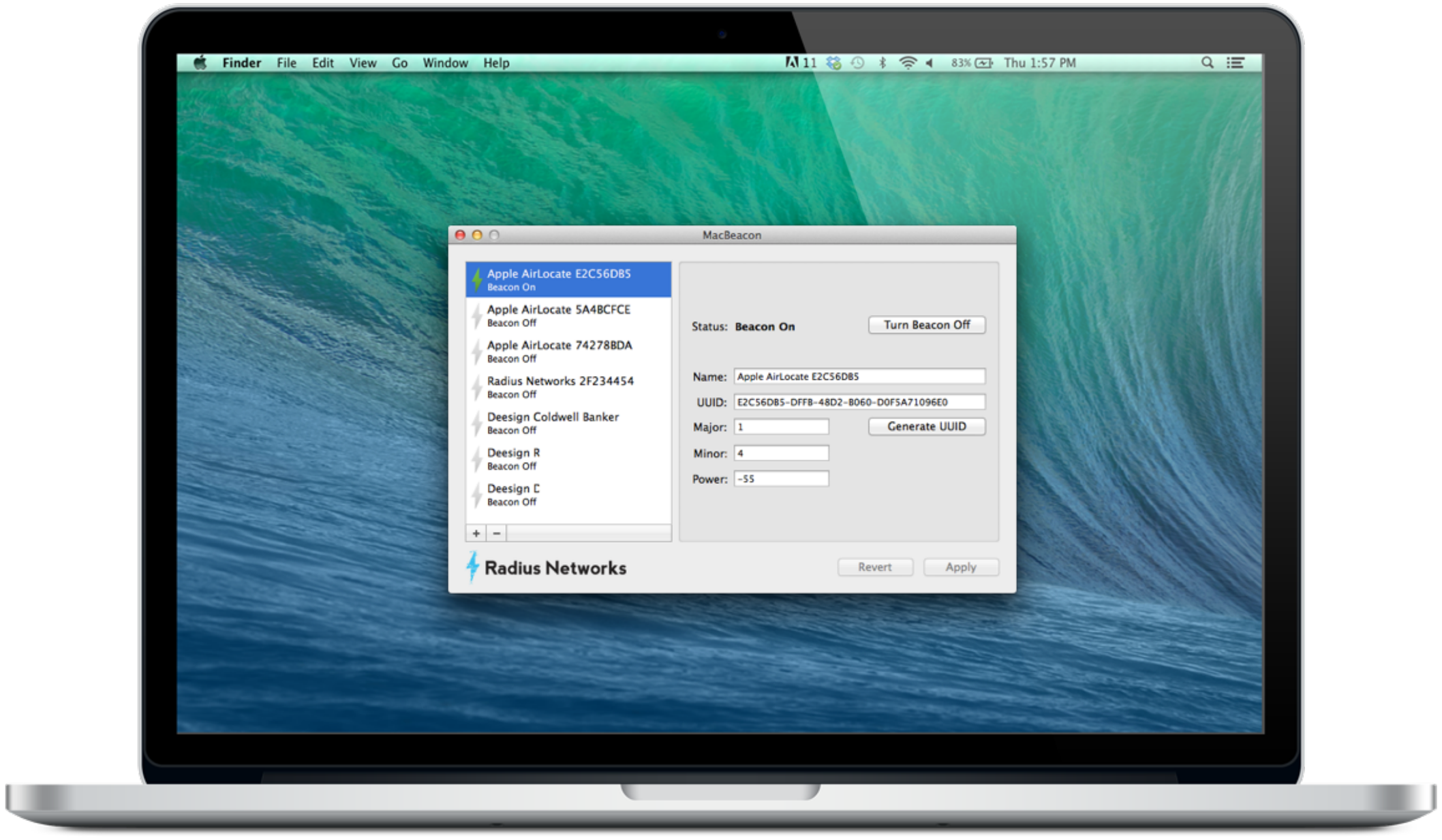
Radius Networks

What are iBeacons? - Laptop form

- PRO: Low cost, if computer present
  - MacBeacon ($10), Virtual Machine (free)
- PRO: iBeacon app runs in background
- CON: Computer can lock up

Radius Networks

What are iBeacons? - Laptop form



Radius Networks

What are iBeacons? - Powered form

USB Nub or Dedicated Computer

- RadBeacon (USB Power, $49)
- iBeacon Dev Kit (AC Power, $99)

PRO: Maintenance Free

CON: Must have USB or A/C power

Radius Networks

What are iBeacons? - Battery form

- Various Models ($30-$60)
- PRO: Total flexibility of placement
- CON: Battery **will** run out - be skeptical of manufacturer claims. Use only if you have to!

Radius Networks

How iBeacons Work

How iBeacons work - Basics

Constant Bluetooth LE transmission

- “advertisement” sent once per second or more

Three part identifier in advertisement

- Org-specific “proximity UUID” (e.g. 2F234454-CF6D-4A0F-ADF2-F4911BA9FFA6)
- Site-specific “major” id (0-65535)
- Location-specific “minor” id (0-65535)

RSSI (signal strength)

- RSSI @1m calibration constant embedded in advertisement
- Enables rough estimate of distance from phone to iBeacon

Radius Networks

How iBeacons work - What they do

- Tell iOS/Android devices they're nearby
- Allow devices to uniquely identify them
- Allow devices to estimate their distance

THAT'S ALL THEY DO!

Radius Networks

How iBeacons work - What they don't do

- Not anything without an app on a device
- Can't transmit, "Welcome to our store"
- Don't tell phone or tablet its lat/lon
- Can't tell what other devices are nearby
- Don't broker device-device communication

Radius Networks

How iBeacons work - building block

- Only a basic building block
- Can do **everything** mentioned above with additional software / web services

Radius Networks

Using iBeacons

Using iBeacons - Two APIs

Monitoring

- are any iBeacons around?

Ranging

- which iBeacons are around?
- how far away are they?

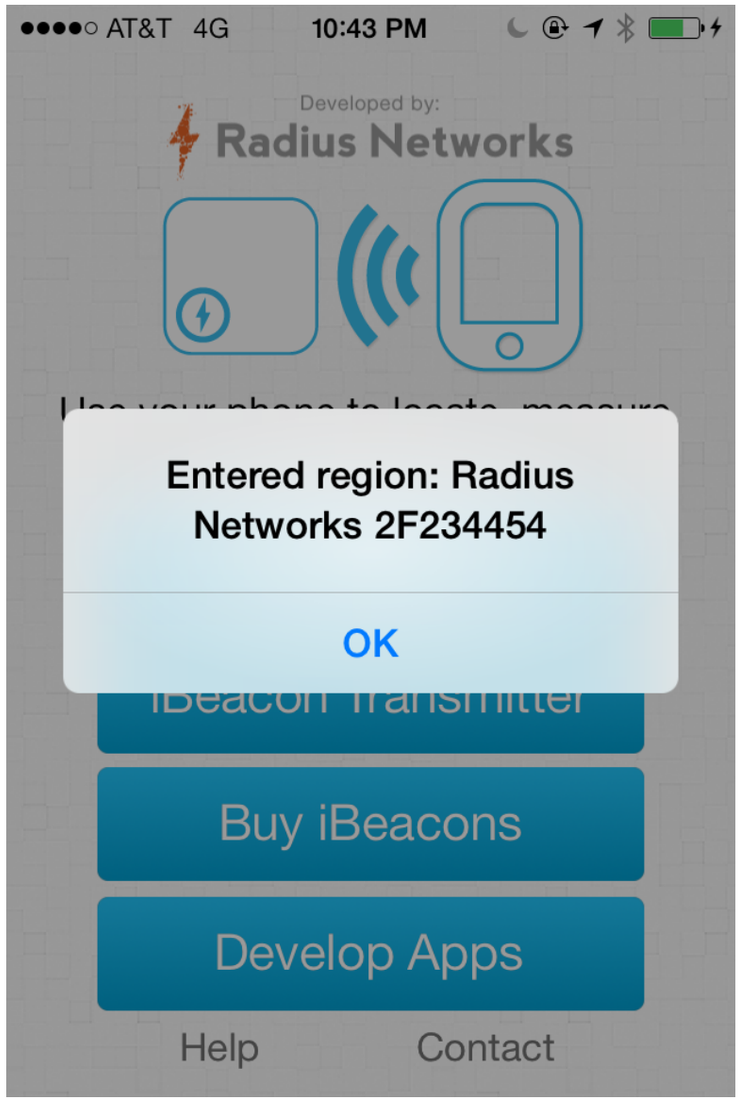
Radius Networks

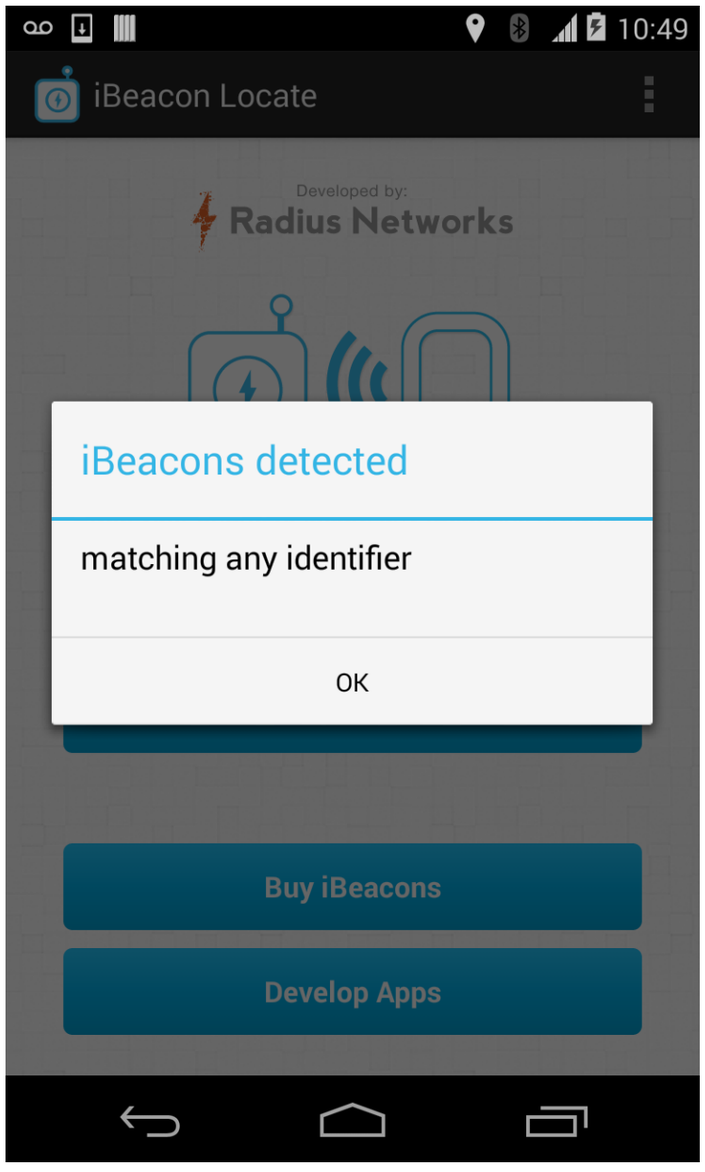
Using iBeacons - Monitoring

- Tells phone when iBeacons are nearby
- Works when app is in background or foreground
- Does not tell you which iBeacon seen

Radius Networks

Using iBeacons - Monitoring Demo





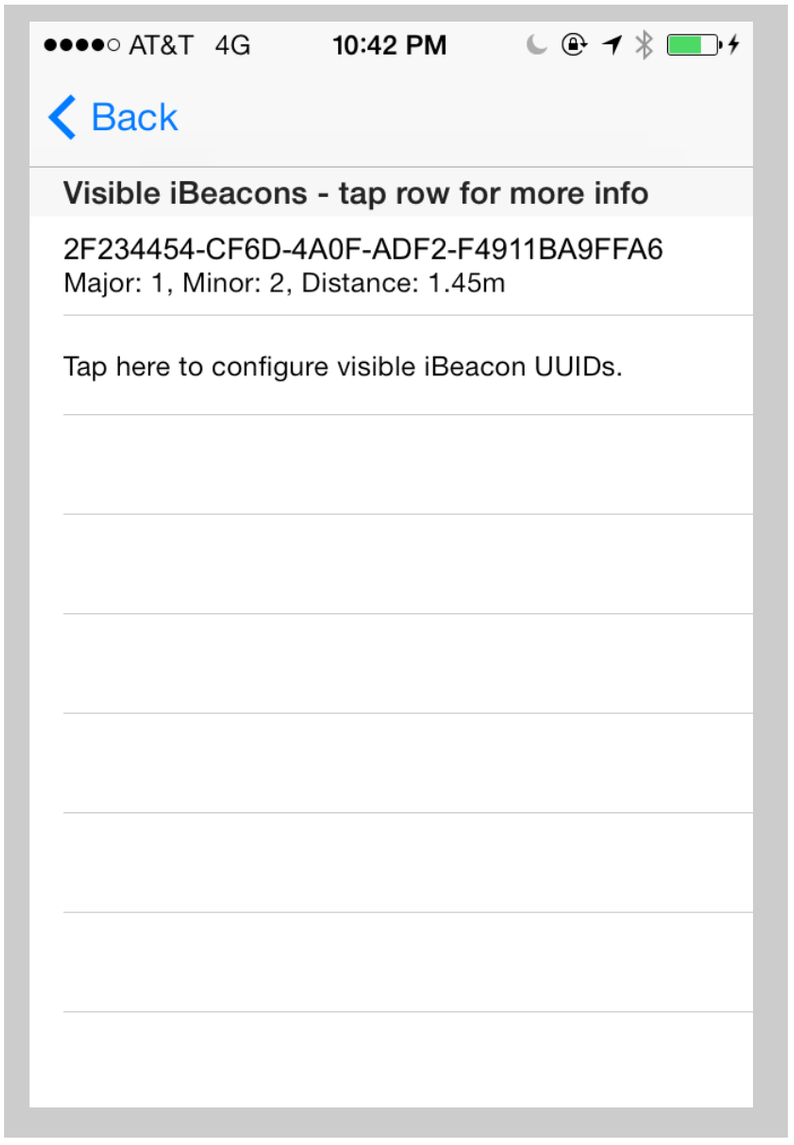
Radius Networks

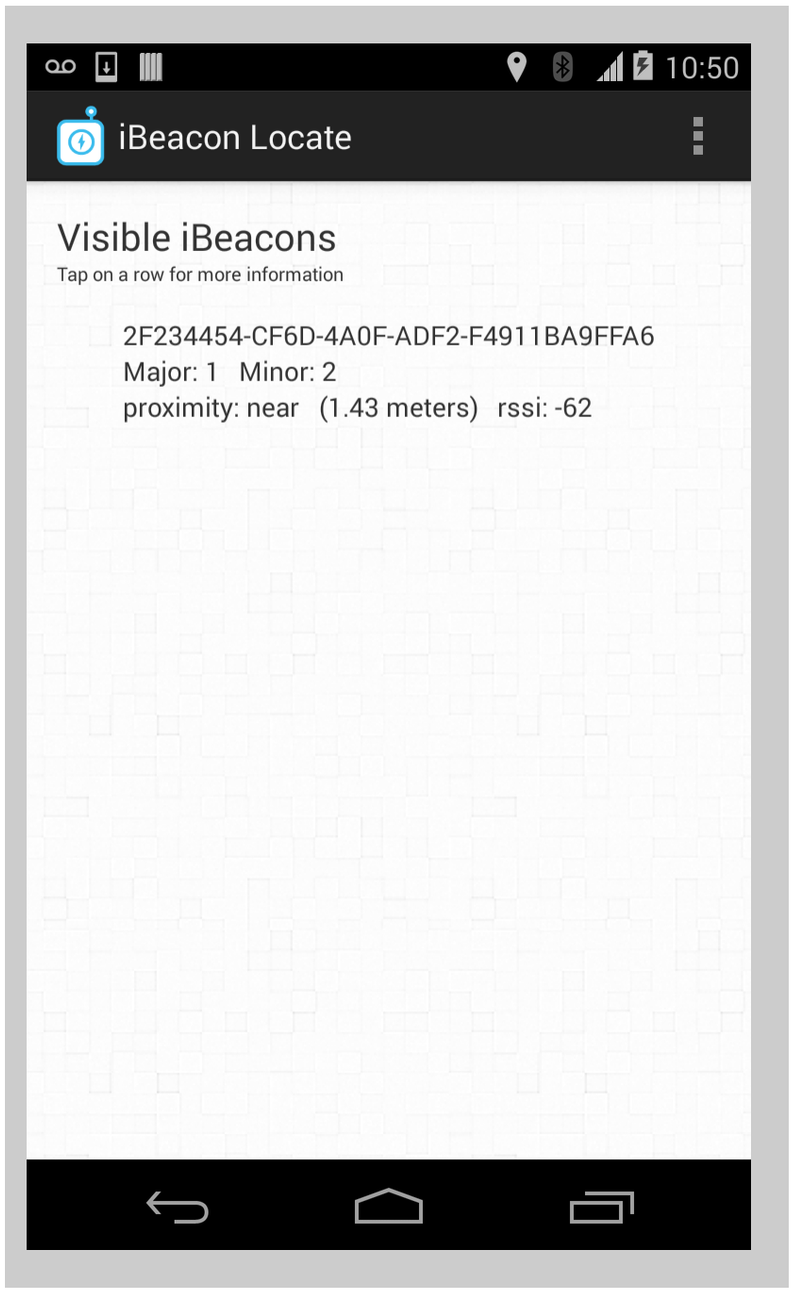
Using iBeacons - Ranging

- Provides the three-part identifier of all iBeacons in radio range
- Updates provided once per second
- Does not work in the background on iOS

Radius Networks

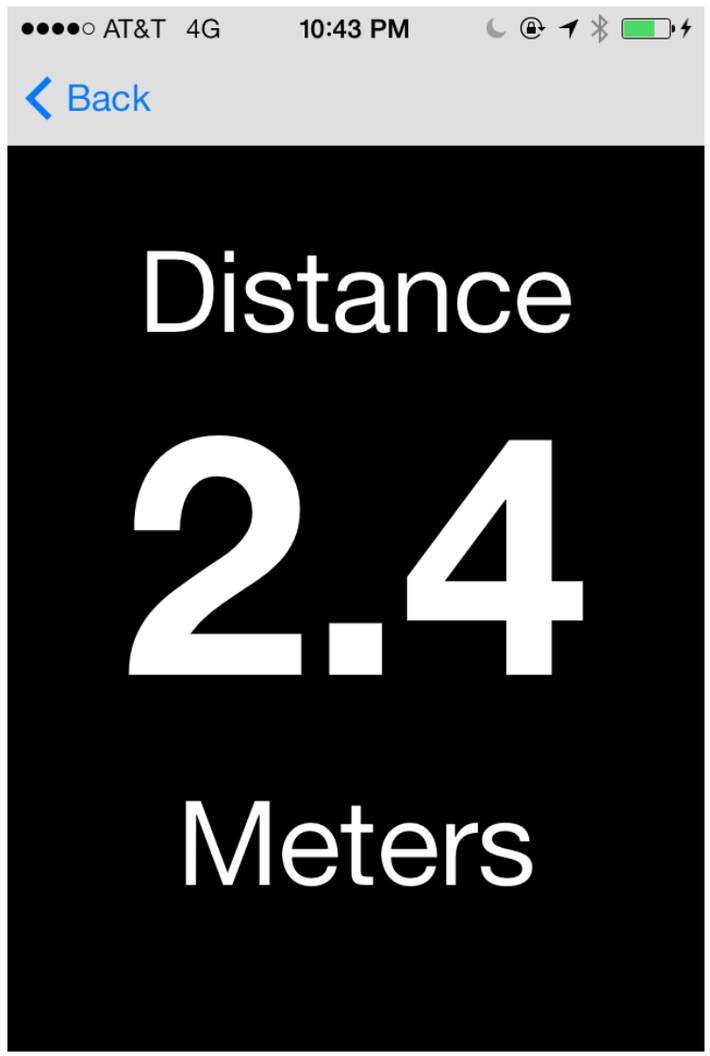
Using iBeacons - Ranging Demo





Radius Networks

Using iBeacons - Ranging Demo



Radius Networks

Using iBeacons - Apps in Background

Functionality limited on iOS

- Monitoring can launch your app into background for only 5s
- Can send notifications to lock screen, call web services
- Cannot launch app at a specific distance from iBeacon
- Not very timely, especially on older phones. Takes up to 15m

Android is very flexible

- But background use drains battery - 90mA on a Nexus 5
- Pro Android iBeacon Library provides tools to save battery

Radius Networks

Using iBeacons - Privacy

- Privacy is a hot-button issue

- iBeacons are privacy friendly
  - As transmit only devices, you can see them, they can't see you!

- Apps must ask permission to detect
  - iOS: "[appname] would like to use your current location"
  - Android: install time request for Bluetooth LE, Bluetooth Admin

Radius Networks

Using iBeacons - Security

Do not assume secret iBeacon IDs

- iBeacon identifiers can be read over the air
- iBeacon identifiers can be decompiled from your app binary

Be careful about wireless configuration

- Wireless configuration interfaces may be vulnerable to hacking

Small devices are easy to steal

Radius Networks

Questions

David Young
Chief Engineer
david@radiusnetworks.com
http://stackoverflow.com/tags/ibeacon
http://developer.radiusnetworks.com/dcmeetup