Introduction to Bluetooth Low Energy

Lightning talk

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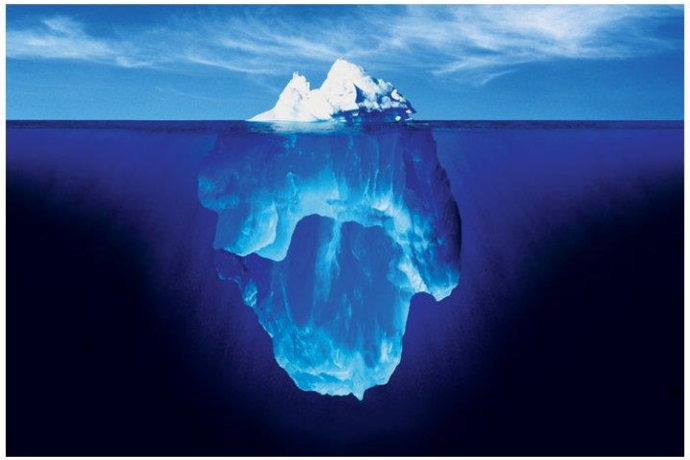
 @geoaxis 

Hej!

IoT STOCKHOLM

- Who am I?
- Who are you?
- Agenda
  - Basics (Tip of the iceberg)
  - Use cases
  - Resources

  No Demos
- Questions and comments welcome during break or on twitter/email.



Bluetooth Low Energy – In short

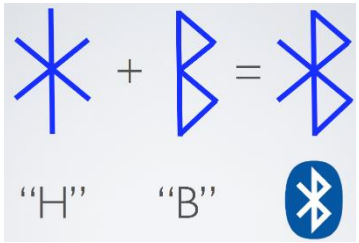
- Wireless technology standard, designed from ground up.
- Simple and easy to use model.
- Small bursts of data.
- Impressive battery life.
- Low cost.
- Works on free 2.4 Ghz band.
- Ideal for sensors/ IoT.

History

ERICSSON

intel

NOKIA



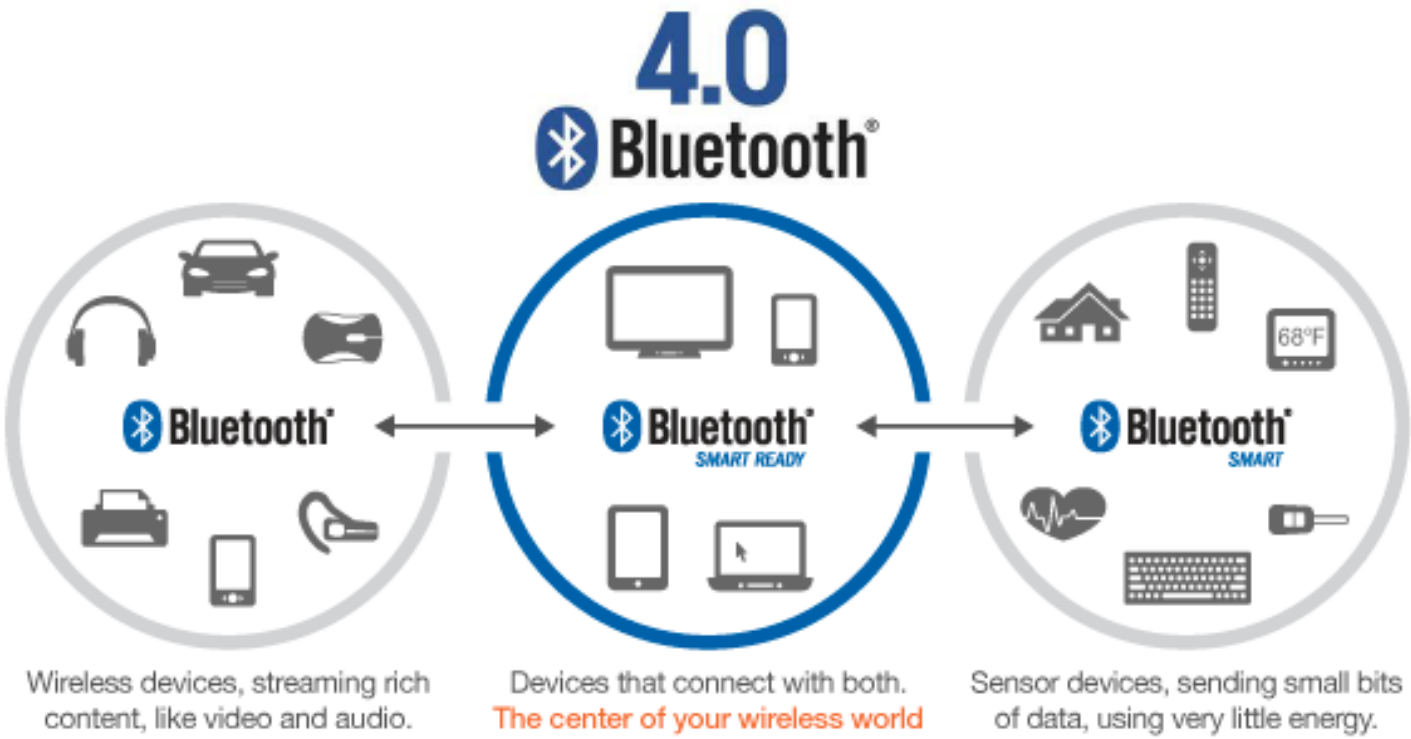
wibree

4.0 Bluetooth®

1994-97 2006 2010 2011-2012 2015

Note on Naming

- Bluetooth 4.0
- Bluetooth Low Energy
  - BLE, BTLE, LE
- SIG Preferred
  - Bluetooth Smart
  - Bluetooth Smart Ready



BLE Roles

Master

Client

Can read/write data to Slave/Server

Central

Peripheral

Slave

Server

Has read/write data

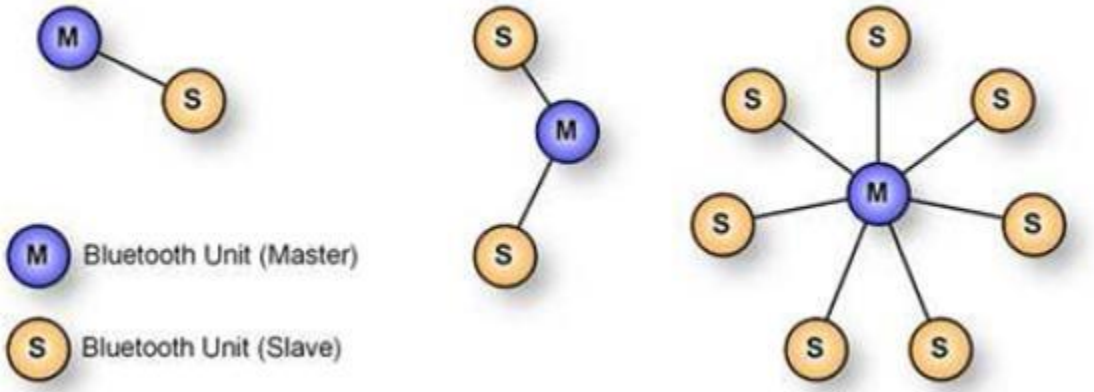
Can receive broadcast data

Observer

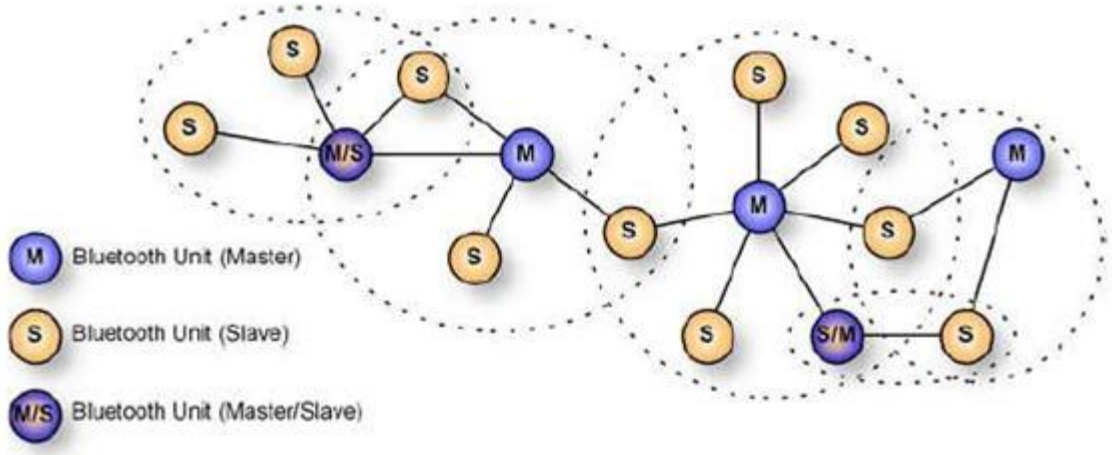
Broadcaster

Has read-only broadcast data

Topology

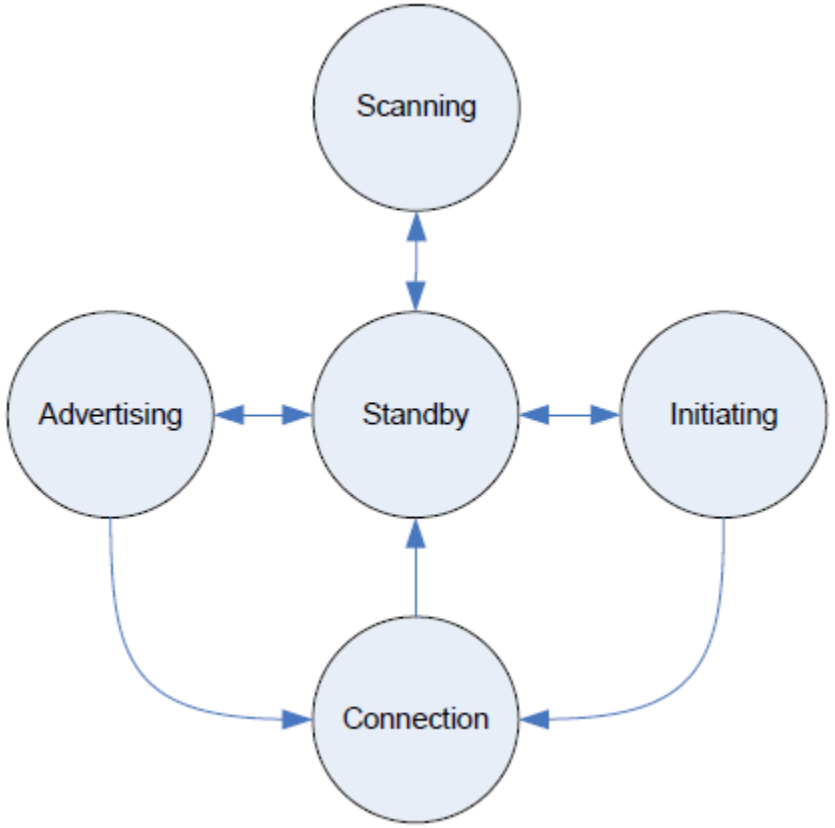


Piconet v4.0

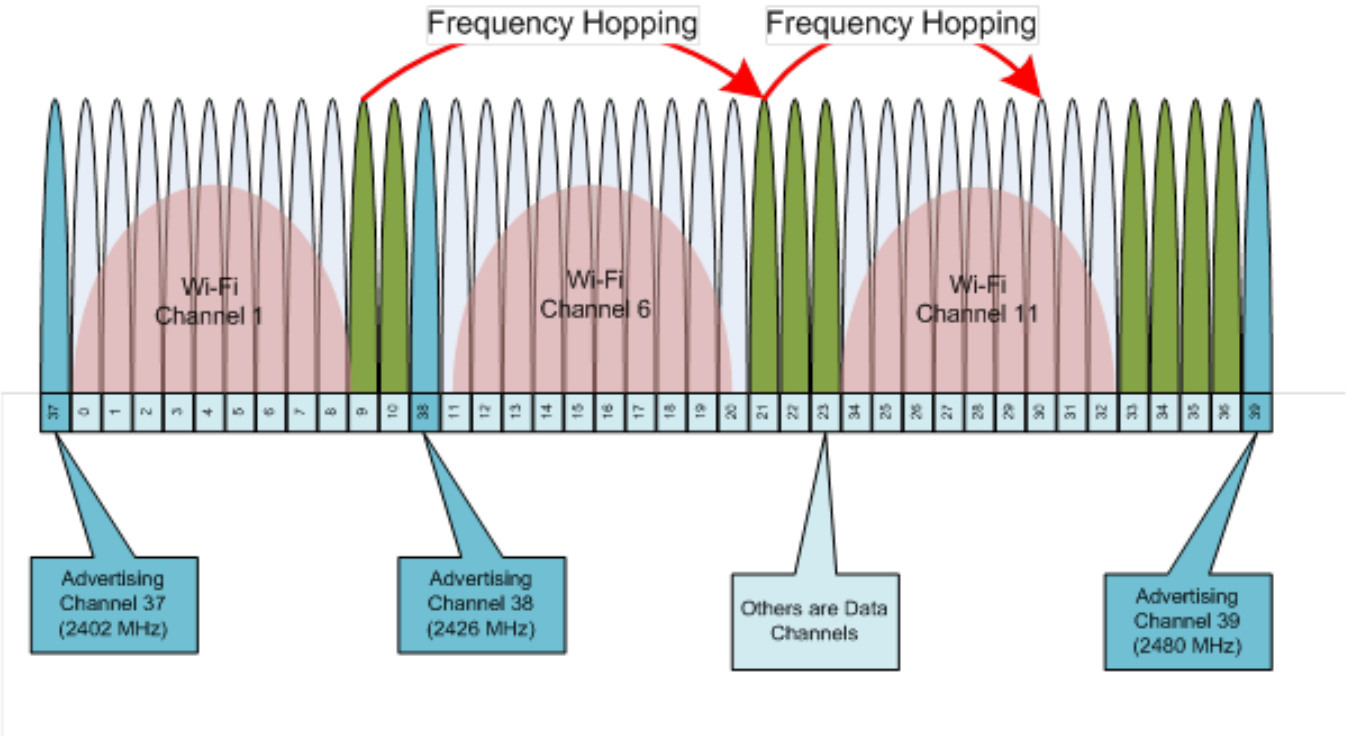


Scatter net v4.1

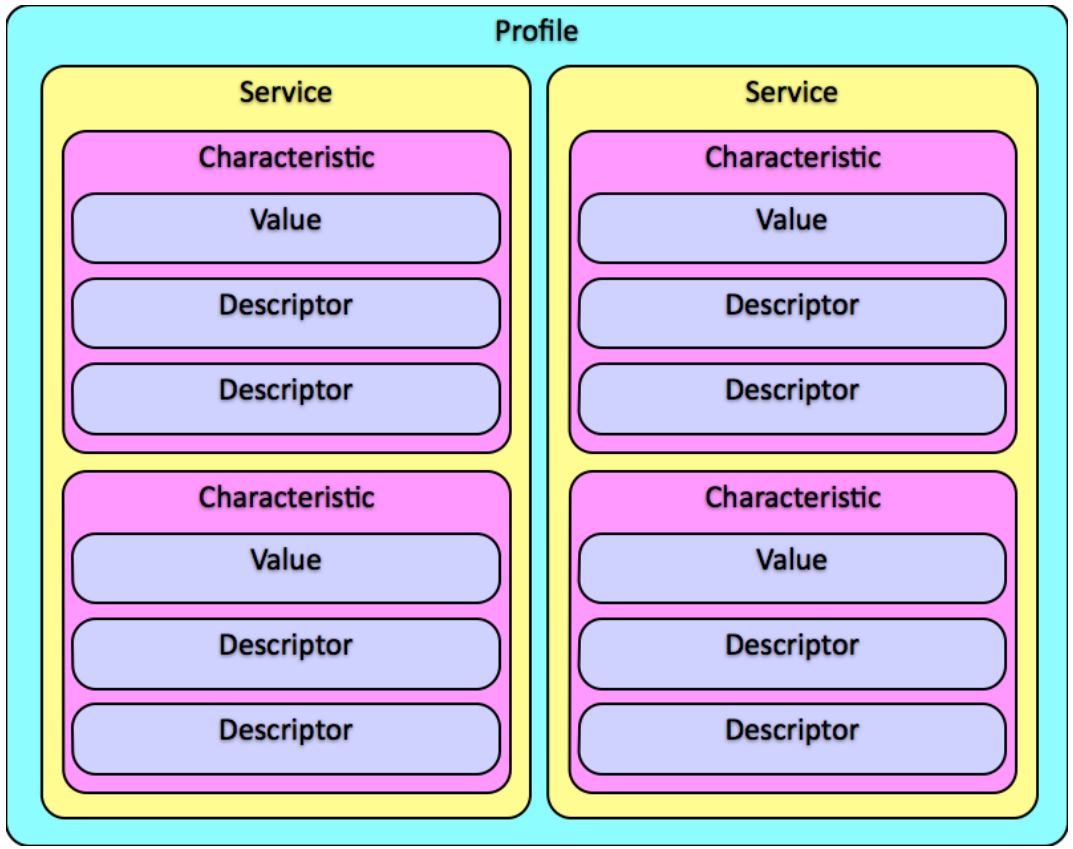
BLE Power States

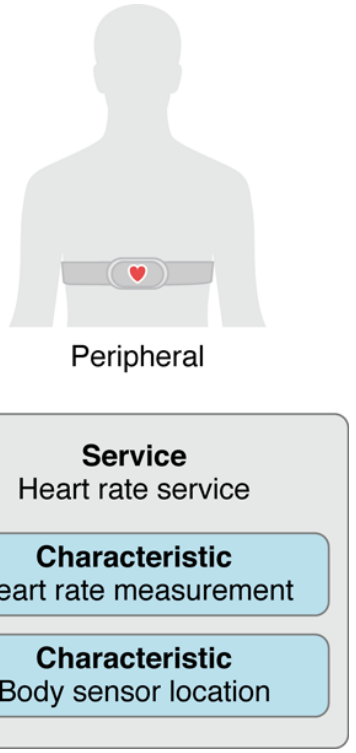


Spectrum/Adaptive Frequency Hopping



Generic Attribute Profile - GATT





Services, characteristics, and descriptors are collectively referred to as *attributes*, and identified by UUIDs.
16 bits (e.g. "**180A**") or 128 bits (e.g. "**6BCF0ED3-68E3-4804-96D5-5AB8765FB9BC** ")

GATT Operations

- Central can
  - discover UUIDs for all primary services.
  - Find a service with a given UUID.
  - Find secondary services for a given primary service.
  - Discover all characteristics for a given service.
  - Find characteristics matching a given UUID.
  - Read all descriptors for a particular characteristic.
  - Can do read, write, long read, long write values etc.
- Peripheral
  - Notify or indicate central of changes.

Security

- Encryption (128 bit AES)
- Pairing (Without key, with a shared key, out of band pairing)
- Passive eavesdropping during key exchange (but fixed in Bluetooth 4.2)
- Many products are building their own security on top of BLE
- Check out Mike Ryan (iSec partners) work on security.

Use cases – Physical Security

Download on the App Store

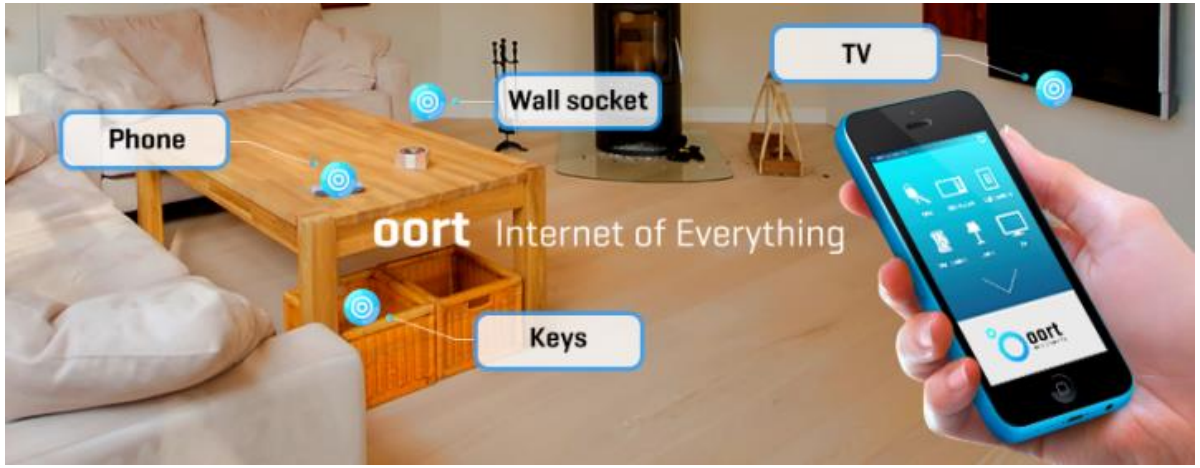
ANDROID APP ON Google play

EMTEK ASSA ABLOY

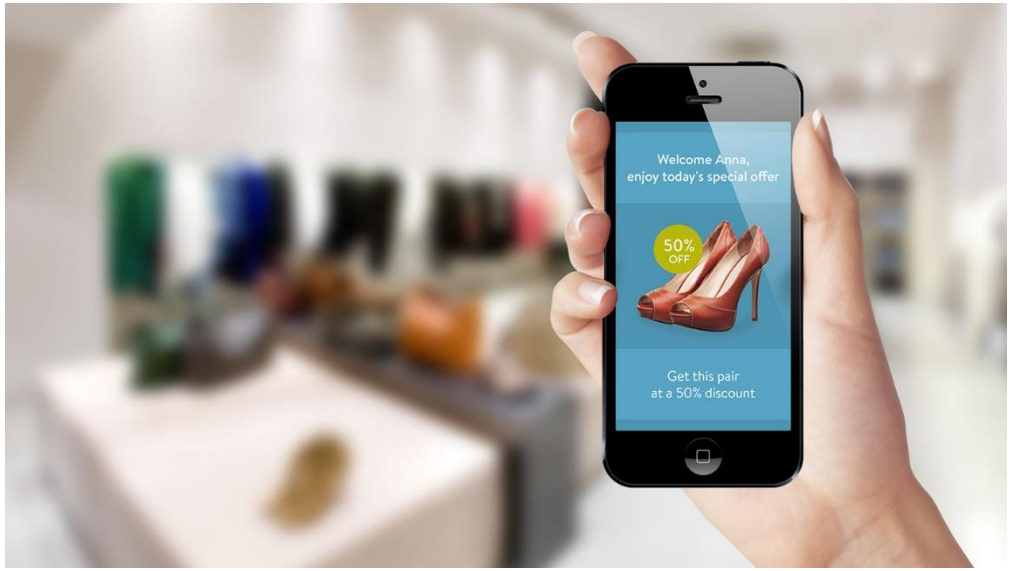
Bluetooth

INTERIOR TRIM

Use cases – Home automation

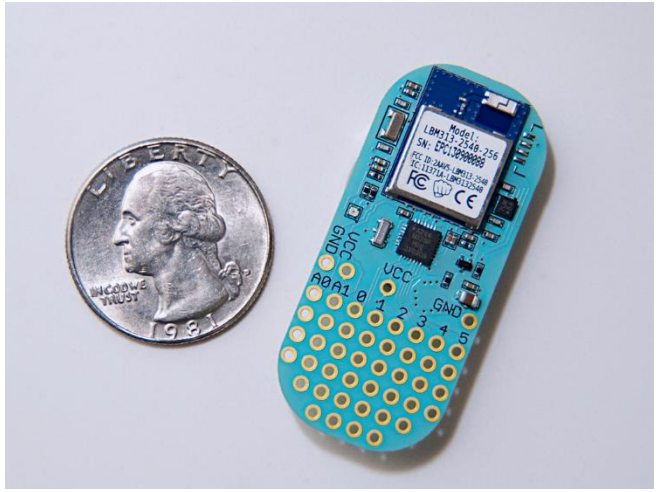


Use cases – Geo-fencing/ positioning



Use cases - Fun

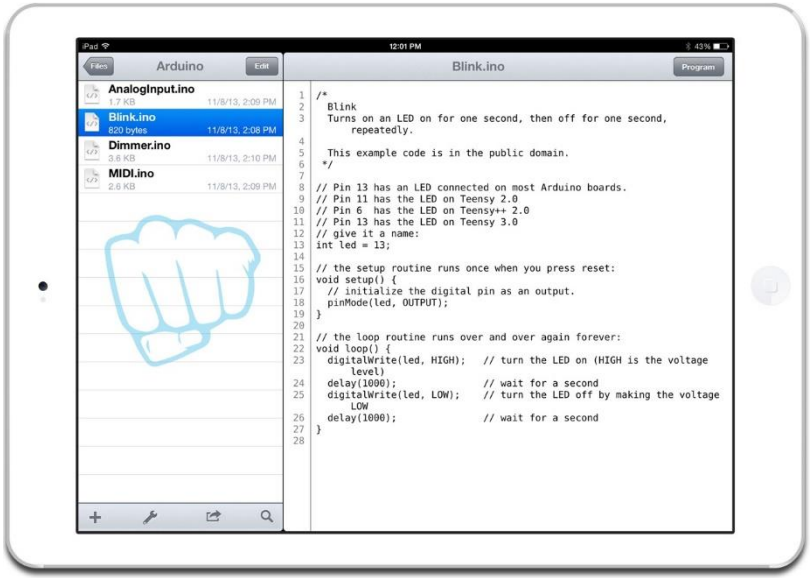
Development Kits/Boards

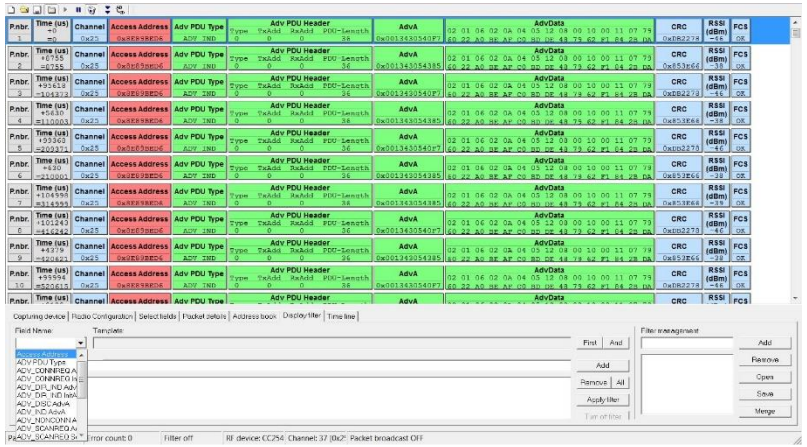


Operating System Support

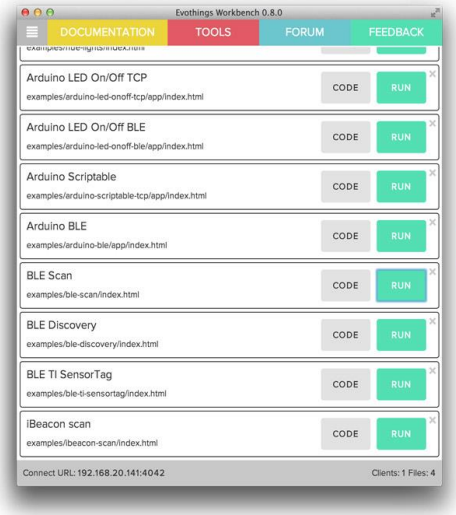
- iOS 8 ☺
- OSX 10.10 ☺
- Android 4.3, 4.4, 5.0 😐
- Linux 3.4, BlueZ 5.0 😐
- Windows Phone 8.1 (only central) ☹
- Windows 8.1 (app mode) ☹

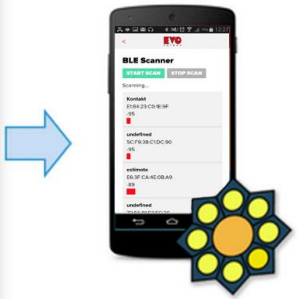
Interesting development tools



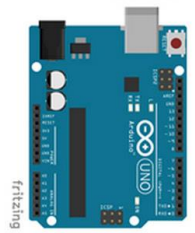


Evothings Workbench



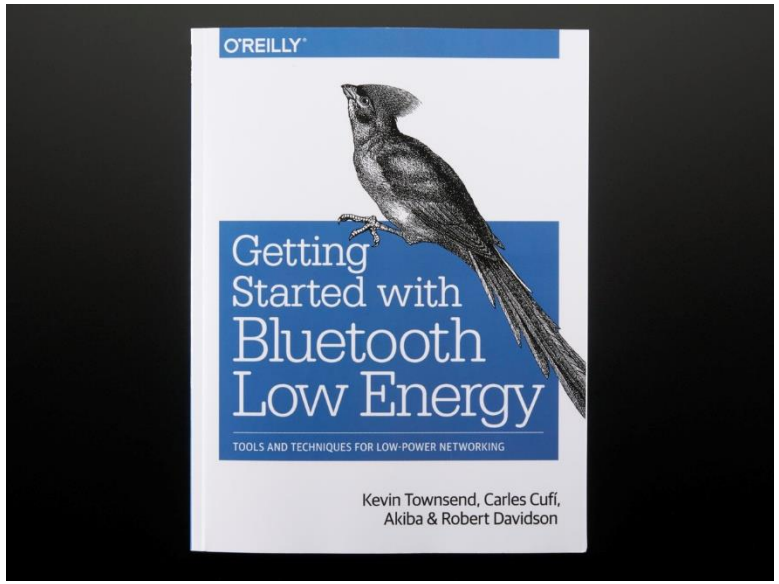


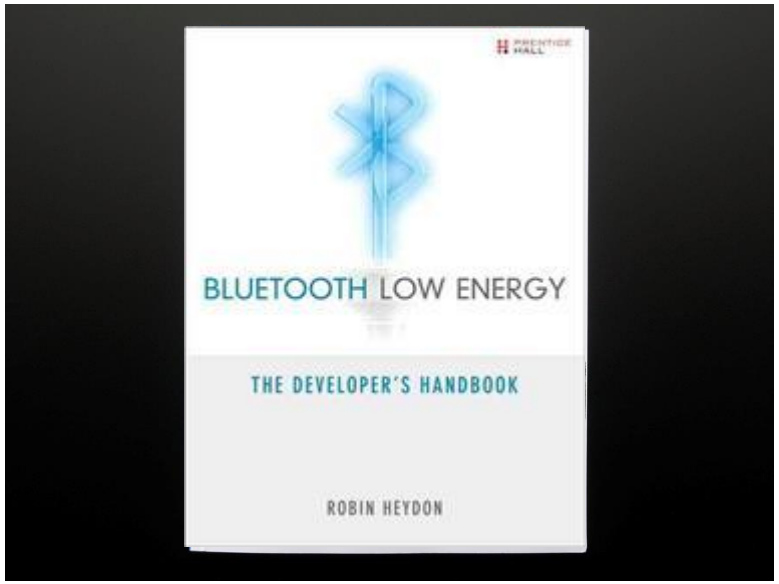
Evothings Client



Resources

- A compilation of resources at my Blog.
- Bluetooth SIG (Bluetooth Europe conference).
- IoT Stockholm meetup (we are meeting tonight).
- Books





Tack ☺

Questions and comments welcome after this talk or on twitter/email.
We are hiring http://www.assaabloy.com/en/com/Career/

Slides will be posted on Jfokus website