Bluetooth Low Energy on Android

Getting it done

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Android Builders Summit 2013

Agenda

- Introduction

- Quick Bluetooth Low Energy recap

- Status of Android BLE support

- Heart Rate profile for Android ICS and JB

- Bluetooth Low Energy in Android 4.2

About us

- Łukasz and Szymon are Tieto employees

- Tieto provides IT and SW engineering services

- Both working in Local Connectivity area

- Doing side projects exploring new technologies
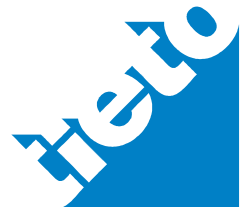
Bluetooth Low Energy (aka Smart)

- Lower power

- Lower latency

- Lower throughput

- Lower range

Connected Watches

Sports and fitness

Medical & Other

Status of Android BLE support

- No API and support in Google AOSP

- Current support is a real mess

- Vendor specific solutions available

  - Broadcom API
    - http://code.google.com/p/broadcom-ble/
    - http://android-btle.github.com/framework/
    - GATT based
    - Use Broadcom BT stack
    - Require BT framework extension from Broadcom

Status of Android BLE support
(part II)

- Vendor specific solutions available (cont)

  - Code Aurora Forum API (Qualcomm)
    - https://www.codeaurora.org/contribute/projects/qaep/
    - Use BlueZ stack – own highly modified branch
    - Framework extensions
    - GATT based API
    - Source code available
    - On 4.2 BT framework part 'reverted' to 4.1 and Bluedroid disabled

  - Motorola API
    - http://www.motorola.com/sites/motodev/library/bluetooth_apis.html
    - GATT and Profile based API
    - Probably based on Code Aurora code
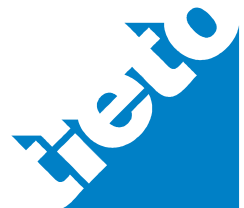
Hear Rate profile for Android ICS and JB 4.1

Our approach

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HRP for ICS and JB 4.1

- Bought Polar Heart Rate device

- Bought BT 4.0 USB dongle

- Start playing with it

- Solved teething problems in the stack

- Idea to add support to Android AOSP

# HRP for ICS and JB 4.1
(part II)

- Keep code close to upstream

  - Use compat-drivers for kernel BT subsystem upgrade

  - Updated BlueZ daemon
    - 4.101+ (up to API breakage for 5.0 release)
    - plugin to handle Android specific tasks and API
    - Expose GATT connect/disconnect on DBus (for generic GATT API)
    - Heart Rate profile implemented in daemon

- Minimal changes to existing AOSP code
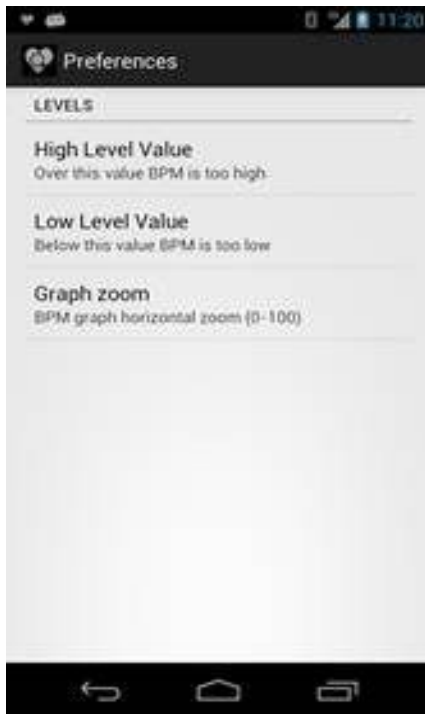
- Isolate framework and applications changes if possible

HRP for ICS and JB 4.1
(part III)

Architecture overview
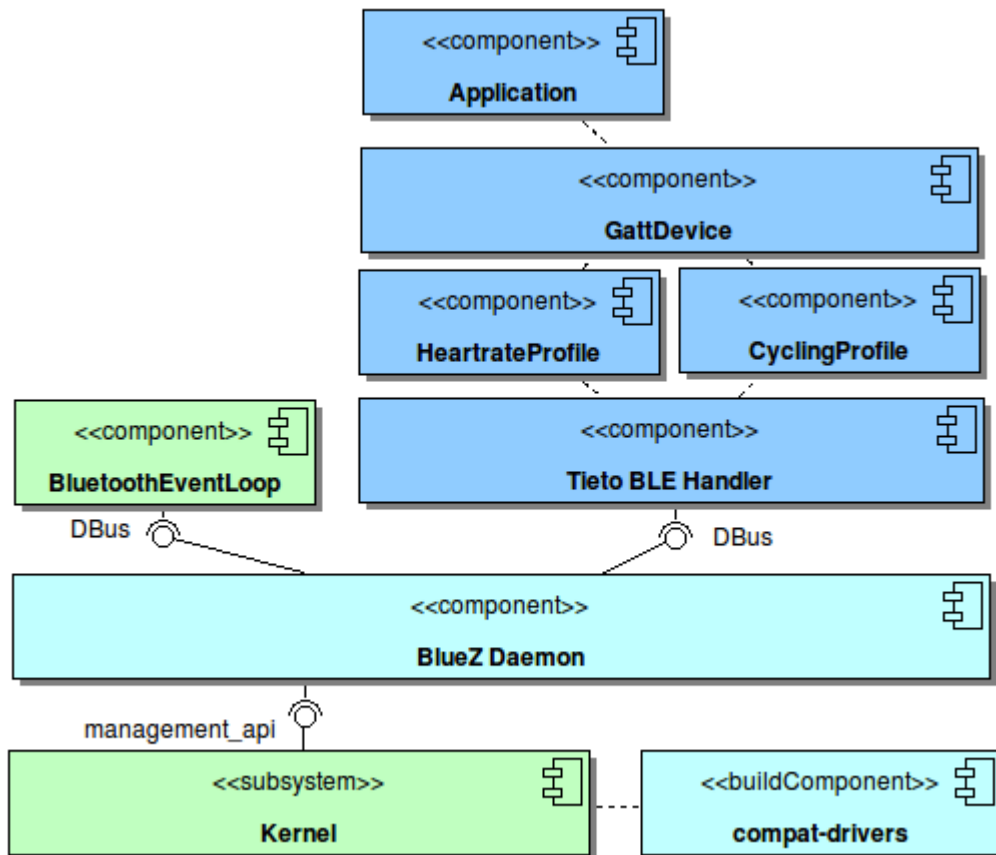
Demo

Android Jelly Bean 4.2

Challenge accepted

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Bluetooth on Android 4.2

- Major changes to BT subsystem architecture

- Bluedroid - completely new Bluetooth stack

  - Based on contribution from Broadcom

  - No DBus and system Bluetooth daemon

- Introduction of BT HAL API

- No HCI interface for userspace

- Linux kernel BT subsystem is not used

New architecture and Low Energy

- Still no Low Energy framework API

- Bluedroid – Low Energy support not present

  - Enabling related flags results in build error

  - Some functions and files implementations are missing

  - Looks like deliberately stripped off Low Energy support

- No Low Energy related API in BT HAL

Try with BlueZ 5 instead

- Has full support for Low Energy including number of profiles

- Community driven so can influence its development

- BT HAL – should minimize change impact on framework

- Could reuse code from 4.1 solution

- Some risks related to classic Bluetooth functionality

- BlueZ targets into not requiring config files in /etc

BlueZ 5 as BT HAL

- Enable HCI interface for adapter

- Use compat-drivers for updated kernel Bluetooth subsystem

- Enable DBus daemon

- Enable BlueZ 5 daemon

- Add BT HAL implementation

- Prepare Tieto BLE Handler

- Reuse profile components
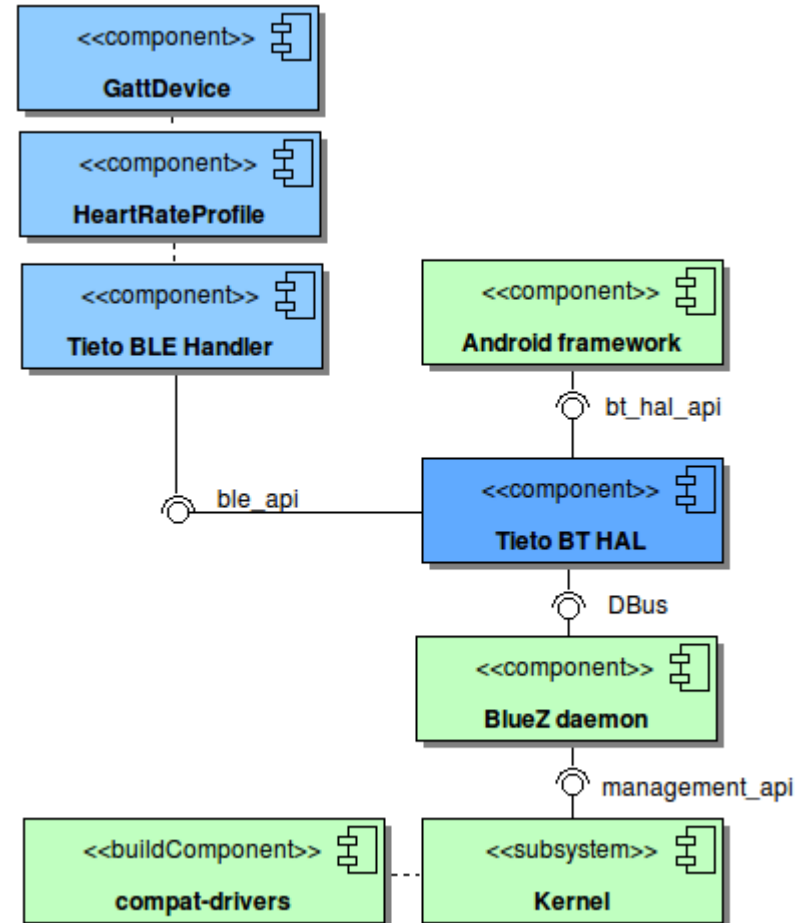
Tieto BT HAL details

- libbluez - implements BT HAL API

- btal library to wrap DBus calls into simple C API (used by libbluez)

- Provide available profiles by extending get_profile_interface call in BT HAL
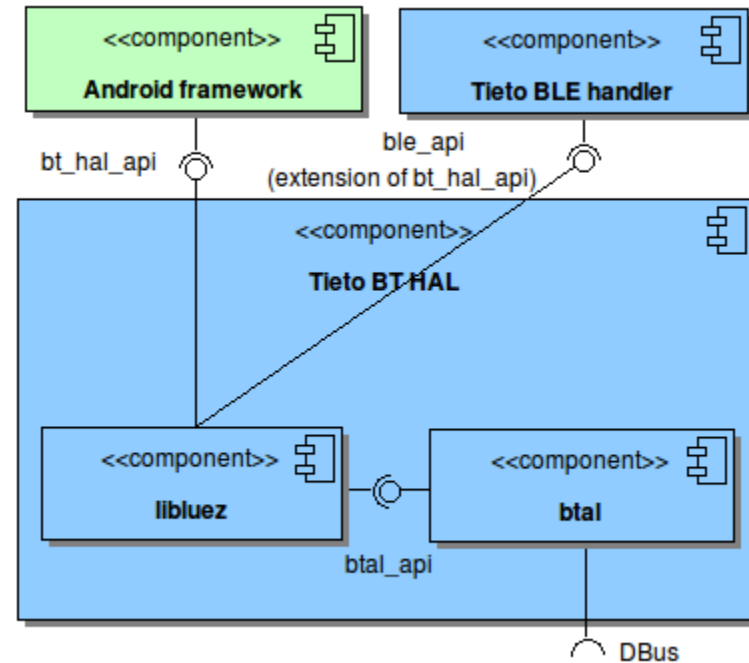
Risks and open points

- Classic Bluetooth support - feature parity with Bluedroid

    - Support for A2DP – needs to wrap Media API

    - HS/HFP – moved from BlueZ to oFono

- Google Bluetooth roadmap is unknown e.g. BT HAL changes

Integration – K.I.S.S.

- Synchronize repository

- In device/FooCompany/BarProduct

  - Define BOARD_HAVE_BLUETOOTH_BLUEZ in BoardConfig.mk

  - Declare services in init.BarProduct.rc

    - DBus daemon, bluetoothd and hciattach

- Integrate compat-drivers if custom kernel is used

Questions?

More about Tieto and Bluetooth Low Energy

BlueZ BLE Profiles (contributions)

- Hear Rate Profile
- Cycling Speed and Cadence Profile
- Medical thermometer Profile
- Blood Pressure Profile (coming)

Tieto BLE Component and Demos

- For Android 4.0-4.2 Heart Rate, Cadence and Multiple sensors
- BlueZ and Android BLE profiles
- Blood Pressure demo with customized peripheral

Thank You

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