Poop Face Detection

Evaluation System

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Introduction

Motivation

Support parents

Simplify the use of elemination communication for parents

Environmental aspects

- **27.4 billion** single-use, plastic diapers every year
- **3.4 million tons** of garbage each year

Overall System

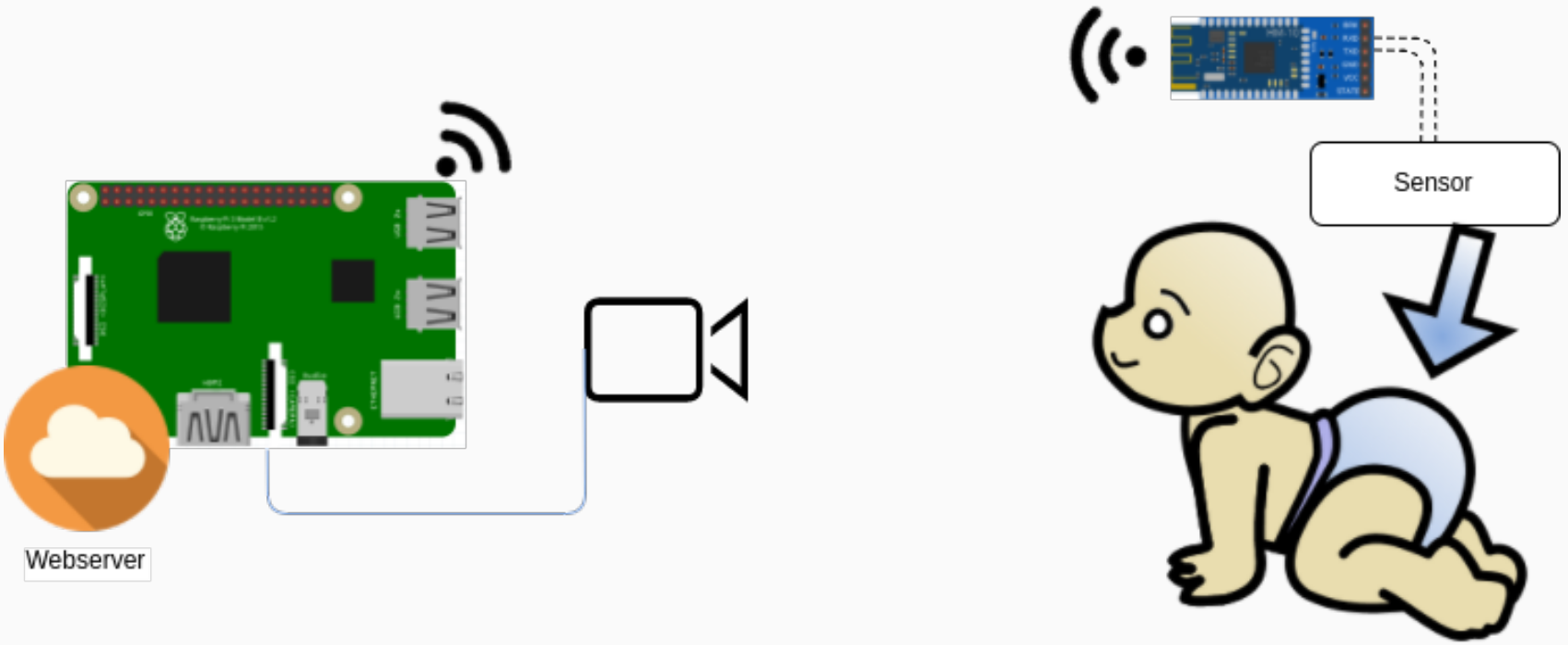


Figure 1: overall system

Evaluation System

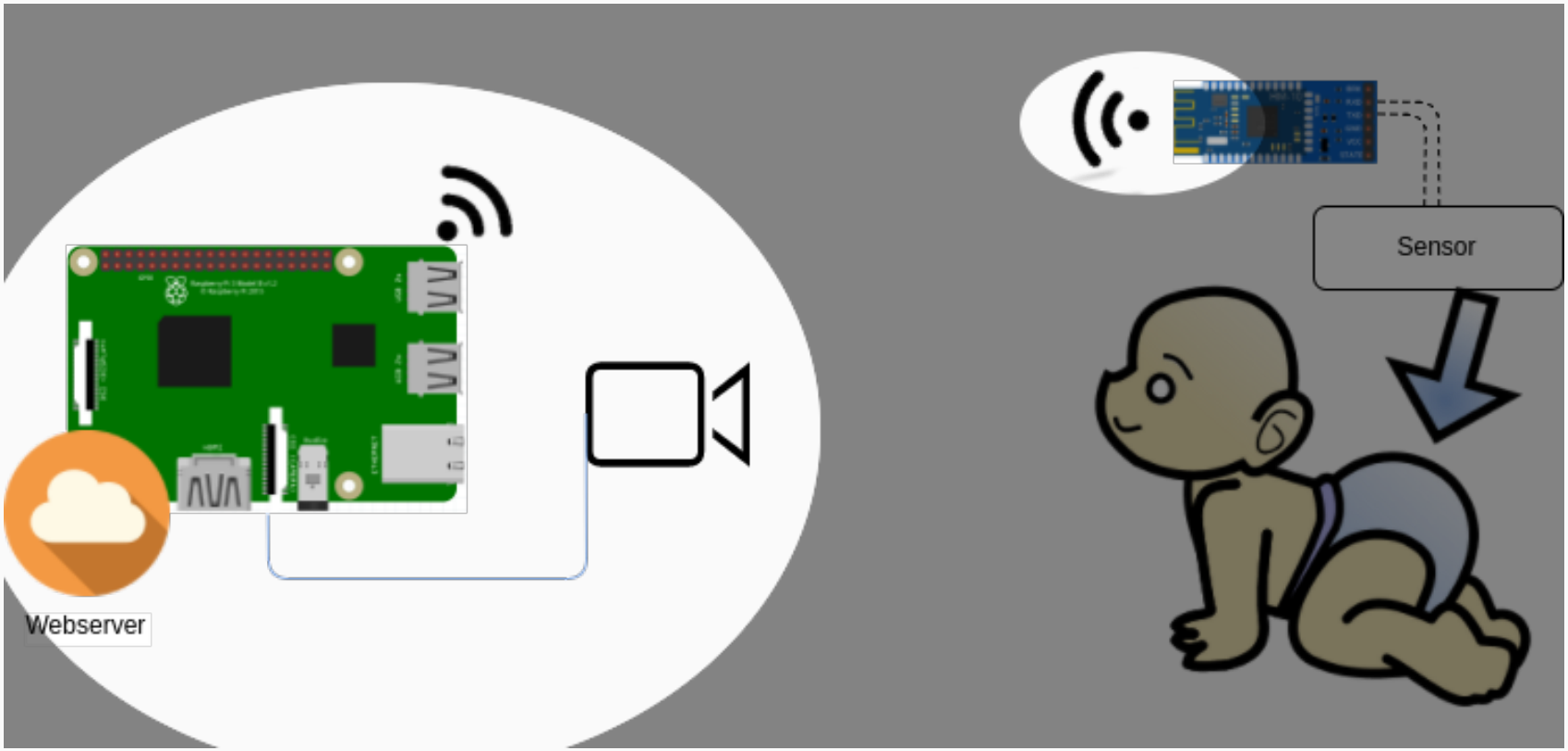


Figure 2: evaluation system

Communication between sensor and evaluation system

Connection

Requirements

- Wireless
- Simple
- Energy saving
- Distance of a few meters
- Low cost

Figure 3: Bluetooth Low Energy

How Bluetooth Low Energy works!

Bluetooth Low Energy - Roles

Broadcaster / Observer

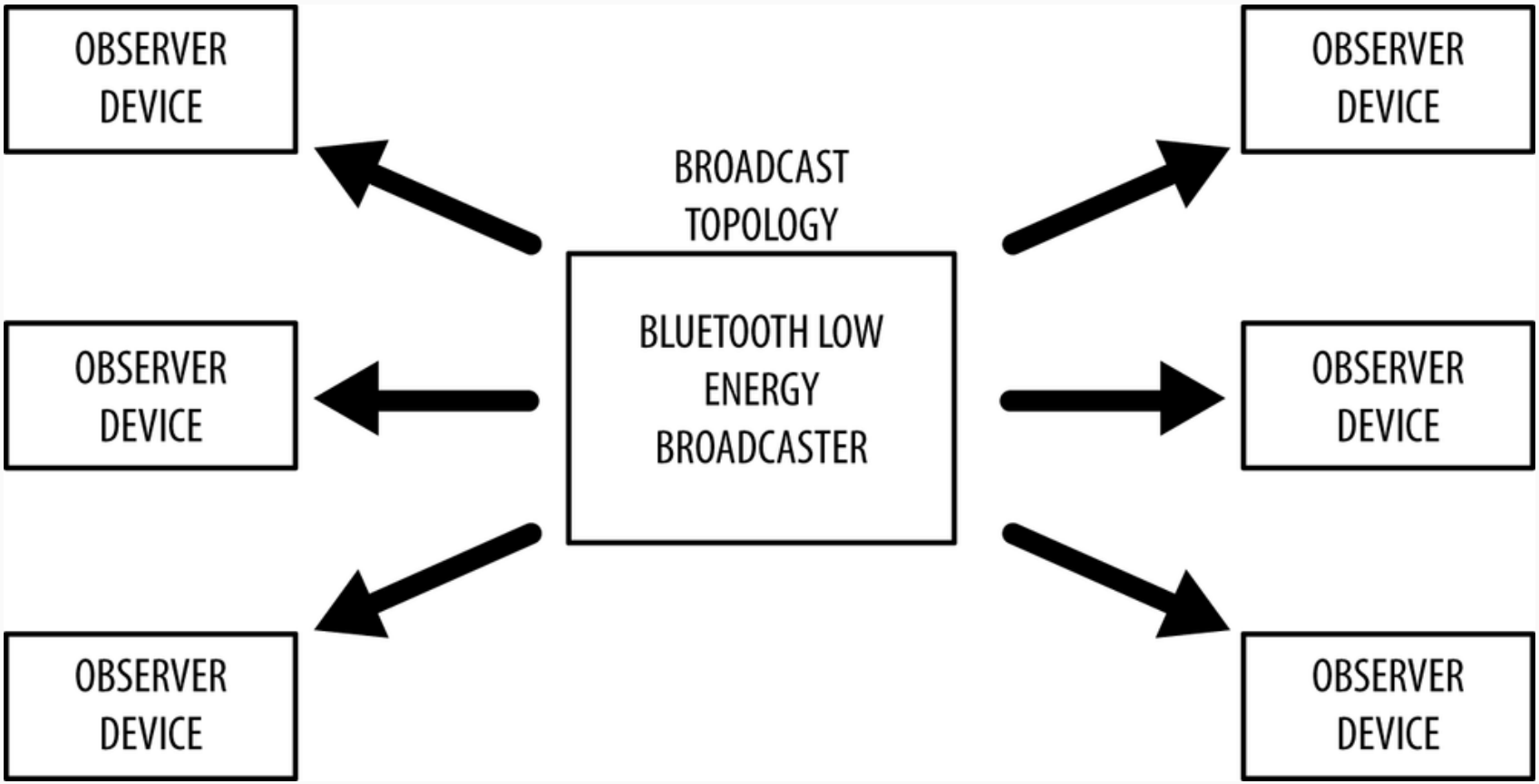


Figure 4: BLE broadcasting topology

Bluetooth Low Energy - Roles

Central / Peripheral

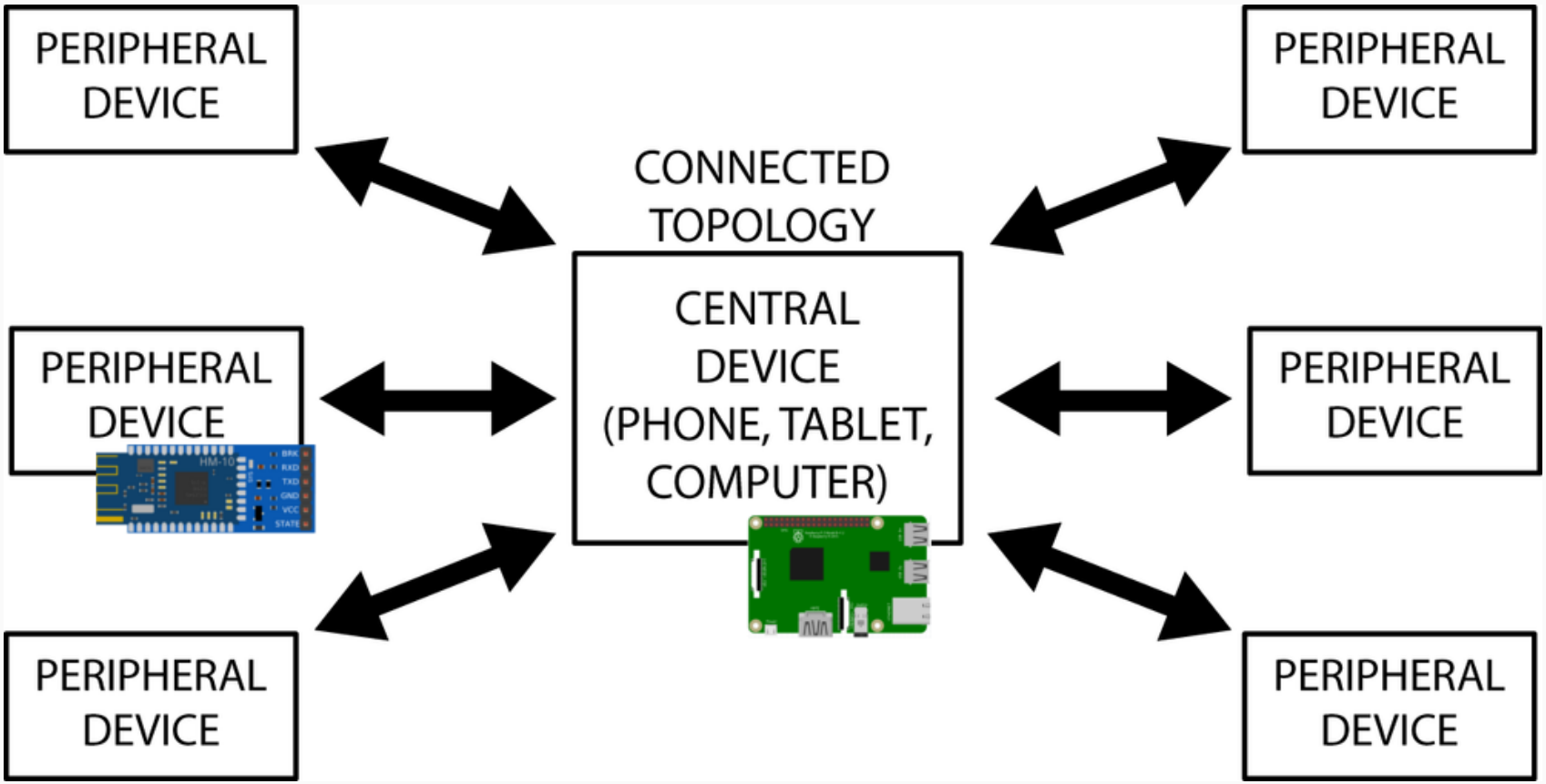


Figure 5: BLE connection topology

Bluetooth Low Energy - Profiles

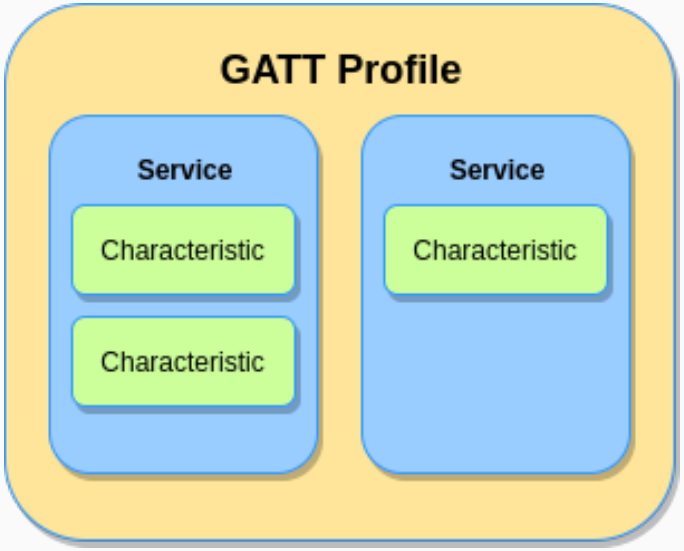


Figure 6: BLE GATT profile

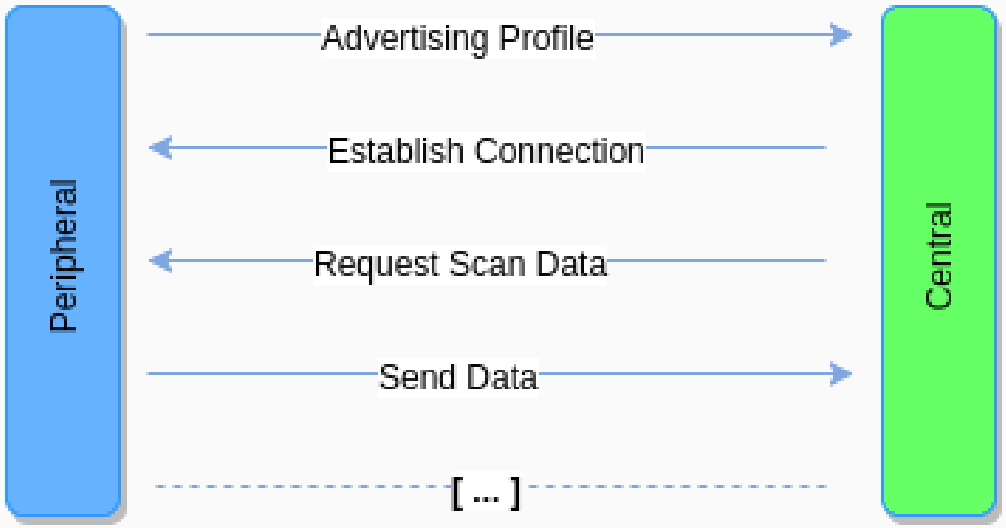


Figure 7: BLE connection

Our Connection Setup

BLE Setup - Overview

Sensor side

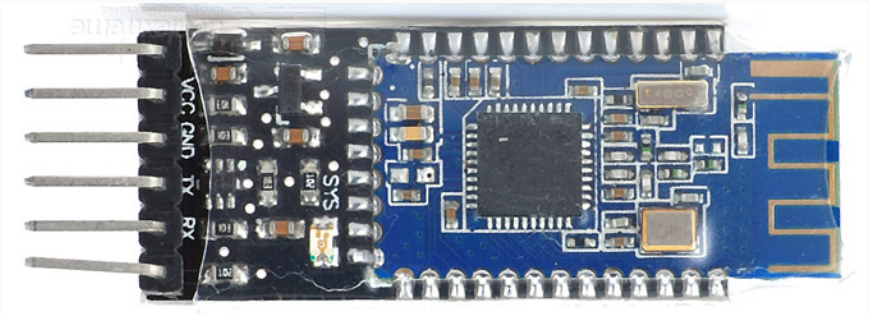


Figure 8: HM10 BLE module

Evaluation system side

Raspberry Pi 3 with integrated BLE chip

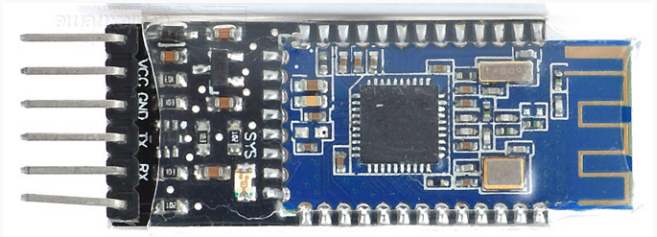
Working with an HM10

Benefits

- Serial type communication
- Easy to setup over AT-Commands
- Low price
- We already had one

Disadvantages

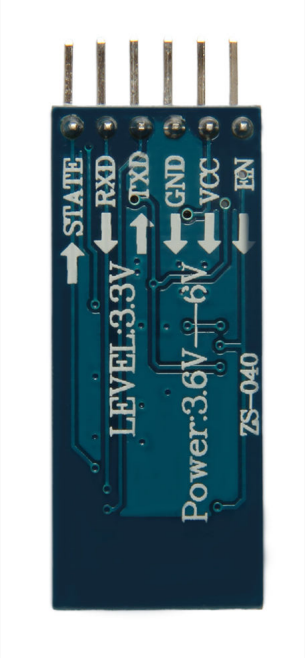
- Only predefined service and characteristic.



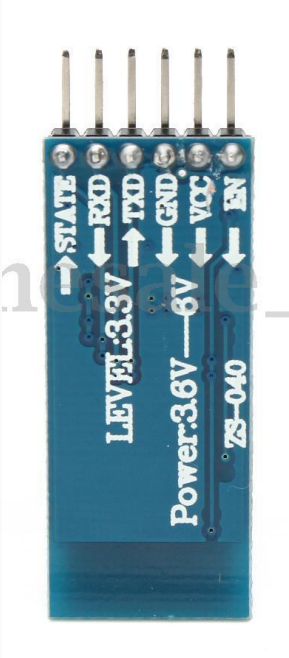
HM-10 Copycats

HM-10

CC41-A



MLT-BT05

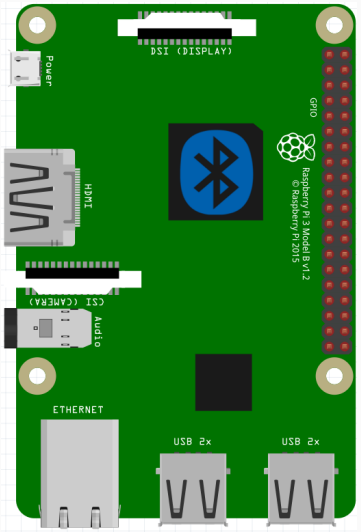


*GitHub:**arduino-ble-ident-n-set***

BLE on a Raspberry Pi 3

Initial situation

- Raspbian as operation system
- BlueZ as the Linux bluetooth stack
- Python as programming language



Problems

- No documentation for blueZ
- Almost no literature on BLE programming
- PCs are not main target for BLE applications

BLE on a Raspberry Pi 3 - First approach

Hcitool & Gatttool

- Standard tools for BLE connections on Linux

Scan for BLE devices

```
sudo hcitool lescan » C8:FD:19:0E:E3:27
```

Start gatttool in interactive mode

```
sudo gatttool -b C8:FD:19:0E:E3:27 -I
```

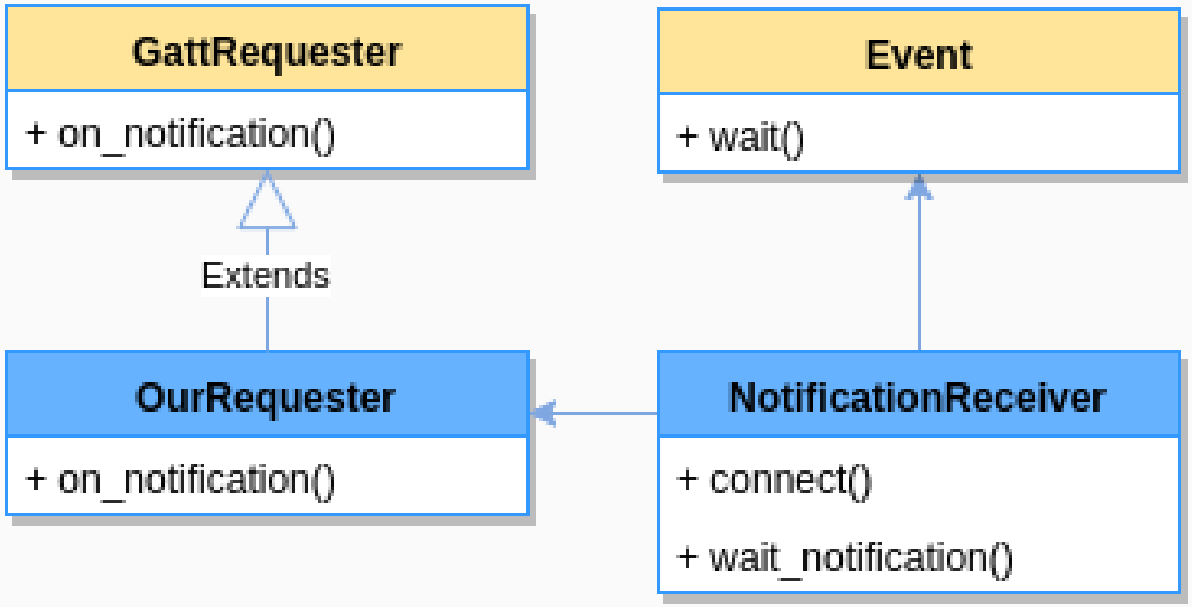
Show all available services

```
primary » 1800,1801,180a,ffe0
```

Show all characteristics

```
char-desc » ..., ffe1, ...
```

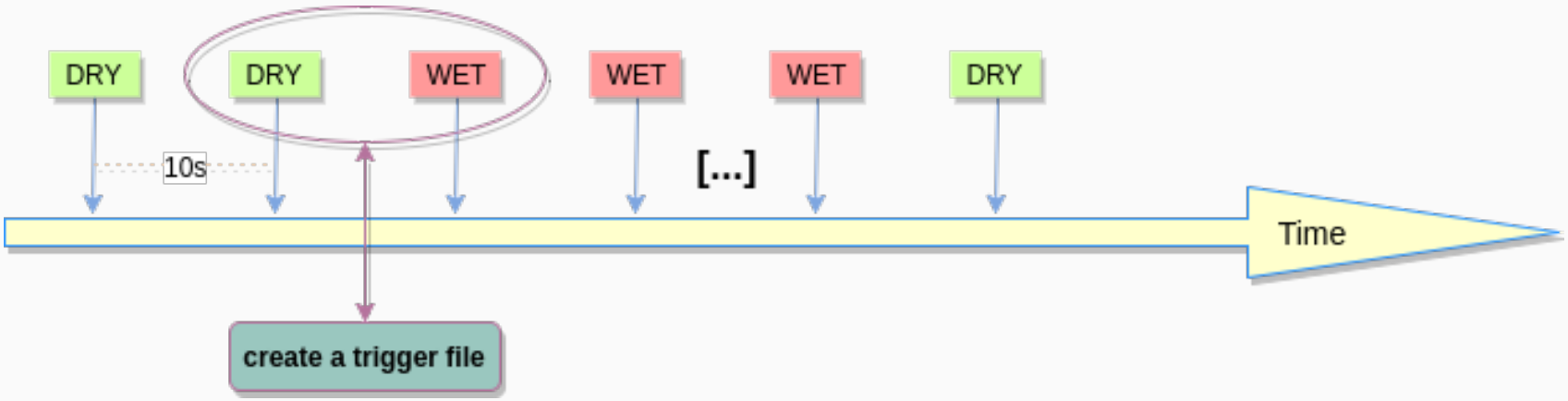
pygattlib is an python lib for gatttool



Examples on Github:matthewelse/pygattlib

BLE on a Raspberry Pi 3 - onNotification

Communication schedule



- triggerfile get's handled by the recording part

Implementation of the recording feature

Using a Raspberry Pi Camera

Benefits

- Good pyhton lib
- Many tutorials
- Cheap

Disadvantages

- No autofocus
- No sound
- Poor video quality in bad light conditions

$\Rightarrow$ Good for prototyping

Recording Process

How does the recording work

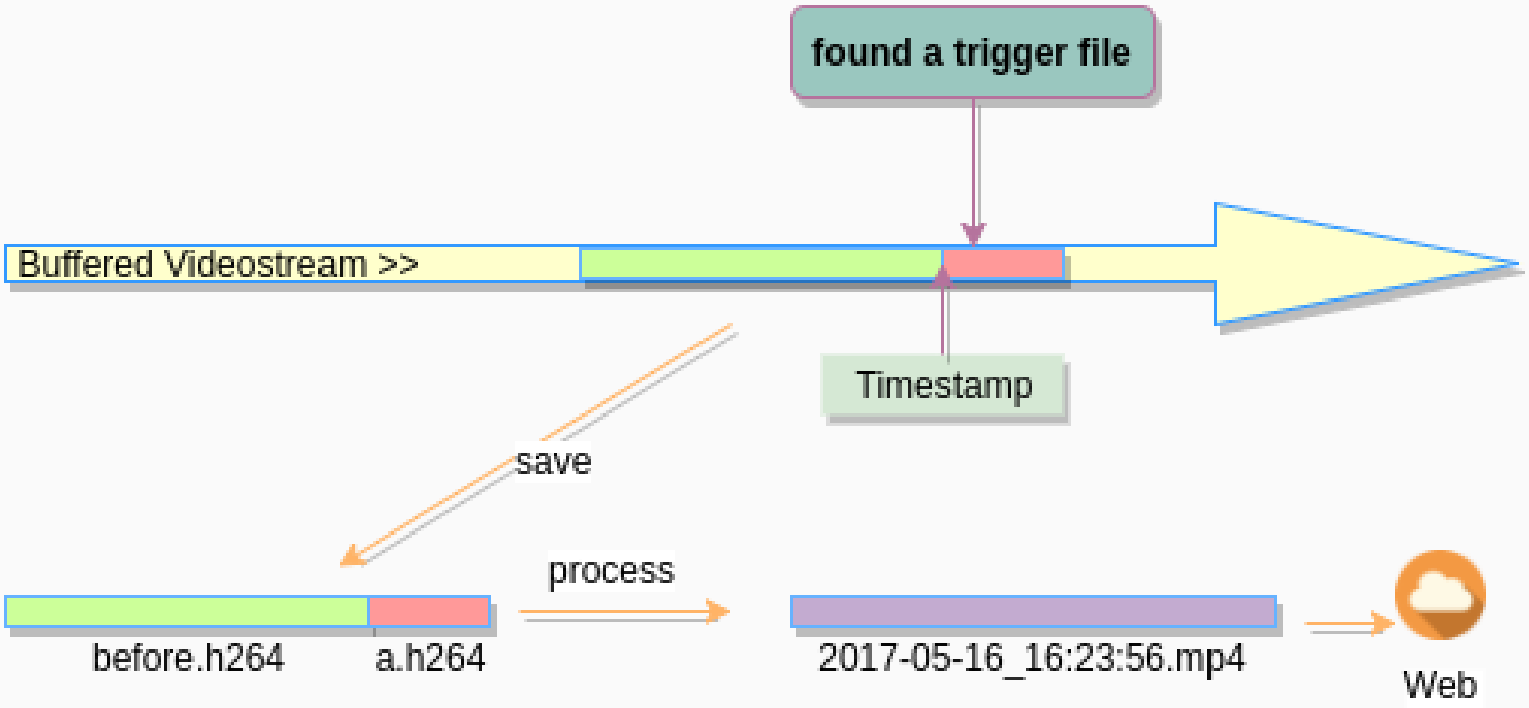


Figure 9: recording process

Conclusion

Conclusion

What we achieved?

- Sending signal over BLE
- Saving the recorded videos

What comes next?

- Creating a webserver which displays the recorded video files

Live Demonstration

Questions

Thank you for your attention.

Now I am happy to answer any questions you might have.