105學年(下)期中報告第三組

無線技術與嵌入式裝置應用

Wireless technology and embedded device applications

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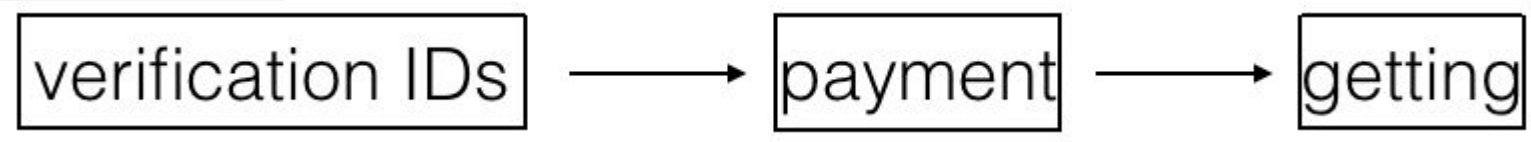
1. *Motivation*
2. *Background Technology*
3. *System Structure*
4. *The Future*

Motivation

About the wine program

Why ?

- Inhabitants in Kimmen know that, KKL will distribute their merchandise to them exclusively every 4 months.
- However, the processes are *tedious*, including verification of IDs, payment and finally getting what they want.



Why ?

- Inspired by the discovery of wireless technology, and the determination to combine local features into our product, we dedicate ourselves into developing this system, trying to make those bothersome procedures simpler and faster.

How To Do ?

- We get help from the built-in interfaces, Wi-Fi / Bluetooth, which from most widespread mobile devices.

Smart phones and tablet PCs

Let’s start from the background technology first.

Background Technology

Wi-Fi Probe Request & Response

- Whenever wifi clients try to associate to an AP, they has to know what AP to connect.
- In order to find that, there are two ways, active one and passive one.

Active Way

- The active way is to send a probe request first, the receiving AP will send a probe response back to the clients, so that clients will know they can rely on that AP.

Passive Way

- The passive way is that clients just sit still with the radio turned on, waiting for beacons from APs, if there are any nearby.

System Structure

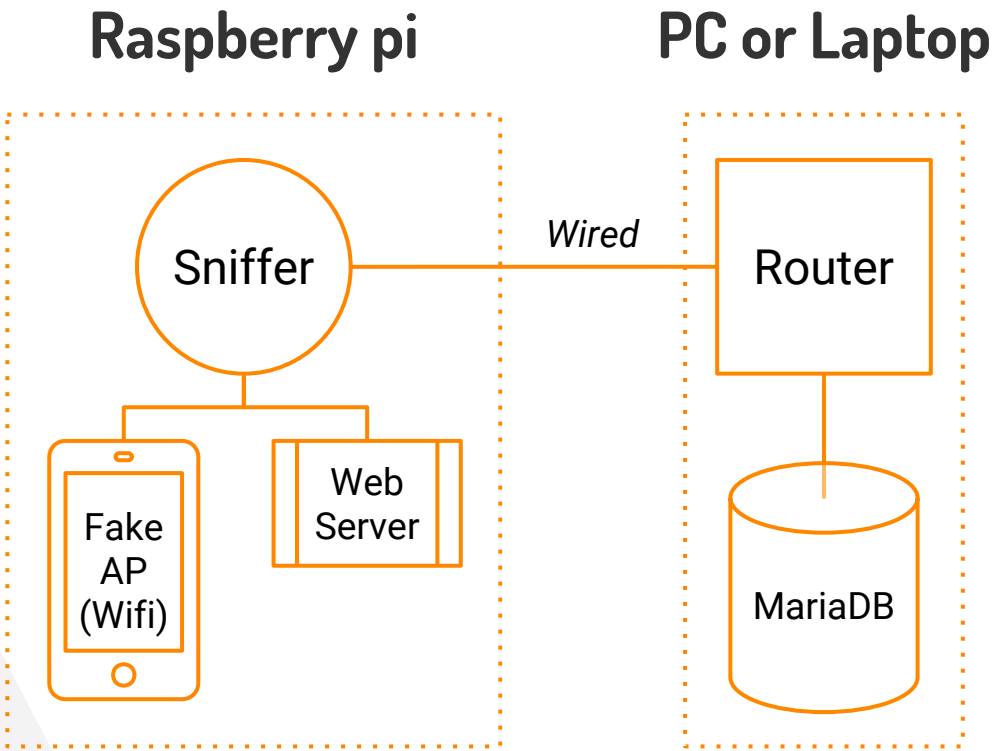
Level 0 - Schematic diagram

3. Web page

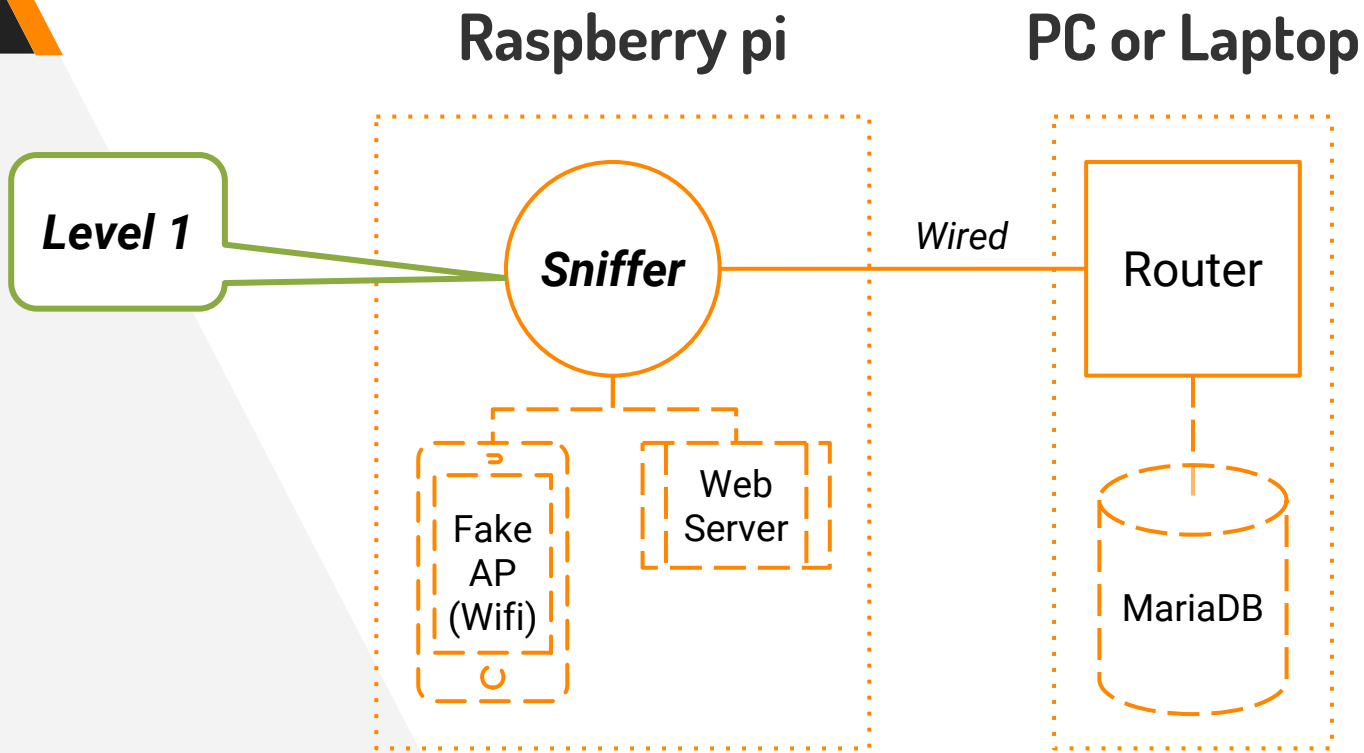
2. Services

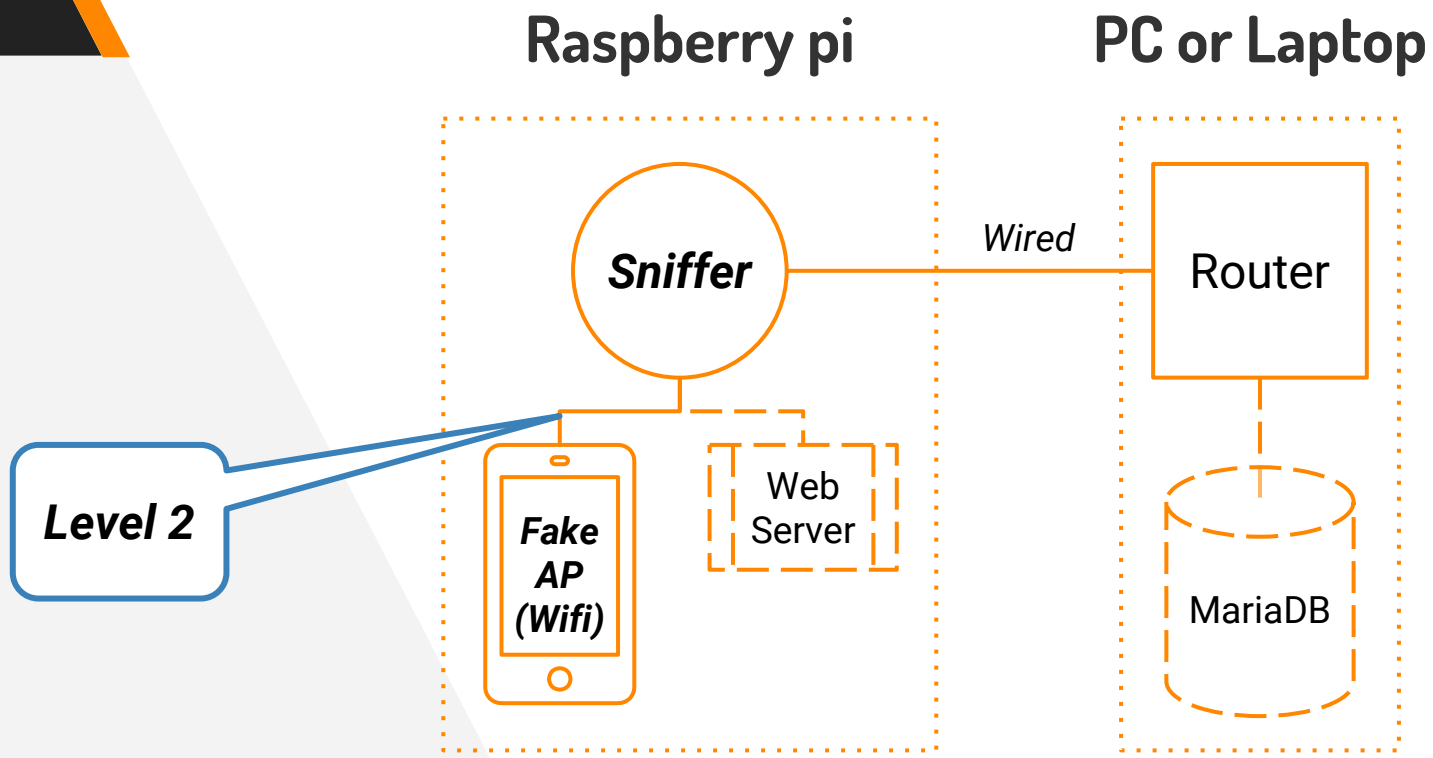
1. Sniffer

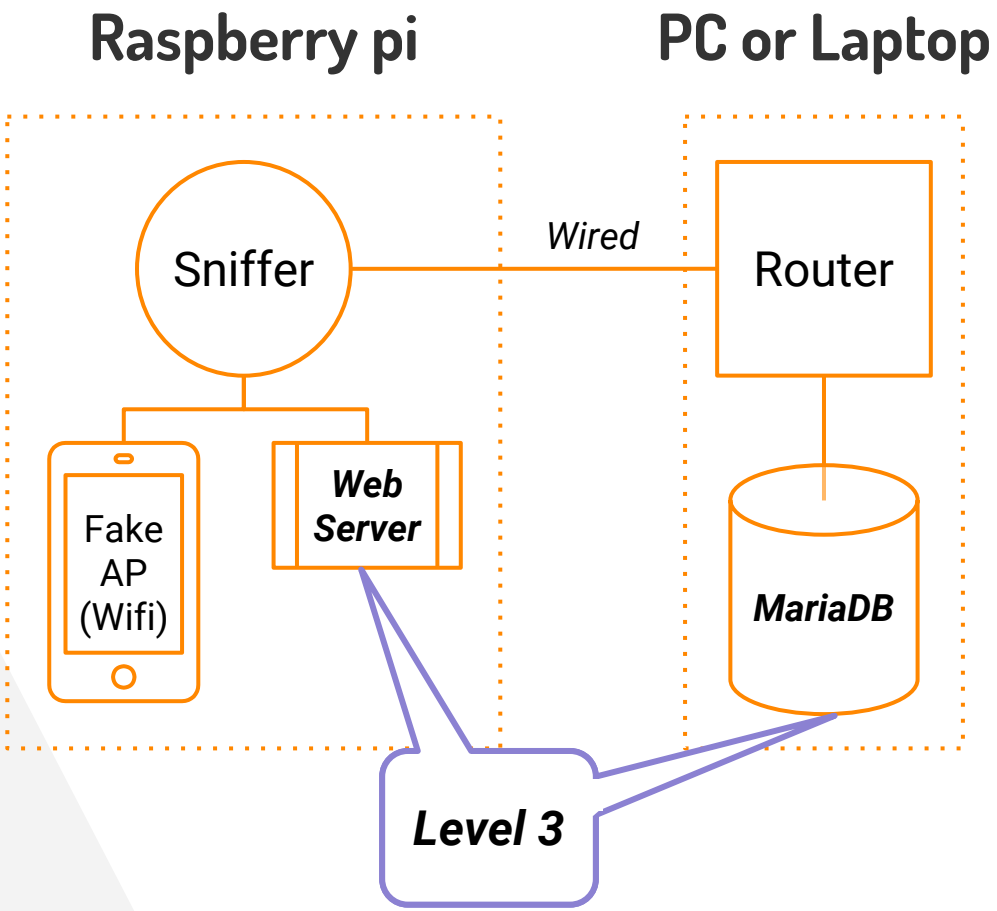
0. Diagram

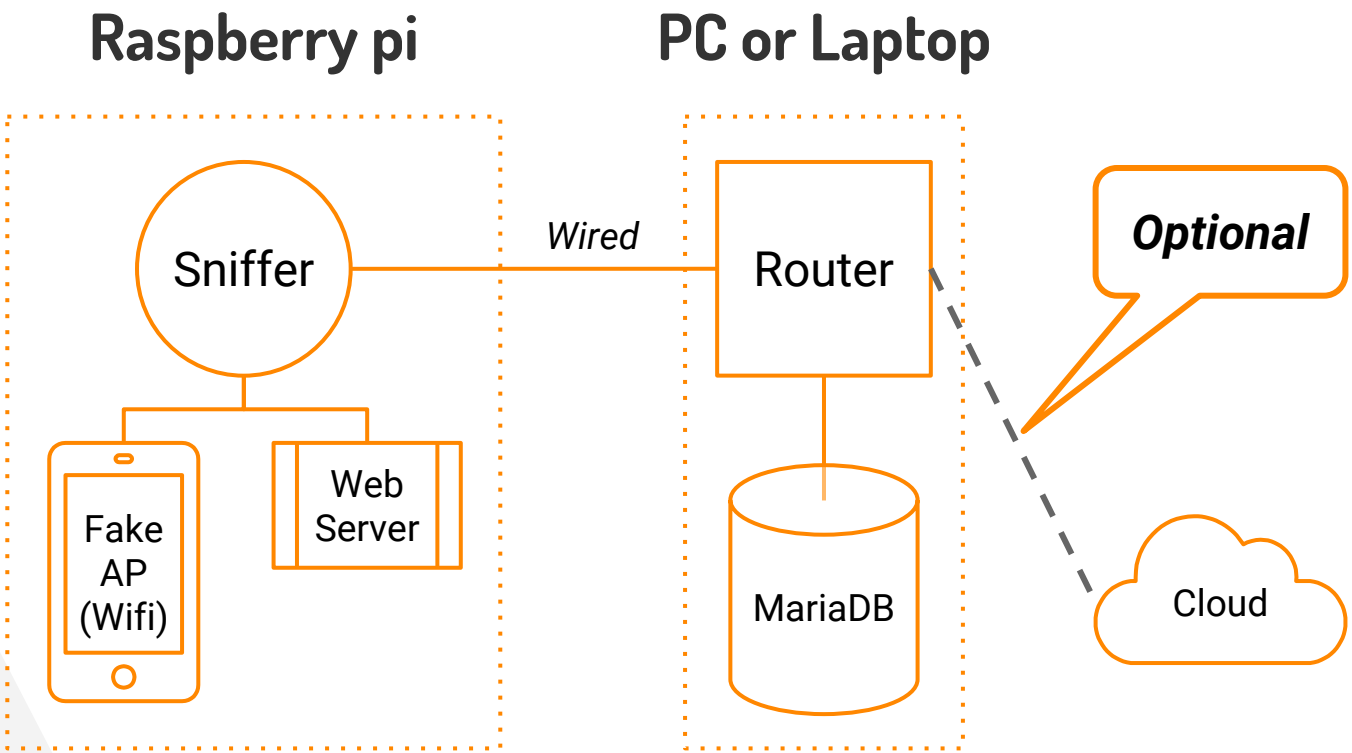


Schematic diagram


Raspberry pi
PC or Laptop
Level 1
Sniffer
Wired
Router
Fake AP (Wifi)
Web Server
MariaDB


Raspberry pi
PC or Laptop
Sniffer
Wired
Router
Level 2
Fake AP (Wifi)
Web Server
MariaDB


Raspberry pi
PC or Laptop
Sniffer
Wired
Router
Fake AP (Wifi)
Web Server
MariaDB
Level 3


Raspberry pi
PC or Laptop
Sniffer
Wired
Router
Optional
Fake AP (Wifi)
Web Server
MariaDB
Cloud

System Structure

Level 1 - The Sniffer

3. Web page

2. Services

1. Sniffer

0. Diagram

Level 1 - The Sniffer

- Wifi

We use tools tshark, iwconfig and grep to extract MAC addresses and RSSI

- Bluetooth

We use tools tshark, grep, crontab and hcitool to retrieve MAC addresses and RSSI

Level 1 – The Sniffer

- After that, we have written a C program (recorder) that will process each address, sort it by RSSI, and write all of these plus received time to a file.

※ Both Wifi and Bluetooth are collected and kept separately

Schematic diagram

System Structure

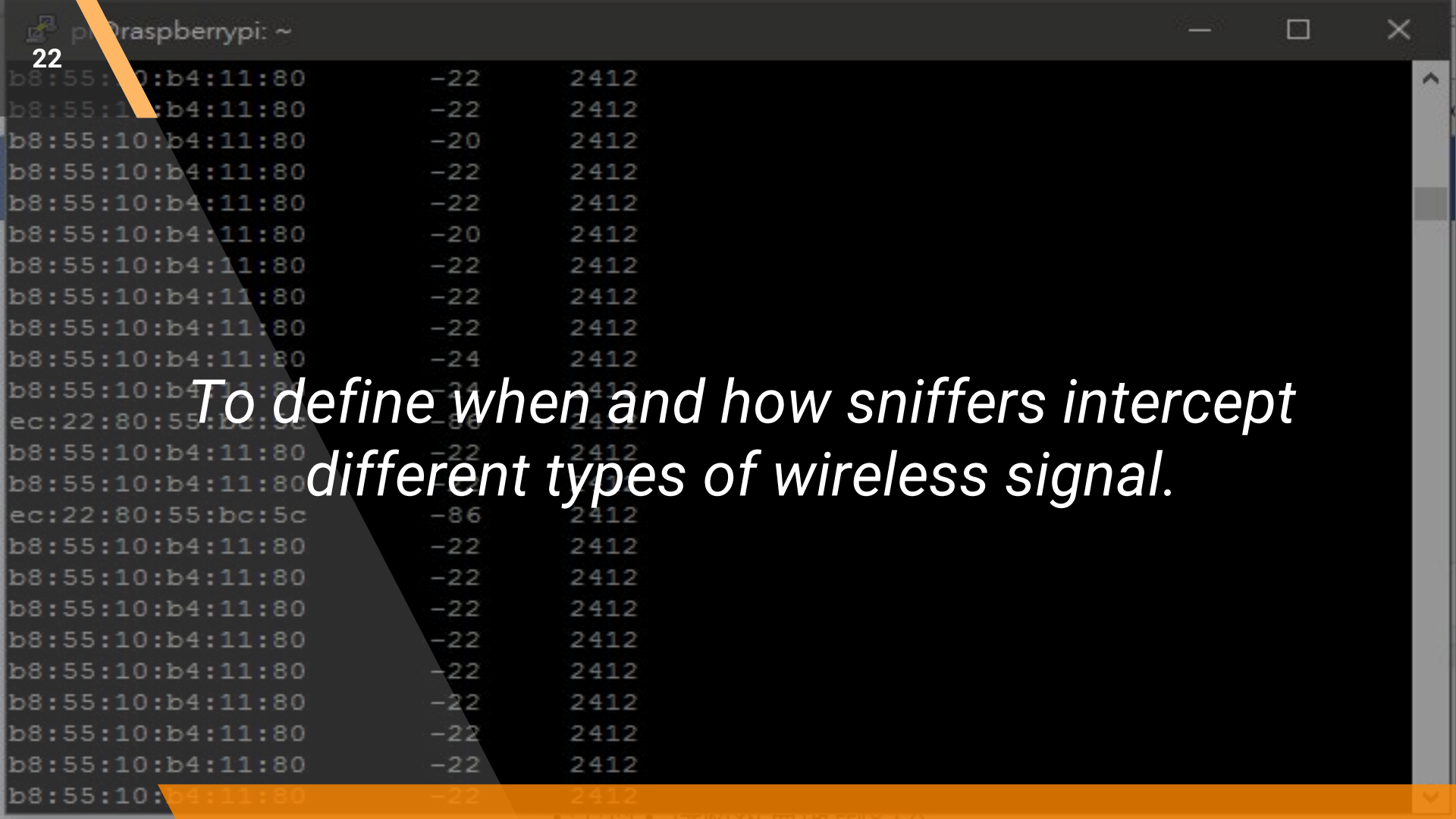
Level 2 - The Service

3. Web page

2. Services

1. Sniffer

0. Diagram

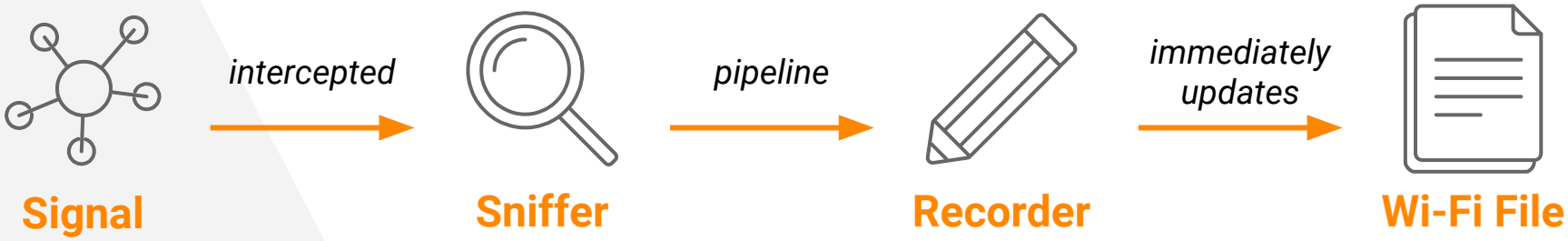


To define when and how sniffers intercept different types of wireless signal.

Level 2 – The Service

- In Wi-fi, this is relatively easy, since Wi-fi clients send probe requests from time to time, while APs send beacons periodically.

We just need to listen passively.

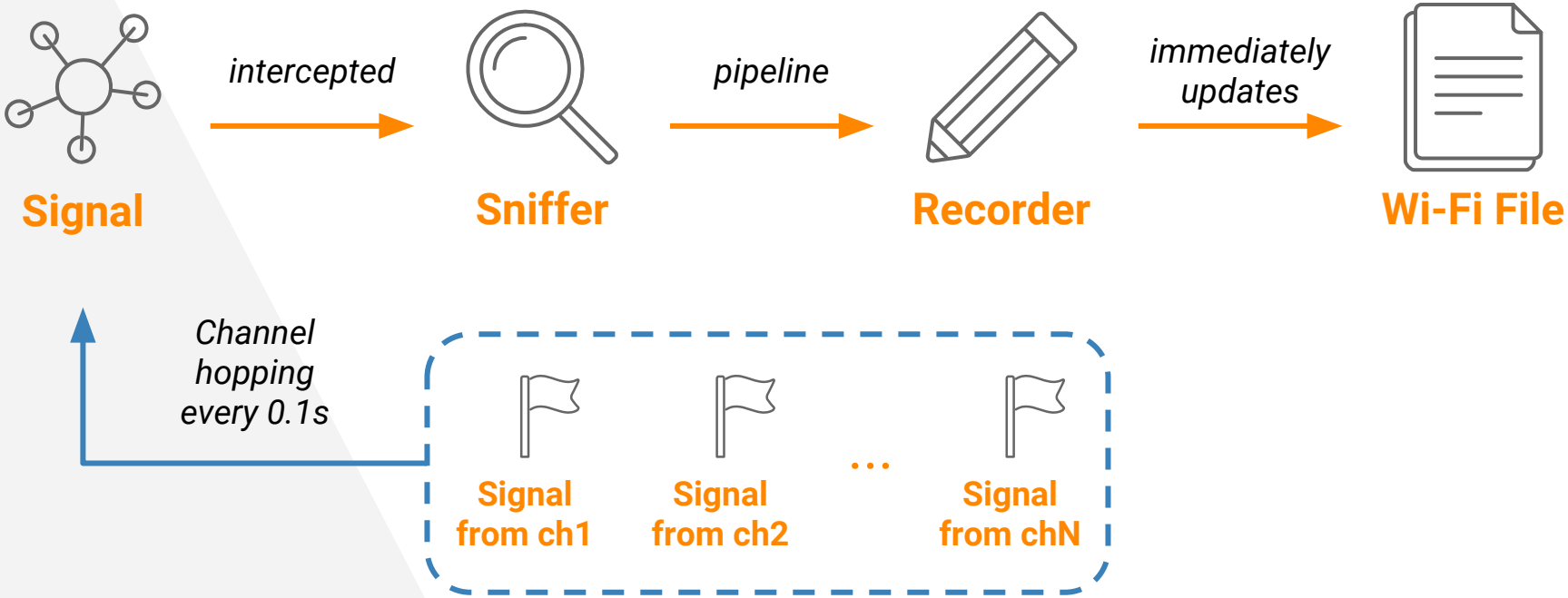


Schematic diagram - Wifi part1

Level 2 - The Service

- However, here comes a problem, we can't let a single wi-fi interface listen on all channels simultaneously.

Because of that, we have to hop between channels.

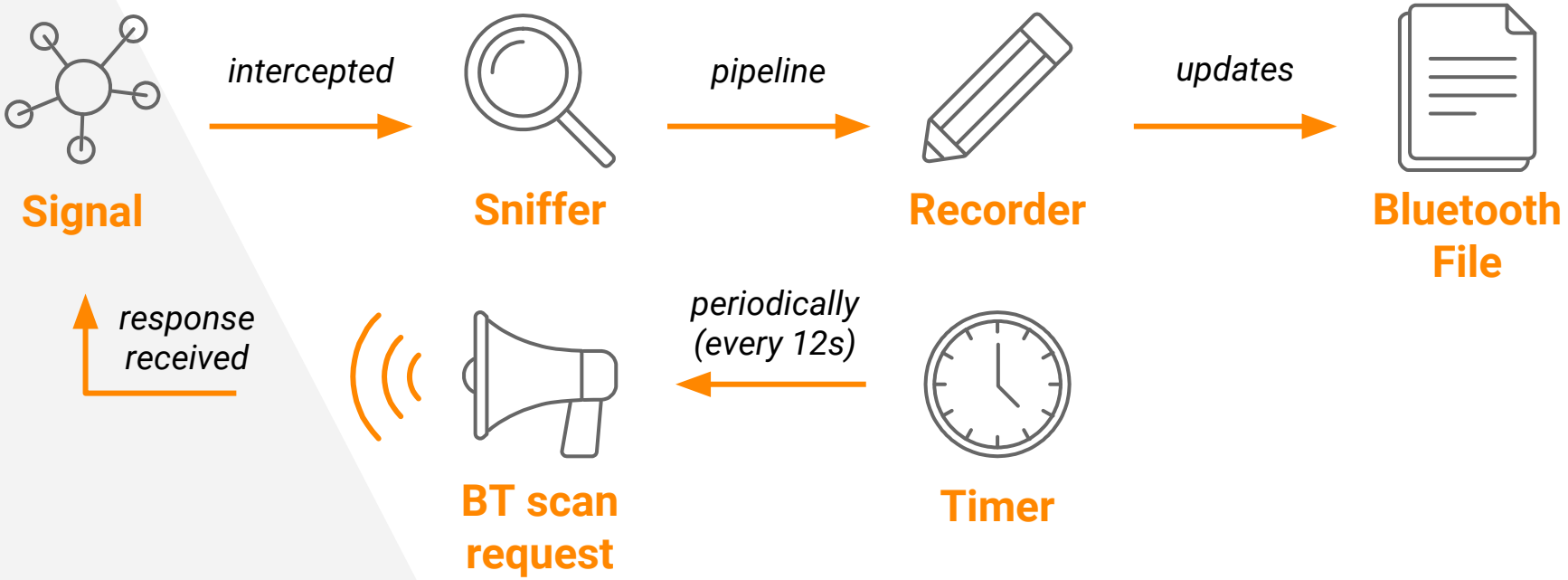


Schematic diagram - Wifi part2

Level 2 - The Service

- In bluetooth, it is more complicated, since they are inactive almost all the time.

What we do is to trigger bluetooth scan every 12s, try to lure BT devices to respond, and always listen to BT signal.



Schematic diagram - Bluetooth

System Structure

Level 3 - The Web Page

3. Web page

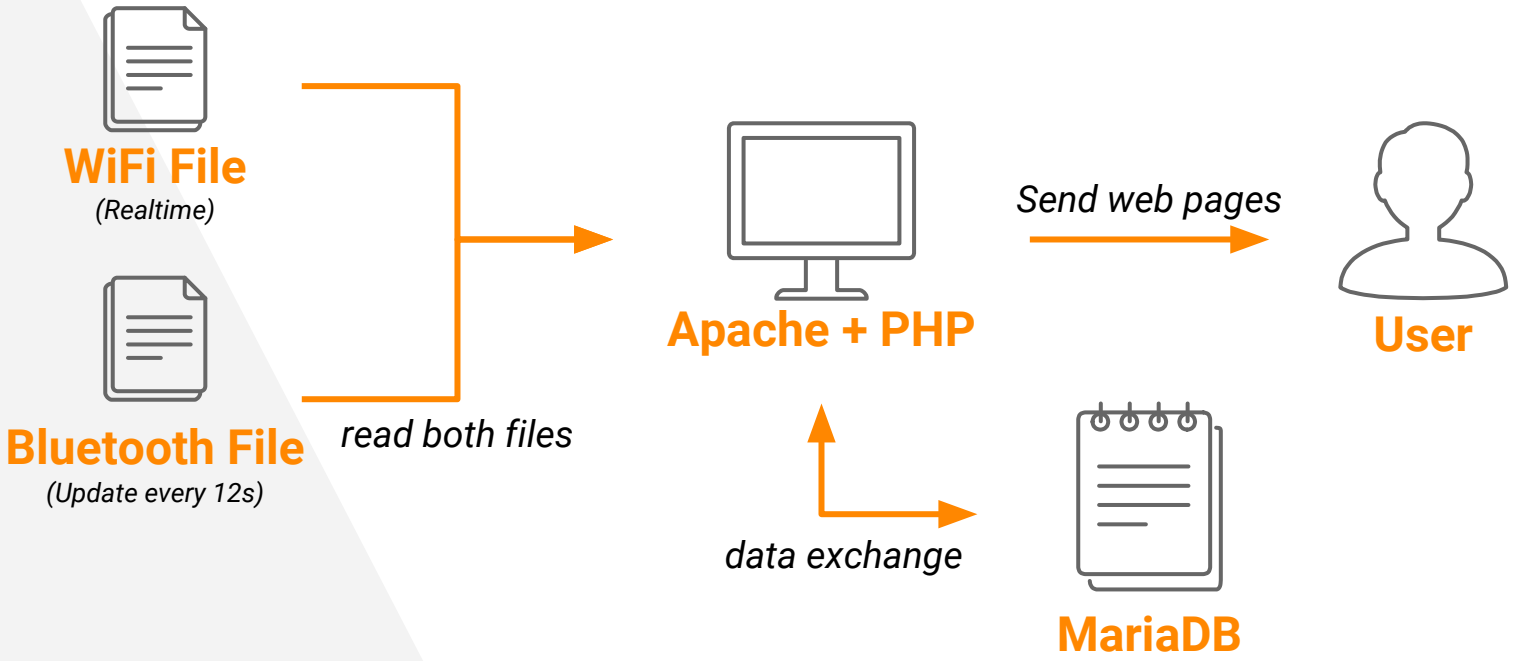
2. Services

1. Sniffer

0. Diagram

To show useful information and functionality to the end users.

Level 3 - The Web Page

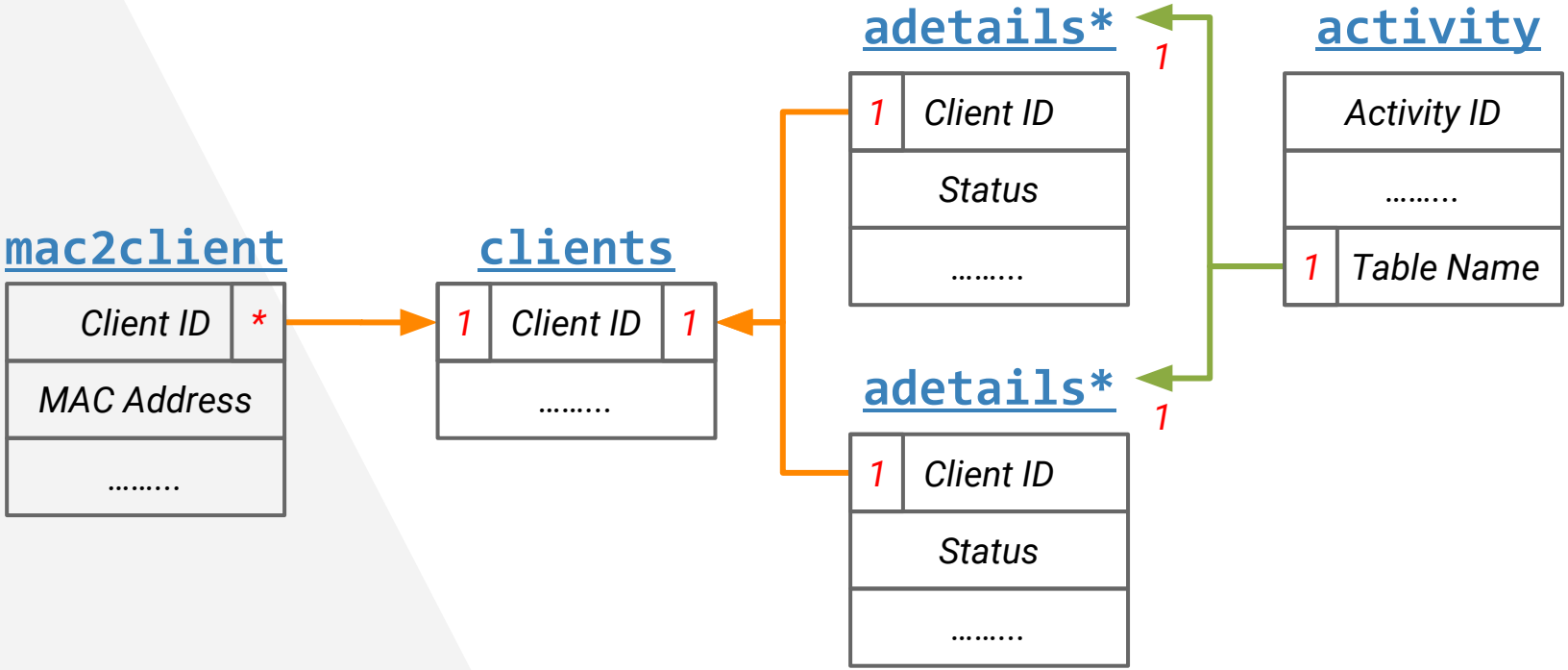


Level 3 - The Web Page

- In our database, we have tables as follows:

`clients`,	holds all clients' data
`mac2client`,	map multiple MAC addresses to a client
`activity`,	tell us what is being hold
`adetails*`,	keep states between clients and activity

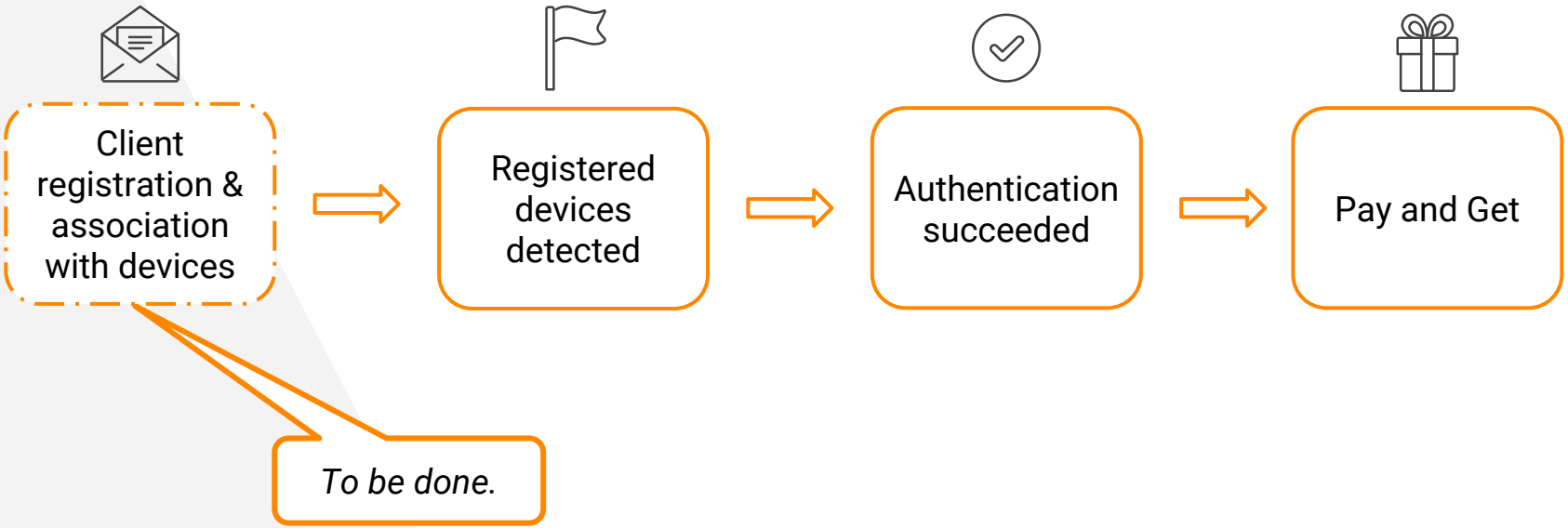
Database Structure

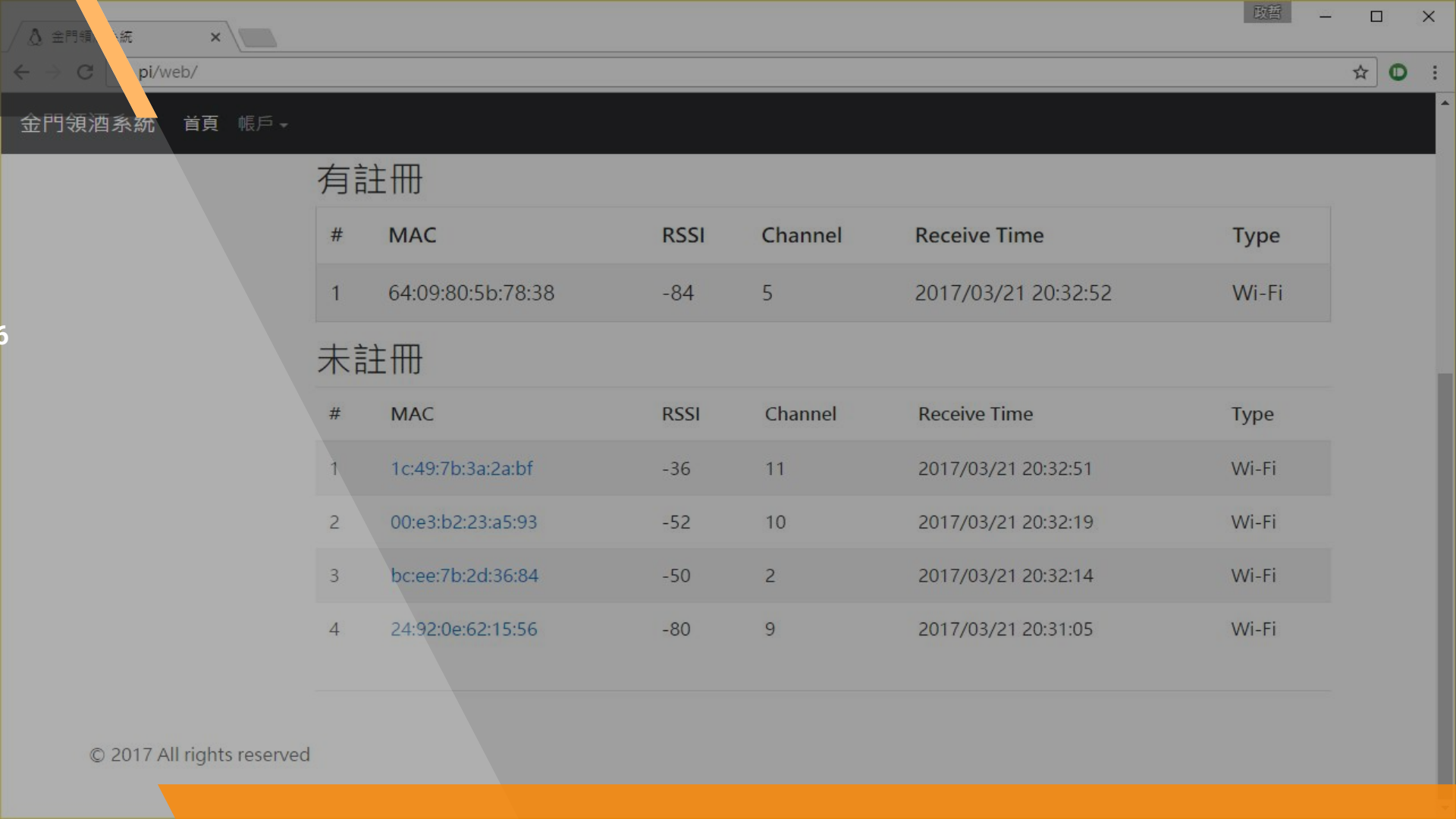


Level 3 – The Web Page

- Currently, our web pages have several functions:
  - *Show nearby devices*
  - *Basic client authentication*
  - *Pay and Get*

Level 3 - The Web Page




pi/web/
金門領酒系統
首頁
帳戶
有註冊
MAC RSSI Channel Receive Time Type
1 64:09:80:5b:78:38 -84 5 2017/03/21 20:32:52 Wi-Fi
未註冊
MAC RSSI Channel Receive Time Type
1 1c:49:7b:3a:2a:bf -36 11 2017/03/21 20:32:51 Wi-Fi
2 00:e3:b2:23:a5:93 -52 10 2017/03/21 20:32:19 Wi-Fi
3 bc:ee:7b:2d:36:84 -50 2 2017/03/21 20:32:14 Wi-Fi
4 24:92:0e:62:15:56 -80 9 2017/03/21 20:31:05 Wi-Fi
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The Future

Expected new features

Expected new features

- "So-called" proxy
- E-mail notification
- NFC Integration
  - *Turn on BT/Wi-Fi automatically*
  - *Auto-login*
  - *Online payment*

"So-called" proxy

- It often happens that one has to run procedures not for himself/herself, instead, for someone else.
- So, some methods must be taken to handle this situation. E.g. Authorization.

E-mail notification

- Currently, known means of promotion are in a traditional fashion, like handbills, newspaper, and broadcast systems.
- We wish, through e-mail notification, we can reduce waste of paper and manpower.

NFC Integration

- For more fluency in our processes, we hope the use of NFC will increase convenience, such as: Wi-fi auto-activation, auto-login, and online payment.

Project URLs & Reference:

- https://github.com/Neol-d2022/1052-www
- https://github.com/Neol-d2022/1052-www-services
- https://github.com/Neol-d2022/mac2file

- http://csie.nqu.edu.tw/smallko/sdn/mininet-wifi_lab1.htm
- http://www.threepullpa.com/376779-scientist-future-images.html
- http://dyconcept.de/wp-content/uploads/2017/01.html
- http://pic.qiantucdn.com/58pic/14/05/04.html

THANKS!

Any questions?