物聯網PLUS

2 摘要

3 LoRa簡介

通訊範圍更廣

4 系統架構

ethernet

LoRa

Wi Fi

Created by Branis Panos
from Noun Project

Created by Ivan Becerra
from Noun Project

ethernet

LoRa™

pot

Bluetooth
DHT11
LoRa
Soil humidity
relay

GPS node

Bluetooth
GPS
LoRa

LoRaWan

LoRa Protocol

Gateway

LoRa Gateway
dnsmasq
hostapd

Server

API for handover
API for pot node
API for GPS node
API for change node status
API for Mqtt Service
API for Database

APP

Bluetooth
Volley
Google maps API
Mqtt Client

Created by Branis Panos
from Noun Project
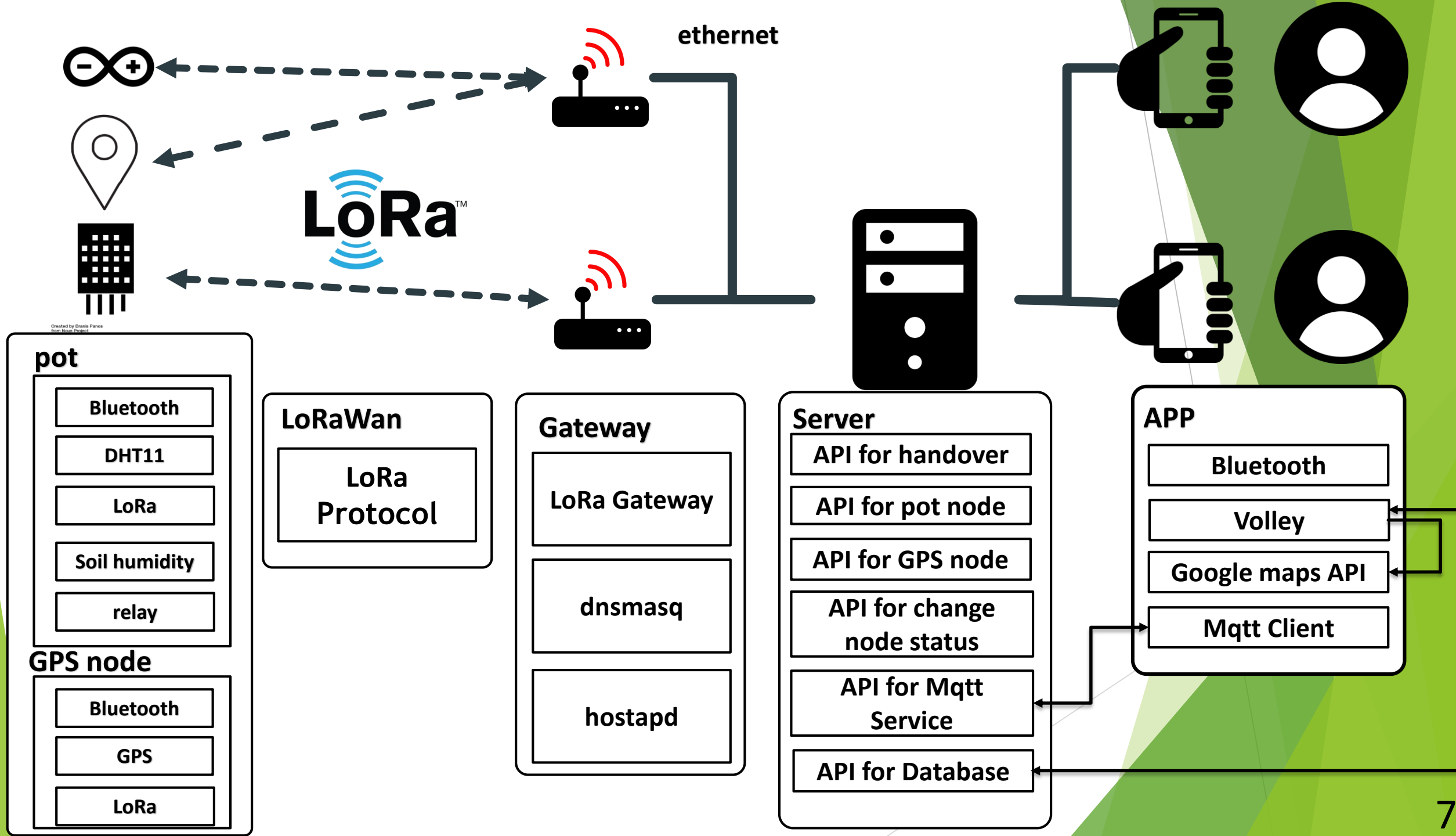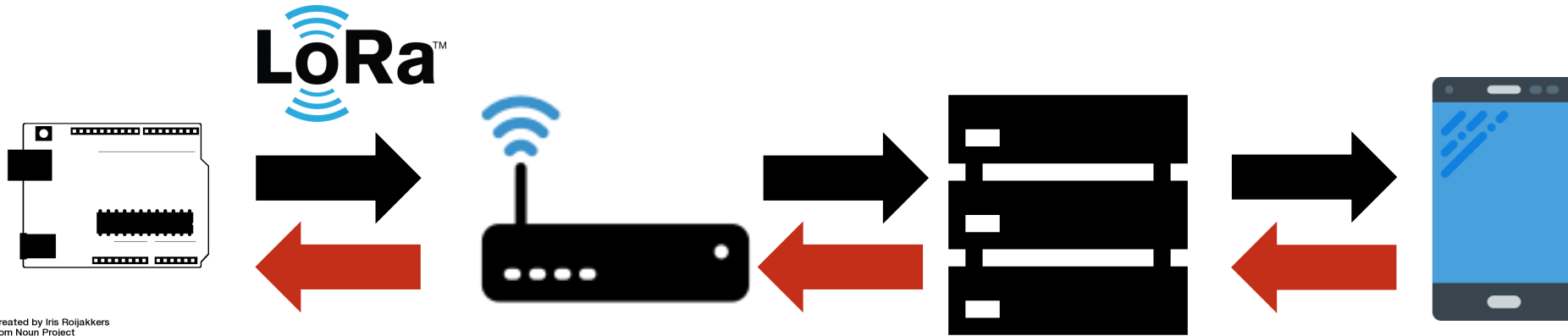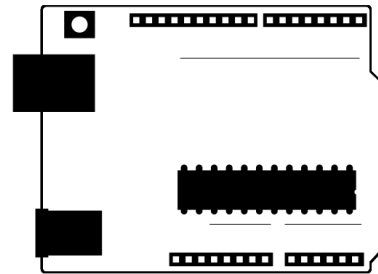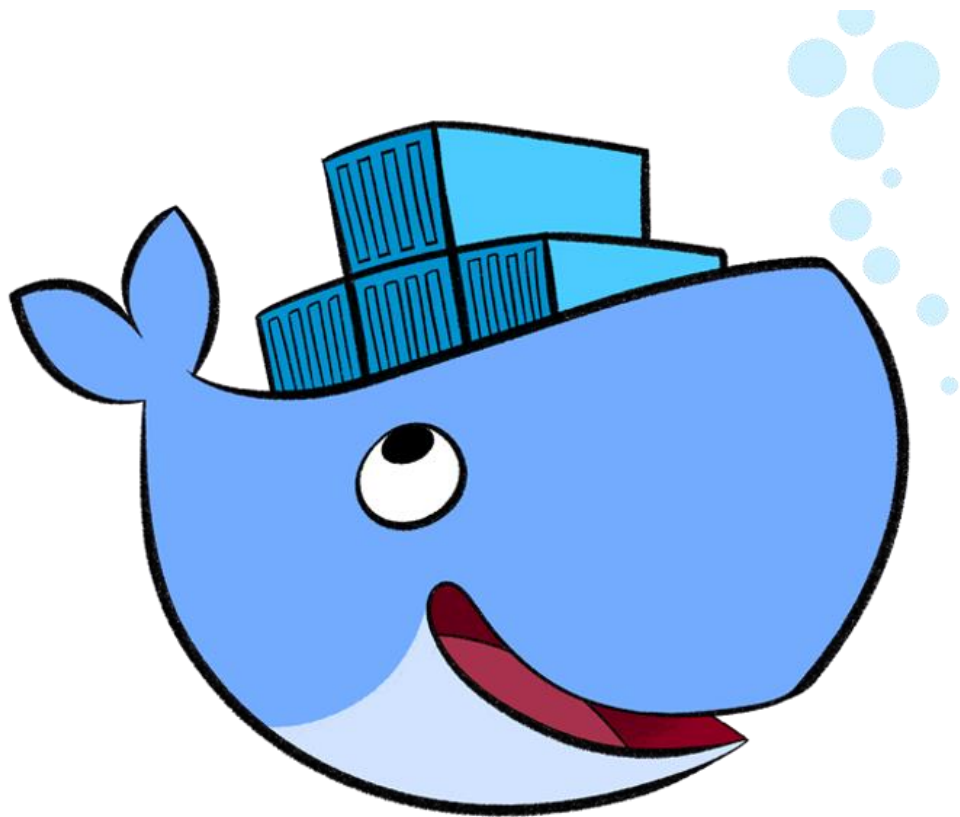
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5 ADVANTAGES :

5.1 Duplex channel LoRaWan

APP can send messages or control signals to LoRaNode

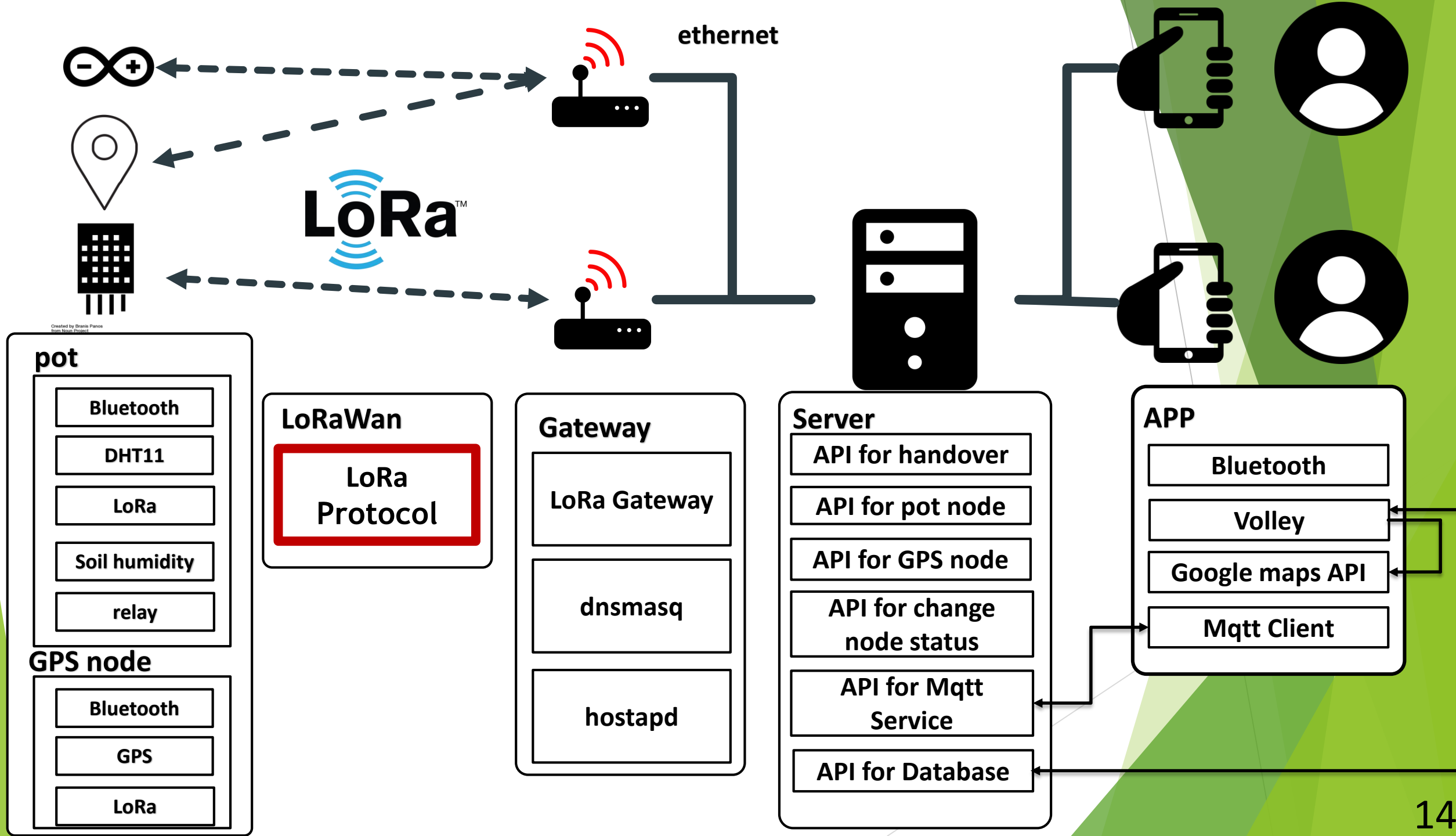# 5.2 LoRaWan add handover

可像手機3G一樣在gateway的涵蓋內移動並隨時與距離最近的gateway連線

Created by Iris Roijakkers
from Noun Project

5.3 導入docker技術使系統部屬更方便快速

6 專題實作

6.1 LoRaWAN

ethernet

LoRa™

pot
- Bluetooth
- DHT11
- LoRa
- Soil humidity
- relay

GPS node
- Bluetooth
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- LoRa

LoRaWan
- LoRa Protocol

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- API for Database

APP
- Bluetooth
- Volley
- Google maps API
- Mqtt Client

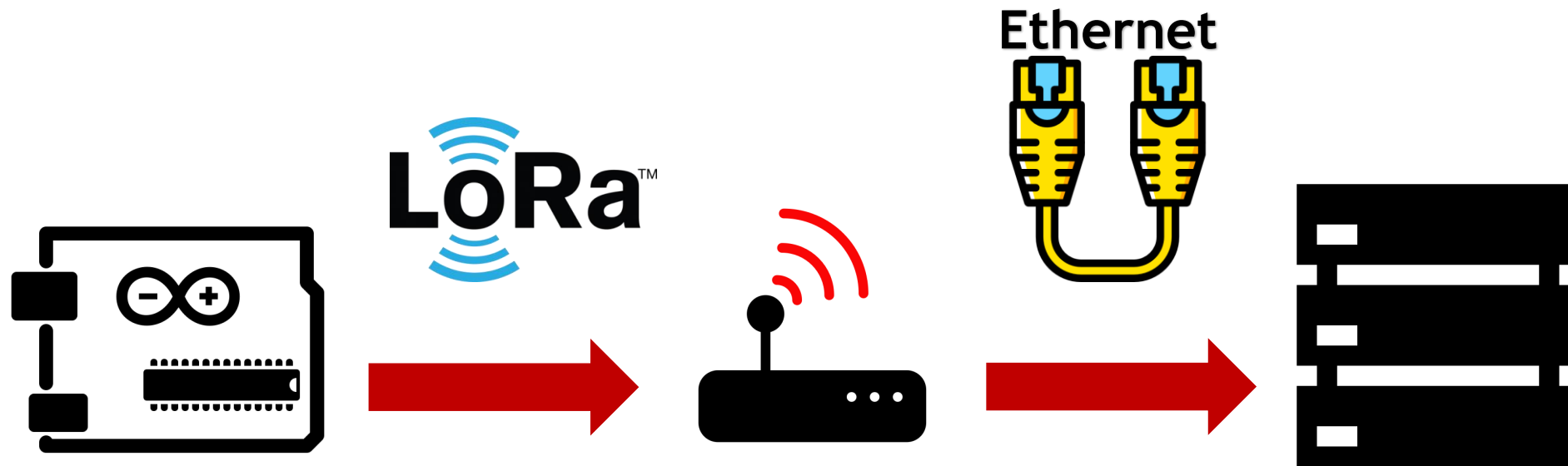Created by Branis Panos from Noun Project

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6.1.1 LoRaWan 封包格式

cjp (3 bytes)	type (1 byte)	destination (6 bytes)	source (6 bytes)	MessageID (1 byte)	length (1 byte)	payload

6.1.2 Package Type:

(1) Data

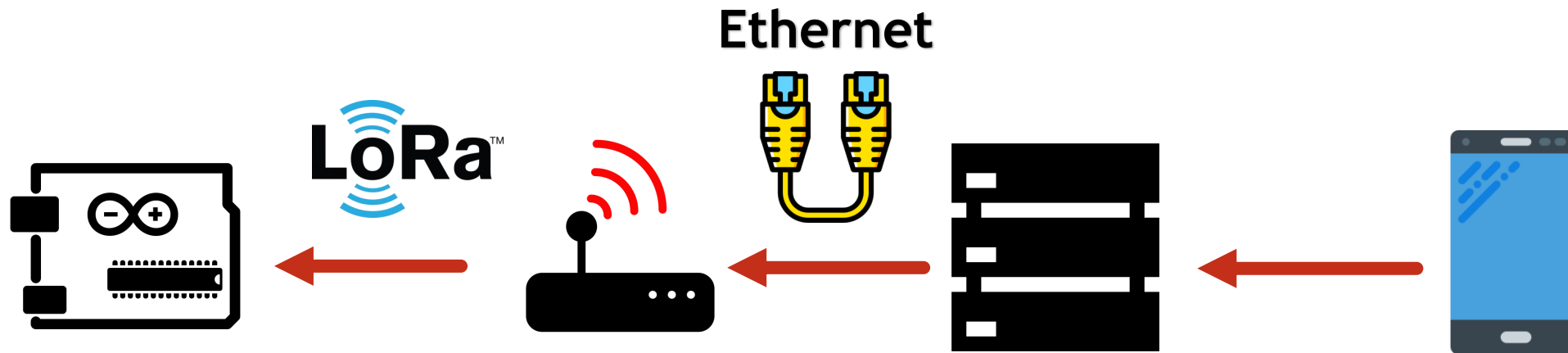| cjp (3 bytes)	D	destination (6 bytes)	source (6 bytes)	MessageID (1 byte)	length (1 byte)	payload

(2) Transfer

Ethernet
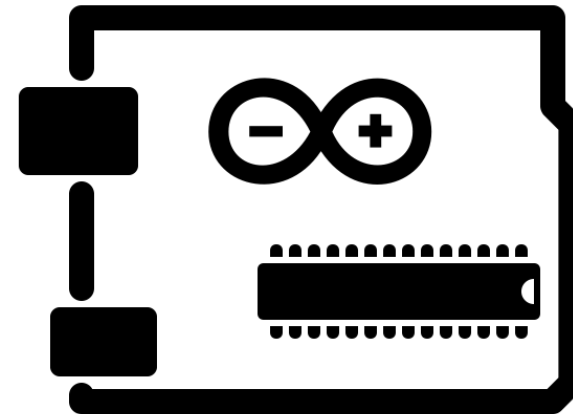

Created by uizin
from Noun Project

cjp (3 bytes)	T	destination (6 bytes)	source (6 bytes)	MessageID (1 byte)	length (1 byte)	payload

(3) Ack
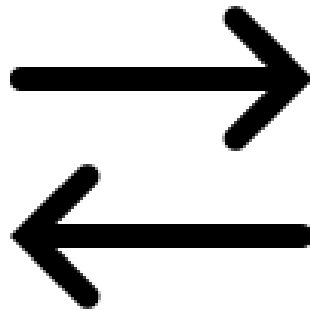
cjp (3 bytes)	A	destination (6 bytes)	source (6 bytes)	MessageID (1 byte)	length (1 byte)	payload

(4) Search
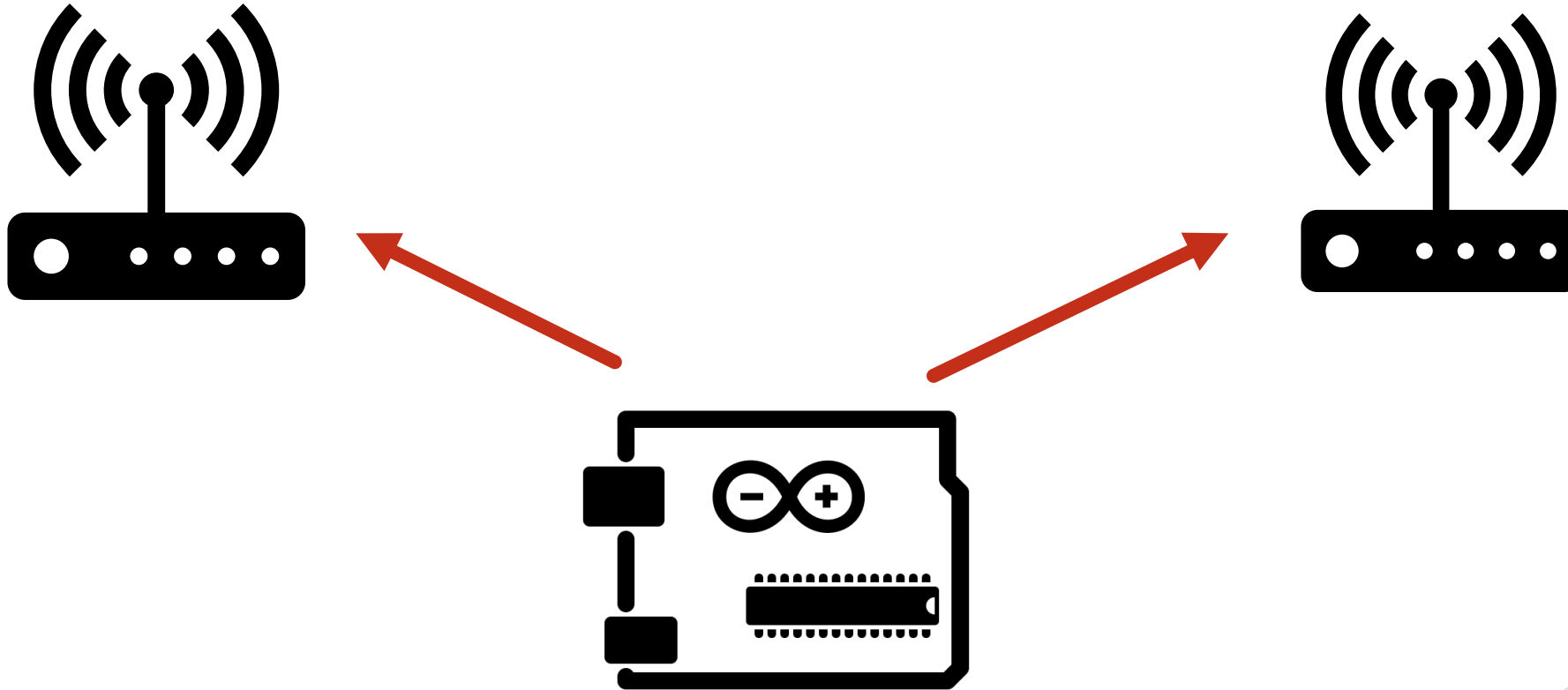
cjp (3 bytes)	**S**	destination (6 bytes)	source (6 bytes)	MessageID (1 byte)	length (1 byte)	payload

Search gateway

start

清空gateway欄位
Set rssi=-200

While(gateway==NULL)

發出search封包

While接收2秒內的回應

If(ack's rssi>rssi)

NO

Update gateway and rssi

while

while

handover

end

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handover

装置送出新狀態 → gateway接收並轉發

推播此訊息 ← Server update routine table
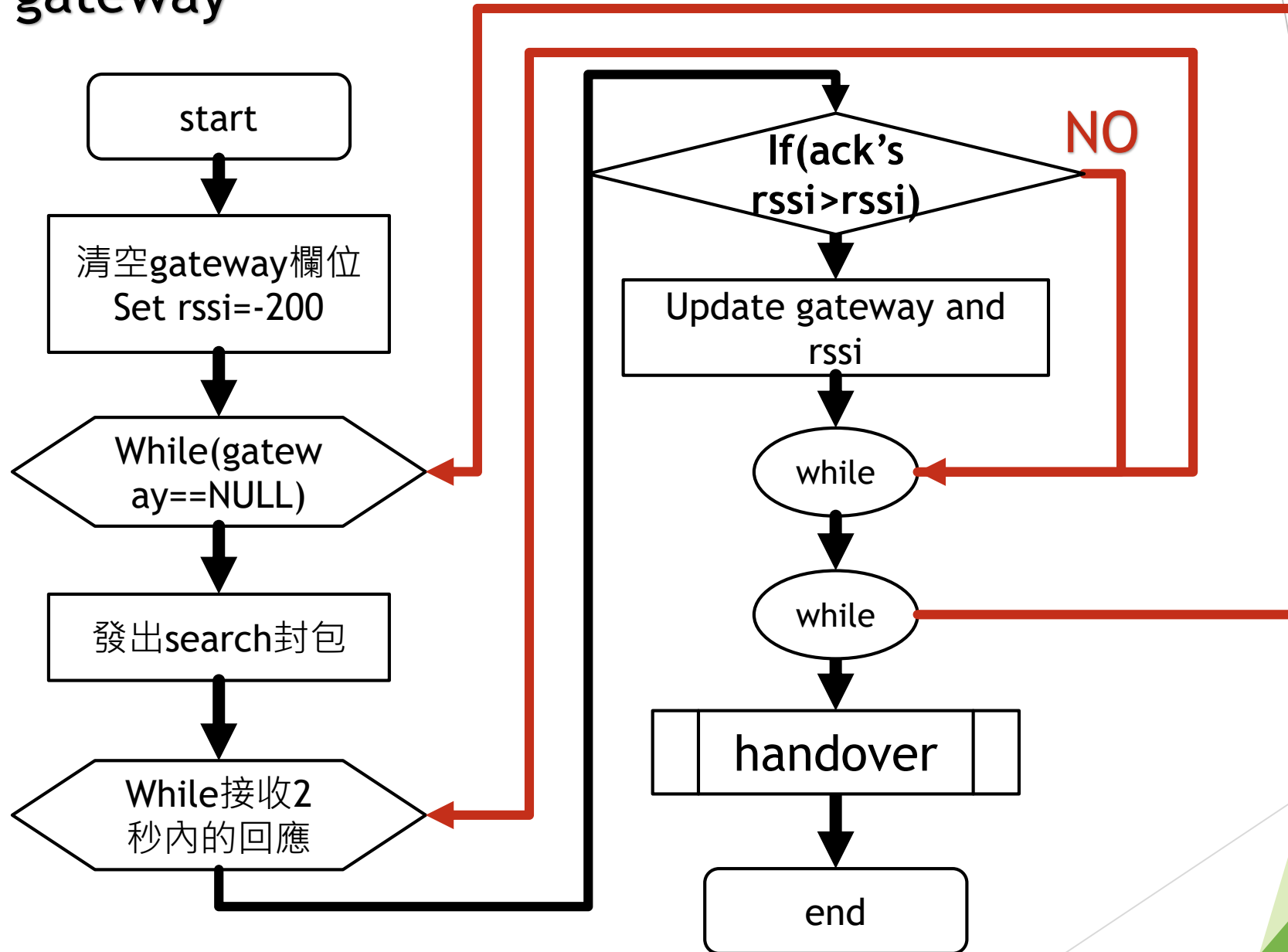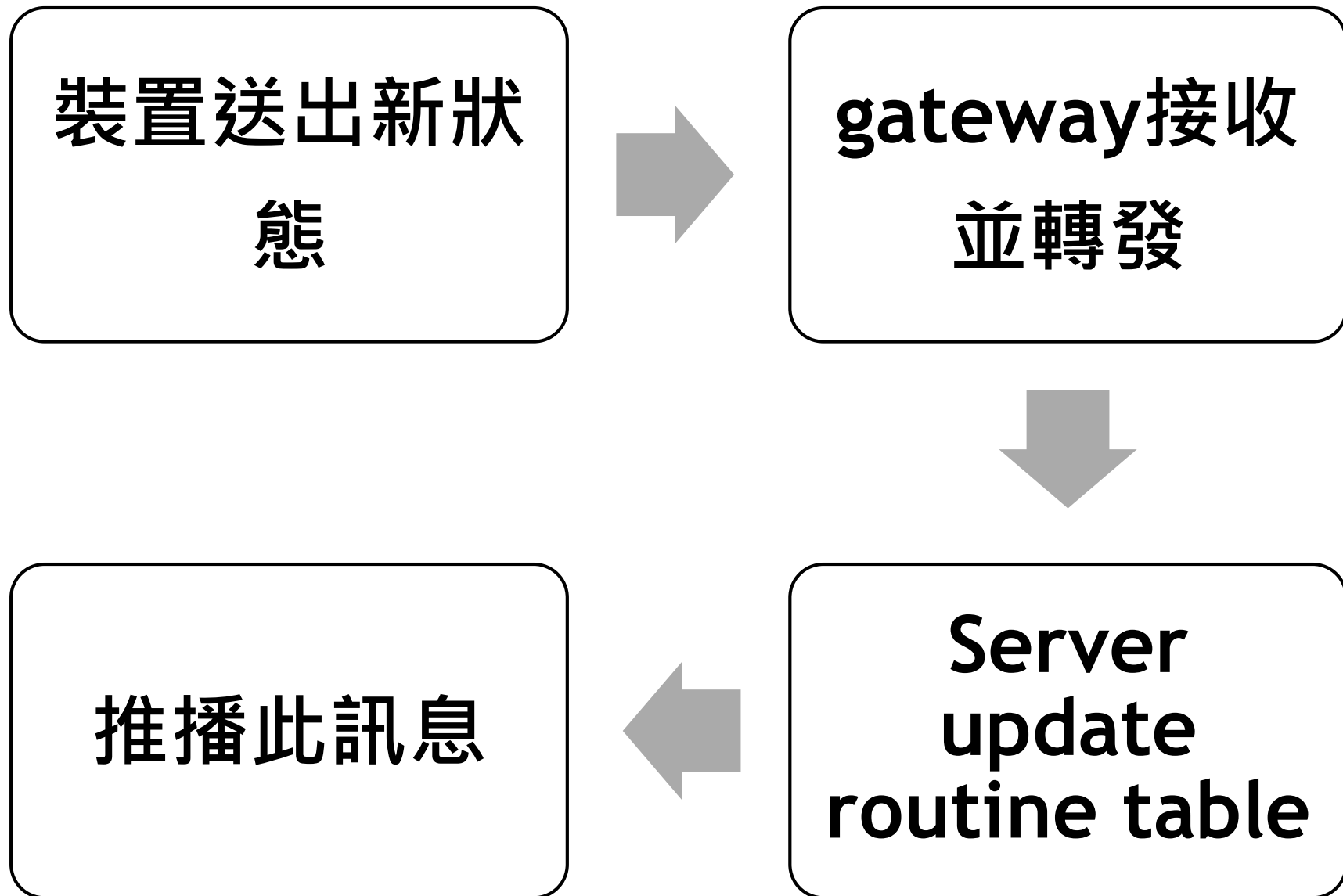
(5) Inform
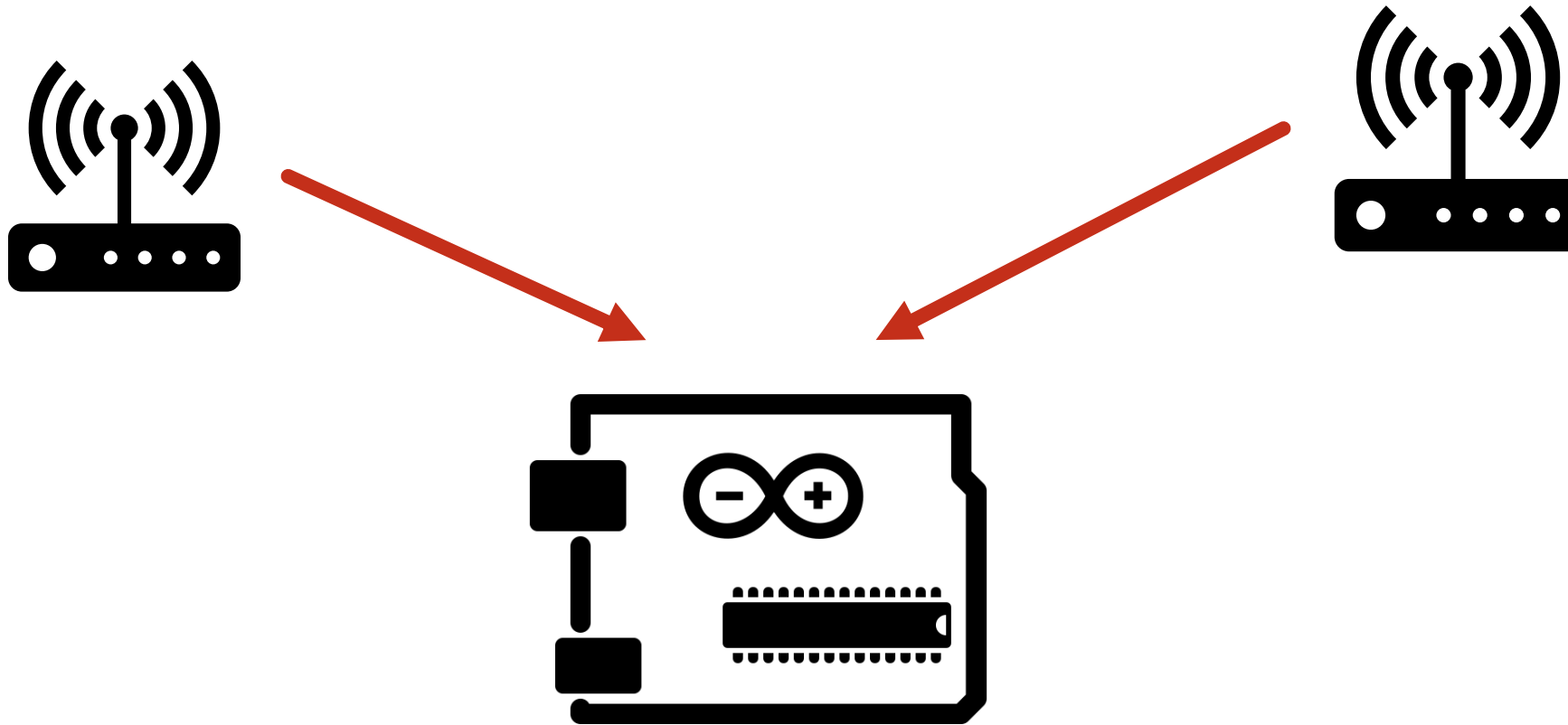
cjp (3 bytes)	I	destination (6 bytes)	source (6 bytes)	MessageID (1 byte)	length (1 byte)	payload

6.1.3 communication:

(1)Send packet
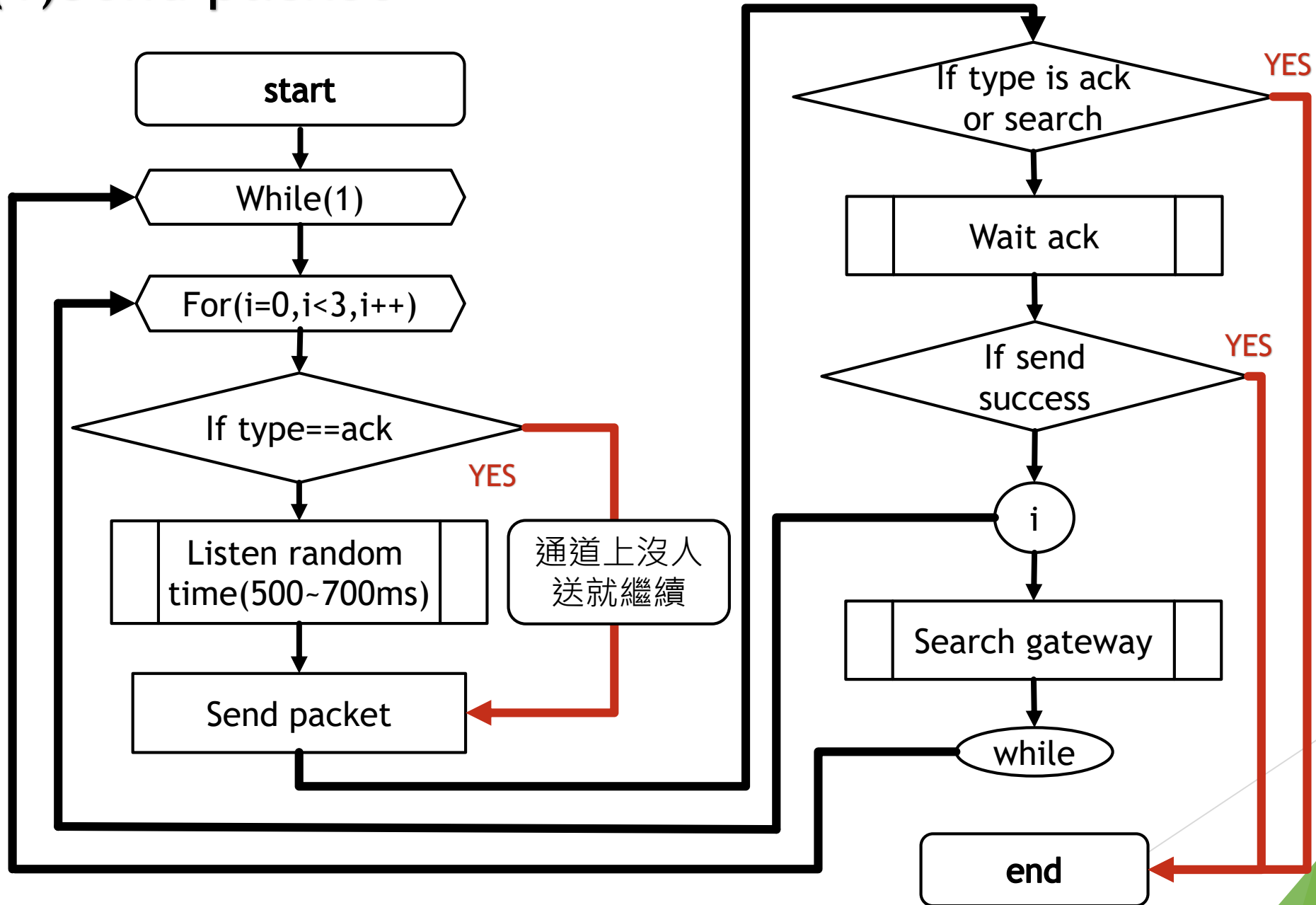
(2)Receive packet

6.2 Gateway

ethernet

LoRa™

pot
- Bluetooth
- DHT11
- LoRa
- Soil humidity
- relay

GPS node
- Bluetooth
- GPS
- LoRa

LoRaWan
- LoRa Protocol

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- hostapd

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- API for GPS node
- API for change node status
- API for Mqtt Service
- API for Database

APP
- Bluetooth
- Volley
- Google maps API
- Mqtt Client
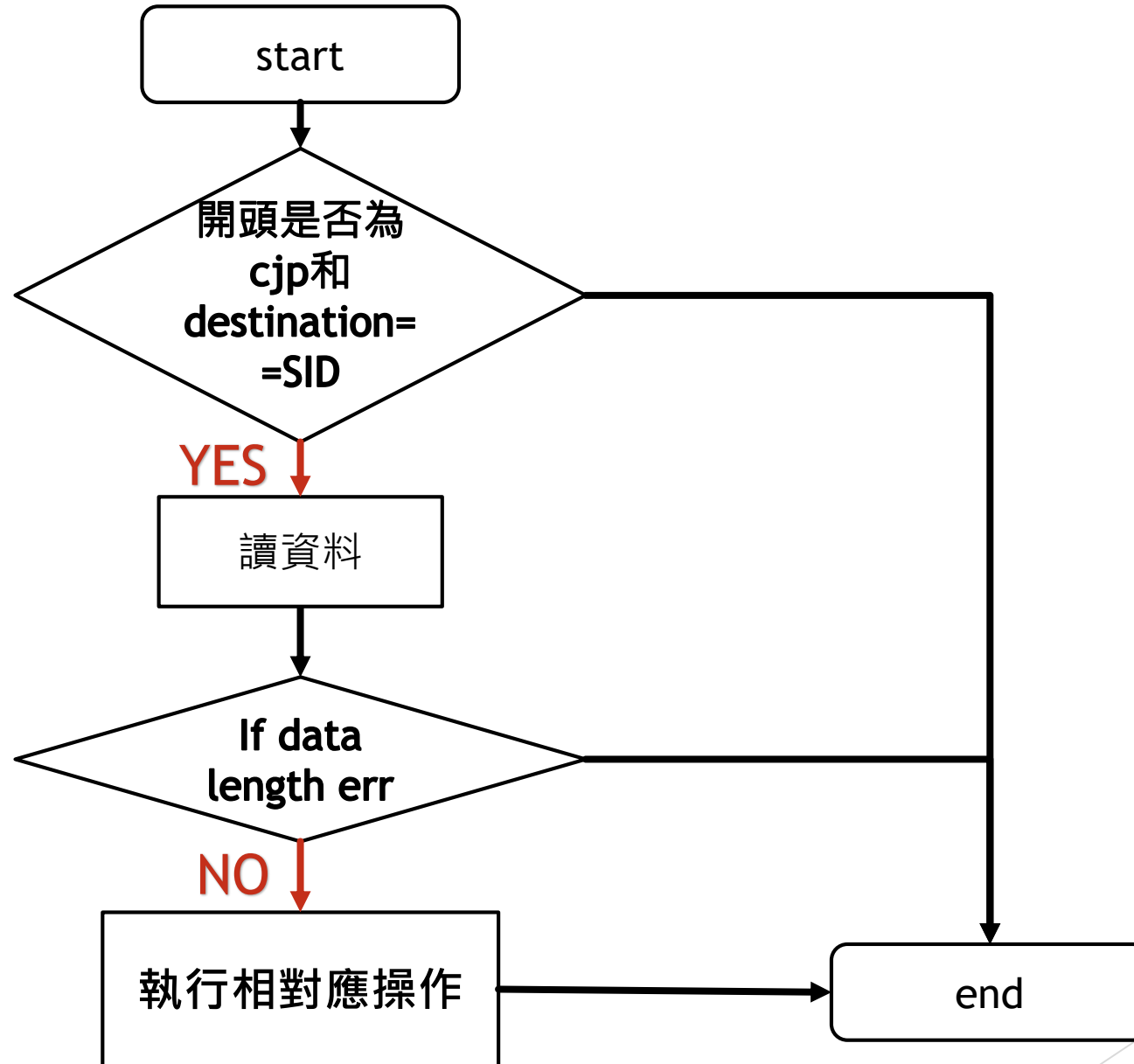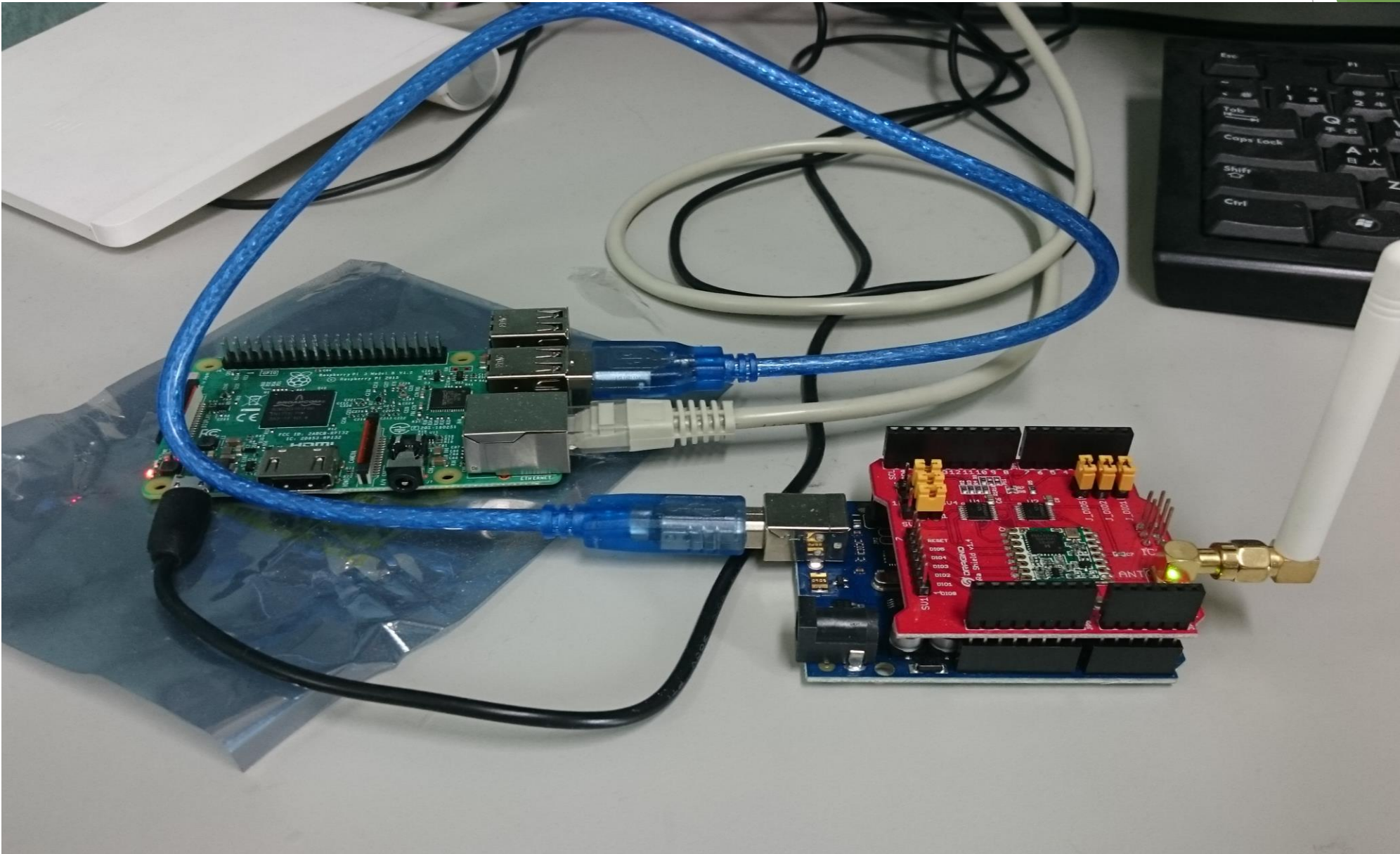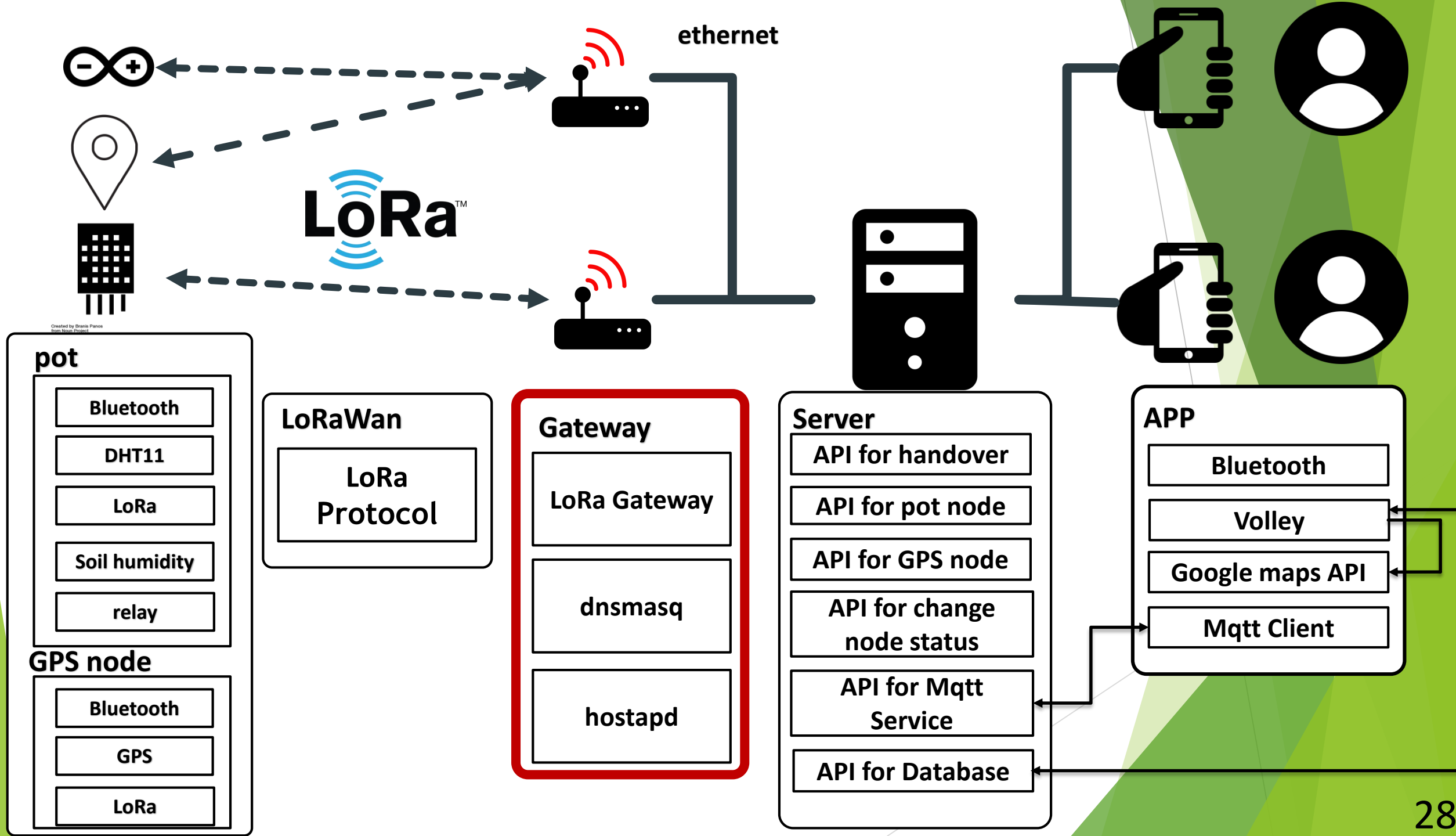
6.2.1 LoRa gateway 運作方式

gateway

USB

Ethernet

傳裝置序號

向mqtt
server 訂閱
此topic

Created by uizin
from Noun Project
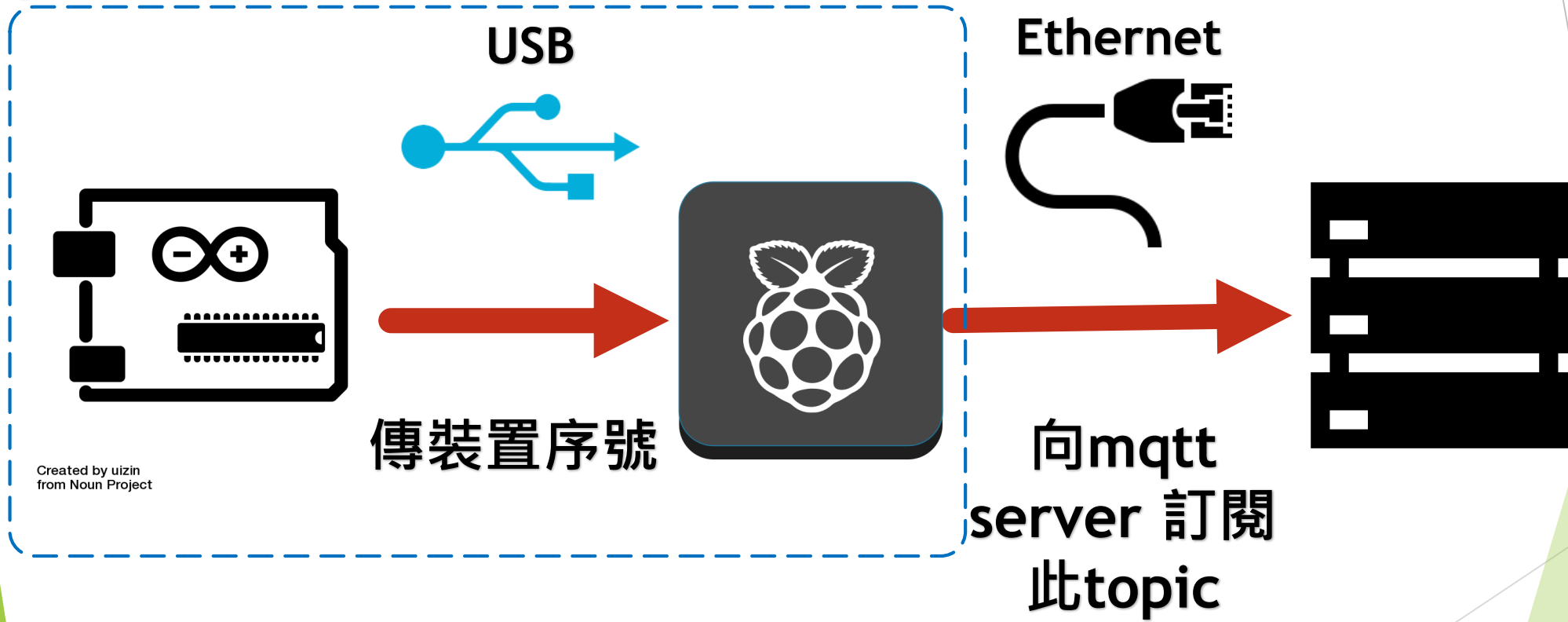
6.2.2 gateway microservices
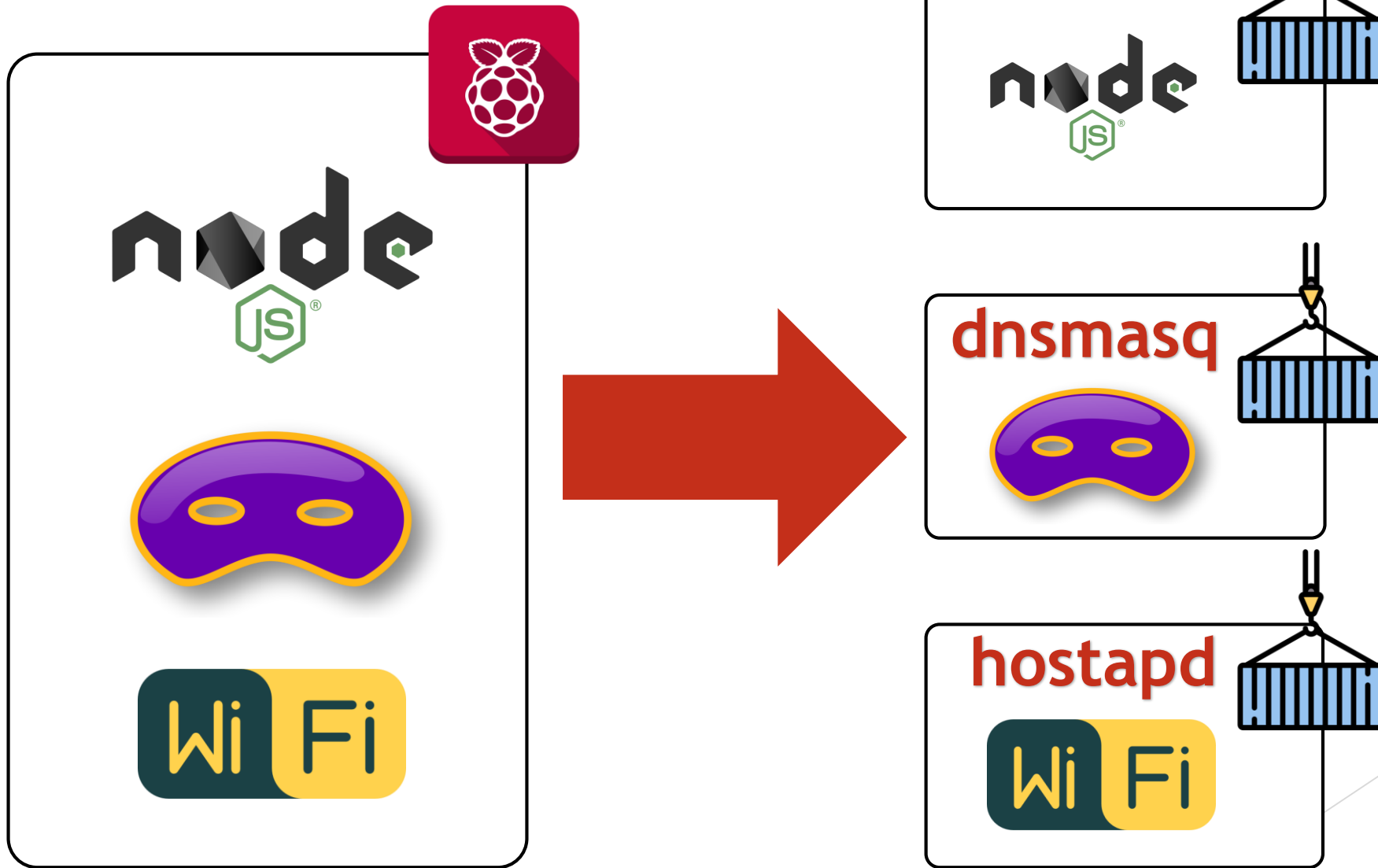
```
pi@raspberrypi: ~

login as: pi
pi@192.168.31.128's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue May  8 21:54:24 2018 from 192.168.31.106
pi@raspberrypi:~ $ sudo docker ps
CONTAINER ID        IMAGE               COMMAND                CREATED             STATUS              PORTS
d1aef19e971b        nodejs:0.1          "node /root/serial.j…" 43 hours ago        Up 43 hours
056eb38eb0ff        hostapd:0.1         "hostapd -dd /etc/ho…" 43 hours ago        Up 43 hours
f19ce288e902        dnsmasq:0.1         "dnsmasq --keep-in-f…" 43 hours ago        Up 43 hours
pi@raspberrypi:~ $
```

6.3 LoRa node

6.3.1 LoRaNode(pot node)

ethernet

LoRa™

pot

Bluetooth
DHT11
LoRa
Soil humidity
relay

GPS node

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GPS
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API for Database

APP

Bluetooth
Volley
Google maps API
Mqtt Client
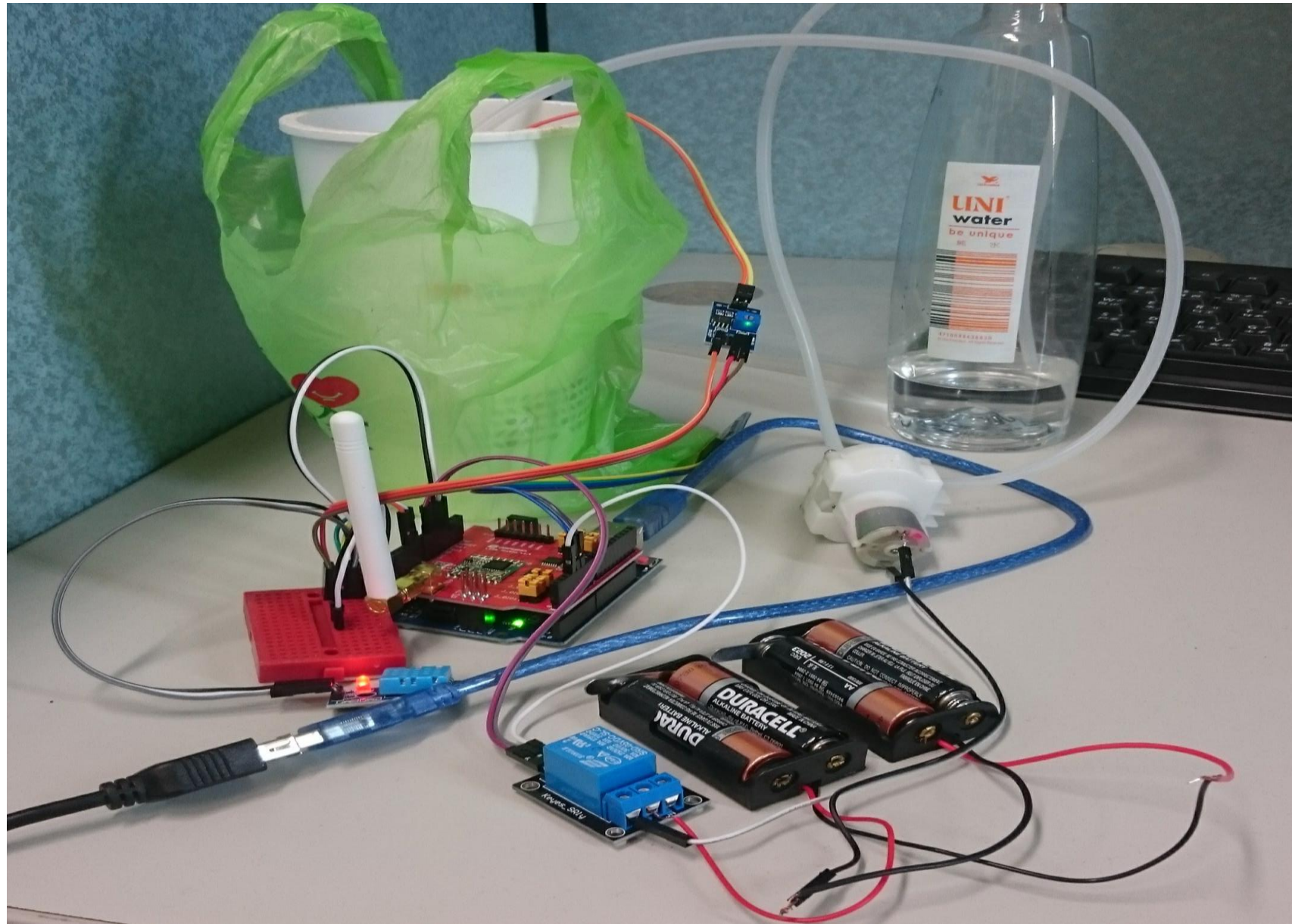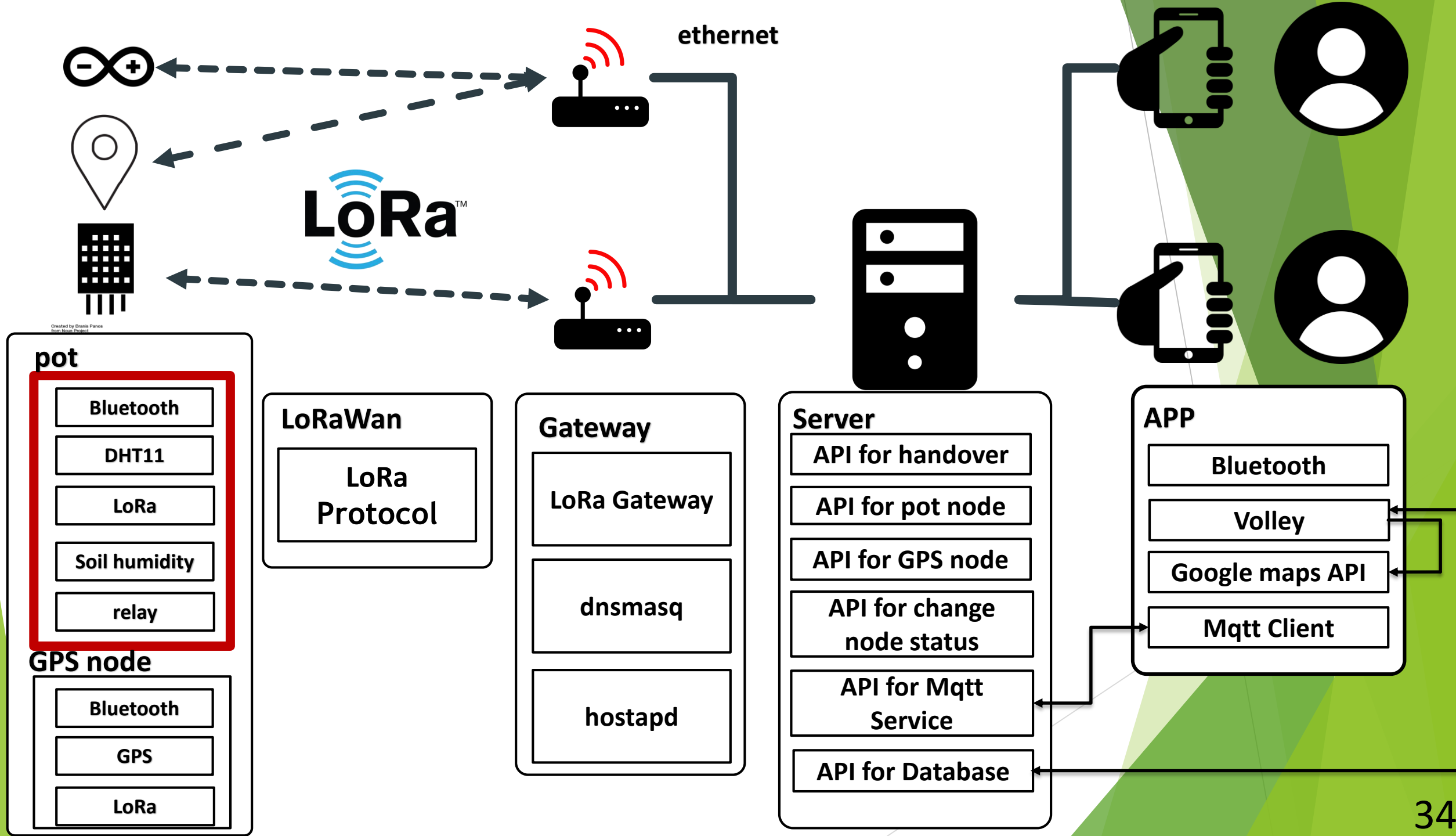
(1) Device initialize

(2) Device 運作流程


```
          ┌──────────────┐                              ┌──────────────────┐
          │    start     │        ┌────────────────────→│  On or off 澆水開關  │
          └──────┬───────┘        │                     │   並送出開關狀態     │
                 │                │                     └─────────┬────────┘
          ┌──────▼───────┐        │                               │
          │ 讀取溫濕度及土壤溫 │        │                     ┌─────────▼────────┐
          │      濕度      │        │              NO     │       end        │
          └──────┬───────┘        │         ┌──────────→└──────────────────┘
                 │                │         │
            ◇ 數值是否改變 ◇ ──NO──┘         │
                 │                          │
          ┌──────▼───────┐                  │
          │   送出新數值    │                  │
          └──────┬───────┘                  │
                 │                          │
         ◇ 是否高於或低 於設定範圍且 ◇ ──NO──────┘
            必須改電開關 狀態
```

(3) 控制device流程

```
┌─────────────┐      ┌─────────────┐      ┌─────────────┐
│ user發布新   │  →   │ 訂閱此topic的 │  →   │ 將此訊息送至  │
│ mqtt訊息     │      │ gateway接收  │      │ LoRaWAN中指  │
│             │      │             │      │ 定裝置       │
└─────────────┘      └─────────────┘      └─────────────┘
                                                 ↓
┌─────────────┐      ┌─────────────┐      ┌─────────────┐
│ Server      │  ←   │ 將新狀態     │  ←   │ 裝置接收訊息  │
│ update      │      │ 送出         │      │ 定完成指定動  │
│             │      │             │      │ 作           │
└─────────────┘      └─────────────┘      └─────────────┘
       ↓
┌─────────────┐
│ 將新狀態推   │
│ 播至user     │
└─────────────┘
```

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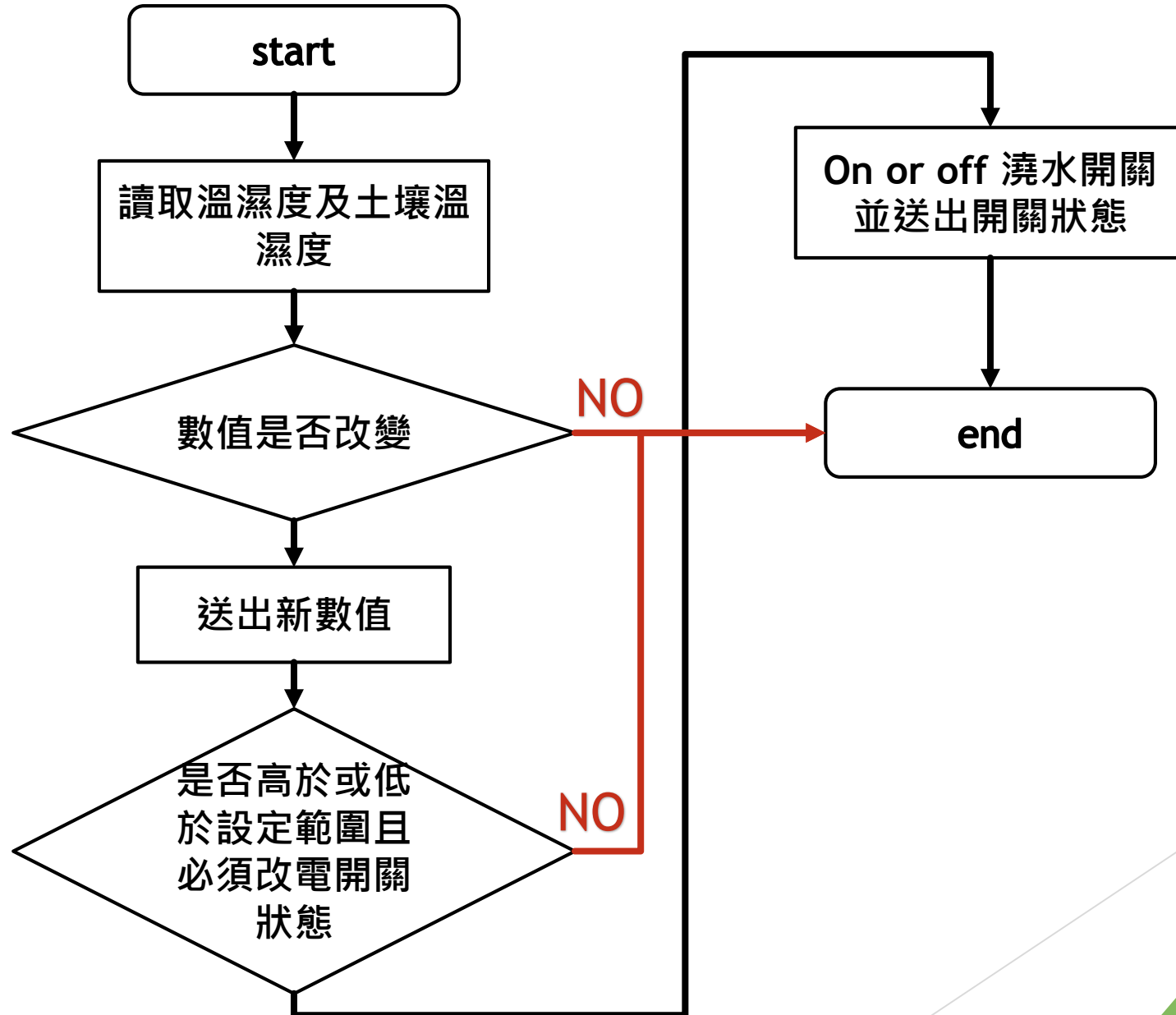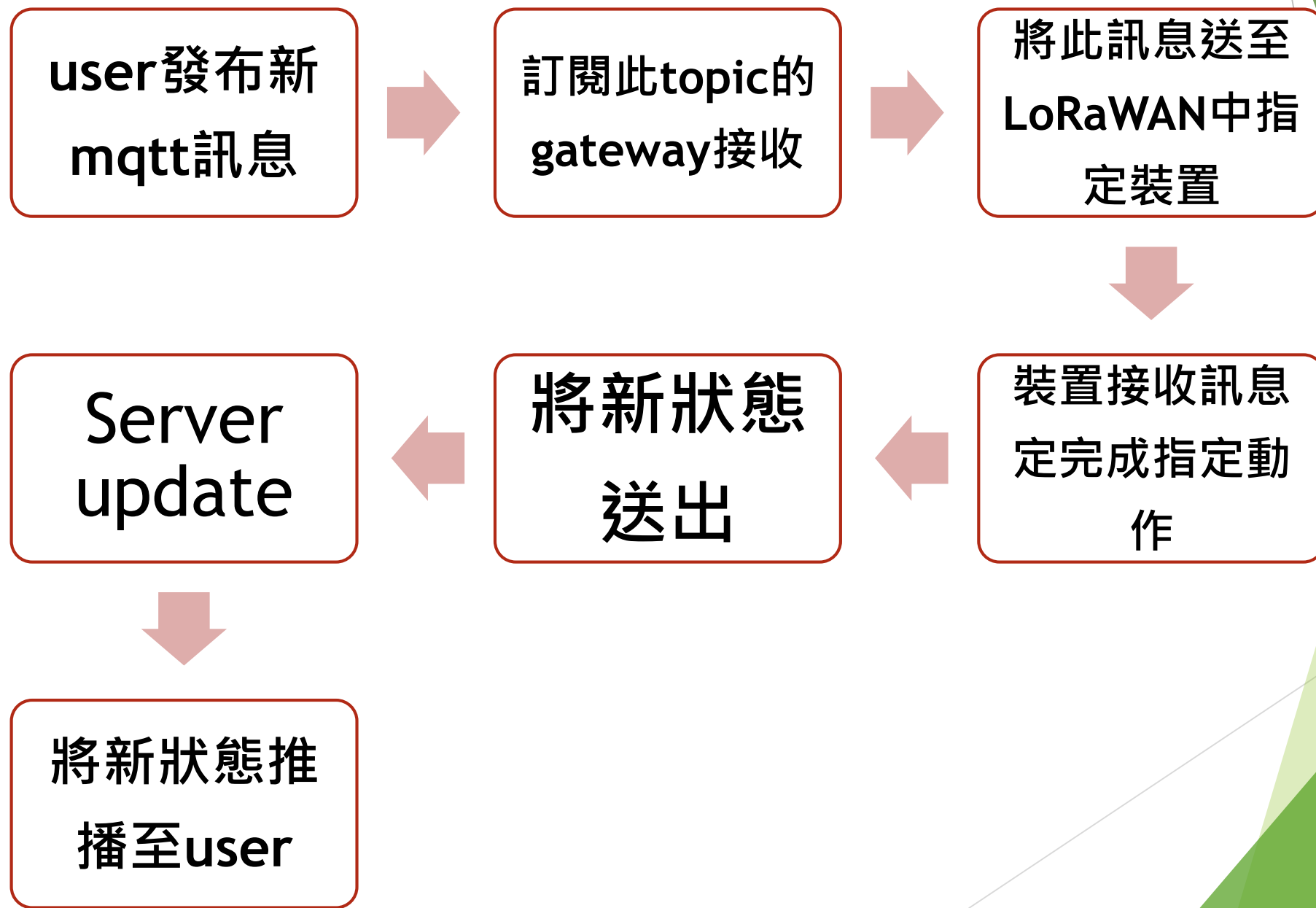
Lgw001

pot001SET+SW011

Count   1
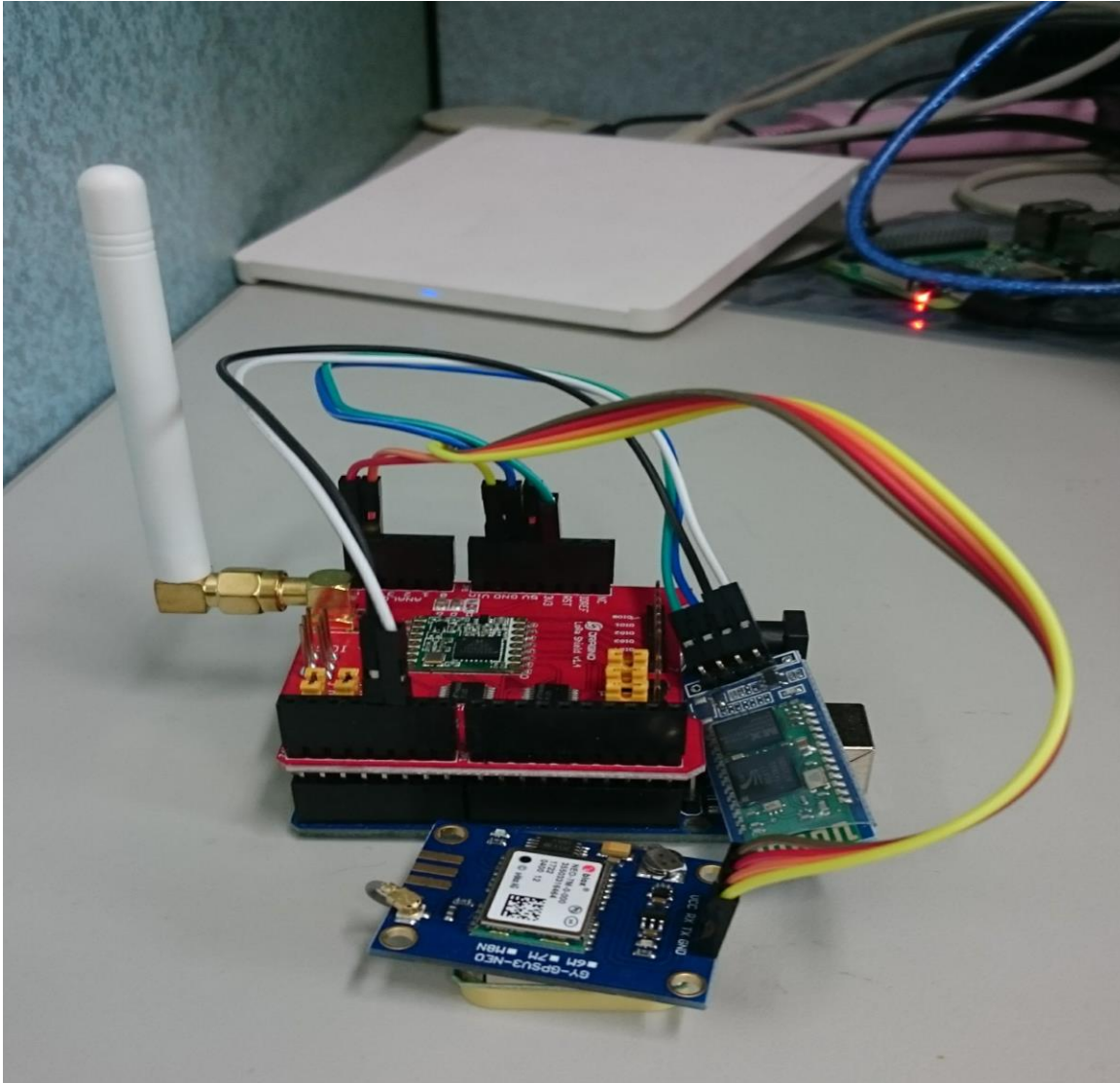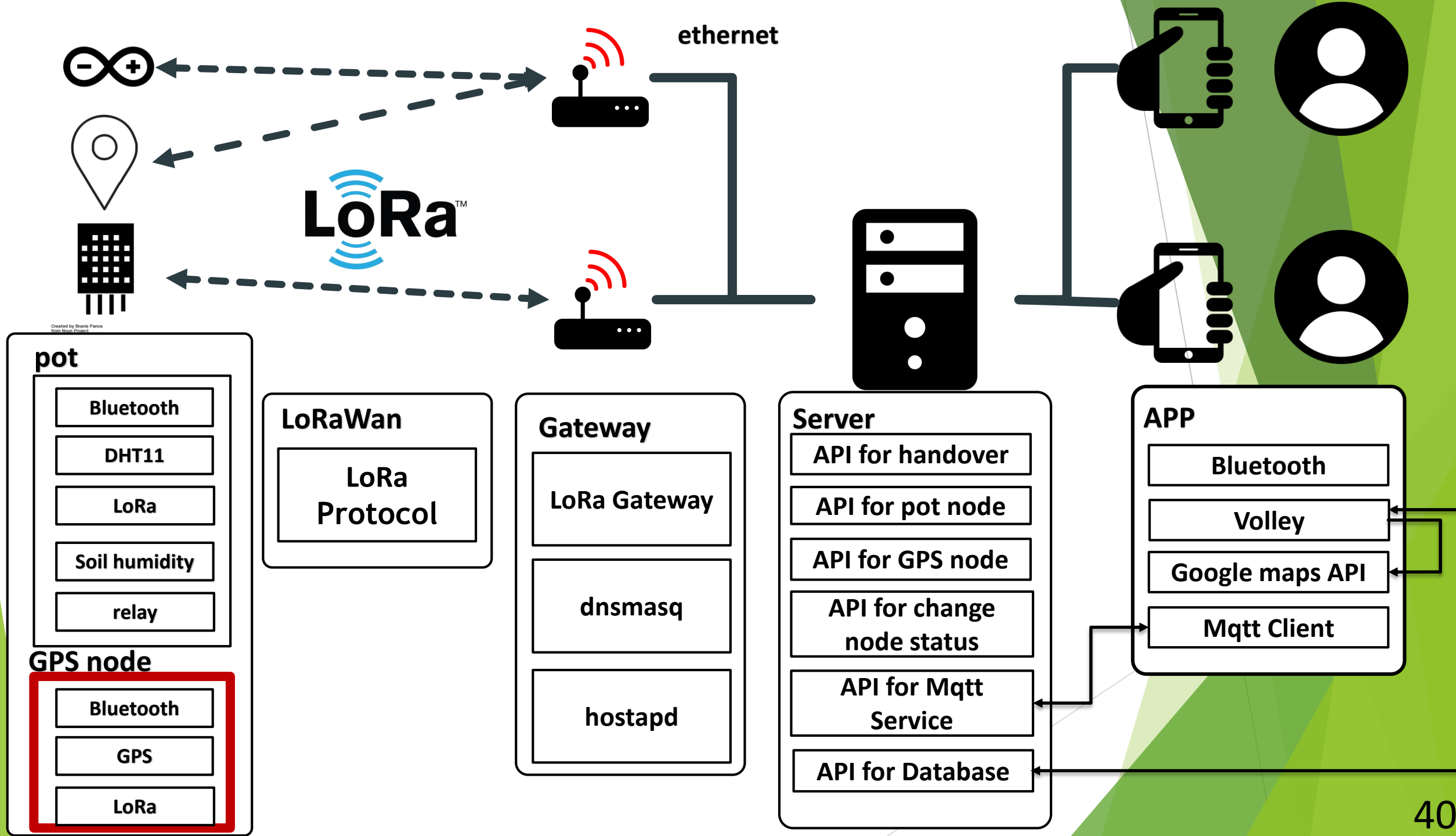
Publish

sw1 = 1
user1/info/pot001

pot001SET+SW011
Lgw001

6.3.2 LoRaNode(GPS node)

ethernet

LoRa™

pot

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GPS node

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LoRaWan

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APP

- Bluetooth
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Created by Branis Panos
from Noun Project

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(1) GPS node 運作流程

8 DEMO

https://github.com/CJP0