HUB5168+ 實務TRAINING

講師: 楊熲煜 (Malo)

W01：基礎教學

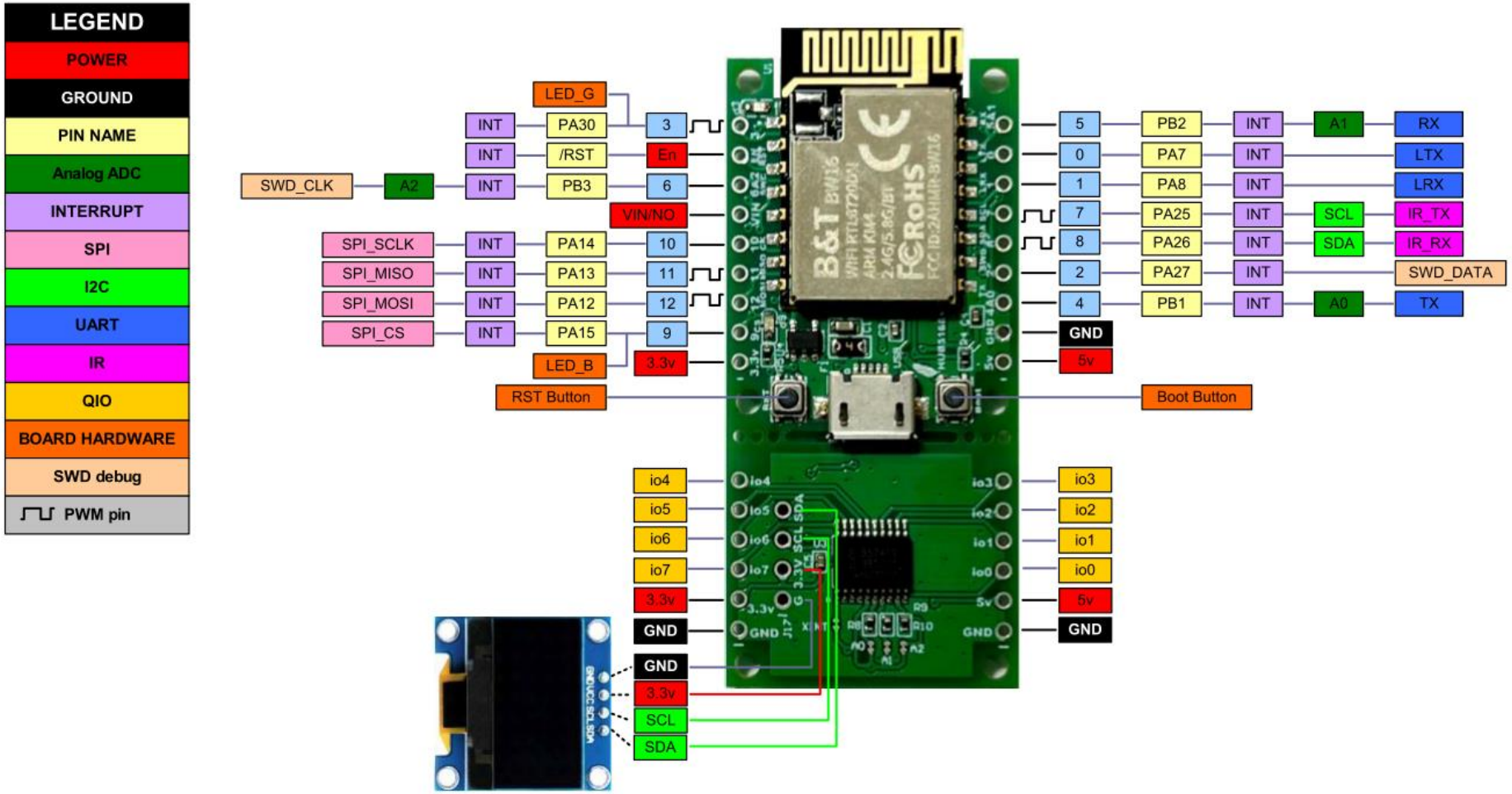
HUB5168+

- 延續了 DSI5168 輕薄短小
- 支援 2.4G, 5G 雙頻 Wi-Fi 和低功耗 BLE5.0 及雙核心處理器
- 擴充模組可直上 OLED
- 為國產晶片於物聯網產品開發的好工具。

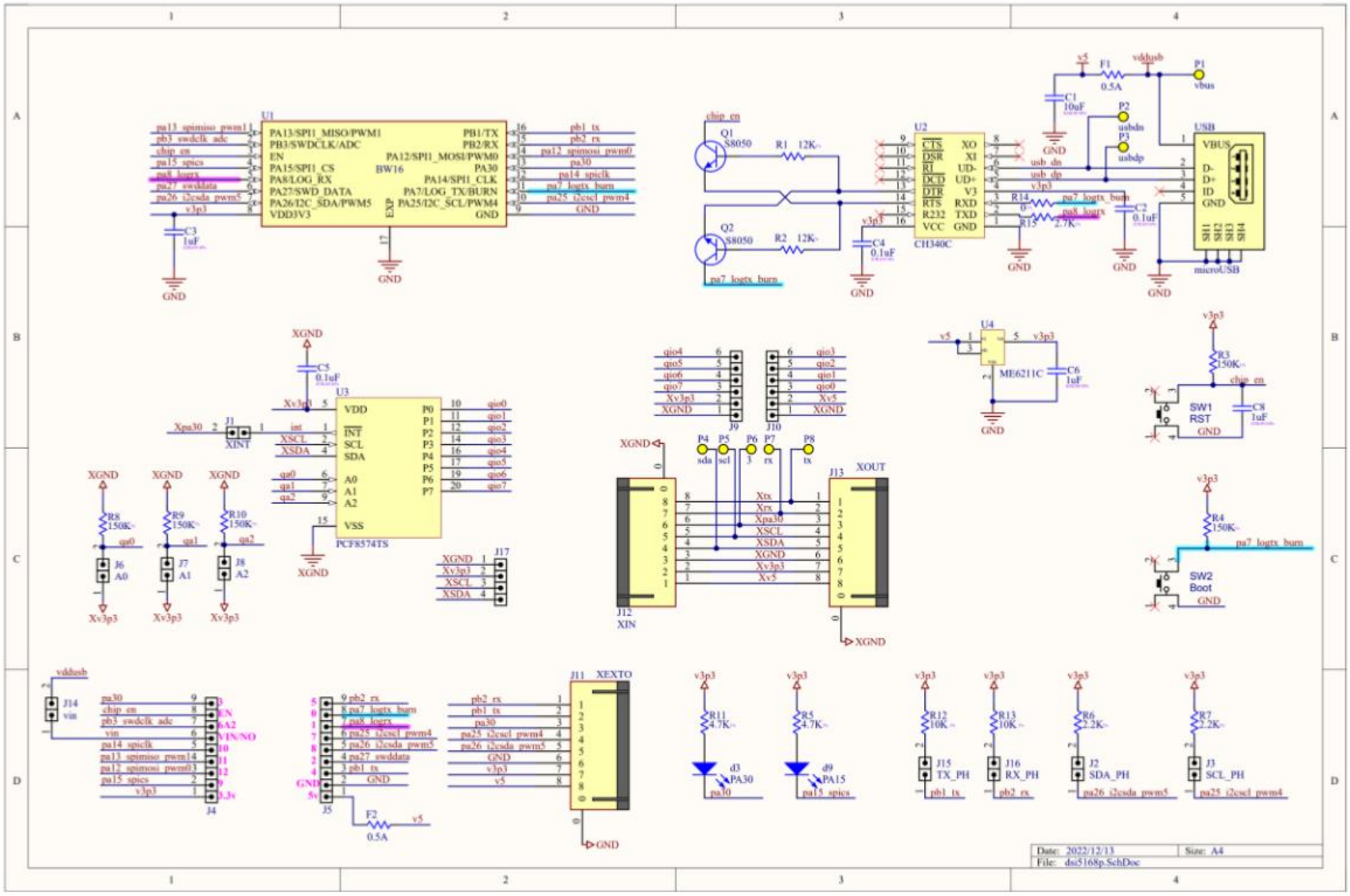
HUB5168+

硬體功能	HUB 5168+
Wireless LAN	2.4G, 5G 雙頻 Wi-Fi
BLE BLE	低功耗 BLE5.0
Chipset	RTL8720DN
MCU	KM4 Arm Cortex-M4 core @ 200 MHz KM0 Arm Cortex-M0 core @ 20 MHz
Length	34.7mm
Width	25.4mm
Flash memory	16Mbit
HS_SRAM	512KB
LP_SRAM	64KB
Clock Speed	200 MHz
I/O	21
ADC	3
SPI	1
UART	2
I2C	1

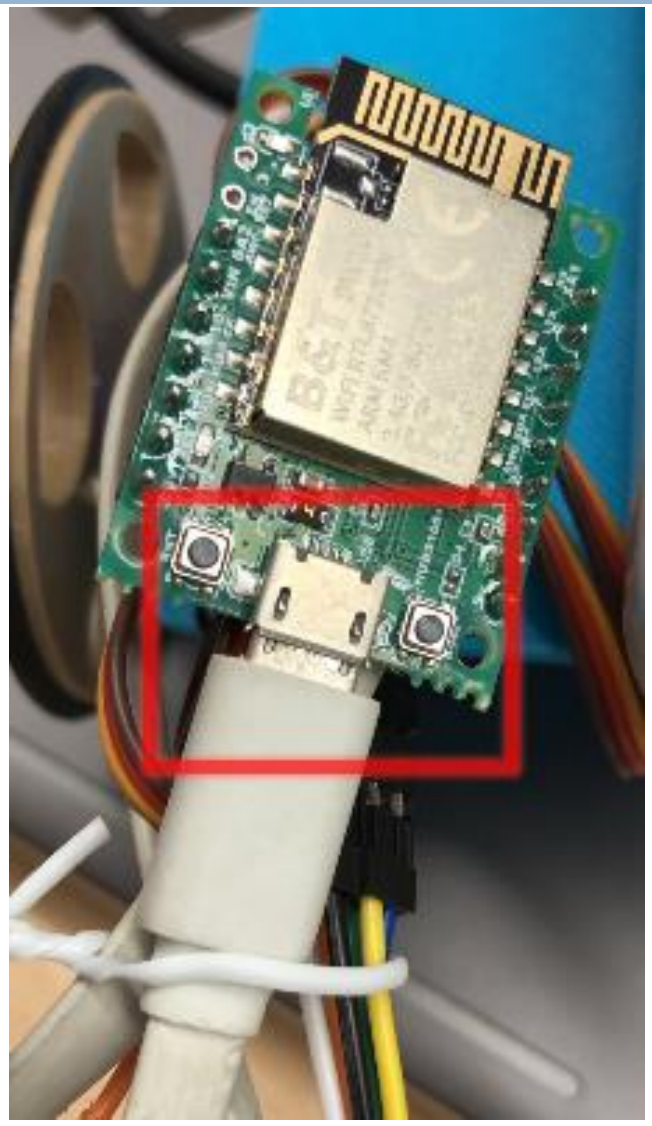
HUB5168+


LEGEND
POWER
GROUND
PIN NAME
Analog ADC
INTERRUPT
SPI
I2C
UART
IR
QIO
BOARD HARDWARE
SWD debug
PWM pin
LED_G
INT
PA30
3
INT
/RST
En
SWD_CLK
A2
INT
PB3
6
VIN/NO
SPI_SCLK
INT
PA14
10
SPI_MISO
INT
PA13
11
SPI_MOSI
INT
PA12
12
SPI_CS
INT
PA15
9
LED_B
3.3v
RST Button
5
PB2
INT
A1
RX
0
PA7
INT
LTX
1
PA8
INT
LRX
7
PA25
INT
SCL
IR_TX
8
PA26
INT
SDA
IR_RX
2
PA27
INT
SWD_DATA
4
PB1
INT
A0
TX
GND
5v
Boot Button
io4
io5
io6
io7
3.3v
GND
io3
io2
io1
io0
5v
GND
GND
3.3v
SCL
SDA

HUB5168+

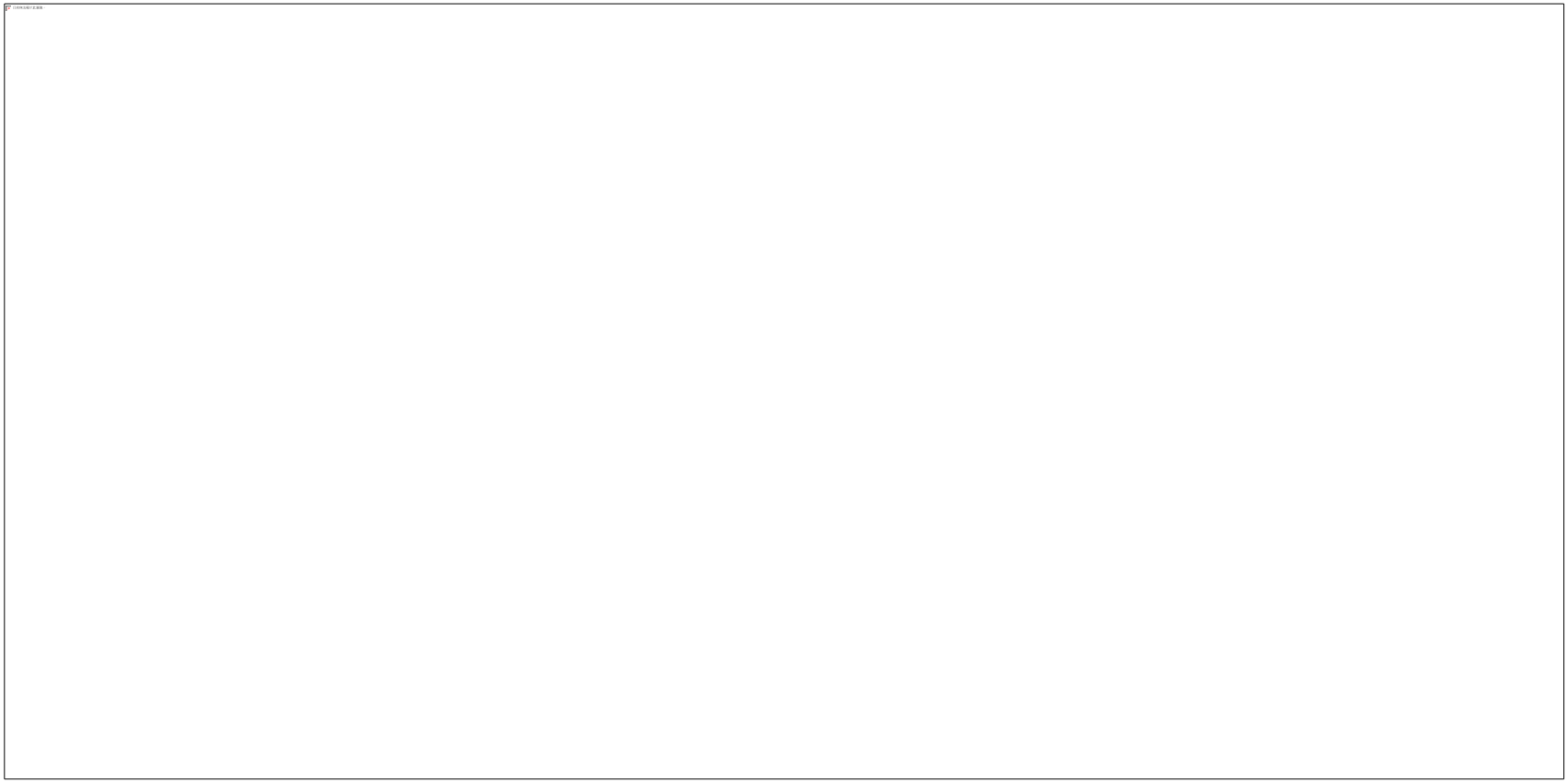

U1
PA13/SPI1_MISO/PWM1
PB3/SWDCLK/ADC
EN
PA15/SPI1_CS
PA8/LOG_RX
PA27/SWD_DATA
PA26/I2C_SDA/PWM5
VDD3V3
PB1/TX
PB2/RX
PA12/SPI1_MOSI/PWM0
PA30
PA14/SPI1_CLK
PA7/LOG_TX/BURN
PA25/I2C_SCL/PWM4
GND
BW16
EXP
U2
CH340C
U3
PCF8574TS
U4
ME6211C
J9
J10
J11 XEXTO
J12 XIN
J13 XOUT
USB
microUSB
SW1 RST
SW2 Boot
Q1 S8050
Q2 S8050
F1 0.5A
F2 0.5A
d3 PA30
d9 PA15
J15 TX_PH
J16 RX_PH
J2 SDA_PH
J3 SCL_PH
Date: 2022/12/13
Size: A4
File: dsi5168p.SchDoc

接線圖



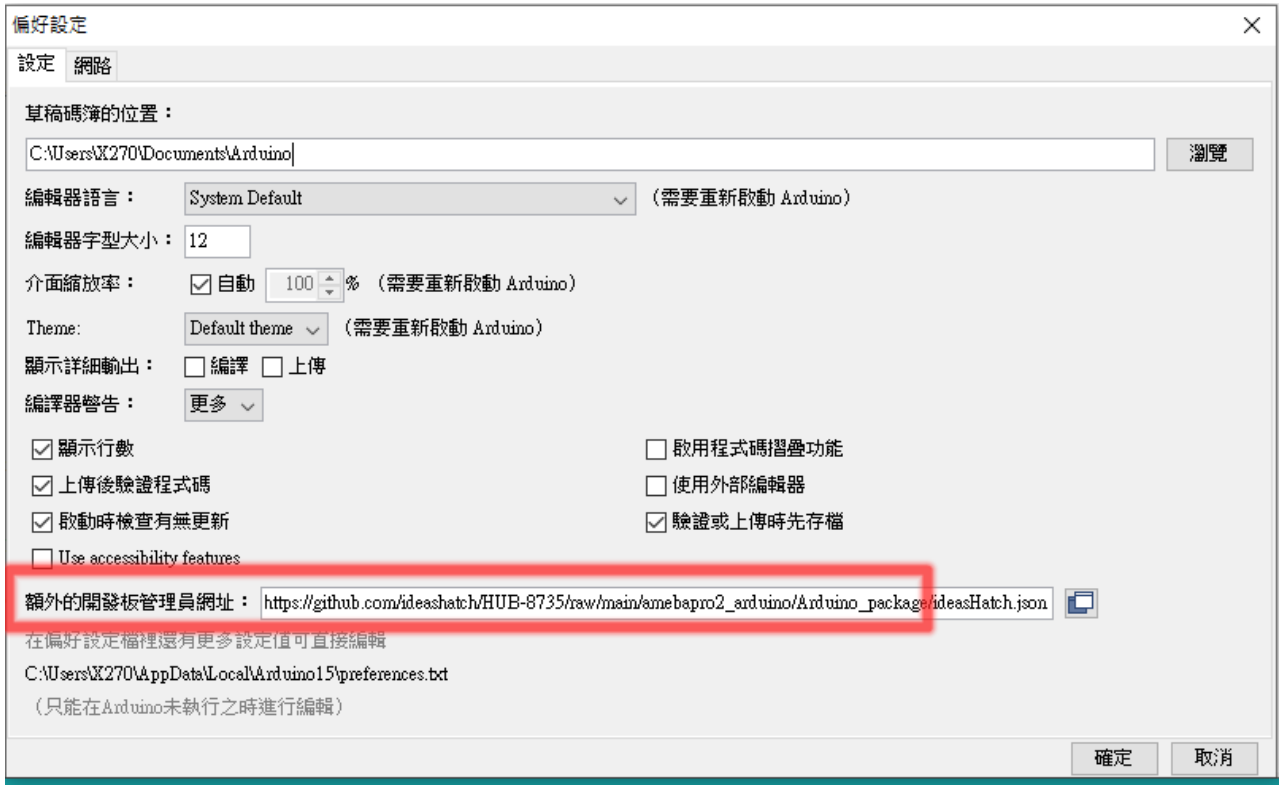
Arduino安裝說明

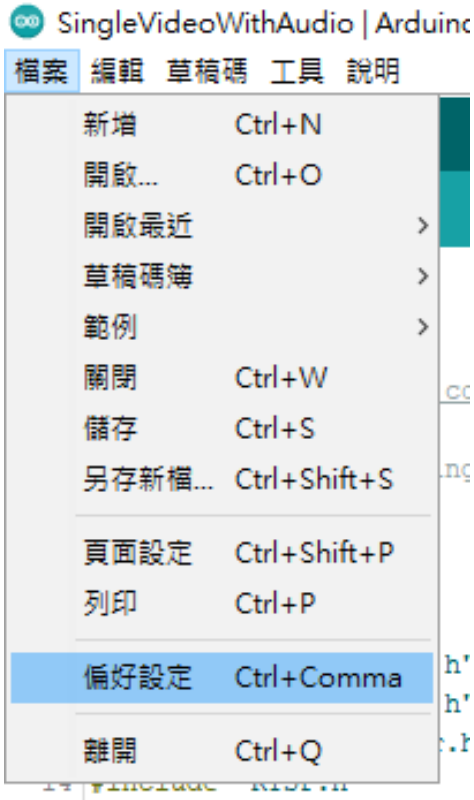
- 盡量使用安裝版
- 使用1.8.19以上版本(講師使用1.8.19)



Arduino安裝說明

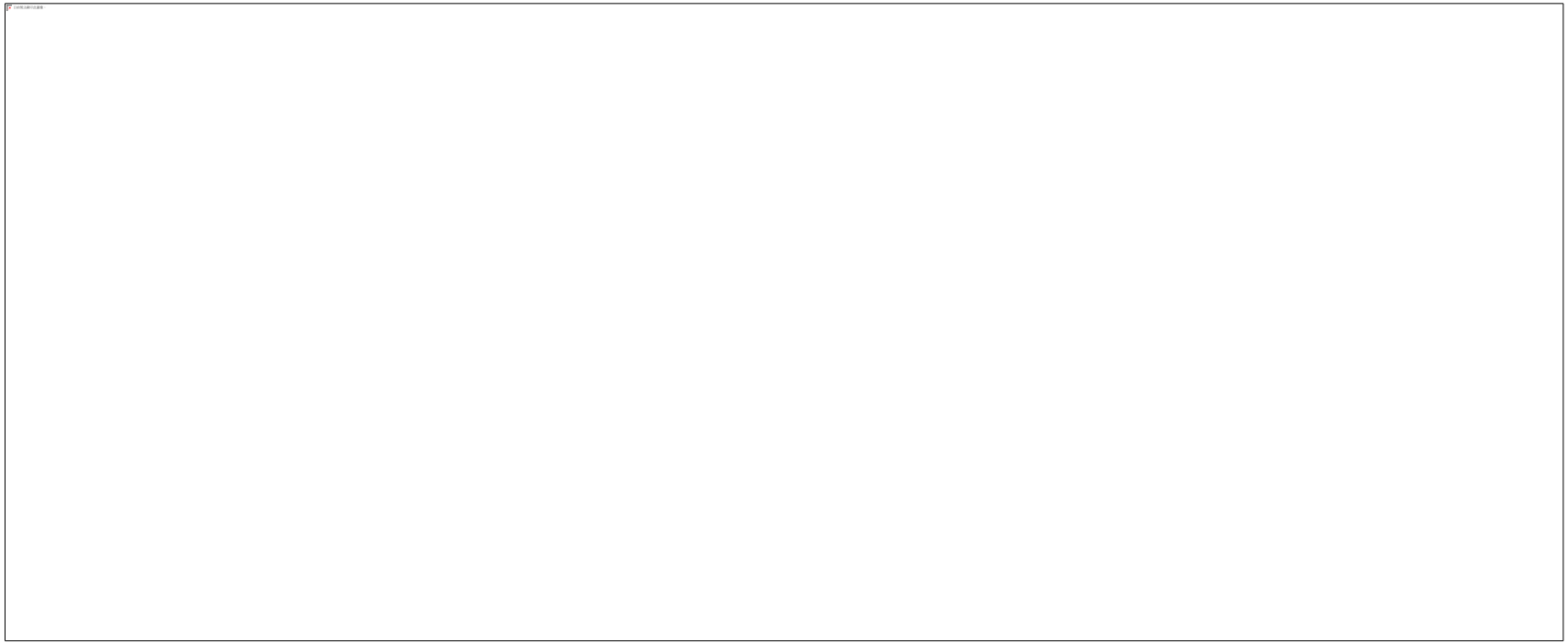
- 開啟Arduino IDE，打開「檔案」/「偏好設定」
- 在「開發板管理員網址」填入網址：
  https://github.com/ambiot/ambd_arduino/raw/master/Arduino_package/package_realtek.com_amebad_index.json





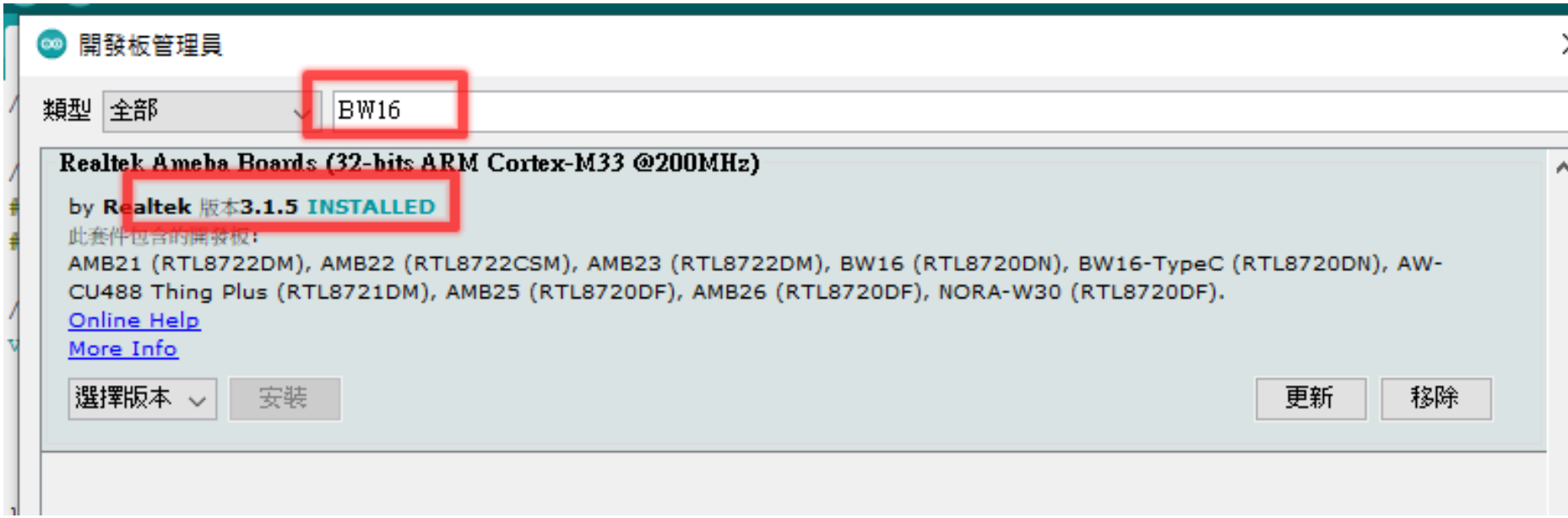
Arduino安裝說明

- 選擇「工具」/「開發板管理員」



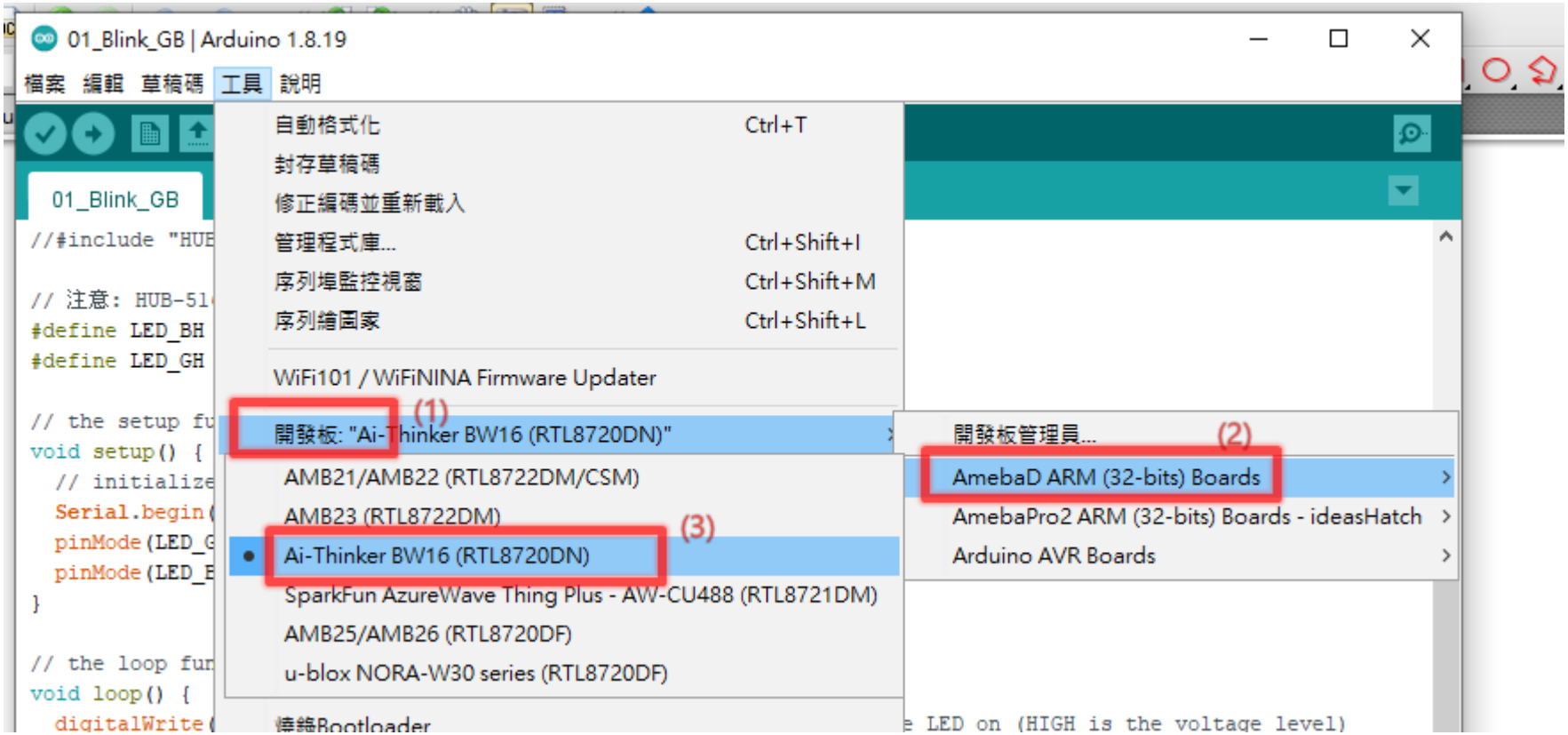
Arduino安裝說明

- 填入BW16，以下為講師安裝的版本



Arduino安裝說明

- 安裝好開發板套件後，再選擇RTL8720DN (此為realtek晶片的名稱)

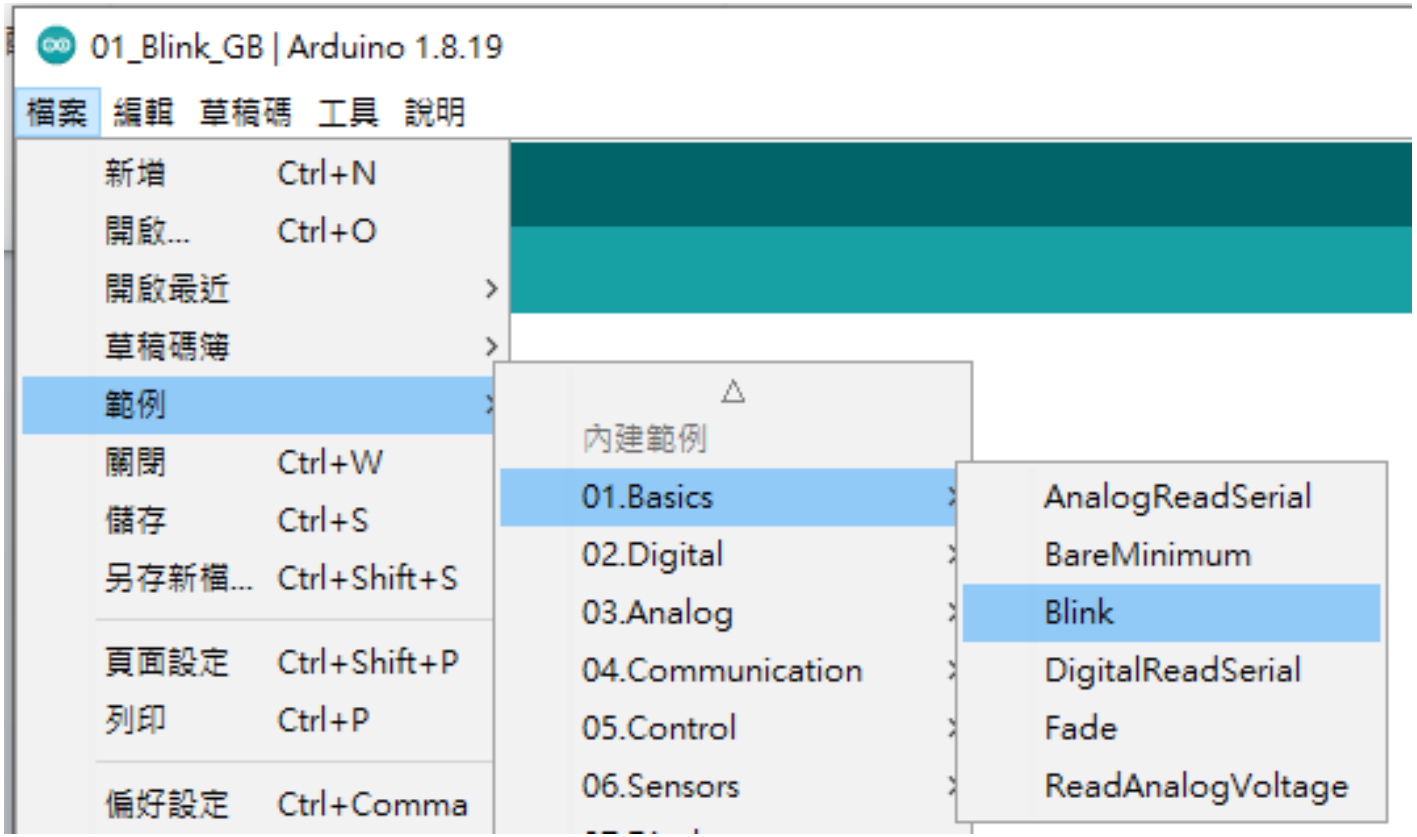


Arduino安裝說明

- 此為講師的設定值
- 這一片模組有支援auto upload模式

Arduino安裝說明

- 環境設定完成後，先載入第一個Arduino的demo程式，用Led說Hello



測試範例: Blink

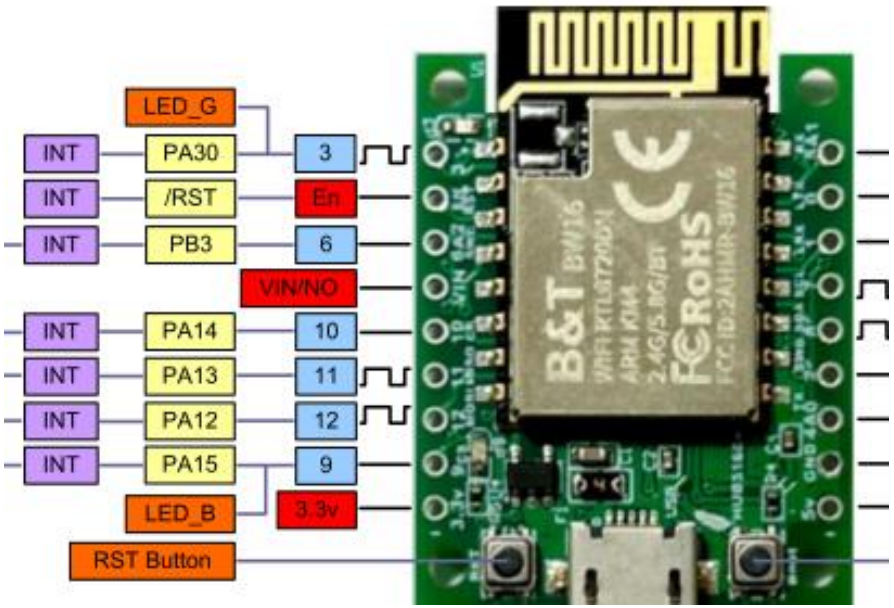
- 燒錄測試最基本的程式!你會發現…

測試範例: Blink

- 失敗…沒有Led在閃爍!!

測試範例: Blink

- 原來!! 要看電路圖



01_Blink | Arduino 1.8.19

檔案 編輯 草稿碼 工具 說明

01_Blink

```
*/

// 注意: HUB-5168的LED要反向控制
#define LED_B 9

// the setup function runs once when you press reset or po
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  Serial.begin(115200);
  pinMode(LED_B, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_B, HIGH);   // turn the LED on (HIGH is
  delay(200);                       // wait for a second
  digitalWrite(LED_B, LOW);    // turn the LED off by maki
  delay(200);                       // wait for a second

  Serial.println("hub5168+");

}
```

測試範例: Blink

- 重新燒錄後可以看到藍色Led快閃

GPIO基本說明-練習題

Blink

測試範例: Blink

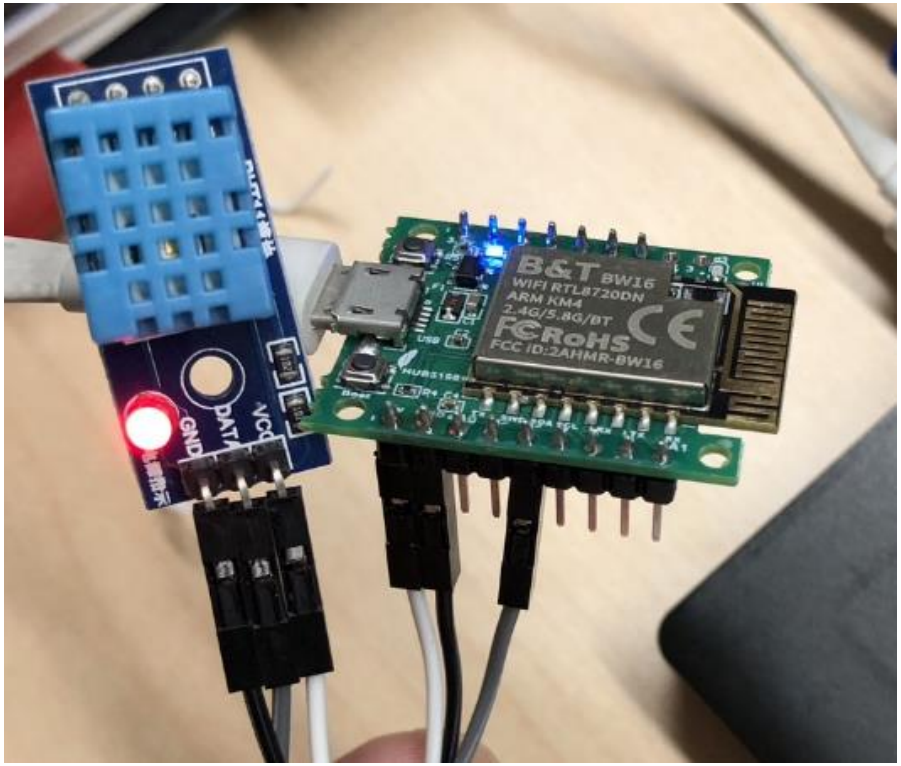
- 請修改剛剛的程式，並研究電路圖上的GPIO腳位，控制綠燈

溫度量測

DHT-11

測試範例: 02_dht11

- 接線如下圖，使用PIN8讀取DHT-11的溫溼度數值



測試範例: 02_dht11

- 打開com port可以看到溫溼度數值

```
#calibration_ok:[2:19:11]
DHTxx test!
Humidity: 40.00%  Temperature: 29.50°C 85.10°F  Heat index: 29.13°C 84.43°F
Humidity: 40.00%  Temperature: 29.40°C 84.92°F  Heat index: 29.02°C 84.24°F
Humidity: 40.00%  Temperature: 29.40°C 84.92°F  Heat index: 29.02°C 84.24°F
Humidity: 39.00%  Temperature: 29.40°C 84.92°F  Heat index: 28.92°C 84.07°F
Humidity: 39.00%  Temperature: 29.40°C 84.92°F  Heat index: 28.92°C 84.07°F
Humidity: 39.00%  Temperature: 29.40°C 84.92°F  Heat index: 28.92°C 84.07°F
Humidity: 39.00%  Temperature: 29.40°C 84.92°F  Heat index: 28.92°C 84.07°F
```

```
#calibration_ok:[2:19:11]
DHTxx test!
Humidity: 44.00%  Temperature: 26.80°C 80.24°F  Heat index: 26.91°C 80.45°F
Humidity: 43.00%  Temperature: 26.90°C 80.42°F  Heat index: 26.94°C 80.49°F
Humidity: 43.00%  Temperature: 26.90°C 80.42°F  Heat index: 26.94°C 80.49°F
Humidity: 43.00%  Temperature: 26.90°C 80.42°F  Heat index: 26.94°C 80.49°F
Humidity: 43.00%  Temperature: 26.90°C 80.42°F  Heat index: 26.94°C 80.49°F
Humidity: 43.00%  Temperature: 26.80°C 80.24°F  Heat index: 26.86°C 80.36°F
Failed to read from DHT sensor!
Failed to read from DHT sensor!
```

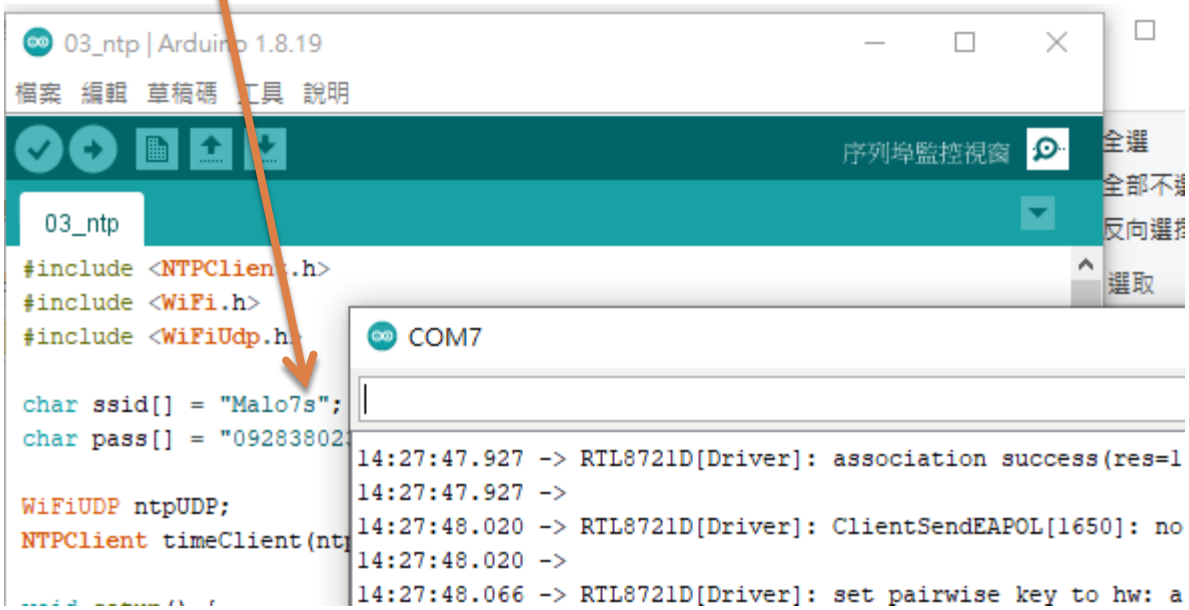
沒有插對的pin腳時

WiFi使用

NTP

測試範例: 03_ntp

- 修改ssid, pass，再燒錄



測試範例: 03_ntp

- 輸出如下，我們可以得到校時後的時間

```
#include <WiFiUdp.h>

char ssid[] = "Malo7s";
char pass[] = "09283802

WiFiUDP ntpUDP;
NTPClient timeClient(nt

void setup() {
    Serial.begin(115200

    WiFi.begin(ssid, pa

    while (WiFi.status(
        delay(500);
        Serial.print(".
    }

  timeClient.begin();
}

void loop() {
```

COM7

傳送

```
14:27:47.927 -> RTL8721D[Driver]: association success(res=1)
14:27:47.927 ->
14:27:48.020 -> RTL8721D[Driver]: ClientSendEAPOL[1650]: no use cache pmksa
14:27:48.020 ->
14:27:48.066 -> RTL8721D[Driver]: set pairwise key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4)
14:27:48.066 ->
14:27:48.066 -> RTL8721D[Driver]: set group key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4) keyid:1
14:27:48.066 ->
14:27:48.631 -> Interface 0 IP address : 172.20.10.206:27:49
14:27:50.793 -> 06:27:50
14:27:51.777 -> 06:27:51
14:27:52.766 -> 06:27:52
14:27:53.803 -> 06:27:53
14:27:54.789 -> 06:27:54
14:27:55.776 -> 06:27:55
```

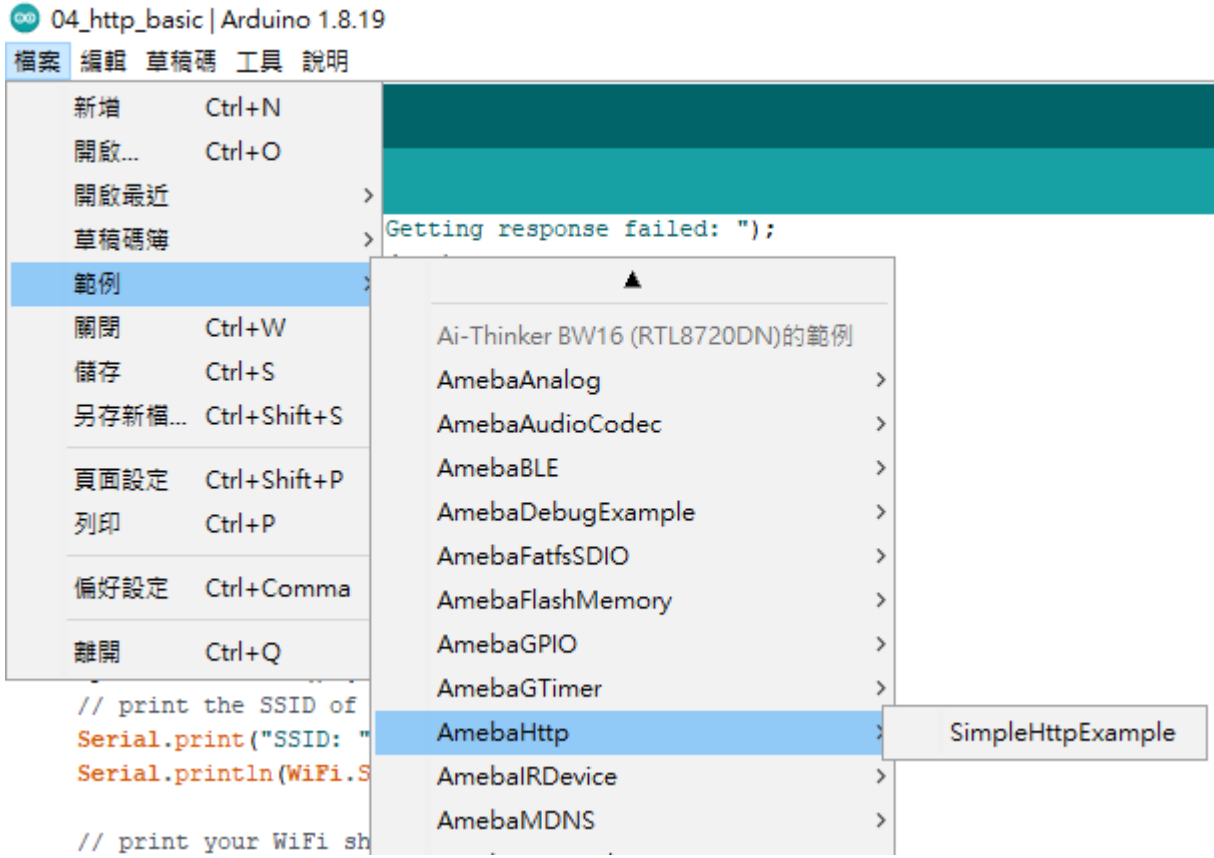
自動捲動 Show timestamp NL (newline) 115200 baud Clear output

http範例

04_http

http應用

- 打開http的範例程式



http應用

- 修改ssid, pass

```
// This example downloads the URL "http://www.amebaiot.com"

char ssid[] = "your ssid"; //  your network SSID (name)
char pass[] = "your password";    // your network password (use
int keyIndex = 0;                 // your network key Index number (r

// Name of the server we want to connect to
const char kHostname[] = "www.amebaiot.com";

const char kPath[] = "/";
// Number of milliseconds to wait without receiving any data bef
const int kNetworkTimeout = 30 * 1000;
// Number of milliseconds to wait if no data is available before
const int kNetworkDelay = 1000;
int status = WL_IDLE_STATUS;
```

http應用

- 可以看到這樣的輸出

```
RTL8721D[Driver]: set group key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4) keyid:1

Interface 0 IP address : 172.20.10.2
Connected to wifi
SSID: Malo7s
IP Address: 172.20.10.2
signal strength (RSSI):-51 dBm

[INFO]server_drv.cpp:  start_client
[INFO] Create socket successfully

[INFO] Connect to Server successfully!
startedRequest ok
Got status code: 301
Content length is: 315

Body returned follows:
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<html><head>
<title>301 Moved Permanently</title>
</head><body>
<h1>Moved Permanently</h1>
<p>The document has moved <a href="https://www.amebaiot.com/">here</a>.</p>
<hr>
<address>Apache/2.4.29 (Ubuntu) Server at www.amebaiot.com Port 80</address>
</body></html>
```

http應用

- 讓我們來解析一下輸出

```
RTL8721D[Driver]: set group key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4) keyid:1

Interface 0 IP address : 172.20.10.2
Connected to wifi
SSID: Malo7s
IP Address: 172.20.10.2
signal strength (RSSI):-51 dBm

[INFO]server_drv.cpp:  start_client
[INFO] Create socket successfully

[INFO] Connect to Server successfully!
startedRequest ok
Got status code: 301
Content length is: 315

Body returned follows:
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<html><head>
<title>301 Moved Permanently</title>
</head><body>
<h1>Moved Permanently</h1>
<p>The document has moved <a href="https://www.amebaiot.com/">here</a>.</p>
<hr>
<address>Apache/2.4.29 (Ubuntu) Server at www.amebaiot.com Port 80</address>
</body></html>
```

要怎麼上傳資料到Server?

- 讓我們來解析一下輸出

```
RTL8721D[Driver]: set group key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4) keyid:1

Interface 0 IP address : 172.20.10.2
Connected to wifi
SSID: Malo7s
IP Address: 172.20.10.2
signal strength (RSSI):-51 dBm

[INFO]server_drv.cpp:  start_client
[INFO] Create socket successfully

[INFO] Connect to Server successfully!
startedRequest ok
Got status code: 301
Content length is: 315

Body returned follows:
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<html><head>
<title>301 Moved Permanently</title>
</head><body>
<h1>Moved Permanently</h1>
<p>The document has moved <a href="https://www.amebaiot.com/">here</a>.</p>
<hr>
<address>Apache/2.4.29 (Ubuntu) Server at www.amebaiot.com Port 80</address>
</body></html>
```

要怎麼上傳資料到Server?

- 利用http get操作

```
int keyIndex = 0;            // your network key

// Name of the server we want to connect to
const char kHostname[] = "api.thingspeak.com";

char kPath[128];
float t=30.5;
float h=80;
```

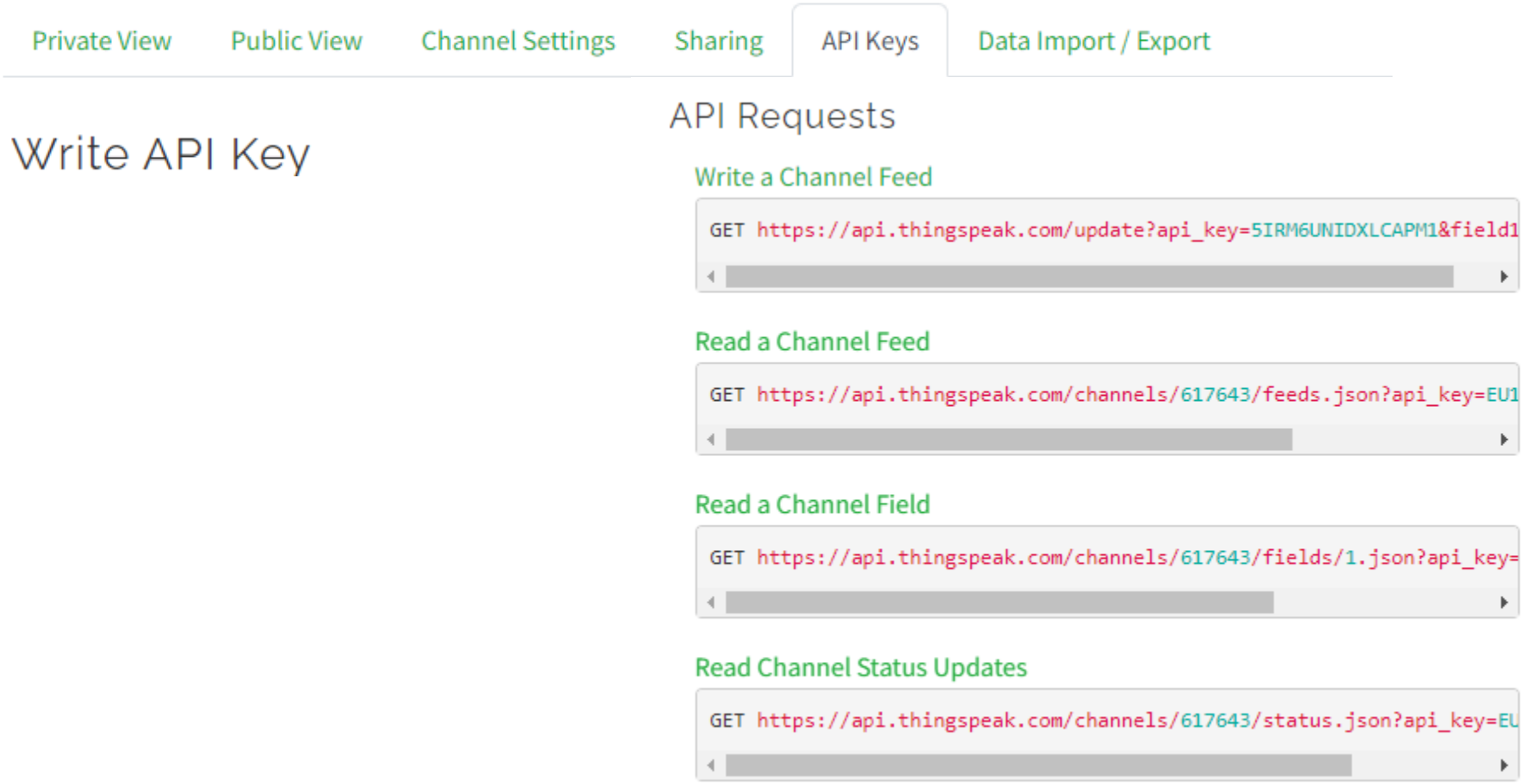
```
WiFiClient c;
HttpClient http(c);


sprintf(kPath, "/update?api_key=5IRM6UNIDXLCAPM1&field1=%.2f&field2=%.2f", t, h);
sprintf(str1, "%s%s", kHostname, kPath);
Serial.println(str1);

err = http.get(kHostname, kPath);
if (err == 0) {
```

申請ThingSpeaker平台帳號

- 先申請ThingSpeaker帳號

申請ThingSpeaker平台帳號

- 進入此分頁，右下角有許多API格式的範例



申請ThingSpeaker平台帳號

- 依照格式可以測試一下讀取功能

api.thingspeak.com/channels/617643/feeds.json?api_key=EU1JSB28NB8MMM2M&results=2


```
{
  "channel": {
    "id": 617643,
    "name": "test",
    "latitude": "0.0",
    "longitude": "0.0",
    "field1": "溫度",
    "field2": "濕度",
    "created_at": "2018-11-03T04:09:10Z",
    "updated_at": "2023-10-20T03:47:27Z",
    "last_entry_id": 281
  },
  "feeds": [
    {
      "created_at": "2023-10-20T03:51:49Z",
      "entry_id": 280,
      "field1": "25",
      "field2": "50"
    },
    {
      "created_at": "2023-10-20T03:52:14Z",
      "entry_id": 281,
      "field1": "28",
      "field2": "81"
    }
  ]
}
```

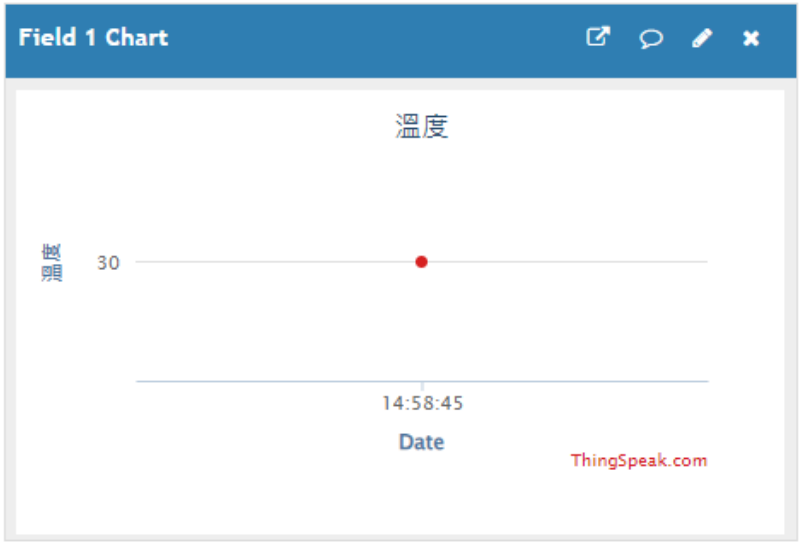
申請ThingSpeaker平台帳號

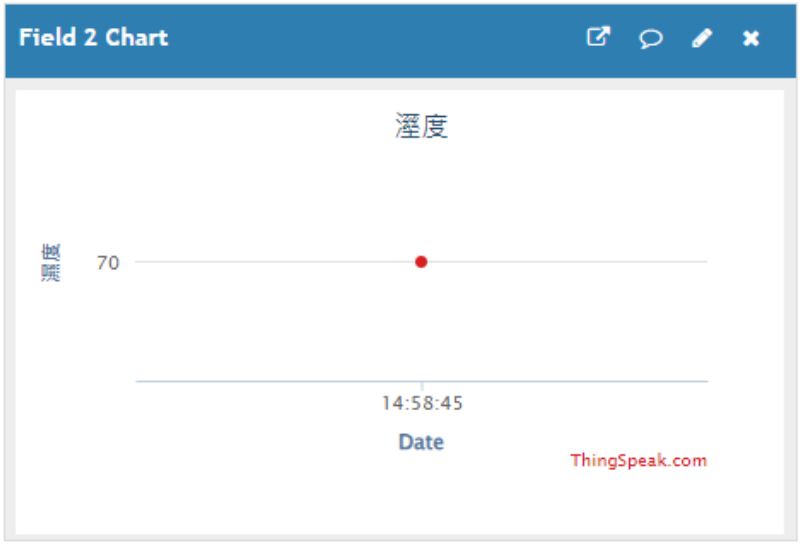
- 接著測試一下上傳資料的功能
- 以我的API來說，長這個樣子
- https://api.thingspeak.com/update?api_key=5IRM6UNIDXLCAPM1&field1=30&field2=70

申請ThingSpeaker平台帳號

- 我們可以得到這樣的視覺化效果

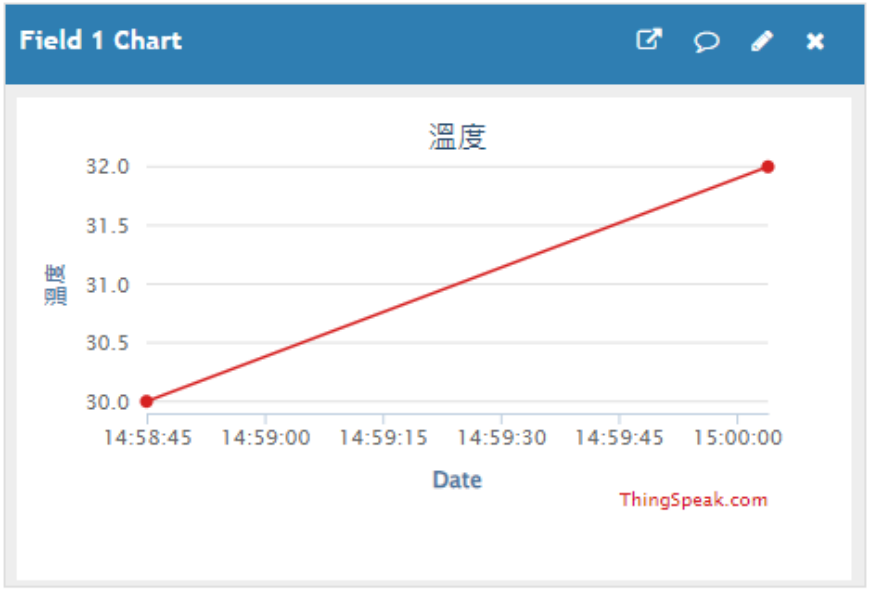
Created: 5 years ago
Last entry: less than a minute ago
Entries: 282

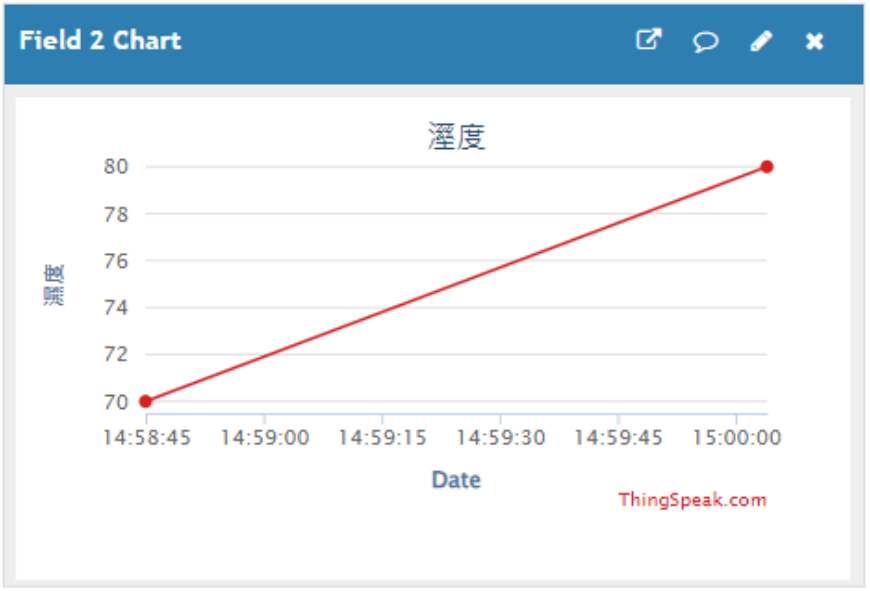




申請ThingSpeaker平台帳號

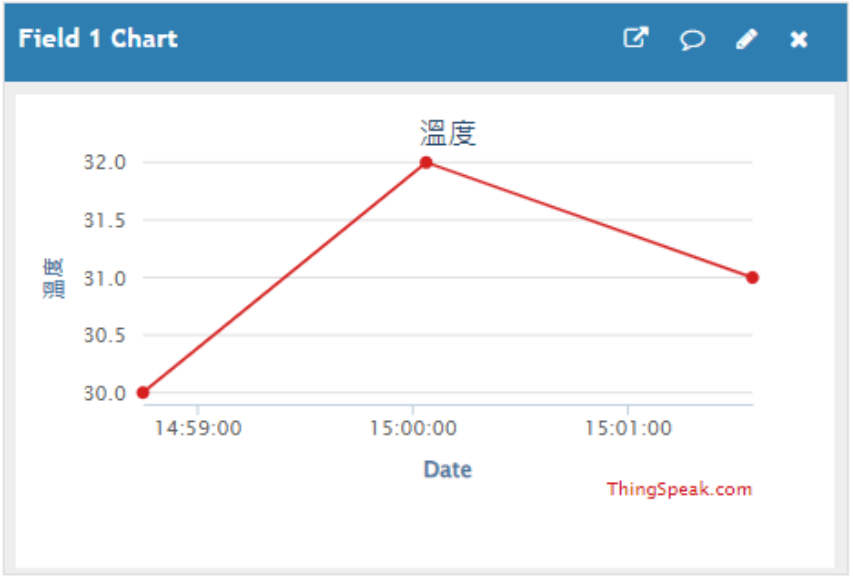
- 但是https對我們來說不好使用，所以調整成:(http://api.thingspeak.com/update?api_key=5IRM6UNIDXLCAPM1&field1=30&field2=70)

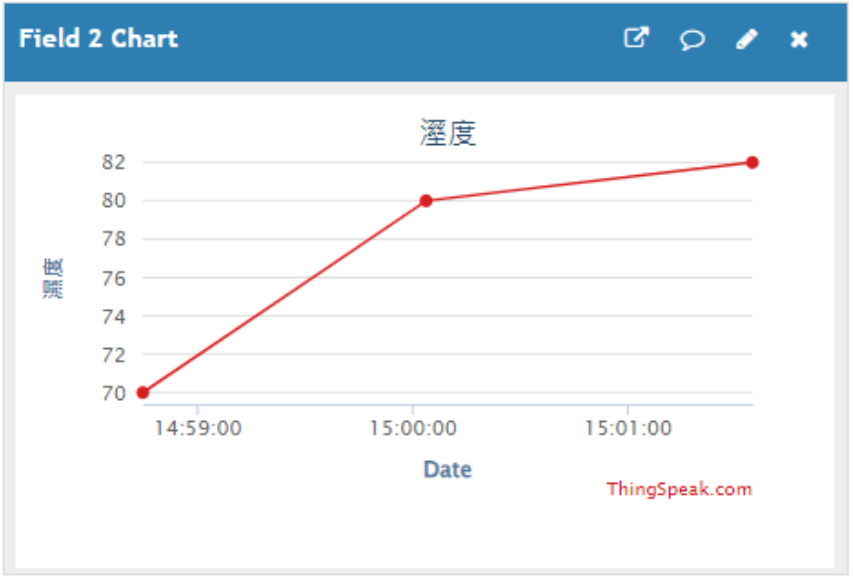




申請ThingSpeaker平台帳號

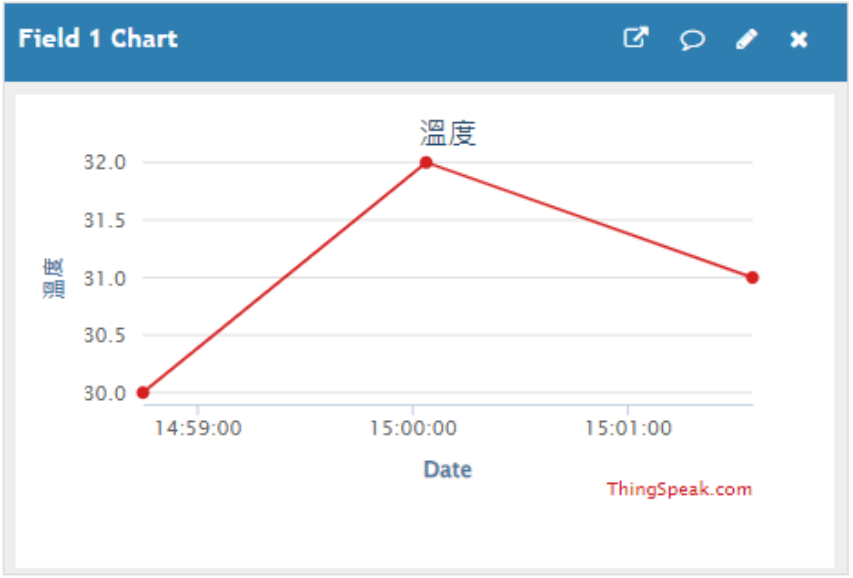
- 再接著試試看:(http://api.thingspeak.com/update?api_key=5IRM6UNIDXLCAPM1&field1=31&field2=82)

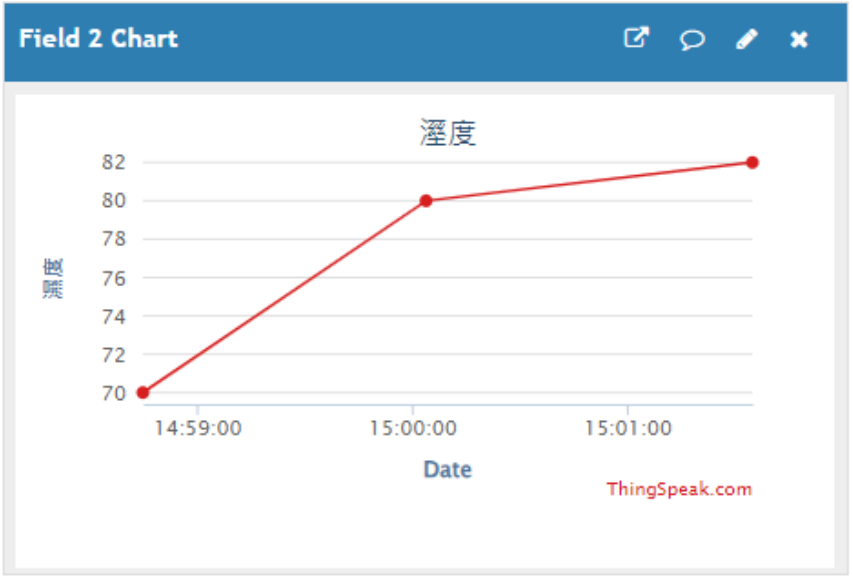




整合ThingSpeaker和DHT11

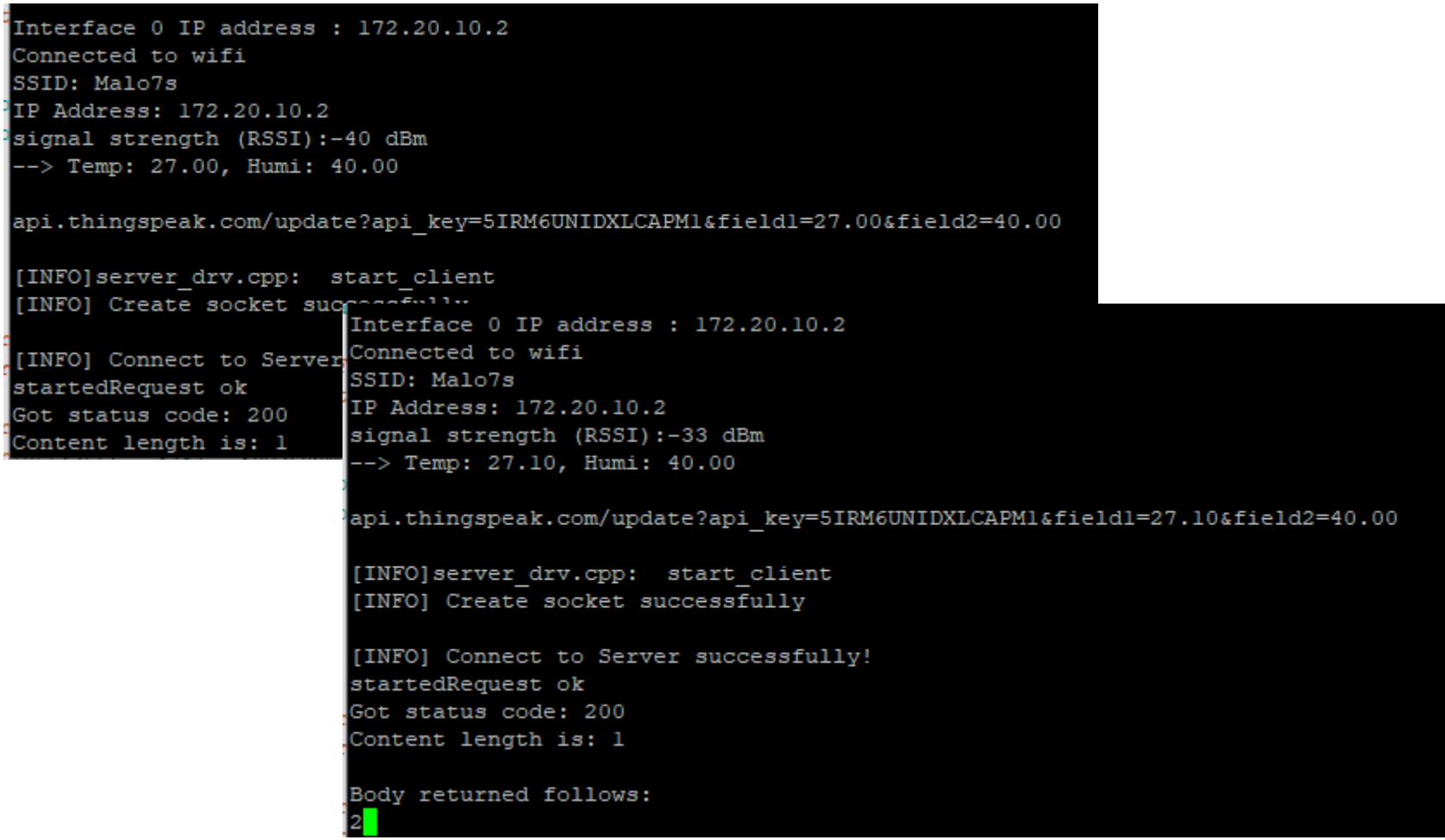
- 以此類推，我們先把http的程式改成可以上傳溫溼度資訊





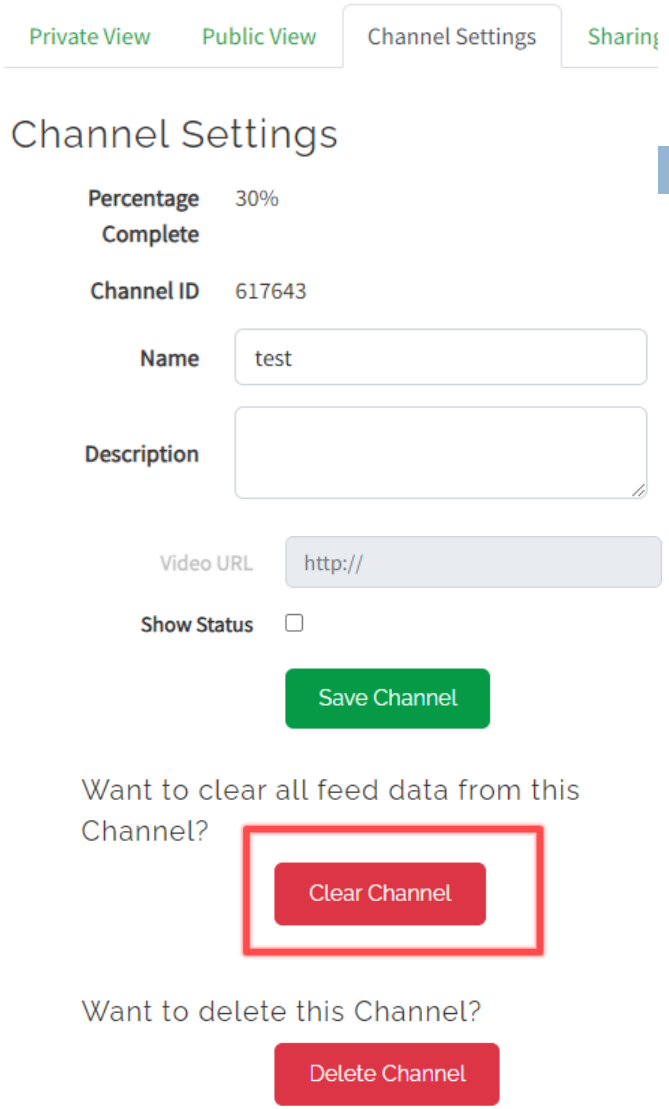
整合ThingSpeaker和DHT11

- 上傳DHT11的資料到ThingSpeaker!



整合ThingSpeaker和I

- 測試前可以先清空原先的測試資料
- 清空的頁面如右圖，在Chanel Settings中



W02: 進階應用

NeoPixel / WS2812B

ws2812B

NeoPixel (WS2812B)

- API手冊參考(link)

NeoPixel (WS2812B)

- WS2812B class
- fill(index, r, g, b)
- setPixelColor(r, g, b, index, num)
- show()

測試範例05:

- 05_NP_01.ino: RGB顏色切換

測試範例05:

- 05_NP_02.ino : 呼吸燈

測試範例05:

- 請試著改寫程式，切換不同的顏色閃動呼吸燈
- 請利用目前學到的應用，配合燈罩設計專屬於你的氣氛燈

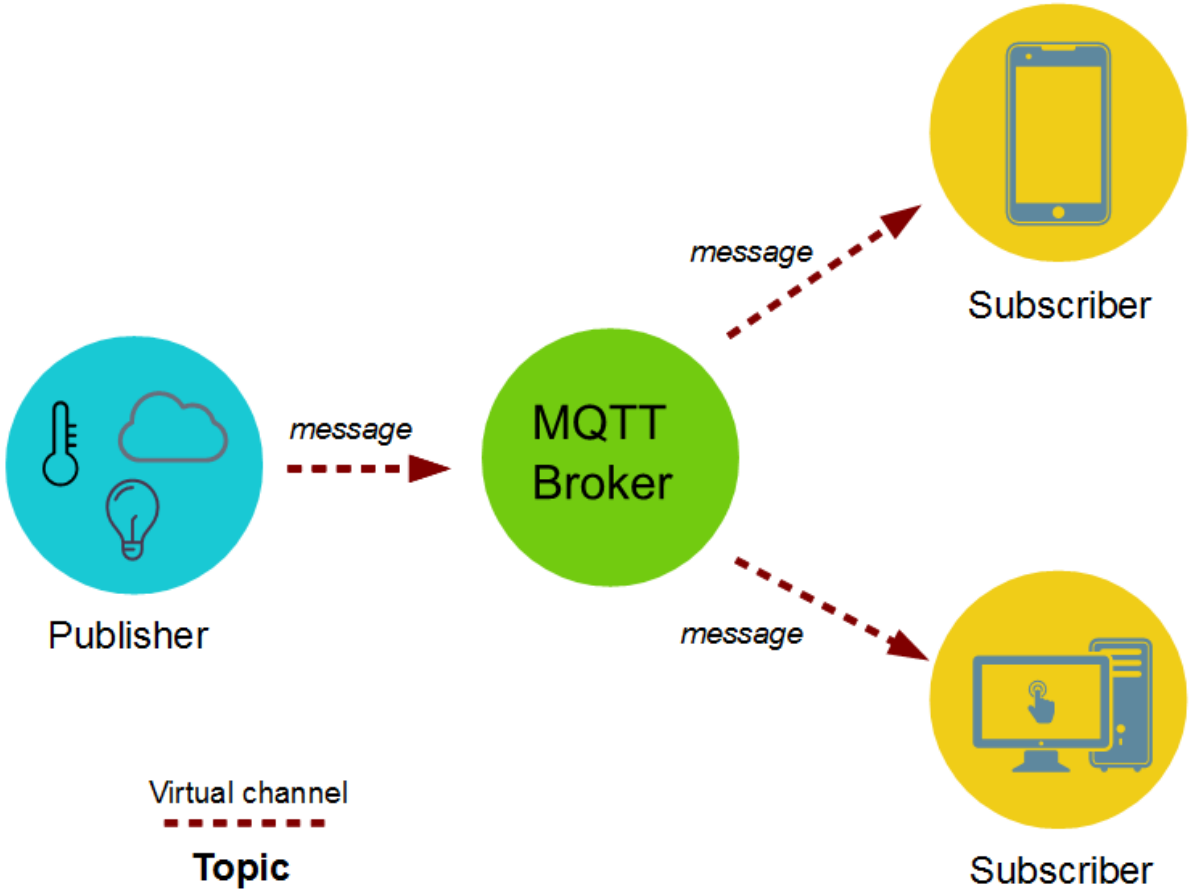
原廠範例

- 05_WS2812B_Basics
- 05_WS2812B_Patterns

MQTT

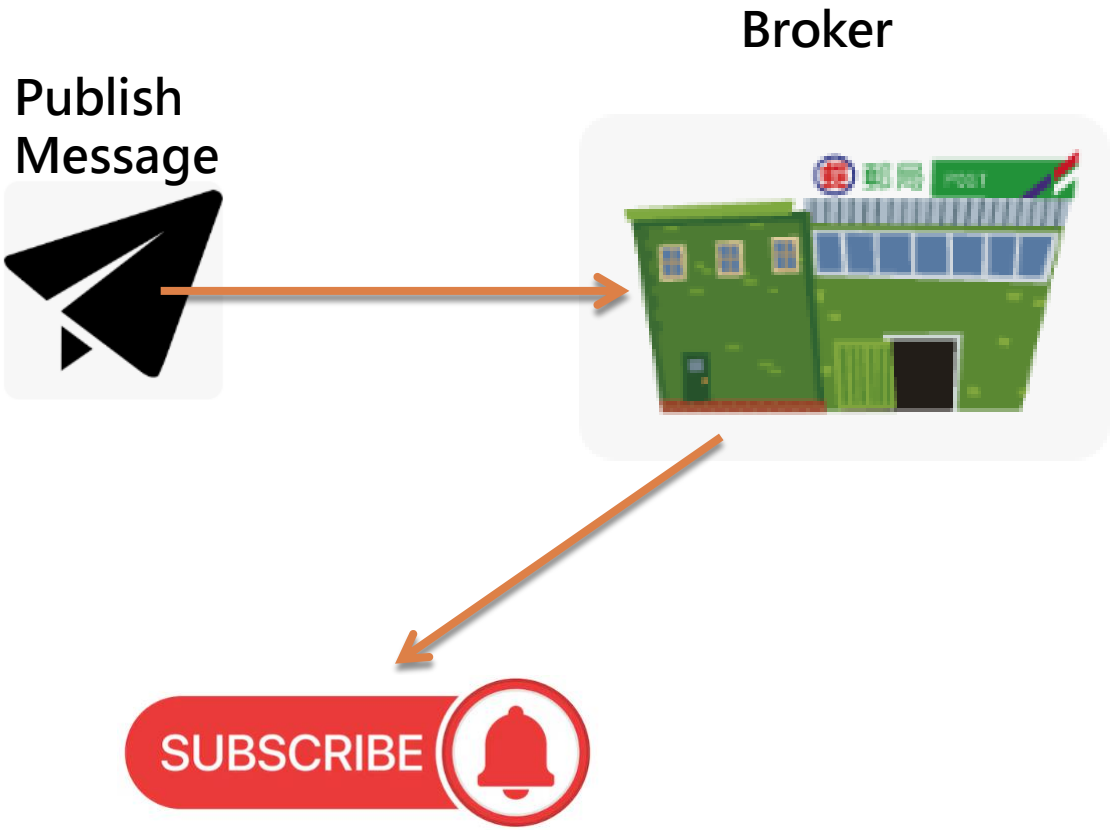
MQTT入門

- 一種輕量化的物聯網協定



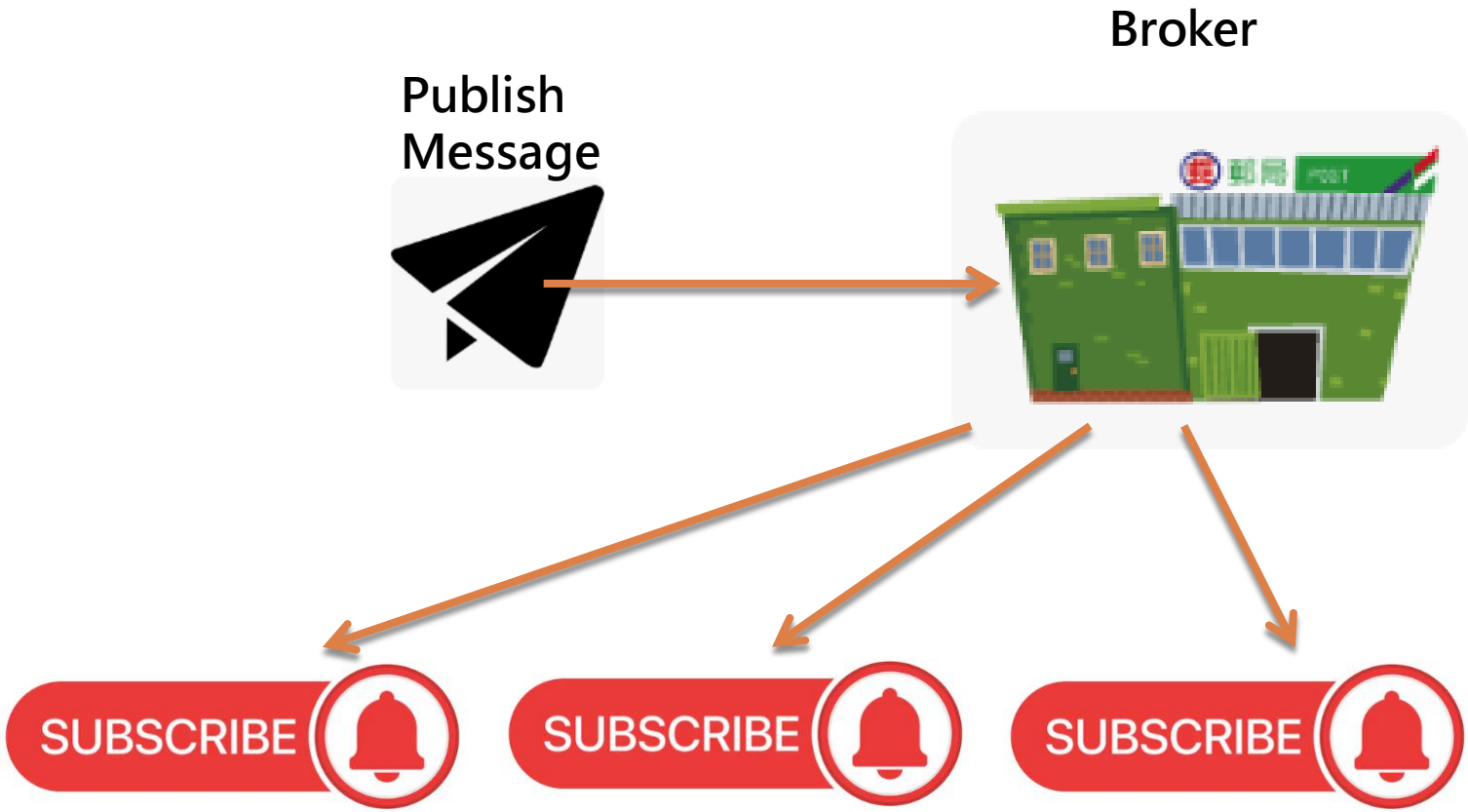
MQTT入門

- 有點像郵局



MQTT入門

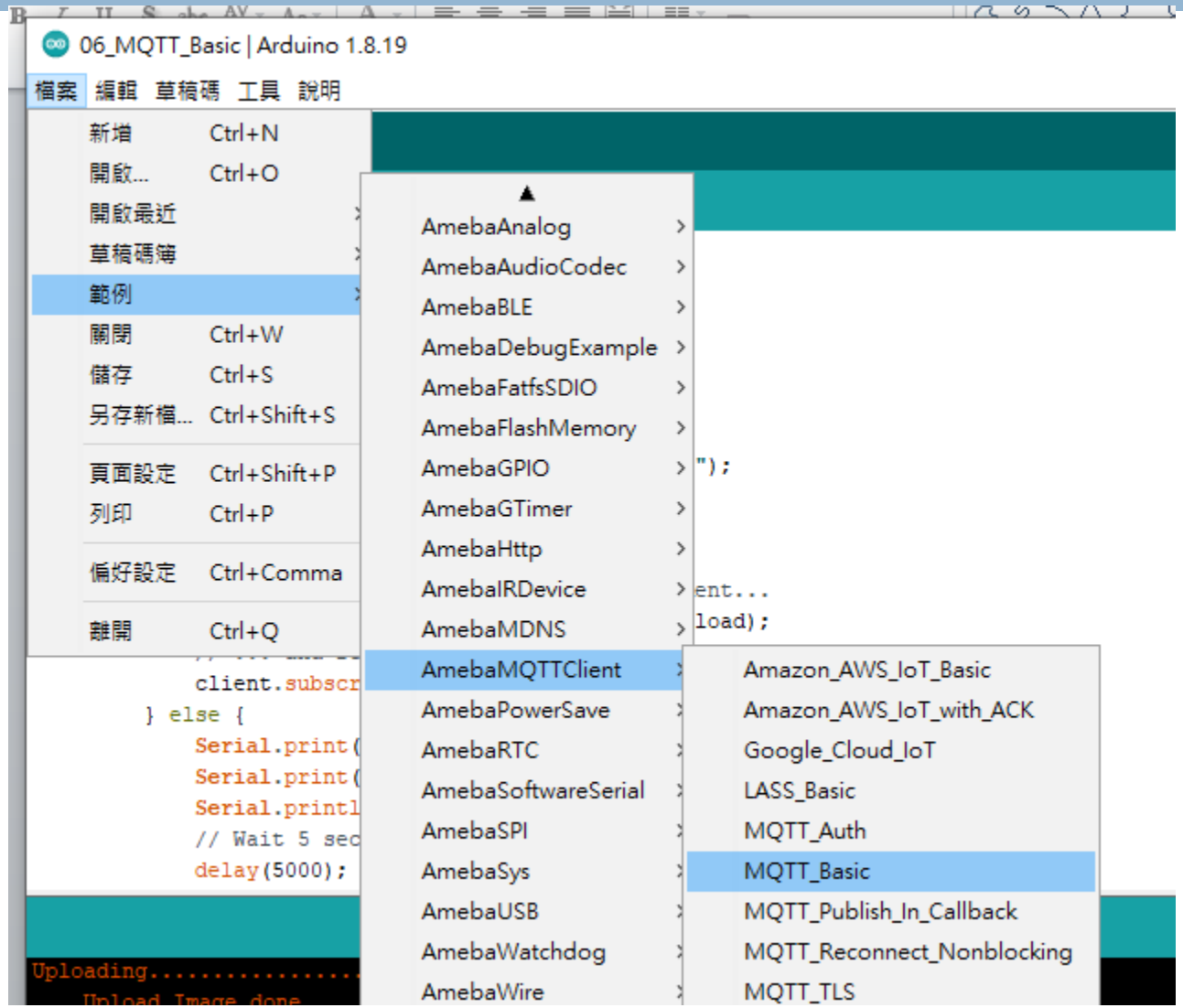
- 但因為是資訊流，同時會有很多接收者



MQTT介紹

- NodeRED工具介紹:
  - 【NodeRED_00_安裝設定】
  - 【NodeRED_01_基礎操作及MQTT】

MQTT基礎範例


06_MQTT_Basic | Arduino 1.8.19
檔案 編輯 草稿碼 工具 說明
新增 Ctrl+N
開啟... Ctrl+O
開啟最近
草稿碼簿
範例
關閉 Ctrl+W
儲存 Ctrl+S
另存新檔... Ctrl+Shift+S
頁面設定 Ctrl+Shift+P
列印 Ctrl+P
偏好設定 Ctrl+Comma
離開 Ctrl+Q
AmebaAnalog
AmebaAudioCodec
AmebaBLE
AmebaDebugExample
AmebaFatfsSDIO
AmebaFlashMemory
AmebaGPIO
AmebaGTimer
AmebaHttp
AmebaIRDevice
AmebaMDNS
AmebaMQTTClient
AmebaPowerSave
AmebaRTC
AmebaSoftwareSerial
AmebaSPI
AmebaSys
AmebaUSB
AmebaWatchdog
AmebaWire
Amazon_AWS_IoT_Basic
Amazon_AWS_IoT_with_ACK
Google_Cloud_IoT
LASS_Basic
MQTT_Auth
MQTT_Basic
MQTT_Publish_In_Callback
MQTT_Reconnect_Nonblocking
MQTT_TLS
");
ent...
load);
client.subscr
} else {
Serial.print(
Serial.print(
Serial.println
// Wait 5 sec
delay(5000);
Uploading.....

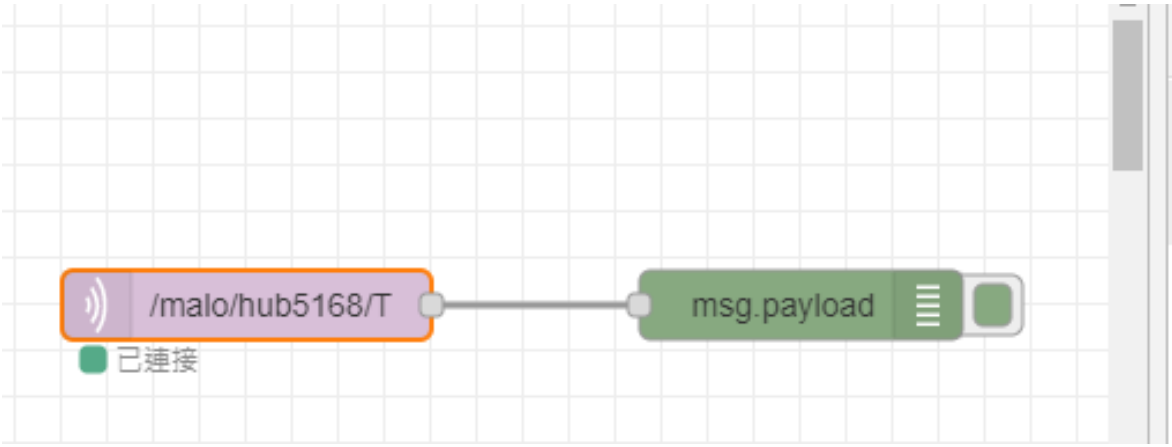
MQTT基礎範例

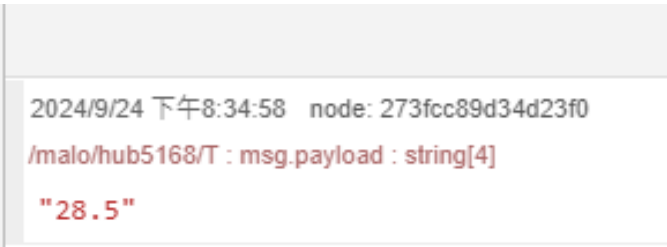
- 修改ssid, pass, topic, mqttServer
- 再進行燒錄

```
24
25 char mqttServer[]     = "broker.hivemq.com";
26 char clientId[]       = "amebaClient_malo_test";
27 char publishTopic[]   = "/malo/hub5168/T";
28 char publishPayload[] = "28.5";
29 char subscribeTopic[] = "inTopic";
30
31 void callback(char* topic, byte* payload, unsigned int length) {
```

MQTT基礎範例

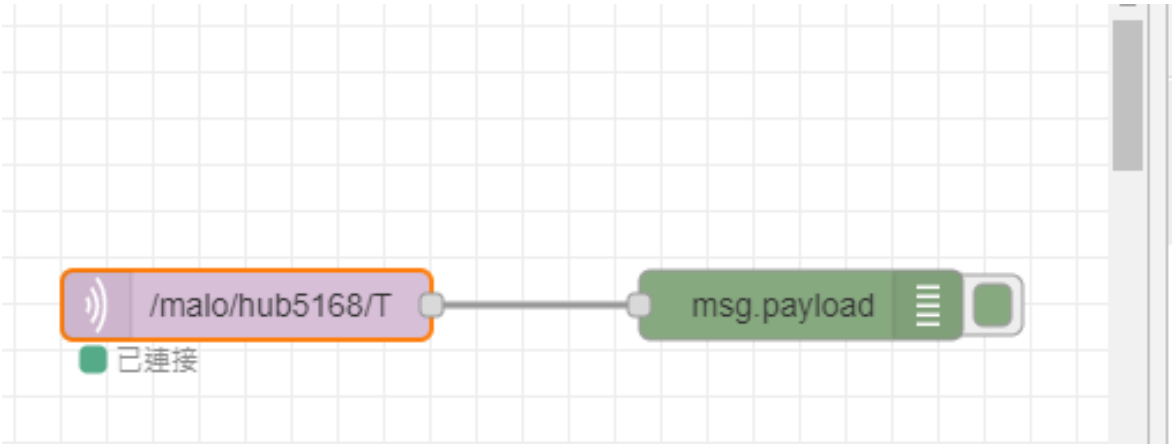
- NodeRED程式測試是否收到資料





MQTT基礎範例

- 進一步把資料視覺化



W03：Robot應用教學

Servo Motor

(09_sg90)

BLE控制

(BLEV7RC_BW16_LED)

BLE遙控燈號

- 可以參考的資料：
  https://www.amebaiot.com/zh/amebad-arduino-ble-v7rc/

BLE遙控燈號

- 手機先安裝V7RC的APP

Google Play
https://play.google.com › store › apps › details › id=com...

V7RC - Google Play 應用程式

這個APP是專門提供給市面上一般遙控車或是科普教育用途的APP, 透過它可以跟嵐奕科技的智能控制板進行連結，讓你的APP就可以控制你的愛車。 這個APP提供可以了兩個Channel與 ...

Apple
https://apps.apple.com › app › v7rc

在App Store 上的「V7RC」

2024年8月30日 — 簡介. 這個APP是專門提供給市面上一般遙控車或是科普教育用途的APP, 透過它可以跟嵐奕科技的智能控制板或是micro:bit教育板(需要使用Make Code編譯與安裝 ...

4.4 ★★★★½ (9) · 免費 · iOS

BLE遙控燈號

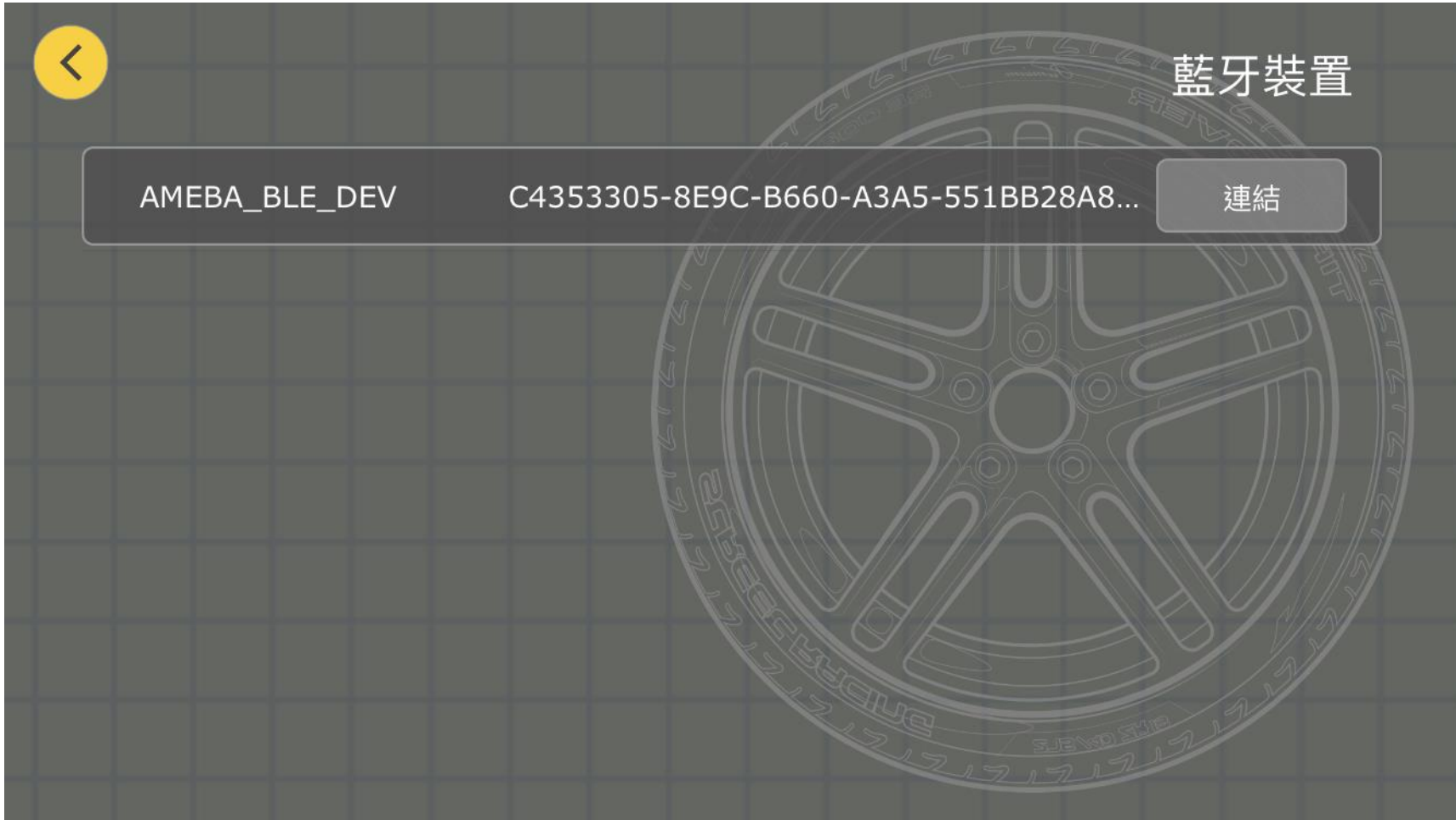
- 開啟APP

BLE遙控燈號

- 開啟APP

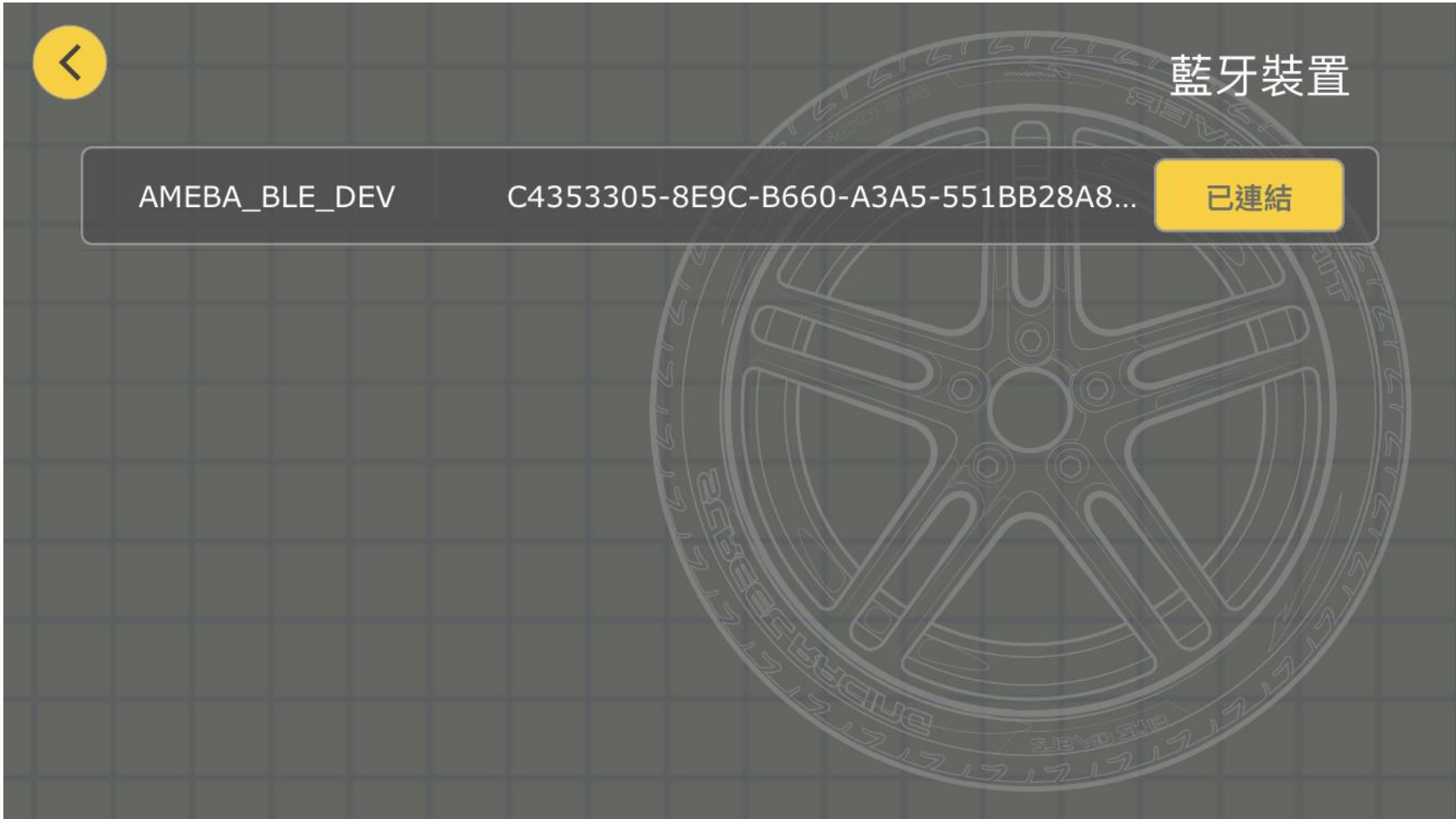
BLE遙控燈號

- 開啟APP



BLE遙控燈號

- 開啟APP



BLE遙控燈號

- 開啟APP

BLE遙控燈號

- 開啟APP

BLE遙控燈號

- 開啟APP

BLE遙控燈號

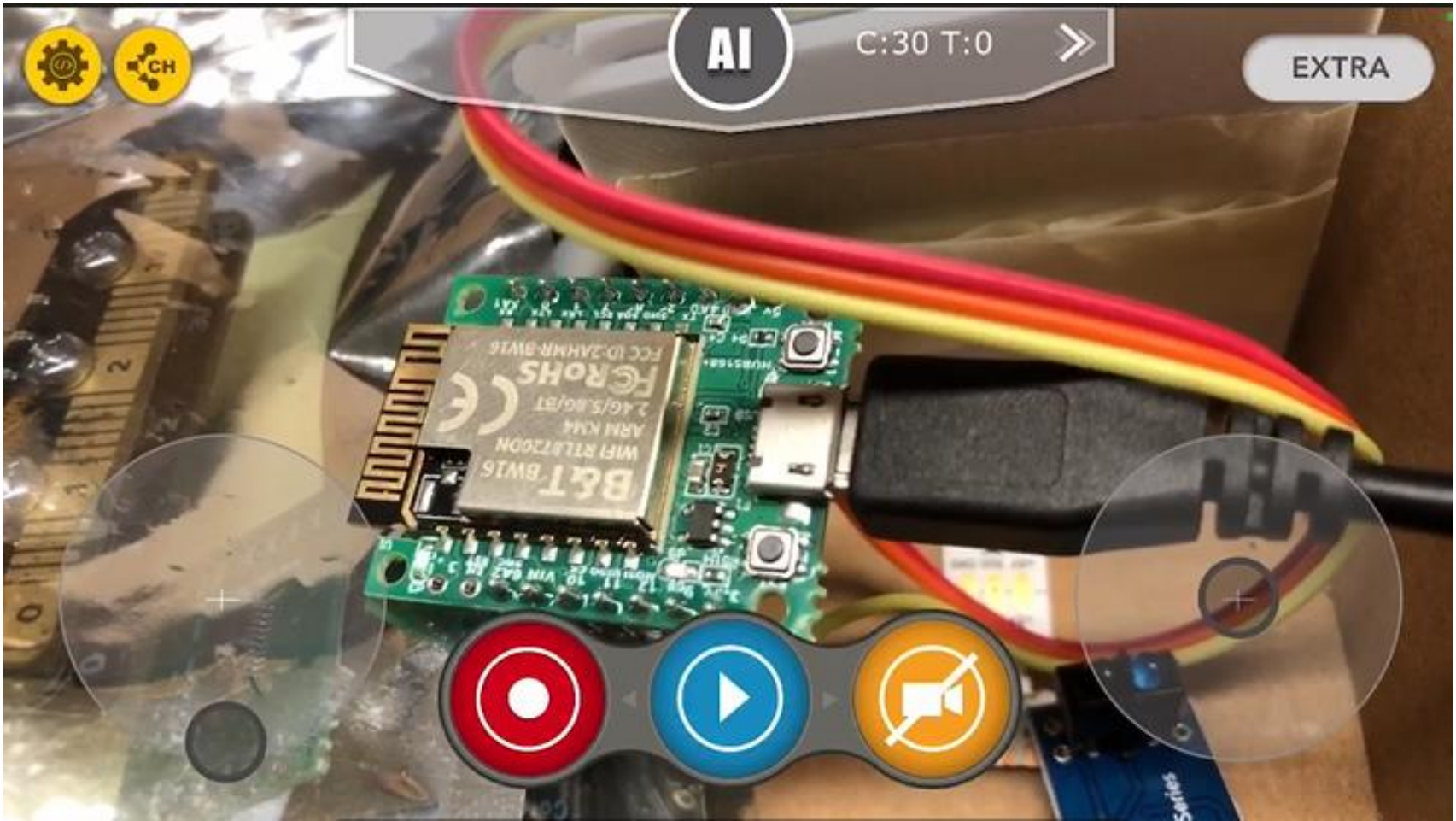
- 開啟APP

BLE遙控燈號

- 開啟APP

BLE遙控燈號

- 開啟APP



BLE遙控燈號

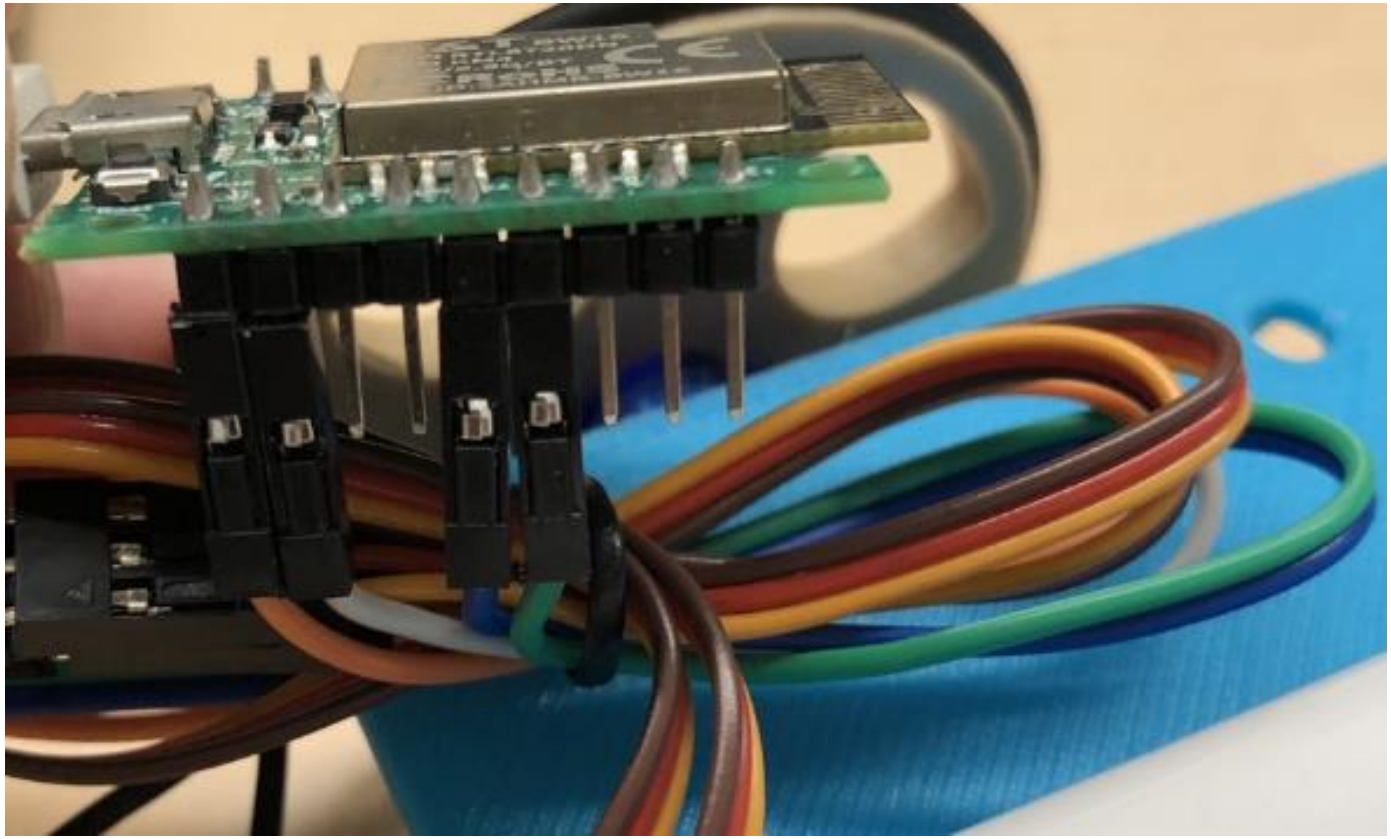
- 觀察一下退後的燈號
- 再使用【BLEV7RC_BW16_LED_02】程式比較看看
- 說明一下觀察到什麼情形

BLE控制進階

BLEV7RC_BW16_CAR_01

遙控車製作

- 接線



BLE遙控燈號

- 編譯問題

```
physical efuse: has data hci_tp_phy_efuse[1]= 9e

hci_tp_phy_efuse[0]=0,
bt_iqk_dump:    DUMP,
the IQK_xx  data is 0xf7,
the IQK_yy  data is 0x1,
the QDAC  data is 0x20,
the IDAC  data is 0x24,
hci_read_rom_check: rom_version 0x0002, bt_hci_chip_id 0x0003
BT ADDRESS: 94:c9:60:38:27:b2

 WRITE  physical FLATK=tx_flatk=fff

hci_tp_config:BT INIT success 7
Start upperStack
[BLE Device] Local BT addr: 94:c9:60:38:27:b2
[BLE Device] GAP adv start
[BLE Device] GAP adv stopped: because connection created
[BLE Device] BT Connected

[vApplicationStackOverflowHook] STACK OVERFLOW - TaskName(BLE_Perip)
```