Acsip LoRaWAN (S76S) Training Course

An IoT Solution Company

2017/11/

Agenda

- Gemtek Gateway Setup
- Mosquitto Setup
- NodeRed Setup
- SmartBlocks Introduction
- How Smart
- LoRaWAN Architecture
- S76S Setup
- Sensor Board Firmware
- Q & A

範例系統及軟體版本規格

PC OS:Windows 7 x64

Node-Red:v9.0.0 x64

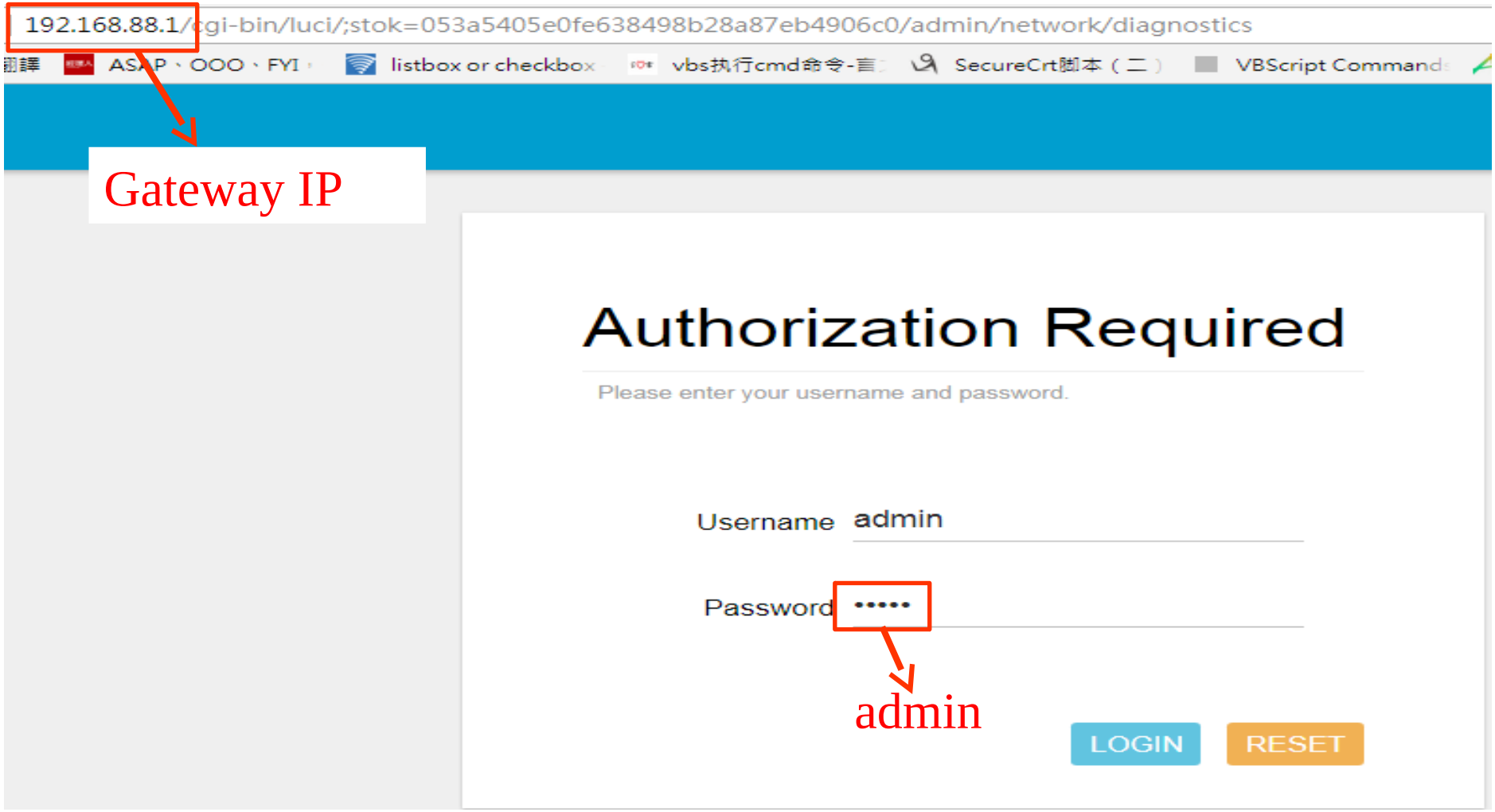
Arduino:1.6.11 x32

Sensor Board FW:1.1.4

Mosquitto:1.4.14 x32

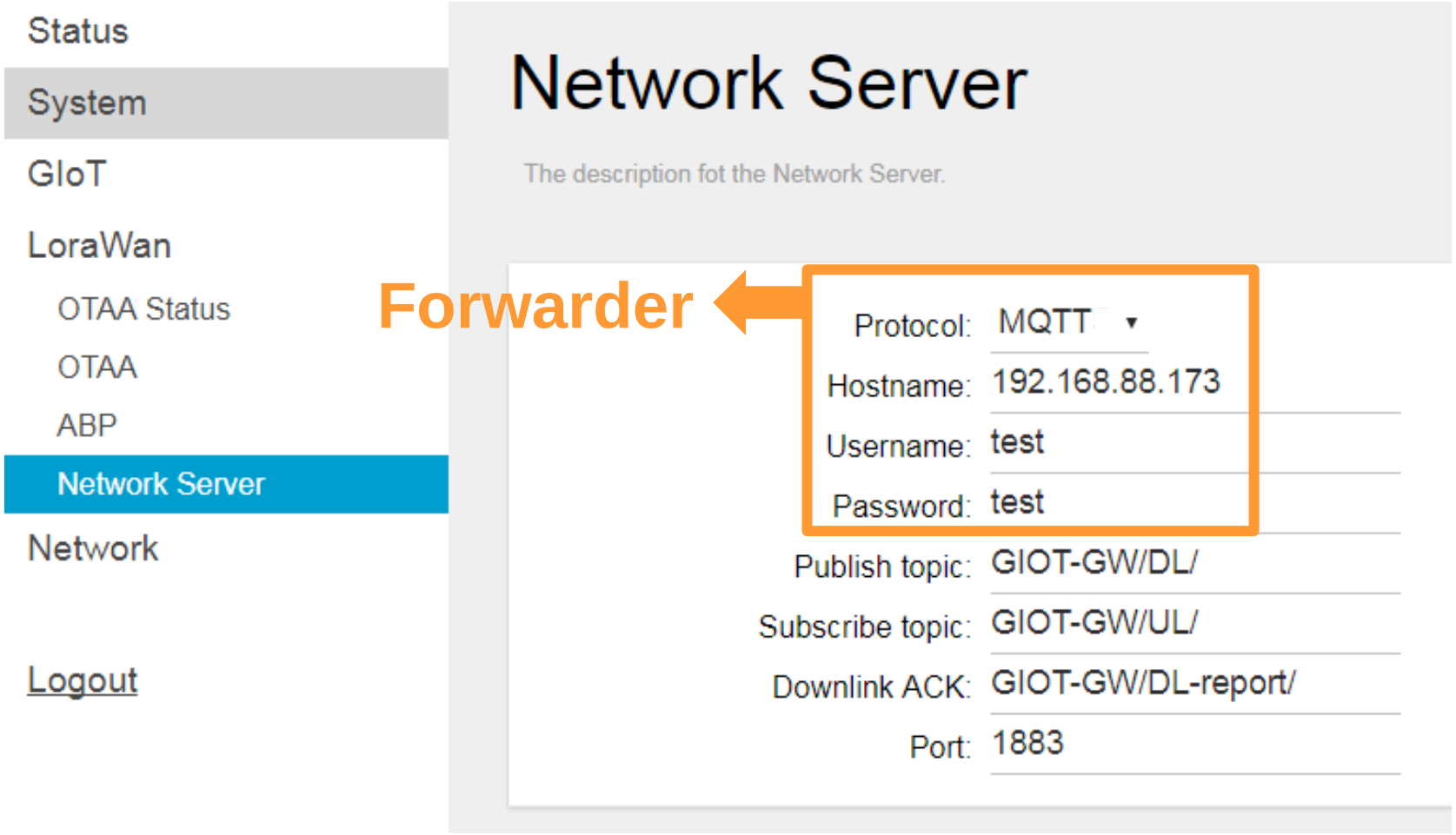
Gemtek Gateway Setup

Login : 192.168.88.1



Gemtek Gateway Setup

Network Server :



Mosquitto Setup

Install Mosquitto :

- **Download pthreads-w32-2-9-1-release.zip**

ftp://sourceware.org/pub/pthreads-win32

built\2\dll\x86\pthreadVCE2.dll

- **Download Win32 OpenSSL v1.0.2k Light**

  Insatll Win32 OpenSSL

  Copy libeay32.dll & ssleay32.dll

https://slproweb.com/products/Win32OpenSSL.html

Mosquitto Setup

Install Mosquitto :

- **Download and Install** :

  mosquitto-1.4.11-install-win32.exe

  https://mosquitto.org/download/

- **Copy** libeay32.dll & ssleay32.dll & pthreadVC2.dll & pthreadVCE2.dll to c:\ mosquitto

Mosquitto Setup

Mosquitto .Conf Setup :

```
# ================================================================
# Default listener
# ================================================================

# IP address/hostname to bind the default listener to. If not
# given, the default listener will not be bound to a specific
# address and so will be accessible to all network interfaces.
# bind_address ip-address/host name
bind_address 192.168.88.173
# Port to use for the default listener.
port 1883
```

Mosquitto Setup

Start Mosquitto :

C:\mosquitto>**mosquitto --help**
mosquitto version 1.4.11 (build date 20/02/2017 23:24:29.40)

mosquitto is an MQTT v3.1.1/v3.1 broker.

Usage: mosquitto [-c config_file] [-d] [-h] [-p port]

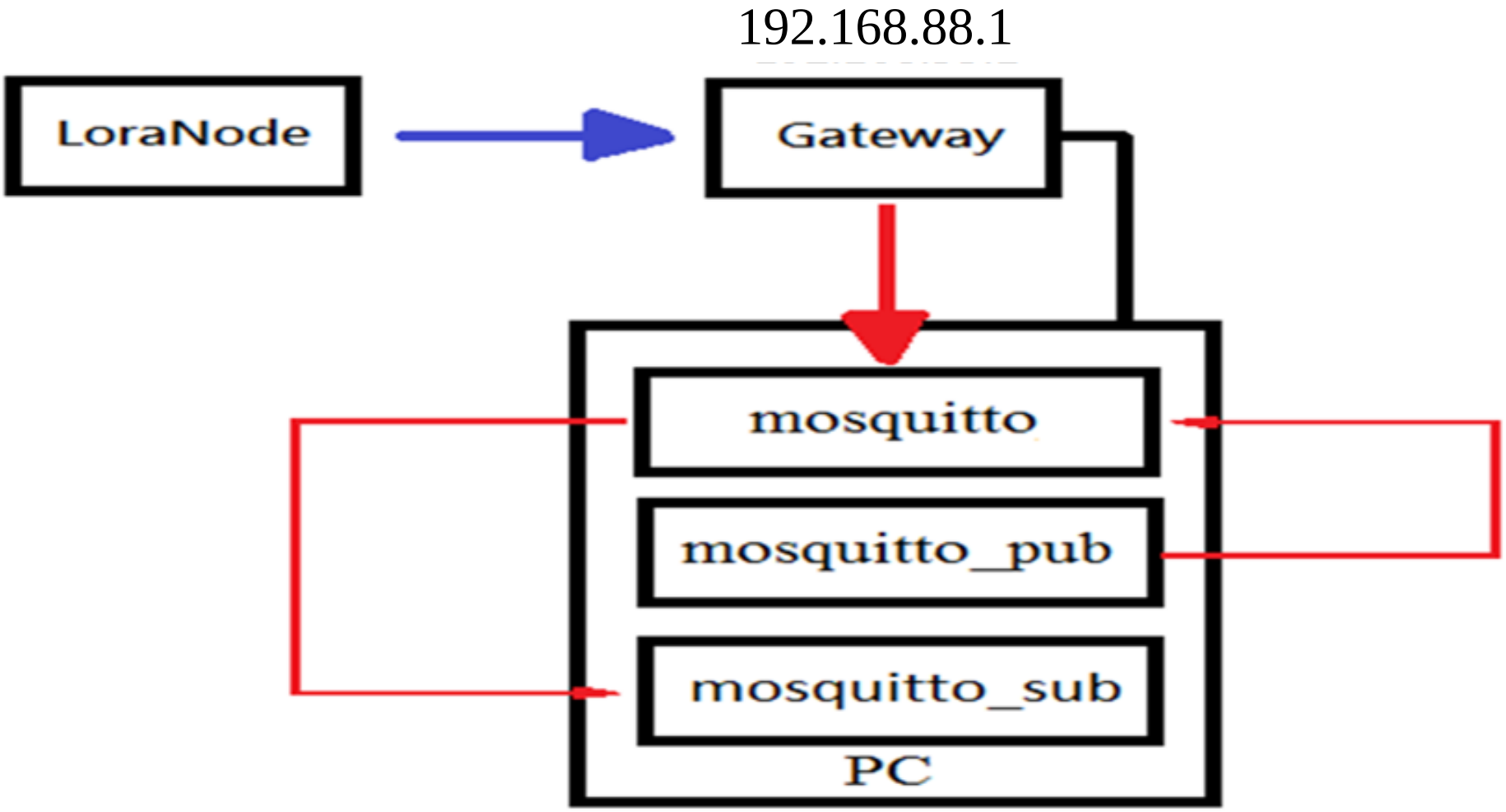
-c : specify the broker config file.
-d : put the broker into the background after starting.
-h : display this help.
-p : start the broker listening on the specified port.
Not recommended in conjunction with the -c option.
-v : verbose mode - enable all logging types. This overrides
any logging options given in the config file.

See http://mosquitto.org/ for more information.

C:\mosquitto>**mosquitto**

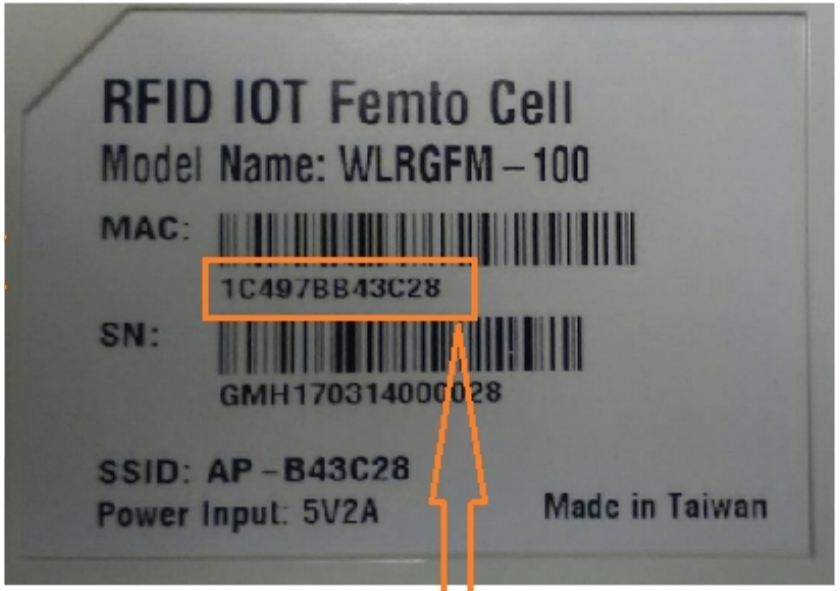
Mosquitto Setup

Data Workflow :



Mosquitto Subscriber

Uplink (UL) Command :

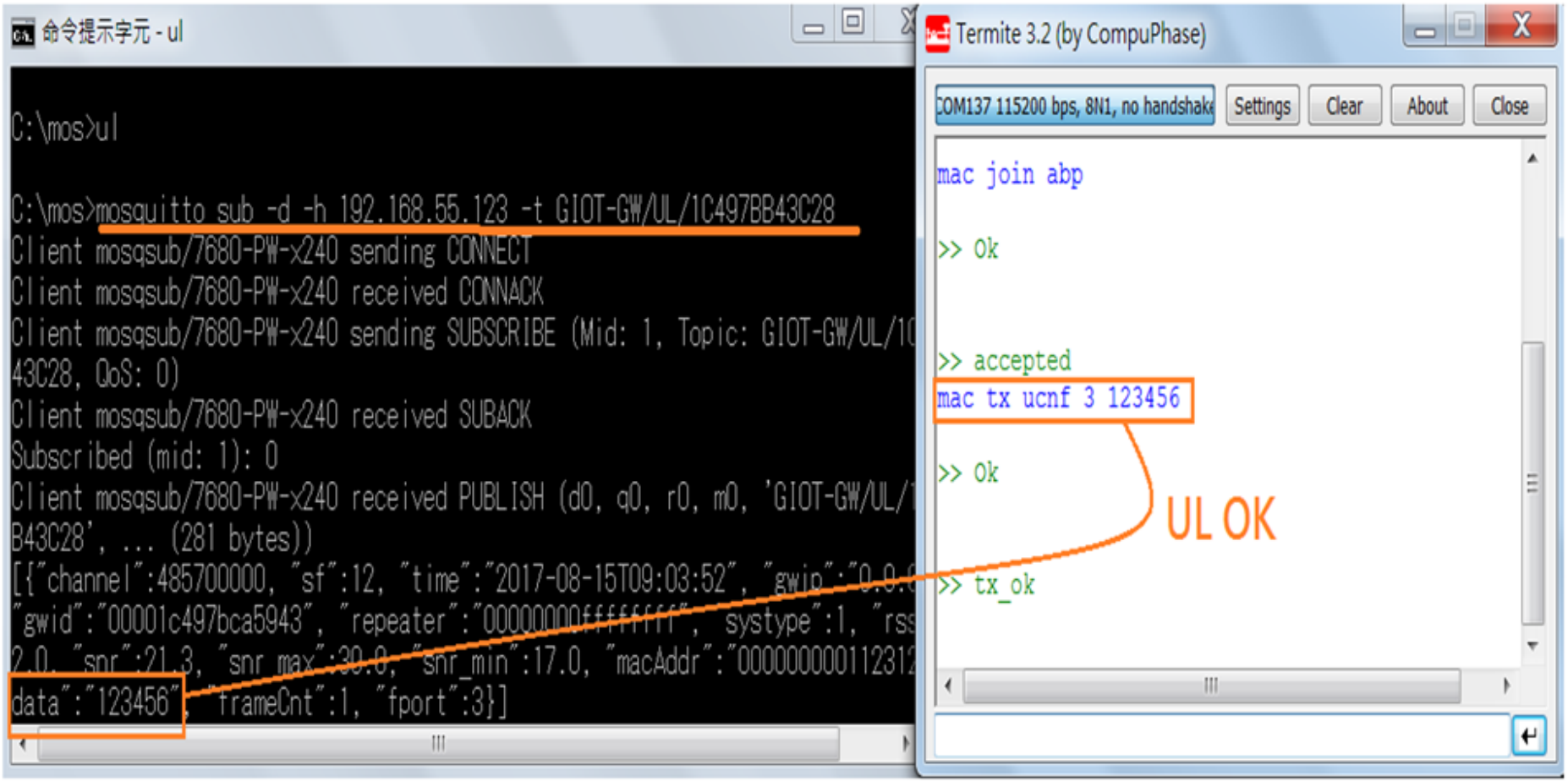


mosquitto_sub -d -h 192.168.55.123 -t GIOT-GW/UL/1C497BB43C28

PC DHCP Address

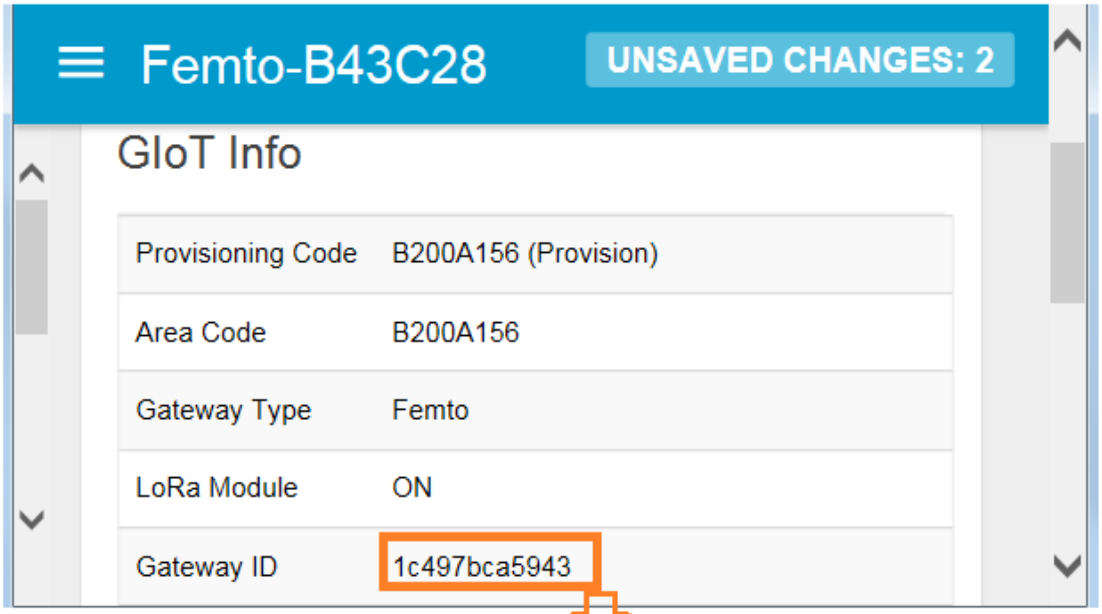
Mosquitto Subscriber

Uplink (UL) Done :



Mosquitto Publisher

Downlink (DL) Command :

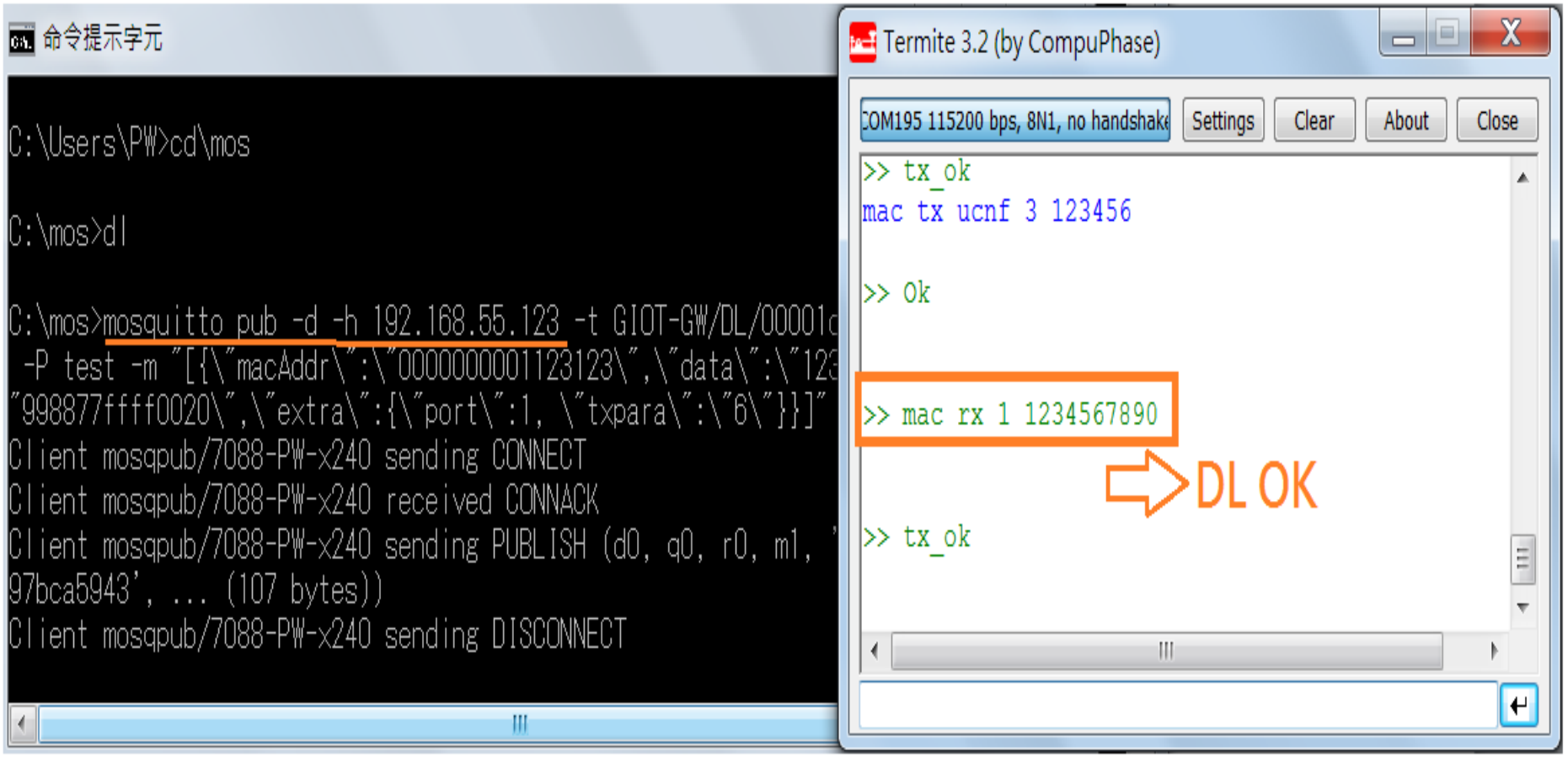


mosquitto_pub -d -h 192.168.55.123 -t GIOT-GW/DL/00001c497bca5943 -u test -P test -m "[{\"macAddr\":\"0000000001123123\",\"data\":\"1234567890\",\"id\":\"998877ffff0020\",\"extra\":{\"port\":1, \"txpara\":\"6\"}}]"

DevAddr

Mosquitto Publisher

Downlink (DL) Done :



Node-Red Setup

NodeRed Setup : Install

Install node.js

We recommend the use of node.js LTS 6.x or 6.x . Node-RED no longer supports node.js 0.10.x or 0.12.x.

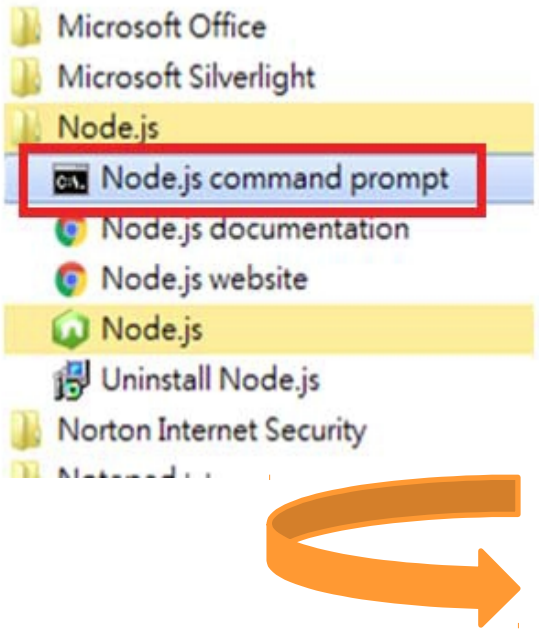
> *Note*: Node.js 7.x is under active development and is not recommended for a stable base. Many 3rd party node packages may not yet fully support Node 7.x and later, especially if they contain a binary component. Check with the author of the package if you are not sure.

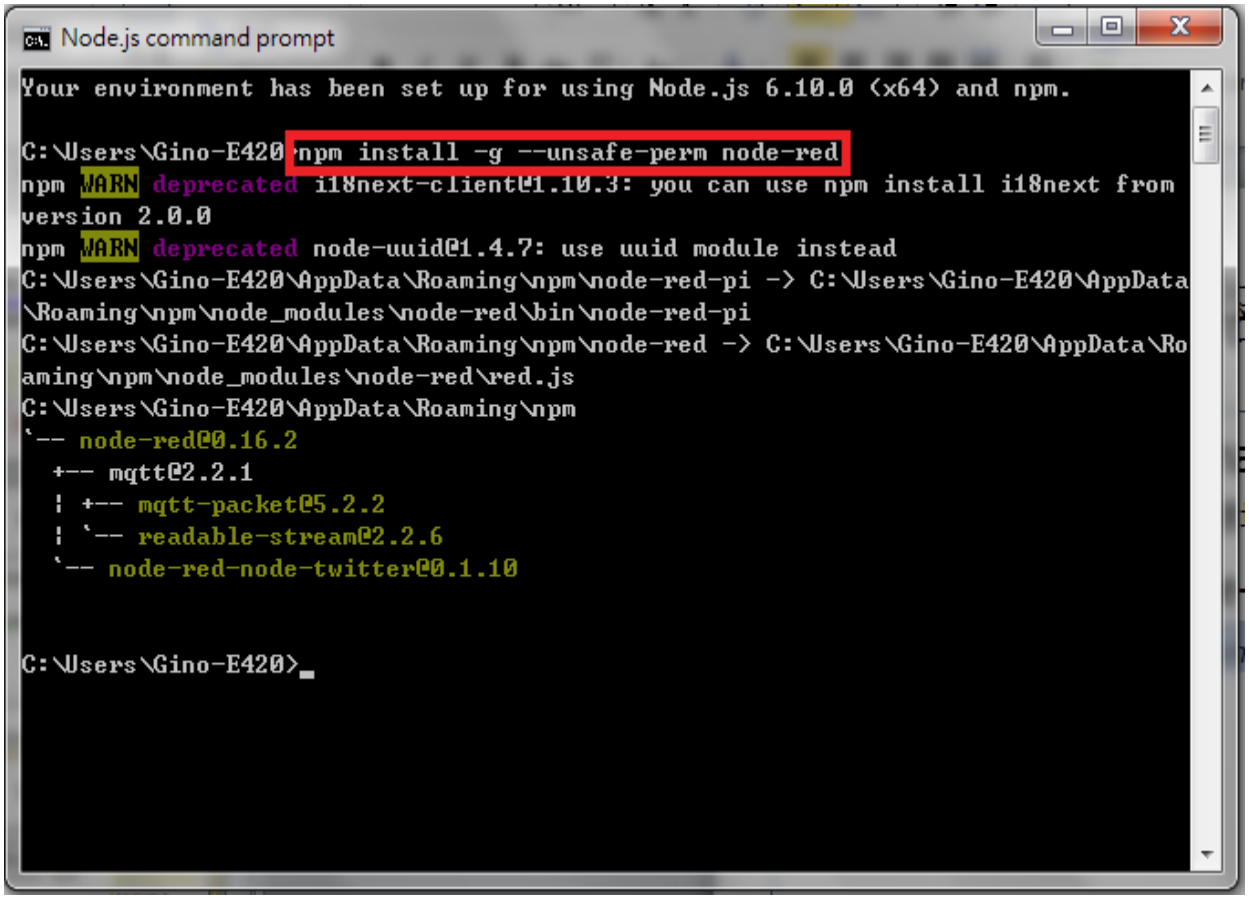
You can get the latest Long Term Support (LTS) version of Node `6.x` from:

- Max OS X Installer: Universal
- Windows Installer: 32-bit or 64-bit
- Linux Binaries: 32-bit or 64-bit

Node-Red Setup

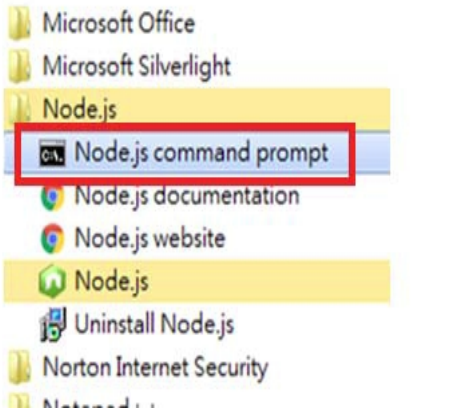
NodeRed Setup : Run Node.js command prompt
npm install -g --unsafe-perm node-red





Node-Red Setup

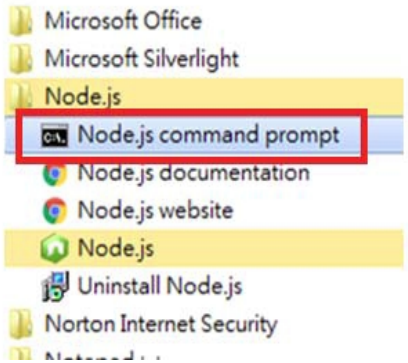
NodeRed Setup : Run Node.js command prompt Execute dashboard Command

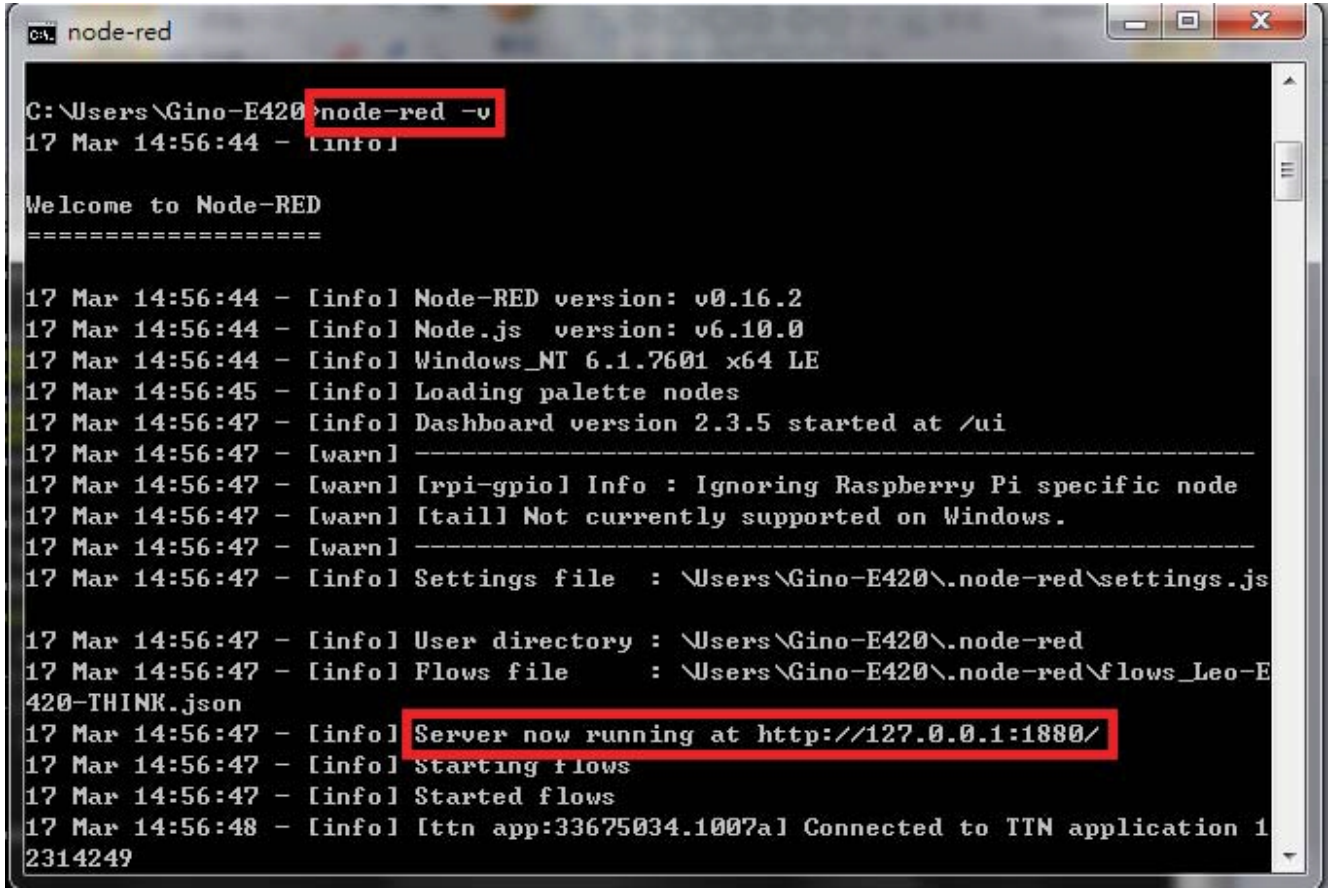



```
  | `-- ultron@1.0.2
  `-- xml2js@0.4.17
    +-- sax@0.6.1
    `-- xmlbuilder@4.2.1
      `-- lodash@4.17.4


C:\Users\PW>npm install node-red-dashboard

> node-red-dashboard@2.4.3 postinstall C:\Users\PW\node_modules\node-red-dashboa
rd
> node fixfa.js

C:\Users\PW
`-- node-red-dashboard@2.4.3
  +-- serve-static@1.12.4
  | +-- encodeurl@1.0.1
  | +-- escape-html@1.0.3
  | +-- parseurl@1.3.1
  | `-- send@0.15.4
  |   +-- debug@2.6.8
  |   +-- depd@1.1.1
  |   +-- destroy@1.0.4
```

Node-Red Setup

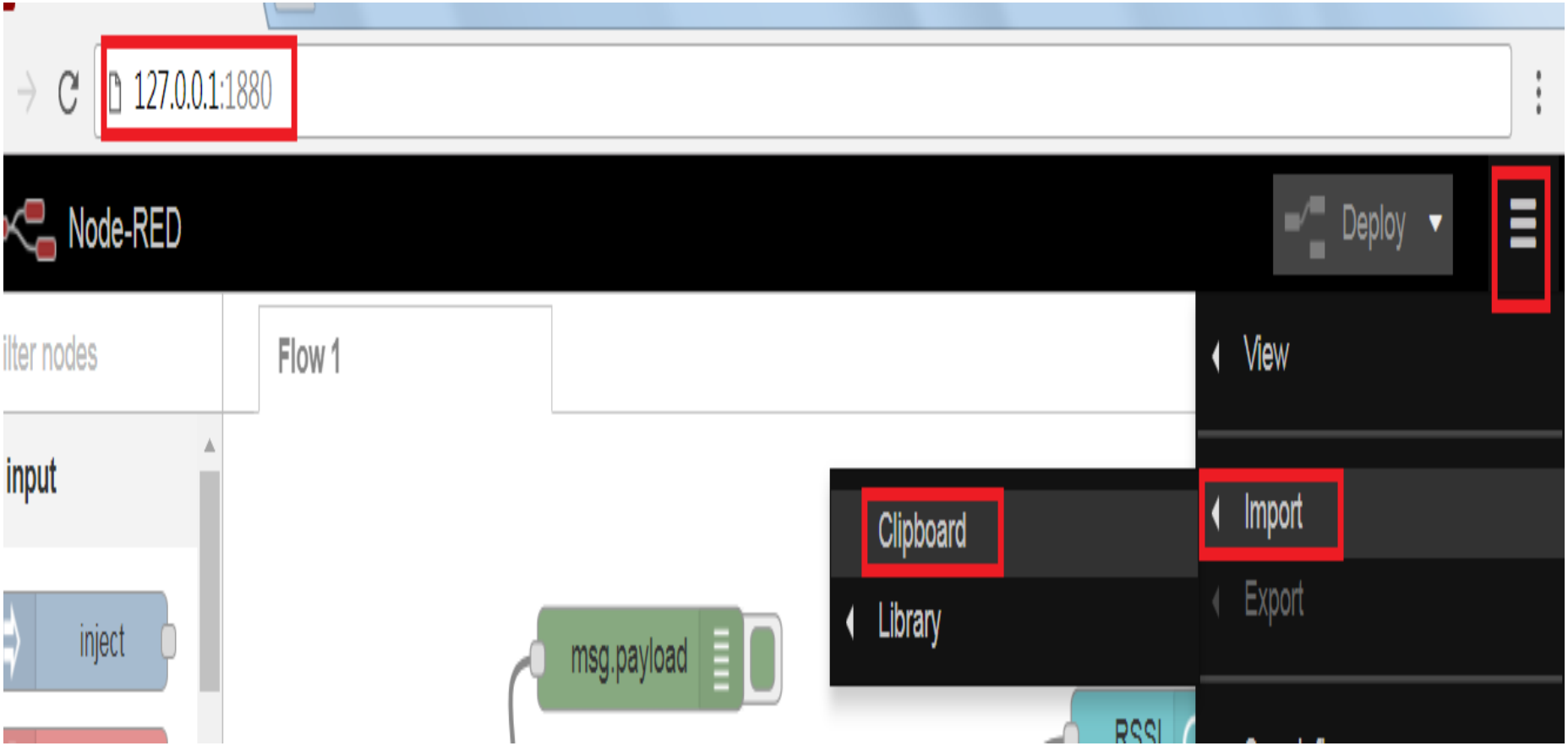
NodeRed Setup : run Node.js command prompt
Execute node-red –v





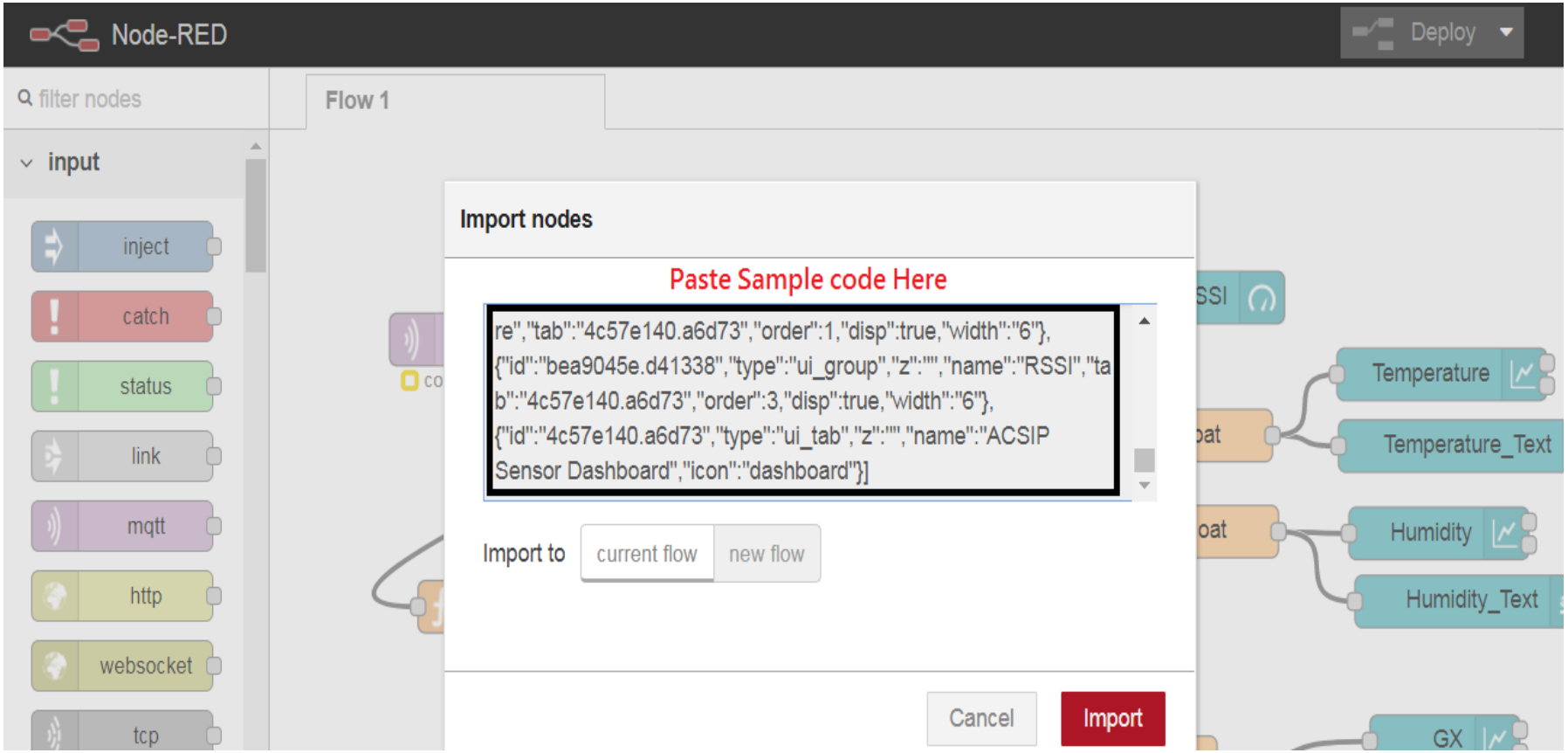
Node-Red Setup

NodeRed Setup : Import Node-Red sample code



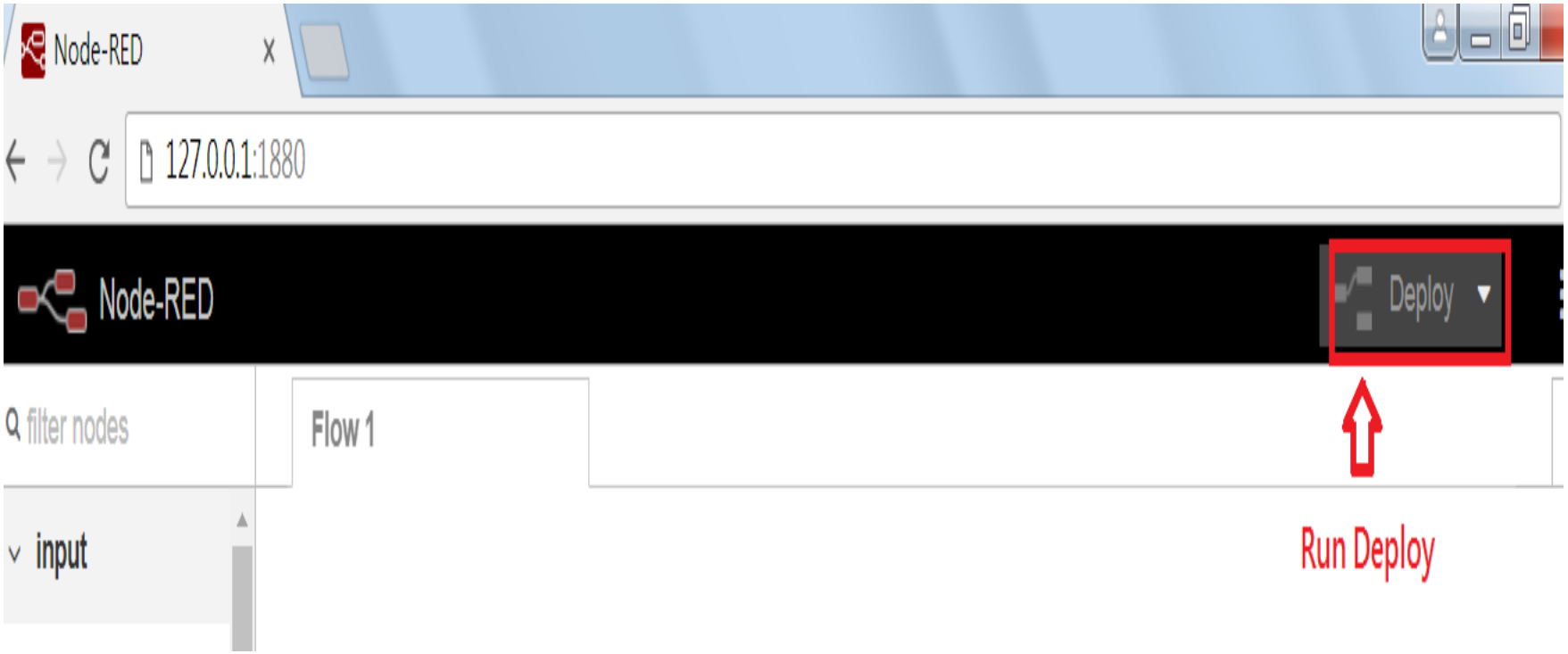
Node-Red Setup

NodeRed Setup : Import Node-Red sample code



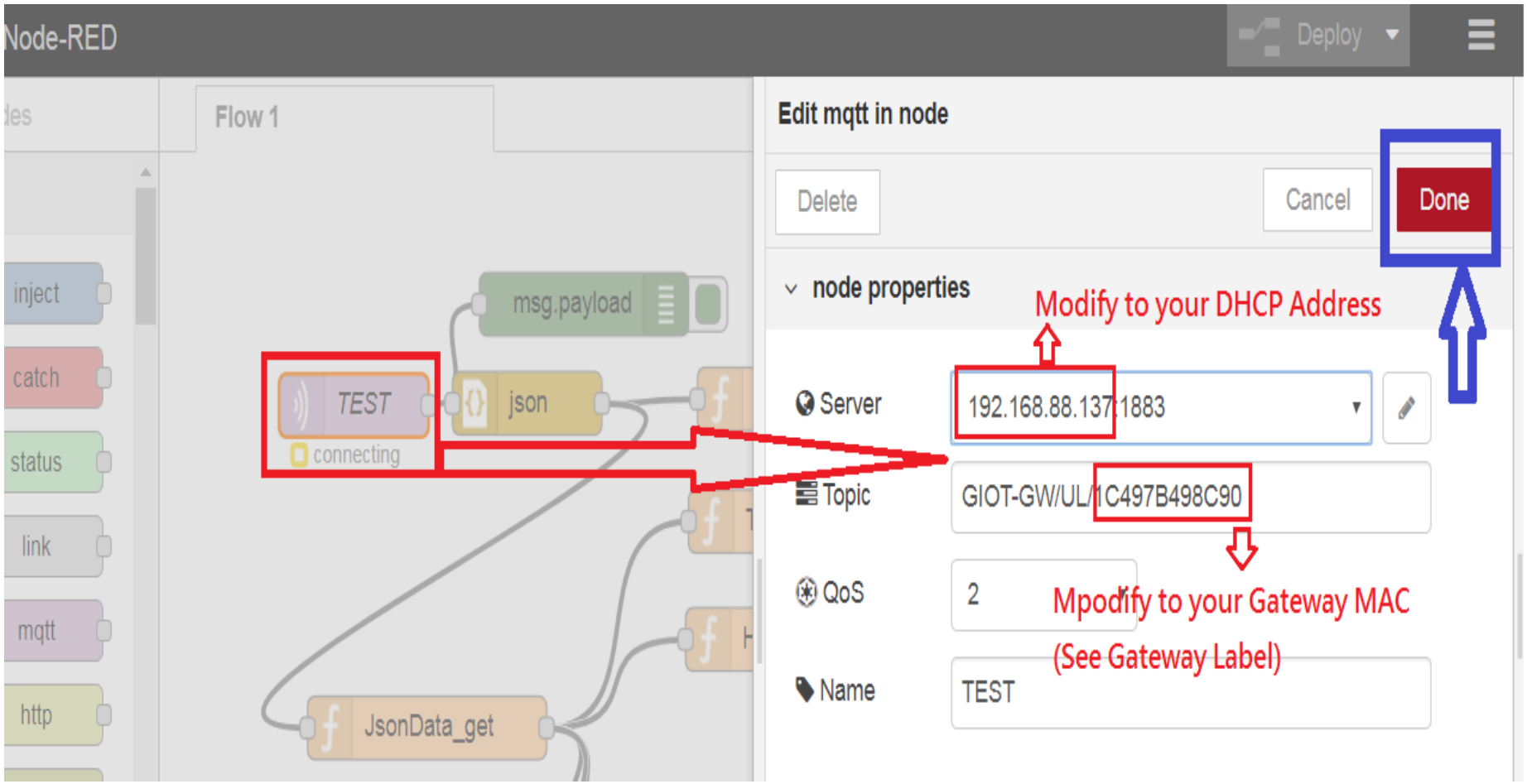
Node-Red Setup

NodeRed Setup : Import Node-Red sample code



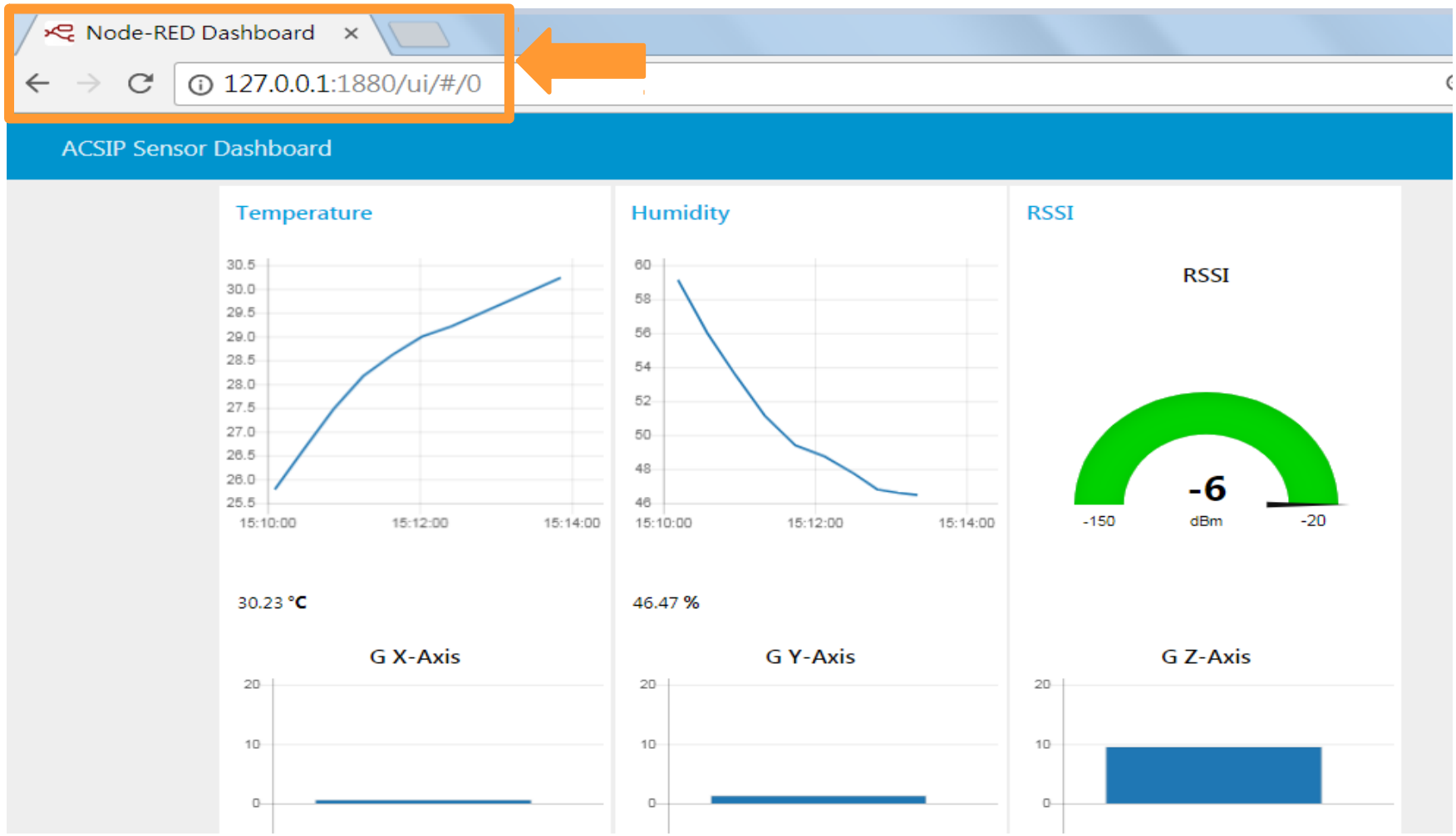
Node-Red Setup

NodeRed Setup : Modify Node Properties



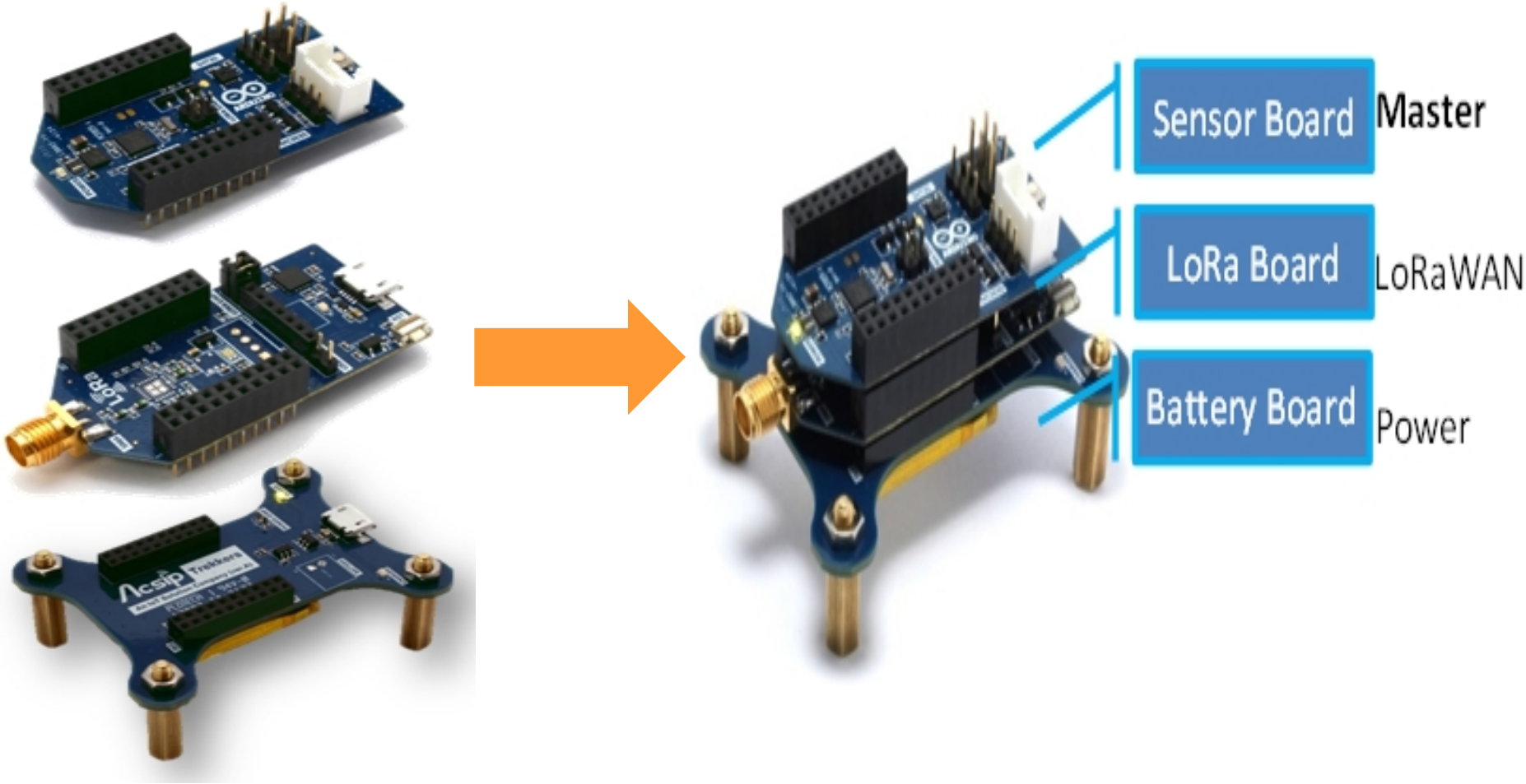
Node-Red Setup

Dashboard Demo : 127.0.0.1:1880/ui/#/0



SmartBlocks Introduction

Hardware Combination : Board Stack



SmartBlocks Introduction

Hardware Combination : Board Communication

S76S Lora

UART 1

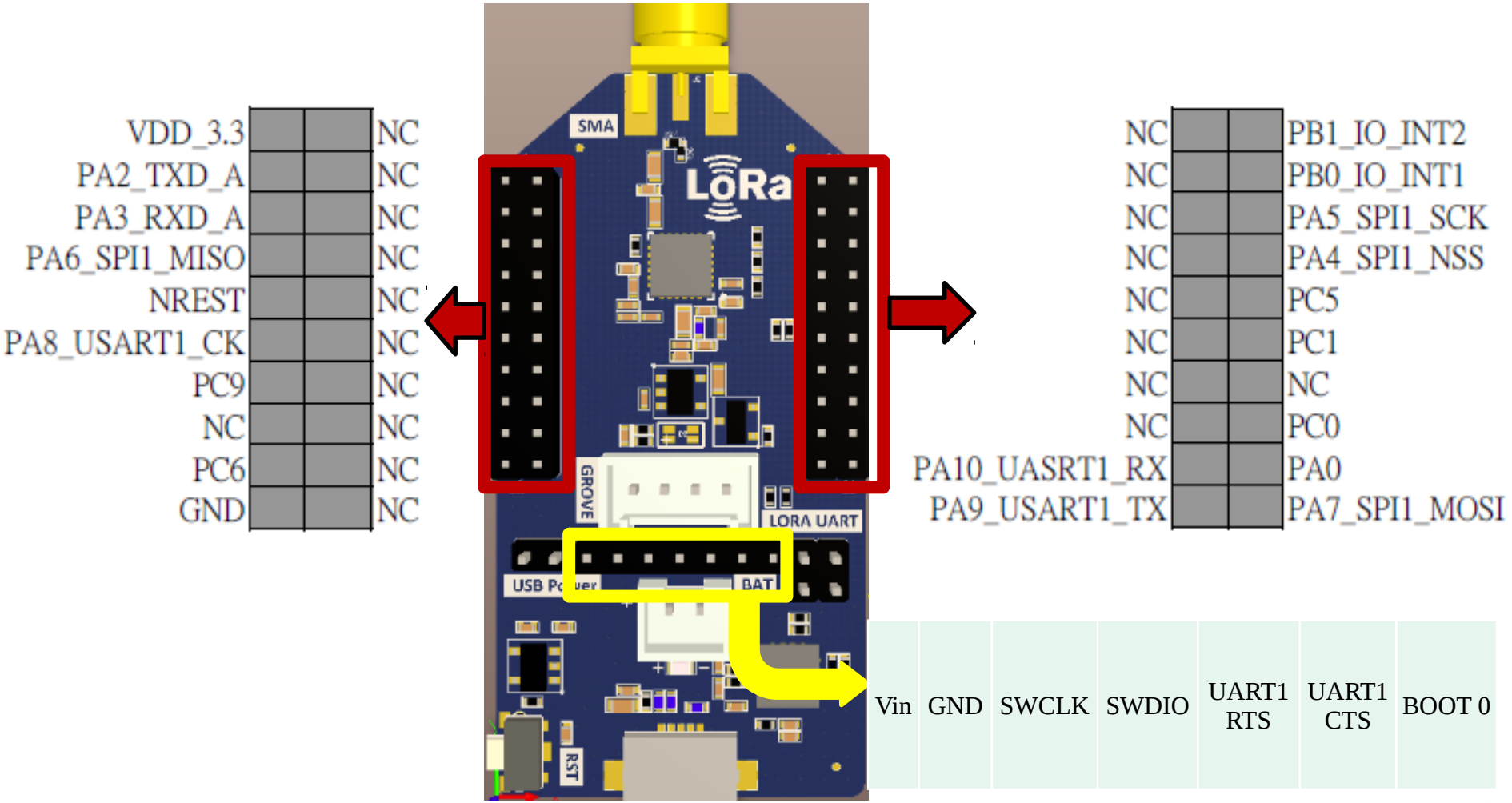
Sensor Board

MCU:ATmega328p

Model Name	Function description	Interface	address
SHT30	Humidity and Temperature Sensor	I²C	0x45
MC3060	3-Axis Accelerometer	I²C	0x6C

SmartBlocks Introduction

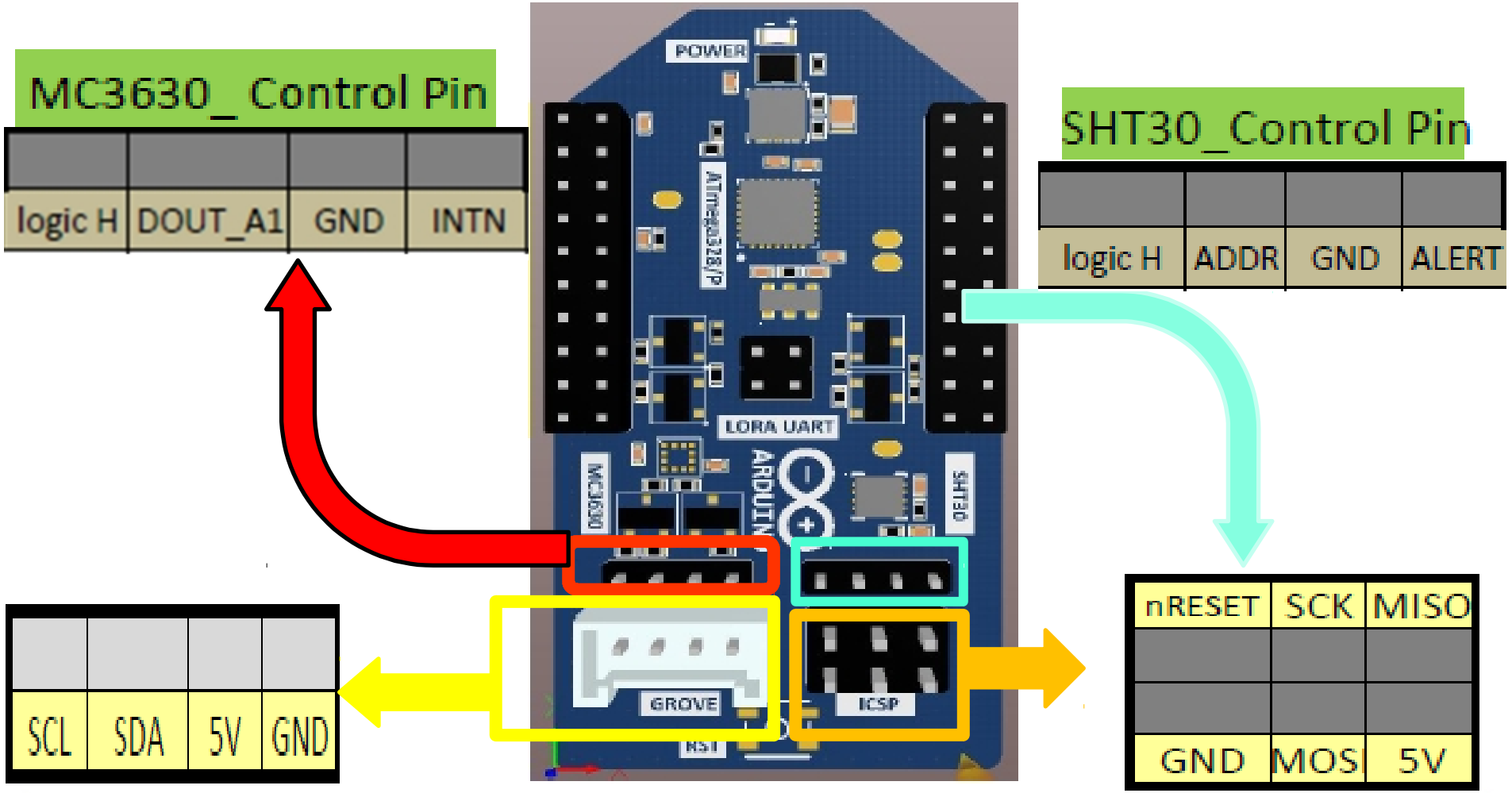
Hardware Combination : LoRa Board Pinout



Vin	GND	SWCLK	SWDIO	UART1 RTS	UART1 CTS	BOOT 0

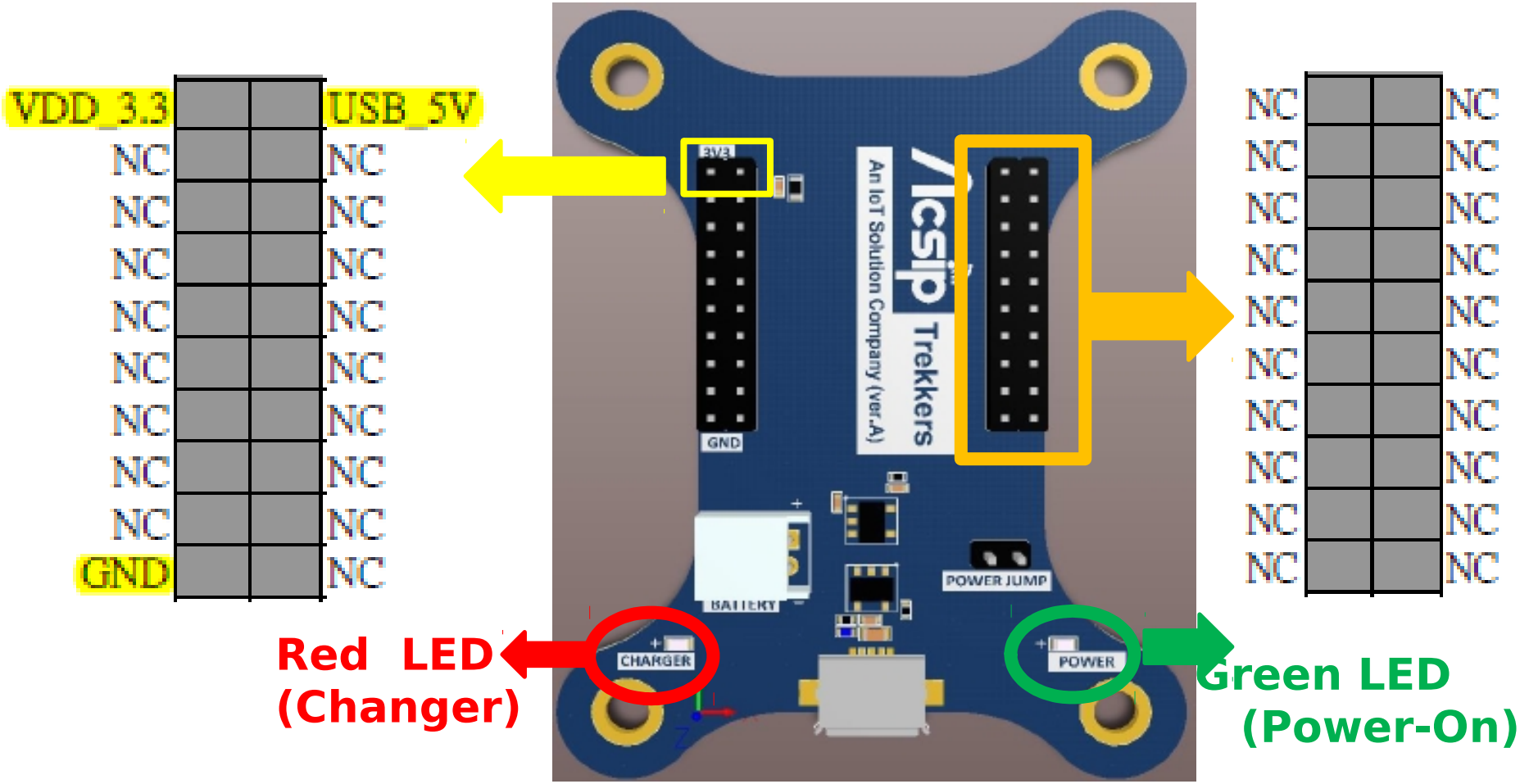
SmartBlock Introduction

Hardware Combination : Sensor Board Pinout



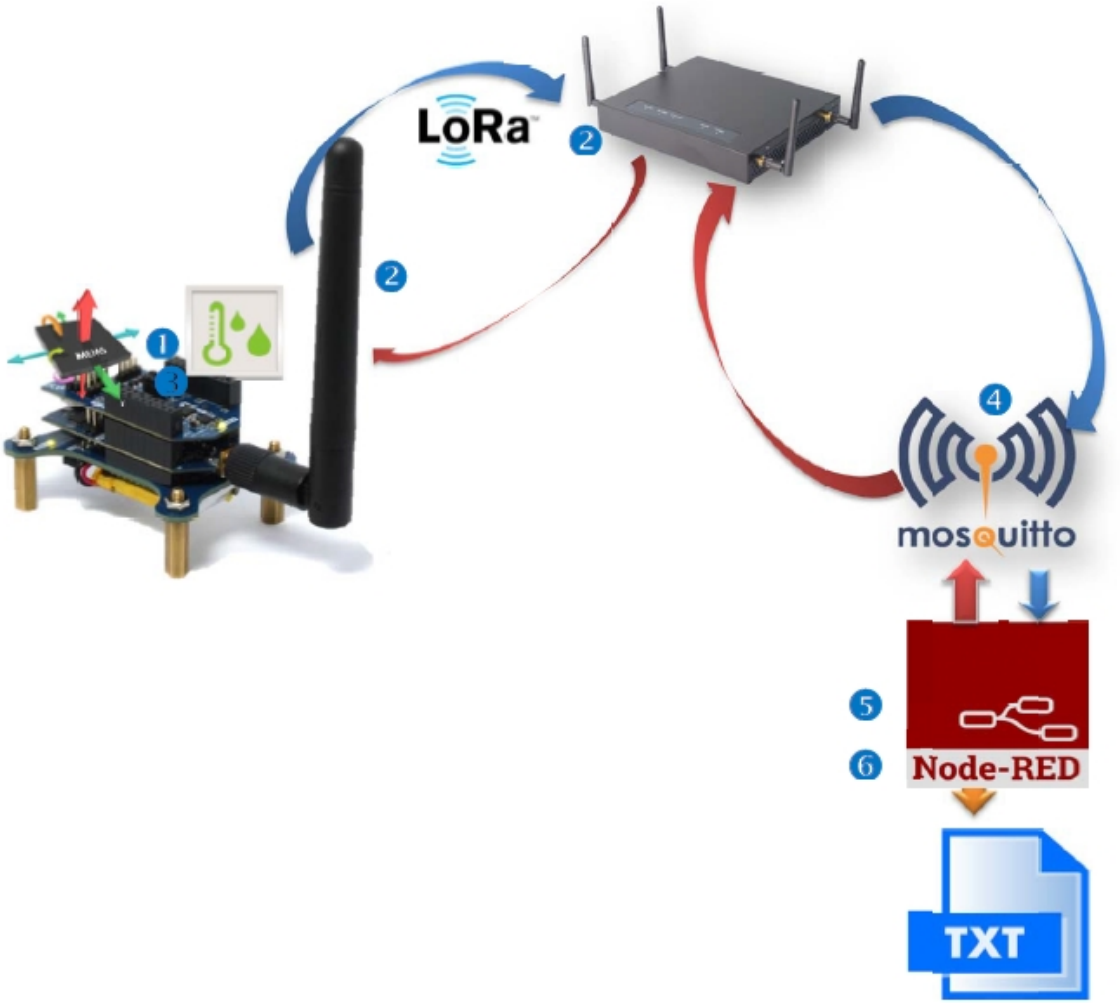
SmartBlocks Introduction

Hardware Combination : Power Board Pinout



SmartBlocks Introduction

Software Setup : Data Flow

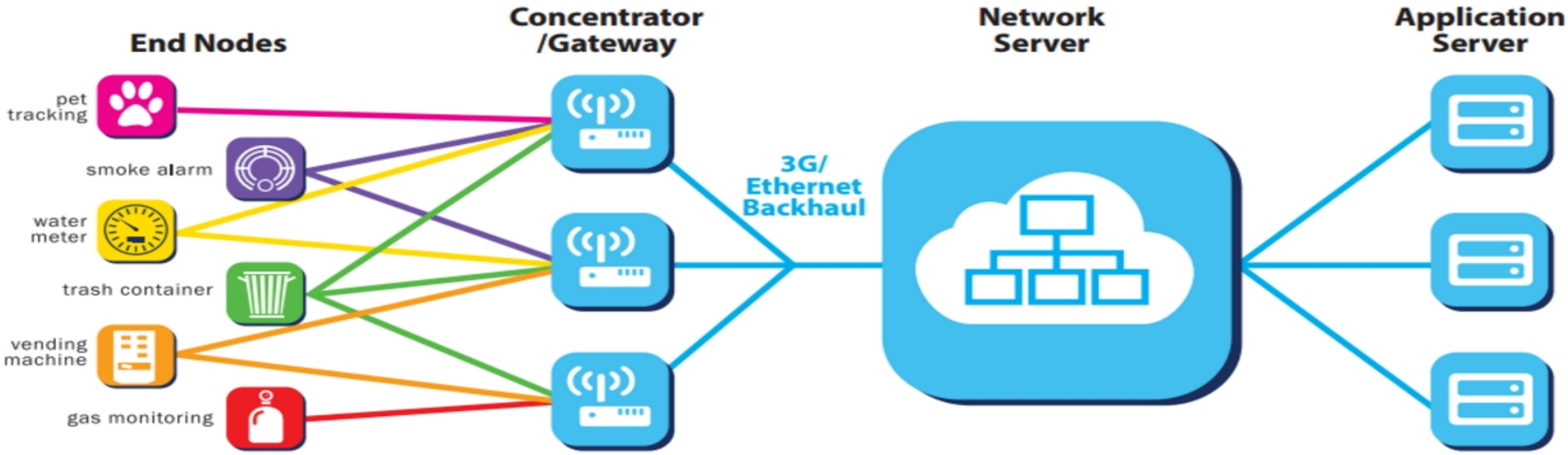


How Smart

1. 節省 RF 開發的時間
2. 軟體彈性
3. 硬體延伸性

LoRaWAN Architecture

Ecosystem :



LoRaWAN Architecture

End-Device Activation :

- Over-The-Air Activation (OTAA)
- Activation By Personalization (ABP)

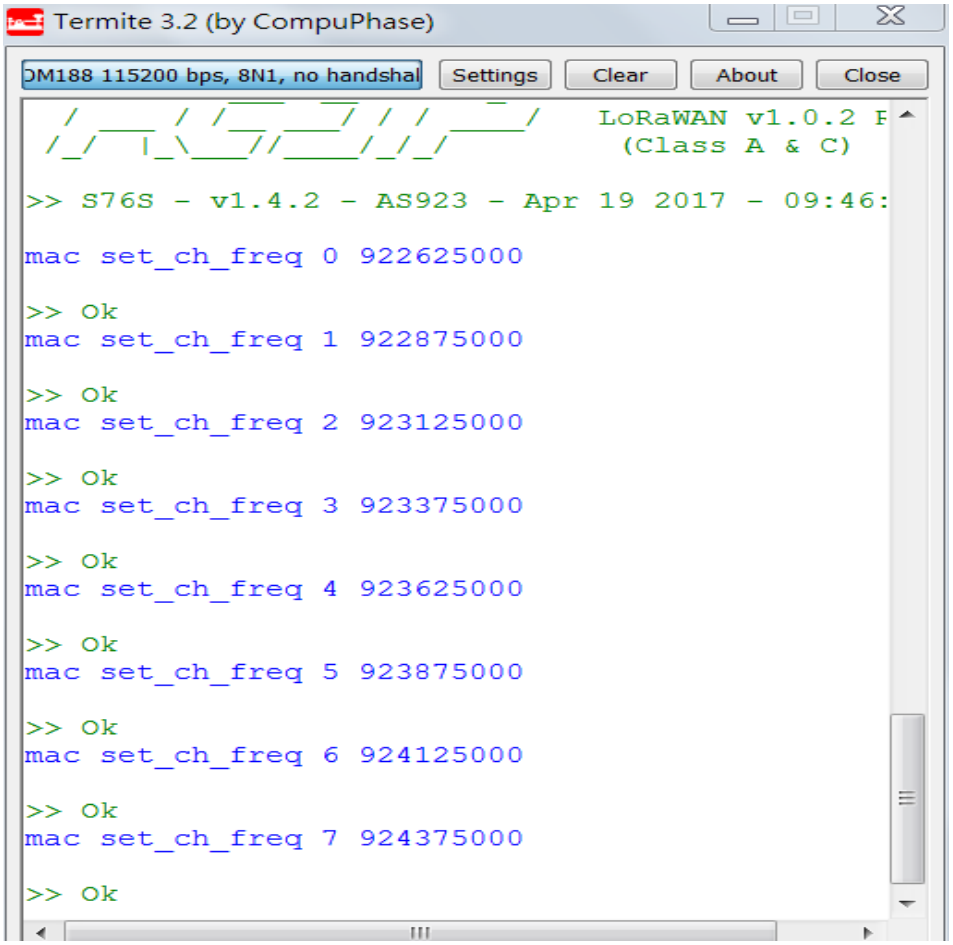
Refer the table below about relationship of key, ID, EUI and mode:

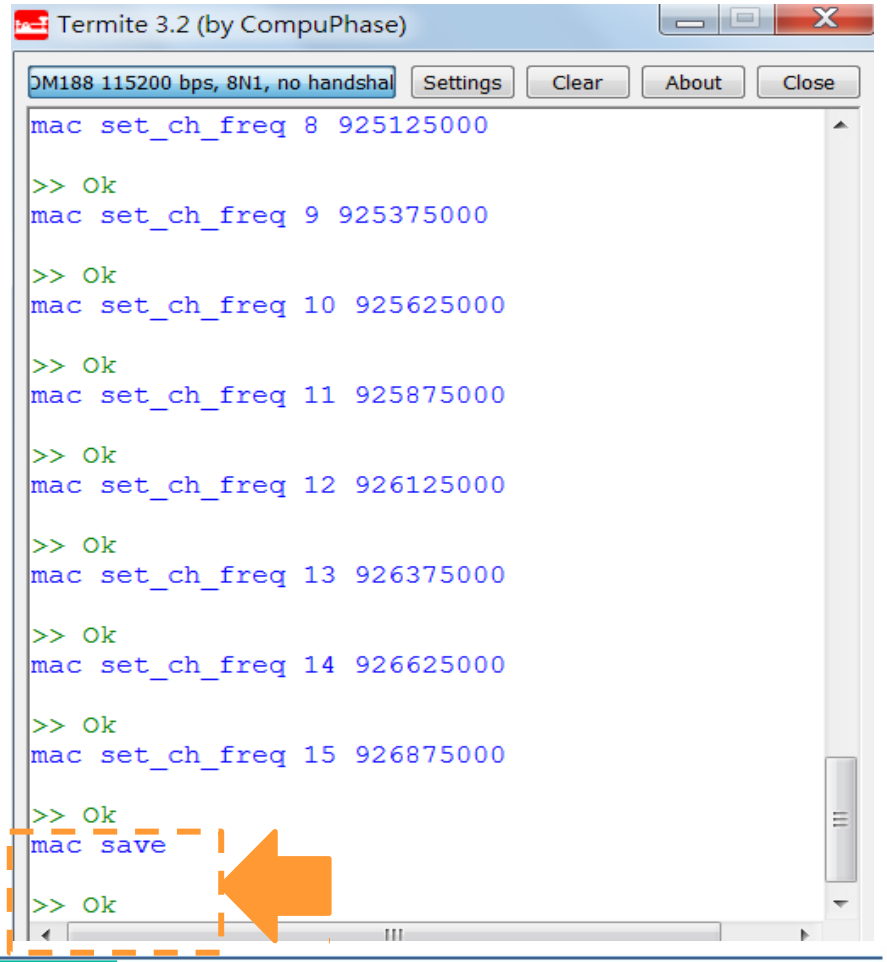
Mode	ID/EUI	Key
ABP	DevAddr	NwkSKey, AppSKey
OTAA	AppEUI, DevEUI	AppKey

S76S Setup – Command Set

Set CH0 ~ CH15 Frequency

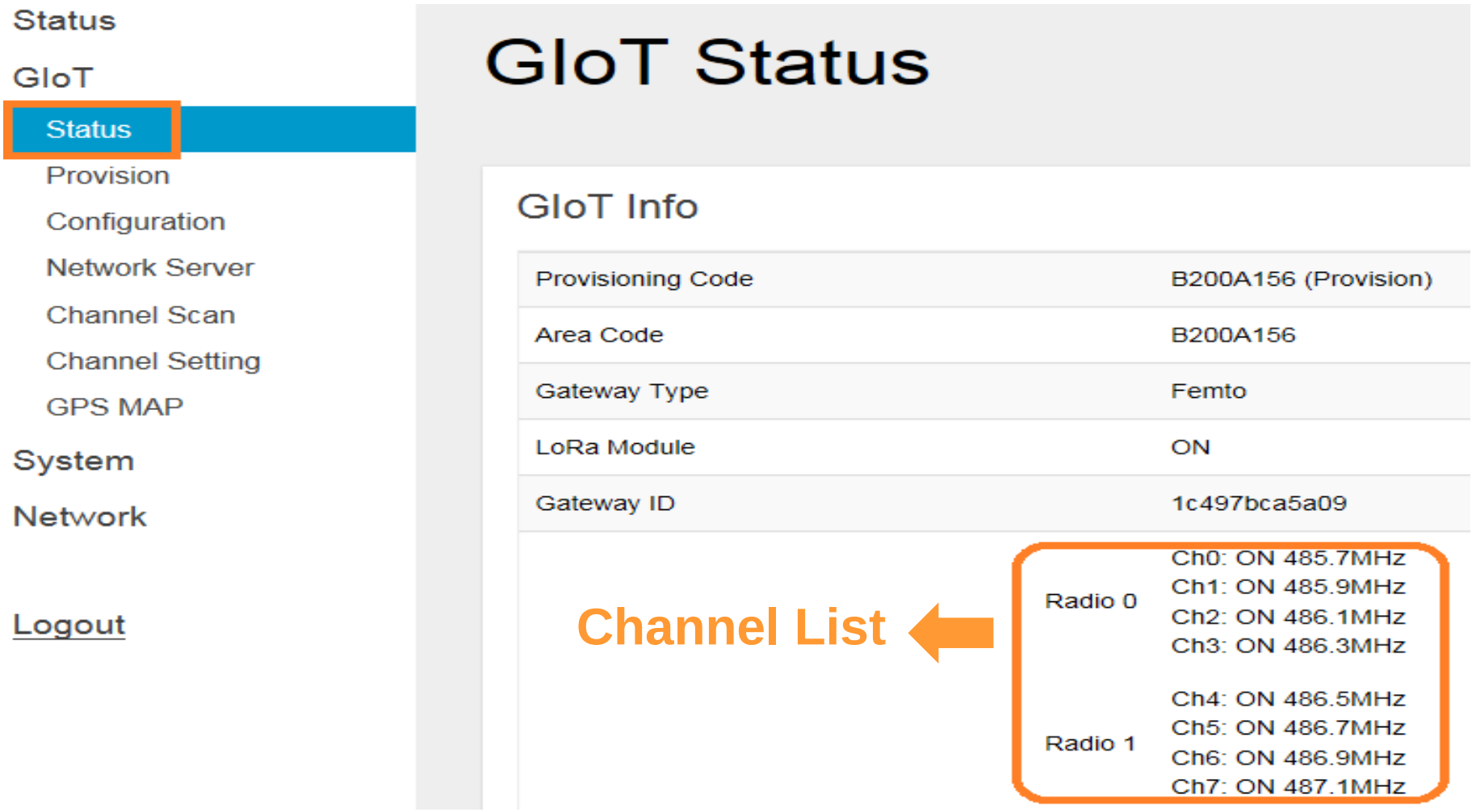
=> Must be the same as Gateway Frequency Plan





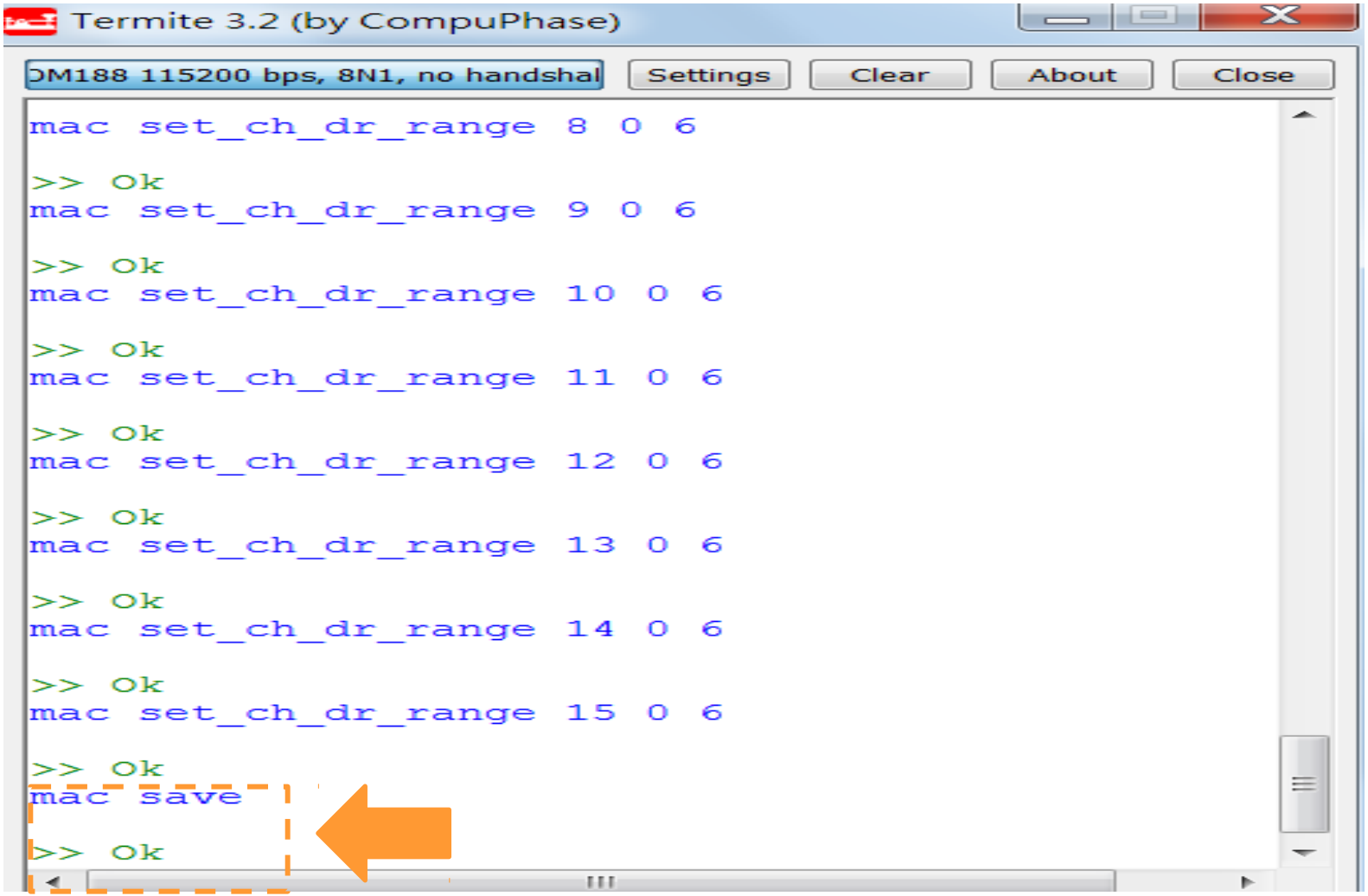
S76S Setup – Command Set

Get Gateway Frequency Plan :



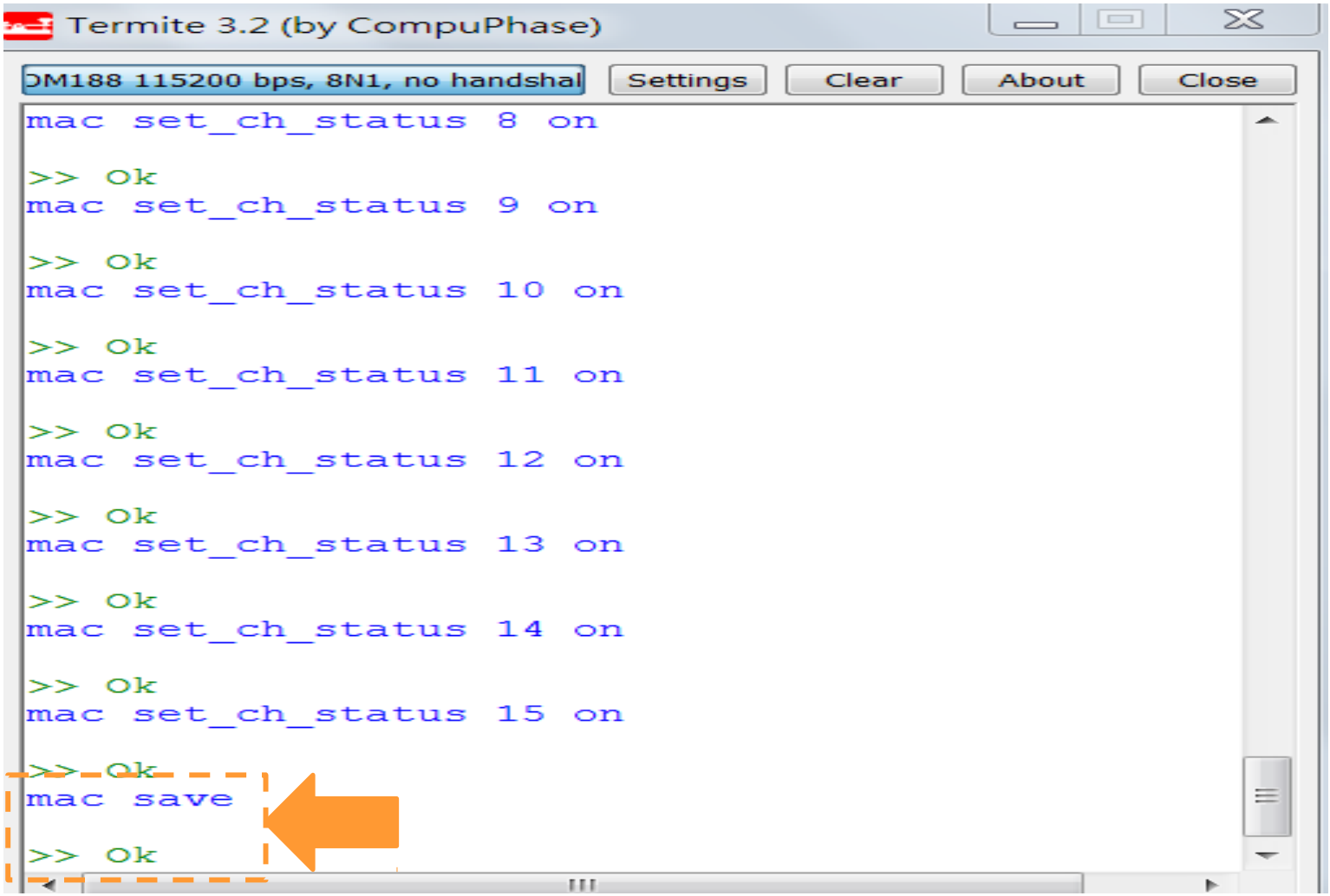
S76S Setup – Command Set

Set CH8 ~ CH15 DR Range



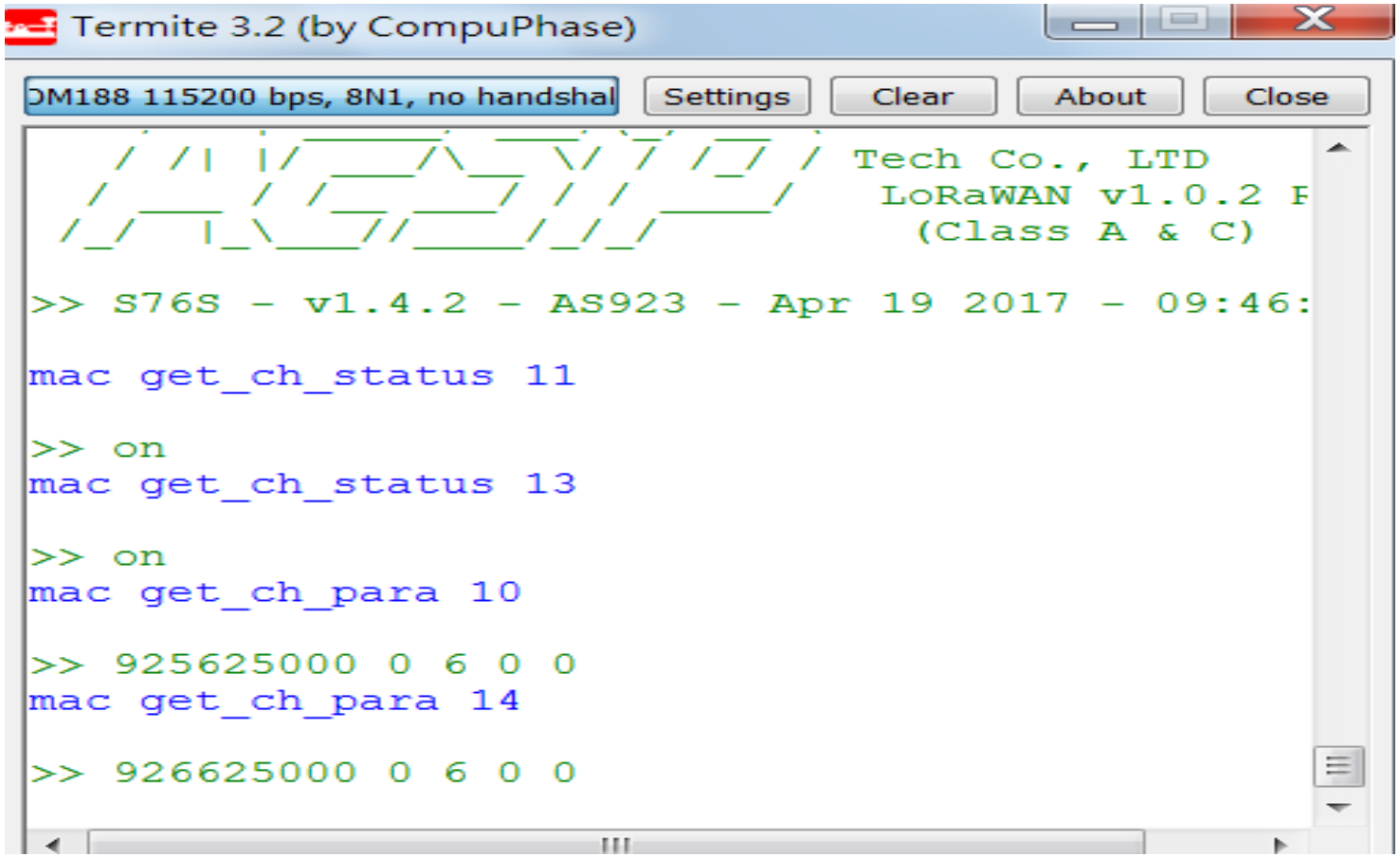
S76S Setup – Command Set

Set CH8 ~ CH15 Status ON



S76S Setup – Command Set

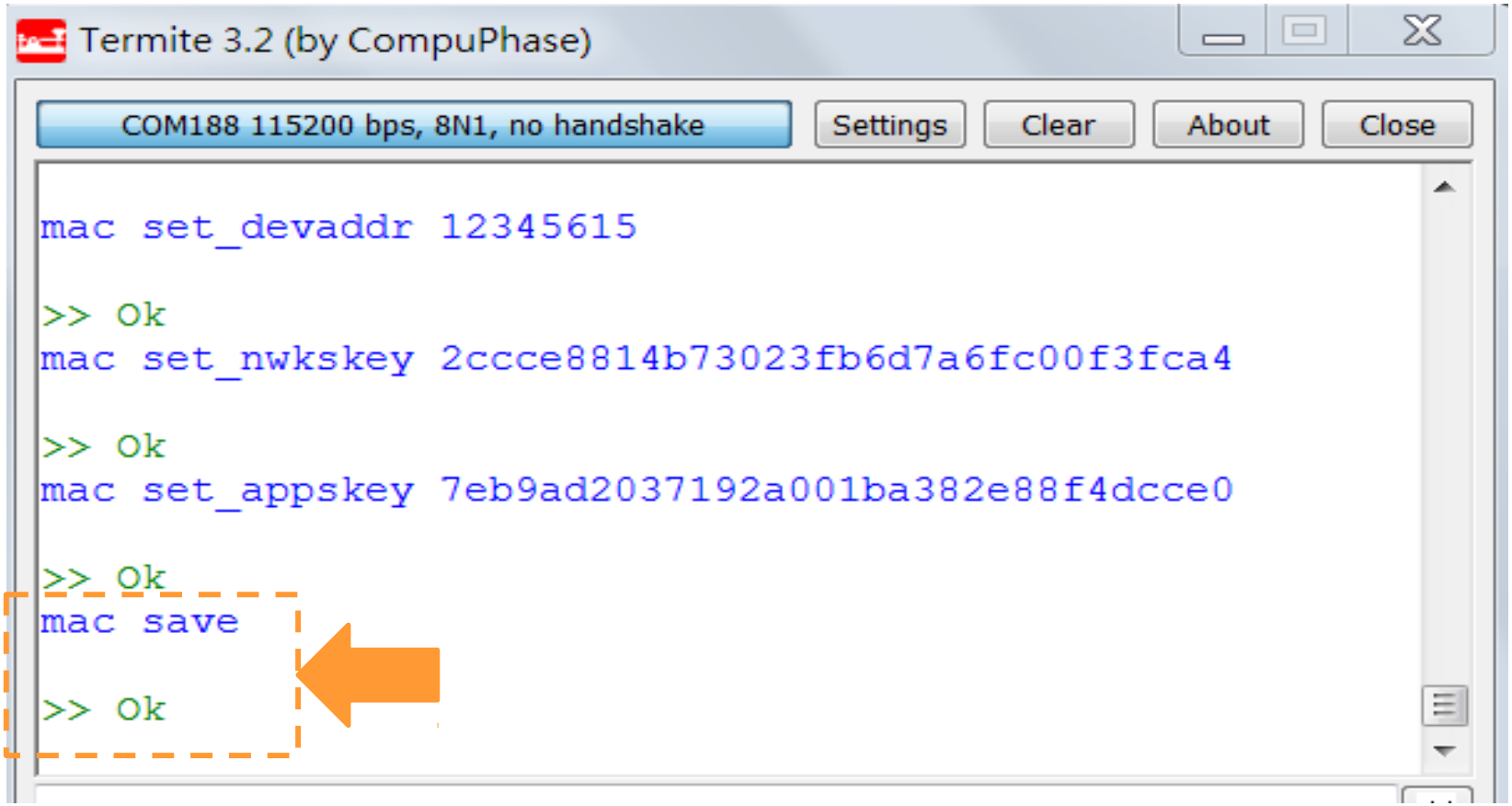
Check CH0 ~ Ch15 Status Command :
mac get_ch_status X & mac get_ch_para X



S76S Setup – Command Set

ABP Setup (DevAddr 、 NwkSKey 、 AppSKey)

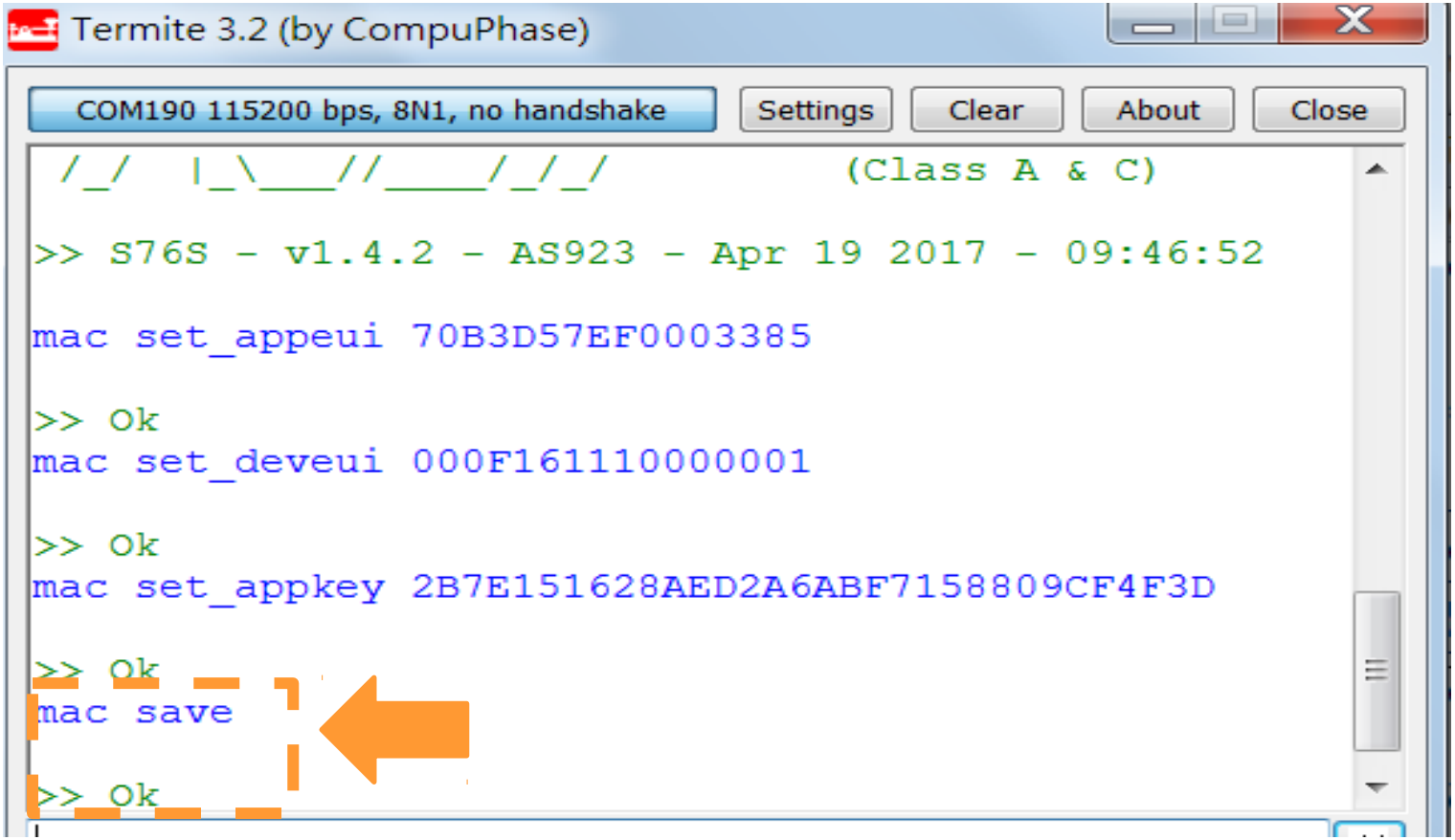
=> Must be the same as Gateway ABP Table



S76S Setup – Command Set

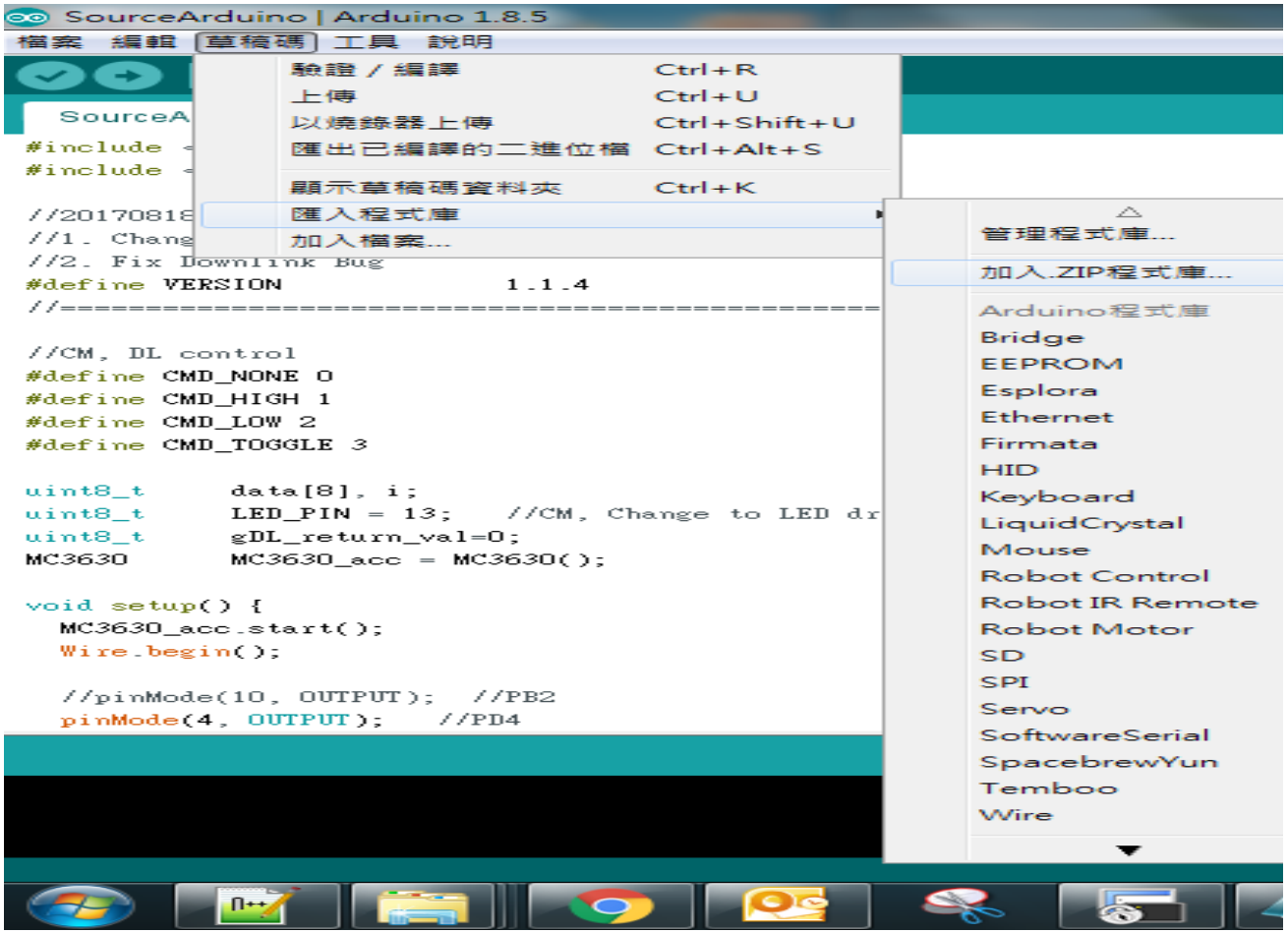
OTAA Setup (AppEUI 、 DevEUI 、 AppKey)

=> Must be the same as Gateway OTAA Table



Sensor Board Firmware

Import library for fist time verify



Sensor Board Firmware

Arduino Firmware:Setup

```
void setup() {
  MC3630_acc.start();
  Wire.begin();

  //pinMode(10, OUTPUT);  //PB2
  pinMode(4, OUTPUT);   //PD4
  pinMode(LED_PIN, OUTPUT);   //PB5
  digitalWrite(LED_PIN, HIGH);
  //digitalWrite(4, HIGH);

  Serial.begin(115200);
  delay(1000);

  /*
   *  joining by otaa (or abp), you should be get a accepted message.
  */
  Serial.print("mac join abp");
  delay(5000);

}
```

Sensor Board Firmware

Arduino Firmware:Loop

```
void loop() {

  static bool pin_status = false;
  SensorSHT30();
  SensorMC3630();
  switch(gDL_return_val)
  {
    case CMD_HIGH:
      pin_status=true;
      digitalWrite(LED_PIN, HIGH);
      break;

    case CMD_LOW:
```

Sensor Board Firmware

Arduino Firmware:Send Tx Command

```
void LoRaPackageTx(String keyword, float data)
{
  String  str1, str2;
  char    test[64];
  int   i;

  str1 = keyword+ data;
  for(i=0; i<str1.length(); i++)
  {
    test[(i<<1)] = str1[i]>>4;
    test[(i<<1)+1] = str1[i]&0xF;
    if(test[(i<<1)]<0xA)  test[(i<<1)] = test[(i<<1)] +0x30;
    else                  test[(i<<1)] = test[(i<<1)] +0x57;
    if(test[(i<<1)+1]<0xA)  test[(i<<1)+1] = test[(i<<1)+1] +0x30;
    else                  test[(i<<1)+1] = test[(i<<1)+1] +0x57;
  }
  test[(i<<1)] =  0x00;
  str2 = test;
  str1 = "mac tx ucnf 2 " + str2;
  Serial.print(str1);

  //digitalWrite(4, HIGH);  //CM, For Debug
  //digitalWrite(13, HIGH);

  return;
}
```

Sensor Board Firmware

Software Setup : Firmware Update

WorkFlow:

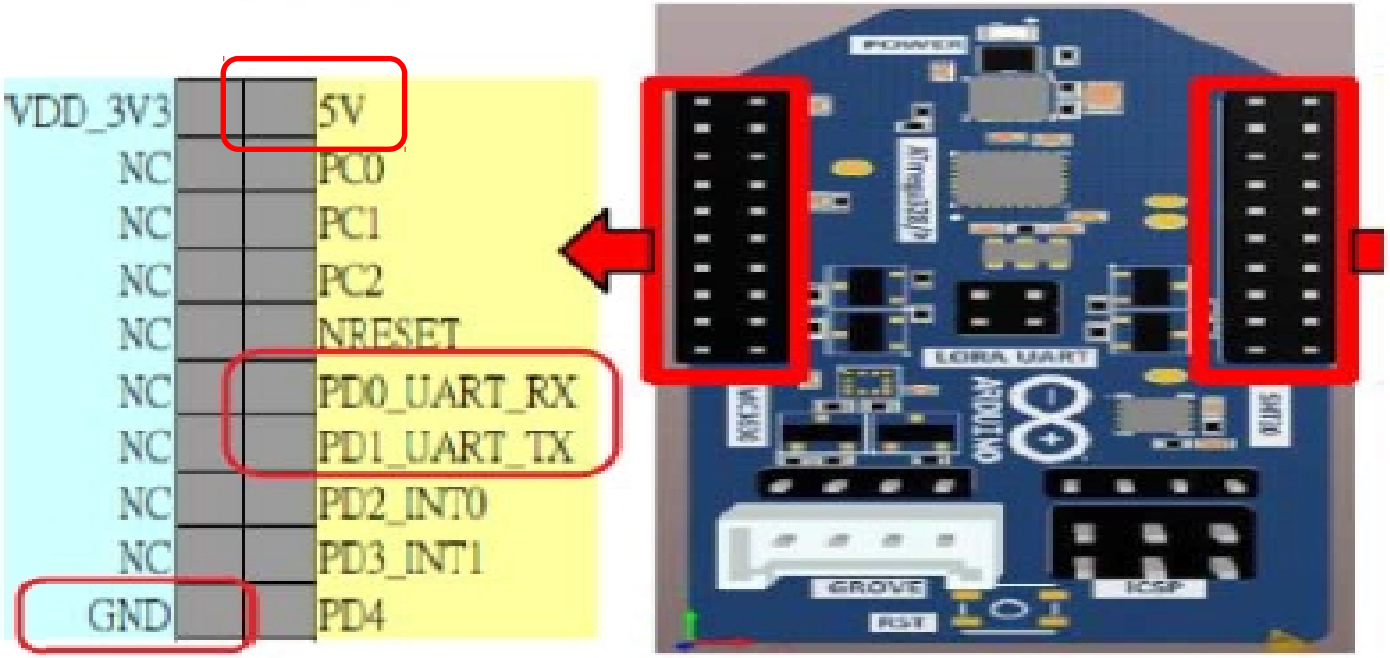
1. Setup ISP
2. Configuring as “Acsip UNO Board”
3. Configuring ISP with your Device(Sensor Board)
4. Programming
5. Verify your ino(Firmware)

詳細內容請參考 :
.\SmartBlocks_DevKit_Package(S76S)_V1.1.4\SmartBlocks_DevKit_Package(S76S)_V1.1.4\Docs\SensorBoard\Arduino_ICSP _Update_ FW.pdf

Sensor Board Firmware

Open UART console tool to Verify Sensor Board Update F/W OK by ISP

Check output log



Q & A