MCU to PABOX_MySQL

1. 建立MQTT Broker

```
# login UBUNTU server
$ sudo apt-add-repository ppa:mosquitto-dev/mosquitto-ppa
$ sudo apt-get update
# 安裝 mosquitto port 1883
$ sudo apt-get install mosquitto
$ sudo apt-get install mosquitto-clients
$ sudo apt-get install mc
# mosquitto安裝到 service auto start
$ sudo systemctl start mosquitto.service
$ sudo systemctl enable mosquitto.service
```

2. 安装PYPY3,及PAHO MQTT sdk

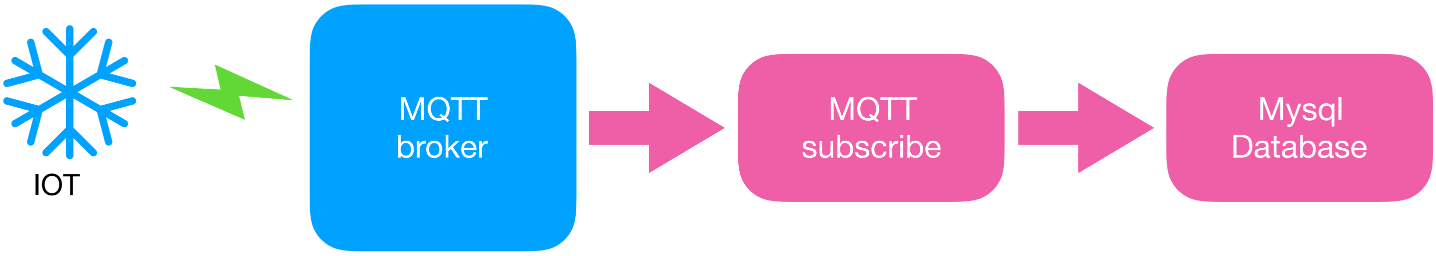
```
# 下载pypy3 （pypy3 非必要）
$ wget https://bitbucket.org/pypy/pypy/downloads/pypy3.6-v7.1.1-linux64.tar.bz2
# unzip it to ${PYPY}
$ ln -s ${PYPY}pypy3.6 /usr/local/bin/pypy
# install pip
$ wget https://bootstrap.pypa.io/get-pip.py
$ pypy3 get-pip.py
$ ln -s ${PYPY}pip3 /usr/local/bin/pypip
# 升级 pypy 的 pip wheel
$ pypip install -U pip wheel
# 安装Python的MQTT sdk(from Eclipse)
$ pypip install paho-mqtt
```

2.1 安裝pabox所需python模组

```
# 安裝python需要的module
$ pip install aiohttp
$ pip install mysql-connector-python
$ pip install paho-mqtt
```

3. 安装MySQL

```
# mysql port 3306
$ sudo apt-get install mysql-server
$ sudo apt-get install default-libmysqlclient-dev
# startup mysql
$ sudo systemctl start mysql.service
$ sudo systemctl enable mysql.service
```



IOT

MQTT
broker

MQTT
subscribe

Mysql
Database

topic:
PABOX/$imei

message:
code+data_length+data,...

* 系统架构 *

4. 测试Mosquitto

```
1 启动代理服务
$ systemctl start mosquitto.service

2 订阅主题
mosquitto_sub -v -t sensor
mosquitto_sub -v -t \$SYS\Broker\+

3 发布内容
mosquitto_pub -t sensor -m 12
```

5. 任务(7/25)

```
* 建立 MQTT Service
* 订阅 Topics
* 建立 MySQL Server
* 设计 MySQL DB table 结构
* 将订阅内容，insert到MySQL

未来项目
* 表现资料
* 根据资料发布Topics
```

6. 云,Mosquitto加密碼

server：
139.198.19.224
iothub.proadvancer.com

```
mosquitto 加上用戶密碼
cd /etc/mosquitto
mosquitto_passwd -c passwd pabox
产生密码当 passwd
```

用戶：pabox
密碼：1qaz2wsx3edc

加上用戶密碼的認證，杜絕外部無關的干擾

将设定密码档案，写入mosquitto设定

```
add
password_file /etc/mosquitto/passwd
to
/etc/mosquitto/mosquitto.conf
```

7. 程序功能

```
pa_rest.py
提供restful service
1.http://host:9000/pub?topic=_[$imei]&cmd=___&data=[_,_]
  再发布至MQTT Broker，此处若topic以 _ 為首，
  則將會使用PABOX/当作是prefix，整個topic將會是PABOX/topic[1:]
2.http://host:9000/query/trandata
  查詢最近的trandata limit 1000
3.http://host:9000/query/item
  查詢item
4.http://host:9000/cmd
  pub可使用的cmd及data樣式
```

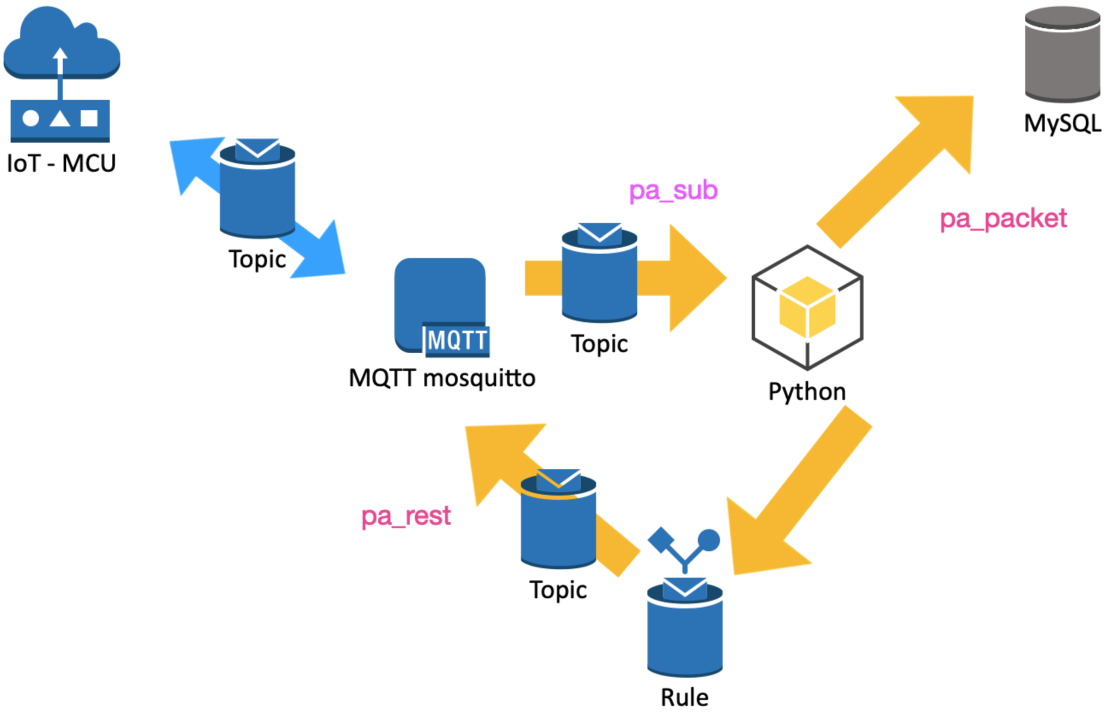
但是目前port9000沒開，可以login server後使用curl 如

```
curl -v -globoff http://host:9000/pub?topic=__\&cmd=__\&data=[_,_]
curl -v -globoff http://host:9000/query/trandata
curl -v -globoff http://host:9000/query/item
curl -v -globoff http://host:9000/cmd
```

將對MQTT發布TOPIC及payload packet(cmd,data)

查詢內容：由未來業務內容決定，此處不做，只列舉兩個測試
查詢畫面：牽涉另外業務系統，此處不做

此处的 pa_rest.py只能在区网做，因为http必须申请ICP备之类认证，在申请之前无法在INTERNET使用



pa_sub.py:

訂閱subscribe from MQTT broker

解析message.payload之data packet(pa_packey.py parse_packet)

insert into mysql.pabox.trandata

~~設定必須收到訂閱的消息之後，必須回覆的指令(此步驟需釐清業務邏輯，不在此次开发範圍)~~

pa_config.py:

環境參數設定

```
HOST = "139.198.19.224"
PORT = 1883
USER = "pabox"
PASS = "1qaz2wsx3edc"
QoS  = 1
HTTP = 9000
SUB_TOPIC = "PABOX"
MY_HOST = "127.0.0.1"
MY_USER = "iot"
MY_PASS = "iot"
MY_DATABASE ="pabox"

# SUBSCRIBE codes those need to Publish back
MUST_REPLY_CODES = ('02',)

## mysql
GET_SQL={
    "add_trandata":("INSERT INTO `pabox`.`trandata`(`iot_id`,`code`,`code_name`,
               `seq`,`attr01`,`desc`,`data`) VALUES (%s, %s, %s, %s, %s, %s, %s)"),
    "trandata":("SELECT * from `pabox`.`trandata` order by `line_id` desc limit 100"),
    "item":("SELECT * from `pabox`.`item` limit 100"),
    }
```

8. MCU的messages

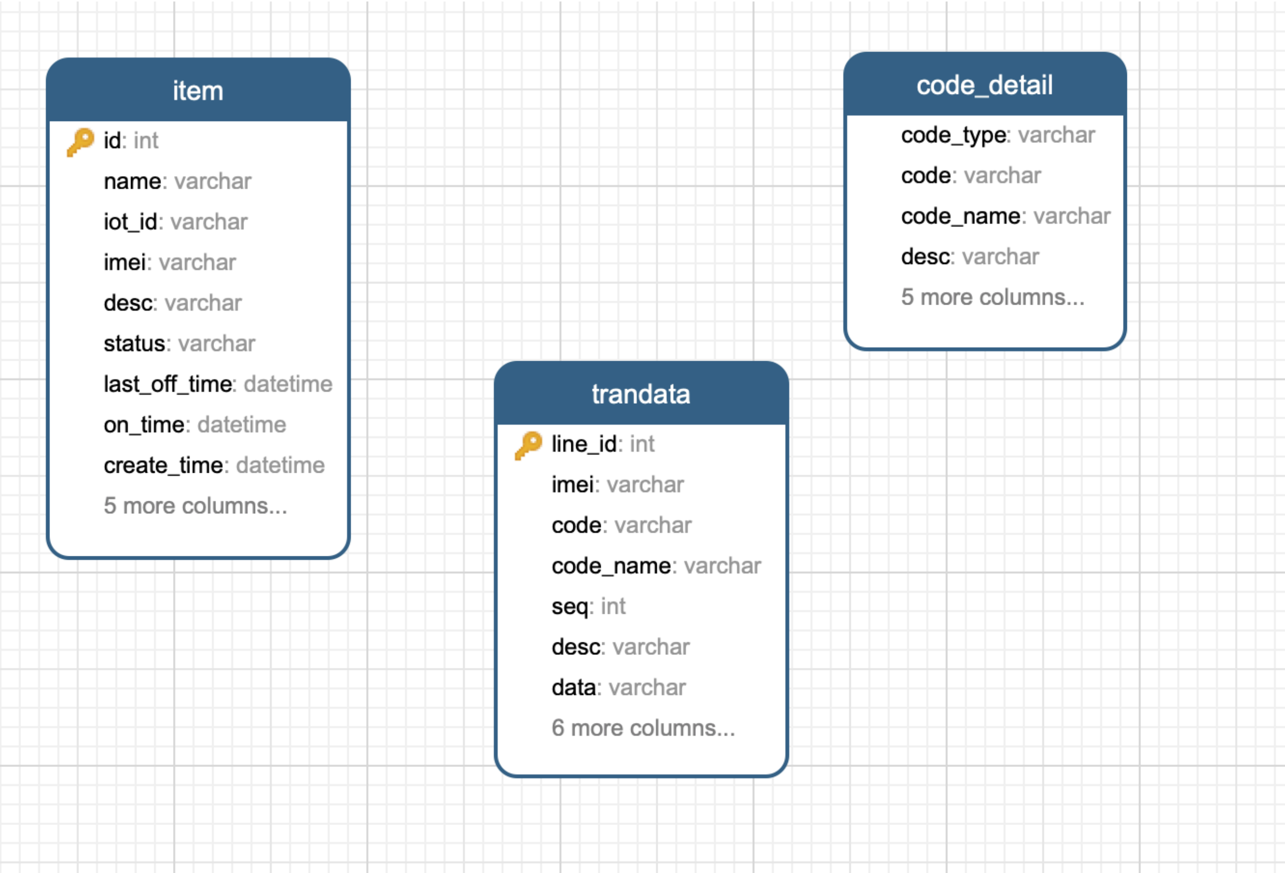
(在pa_packet.py中定义)

```
   "SETM":{"CODE":'00',"TYPE":"1","DESC":"工作模式转换"}, # 1 自控 0, 外控 1
    "PING":{"CODE":'01',"TYPE":"2","DESC":"连接握手(sec)"}, # 2 秒数
    "TSYN":{"CODE":'02',"TYPE":"7","DESC":"时间同步"}, # 7 year2+mon1+mday1+hour1+min1+sec1, 7bytes
    "OFF_":{"CODE":'03',"TYPE":"0","DESC":"断开连接"}, # 0
    "GETT":{"CODE":'04',"TYPE":"1,2","DESC":"获取温度(°C)"}, # 1+2   通道+温度
    "SETT":{"CODE":'05',"TYPE":"1,2,2","DESC":"设置温度上限和下限参数(°C)"}, # 1+2+2 通道+温度上限和温度
    "GETF":{"CODE":'06',"TYPE":"1,2","DESC":"获取风扇状态(mA)"}, # 1+2 风扇电流
    "SETF":{"CODE":'07',"TYPE":"1,1","DESC":"控制风扇动作"}, # 1+1 控制风扇动作
    "GETL":{"CODE":'08',"TYPE":"1,1","DESC":"查询锁的状态"}, # 1+1 通道+锁状态
    "SETL":{"CODE":'09',"TYPE":"1,1","DESC":"控制开锁动作"}, # 1+1 通道+锁动作
    "BIND":{"CODE":'0A',"TYPE":"1,1","DESC":"绑定风扇和温度控制"}, # 1+1 风扇通道+温度通道
    "LOG_":{"CODE":'0B',"TYPE":"0,N","DESC":"终端日志获取"}, # 0
    "GPS_":{"CODE":'0C',"TYPE":"0,N","DESC":"GPS定位经纬度信息"}, # 0 DDDDDddddNDDDDDddddE
    "TCOM":{"CODE":'0D',"TYPE":"2","DESC":"通信时间间隔(sec)"}, # 2
    "TSEN":{"CODE":'0E',"TYPE":"2","DESC":"数据采集唤醒间隔(sec)"}, # 2
    "VBAT":{"CODE":'0F',"TYPE":"2","DESC":"电池电压与电量(mV)"}, # 2
    "VOUT":{"CODE":'10',"TYPE":"2","DESC":"外来电压(mV)"}, # 2
    "SIGN":{"CODE":'11',"TYPE":"1","DESC":"通信信号强度(0~31)"}, # 1
    "CIMI":{"CODE":'12',"TYPE":"0,N","DESC":"SIM卡CIMI码"}, # 0
    "FXMA":{"CODE":'13',"TYPE":"2","DESC":"风扇最大的工作电流(mA)"}, # 2
    "DOWA":{"CODE":'14',"TYPE":"2","DESC":"舱门开启告警时间设定(sec)"}, # 2
    "TWAR":{"CODE":'15',"TYPE":"1,2","DESC":"温度通道告警设置(°C)"}, # 1 + 2 通道+温度
    "VLOW":{"CODE":'80',"TYPE":"2","DESC":"电池过低(mV)"}, # 2 mV
    "FLOW":{"CODE":'81',"TYPE":"2","DESC":"风扇堵转或者故障(mA)"}, # 2 mA
    "DOAL":{"CODE":'82',"TYPE":"2","DESC":"舱门开启时间过长告警(sec)"}, # s
    "DOTI":{"CODE":'83',"TYPE":"2","DESC":"舱门开启动作(sec)"}, # 2
    "VOVA":{"CODE":'84',"TYPE":"2","DESC":"外供电开始(mV)"}, # 2 mV
    "T_AL":{"CODE":'85',"TYPE":"1,2","DESC":"箱体温度告警(°C)"}, # 1+2 温度*10
```

```
int.from_bytes(pac[6:8], byteorder='little', signed=True) => low byte first
```

```
PACKET:
PACKET_CODE=code
PACKET_LEN=length(PACKET_DATA)
PACKET_DATA=bytes
```

9. 建立tables



item

- 🔑 id: int
- name: varchar
- iot_id: varchar
- imei: varchar
- desc: varchar
- status: varchar
- last_off_time: datetime
- on_time: datetime
- create_time: datetime
- 5 more columns...

trandata

- 🔑 line_id: int
- imei: varchar
- code: varchar
- code_name: varchar
- seq: int
- desc: varchar
- data: varchar
- 6 more columns...

code_detail

- code_type: varchar
- code: varchar
- code_name: varchar
- desc: varchar
- 5 more columns...

安装 mysql 后

```
$ sudo mysql
create user 'iot'@localhost identified by 'iot';
grant all on *.* to iot@localhost;
exit;
```

```
$ mysql -u iot -piot
create database pabox;
use pabox;
```

	ITEM		
ID	VARCHAR(30)	internal Unique ID	
NAME	VARCHAR(200)	IOT名字	
IMEI	VARCHAR(200)		
ITEM_DESC	VARCHAR(200)	IOT描述	
STATUS	VARCHAR(10)	valid ?	
CREATE_TIME	DATETIME	建立时间	
LAST_OFF_TIME	DATETIME	上次关机时间	
ON_TIME	DATETIME	开机时间	
ATTR01	VARCHAR(45)	DIRTY Flag(资料有变动?)	
ATTR02	VARCHAR(45)	设置温度上限和下限参数(°C)	
ATTR03	VARCHAR(45)	风扇最大的工作电流(mA)	
ATTR04	VARCHAR(45)	舱门开启告警时间设定(秒)	
ATTR05	VARCHAR(45)	温度通道告警设置(°C)	
ATTR06	VARCHAR(200)	控制开锁动作	
ATTR07	VARCHAR(200)	通信时间间隔(sec)	
ATTR08	VARCHAR(200)	数据采集唤醒间隔(sec)	
ATTR09	VARCHAR(200)		
ATTR10	VARCHAR(200)		

	CODE_DETAIL		
CODE_TYPE	VARCHAR(10)		
CODE	VARCHAR(200)		
DETAIL	VARCHAR(200)		
DESC	VARCHAR(200)		
ATTR01	VARCHAR(45)		
ATTR02	VARCHAR(45)		
ATTR03	VARCHAR(45)		
ATTR04	VARCHAR(45)		
ATTR05	VARCHAR(45)		

	TRANDATA		
LINE_ID	INTEGER	表序号	
IMEI	VARCHAR(32)	IMEI号码	
CODE	VARCHAR(45)	接收的指令	
CODE_NAME	VARCHAR(45)	指令名称	
SEQ	NUMBER		
DESC	VARCHAR(45)	指令描述	
DATA	VARCHAR(1024)	接收或是传送的资料(json)	
ATTR01	VARCHAR(45)		
ATTR02	VARCHAR(45)		
ATTR03	VARCHAR(45)		
ATTR04	VARCHAR(45)		
ATTR05	VARCHAR(45)		
CREATE_TIME	DATETIME		
TIME_D	VARCHAR(32)	S or D or C上传时机	

以上归纳出建立tables的script：

```
  CREATE DATABASE `pabox`;
  USE `pabox`;

CREATE TABLE `code_detail` (
  `code_type` varchar(32) DEFAULT NULL,
  `code` varchar(45) DEFAULT NULL,
  `code_name` varchar(45) DEFAULT NULL,
  `desc` varchar(45) DEFAULT NULL,
  `attr01` varchar(45) DEFAULT NULL,
  `attr02` varchar(45) DEFAULT NULL,
  `attr03` varchar(45) DEFAULT NULL,
  `attr04` varchar(45) DEFAULT NULL,
  `attr05` varchar(45) DEFAULT NULL,
  UNIQUE KEY `code_UNIQUE` (`code_type`,`code`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;


CREATE TABLE `item` (
  `id` int(11) NOT NULL AUTO_INCREMENT,
  `name` varchar(64) DEFAULT NULL,
  `iot_id` varchar(45) DEFAULT NULL,
  `imei` varchar(45) DEFAULT NULL,
  `desc` varchar(45) DEFAULT NULL,
  `status` varchar(45) DEFAULT NULL,
  `last_off_time` datetime DEFAULT NULL,
  `on_time` datetime DEFAULT NULL,
  `create_time` datetime DEFAULT CURRENT_TIMESTAMP,
  `attr01` varchar(45) DEFAULT NULL,
  `attr02` varchar(45) DEFAULT NULL,
  `attr03` varchar(45) DEFAULT NULL,
  `attr04` varchar(45) DEFAULT NULL,
  `attr05` varchar(45) DEFAULT NULL,
  `attr06` varchar(200) DEFAULT NULL,
  `attr07` varchar(200) DEFAULT NULL,
  `attr08` varchar(200) DEFAULT NULL,
  `attr09` varchar(200) DEFAULT NULL,
  `attr10` varchar(200) DEFAULT NULL,
  PRIMARY KEY (`id`),
  KEY `item_iot_id` (`iot_id`),
  KEY `item_imei` (`imei`)
) ENGINE=InnoDB AUTO_INCREMENT=1 DEFAULT CHARSET=utf8;


DROP TABLE IF EXISTS `trandata`;
CREATE TABLE `trandata` (
  `line_id` int(11) NOT NULL AUTO_INCREMENT,
  `imei` varchar(32) DEFAULT NULL,
  `code` varchar(45) DEFAULT NULL,
  `code_name` varchar(45) DEFAULT NULL,
  `seq` int(11) DEFAULT NULL,
  `desc` varchar(45) DEFAULT NULL,
  `data` varchar(1024) CHARACTER SET utf8 COLLATE utf8_general_ci DEFAULT NULL,
  `attr01` varchar(45) DEFAULT NULL,
  `attr02` varchar(45) DEFAULT NULL,
  `attr03` varchar(45) DEFAULT NULL,
  `attr04` varchar(45) DEFAULT NULL,
  `attr05` varchar(45) DEFAULT NULL,
  `create_time` datetime DEFAULT CURRENT_TIMESTAMP,
  `time_d` varchar(32) DEFAULT NULL,
  PRIMARY KEY (`line_id`)
) ENGINE=InnoDB AUTO_INCREMENT=1 DEFAULT CHARSET=utf8;
```

10. 安裝執行

login iothub
ssh ubuntu@iothub

安裝

```
$ mkdir mqtt
$ cp pa*.py mqtt/*
```

執行

```
$ cd ~/mqtt
$ ./pa_sub.py
```

此处未将pa_sub.py做成系统service (systemctl),待系统稳定后，再设定或是不做

PABOX/$IMEI topic的 $IMEI 必须先行在TABLE ITEM注册输入，才会处理，否则会因为无资料而略过。