INGICS TECHNOLOGY

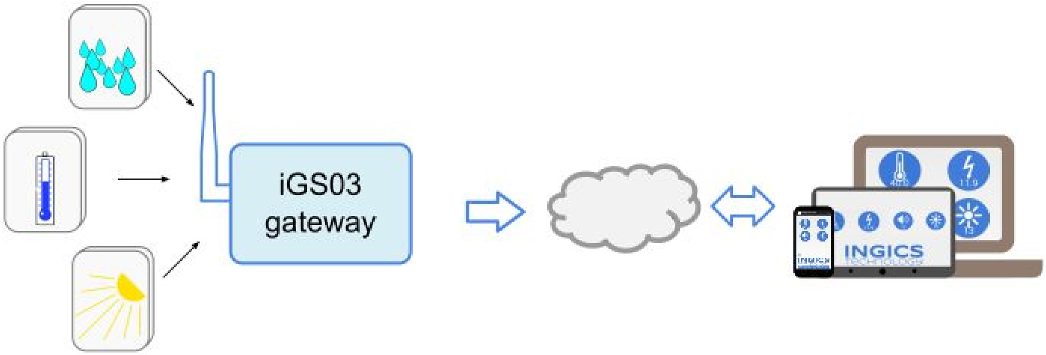
AP NOTE

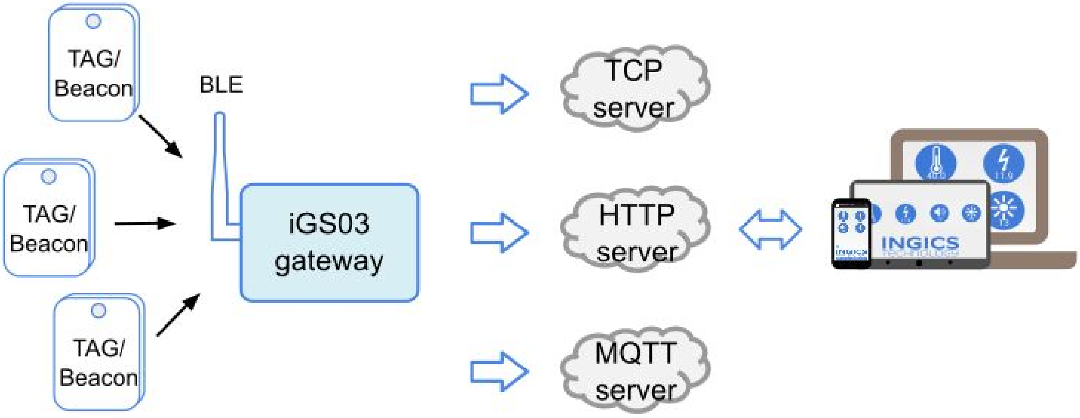
Ver.1

Getting Started with iGS03M

Introduction

The iGS03M device is a BLE-Gateway used to receive BLE advertising data from BLE beacons, tags and sensors, and then send the data to the network server through LTE interface.





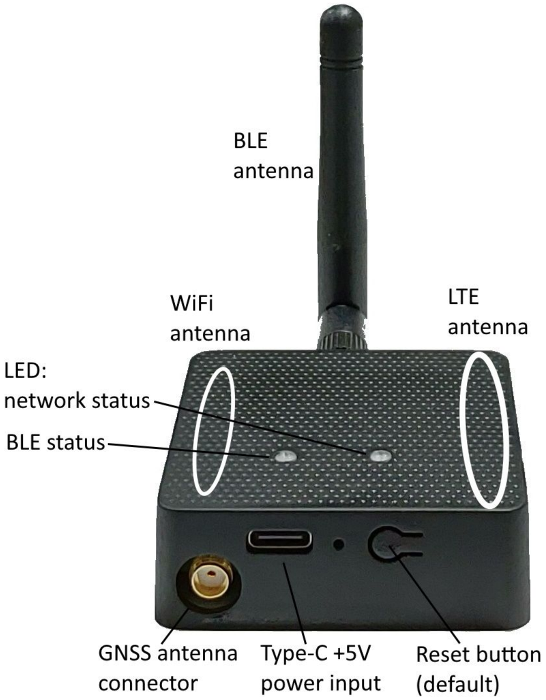
In this tutorial, you will learn about how to:

1. set up and configure the iGS03M
2. collect data with a simple TCP client
3. identify the data you want, and set up the beacon filter
4. publish and collect data with a public MQTT broker using LTE interface

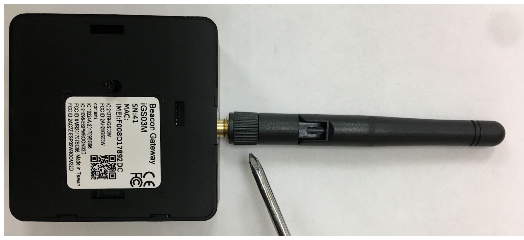
Device Preparation

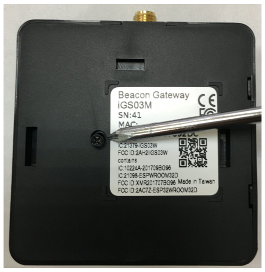
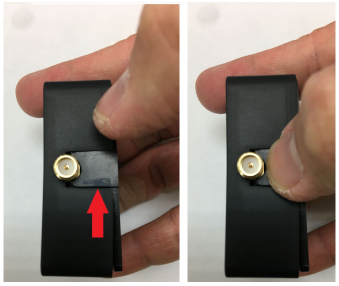
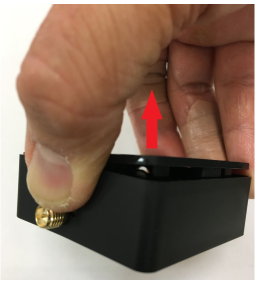
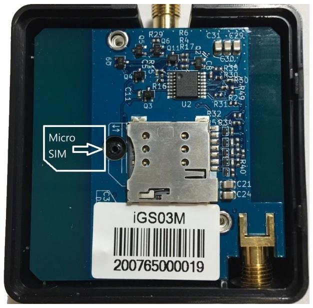
1. iGS03M

To power on the iGS03M, connect the device to the power supply with the USB-C connector. The iGS03M requires a 5V, 2A throughput adapter.



To use LTE transmission, you have to put a **LTE Cat-M1** micro SIM card into the socket of iGS03M. Please follow below steps to open the bottom cover and insert the SIM card.

Step 1. Remove external BLE antenna	

Step 2. Remove the screw from bottom cover	
Step 3. Use finger to press and hold the arrow part	
Step 4. Pull out the bottom cover	
Step 5. Insert Micro SIM in to the socket	

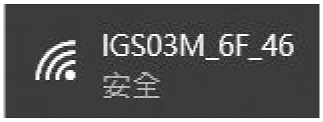
2. Tag/Beacon

To test the BLE-Gateway functionality, it will require a tag/beacon like Apple iBeacon, Eddystone or any other BLE tag/beacon as the BLE data source. We use an Ingics iBS03T (temperature sensor beacon) as the example in this guide. Follow the beacon's user guide to powered on and configure (if required) the beacon.

Connect to the device

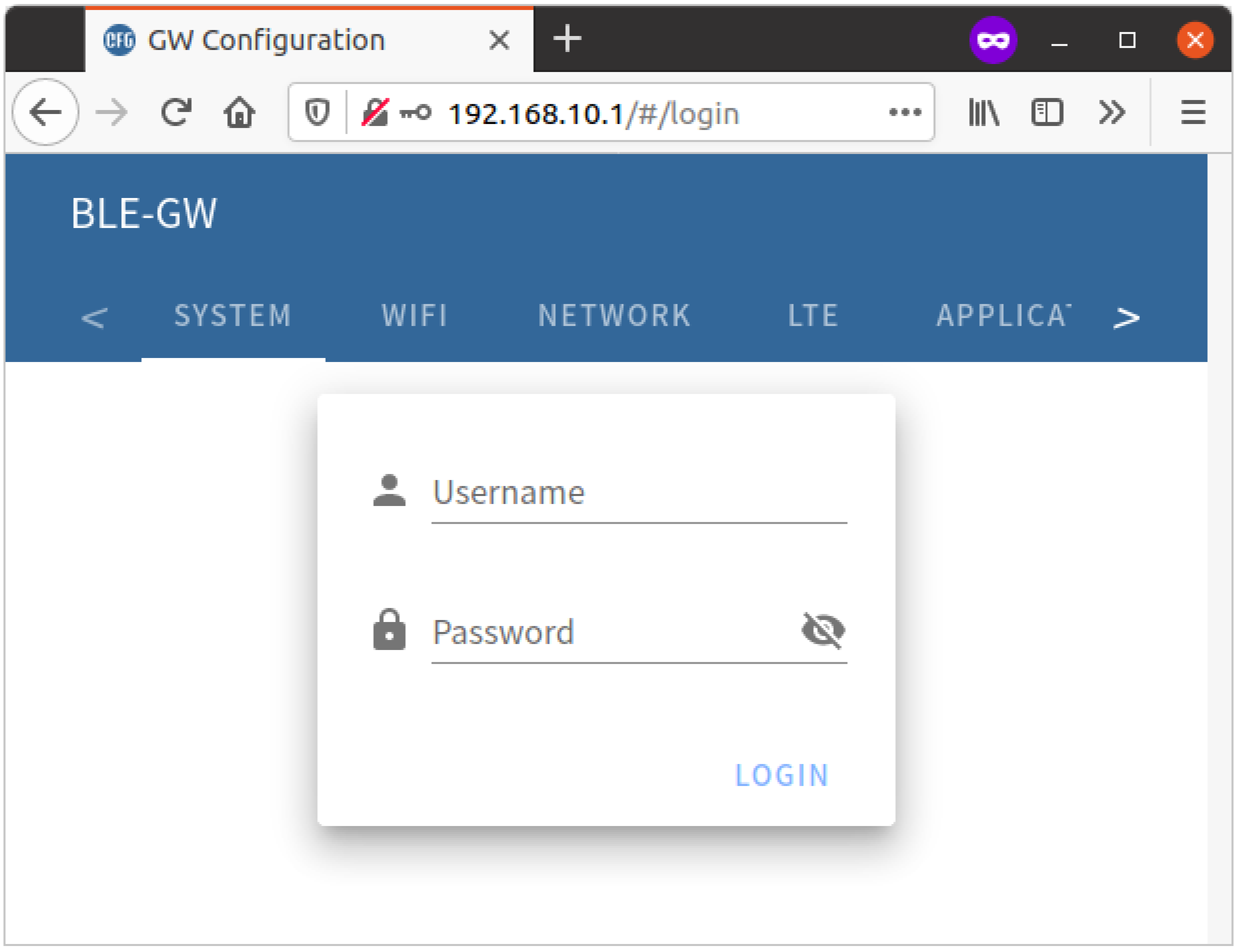
1. Join WiFi AP

The iGS03M has a WiFi device that works as a WiFi access point (AP) by default. After it is powered on, you could scan its native AP and connect it with the WiFi of your NB, PC, Mac, Tablet or Smartphone. It's SSID is just like the below figure with part of the mac address. The default key to connect with it is "12345678".



2. Access WebUI

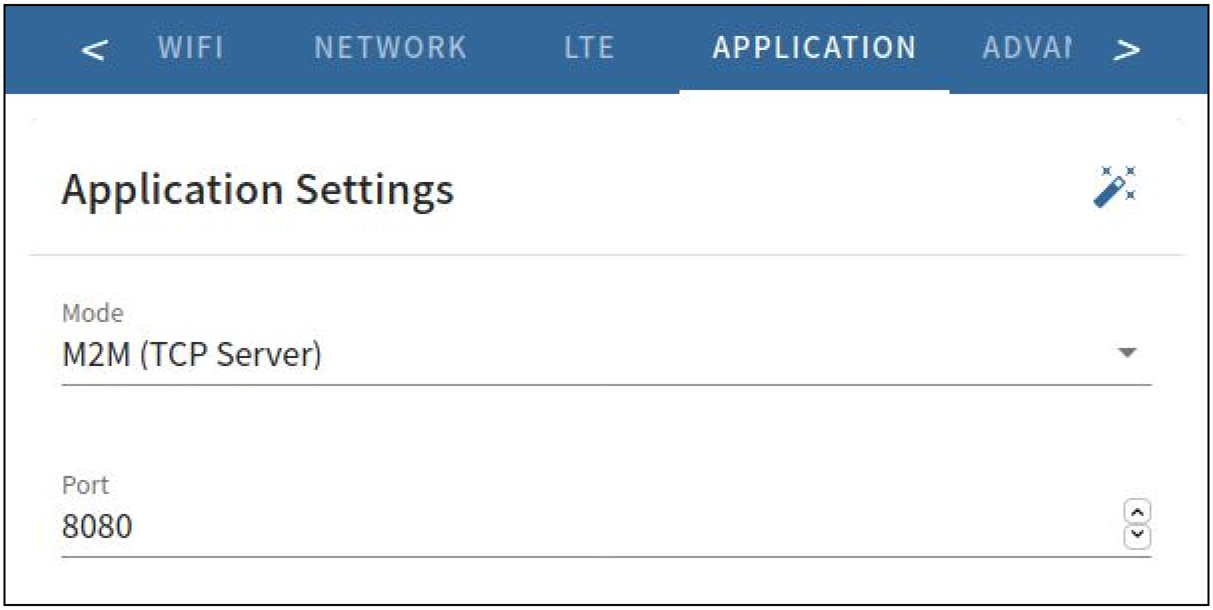
After connection, the iGS03M IP address will be 192.168.10.1 by default. You can connect to the IP address on your web browser to access the Web UI. The default account/password are both "**admin**".



Collect data using TCP client

1. Configuration

After login to the Web UI, switch to the “APPLICATION” tab. The application means the gateway how-to report data. The default setting is “**M2M (TCP Server)**”, it means the gateway works as a TCP server, you can connect to the server, and the gateway will send the received BLE data to the connection.



Application Settings

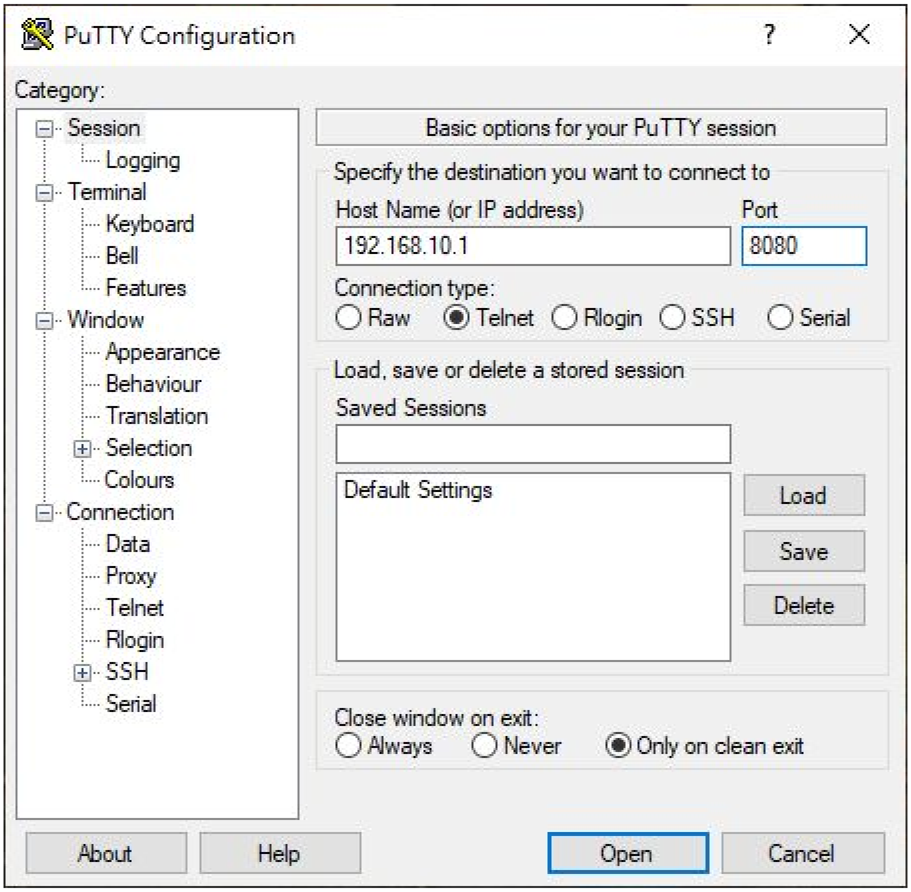
Mode
M2M (TCP Server)

Port
8080

This mode is normally used for testing only. You can check if the gateway can receive the BLE data as your expection without any server set up and configuration.

2. Connect to the TCP Server

As described above, the default setting is running a TCP server at port 8080. You can choose your favorite telnet client to connect to **192.168.10.1** port **8080**.
For example, using PuTTY (https://www.putty.org/):



PuTTY Configuration

Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address): 192.168.10.1

Port: 8080

Connection type: ○ Raw ● Telnet ○ Rlogin ○ SSH ○ Serial

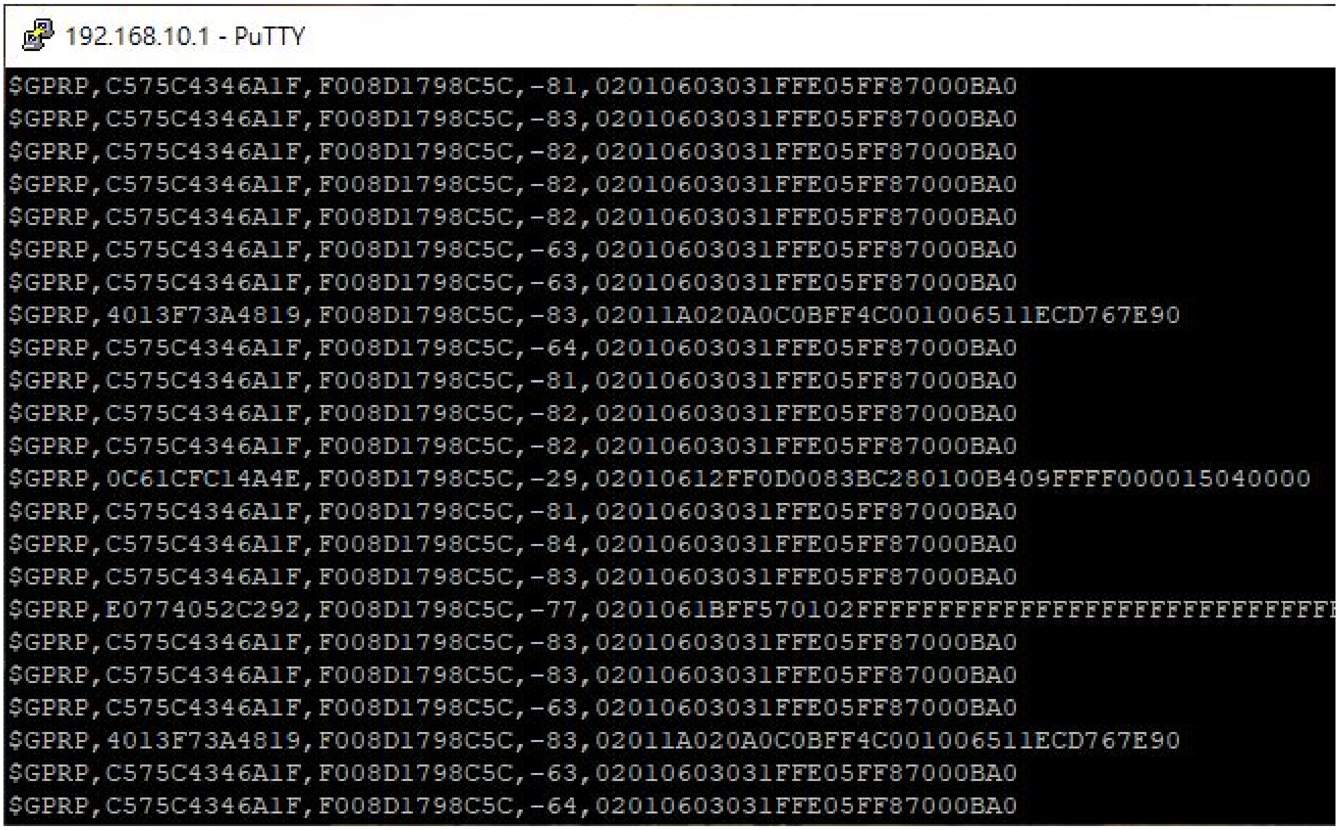
Load, save or delete a stored session

Saved Sessions

Default Settings

Close window on exit: ○ Always ○ Never ● Only on clean exit

After connecting, you should see the iGS03M keep reporting data to the connection as below figure. That means the iGS03M is working, it can receive the BLE advertisements and report them following the “APPLICATION” settings.



192.168.10.1 - PuTTY

```
$GPRP,C575C4346A1F,F008D1798C5C,-81,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-83,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-82,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-82,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-82,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-63,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-63,02010603031FFE05FF87000BA0
$GPRP,4013F73A4819,F008D1798C5C,-83,02011A020A0C0BFF4C001006511ECD767E90
$GPRP,C575C4346A1F,F008D1798C5C,-64,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-81,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-82,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-82,02010603031FFE05FF87000BA0
$GPRP,0C61CFC14A4E,F008D1798C5C,-29,02010612FF0D0083BC280100B409FFFF000015040000
$GPRP,C575C4346A1F,F008D1798C5C,-81,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-84,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-83,02010603031FFE05FF87000BA0
$GPRP,E0774052C292,F008D1798C5C,-77,0201061BFF570102FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
$GPRP,C575C4346A1F,F008D1798C5C,-83,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-83,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-63,02010603031FFE05FF87000BA0
$GPRP,4013F73A4819,F008D1798C5C,-83,02011A020A0C0BFF4C001006511ECD767E90
$GPRP,C575C4346A1F,F008D1798C5C,-63,02010603031FFE05FF87000BA0
$GPRP,C575C4346A1F,F008D1798C5C,-64,02010603031FFE05FF87000BA0
```

3. Report format

Each line reported by iGS03M present one BLE advertisement it received, and the format is:

$<report type>,<tag id>,<gateway id>,<rssi>,<raw packet content>,*<unix epoch timestamp>\r\n

<report type>	Different report type to distinguish the source of the report.
<tag id>	MAC address or ID of tag/beacon
<gateway id>	MAC address of gateway
<rssi>	RSSI of tag/beacon
<raw packet content>	Raw packet received by the gateway in HEX string
<unix epoch timestamp>	Optional timestamp configured in applications page

You can use the <tag id> to identify the data sent by your beacon. And you can parse the <raw packet content> according to the beacon's payload format.

Below is the example belonging to the test iBS03T beacon. We marked the battery voltage in green (2.96V) and temperature in blue (25.26) here for easy understanding. You can refer to the iBS03 payload format document for detail.

$GPRP,0C61CFC14A4E,F008D1798C5C,-29,02010612FF0D0083BC280100D109FFFF000015040000

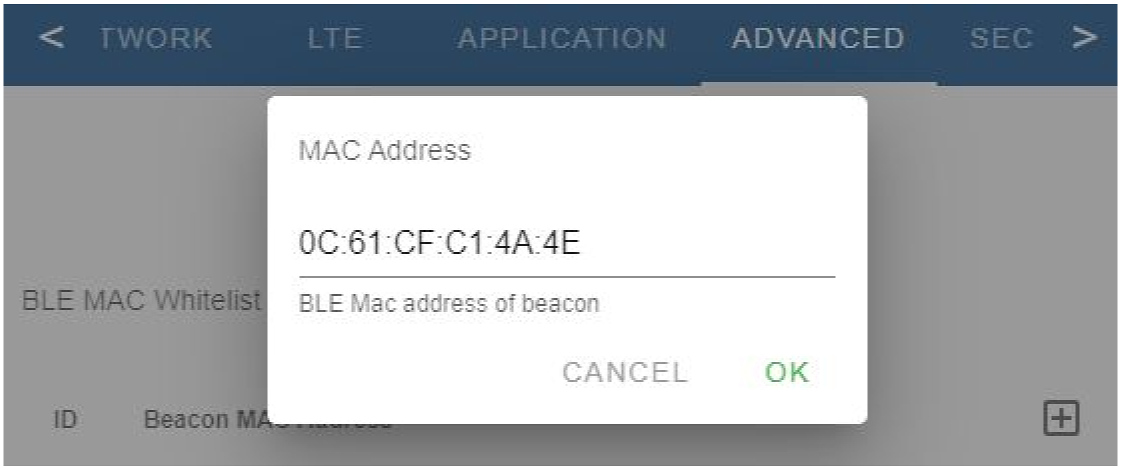
And here is an example for Apple iBeacon. You can find the iBeacon payload format on the internet, the UUID marked as yellow, major number in blue, and the minor number in green.

$GPRP,0081F985FE8C,F008D1798C5C,-68,0201061AFF4C000215B9A5D27D56CC4E3AAB511F2153BCB96700001FE8CD6

4. Set up Beacon filter

You may notice that there are many BLE devices that broadcast data, and that cause it's hard to identify which data belongs to your beacon. And further, if iGS03M reports those data to the server using LTE interface, that may take a lot of data usage of your LTE account. So, we strongly recommend that you set up the beacon filter before enabling LTE transmission.

In this example, the test beacon's BLE MAC address is 0C:61:CF:C1:4A:4E. Normally you can find the MAC address on your beacon's label. Open the Web UI, switch to "ADVANCED" tab, scroll down to the "BLE White List", add a new entry and fill the MAC address.



MAC Address

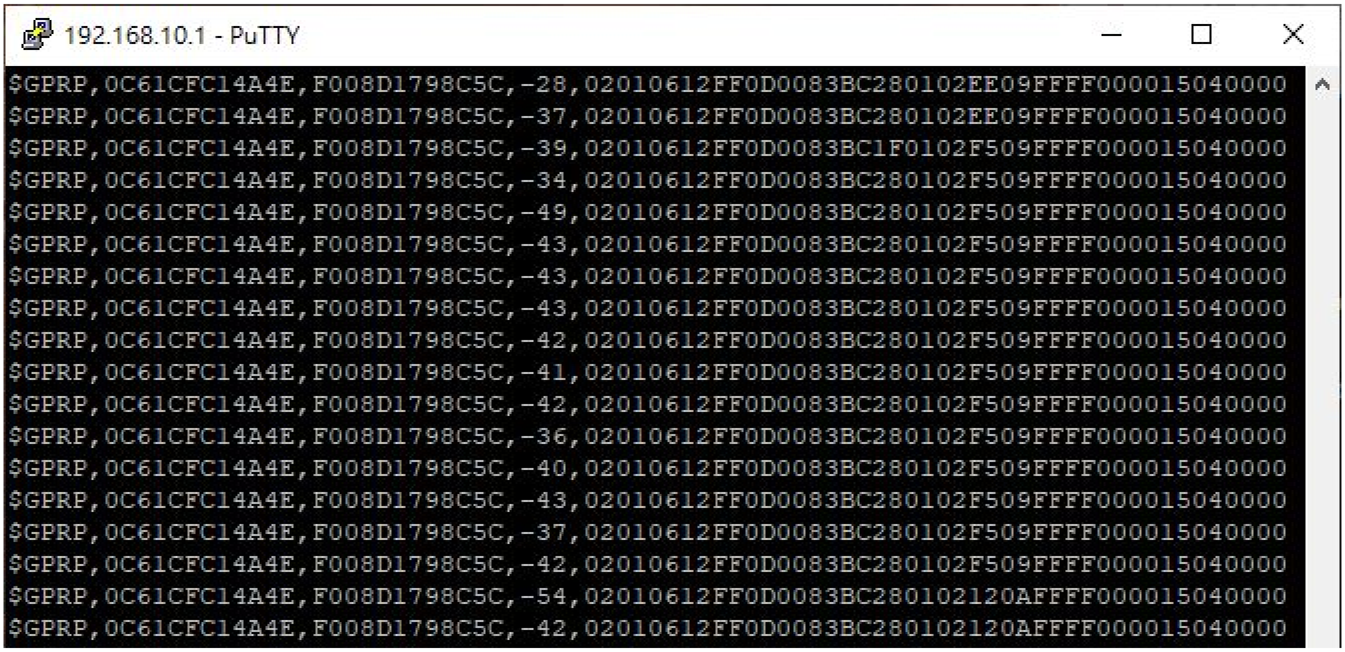
0C:61:CF:C1:4A:4E

BLE Mac address of beacon

You need to “SAVE” the change and reboot the device to let filter setting take effect.

Require reboot for the changes to take effect. REBOOT

Then you can telnet to the device again, you should see only the data belonging to this beacon will be reported.

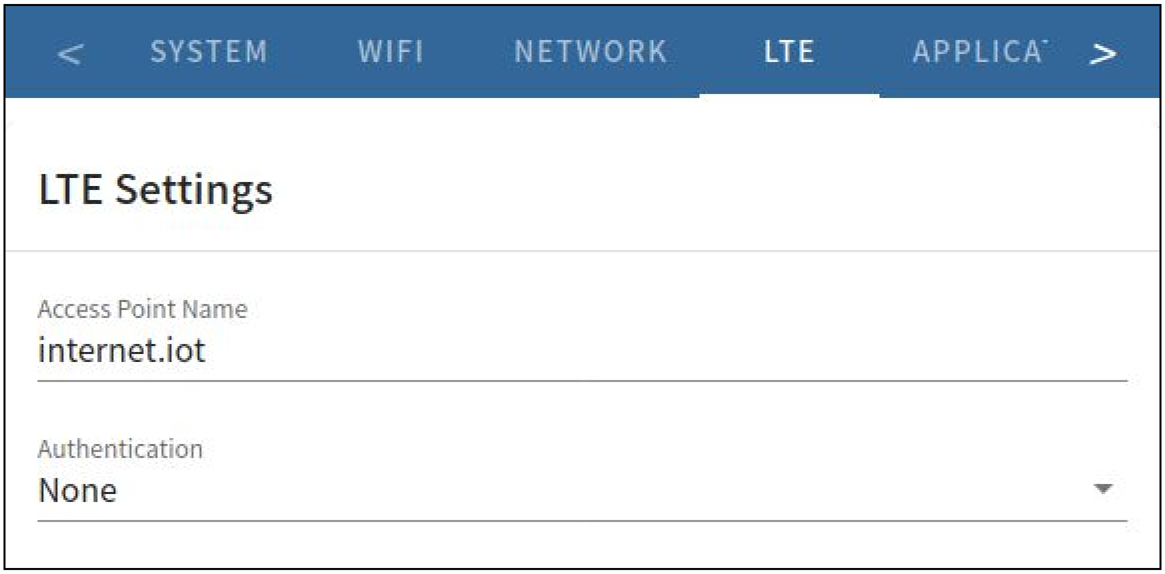


```
$GPRP,0C61CFC14A4E,F008D1798C5C,-28,02010612FF0D0083BC280102EE09FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-37,02010612FF0D0083BC280102EE09FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-39,02010612FF0D0083BC1F0102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-34,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-49,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-43,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-43,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-43,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-42,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-41,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-42,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-36,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-40,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-43,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-37,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-42,02010612FF0D0083BC280102F509FFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-54,02010612FF0D0083BC280102120AFFFF000015040000
$GPRP,0C61CFC14A4E,F008D1798C5C,-42,02010612FF0D0083BC280102120AFFFF000015040000
```

Transmit data using MQTT protocol and LTE interface

1. LTE Configuration

Switch to 'LTE' tab in Web UI. Fill the APN and authentication (if required) follows the carrier's requirement.

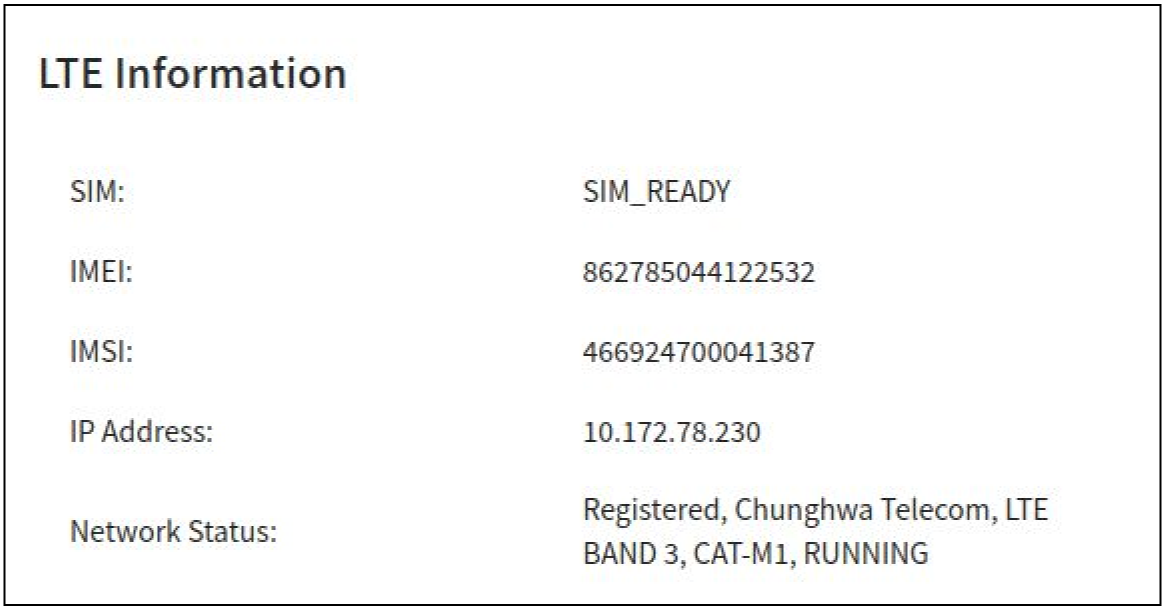


LTE Settings

Access Point Name
internet.iot

Authentication
None

SAVE the configuration and reboot the device, the network status LED should be light on GREEN. And you can check the LTE information in the "SYSTEM" tab of Web UI.



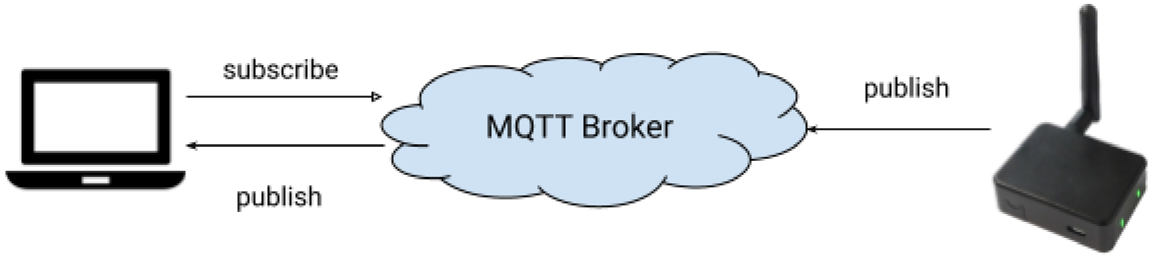
LTE Information

SIM:	SIM_READY
IMEI:	862785044122532
IMSI:	466924700041387
IP Address:	10.172.78.230
Network Status:	Registered, Chunghwa Telecom, LTE BAND 3, CAT-M1, RUNNING

Please make sure the network status is registered, and the IP address is obtained. If the SIM status is not READY or IMSI is empty, which means the device fails to access the SIM card, please re-install the SIM card and test again. If still having issues, please follow the LTE troubleshooting section to collect related logs and information and report to us.

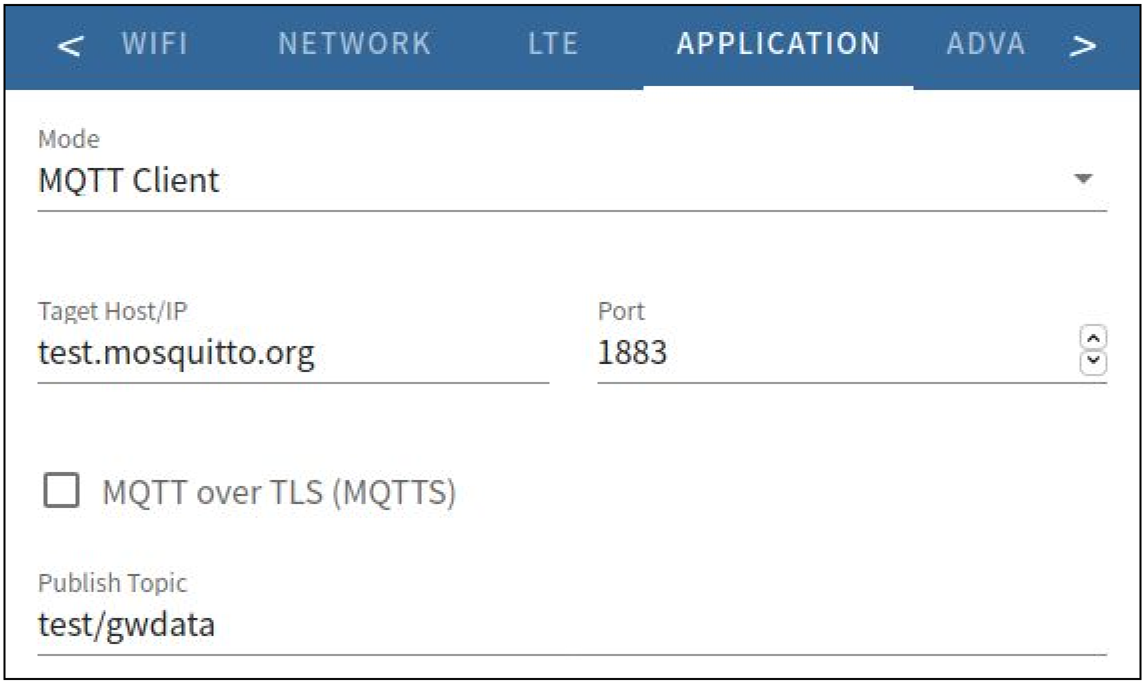
2. MQTT Configuration

Message Queuing Telemetry Transport is a message protocol for restricted networks (low bandwidth) and IoT devices with extremely high latency. The iGS03M device will publish data to the MQTT broker, and you can use any MQTT subscriber to subscribe and receive the data from the broker.



In “APPLICATION” tab, set up as below

- Mode: MQTT Client
- Target Host/IP: test.mosquitto.org
- Port: 1883
- Publish Topic: test/gwdata



Mode
MQTT Client

Taget Host/IP
test.mosquitto.org

Port
1883

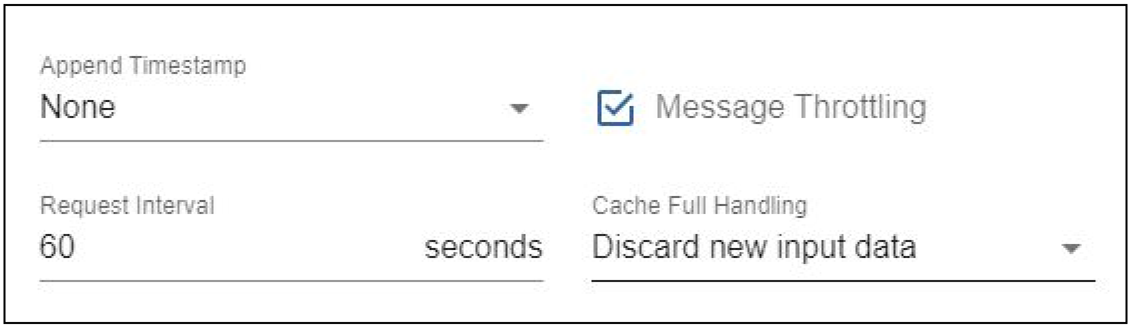
□ MQTT over TLS (MQTTS)

Publish Topic
test/gwdata

The “test.mosquitto.org” host a publicly available MQTT broker for testing. You should set up your own MQTT broker for your application. We did not invoke the broker set up in this guide, just focus on how-to set up and use MQTT transmission on iGS03M.

Again, to avoid any unexpected data usage on LTE transmission, please scrolling down in the “APPLICATION” tab to the bottom, follow below settings:

- Enable message throttling
- Setup request interval to 60 seconds
- Discard new input data when cache full



Append Timestamp
None

☑ Message Throttling

Request Interval
60 seconds

Cache Full Handling
Discard new input data

This configuration means the iGS03M publishes only one record for each beacon every 60 seconds.

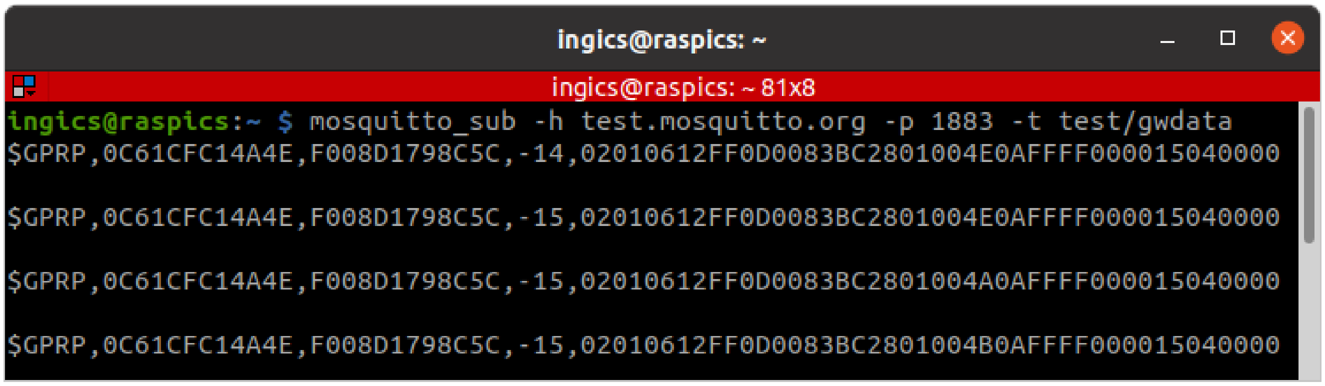
3. Collect (subscribe) data from MQTT broker

Now we can use a MQTT subscriber to verify the data published by iGS03M. We list three examples here for you to reference.

Eclipse Mosquitto™

Eclipse Mosquitto is a project with full function implements of the MQTT protocol. It supports various platforms and operating systems. It includes a MQTT command line client “mosquitto_sub”, and we can use it to verify the MQTT data. You can download the installer in below URL
https://mosquitto.org/download/

$ mosquitto_sub -h test.mosquitto.org -p 1883 -t test/gwdata

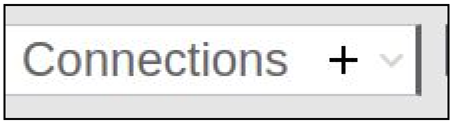


```
ingics@raspics:~ $ mosquitto_sub -h test.mosquitto.org -p 1883 -t test/gwdata
$GPRP,0C61CFC14A4E,F008D1798C5C,-14,02010612FF0D0083BC2801004E0AFFFF000015040000

$GPRP,0C61CFC14A4E,F008D1798C5C,-15,02010612FF0D0083BC2801004E0AFFFF000015040000

$GPRP,0C61CFC14A4E,F008D1798C5C,-15,02010612FF0D0083BC2801004A0AFFFF000015040000

$GPRP,0C61CFC14A4E,F008D1798C5C,-15,02010612FF0D0083BC2801004B0AFFFF000015040000
```

MQTTLens

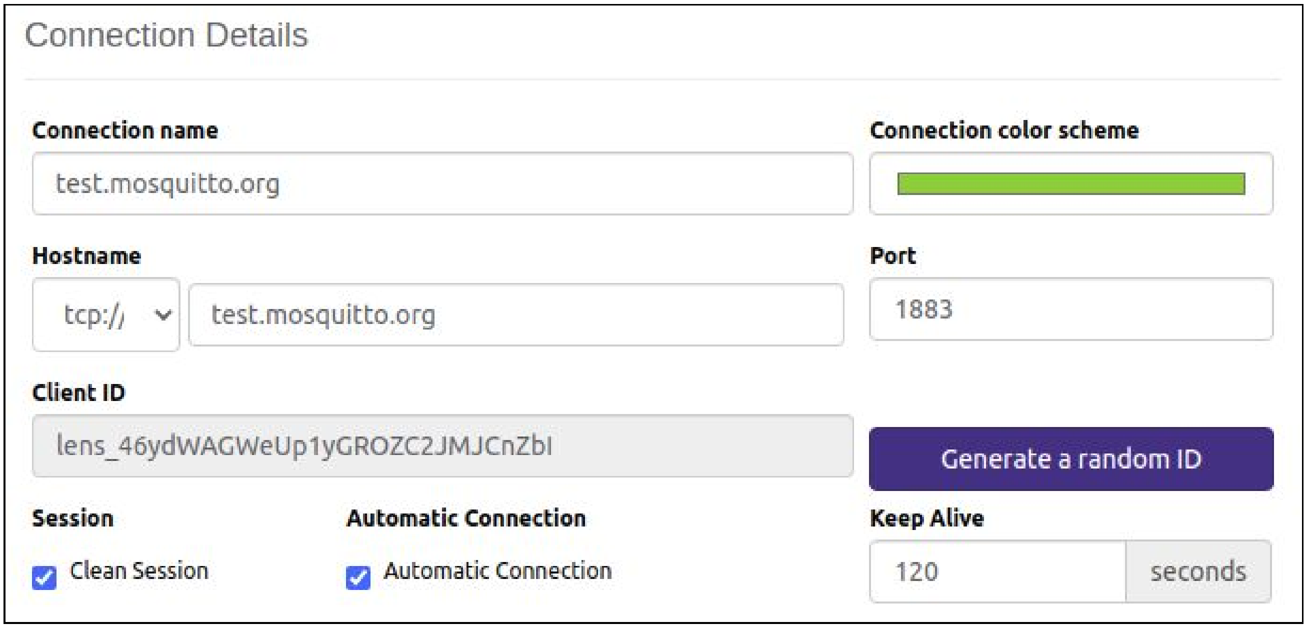
MQTTLens is a Google Chrome Application, you can install and launch it by below URL
https://chrome.google.com/webstore/detail/mqttlens/hemojaaeigabkbcookmlgmdigohjobjm

Click the “plus” button to create a new connection.



Fill the connect configuration

- Hostname: test.mosquitto.org
- Port: 1883



Connection Details

Connection name: test.mosquitto.org

Connection color scheme: 🟩

Hostname: tcp:// test.mosquitto.org

Port: 1883

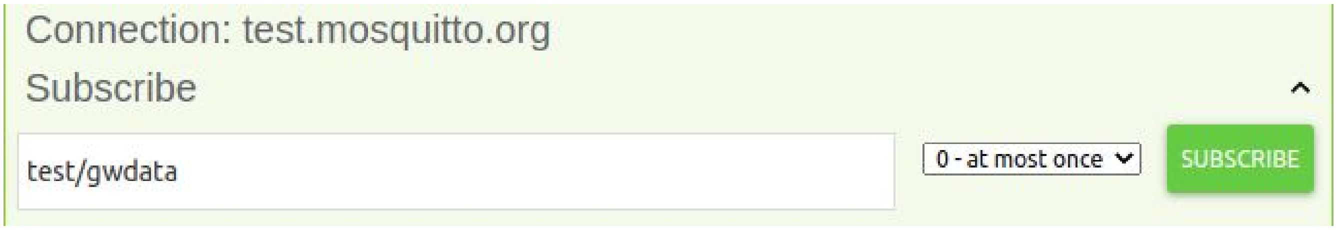
Client ID: lens_46ydWAGWeUp1yGROZC2JMJCnZbI

Session: ☑ Clean Session

Automatic Connection: ☑ Automatic Connection

Keep Alive: 120 seconds

After connection created, fill the subscribe topic: test/igs03m



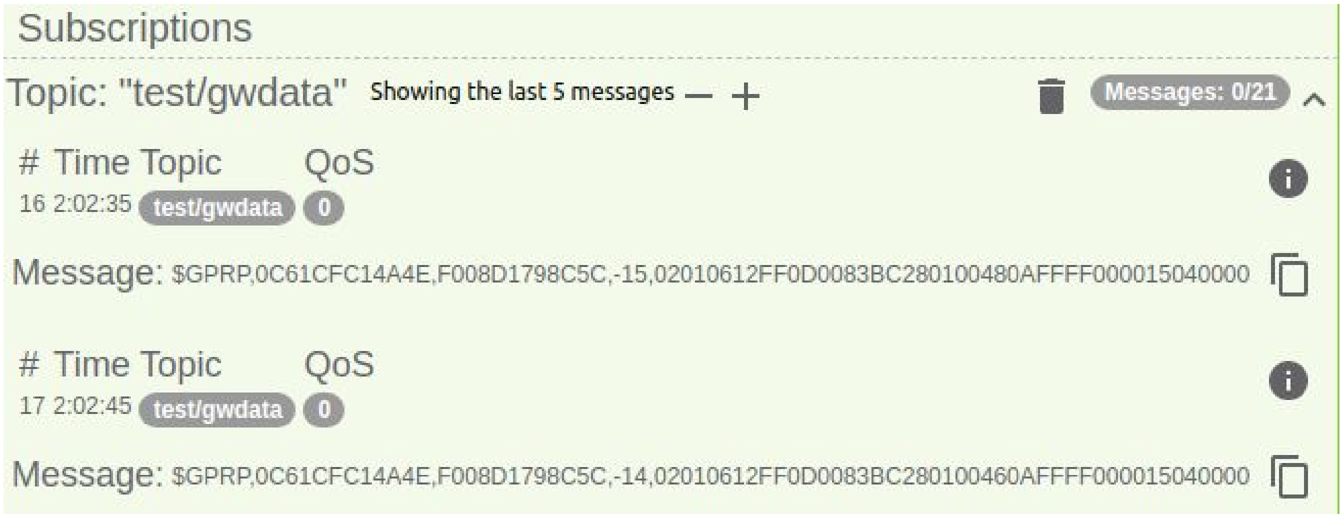
Connection: test.mosquitto.org

Subscribe

test/gwdata

0 - at most once

Click the "SUBSCRIBE" button, you should see the published data like below.



Subscriptions

Topic: "test/gwdata" Showing the last 5 messages

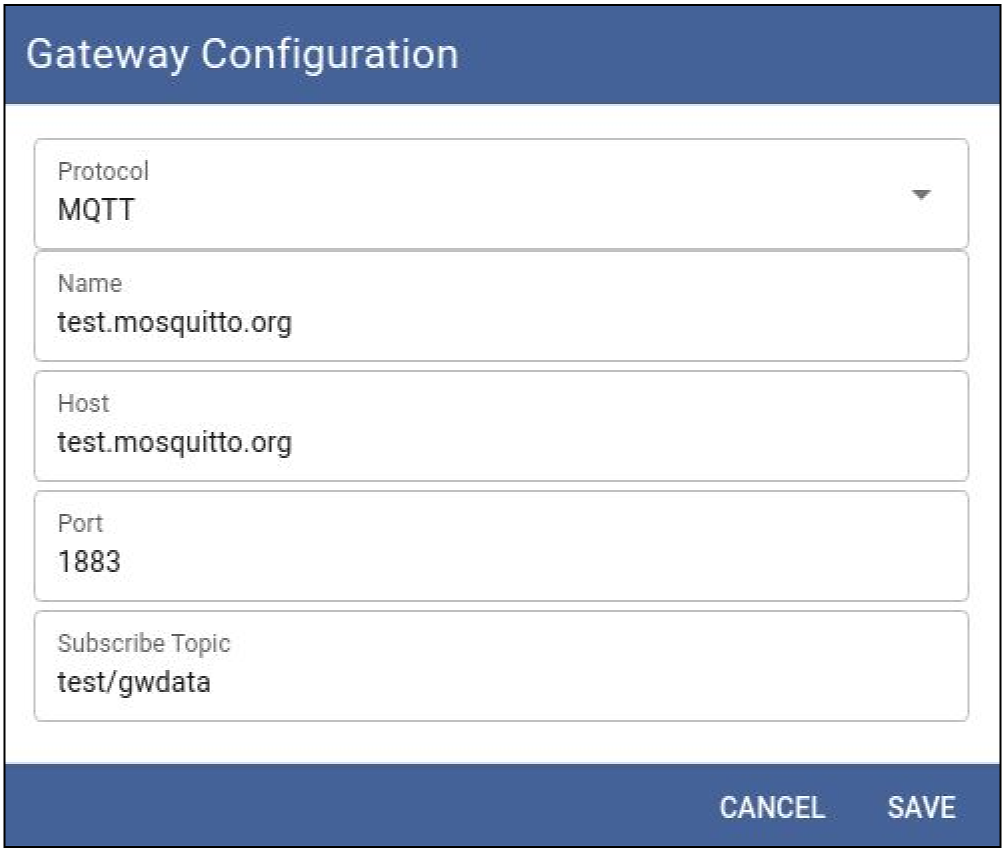
```
# Time Topic        QoS
16 2:02:35 test/gwdata 0
Message: $GPRP,0C61CFC14A4E,F008D1798C5C,-15,02010612FF0D0083BC280100480AFFFF000015040000

# Time Topic        QoS
17 2:02:45 test/gwdata 0
Message: $GPRP,0C61CFC14A4E,F008D1798C5C,-14,02010612FF0D0083BC280100460AFFFF000015040000
```

Ingics DemoBoard APP

It is an application for Ingics Beacon Gateway testing & demonstration. The application includes a payload parser for most of INGICS BLE beacons and some public payload format (for example, iBeacon, Eddystone, …, etc). You can download the latest release in the URL below.
https://github.com/ingics/ingics-blegw-demoboard/releases

Click the “plus” button to create a new Gateway.

- Protocol: MQTT
- Host: test.mosquitto.org
- Port: 1883
- Subscribe Topic: test/gwdata



Gateway Configuration

Protocol
MQTT

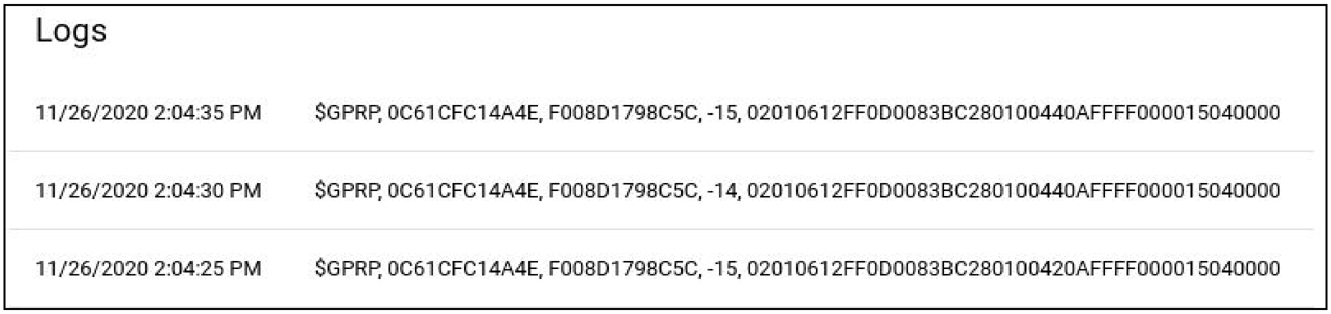
Name
test.mosquitto.org

Host
test.mosquitto.org

Port
1883

Subscribe Topic
test/gwdata

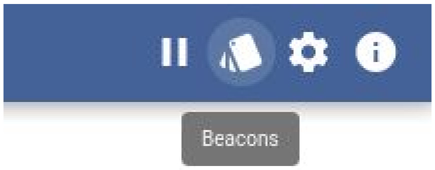
Click the gateway card to start receiving data.



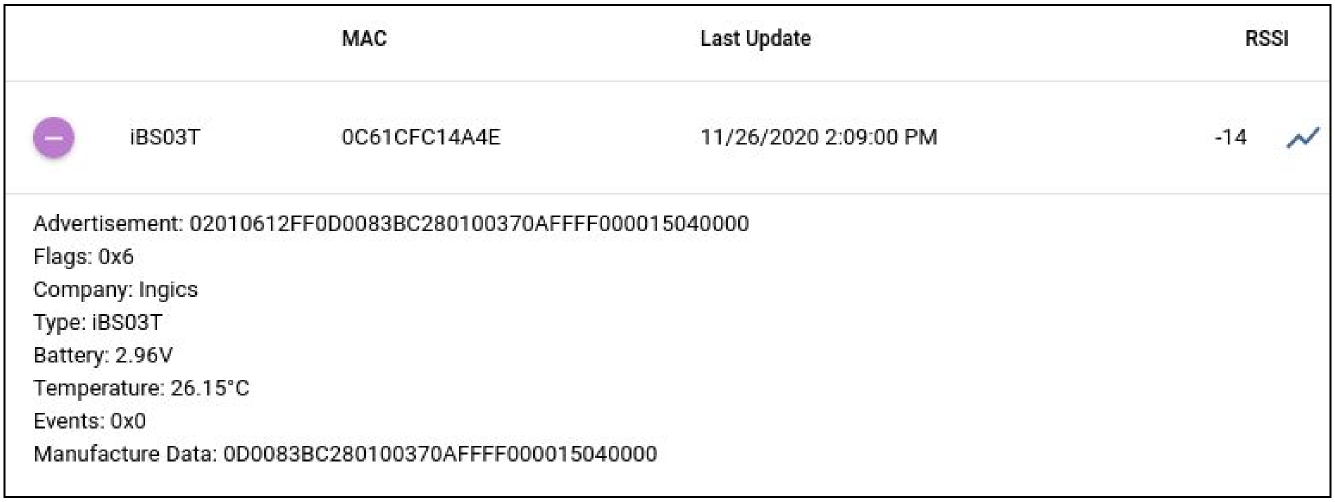
Logs

```
11/26/2020 2:04:35 PM    $GPRP, 0C61CFC14A4E, F008D1798C5C, -15, 02010612FF0D0083BC280100440AFFFF000015040000
11/26/2020 2:04:30 PM    $GPRP, 0C61CFC14A4E, F008D1798C5C, -14, 02010612FF0D0083BC280100440AFFFF000015040000
11/26/2020 2:04:25 PM    $GPRP, 0C61CFC14A4E, F008D1798C5C, -15, 02010612FF0D0083BC280100420AFFFF000015040000
```

Click the “Beacon” icon on the right of the header to switch to the beacon view.



The beacon view will display the newest status (parsed from latest log) of beacon.



		MAC	Last Update	RSSI
●	iBS03T	0C61CFC14A4E	11/26/2020 2:09:00 PM	-14

Advertisement: 02010612FF0D0083BC280100370AFFFF000015040000
Flags: 0x6
Company: Ingics
Type: iBS03T
Battery: 2.96V
Temperature: 26.15°C
Events: 0x0
Manufacture Data: 0D0083BC280100370AFFFF000015040000

Troubleshooting

LTE

For LTE-M connection related issue, please provide us below information:

- Which carrier is used
- Which SIM card is used (APN/auth/user/password settings). Please check with the carrier to make sure the SIM card is LTE-M capable.
- Telnet to device IP and get below command output
  - SYS
  - LTE INFO
  - LTE LOG

Revision History

DATE	REVISION	CHANGES
Nov 26, 2020	1	Initial release