

# UNOlite indoor air quality monitor

## MQTT User Guide

VER 0.1



**uno**<sup>®</sup>  
lite

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## 【Revision】

Date	Version	Description
2023/07/27	0.1	Initial Version

## 【Overview】

UNOLite is an indoor air quality monitor to measure the space temperature / humidity / CO2 / PM2.5 / PM10 / PM1 / TVOC and expose the measurements directly via MQTT publishing or other communicated protocols.

UNOLite is suitable for many different types of environments, including residential buildings, commercial buildings, medical institutions, and places sensitive to air quality, such as nursing homes and day care centers.

This user guide focus on how to receive data from UNOLite via MQTT publishing and describe the data content published from UNOLite.

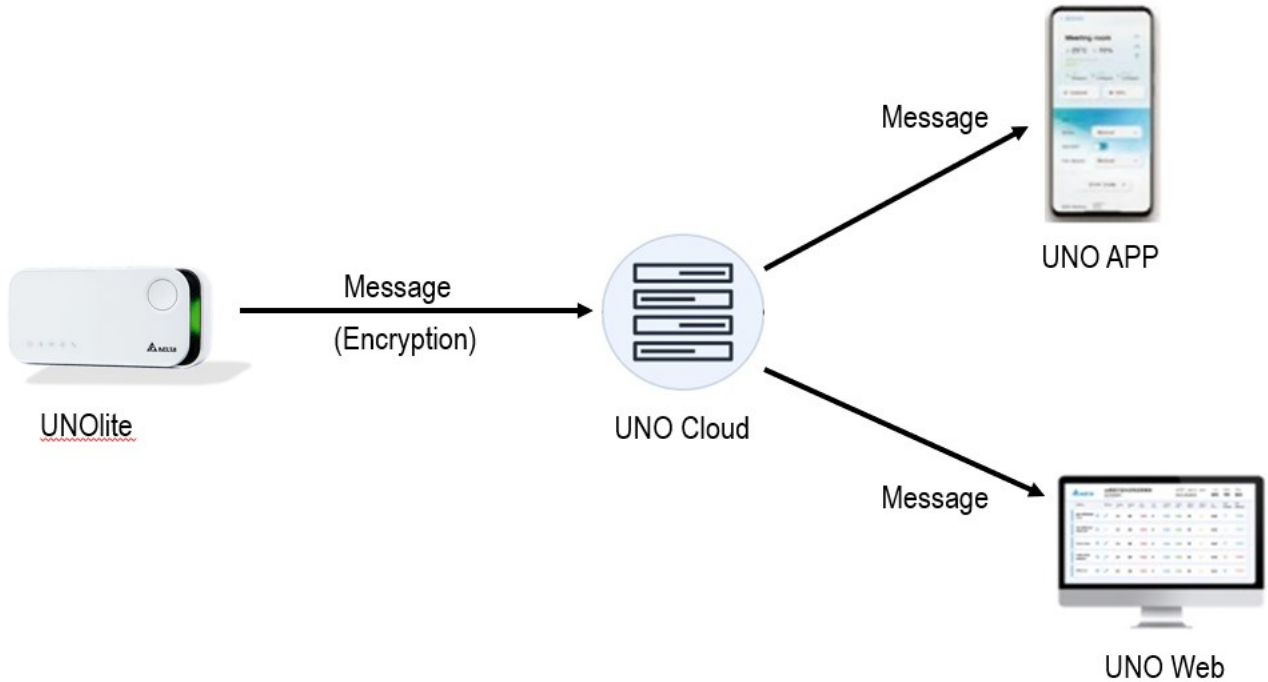
Please notice MQTT is only supported on UNOLite Wi-Fi models (ie: UNO-LW ).

## 【UNOlite and MQTT】

**Note** : UNOlite support the MQTT v3.1.1

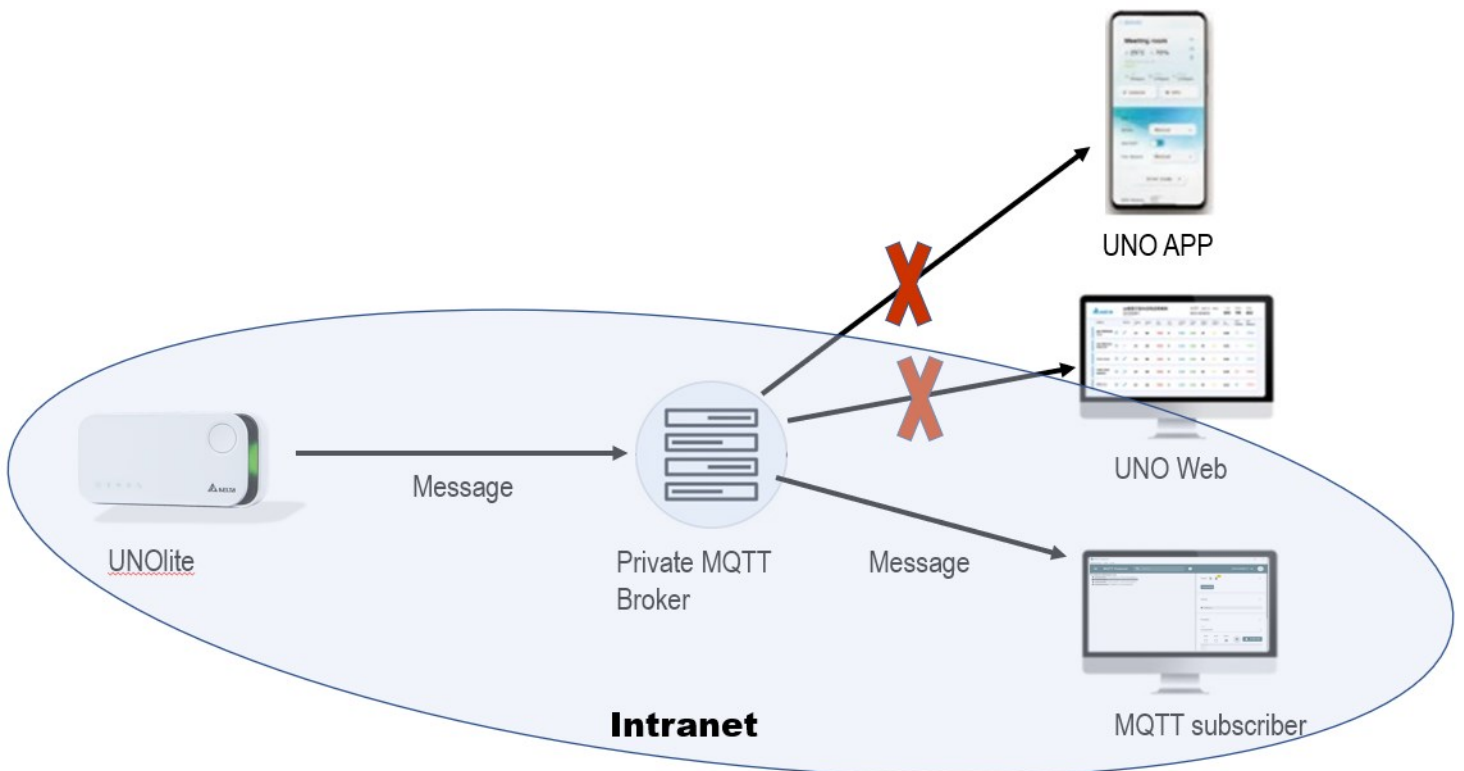
The Message Queueing Telemetry Transport(MQTT) is a lightweight publish/subscribe network protocol built on TCP/IP. There are two network entities in the typical MQTT protocol architecture : a message broker and multiple clients. Client can publish message to clients that subscribed the same topic through a broker server.

UNOlite, in MQTT protocol, is a message publisher and will publish sensor and device information periodically. It will connect to the default broker through encrypted channel and UNO AP-P/Web (subscriber) will retrieve information from server.



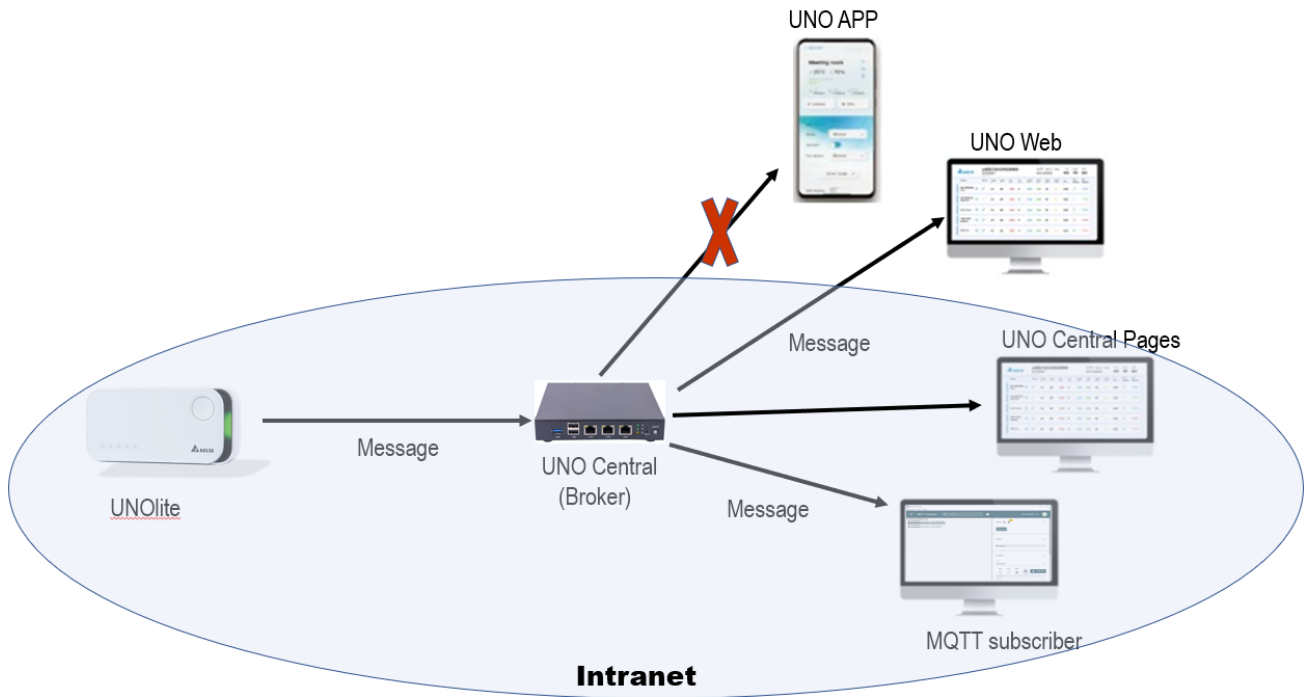
UNOlite also can be set to connect to other MQTT broker. Then user can connect to a privated broker to receive sensor data via MQTT client application. Please note if the default broker has been changed, the UNO APP and UNO Web won't receive any data. The default broker setting can be recovered by executing factory reset.

**Note** : MQTT configuration can be changed through UNO APP Engineer mode



## 【UNOlite and MQTT】

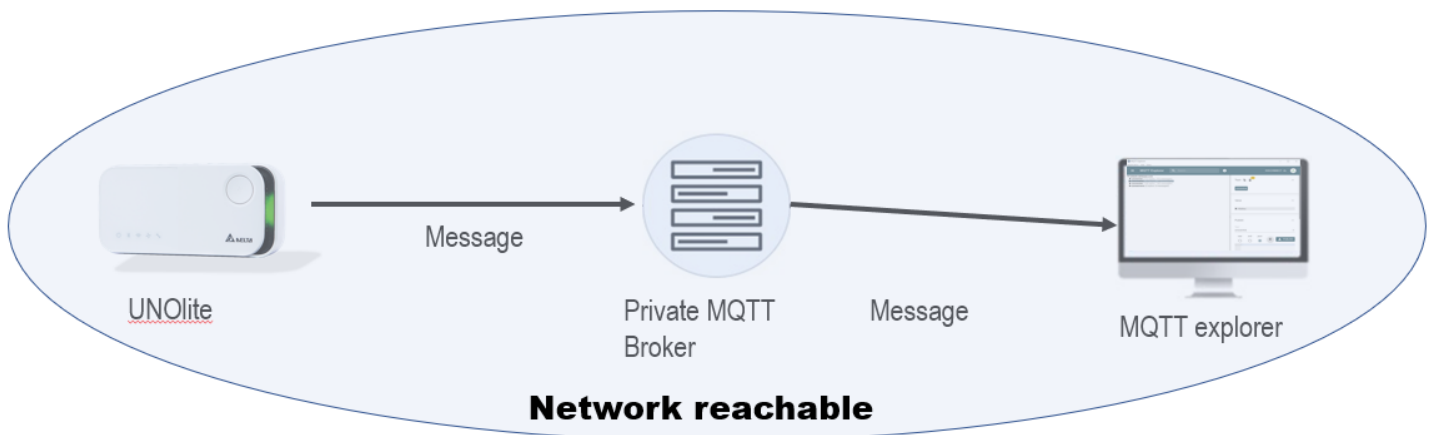
Furthermore, UNOCentral can function as an MQTT broker, allowing users to develop MQTT client applications to receive data from it. When the internet connection of UNOCentral is operational, the MQTT data will be seamlessly published to the UNO cloud. Consequently, users gain access to real-time and historical data through UNOweb, enabling them to monitor and analyze information conveniently.



## 【Getting started】

This section will demonstrate how to receive data from UNOLite through MQTT client. For this example, we need a message broker, an UNOLite, a MQTT client software and UNO APP.

- \* MQTT client : we will use MQTT explorer, a desktop MQTT client software.
- \* Message broker : we will use a private broker in an Ubuntu PC for this demonstration.
- \* UNOLite APP : we use this app to set UNOLite's MQTT configuration.
- \* UNOLite : In this example, the serial number of UNOLite is 2321L0170051.



The below sections will describe how to retrieve the sensor data from UNOLite.

## Step 1 : Configure network

The first step of configuration is to check the network environment. In this example, we will connect the laptop, the broker and the UNOLite to the same wireless AP. In this demonstration, the broker's IP address is **192.168.31.115**. Next, we need to configure the UNOLite to connect the wireless AP. (The SSID name is "WIFITEST" in this example)

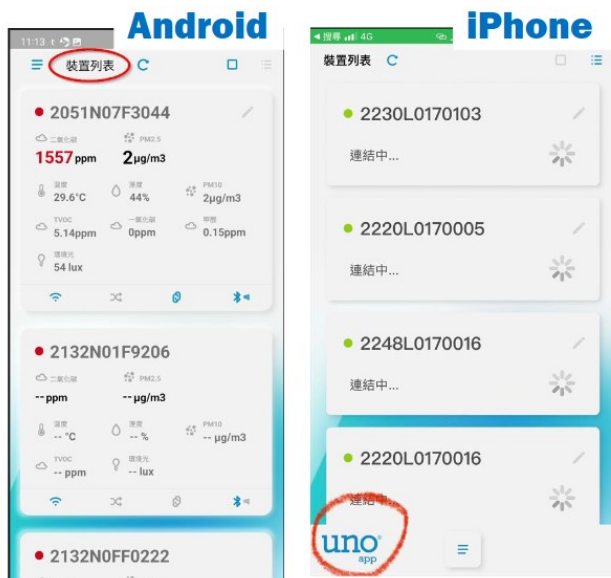
### Step 1.1 : Setting UNOLite's Wi-Fi connection

A : Run UNO APP and enable engineer mode

If you are using the Android version, open the UNO APP and tap the "Device List" **five times** to access Engineering Mode. A prompt message will appear upon successful activation of Engineering Mode.

( For iPhone users, tap on the UNO APP icon in the lower-left corner.)

Please refer to the illustration below.



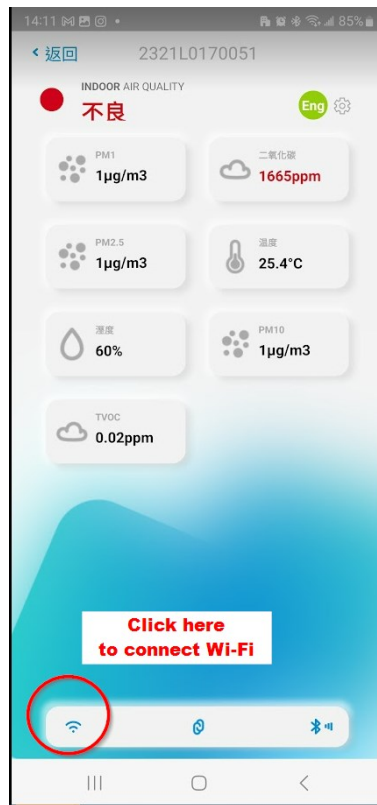
B : Run UNO APP and find the UNOnext (2321L0170051)



## Step 1.1 : Setting UNOnext's Wi-Fi connection

**Note :** The phone's wi-fi function should be turned on before this step

C : Click the Wi-Fi icon to configure Wi-Fi connection.



D : Select the Wi - Fi AP's name to connect





### Step 1.1 : Setting UNOnext's Wi-Fi connection

E : Input the password and press the connect button.

Then UNOlite will start to connect Wi Fi.



F : After several seconds, the Wi-Fi's notification should remain lit if everything is fine. The UNOlite's network setup is ready.

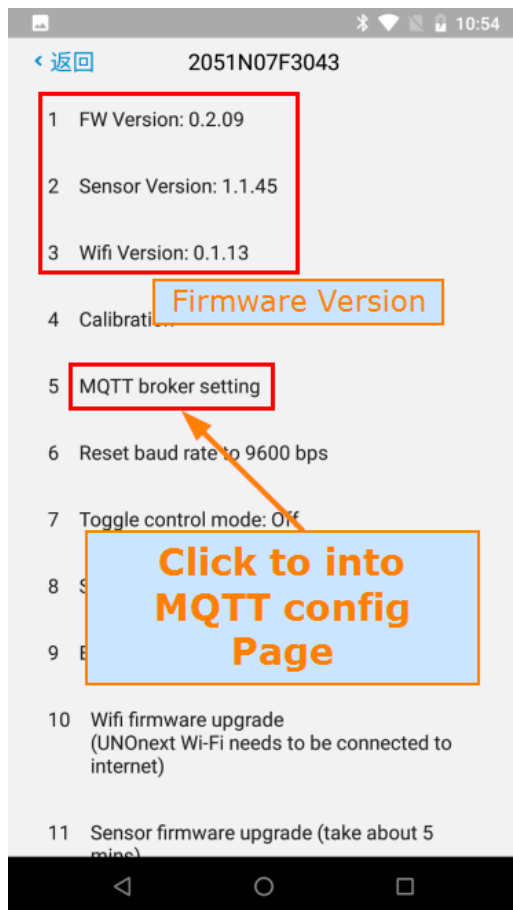


## Step 2 : Setting UNOnext's MQTT configuration

A : After network configuration done, click “Eng” icon into device configuration page.



B : Enter MQTT configuration page.

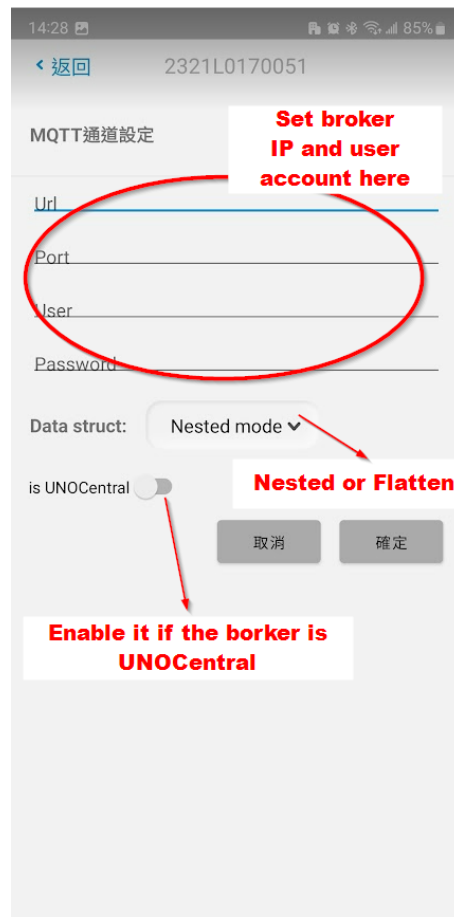


## Step 2 : Setting UNOnext's MQTT configuration

D : Press "EDIT" to change MQTT's default config.



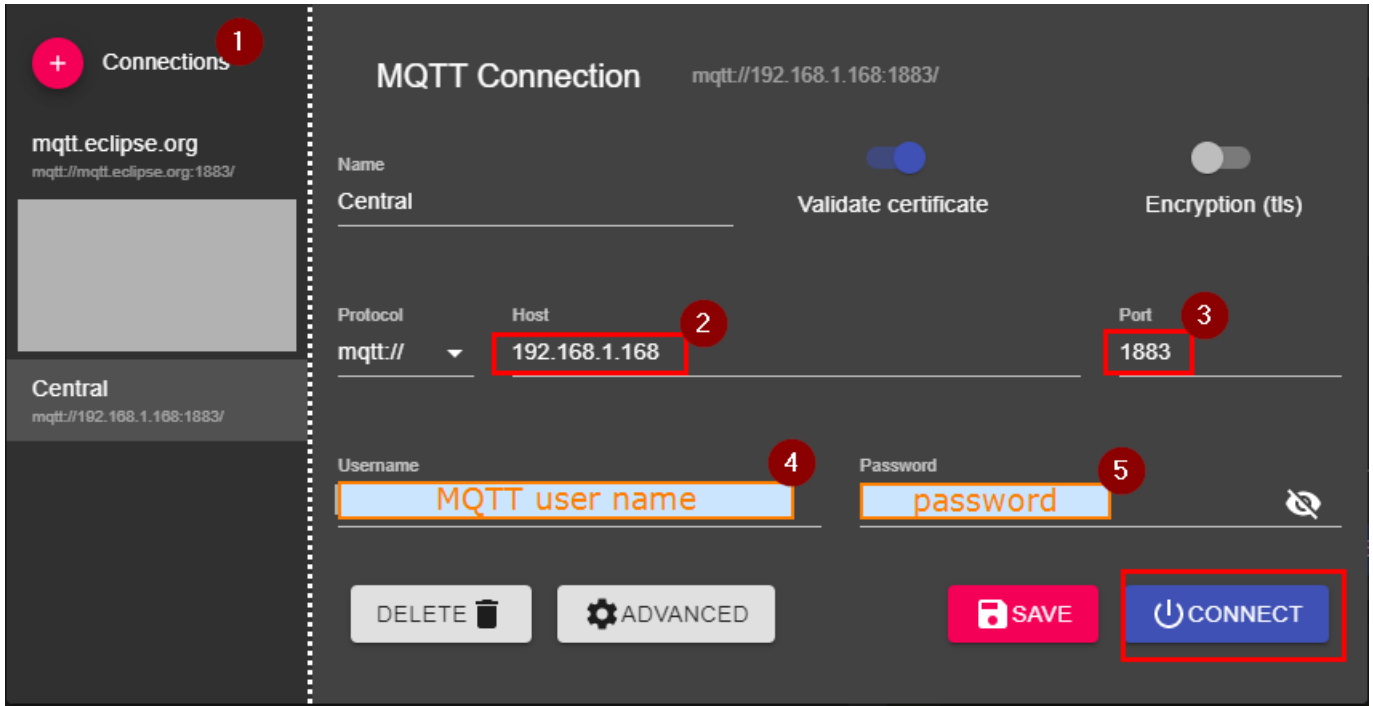
E : Input the MQTT broker's IP/Port/user name/password and press "Enter".  
The UNOlite will connect to MQTT's new broker automatically now.



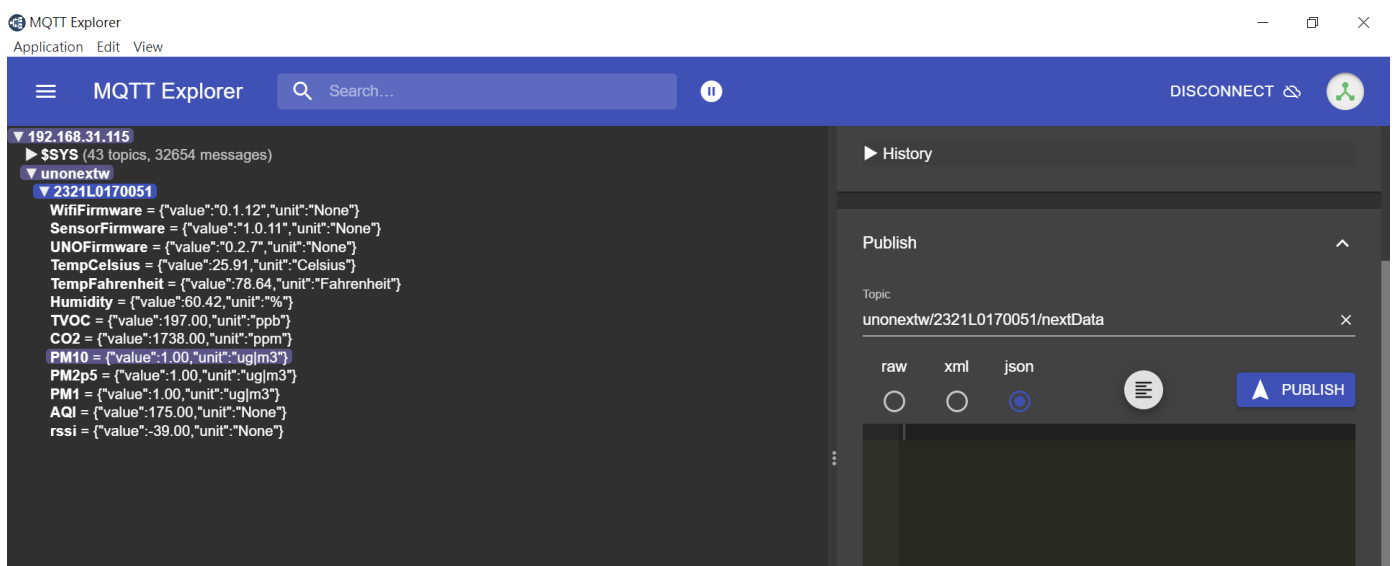
### Step 3 : Receive UNOLite's data from MQTT Explorer

A : Run the MQTT explorer on PC. The first page in application is the information about broker. You should fill the MQTT broker's IP/port/user account/password and press "connect".

**Note :** MQTT explorer will subscribe all topics by default. You can change the setting on "ADVANCED" page to subscribe the specific topics only.



B : After connecting done, MQTT explorer will keep receive the whole data from Broker.



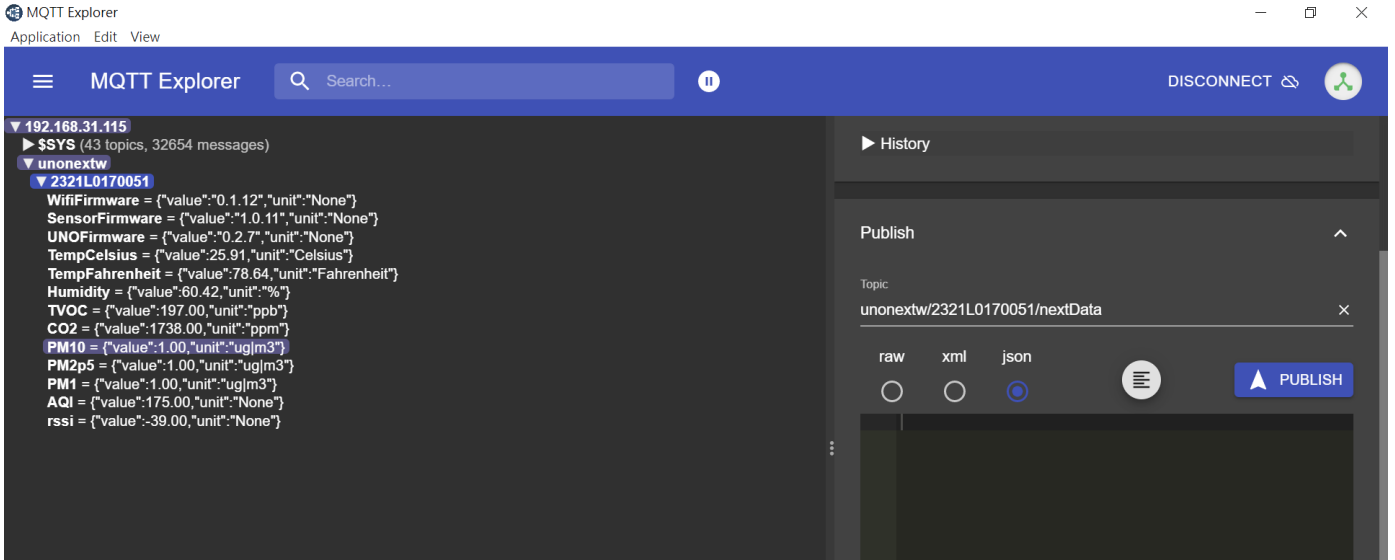
### Step 3 : Receive UNOLite's data from MQTT Explorer

C : Our target in this example is to get the sensor value.  
Let's check the topic:

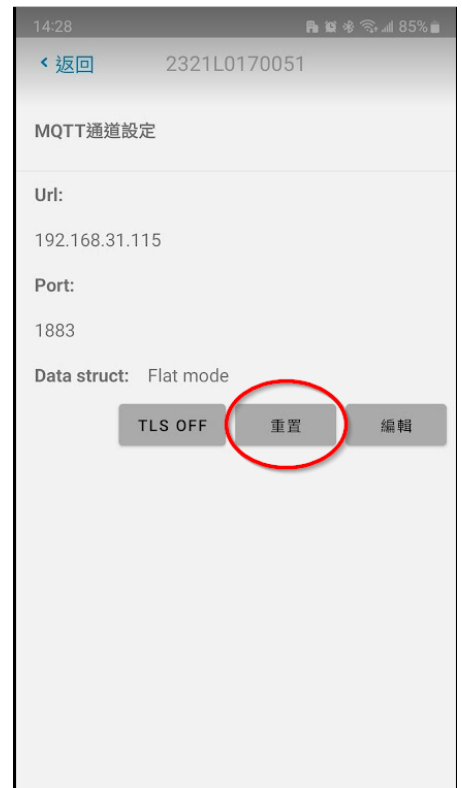
/unonextw/2321L0170052/TempCelsius

/unonextw/2321L0170052/CO2/

And get the temperature value is 25.91 and the co2 value is 1738 ppm.



**Note :** If the MQTT's configuration is changed, the UNO APP and UNO WEB won't receive UNOLite data. You can click "reset" button in MQTT setting page to restore to default setting.



## 【UNOlite MQTT Data Format】

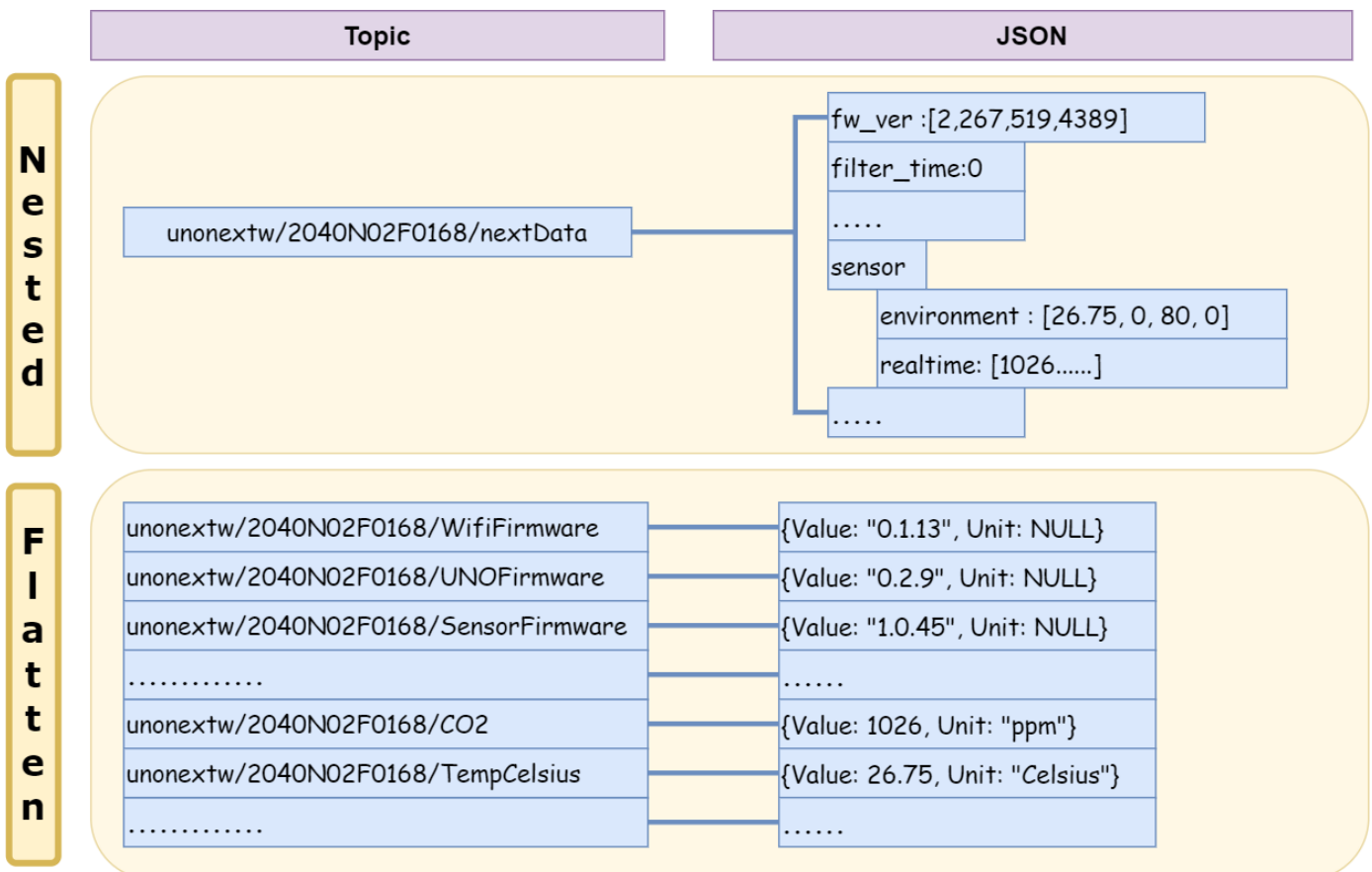
The data format of UNOlite follows JSON format. JSON is a standard text-based format with key-value pairing style. This section describes the meaning of the item in UNOlite's JSON and how to parse valuable data from it.

There are two mode of UNOlite's MQTT : Flatten mode or Nested mode.

In Flatten mode, all keys with a topic respectively. The client can process data simply and only subscribe the specific topics.

In Nested mode, all keys are packaged in one topic and the publish frequency (i.e. 10 seconds roughly) is also slower than Flatten mode. The benefit of Nested mode is the reduction of network flow and the broker loading.

The default type is Flatten mode if the default broker has been changed to UNOCentral else. If the borker has been set to default broker else, the MQTT type will set to flatten mode automatically.



## 【UNOlite Flatten Mode】

The entities of JSON in Flatten mode are all composited of “Value” and “Unit”.

```
{ Value : “xxxx”, unit : “xxxx” }
```

The topic is composited of UNOlite’s serial number and object name. EX:

```
unonextw/xxxxxxxxxxxx/object_name
```

For example, the CO<sub>2</sub> object in UNOlite (2321L0170051) should be:

```
unonextw/2321L0170051/CO2      { Value : 800.0, unit : “ppm”}
```

The below is the description of UNOnext’s objects (topics).

( 2321L0170051 is a simulated UNOlite SN. Replace it with your UNOlite’s SN )

Topic	Description
1 unonextw/2321L0170051/WifiFirmware	Wi-Fi firmware version of UNOlite. Unit is None.
2 unonextw/2321L0170051/SensorFirmware	Sensor firmware version of UNOlite. Unit is None.
3 unonextw/2321L0170051/UNOFirmware	Device firmware version of UNOlite. Unit is None.
4 unonextw/2321L0170051/TempCelsius	Temperature in Celsius degree. Resolution is 0.01 °C.
5 unonextw/2321L0170051/TempFahrenheit	Temperature in Fahrenheit degree. Resolution is 0.01 °F.
6 unonextw/2321L0170051/Humidity	Relative humidity. Resolution is 0.01 %.
7 unonextw/2321L0170051/CO2	Carbon dioxide. Resolution is 1 ppm.
8 unonextw/2321L0170051/TVOC	Total volatile organic compounds. Resolution is 1 ppb.
9 unonextw/2321L0170051/PM10	Particulate matter smaller than 10 micrometers . Unit is ug/m <sup>3</sup>
10 unonextw/2321L0170051/PM2p5	Particulate matter smaller than 2.5 micrometers . Unit is ug/m <sup>3</sup>
11 unonextw/2321L0170051/PM1	Particulate matter smaller than 1 micrometers . Unit is ug/m <sup>3</sup>
12 unonextw/2321L0170051/AQI	an index according to current PM and CO2 concentration
13 unonextw/2321L0170051/rssi	The RSSI value to show the strength of wifi connection

## 【UNOlite Nested Mode】

In Nested Mode, all data will be packed in one nested JSON structure and there is only one topic that need to be subscribed by clients. Moreover, the message publishing frequency (i.e. 10 seconds roughly) of Nested Mode is less than Flatten Mode's.

The topic of Nested Mode is composited of UNOlite's serial number:

```
unonextw/xxxxxxxxxxxxx/nextData
```

For example, the topic of UNOlite (2321L0170051) should be:

```
unonextw/2321L0170051/nextData
```

( 2321L0170051 is a simulated UNOlite SN. Replace it with your UNOlite's SN )

The below is the structure of UNOlite's data of nested mode:

Level 1	Level 2	Value	Description																																												
fw_ver		[ Val1, Val2, Val3, Val4]	<p>Version information is packed into 4 values. The values :</p> <table border="1"> <tr> <td>Val1</td> <td>Don't Care</td> </tr> <tr> <td>Val2</td> <td>Wi-Fi Version</td> </tr> <tr> <td>Val3</td> <td>UNO Version</td> </tr> <tr> <td>Val4</td> <td>Sensor Version</td> </tr> </table> <p>The version format as below:</p> <table border="1"> <tr> <td colspan="4">Byte2</td> <td colspan="4">Byte1</td> </tr> <tr> <td>7</td><td>6</td><td>5</td><td>4</td> <td>3</td><td>2</td><td>1</td><td>0</td> <td>7</td><td>6</td><td>5</td><td>4</td> <td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td colspan="4">Major</td> <td colspan="4">Minor</td> <td colspan="4">Build number</td> </tr> </table> <p>Example: 4389<sub>(10)</sub> = 1125<sub>(16)</sub> ==&gt; 1.1.25<sub>(16)</sub> ==&gt; 1.1.37<sub>(10)</sub></p>	Val1	Don't Care	Val2	Wi-Fi Version	Val3	UNO Version	Val4	Sensor Version	Byte2				Byte1				7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	Major				Minor				Build number			
Val1	Don't Care																																														
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Major				Minor				Build number																																							
filter_time		Val	Reserved.																																												
filter_threshold		Val	Reserved.																																												
err_code		Val	Reserved.																																												
dry_contact		Val	Reserved.																																												
btn_state		Val	Reserved.																																												
ctrl_mode		Val	<p>The state of UNOlite's control mode. (For ventilation equipment)</p> <table border="1"> <tr> <td>0</td> <td>Disabled</td> </tr> <tr> <td>1</td> <td>Enabled</td> </tr> </table>	0	Disabled	1	Enabled																																								
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1	Enabled																																														



## 【UNOnext Nested Mode】

Level 1	Level 2	Value	Description													
sensor	aqi	Val	Give an index according to current PM and CO2 concentration. The index also be referenced by IAQ LED: <table border="1" data-bbox="1082 378 1453 640"> <tr> <td>Green</td> <td>0 - 80</td> </tr> <tr> <td>Yellow</td> <td>81 - 100</td> </tr> <tr> <td>Red</td> <td>101 - 400</td> </tr> <tr> <td>Purple</td> <td>401 -</td> </tr> </table>	Green	0 - 80	Yellow	81 - 100	Red	101 - 400	Purple	401 -					
	Green	0 - 80														
	Yellow	81 - 100														
	Red	101 - 400														
	Purple	401 -														
	environment	[ Val1, Val2, Val3, Val4]	The environment information: <table border="1" data-bbox="735 728 1410 1014"> <tr> <td>Val1</td> <td>Temperature (°C)</td> <td>0.01°C</td> </tr> <tr> <td>Val2</td> <td>Reserved</td> <td>-</td> </tr> <tr> <td>Val3</td> <td>Relative Humidity (%)</td> <td>0.01%</td> </tr> <tr> <td>Val4</td> <td>Reserved</td> <td>-</td> </tr> </table>	Val1	Temperature (°C)	0.01°C	Val2	Reserved	-	Val3	Relative Humidity (%)	0.01%	Val4	Reserved	-	
	Val1	Temperature (°C)	0.01°C													
Val2	Reserved	-														
Val3	Relative Humidity (%)	0.01%														
Val4	Reserved	-														
realtime	[ Val1, Val2, Val3, Val4, Val5, Val6, Val7 ]	The air quality sensor information: <table border="1" data-bbox="719 1106 1131 1520"> <tr> <td>Val1</td> <td>CO2 (ppm)</td> </tr> <tr> <td>Val2</td> <td>Reserved</td> </tr> <tr> <td>Val3</td> <td>Reserved</td> </tr> <tr> <td>Val4</td> <td>TVOC (ppb)</td> </tr> <tr> <td>Val5</td> <td>Reserved</td> </tr> <tr> <td>Val6</td> <td>PM<sub>2.5</sub> (ug/m<sup>3</sup>)</td> </tr> <tr> <td>Val7</td> <td>PM<sub>10</sub> (ug/m<sup>3</sup>)</td> </tr> </table>	Val1	CO2 (ppm)	Val2	Reserved	Val3	Reserved	Val4	TVOC (ppb)	Val5	Reserved	Val6	PM <sub>2.5</sub> (ug/m <sup>3</sup> )	Val7	PM <sub>10</sub> (ug/m <sup>3</sup> )
Val1	CO2 (ppm)															
Val2	Reserved															
Val3	Reserved															
Val4	TVOC (ppb)															
Val5	Reserved															
Val6	PM <sub>2.5</sub> (ug/m <sup>3</sup> )															
Val7	PM <sub>10</sub> (ug/m <sup>3</sup> )															
fahrenheit	val	Temperature in Fahrenheit. (°F)														
pm1	val	The sensor value of PM1														
asc	val	Reserved														

## 【UNOnext Nested Mode】

Level 1	Level 2	Value	Description															
device	cmd	Key: val	<p>The key : value structure for ventilation control state.</p> <table border="1"> <tr> <td>mode</td> <td>Reserved</td> </tr> <tr> <td>power</td> <td>0: power on 1: power off</td> </tr> <tr> <td>speed</td> <td>The fan speed level. 0 : power off 1 : low speed 2 : medium speed 3 : high speed</td> </tr> </table>	mode	Reserved	power	0: power on 1: power off	speed	The fan speed level. 0 : power off 1 : low speed 2 : medium speed 3 : high speed									
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power	0: power on 1: power off																	
speed	The fan speed level. 0 : power off 1 : low speed 2 : medium speed 3 : high speed																	
err_code	[ Val1, Val2, Val3, Val4, Val5, Val6, Val7, Val8 ]	<p>If UNOnext is run in <b>RS485</b> mode, this item shows the status of the ventilation fan:</p> <table border="1"> <tr> <td>Val1</td> <td>1: Fan1 online 0: Fan1 offline</td> </tr> <tr> <td>Val2</td> <td>0: Fan1 normal</td> </tr> <tr> <td>Val3</td> <td>1: Fan2 online 0: Fan2 offline</td> </tr> <tr> <td>Val4</td> <td>0: Fan2 normal</td> </tr> <tr> <td>Val5</td> <td>1: Fan3 online 0: Fan3 offline</td> </tr> <tr> <td>Val6</td> <td>0: Fan3 normal</td> </tr> <tr> <td>Val7</td> <td>1: Fan4 online 0: Fan4 offline</td> </tr> <tr> <td>Val8</td> <td>0: Fan4 normal</td> </tr> </table>	Val1	1: Fan1 online 0: Fan1 offline	Val2	0: Fan1 normal	Val3	1: Fan2 online 0: Fan2 offline	Val4	0: Fan2 normal	Val5	1: Fan3 online 0: Fan3 offline	Val6	0: Fan3 normal	Val7	1: Fan4 online 0: Fan4 offline	Val8	0: Fan4 normal
Val1	1: Fan1 online 0: Fan1 offline																	
Val2	0: Fan1 normal																	
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Val5	1: Fan3 online 0: Fan3 offline																	
Val6	0: Fan3 normal																	
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wifi	rsi	val	The RSSI value to show the strength of wifi connection															

