

Lab2: MQTT and LoPy WiFi

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Labs

- 1/3 Ready to use, tested examples
- 1/3 Exercise based on the examples
- 1/3 Your imagination → create new applications

Our Lab equipment

Pycom LoPy 4

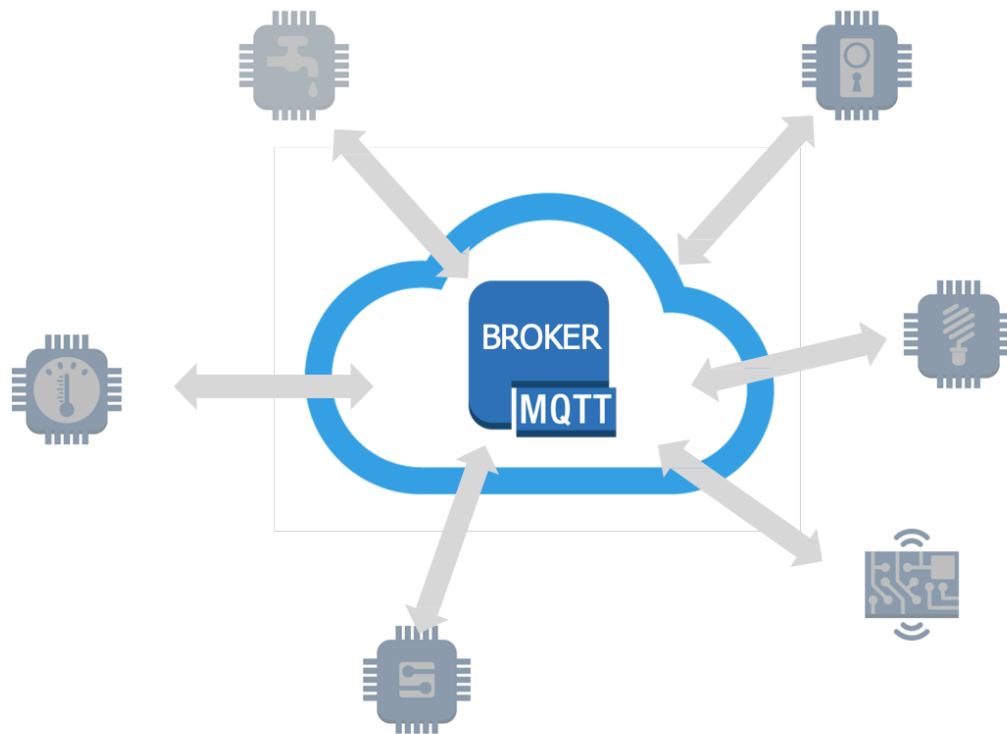
PySense

microUSB Cable

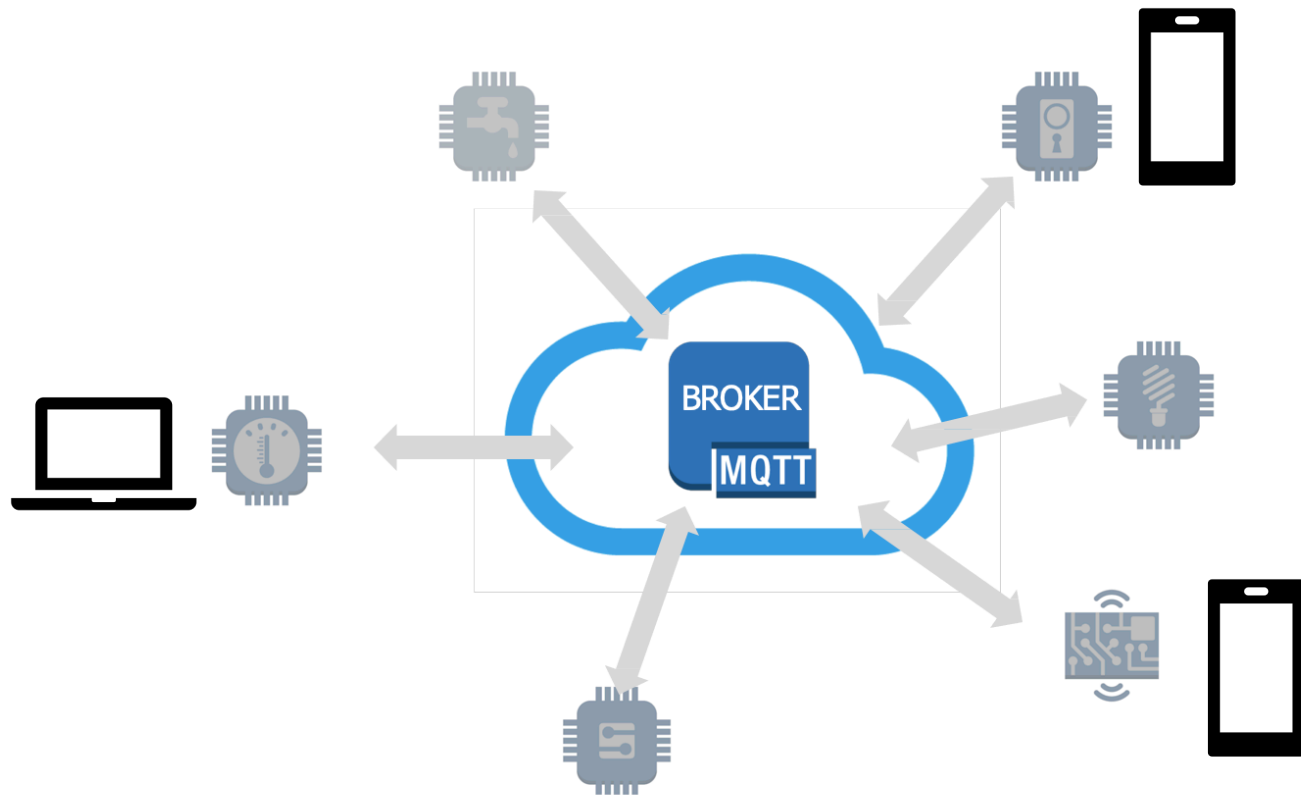
Laptop/Desktop

Smartphone









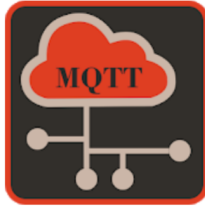

MQTT



MQTT



MQTT: Android

 <p>MQTT Dash (IoT, Sn) Routix software</p> <p>★★★★★</p>	 <p>MyMQTT instant:solutions OG</p> <p>★★★★★</p>	 <p>IoT MQTT Panel Rahul Kundu</p> <p>★★★★★</p>	 <p>IoT MQTT Dashboard Nghia TH</p> <p>★★★★★</p>	 <p>MQTT Client Webneurons</p> <p>★★★★★</p>
 <p>MQTT Snooper Maxime Carrier</p> <p>★★★★★</p>	 <p>MQTIZER - Free MQ Sanyam Arya</p> <p>★★★★★</p>	 <p>Linear MQTT Dashboard ravendmaster</p> <p>★★★★★</p>	 <p>Virtuino MQTT Ilias Lamprou</p> <p>★★★★★</p>	 <p>Mqtt Client Darlei Kroth</p> <p>★★★★★</p>

MQTT: iOS

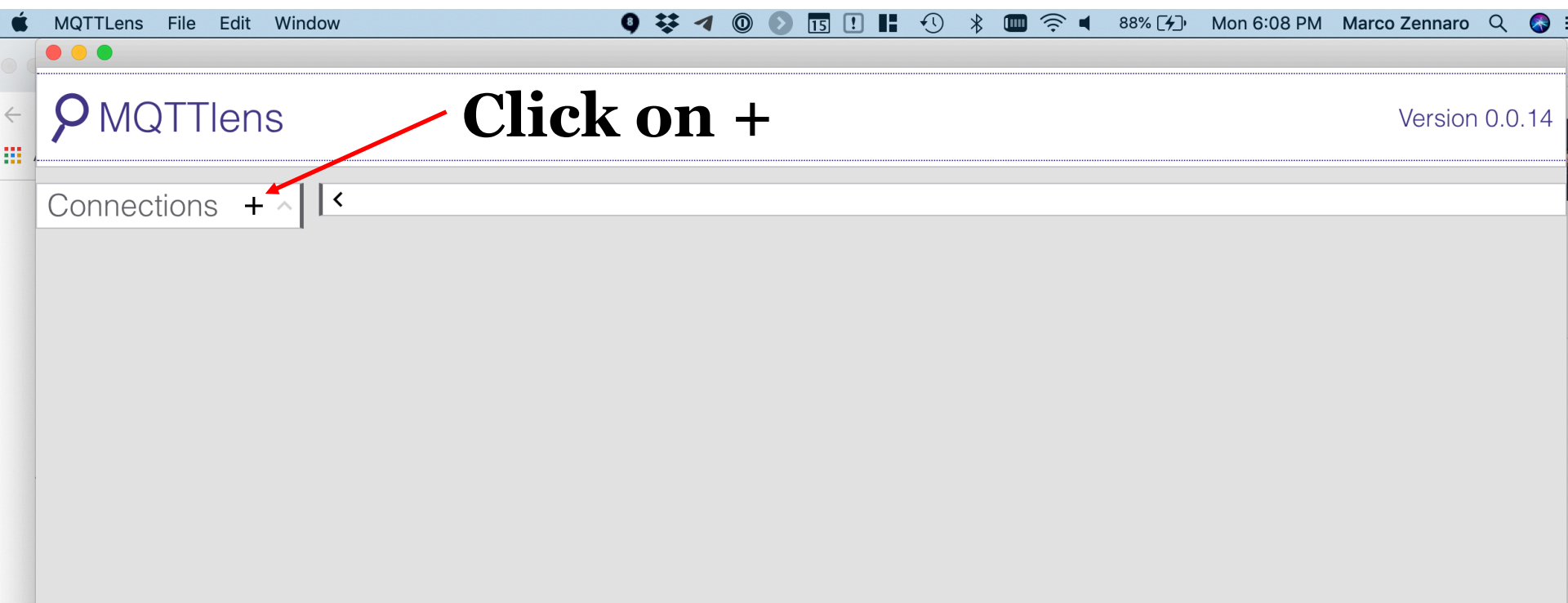


MQTT: browser

MQTT Lens: a Google Chrome application, which connects to a MQTT broker and is able to subscribe and publish to MQTT topics.

Google for MQTT Lens and install it in Chrome.

MQTT: Chrome browser



MQTT: Chrome browser

Name **Broker address** **Broker port #**

Connection name
Eclipse MQTT

Connection color scheme
[Green bar]

Hostname
tcp:// e.g. iot.eclipse.org

Port
1883

Client ID
lens_xUNxxwliALGArFmSnbwCOpmt7Xp

Generate a random ID

Session
☒ Clean Session

Automatic Connection
☒ Automatic Connection

Keep Alive
120 seconds

Credentials

Username
Enter username

Password
Enter password

Create connection

Last-Will
[Dropdown arrow]

CANCEL **CREATE CONNECTION**

MQTT: subscriber



Connection: Test
Subscribe

Topic name

topic

0 - at most once

SUBSCRIBE

Publish

topic

0 - at most once



Retained

PUBLISH

Message

Subscriptions

MQTT: publisher



Connection: Test

Subscribe

topic

0 - at most once ▾

SUBSCRIBE

Publish

Topic name

topic

Message

0 - at most once ▾



Retained

PUBLISH

Message

Subscriptions

MQTT: brokers

<https://iot.eclipse.org/getting-started/#sandboxes>

Hostname: **iot.eclipse.org**

<http://test.mosquitto.org/>

Hostname: **test.mosquitto.org**

<https://www.hivemq.com/mqtt-demo/>

Hostname: **broker.hivemq.com**



MQTT: brokers

Ports: standard: 1883

encrypted: 8883

List of open brokers:

https://github.com/mqtt/mqtt.github.io/wiki/public_brokers

MQTT: exercise

Divide the class in two groups: one group will publish messages and the other will receive them.

You must first agree on:

- 1) The broker you will use
- 2) The topic you will use to publish/subscribe

MQTT: exercise #2

Download this app from the Google Play Store



MQTT: exercise #2

Experiment with the app and send data from your phone's sensors to an MQTT broker.

Can you see the data from an MQTT subscriber?

WiFi

WiFi

In this example, we will use the LoPy to connect to a WiFi network and to measure the WiFi signal level

The WiFi examples are in the Code/wifi directory

WiFi: WPA example

Open the example in the `Code/wifi/WPA` directory.

WPA is the authentication method used by most WiFi Access Points. It requires a password to connect to WiFi.

If your AP does not require a password, use the example in `Code/wifi/Open`.

WiFi WPA example, part 1

```
import machine
```

Import the python libraries needed

```
from network import WLAN
```

```
wlan = WLAN(mode=WLAN.STA)
```

Set the LoPy as a Station and not as an Access Point. We want to connect to an existing Access Point!

```
nets = wlan.scan()
```

Scan all the AP and put their names in the variable nets

WiFi WPA example, part 2

for net in nets:

```
    if net.ssid == 'MarconiLab':
```

```
        print('Network found!')
```

```
        wlan.connect(net.ssid, auth=(net.sec,  
'marconi-lab'), timeout=5000)
```

```
        while not wlan.isconnected():
```

```
            machine.idle() # save power while  
            waiting
```

```
            print('WLAN connection succeeded!')
```

```
            break
```

For all the networks in nets, if the name is “MarconiLab” then write “Network found” and send the password.

If you are not connected, go to idle mode.

If you are connected, then write “WLAN connection succeeded”

WiFi: exercise

- 1) Connect to the Lab's WiFi network. Can you join it?

WiFi: RSSI

RSSI (Received Signal Strength Indication) is a general term used by any radio-based technology to indicate the strength of a received signal.

The received signal level is a negative value when expressed in dBm, and higher values show a stronger signal.

For example, -65 is a stronger signal level than -90.



WiFi: RSSI

WI-FI Signal Strength



Excellent

> -50 dBm



Good

-50 to -60 dBm



Fair

-60 to -70 dBm



Weak

< -70 dBm

Credit: <https://www.netspotapp.com/what-is-rssi-level.html>

WiFi: RSSI example

Open the example in Code/wifi/RSSI directory.

The example code scans all available APs and shows their name (ssid) and RSSI reading.

```
while True:
```

```
    for net in nets:
```

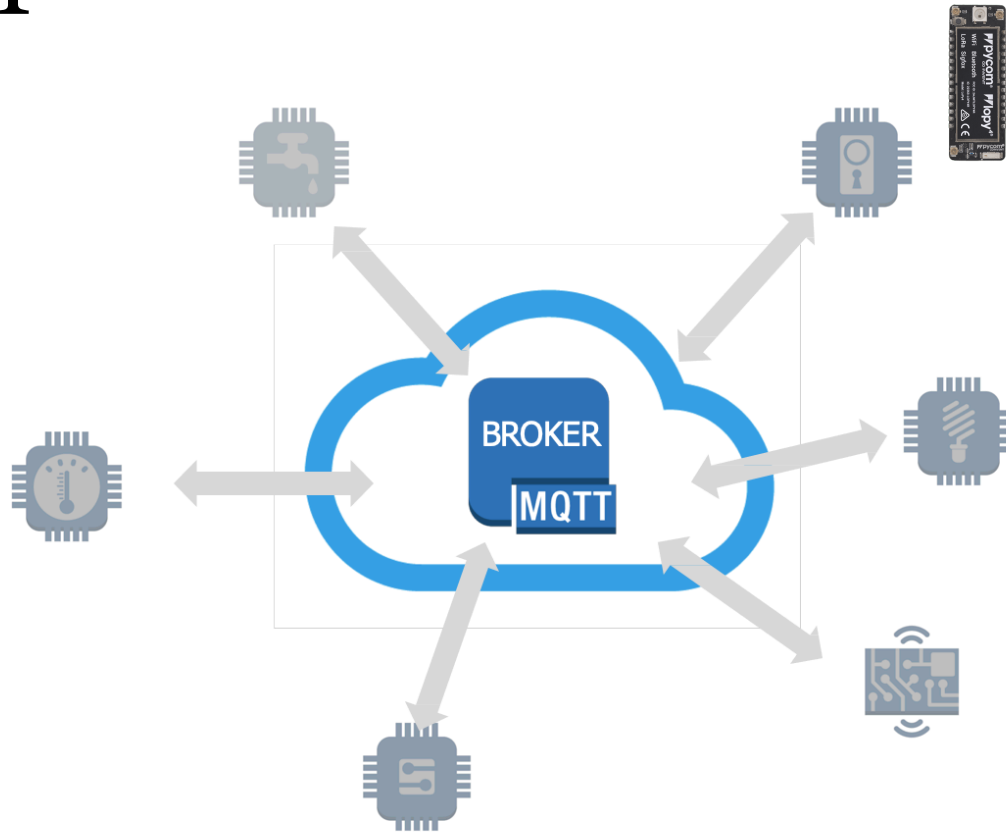
```
        print(net.ssid, net.rssi)
```

WiFi: Exercises

- 1) Move in the lab and check the RSSI values. How far can you go while still receiving a specific APs?
- 2) Without moving the LoPy, plot the RSSI values over time. How much does the RSSI fluctuate?
- 3) Use the LED to show the RSSI signal level (green = good signal, red = low signal)

MQTT via WiFi with LoPy

MQTT



WiFi MQTT Publisher example

Open the example in Code/MQTT/publisher directory.

The example code connects to a WiFi Access Point using WPA, connects to an MQTT broker, creates some random data and sends data using a specific topic.

WiFi MQTT Publisher: Exercises

- 1) Can you receive the data using a subscriber on your phone/browser?
- 2) Publish using MQTT the values of temperature and humidity of the PySense. Can you receive them?

WiFi MQTT Subscriber example

Open the example in Code/MQTT/subscriber directory.

The example code connects to a WiFi Access Point using WPA, connects to an MQTT broker and waits for messages on a specific topic.

WiFi MQTT: Final Exercise

Divide the class in two groups: the first group publishes temperature and humidity values and the second group changes the LED color according to the temperature value (eg red if $\text{temp} > 30$, green if $\text{temp} < 30$).

Summary

We learned how to publish and subscribe to MQTT messages using a smartphone or a PC.

We learned how to use WiFi capabilities of the LoPy to connect to an AP, sync the internal clock and read RSSI values.

We sent and received MQTT messages using LoPys.



Feedback?

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