



# TESA TOPGUN

## MQTT: Experimental System Setup

ผศ.ดร.สันติ นุราช

Asst.Prof.Dr.Santi Nuratch

Embedded Computing and Control Laboratory

Department of Control System and Instrumentation Engineering, Faculty of Engineering

King Mongkut's University of Technology Thonburi (KMUTT)

# Download & Install Software Tools



## Mosquitto

Download Link:

<https://mosquitto.org/download/>

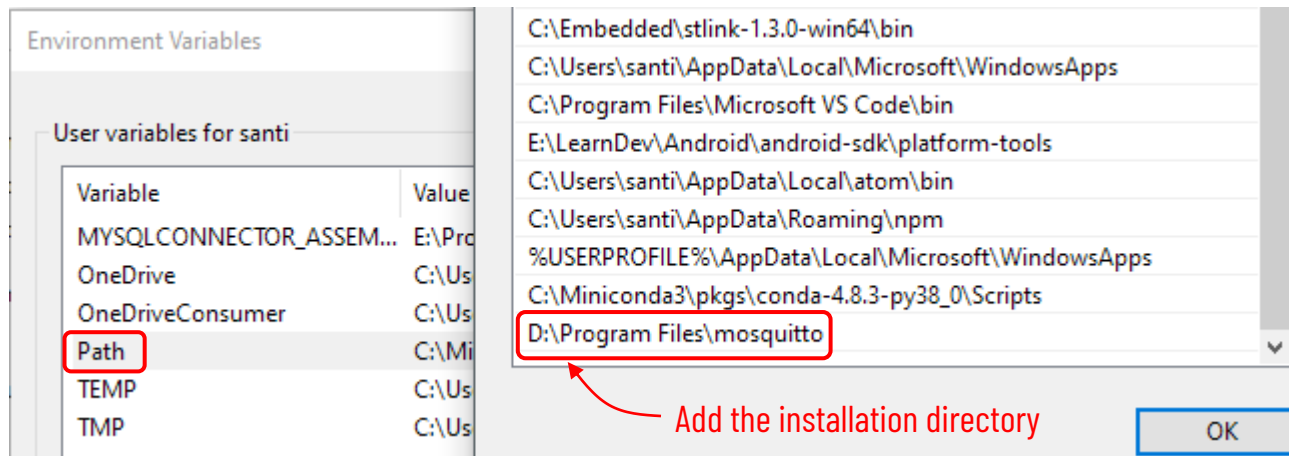


## MQTT Explorer

Download Link:

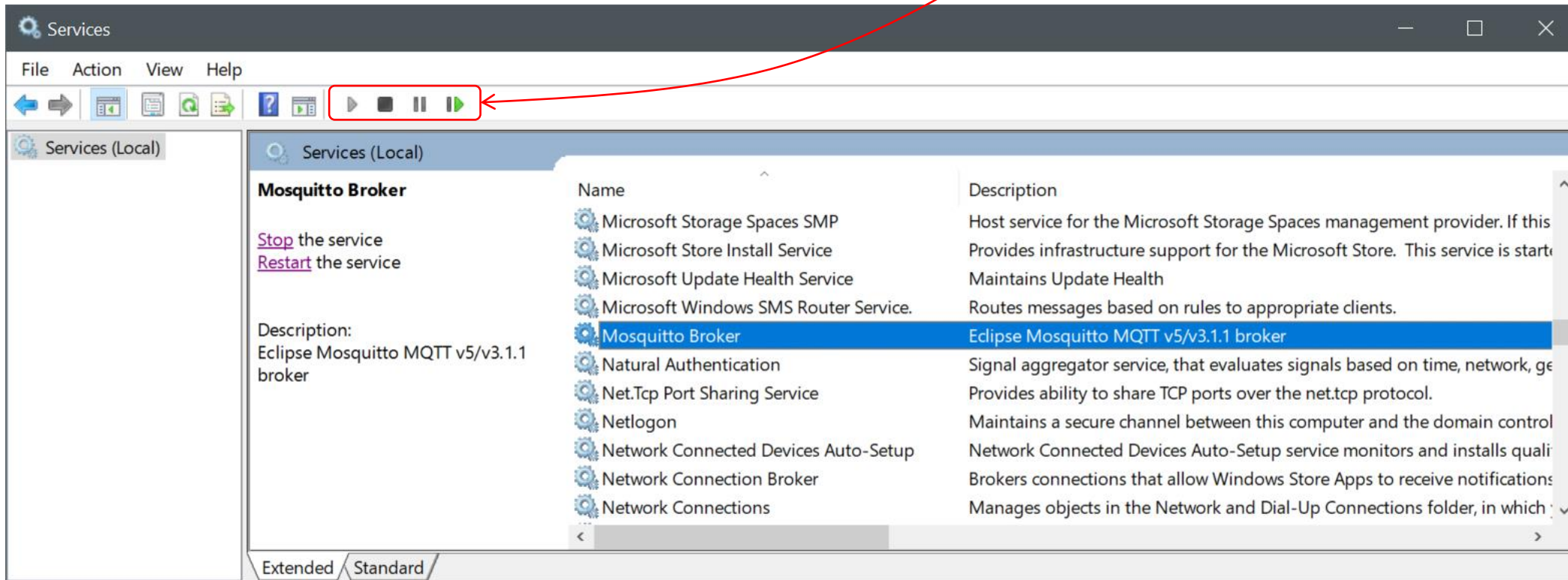
<http://mqtt-explorer.com/>

Note: After installed, add its path into environment variable



# Mosquitto Broker (Service)

Open the Service and check if the Mosquitto Broker is running or not. Click these buttons to change running state of the Mosquitto Broker.



Note: For development process, **STOP** the Mosquitto Broker service and run it through a Command Line using **mosquitto -v** (check next slide)



# Mosquitto Broker (Command Line)

Stop the Mosquitto Broker service (check the previous slide)

Run the Command Prompt and give it a command **mosquitto -v**

```
Administrator: Command Prompt - mosquitto -v
C:\Windows\system32>mosquitto -v
1606456178: mosquitto version 1.6.12 starting
1606456178: Using default config.
1606456178: Opening ipv6 listen socket on port 1883.
1606456178: Opening ipv4 listen socket on port 1883.
1606456178: mosquitto version 1.6.12 running
1606456179: New connection from 192.168.43.10 on port 1883.
1606456179: New client connected from 192.168.43.10 as ECCLab-IoTNode-001 (p2, c1, k60).
1606456179: No will message specified.
1606456179: Sending CONNACK to ECCLab-IoTNode-001 (0, 0)
1606456179: Received SUBSCRIBE from ECCLab-IoTNode-001
1606456179:      /devices/ECCLab-IoTNode-001/control (QoS 0)
1606456179: ECCLab-IoTNode-001 0 /devices/ECCLab-IoTNode-001/control
1606456179: Sending SUBACK to ECCLab-IoTNode-001
```

If these lines are printed, it means that the Broker is running (ready to go)



# IP Address of Broker

Run the Command Prompt and give it a command **ipconfig**

```
Administrator: Command Prompt
C:\Windows\system32>ipconfig

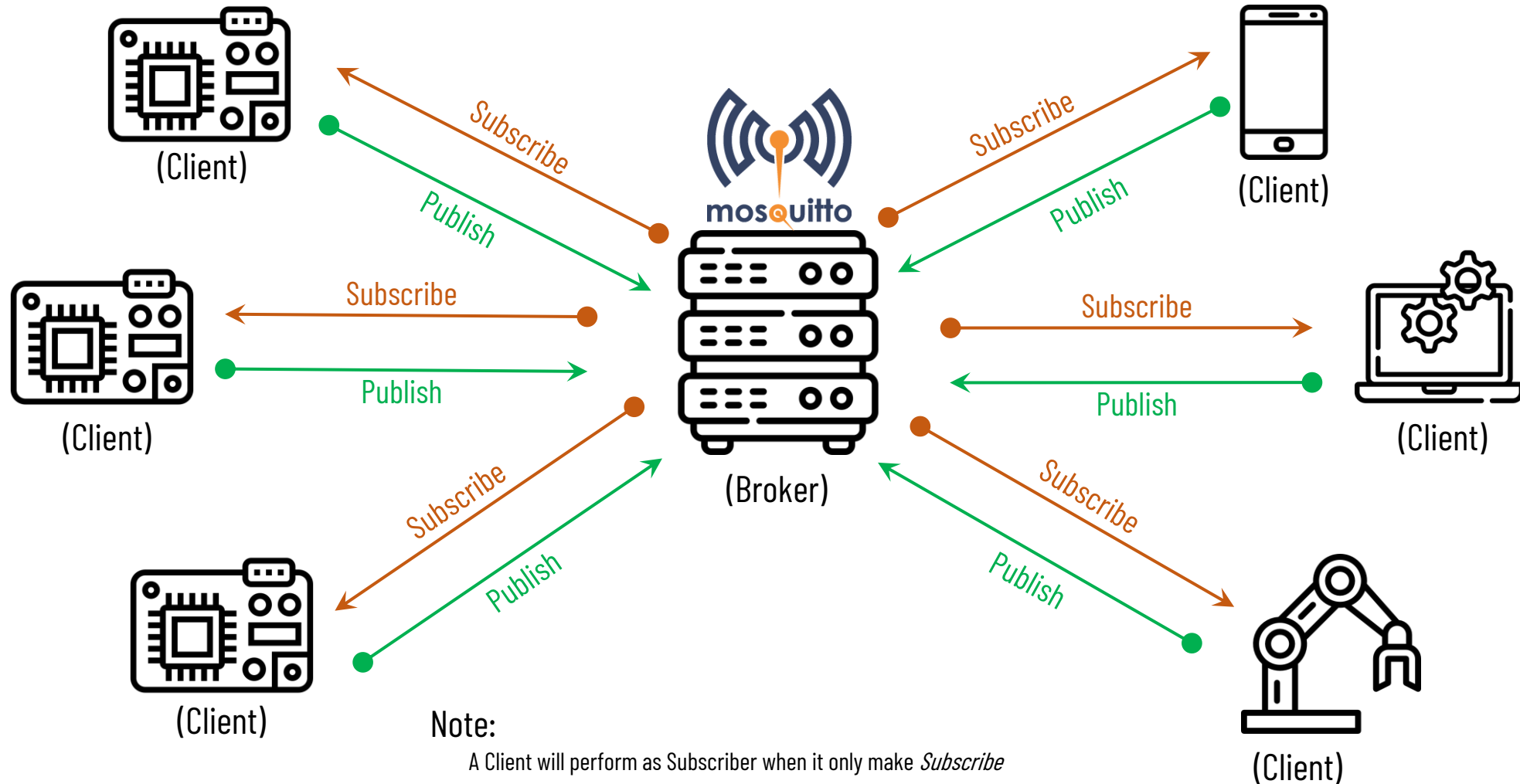
Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::ed7d:29ac:4fd0:18aa%11
    IPv4 Address. . . . . : 192.168.43.124
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.43.1
```

Note: Other devices (clients) in the same network can connect to the Broker via this IP Address



# MQTT: Server-Client



## Note:

A Client will perform as Subscriber when it only make *Subscribe*

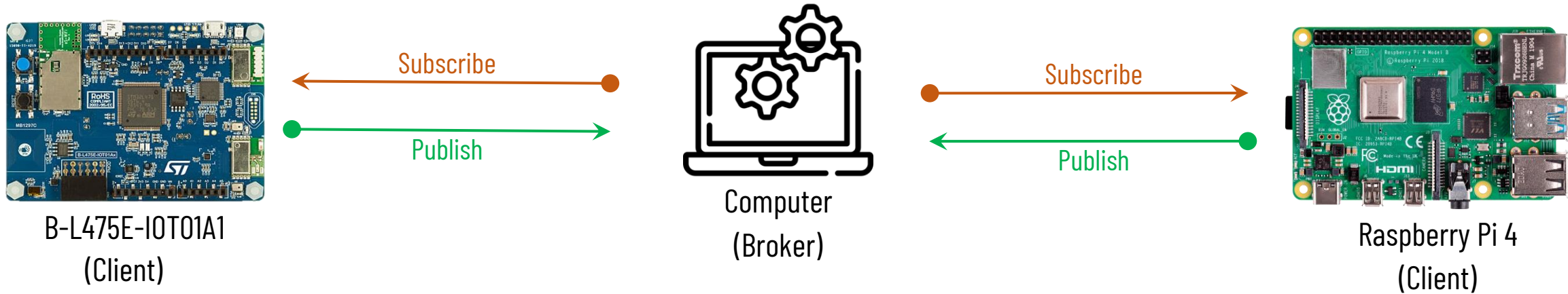
A Client will perform as Publisher when it only make *Publish*

A Client will perform as Publisher and Subscriber when it make both *Publish* and *Subscribe*

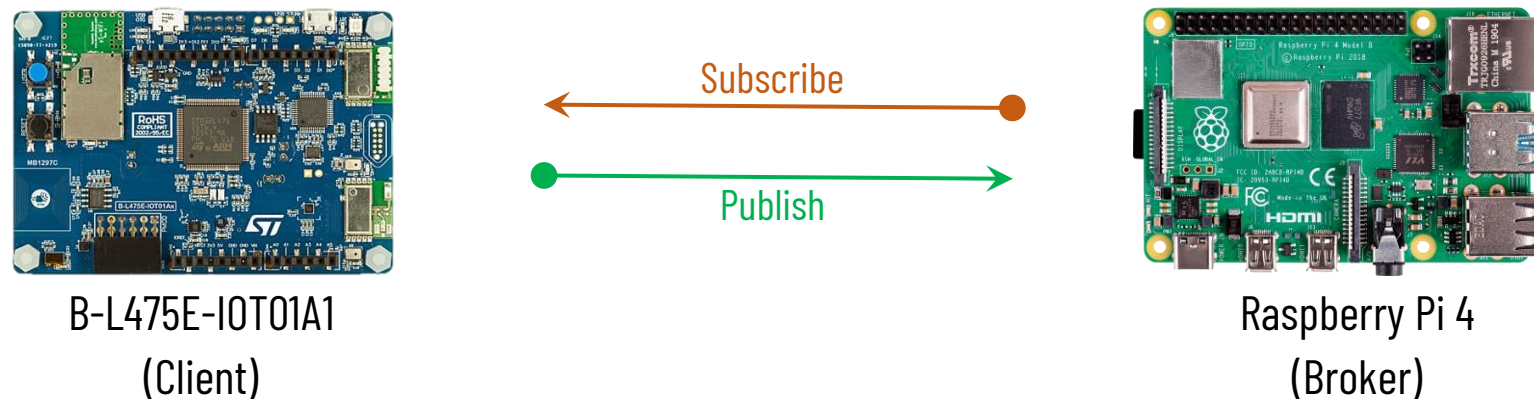


# MQTT: Server-Client (for TOPGUN)

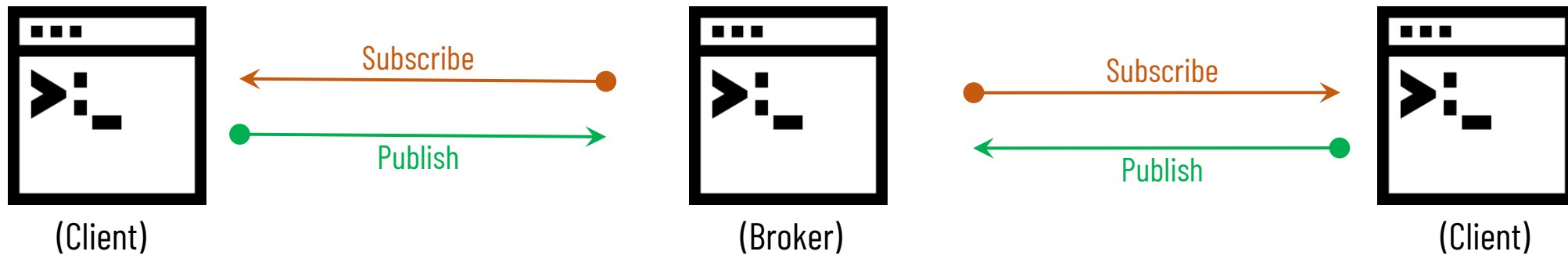
## SETUP 1:



## SETUP 2:



# MQTT: Server-Client (for learning)



Note: We use this setup to learn some basic commands/operations of the MQTT



# Server: Start the Broker

Stop the Mosquitto Broker service (check the previous slide)

Run the Command Prompt and give it a command **mosquitto -v**

```
Administrator: Command Prompt - mosquitto -v
C:\Windows\system32>mosquitto -v
1606456178: mosquitto version 1.6.12 starting
1606456178: Using default config.
1606456178: Opening ipv6 listen socket on port 1883.
1606456178: Opening ipv4 listen socket on port 1883.
1606456178: mosquitto version 1.6.12 running
1606456179: New connection from 192.168.43.10 on port 1883.
1606456179: New client connected from 192.168.43.10 as ECCLab-IoTNode-001 (p2, c1, k60).
1606456179: No will message specified.
1606456179: Sending CONNACK to ECCLab-IoTNode-001 (0, 0)
1606456179: Received SUBSCRIBE from ECCLab-IoTNode-001
1606456179:      /devices/ECCLab-IoTNode-001/control (QoS 0)
1606456179: ECCLab-IoTNode-001 0 /devices/ECCLab-IoTNode-001/control
1606456179: Sending SUBACK to ECCLab-IoTNode-001
```

If these lines are printed, it means that the Broker is running (ready to go)



- 1 If the Broker is not running, run it using the command **mosquitto -v**
- 2 Open a new Command Prompt and give it a command **mosquitto\_sub -d -h 192.168.43.124 -p 1883 -t /ecclab/nodes/status**

**mosquitto\_sub -d -h 192.168.43.124 -p 1883 -t /ecclab/nodes/status**

Broker IP Address

Broker Port

Topic Name

```
Administrator: Command Prompt - mosquitto_sub -d -h 192.168.43.124 -p 1883 -t /ecclab/nodes/status
C:\Windows\system32>mosquitto_sub -d -h 192.168.43.124 -p 1883 -t /ecclab/nodes/status
Client mosq-Qf3SEaGl9zvzM0zJRr sending CONNECT
Client mosq-Qf3SEaGl9zvzM0zJRr received CONNACK (0)
Client mosq-Qf3SEaGl9zvzM0zJRr sending SUBSCRIBE (Mid: 1, Topic: /ecclab/nodes/status, QoS: 0, Options: 0x00)
Client mosq-Qf3SEaGl9zvzM0zJRr received SUBACK
Subscribed (mid: 1): 0
```

Client

```
Administrator: Command Prompt - mosquitto -v
C:\Windows\system32>mosquitto -v
1606458174: mosquitto version 1.6.12 starting
1606458174: Using default config.
1606458174: Opening ipv6 listen socket on port 1883.
1606458174: Opening ipv4 listen socket on port 1883.
1606458174: mosquitto version 1.6.12 running
1606458177: New connection from 192.168.43.124 on port 1883.
1606458177: New client connected from 192.168.43.124 as mosq-Qf3SEaGl9zvzM0zJRr (p2, c1, k60).
1606458177: No will message specified.
1606458177: Sending CONNACK to mosq-Qf3SEaGl9zvzM0zJRr (0, 0)
1606458177: Received SUBSCRIBE from mosq-Qf3SEaGl9zvzM0zJRr
1606458177: /ecclab/nodes/status (QoS 0)
1606458177: mosq-Qf3SEaGl9zvzM0zJRr 0 /ecclab/nodes/status
1606458177: Sending SUBACK to mosq-Qf3SEaGl9zvzM0zJRr
```

Broker (Server)



Open a new Command Prompt and give it a command `mosquitto_pub -d -h 192.168.43.124 -p 1883 -t /ecclab/nodes/status -m hello`

`mosquitto_pub -d -h 192.168.43.124 -p 1883 -t /ecclab/nodes/status -m hello`

Broker IP Address

Broker Port

Topic Name

Message

```
Administrator: Command Prompt
C:\Windows\system32>mosquitto_pub -d -h 192.168.43.124 -p 1883 -t /ecclab/nodes/status -m hello
Client mosq-dV4KnLRgnikiJq48qI sending CONNECT
Client mosq-dV4KnLRgnikiJq48qI received CONNACK (0)
Client mosq-dV4KnLRgnikiJq48qI sending PUBLISH (d0, q0, r0, m1, '/ecclab/nodes/status', ... (5 bytes))
Client mosq-dV4KnLRgnikiJq48qI sending DISCONNECT
```

Client

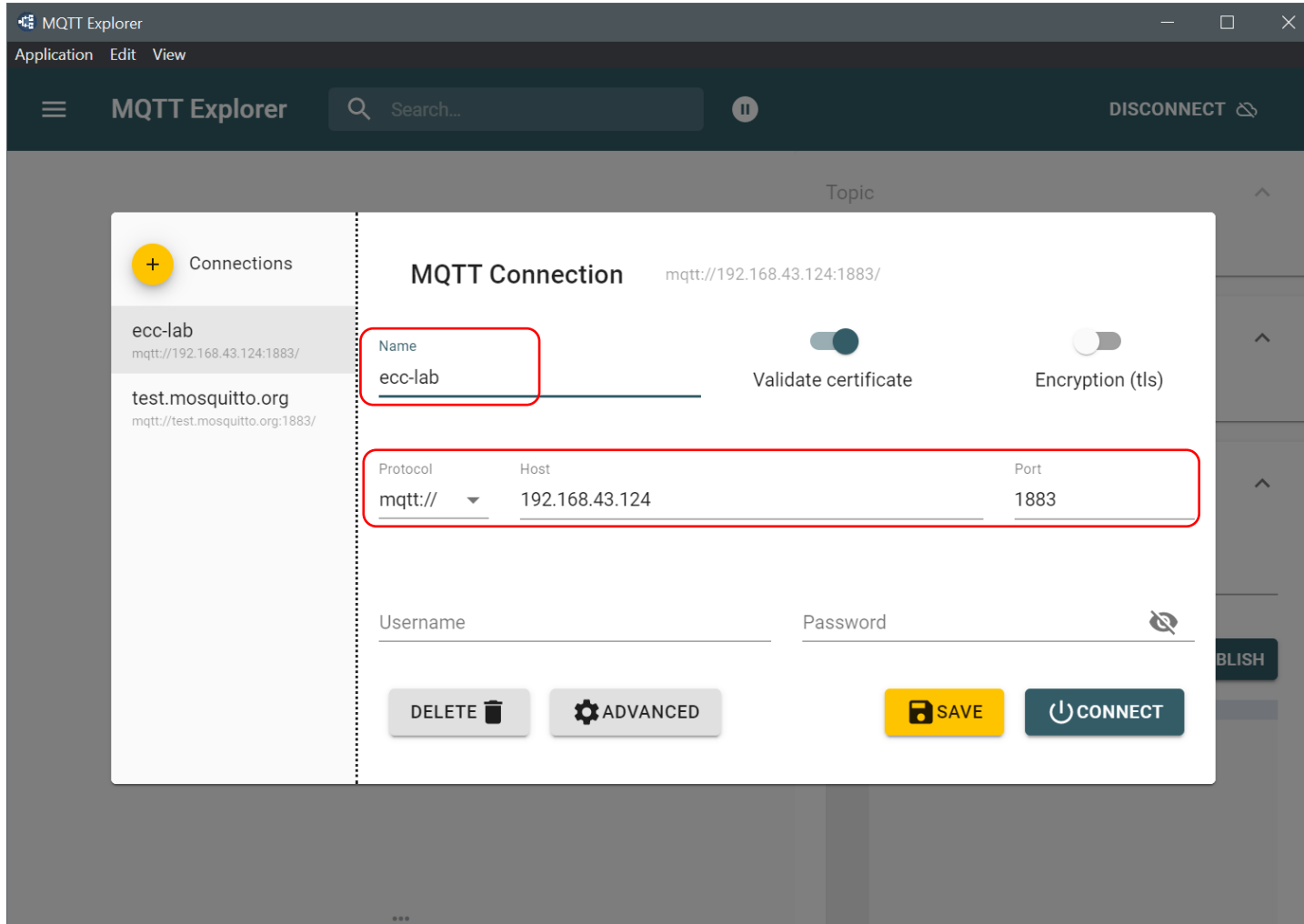
```
Administrator: Command Prompt - mosquitto -v
1606460024: Client mosq-amiNE4CuyVg7aThwqI disconnected.
1606460026: New connection from 192.168.43.124 on port 1883.
1606460026: New client connected from 192.168.43.124 as mosq-dxVYb0DF9DZQhbbd8B (p2, c1, k60).
1606460026: No will message specified.
1606460026: Sending CONNACK to mosq-dxVYb0DF9DZQhbbd8B (0, 0)
1606460026: Received PUBLISH from mosq-dxVYb0DF9DZQhbbd8B (d0, q0, r0, m0, '/ecclab/nodes/status', ... (5 bytes))
1606460026: Sending PUBLISH to mosq-Qf3SEaGl9zvgM0zJRr (d0, q0, r0, m0, '/ecclab/nodes/status', ... (5 bytes))
1606460026: Received DISCONNECT from mosq-dxVYb0DF9DZQhbbd8B
1606460026: Client mosq-dxVYb0DF9DZQhbbd8B disconnected.
```

Broker (Server)



# MQTT Explorer - Login

Open the MQTT Explorer and give it the required information, then click the CONNECT button



The screenshot shows the MQTT Explorer application window. The main interface has a dark theme with a menu bar (Application, Edit, View) and a search bar. A sidebar on the left lists connections: "ecc-lab" (mqtt://192.168.43.124:1883/) and "test.mosquitto.org" (mqtt://test.mosquitto.org:1883/). The "ecc-lab" connection is selected, and its details are shown in the main panel. The "MQTT Connection" dialog box is open, displaying the connection name "ecc-lab", the protocol "mqtt://", the host "192.168.43.124", and the port "1883". The "Validate certificate" and "Encryption (tls)" options are both disabled. The "Username" and "Password" fields are empty. At the bottom of the dialog are buttons for "DELETE", "ADVANCED", "SAVE", and "CONNECT".

MQTT Explorer

Application Edit View

MQTT Explorer Search...

DISCONNECT

Topic

Connections

ecc-lab  
mqtt://192.168.43.124:1883/

test.mosquitto.org  
mqtt://test.mosquitto.org:1883/

MQTT Connection mqtt://192.168.43.124:1883/

Name  
ecc-lab

Validate certificate

Encryption (tls)

Protocol Host Port

mqtt:// 192.168.43.124 1883

Username Password

DELETE ADVANCED SAVE CONNECT

# MQTT Explorer - Using

v1.0.1

Check it in details and choose the powerful functions for your development

MQTT Explorer

ApplicationEditView

MQTT Explorer

Search...

DISCONNECT

192.168.43.124

SSYS

broker

version = mosquitto version 1.6.12

uptime = 319 seconds

load

messages (6 topics, 260 messages)

publish (9 topics, 219 messages)

bytes (6 topics, 264 messages)

sockets (3 topics, 93 messages)

connections (3 topics, 93 messages)

messages

received = 42

sent = 917

stored = 51

store (2 topics, 30 messages)

bytes (2 topics, 70 messages)

clients (7 topics, 22 messages)

subscriptions (1 topic, 5 messages)

retained messages (1 topic, 5 messages)

publish (5 topics, 111 messages)

shared\_subscriptions (1 topic, 1 message)

ecclab

nodes

status = {led: true}

devices

ECCLab-IoTNode-001

status = { "state": { "reported": { "LedOn": true, "TelemetryInterval": 5, "ts": 1606462641, "mac": "C47F519427E" "devId": "ECCLab-IoTNode-001" } } }

sensors

ECCLab-IoTNode-001 = { "state": { "reported": { "temperature": 34.72, "humidity": 69.21, "pressure": 1012.23, "proximity": 8190, "acc\_x": -210, "acc\_y": 208, "acc\_z": 986 } } }

Topic

/sensors/ECCLab-IoTNode-001

Value

<>

QoS: 0

11/27/2020 2:41:07 PM

{

"state": {

"reported": {

"temperature": 34.69,

"humidity": 69.34,

"pressure": 1012.17,

"temperature": 34.72,

"humidity": 69.21,

"pressure": 1012.23,

"proximity": 8190,

"acc\_x": -208,

"acc\_y": 41,

"acc\_z": 986

}

}

}

Comparing with previous message: + 12 lines, - 12 lines

History16

Publish

Topic

/sensors/ECCLab-IoTNode-001

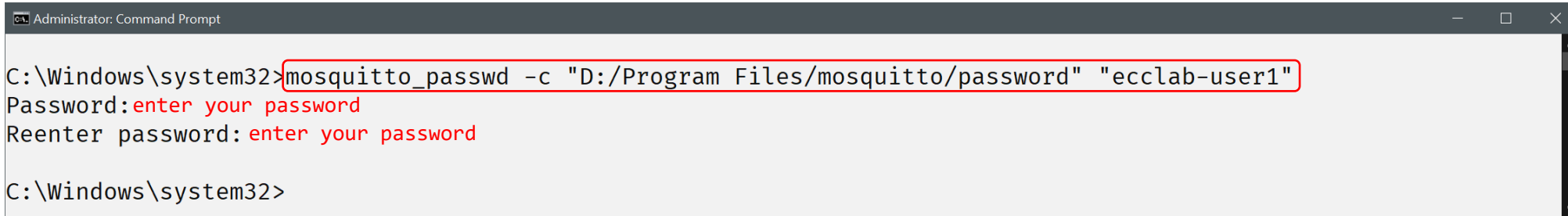
# Add Username & Password

Stop the Mosquito (if it is running)

Run the command `mosquitto_passwd -c <full_path> <user_name>`

`mosquitto_passwd -c "D:/Program Files/mosquitto/password" "ecclab-user1"`

Full path for saving the password file      Username



```
Administrator: Command Prompt
C:\Windows\system32>mosquitto_passwd -c "D:/Program Files/mosquitto/password" "ecclab-user1"
Password:enter your password
Reenter password:enter your password
C:\Windows\system32>
```

Go to the directory `"D:/Program Files/mosquitto/"` and open the file `"password"` using text editor, and check the username and encoded password. It look like this: `ecclab-user1:$6$Sh6u7bcS/fMFZStZ$uA5p0y7aQ8Q8b0L8uPvmPeMyQdxCFESh4aKrjHryy6ARPah1eTTuycLEapF6g4eT/bjA84TlvbXPeV1o0FX1Sg==`

Go to the directory `"D:/Program Files/mosquitto/"` open the file `"mosquitto.conf"` using text editor, and add the following two lines

```
987 # processed before the next instance. See the man page for examples.
988 #include_dir
989
990 allow_anonymous false
991 password_file D:\Program Files\mosquitto\password
```

Add these two lines, save and close

# Run the Broker, Subscriber and Publisher

Open three Command Prompt Windows and enter the commands (close all previous windows if they are opening)

```
Administrator: Command Prompt - mosquitto -v

C:\Windows\system32>mosquitto -v
1606551742: mosquitto version 1.6.12 starting
1606551742: Using default config.
1606551742: Opening ipv6 listen socket on port 1883.
1606551742: Opening ipv4 listen socket on port 1883.
```

Broker (Server)

```
Administrator: Command Prompt - mosquitto_sub -d -h 192.168.43.124 -p 1883 -t /test/topic -u ecclab-user1 -P ecclab-user1

C:\Windows\system32>mosquitto_sub -d -h 192.168.43.124 -p 1883 -t /test/topic -u ecclab-user1 -P ecclab-user1
Client mosq-INPxq7rMrDspN0ZmvG sending CONNECT
Client mosq-INPxq7rMrDspN0ZmvG received CONNACK (0)
Client mosq-INPxq7rMrDspN0ZmvG sending SUBSCRIBE (Mid: 1, Topic: /test/topic, QoS: 0, Options: 0x00)
Client mosq-INPxq7rMrDspN0ZmvG received SUBACK
```

Subscriber (Client)

```
Administrator: Command Prompt

C:\Windows\system32>mosquitto_pub -d -h 192.168.43.124 -p 1883 -t /test/topic -u ecclab-user1 -P ecclab-user1 -m "hello"
Client mosq-Uu985HdD15bdHbS8pM sending CONNECT
Client mosq-Uu985HdD15bdHbS8pM received CONNACK (0)
Client mosq-Uu985HdD15bdHbS8pM sending PUBLISH (d0, q0, r0, m1, '/test/topic', ... (5 bytes))
Client mosq-Uu985HdD15bdHbS8pM sending DISCONNECT
```

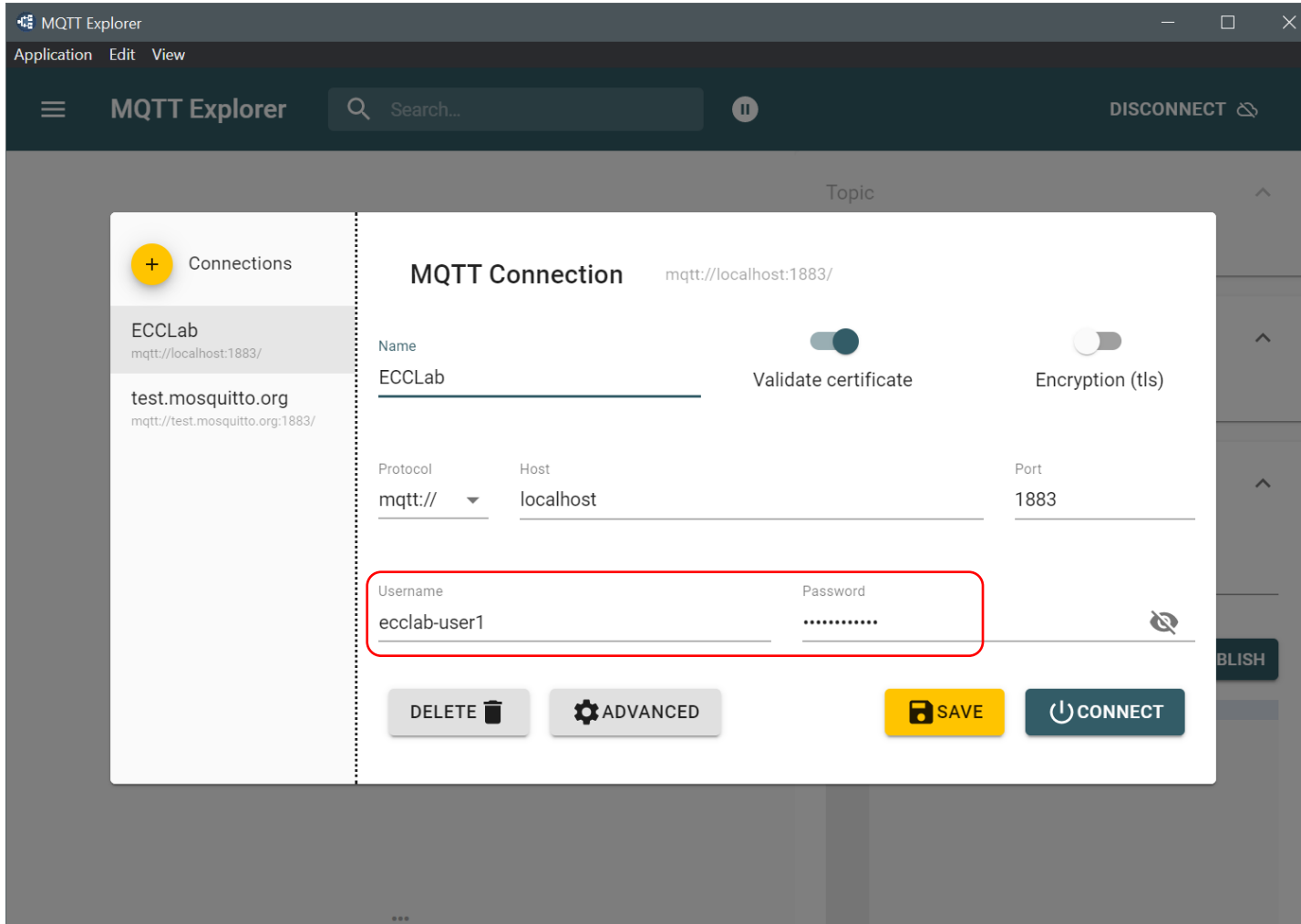
Publisher (Client)

Note: The IP Address of the server can be replaced by **localhost**



# MQTT Explorer with Username & Password

Now, you can make the connection with the username and password for the MQTT Explorer



The screenshot shows the MQTT Explorer application window. On the left, a sidebar lists connections: 'ECCLab' (mqtt://localhost:1883/) and 'test.mosquitto.org' (mqtt://test.mosquitto.org:1883/). The main area displays the 'MQTT Connection' dialog for 'ECCLab'. The dialog includes fields for Name, Protocol, Host, Port, Username, and Password. The 'Validate certificate' and 'Encryption (tls)' toggles are currently off. The Username field is highlighted with a red rectangle and contains 'ecclab-user1'. The Password field contains masked characters. At the bottom of the dialog are buttons for 'DELETE', 'ADVANCED', 'SAVE', and 'CONNECT'.

MQTT Explorer

Application Edit View

MQTT Explorer Search...

DISCONNECT

Topic

+ Connections

ECCLab  
mqtt://localhost:1883/

test.mosquitto.org  
mqtt://test.mosquitto.org:1883/

MQTT Connection mqtt://localhost:1883/

Name ECCLab

Validate certificate

Encryption (tls)

Protocol mqtt:// Host localhost Port 1883

Username ecclab-user1 Password .....

DELETE ADVANCED SAVE CONNECT

# THANK YOU!



ผศ.ดร.สันติ นุราช

Asst.Prof.Dr.Santi Nuratch

Embedded Computing and Control Laboratory

Department of Control System and Instrumentation Engineering, Faculty of Engineering  
King Mongkut's University of Technology Thonburi (KMUTT)