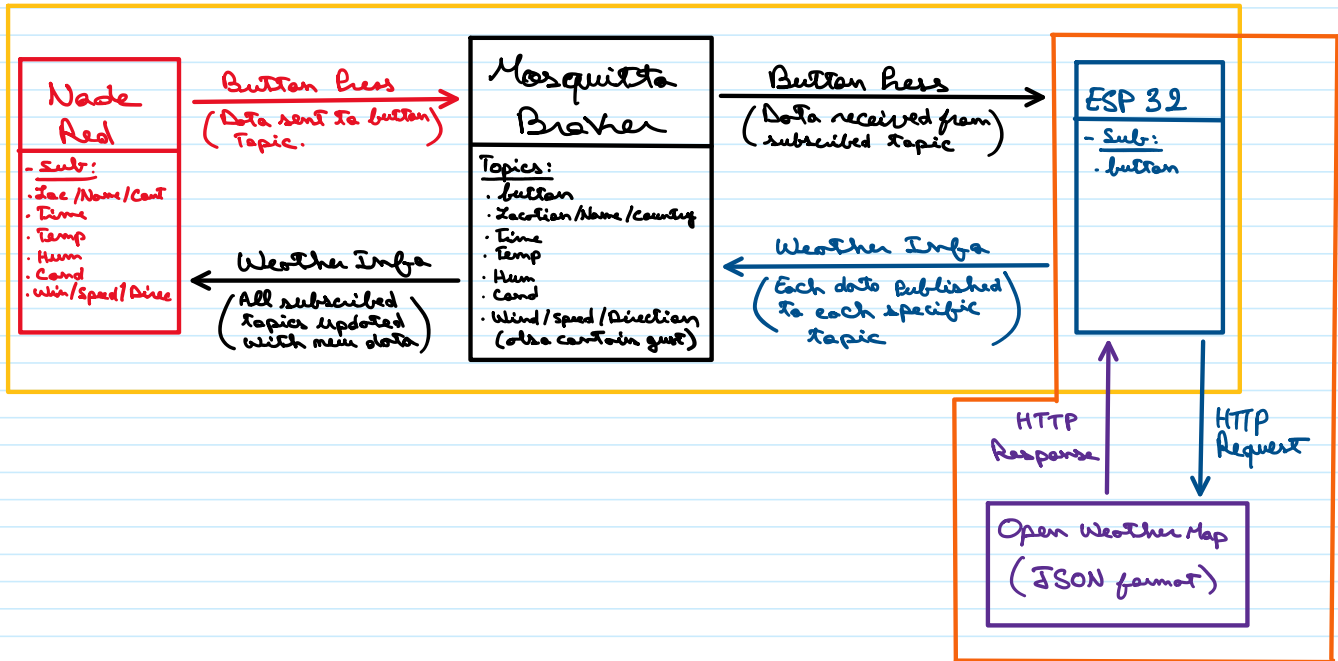


* System Level Architecture :

MQTT Process



HTTP Process

> Description of MQTT Topics used:

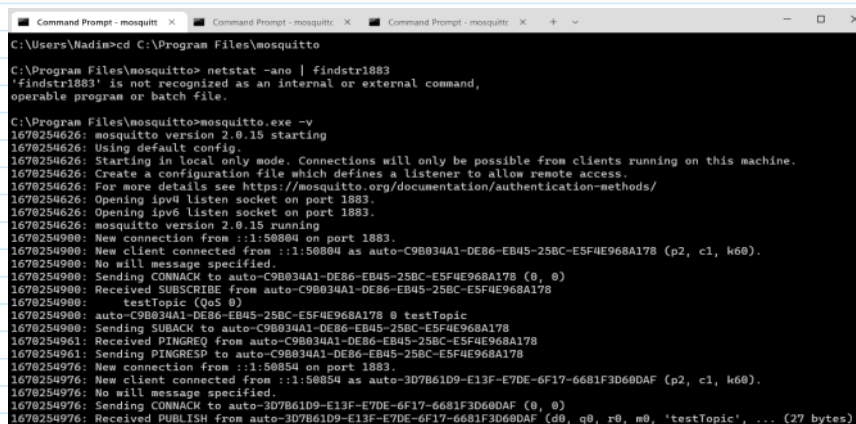
- 1) Button Topic: - ESP32 subscribed to it.
 - Each button press updates topic and notifies ESP32 client that weather data is being requested.
 - Button press published by Node Red.
- 2) Location/Name/Country: - Published by ESP32 client.
 - Subscribed by Node Red client.
 - Contains city and country.
- 3) Time: - Published by ESP32 client.
 - Subscribed by Node Red client.
 - Contains time of last reading.
- 4) Temp: - Published by ESP32 client.
 - Subscribed by Node Red client.
 - Contains temperature reading.
- 5) Hum: - Published by ESP32 client.
 - Subscribed by Node Red client.
 - Contains humidity reading.
- 6) Cond: - Published by ESP32 client.
 - Subscribed by Node Red client.
 - Contains condition description.
- 7) Wind/Speed/Direction: - Published by ESP32 client.
 - Subscribed by Node Red client.
 - Contains wind speed, direction and gust (if available).

* Description of ESP32 HTTP/MQTT client:

- > wifi-event-handler: - Checks for wifi connection and IP address status.
- > wifi-connection: - Specify which wifi to connect to.
- Connects to it provided SSID and password.
- > client-event-get-handler: - When data received in packet form
↳ Store it in char buffer and concatenate it to an other buffer until we get full response.
- > rest-get: - get request from the URL we specify to it.
- > mqtt-event-handler-cb: - subscribes to wanted topics when MQTT connected.
- publishes to wanted topics when data received.
- > mqtt-app-start: - specify URI to connect to common server.
- > app-main: - calls needed functions
- translates JSON file to string and writes extracted weather information to output buffer. (using <JSON.h> library functions)

* Mosquitto Broker: (Download and Testing)

- 1) Downloaded mosquitto from eclipse website.
- 2) Ran the mosquitto.exe file using the command prompt by typing the command "`mosquitto.exe -v`"
 - i) This starts mosquitto and sets up this cmd tab to be mosquitto's log for connects and disconnects.



```
C:\Users\Wadim> cd C:\Program Files\mosquitto
C:\Program Files\mosquitto> netstat -ano | findstr 1883
'findstr1883' is not recognized as an internal or external command,
operable program or batch file.
C:\Program Files\mosquitto> mosquitto.exe -v
1678254626: mosquitto version 2.0.15 starting
1678254626: Using default config.
1678254626: Starting in local only mode. Connections will only be possible from clients running on this machine.
1678254626: Create a configuration file which defines a listener to allow remote access.
1678254626: For more details see https://mosquitto.org/documentation/authentication-methods/
1678254626: Opening ipv4 listen socket on port 1883.
1678254626: Opening ipv6 listen socket on port 1883.
1678254626: mosquitto version 2.0.15 running
1678254900: New connection from ::1:58804 on port 1883.
1678254900: New client connected from ::1:58804 as auto-C9B034A1-DE86-EB45-25BC-ESF4E968A178 (p2, c1, k60).
1678254900: No will message specified.
1678254900: Sending CONNACK to auto-C9B034A1-DE86-EB45-25BC-ESF4E968A178 (0, 0)
1678254900: Received SUBSCRIBE from auto-C9B034A1-DE86-EB45-25BC-ESF4E968A178
1678254900: testTopic (QoS 0)
1678254900: auto-C9B034A1-DE86-EB45-25BC-ESF4E968A178 0 testTopic
1678254900: Sending SUBACK to auto-C9B034A1-DE86-EB45-25BC-ESF4E968A178
1678254961: Received PINGREQ from auto-C9B034A1-DE86-EB45-25BC-ESF4E968A178
1678254961: Sending PINGRESP to auto-C9B034A1-DE86-EB45-25BC-ESF4E968A178
1678254976: New connection from ::1:58854 on port 1883.
1678254976: New client connected from ::1:58854 as auto-3D7B61D9-E13F-E7DE-6F17-6681F3D68DAF (p2, c1, k60).
1678254976: No will message specified.
1678254976: Sending CONNACK to auto-3D7B61D9-E13F-E7DE-6F17-6681F3D68DAF (0, 0)
1678254976: Received PUBLISH from auto-3D7B61D9-E13F-E7DE-6F17-6681F3D68DAF (d0, q0, r0, m0, 'testTopic', ... (27 bytes)
```

- 3) Opened an other cmd tab and type "`mosquitto-sub.exe -t TopicName`" which subscribes mosquitto to specified topic.
 - i) This tab will now on show us messages sent to subscribed

i) This tab will now on show us messages sent to subscribed topic.

```

Microsoft Windows [Version 10.0.22621.819]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Nadia>cd C:\Program Files\mosquitto

C:\Program Files\mosquitto>mosquitto_sub.exe -t testTopic
is there anybody out there?
YES!
  
```

messages here
are first message
I sent.

- 4) To publish messages we entered "mosquitto-pub.exe -t TopicName -m message"
- they show in the previous log.
 - the first log gets updated with sub and pub connection.

```

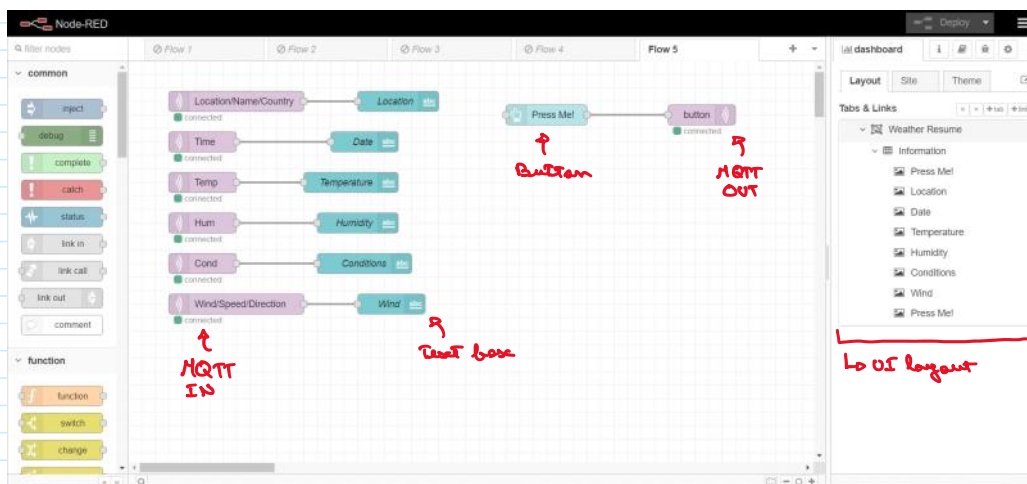
Microsoft Windows [Version 10.0.22621.819]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Nadia>cd C:\Program Files\mosquitto

C:\Program Files\mosquitto>mosquitto_pub.exe -t testTopic -m "is there anybody out there?"
C:\Program Files\mosquitto>mosquitto_pub.exe -t testTopic -m "YES!"
C:\Program Files\mosquitto>mosquitto_sub.exe -t Time
  
```

5) We made sure we are able to sub and pub manually, which means we can apply the HTTP/MQTT client code to mosquitto to exchange messages with the ESP32.

* Node-Red:



> Flow code and UI layout.

Information

Location:
📍 Beirut, LB
Date:
📅 Wednesday, December 07, 2022 02:26:18 AM
Temperature:
🌡 16.41 C
Humidity:
💧 63.00 %
Condition:
☁ scattered clouds
Wind:
🌬 2.06 km/h from the E

✓ PRESS ME!

> Final UI with
Temp readings.

* Roles:

- > HTTP client: Nadim and Ramzi; both coding and research.
- > Mosquitto: Ramzi; setting up broker.
- > Node Red: Nadim; flow and UI design.
- > MQTT client: Nadim and Ramzi; both coding and research.