Capítulo 1

Using MQTT Over WebSockets with Mosquitto

`http://www.steves-internet-guide.com/mqtt-websockets/`

1.1. What is websockets and How it Works ?

WebSocket is a computer communications protocol, providing full-duplex communication channels over a single TCP/IP connection.

It is closely associated with http and it uses http for the initial connection establishment.

The client and server connect using http and then negotiate a connection upgrade to websockets, the connection then switches from http to websockets.

The client and server can now exchange full duplex binary data over the connection.

1.2. Why Use MQTT over Websockets?

MQTT over Websockets allows you to receive MQTT data directly into a web browser.

This is important as the web browser may become the DE-facto interface for displaying MQTT data.

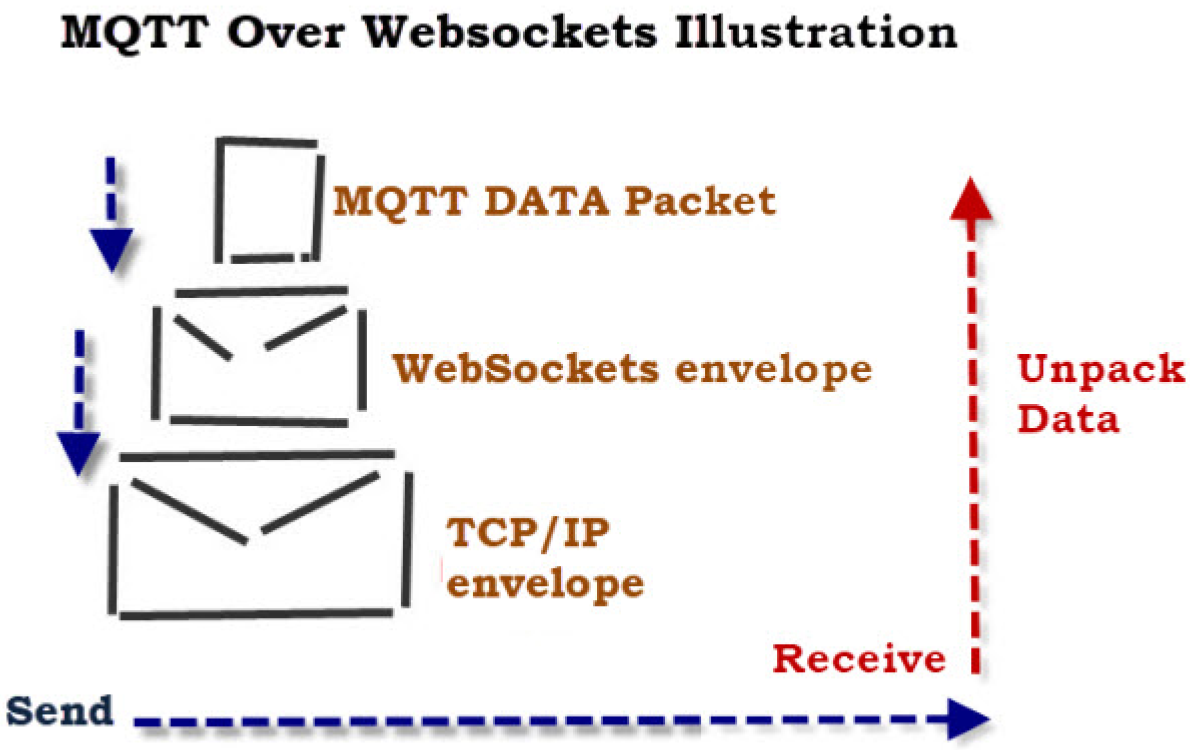
MQTT websocket support for web browsers is provided by the JavaScript client.

1.3. MQTT Over Websockets vs MQTT.

In the case of MQTT over Websockets the websockets connection forms an outer pipe for the MQTT protocol.

The MQTT broker places the MQTT packet into a websockets packet, and sends it to the client.

The client unpacks the MQTT packet from the websockets packet and then processes it as a normal MQTT packet.



With MQTT the MQTT Packet is placed directly into the TCP/IP Packet.

1.4. Websockets and Mosquitto

The default Mosquitto install packages for Windows and Linux both support WebSockets.

Very early versions 1.4.x needed to be compiled with websocket support. This is no longer necessary.

1.4.1. Websockets on Windows

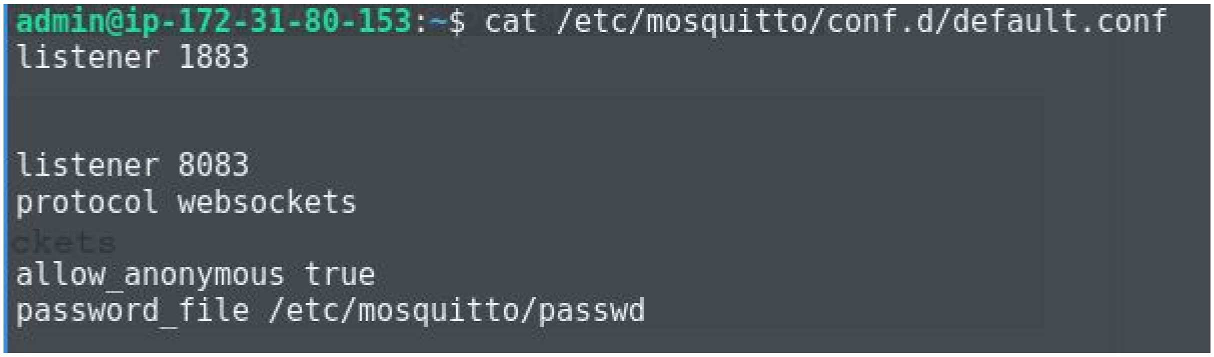
Since mosquitto 1.5.1 websockets support has been enabled on the windows binary files.

However when you start mosquitto it appears to be listening on the websocket port but doesn't allow connections.

1.4.2. Configuring Websockets On Your Own Mosquitto Broker

MQTT over Websockets usually uses port 9001 but it isn't fixed.

You need to make change to the mosquitto.conf file, by adding the following:



```
admin@ip-172-31-80-153:~$ cat /etc/mosquitto/conf.d/default.conf
listener 1883


listener 8083
protocol websockets
ckets
allow_anonymous true
password_file /etc/mosquitto/passwd
```

Figura 1.1: Configuración Mosquitto

This creates an extra listener using websockets and port 8083.

Capítulo 2

How to enable Mosquitto MQTT over WebSocket on Windows

`https://iot4beginners.com/how-to-enable-mosquitto-mqtt-over-websocket-on-windows/`
WebSocket is one of the communication protocols which provides full duplex communication over a single TCP/IP connection. It uses HTTP as a initial connection establishment. The WebSocket enables the communication from the web browser (client) to the server, in which you can send some data or a real-time data to the client from the server or even bidirectional. At first, the client and the server interacts with HTTP, then the connection upgrades to the WebSocket, providing full duplex communication unlike HTTP.

HTTP Protocol always use long polling, but Websockets overcomes this problem. Because, the HTTP protocol always sends the data on request/response, and the WebSockets allows the server to send the data to the web browser or the client, even without any request from the browser. So, 2-way client server communication is possible with WebSockets.

In this tutorial, we will learn how to enable MQTT over WebSocket on your windows machine. I have used Mosquitto Broker in this tutorial, you can use any broker of your own, for example, a cloud based MQTT like HiveMQ.

Now, these two powerful protocols (MQTT and WebSockets) comes together to make some tremendous possibilities on data transmission (or even control). The interesting thing is, you don't need to refresh your client side (your web browser) or get polling for viewing your data.

The MQTT Broker places the MQTT data in the WebSocket framework and sends it to the web client. The web client unpacks the MQTT packet from the websocket and processes it as a normal MQTT data. With the MQTT data in the Websocket frame, it is actually directly placed on the TCP/IP envelope.

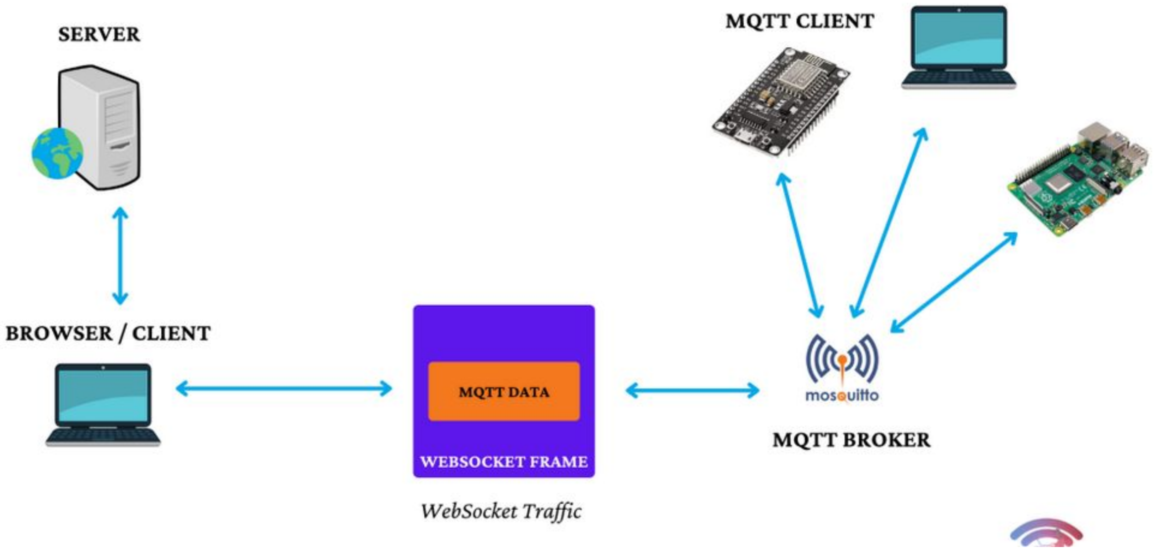


Figura 2.1: Server and Broker

2.1. WebSockets on Windows

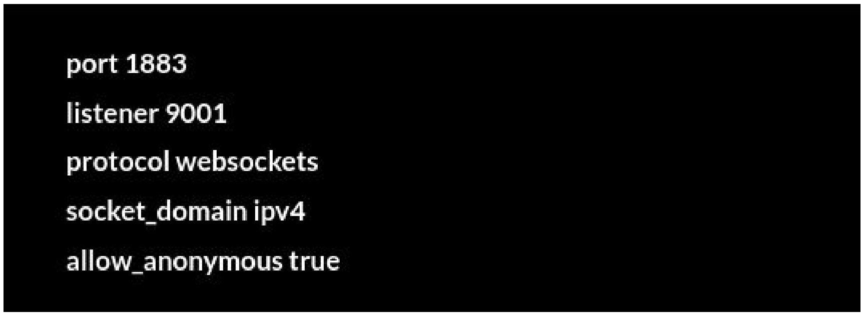
Step 1: Install MQTT Broker on Windows

Step 2: Configure the mosquitto.conf file

You have to configure the mosquitto.conf file in your mosquitto folder. In my windows, I have setup my mosquitto.conf file in the C:\Program Files\mosquitto folder. Open the configuration file with Notepad++, and then add the following lines. Save your configuration file.

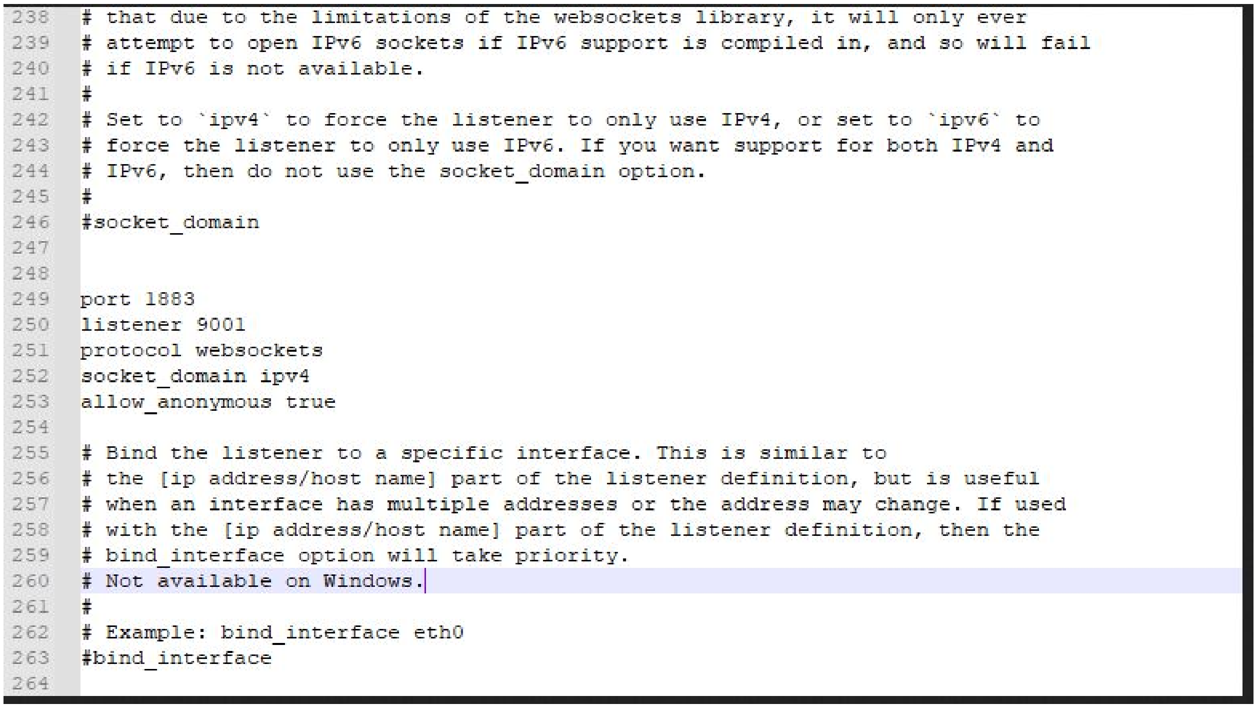
By default, Port 1883 is for the MQTT Service and,

Port 9001 is for the WebSockets



```
port 1883
listener 9001
protocol websockets
socket_domain ipv4
allow_anonymous true
```

Figura 2.2: mosquitto setup on Windows



```
# that due to the limitations of the websockets library, it will only ever
# attempt to open IPv6 sockets if IPv6 support is compiled in, and so will fail
# if IPv6 is not available.
#
# Set to `ipv4` to force the listener to only use IPv4, or set to `ipv6` to
# force the listener to only use IPv6. If you want support for both IPv4 and
# IPv6, then do not use the socket_domain option.
#
#socket_domain


port 1883
listener 9001
protocol websockets
socket_domain ipv4
allow_anonymous true

# Bind the listener to a specific interface. This is similar to
# the [ip address/host name] part of the listener definition, but is useful
# when an interface has multiple addresses or the address may change. If used
# with the [ip address/host name] part of the listener definition, then the
# bind_interface option will take priority.
# Not available on Windows.
#
# Example: bind_interface eth0
#bind_interface
```

Figura 2.3: mosquitto setup on Windows

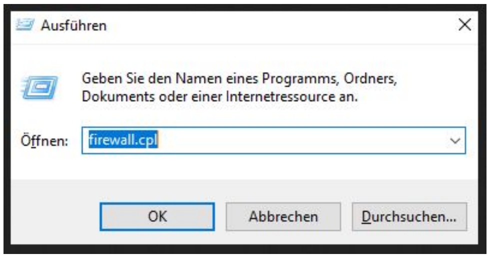
mosquitto/mosquitto.conf file

Important Note: Always check the version of mosquitto broker you are using, in this case I have used Version 2.0.14, so I needed the line, socket_domain ipv4. Somehow I have encountered problems when using the newest version of mosquitto broker, adding that line above worked out for me. By adding this, you are forcing the listener to use IPv4.

Step 3: Open two ports (1883 and 9001)

Now, you have to open the port 1883, and port 9001 on your windows machine. Basically, the ports are used to identify specific services in on your machine. For instance, the port for HTTP is 80, Netscape uses port 443 to secure the HTTP. By default, port 1883 is used by the MQTT.

To open the ports on your windows machine, Press Windows + R, type firewall.cpl and click Ok.



Geben Sie den Namen eines Programms, Ordners, Dokuments oder einer Internetressource an.

Öffnen: firewall.cpl

Figura 2.4: firewall.cpl

Click on Advanced Settings ¡Inbound Rule ¡New Rule

Now, for opening a port you have to select the Rule Type as Port.

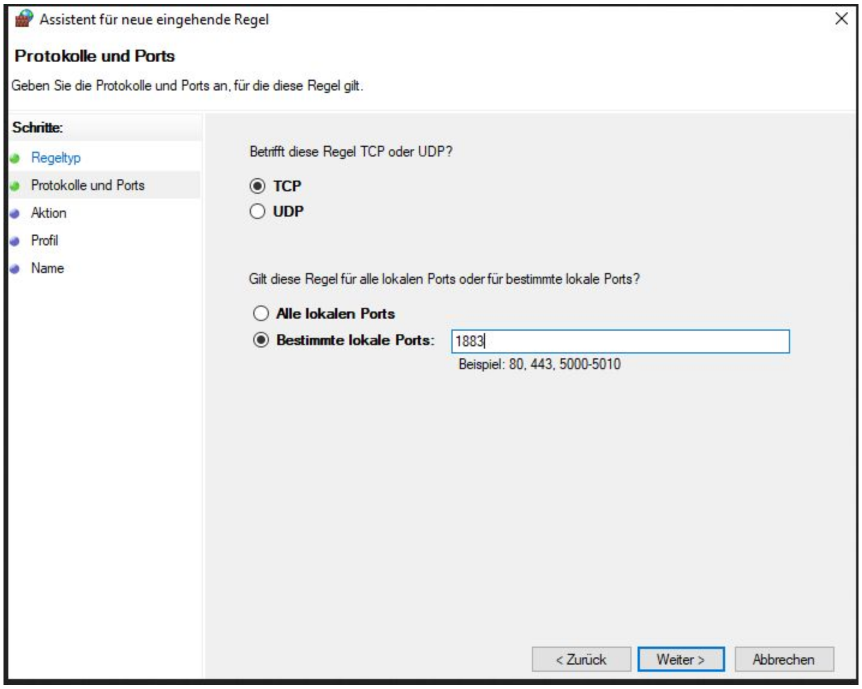
Next, you have to select TCP or UDP Protocol, Since you are opening an MQTT port, select TCP as your protocol. Also, give specific local points, as 1883 (for MQTT).

Under Action, select Allow Connection.

In the Profile section, make sure everything (Domain, Private and Public) is on check.

Under the section Name, give your port name. (you can name anything here)

Click Finish.



Assistent für neue eingehende Regel

Protokolle und Ports

Geben Sie die Protokolle und Ports an, für die diese Regel gilt.

Schritte:

- Regeltyp
- Protokolle und Ports
- Aktion
- Profil
- Name

Betrifft diese Regel TCP oder UDP?

● **TCP**

○ **UDP**

Gilt diese Regel für alle lokalen Ports oder für bestimmte lokale Ports?

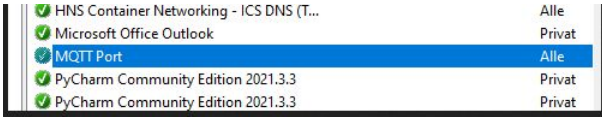
○ **Alle lokalen Ports**

● **Bestimmte lokale Ports:** 1883

Beispiel: 80, 443, 5000-5010

Figura 2.5: Configuring port

Go to Inbound rules, now you can see the port you have created.



✓ HNS Container Networking - ICS DNS (T...	Alle
✓ Microsoft Office Outlook	Privat
✓ MQTT Port	Alle
✓ PyCharm Community Edition 2021.3.3	Privat
✓ PyCharm Community Edition 2021.3.3	Privat

Figura 2.6: Inbound Rules

Repeat the same procedure to open the port 9001 for the WebSockets. Follow every steps except the port number as 9001 and with a different name.

2.2. Connect to MQTT broker with Websocket

https://www.emqx.com/en/blog/connect-to-mqtt-broker-with-websocket