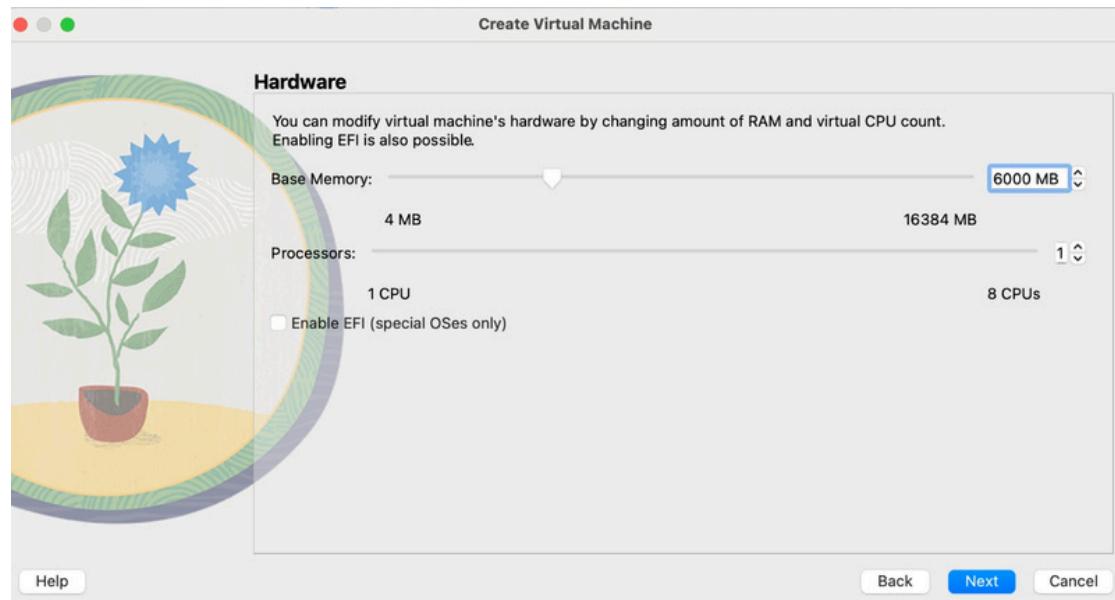
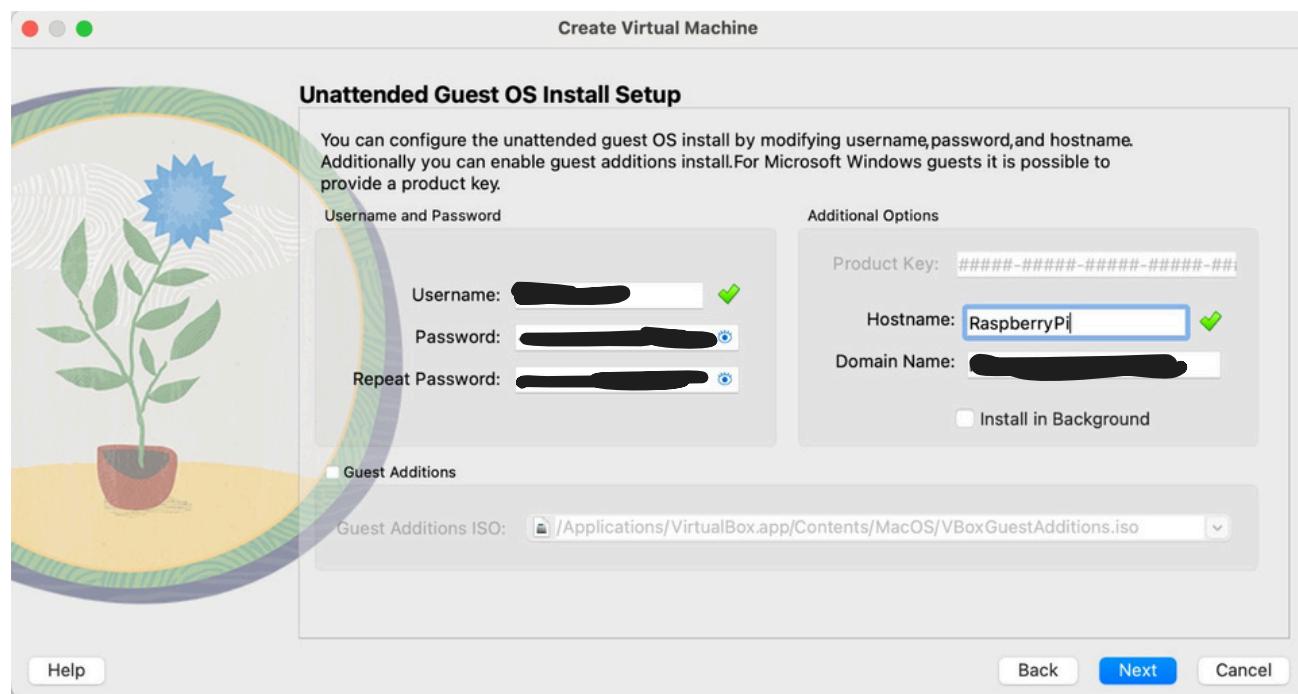
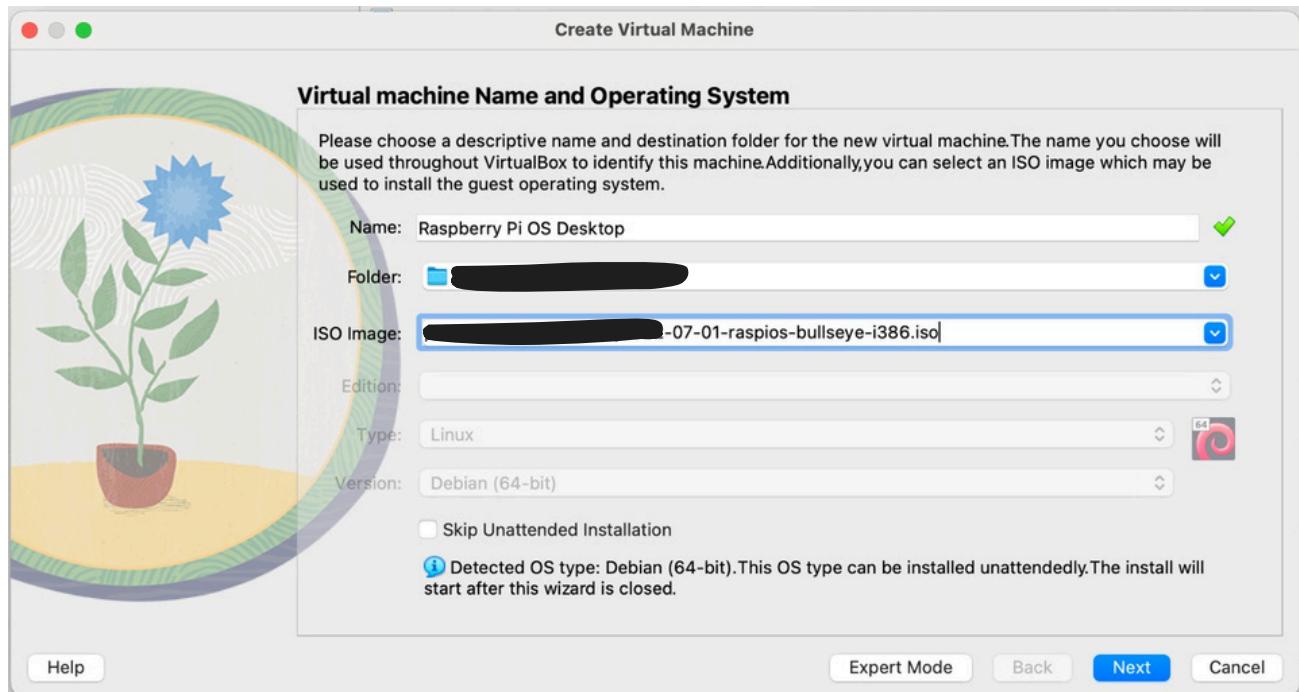


# **Setting Up an IoT Server with Node-RED, Mosquitto, and Dashboard**

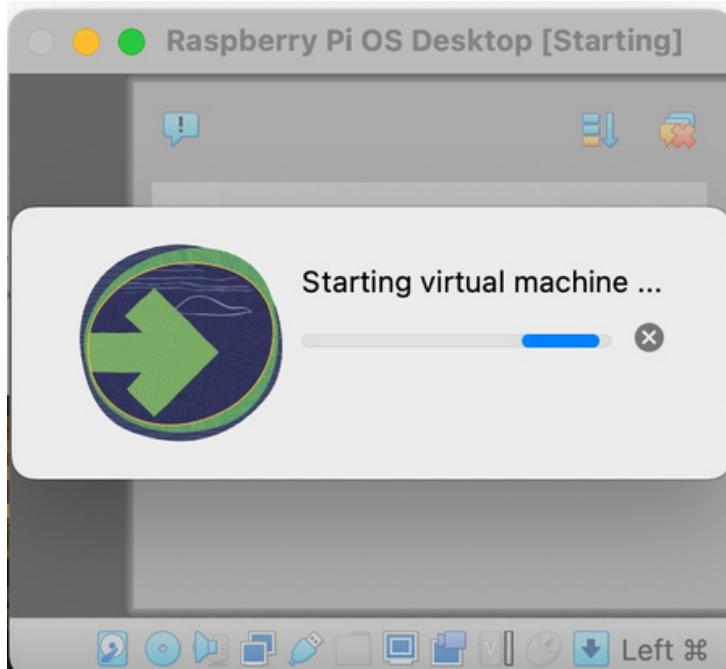
**Pakistan Institute of Engineering and Applied Sciences**

# Step 1: Set Up the Virtual Machine



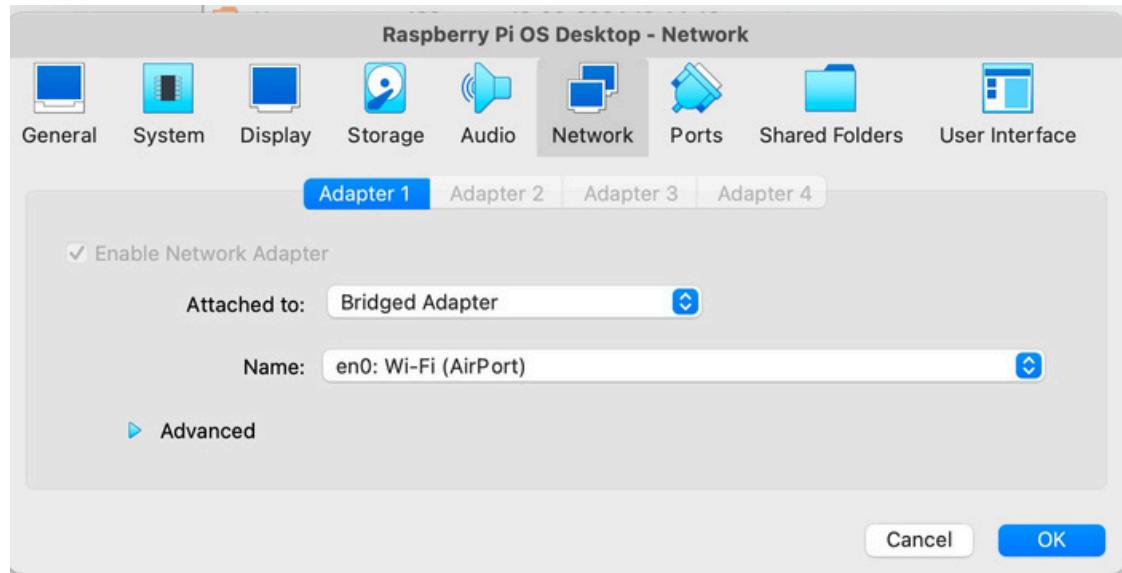


Followed it step by step. And configured its properties like RAM, CPUs and password setup etc.



## Configured Network Settings:

The screenshot shows the 'VM Settings' window for the 'Raspberry Pi OS Desktop' VM. The left sidebar lists 'Tools', 'ubuntu' (Powered Off), and 'Raspberry Pi OS Desktop' (Running). The main pane shows various configuration tabs: General, System, Display, Storage, Audio, Network, USB, Shared folders, and Description. The 'Network' tab is selected, showing Adapter 1: Intel PRO/1000 MT Desktop (NAT). The 'Storage' tab shows the attached 'ubuntu.vdi' disk. A preview window on the right shows a terminal session with multiple windows open.



## Step 2: Install Mosquitto MQTT Broker

Ran the commands to install the MQTT Broker

```
nida-pervaiz@raspberry: ~
File Edit Tabs Help
Selecting previously unselected package libk5crypto3:amd64.
Preparing to unpack .../06-libk5crypto3_1.18.3-6+deb11u6_amd64.deb ...
Unpacking libk5crypto3:amd64 (1.18.3-6+deb11u6) ...
Selecting previously unselected package libkeyutils1:amd64.
Preparing to unpack .../07-libkeyutils1_1.6.1-2_amd64.deb ...
Unpacking libkeyutils1:amd64 (1.6.1-2) ...
Selecting previously unselected package libssl1.1:amd64.
Preparing to unpack .../08-libssl1.1_1.1.1w-0+deb11u2_amd64.deb ...
Unpacking libssl1.1:amd64 (1.1.1w-0+deb11u2) ...
Selecting previously unselected package libkrb5-3:amd64.
Preparing to unpack .../09-libkrb5-3_1.18.3-6+deb11u6_amd64.deb ...
Unpacking libkrb5-3:amd64 (1.18.3-6+deb11u6) ...
Selecting previously unselected package libgssapi-krb5-2:amd64.
Preparing to unpack .../10-libgssapi-krb5-2_1.18.3-6+deb11u6_amd64.deb ...
Unpacking libgssapi-krb5-2:amd64 (1.18.3-6+deb11u6) ...
Selecting previously unselected package libunistring2:amd64.
Preparing to unpack .../11-libunistring2_0.9.10-4_amd64.deb ...
Unpacking libunistring2:amd64 (0.9.10-4) ...
Selecting previously unselected package libidn2-0:amd64.
Preparing to unpack .../12-libidn2-0_2.3.0-5_amd64.deb ...
Unpacking libidn2-0:amd64 (2.3.0-5) ...
Selecting previously unselected package libtirpc3:amd64.
Preparing to unpack .../13-libtirpc3_1.3.1-1+deb11u1_amd64.deb ...
Unpacking libtirpc3:amd64 (1.3.1-1+deb11u1) ...
```

```
nida-pervaiz@raspberry: ~
File Edit Tabs Help
GNU nano 5.4          /etc/mosquitto/mosquitto.conf *
# Place your local configuration in /etc/mosquitto/conf.d/
#
# A full description of the configuration file is at
# /usr/share/doc/mosquitto/examples/mosquitto.conf.example

pid_file /run/mosquitto/mosquitto.pid

persistence true
persistence_location /var/lib/mosquitto/

log_dest file /var/log/mosquitto/mosquitto.log

include_dir /etc/mosquitto/conf.d
listener 1883
allow_anonymous true

^G Help      ^O Write Out  ^W Where Is  ^K Cut      ^T Execute  ^C Location
^X Exit      ^R Read File  ^N Replace   ^U Paste    ^J Justify  ^_ Go To Line
```

```
1743689226: Opening ipv4 listen socket on port 1883.  
1743689226: Error: Address already in use  
1743689226: Opening ipv6 listen socket on port 1883.  
1743689226: Error: Address already in use  
nida-pervaiz@raspberry:~ $ sudo nano /etc/mosquitto/mosquitto.conf  
nida-pervaiz@raspberry:~ $ sudo systemctl restart mosquitto
```

Got the IP Address

```
nida-pervaiz@raspberry:~ $ sudo systemctl restart mosquitto  
nida-pervaiz@raspberry:~ $ hostname -I  
192.168.10.7  
nida-pervaiz@raspberry:~ $
```

```
nida-pervaiz@raspberry:~ $ sudo systemctl restart mosquitto  
nida-pervaiz@raspberry:~ $ hostname -I  
192.168.10.7  
nida-pervaiz@raspberry:~ $ curl ifconfig.me  
39.59.116.192nida-pervaiz@raspberry:~ $
```

For more security, we configured user name and password for authentication

```
nida-pervaiz@raspberry:~ $  
nida-pervaiz@raspberry:~ $  
nida-pervaiz@raspberry:~ $ sudo mosquitto_passwd -c /etc/mosquitto/passwd  
[REDACTED]  
Password:  
Reenter password:  
nida-pervaiz@raspberry:~ $
```

```
GNU nano 5.4          /etc/mosquitto/mosquitto.conf  
# Place your local configuration in /etc/mosquitto/conf.d/  
#  
# A full description of the configuration file is at  
# /usr/share/doc/mosquitto/examples/mosquitto.conf.example  
per_listener_settings true  
pid_file /run/mosquitto/mosquitto.pid  
  
persistence true  
persistence_location /var/lib/mosquitto/  
  
log_dest file /var/log/mosquitto/mosquitto.log  
  
include_dir /etc/mosquitto/conf.d  
allow_anonymous false  
listener 1883  
password_file /etc/mosquitto/passwd
```

[ Read 16 lines ]

**^G Help** **^O Write Out** **^W Where Is** **^K Cut** **^T Execute** **^C Location**  
**^X Exit** **^R Read File** **^V Replace** **^U Paste** **^J Justify** **^\_ Go To Line**

Now the MQTT is running, the status is active.

```
nida-pervaiz@raspberry:~ $ sudo systemctl restart mosquitto
nida-pervaiz@raspberry:~ $ sudo systemctl status mosquitto
● mosquitto.service - Mosquitto MQTT Broker
   Loaded: loaded (/lib/systemd/system/mosquitto.service; enabled; vendor pre>
   Active: active (running) since Thu 2025-04-03 10:27:50 CDT; 25s ago
     Docs: man:mosquitto.conf(5)
           man:mosquitto(8)
  Process: 5708 ExecStartPre=/bin/mkdir -m 740 -p /var/log/mosquitto (code=ex>
  Process: 5709 ExecStartPre=/bin/chown mosquitto /var/log/mosquitto (code=ex>
  Process: 5710 ExecStartPre=/bin/mkdir -m 740 -p /run/mosquitto (code=exited>
  Process: 5712 ExecStartPre=/bin/chown mosquitto /run/mosquitto (code=exited>
 Main PID: 5713 (mosquitto)
    Tasks: 1 (limit: 4915)
   Memory: 784.0K
      CPU: 66ms
     CGroub: /system.slice/mosquitto.service
             └─5713 /usr/sbin/mosquitto -c /etc/mosquitto/mosquitto.conf

Apr 03 10:27:50 raspberry systemd[1]: Starting Mosquitto MQTT Broker...
Apr 03 10:27:50 raspberry systemd[1]: Started Mosquitto MQTT Broker.
lines 1-18/18 (END)
```

```
This command can get or set the host name or the NIS domain name. You can
also get the DNS domain or the FQDN (fully qualified domain name).
Unless you are using bind or NIS for host lookups you can change the
FQDN (Fully Qualified Domain Name) and the DNS domain name (which is
part of the FQDN) in the /etc/hosts file.
nida-pervaiz@raspberry:~ $ hostname -I
192.168.10.7
```

Checked by pinging it, it is working

```
Process: 5776 ExecStartPre=/bin/chown mosquitto /var/log/mosquitto (code=ex>
nida-pervaiz@raspberry:~ $ nida-pervaiz@raspberry:~ 
File Edit Tabs Help
Client (null) sending DISCONNECT
nida-pervaiz@raspberry:~ $ mosquitto_sub -d -h 192.168.10.7 -t testTopic -u nida
-pervaiz -P Nida@akhtar08it
Client (null) sending CONNECT
Client (null) received CONNACK (0)
Client (null) sending SUBSCRIBE (Mid: 1, Topic: testTopic, QoS: 0, Options: 0x00
)
Client (null) received SUBACK
Subscribed (mid: 1): 0

Client (null) sending PINGREQ
Client (null) received PINGRESP
Client (null) sending PINGREQ
Client (null) received PINGRESP

Client (null) sending PINGREQ
Client (null) received PINGRESP
Client (null) received PUBLISH (d0, q0, r0, m0, 'testTopic', ... (12 bytes))
Hello, Mqtt!
Client (null) sending PINGREQ
Client (null) received PINGRESP
Client (null) sending PINGREQ
Client (null) received PINGRESP
```

# Step 3: Install Node-RED

```
nida-pervaiz@raspberry: Node-RED update
File Edit Tabs Help
Running Node-RED install for user nida-pervaiz at /home/nida-pervaiz on debian

This can take 20-30 minutes on the slower Pi versions - please wait.

Stop Node-RED          ✓
Remove old version of Node-RED    ✓
Remove old version of Node.js
Install Node.js
Clean npm cache
Install Node-RED core
Move global nodes to local
Npm rebuild existing nodes
Install extra Pi nodes
Add shortcut commands
Update systemd script

Any errors will be logged to /var/log/nodered-install.log
```

```
nida-pervaiz@raspberry: Node-RED update
File Edit Tabs Help
Follow the guide at https://nodered.org/docs/user-guide/runtime/securing-node-red
to setup security.

### ADDITIONAL RECOMMENDATIONS ###
- Remove the /etc/sudoers.d/010_pi-nopasswd file to require entering your password
when performing any sudo/root commands:
  sudo rm -f /etc/sudoers.d/010_pi-nopasswd

- You can customise the initial settings by running:
  node-red admin init
*****
**


Node-RED Settings File initialisation
=====
This tool will help you create a Node-RED settings file.

? Settings file > /home/nida-pervaiz/.node-red/settings.js
```

```
nida-pervaiz@raspberry: ~
File Edit Tabs Help
nida-pervaiz@raspberry:~ $ node-red-pi --max-old-space-size=256
3 Apr 11:55:55 - [info]
Welcome to Node-RED
=====

3 Apr 11:55:55 - [info] Node-RED version: v4.0.9
3 Apr 11:55:55 - [info] Node.js version: v20.18.3
3 Apr 11:55:55 - [info] Linux 5.10.0-15-amd64 ia32 LE
3 Apr 11:55:55 - [info] Loading palette nodes
3 Apr 11:55:56 - [warn] rpi-gpio : Raspberry Pi specific node set inactive
3 Apr 11:55:56 - [info] Settings file : /home/nida-pervaiz/.node-red/settings.json
3 Apr 11:55:56 - [info] Context store : 'default' [module=memory]
3 Apr 11:55:56 - [info] User directory : /home/nida-pervaiz/.node-red
3 Apr 11:55:56 - [warn] Projects disabled : editorTheme.projects.enabled=false
3 Apr 11:55:56 - [info] Flows file : /home/nida-pervaiz/.node-red/flows.json
3 Apr 11:55:56 - [info] Creating new flow file
3 Apr 11:55:56 - [warn]

-----
Your flow credentials file is encrypted using a system-generated key.

If the system-generated key is lost for any reason, your credentials
```

## Starting NODE-RED

```
nida-pervaiz@raspberry:~$ sudo systemctl enable nodered.service
Created symlink /etc/systemd/system/multi-user.target.wants/nodered.service → /lib/systemd/system/nodered.service.
nida-pervaiz@raspberry:~$
```

```
nida-pervaiz@raspberry:~$ node-red
3 Apr 12:07:12 - [info]

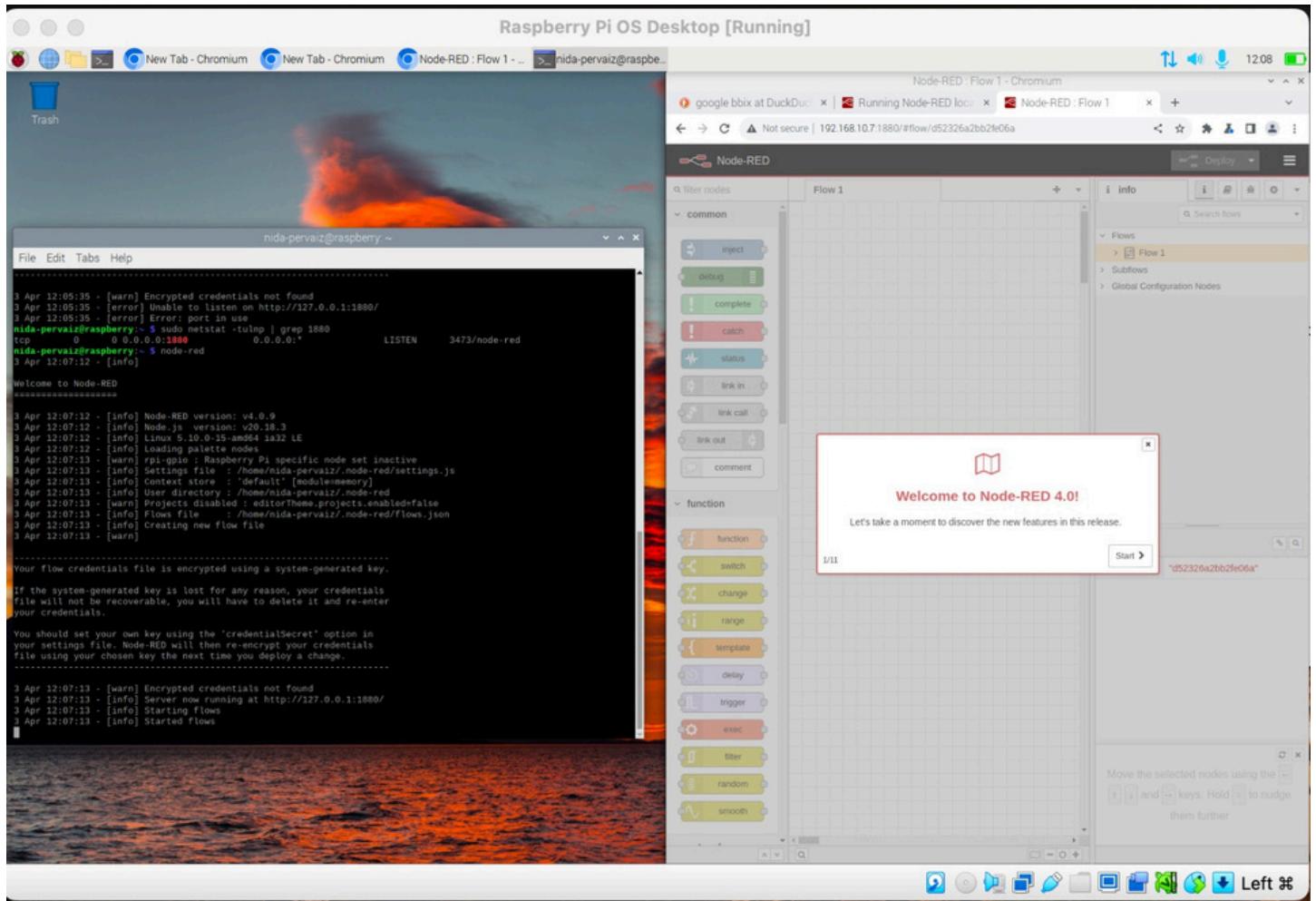
Welcome to Node-RED
=====
3 Apr 12:07:12 - [info] Node-RED version: v4.0.9
3 Apr 12:07:12 - [info] Node.js version: v20.18.3
3 Apr 12:07:12 - [info] Linux 5.10.0-15-amd64 ia32 LE
3 Apr 12:07:12 - [info] Loading palette nodes
3 Apr 12:07:13 - [warn] rpi-gpio : Raspberry Pi specific node set inactive
3 Apr 12:07:13 - [info] Settings file  : /home/nida-pervaiz/.node-red/settings.js
3 Apr 12:07:13 - [info] Context store  : 'default' [module=memory]
3 Apr 12:07:13 - [info] User directory : /home/nida-pervaiz/.node-red
3 Apr 12:07:13 - [warn] Projects disabled : editorTheme.projects.enabled=false
3 Apr 12:07:13 - [info] Flows file    : /home/nida-pervaiz/.node-red/flows.json
3 Apr 12:07:13 - [info] Creating new flow file
3 Apr 12:07:13 - [warn]

-----
Your flow credentials file is encrypted using a system-generated key.

If the system-generated key is lost for any reason, your credentials
file will not be recoverable, you will have to delete it and re-enter
your credentials.

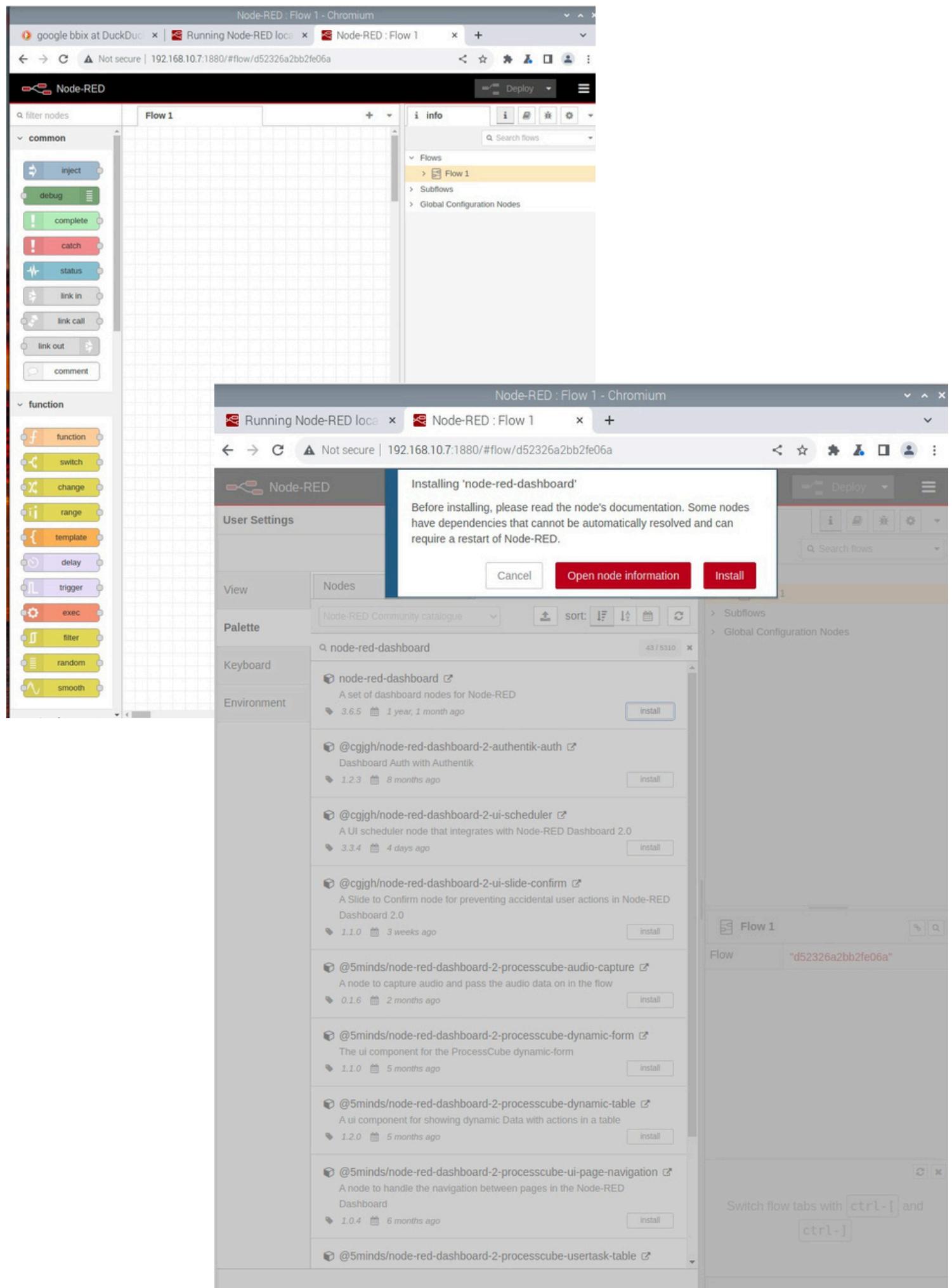
You should set your own key using the 'credentialSecret' option in
your settings file. Node-RED will then re-encrypt your credentials
file using your chosen key the next time you deploy a change.
-----

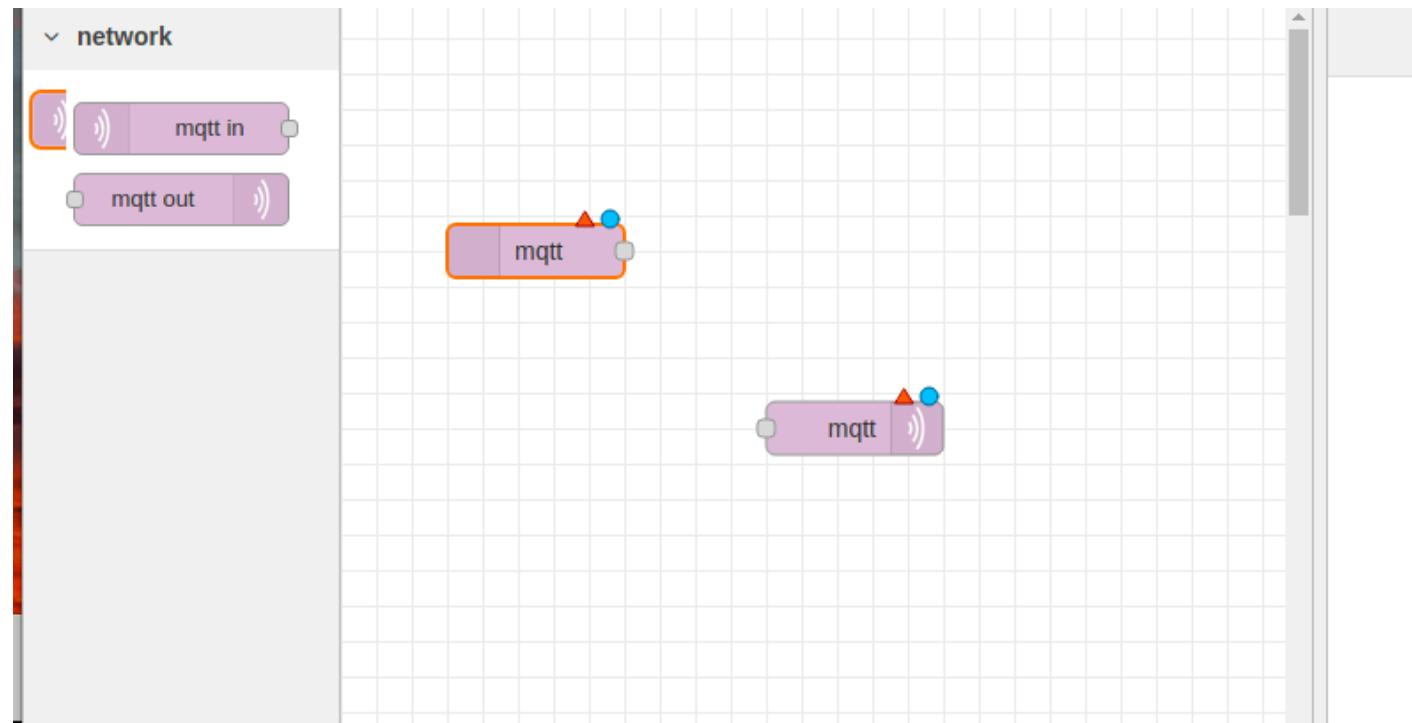
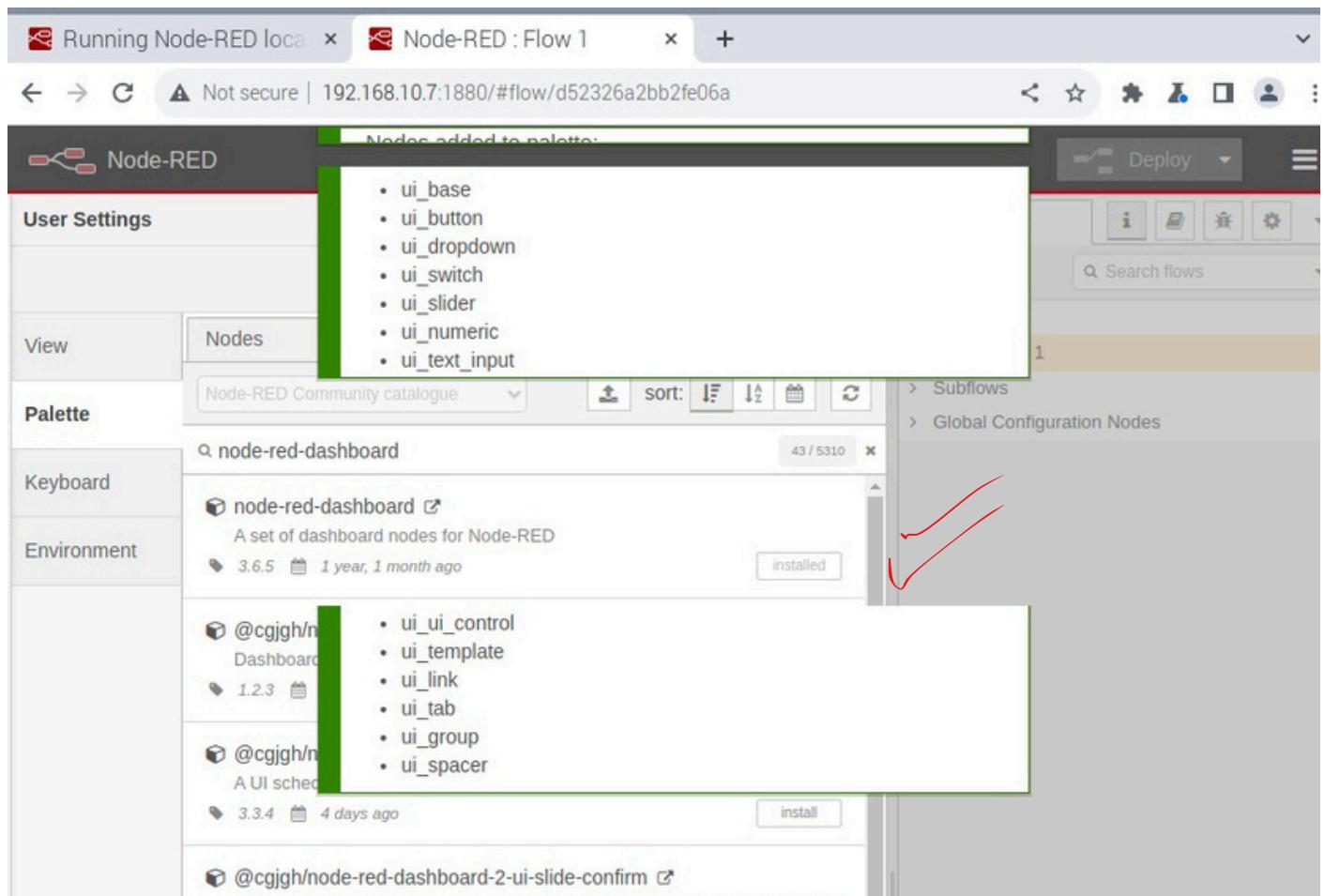
3 Apr 12:07:13 - [warn] Encrypted credentials not found
3 Apr 12:07:13 - [info] Server now running at http://127.0.0.1:1880/
3 Apr 12:07:13 - [info] Starting flows
3 Apr 12:07:13 - [info] Started flows
```



Installed NODE-RED and then opened it on the browser using the URL <http://192.168.10.7:1880> because the Node-Red is working on port 1880 and MQTT Broker is working on port 1883.

# Step 4: Install Node-RED Dashboard





Added the MQTT IN and MQTT OUT Nodes and will configure the both by using the local host server.

## MQTT IN NODE

Raspberry Pi OS Desktop [Running]

nida-pervaiz@raspb... 22:26

Node-RED : Flow 1 - Chromium  
Running Node-RED locally | Node-RED : Flow 1 | Not secure | 192.168.10.7:1880/#flow/d52326a2bb2fe06a

Node-RED

Edit mqtt in node > Add new mqtt-broker config node

Properties

Name: Local MQTT Broker

Connection:

- Server: localhost
- Port: 1883
- Connect automatically
- Use TLS

Protocol: MQTT V3.1.1

Client ID: Leave blank for auto generated

Keep Alive: 60

Session:  Use clean session

Cancel Add

info

Flows

- Flow 1

Subflows

Global Configuration Nodes

Search flows

undefined:1883

Node	"86fbea3cdf963bf6"
Type	mqtt-broker

show more

Enabled 0 On all flows

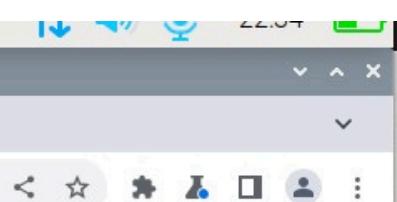
Left

The screenshot shows the Node-RED interface running on a Raspberry Pi OS desktop. A new MQTT broker configuration node is being added, named 'Local MQTT Broker'. The connection settings are set to 'localhost' on port 1883, with 'Connect automatically' checked and 'Use TLS' unchecked. The protocol is set to 'MQTT V3.1.1'. The node is currently disabled (0 nodes). The right sidebar displays the flow structure, showing 'Flow 1' and its components.

Running Node-RED locally

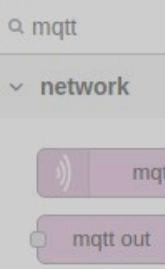
Node-RED : Flow 1

Not secure | 192.168.10.7:1880/#flow/d52326a2bb2fe06a



## Node-RED

Deploy

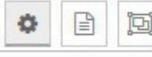


## Edit mqtt in node

Delete

Cancel

Done



## Properties

Server

Local MQTT Broker



Action

Subscribe to single topic



Topic

sensor/dht11/temperature

QoS

2

Output

auto-detect (parsed JSON object, string or buf)

Name

Name

## info



Search flows

## Flows

&gt; Flow 1

&gt; Subflows

&gt; Global Configuration Nodes

## mqtt



Node	"808abd50c59951bd"
Type	mqtt in

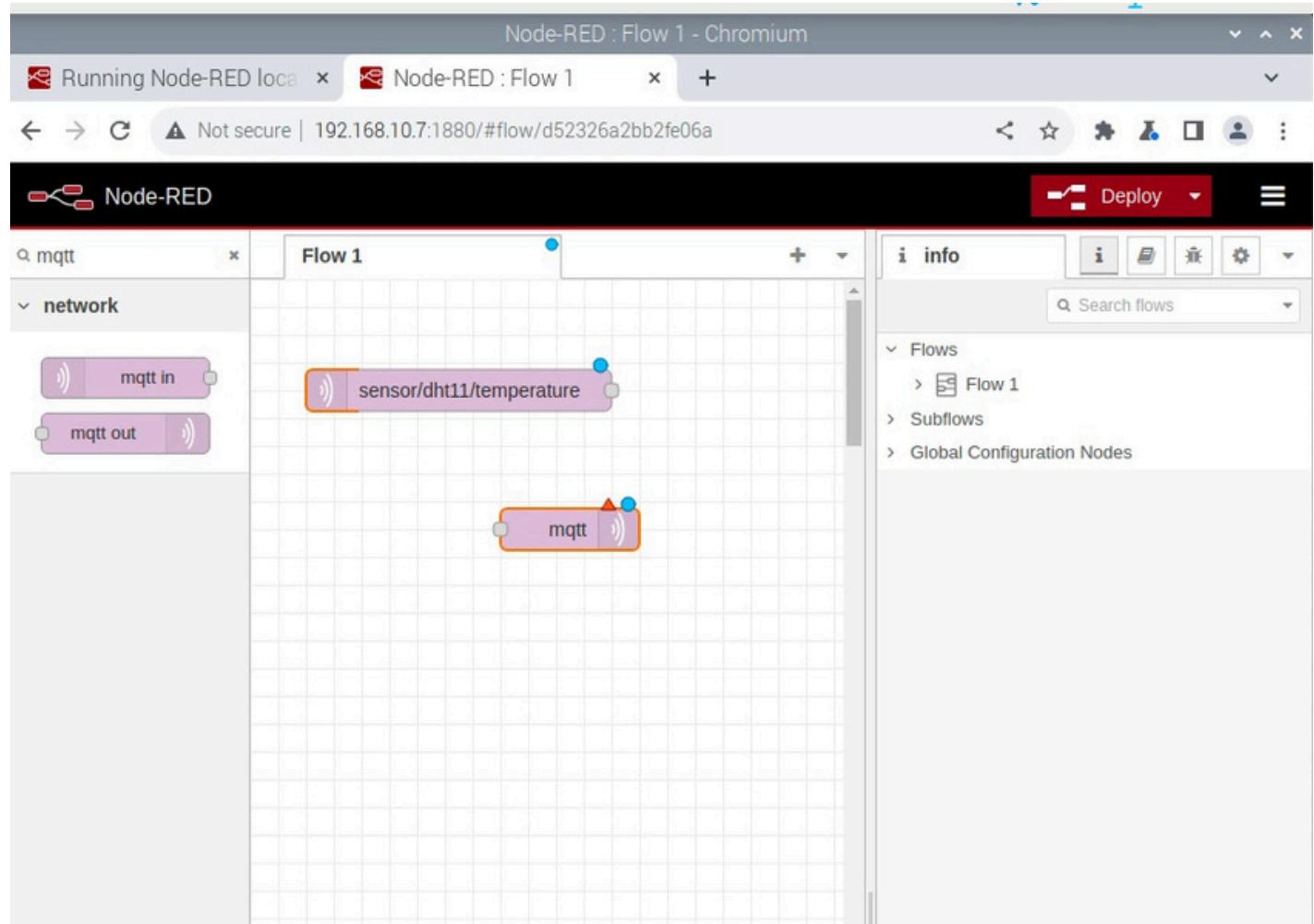
show more ▾

ctrl-space will toggle the view of  
this sidebar

Enabled



# Step 5: Create a Simple Flow to Test the Setup



## MQTT OUT NODE

The screenshot shows the "Edit mqtt out node" dialog. It includes fields for "Server" (set to "Local MQTT Broker"), "Topic" (set to "sensor/dht11/temperature"), "QoS" (set to "2"), "Retain" (checkbox checked), and "Name" (empty). There are also "Delete", "Cancel", and "Done" buttons. A tip at the bottom states: "Tip: Leave topic, qos or retain blank if you want to set them via msg properties." The right side of the screen shows the same Node-RED interface as the first screenshot, with the "info" panel and "Flows" section.

## Adding Dashboard

The screenshot shows the Node-RED interface with the following details:

- Top Bar:** Node-RED, Deploy, and a menu icon.
- Left Sidebar:** Nodes categorized as gauge, dashboard, and a selected gauge node.
- Central Panel:** A modal window titled "Edit gauge node > Add new dashboard group config node".
  - Properties:** A tab labeled "Properties" with settings:
    - Name: Default
    - Tab: Add new dashboard tab... (dropdown with edit and add icons)
    - Class: Optional CSS class name(s) for widget
    - Width: 6
    - Display group name
    - Allow group to be collapsed
- Right Panel:** A sidebar with "info" tab and search bar. It lists "Flows" (Flow 1), "Subflows", and "Global Configuration Nodes".
- Bottom Panel:** A table for the newly created node:

Node	"3fe21d5357ff82b9"
Type	ui_group

With a "show more" link.

A tooltip at the bottom right says: "Hold down ↑ when you click on a node to also select all of its connected nodes".

Node-RED

Edit gauge node > Add new dashboard group config node

**Properties**

- Name: Default
- Tab: Home
- Class: Optional CSS class name(s) for widget
- Width: 6
- Display group name
- Allow group to be collapsed

i info

- Flows
- > Flow 1
  - > Subflows
  - > Global Configuration Nodes

Node-RED

Edit gauge node

**Properties**

- Group: [Home] Default
- Size: auto
- Type: Gauge
- Label: gauge
- Value format: {{value}}
- Units: C
- Range: min 0 max 100
- Colour gradient:
- Sectors: 0 ... optional ... optional ... 10
- Fill gauge from centre.
- Class: Optional CSS class name(s) for widget
- Name:

Enabled

i info

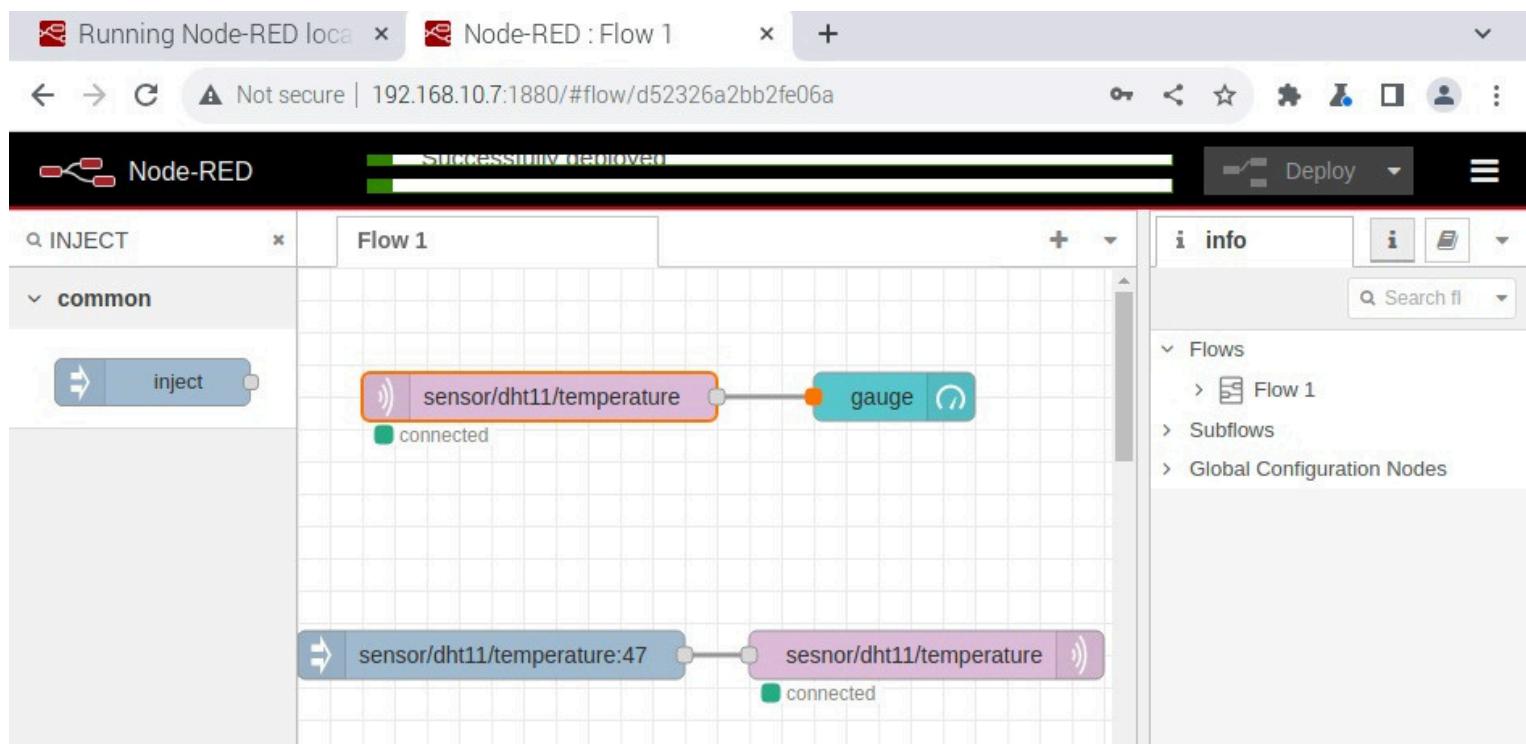
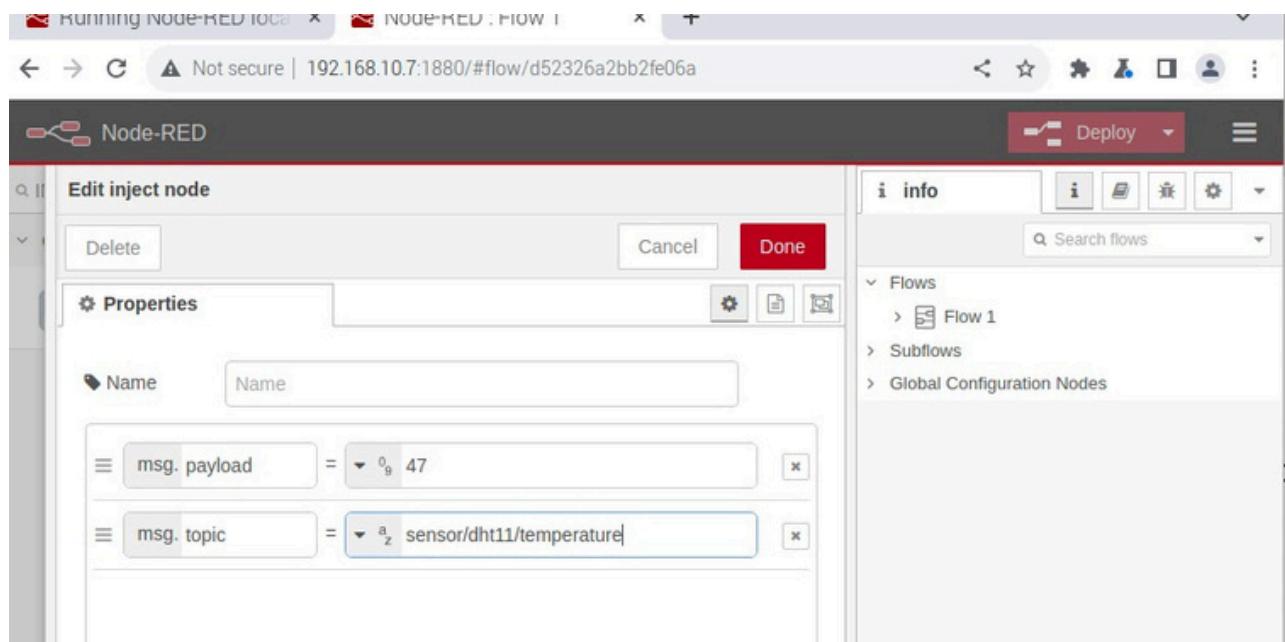
- Flows
- > Flow 1
  - > Subflows
  - > Global Configuration Nodes

gauge

Node: "11ad3c1355cfbde6"  
Type: ui\_gauge

[show more](#)

Your flow configuration nodes are listed in the sidebar panel. It can be accessed from the menu or with



There was issue it was showing connecting continuously but not the connected status so inside the node configuration I added my user name and password in the security section then it started showing me the connected sttaus

Subscribed and published the temperature for testing using mQTT Broker using the command line terminal.

The image shows two terminal windows side-by-side. The top window has the title 'nida-pervaiz@raspberry: ~'. It contains the command: 'mosquitto\_pub -h 192.168.10.7 -t "sensor/dht11/temperature" -m "25.5" -u nida-pervaiz -P Nida@akhtar08it'. The bottom window also has the title 'nida-pervaiz@raspberry: ~'. It shows the output of the 'mosquitto -v' command, which includes messages about starting the broker in local mode, opening listen sockets, and handling connection errors. It also shows the command 'mosquitto\_sub -h 192.168.10.7 -t "sensor/dht11/temperature" -u nida-pervaiz -P Nida@akhtar08it' and the received message '25.5'.

```
nida-pervaiz@raspberry:~ $ mosquitto_pub -h 192.168.10.7 -t "sensor/dht11/temperature" -m "25.5" -u nida-pervaiz -P Nida@akhtar08it
nida-pervaiz@raspberry:~ $ 
nida-pervaiz@raspberry:~ $ bash: mqtt: command not found
nida-pervaiz@raspberry:~ $ mosquitto -v
1743739410: mosquitto version 2.0.11 starting
1743739410: Using default config.
1743739410: Starting in local only mode. Connections will only be possible from clients running on this machine.
1743739410: Create a configuration file which defines a listener to allow remote access.
1743739410: For more details see https://mosquitto.org/documentation/authentication-methods/
1743739410: Opening ipv4 listen socket on port 1883.
1743739410: Error: Address already in use
1743739410: Opening ipv6 listen socket on port 1883.
1743739410: Error: Address already in use
nida-pervaiz@raspberry:~ $ sudo systemctl start mosquitto
nida-pervaiz@raspberry:~ $ mosquitto_sub -h 192.168.10.7 -t "sensor/dht11/temperature"
Connection error: Connection Refused: not authorised.
nida-pervaiz@raspberry:~ $ mosquitto_sub -h 192.168.10.7 -t "sensor/dht11/temperature" -u nida-pervaiz -P Nida@akhtar08it

25.5
```

After fails the connection was successful. It was failing due to the above mentioned issue, which we resolved and then it got connected.

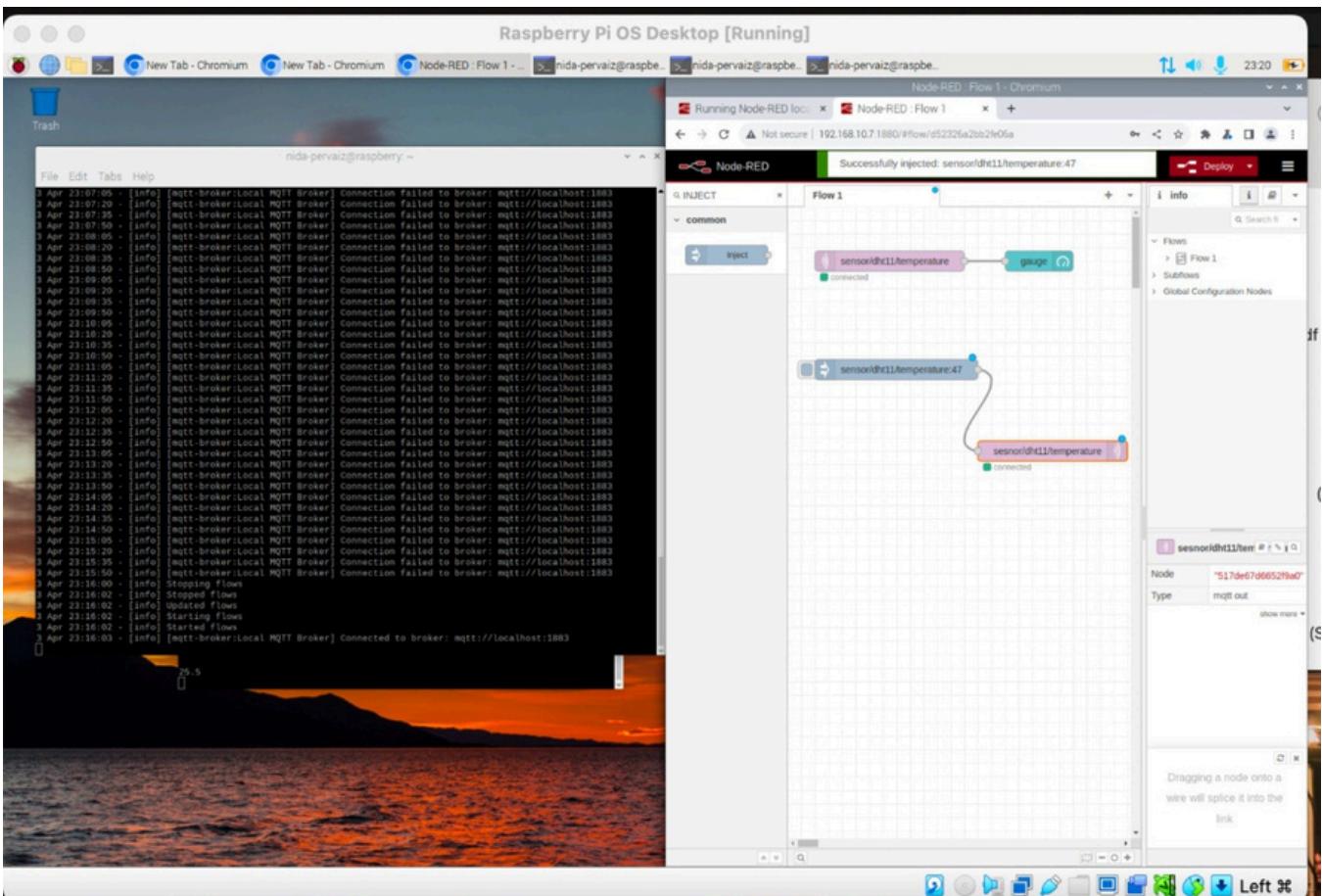
The image shows a single terminal window with the title 'nida-pervaiz@raspberry: ~'. It displays a log of messages from the MQTT broker. The log shows numerous failed connection attempts to 'localhost:1883' from 'mqtt-broker:Local MQTT Broker' over a period of time, followed by a series of successful connection messages at the end.

```
nida-pervaiz@raspberry:~ 
File Edit Tabs Help
3 Apr 23:07:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:07:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:07:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:07:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:08:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:08:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:08:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:08:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:09:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:09:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:09:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:09:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:10:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:10:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:10:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:10:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:11:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:11:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:11:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:11:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:12:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:12:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:12:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:12:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:13:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:13:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:13:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:13:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:14:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:14:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:14:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:14:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:15:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:15:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:15:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:15:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:16:00 - [info] Stopping flows
3 Apr 23:16:02 - [info] Stopped flows
3 Apr 23:16:02 - [info] Updated flows
3 Apr 23:16:02 - [info] Starting flows
3 Apr 23:16:02 - [info] Started flows
3 Apr 23:16:03 - [info] [mqtt-broker:Local MQTT Broker] Connected to broker: mqtt://localhost:1883
```

```

3 Apr 23:15:05 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:15:20 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:15:35 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:15:50 - [info] [mqtt-broker:Local MQTT Broker] Connection failed to broker: mqtt://localhost:1883
3 Apr 23:16:00 - [info] Stopping flows
3 Apr 23:16:02 - [info] Stopped flows
3 Apr 23:16:02 - [info] Updated flows
3 Apr 23:16:02 - [info] Starting flows
3 Apr 23:16:02 - [info] Started flows
3 Apr 23:16:03 - [info] [mqtt-broker:Local MQTT Broker] Connected to broker: mqtt://localhost:1883

```

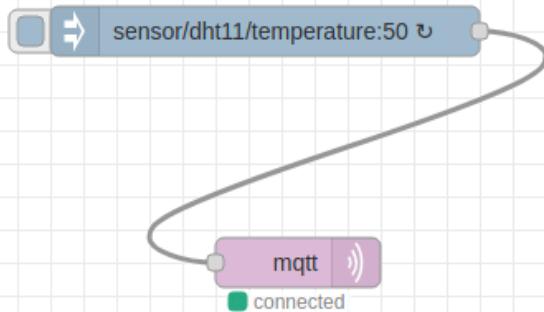
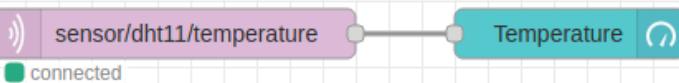


## Step 6: Access the Dashboard

The issue we faced was that the gauge needle was not moving

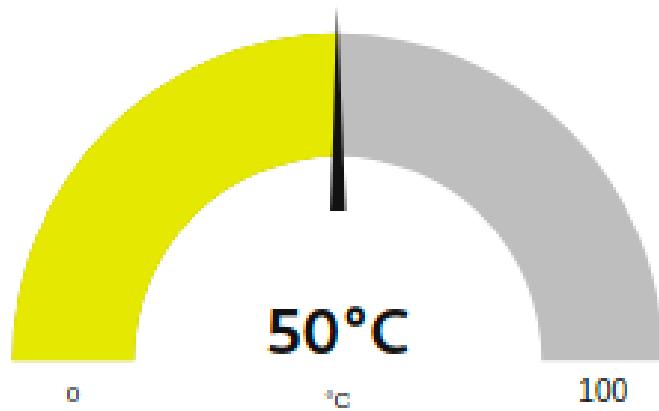
It was because there was a spelling or typo mistake in the topics of both subscriber and publisher they were not matching, so when I fixed that it worked, other fix was that I left the topic field empty in MQTT Out node (publisher), it send the messages to the default topic so it worked in both ways.

Flow 1

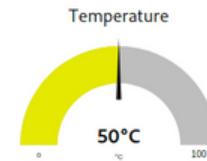


## Temperature Sensor

Temperature



Temperature Sensor



## FLOW.JSON

```
[  
 {  
   "id": "d52326a2bb2fe06a",  
   "type": "tab",  
   "label": "Flow 1",  
   "disabled": false,  
   "info": "",  
   "env": []  
 },  
 {  
   "id": "808abd50c59951bd",  
   "type": "mqtt in",  
   "z": "d52326a2bb2fe06a",  
   "name": "",  
   "topic": "sensor/dht11/temperature",  
   "qos": "2",  
   "datatype": "auto-detect",  
   "broker": "86fbea3cdf963bf6",  
   "nl": false,  
   "rap": true,  
   "rh": 0,  
   "inputs": 0,  
   "x": 150,  
   "y": 80,  
   "wires": [  
     [  
       "11ad3c1355cfbde6"  
     ]  
   ]  
 },  
 ]  
,
```

```
{
  "id": "517de67d6652f9a0",
  "type": "mqtt out",
  "z": "d52326a2bb2fe06a",
  "name": "",
  "topic": "",
  "qos": "",
  "retain": "",
  "respTopic": "",
  "contentType": "",
  "userProps": "",
  "correl": "",
  "expiry": "",
  "broker": "86fbea3cdf963bf6",
  "x": 230,
  "y": 440,
  "wires": []
},
{
  "id": "11ad3c1355cfbde6",
  "type": "ui_gauge",
  "z": "d52326a2bb2fe06a",
  "name": "",
  "group": "3fe21d5357ff82b9",
  "order": 0,
  "width": 0,
  "height": 0,
  "gtype": "gage",
  "title": "Temperature",
  "label": "°C",
  "format": "{{value}}°C",
  "min": 0,
  "max": "100",
  "colors": [
    "#00b500",
    "#e6e600",
    "#ca3838"
  ],
  "seg1": "",
  "seg2": "",
  "diff": false,
  "className": ".nr-dashboard-gauge path { transition: stroke 0.5s ease-in-out;}",
  "x": 390,
  "y": 80,
  "wires": []
},
```

```
{  
  "id": "b5942a5a648e5a2e",  
  "type": "inject",  
  "z": "d52326a2bb2fe06a",  
  "name": "",  
  "props": [  
    {  
      "p": "payload"  
    },  
    {  
      "p": "topic",  
      "vt": "str"  
    }  
  ],  
  "repeat": "1",  
  "crontab": "",  
  "once": false,  
  "onceDelay": 0.1,  
  "topic": "sensor/dht11/temperature",  
  "payload": "50",  
  "payloadType": "num",  
  "x": 210,  
  "y": 300,  
  "wires": [  
    [  
      "517de67d6652f9a0"  
    ]  
  ]  
},
```

```
{  
  "id": "86fbea3cdf963bf6",  
  "type": "mqtt-broker",  
  "name": "Local MQTT Broker",  
  "broker": "localhost",  
  "port": 1883,  
  "clientid": "",  
  "autoConnect": true,  
  "useTls": false,  
  "protocolVersion": 4,  
  "keepalive": 60,  
  "cleansession": true,  
  "autoUnsubscribe": true,  
  "birthTopic": "",  
  "birthQos": "0",  
  "birthRetain": "false",  
  "birthPayload": "",  
  "birthMsg": {},  
  "closeTopic": "",  
  "closeQos": "0",  
  "closeRetain": "false",  
  "closePayload": "",  
  "closeMsg": {},  
  "willTopic": "",  
  "willQos": "0",  
  "willRetain": "false",  
  "willPayload": "",  
  "willMsg": {},  
  "userProps": "",  
  "sessionExpiry": ""  
},
```

```
        {
      "id": "3fe21d5357ff82b9",
      "type": "ui_group",
      "name": "Temperature Sensor",
      "tab": "aabab78a80bc9d7a",
      "order": 1,
      "disp": true,
      "width": 6,
      "collapse": false,
      "className": ""
    },
    {
      "id": "aabab78a80bc9d7a",
      "type": "ui_tab",
      "name": "Home",
      "icon": "dashboard",
      "disabled": false,
      "hidden": false
    }
]
```

## **Analysis:**

This IOT setup uses three main components to collect ,process and visualize sensor data:

### **MQTT:**

Act as a lightweight messaging hub for IoT devices..

Devices(e.g Esp8266) publish data to topics (e.g temperature)

Node-Red subscribe to these topics to receive the data

### **Node-Red:**

Connects to the MQTT broker using MQTT-in and MQTT-out nodes.

Process incoming data.

Send process data to Dashboard nodes.

### **Dashboard:**

Provide a real-time web interface.

Display sensor data.

Can also send commands back to device via MQTT out

---

## **Short description:**

### **Step followed:**

Setup a virtual machine with Raspberry Pi OS.

Installed Mosquitto MQTT broker

Installed Node-Red and added the Dashboard nodes.

Create a flow with MQTT-in ,MQTT-out and Gauge nodes.

Connect a Esp8266 to publish sensor data.

## **How I Verified Functionality:**

Tested MQTT using MQTT Explorer to check messages are being sent.

Used Node-Red Debug node to see incoming data.

Check the Dashboard to confirm the real time updates.

## **Challenges and Fixes:**

The MQTT topic names in the publisher and subscriber didnot match due to a typo. Fix this error by corrected the names.

Left the topic field empty in the MQTT-out node, so messages went to a default topic. Fix it by Either set the corrected topic or kept it empty both worked.

Node\_Red showed “Connecting” but never “Connected”. fix it by added password/username in MQTT node’s security setting .

Didn’t connect harware because the sensor wasd not available in the LAB.

---

**END**