Node-Red Implementation

 How to Install Node-Red in Windows (YouTube Video Reference : <u>LINK</u>) <u>https://nodejs.org/en/download/prebuilt-installer</u> : Click on this link. It will redirect you to this website

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you want the same software I used, then click on this link .

Follow the next steps to install node-red



Click on Next.

https://highvoltages.co/iot-internet-of-things/mqtt/mqtt-in-nodered-and-mqtt-dashboard/

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Click on Next

Node.js Setup		3 44		×
Tools for Native Modules		-	-	
Optionally install the tools necessary	to compile native modules.	п	19	•
Some npm modules need to be compile to install such modules, some tools (Py installed.	ed from C/C++ when installing. rthon 2 and Visual Studio Build 1	If you wa fools) nee	ant to be a d to be	able
Automatically install the necessary script will pop-up in a new window a	tools. Note that this will also in after the installation completes	stall Choo	olatey. Th	
Alternatively, follow the instructions a	C ntdps://dialab.com/nodejs/no	de-dyp+	201-2WINDOW	12
to install the dependencies yourself.				
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to install the dependencies yourself.				
to install the dependencies yourself.				

Enable the checkbox and click on Next

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Next click on Install



Atlast click on finish, which will redirect you to



This command promt, Press any key to continue. This will redirect to windows powershell. From there it will automatically install the necessary files. It will take 15 to 30 minutes to install depending upon the internet speed.

After the software installation, we can check whether the installation is proper or not by also version

Commend Prompt	
Microsoft Windows [Version (c) Microsoft Corporation.	10.0.19043.1706] All rights reserved.
C:\Users\ramac>node -v v20.15.1	

of node js

If you get the response like this, then your software is successfully installed.

Then we need to update npm by the below command

C:\Users\ramac>npm install npm C:\Users\ramac>npm install npm added 1 package in 26s 22 packages are looking for funding run `npm fund` for details npm notice npm notice New minor version of npm available! 10.7.0 -> 10.8.2 npm notice Changelog: https://github.com/npm/cli/releases/tag/v10.8.2 npm notice To update run: npm install -g npm@10.8.2 npm notice

Next give the below command in command prompt C:\Users\ramac>npm install npm --global

C:\Users\ramac>npm install npm --global added 1 package in 14s 22 packages are looking for funding run `npm fund` for details

Then if you get the version response



. It should print the both the versions,

then the node and npm are successfully installed.

Now we need to install node red,

For that we need to open command prompt and put the below command

C:\Users\ramac>npm install -g --unsafe-perm node-red C:\Users\ramac>npm install -g --unsafe-perm node-red added 312 packages in 1m 60 packages are looking for funding run `npm fund` for details

Now to run node red, type node-red on command prompt and click on enter, allow the network access if PC asks for access

```
18 Jul 14:57:28 - [info] Server now running at http://127.0.0.1:1880/
18 Jul 14:57:28 - [warn] Encrypted credentials not found
18 Jul 14:57:28 - [info] Starting flows
18 Jul 14:57:28 - [info] Started flows
```

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You can simply put the running server url in web browser, it will open the node-red page.

2. Sensor Values and Relay Control using MQTT Connection: (for your reference Link)

To create a dashboard, you need some palletes, to install palletes follow the below instructions,

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node-red

node-red-contrib-open

node-red-dashboard



TempData:

It is a MQTT IN node and the settings I used here is given below, Server is the MQTT server, you have to add your MQTT server credentials.



Edit mqtt in node	9
Delete	Cancel Done
Properties	• = 1
Server	+
Action	Subscribe to single topic
📰 Topic	TempData
⊛ QoS	2 🗸
G Output	a String 🗸
🗣 Name	Name

Extract Temperature 1: It is a function, where you will parse the incoming string data to separate the temperature 1 value



```
var input = msg.payload; // Assuming the input is in msg.payload
// Remove any leading or trailing whitespace
input = input.trim();
// Split the input string using commas as the delimiter
var values = input.split(',');
// Remove leading and trailing whitespace from each value and convert to float
values = values.map(function (value) {
    return parseFloat(value.trim());
});
msg.payload = values[0]; // Set the output payload to the array of float
values
return msg;
```

o gauge	O
Edit gauge node	
Delete	Cancel Done
Properties	
I Group	[Home] RDL Dashboard V
ច្រាំ Size	2 x 4
і≣ Туре	Gauge 🗸
1 Label	Temperature 1 Gauge
∑ Value format	{{value}}
1 Units	٥
Range	min -20 max 60
Colour gradient	
Sectors	-20 optional optional 60

Temperature Gauge 1 : Dashboard Gauge to show the temperature 1 values

Extract temperature 2 : The incoming temperature values will be like XX,YY where XX is 1st temperature value and YY is the second temperature value.

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O Prope	rties					0	8	
Name	ŧ	Extrac	t Temperature 2				#-	
0 Se	tup		On Start	On Message	On Stap			
1 2 3 4 5 6 7 8 9 10 11 12 13 14	var // R inpu // S var // R valu]); msg.	input - encove a t - inp plit th values encove 1 es - va neturn payload	<pre>msg.payload; / ny leading or t ut.trim(); e input string - input.split(' eading and trai luos.map(functi parseFloat(valu - values[1]; /</pre>	<pre>// Assuming the input trailing whitespace using commas as the .'); lling whitespace from ton (value) [] us.trim()); // Set the output pay</pre>	is in msg.p. delimiter each valum ; load to the ;	and		

```
var input = msg.payload; // Assuming the input is in msg.payload
// Remove any leading or trailing whitespace
input = input.trim();
// Split the input string using commas as the delimiter
var values = input.split(',');
// Remove leading and trailing whitespace from each value and convert to float
values = values.map(function (value) {
    return parseFloat(value.trim());
});
msg.payload = values[1]; // Set the output payload to the array of float
values
return msg;
```

Temperature Gauge 2 : Dashboard Gauge to show the second temperature values

	gauge 🤇	ה ה
	Edit gauge node	
	Delete	Cancel Done
	Properties	
	I Group	[Home] RDL Dashboard V
	៉្រារ៉ូ Size	2 x 4
	🔳 Туре	Gauge 🗸
	£ Label	Temperature 2 Gauge
	∃ Value format	{{value}}
	£ Units	°C
	Range	min 0 max 300
	Colour gradient	
	Sectors	0 optional optional 300

HumPressureData : As like temperature data, you can see the Humidity data coming through MQTT

)) mqt	t in		
Edit mqtt in nod	e		
Delete		Cancel Do	ne
Properties		•	Ŀ
Server		+	
Action	Subscribe to single topic	~	
📰 Торіс	HumPressureData		
⊛ QoS	2 🗸		
G Output	a String	~	
Name	Name		

Extract Humidity : Extract the humidity values from the incoming string from MQTT

-	f	function	
	Edit functio	on node	
	Delete	Cancel Done	
	Proper	ties 🔹 🗎	
Name Extract Humidity			
	1	var input = msg.payload; // Assuming the input is in msg.payl 🧹	
i.	2		
	3	// Remove any leading or trailing whitespace	
1	4	input = input.trim();	
	6	//.Snlit.the.input.stning.using.commas.as.the.delimitan	
	7	var values = input solit(' '):	
	8	-	
	9	// Remove leading and trailing whitespace from each value and	
	10	values = values.map(function (value)){	
	11	<pre>return parseFloat(value.trim());</pre>	
	12	});	
	13		
	14	msg.payload = values[0]; // Set the output payload to the arr	
	15	return msg;	

```
var input = msg.payload; // Assuming the input is in msg.payload
// Remove any leading or trailing whitespace
input = input.trim();
// Split the input string using commas as the delimiter
var values = input.split(',');
// Remove leading and trailing whitespace from each value and convert to float
values = values.map(function (value) {
    return parseFloat(value.trim());
});
msg.payload = values[0]; // Set the output payload to the array of float
values
```

```
return msg;
```

Humidity Chart : Dashboard Chart to show the humidity values



Edit chart node				
Delete	Cancel Done			
Properties				
I Group	[Home] RDL Dashboard 🗸 🖌			
ច្រាំ Size	2 x 4			
£ Label	Humidity Chart			
🜌 Туре	Line chart			
X-axis	last 1 hours v OR 1000 points			
X-axis Label	▼ HH:mm:ss □ as UTC			
Y-axis	min 0 max 100			
Legend	None Interpolate step			
Series Colours				

Extract Pressure : The incoming humidity and pressure values will be like XX,YY where XX is 1st humidity value and YY is the second pressure value



var input = msg.payload; // Assuming the input is in msg.payload

```
// Remove any leading or trailing whitespace
input = input.trim();
// Split the input string using commas as the delimiter
var values = input.split(',');
// Remove leading and trailing whitespace from each value and convert to float
values = values.map(function (value) {
    return parseFloat(value.trim());
});
msg.payload = values[1]; // Set the output payload to the array of float
values
return msg;
```

Pressure Chart : Dashboard Chart to show the pressure values	
--	--

chart	
Edit chart node	
Delete	Cancel Done
Properties	
I Group	[Home] RDL Dashboard V
ច្រាំ Size	2 x 4
1 Label	Pressure Chart
⊥ ∕∕ Туре	Line chart
X-axis	last 1 hours V OR 1000 points
X-axis Label	▼ HH:mm:ss □ as UTC
Y-axis	min 1000 max 1020
Legend	None Interpolate linear
Series Colours	

 $\ensuremath{\text{LED 1}}$: This is switch to turn on and off the relay 1 or led 1

	o swi	itch	
	Edit switch node		
	Delete	Cancel	Done
	© Properties	٥	
	I Group	[Home] RDL Dashboard 🗸 🖌	
	ច្រាំ Size	2 x 1	
	1 Label	LED 1	
l	 Tooltip 	optional tooltip	
	🖾 Icon	Default 🗸	
	→ Pass through	msg if payload matches valid state: 🗹	
	When clicked,	send:	
	On Payload	▼ ^a _z 1N	
	Off Payload	▼ ^a _z 1F	
	Торіс	▼ ^a _z TestLED	

TestLed 1 : To send the switch status to MQTT Subscriber

Delete			Cancel	Done
Properties				•
Server			1	+
Bi Topic	TestLED 1			
9 QoS	-	D Retain		×
Name	Name			
Tip: Leave top	pic, qos or retain bl	ank if you want to	set them v	la msg
properties				

LED 2 : This is switch to turn on and off the relay 2 or led 2

	switc	h
	Edit switch node	
	Delete	Cancel Done
ſ	Properties	* E
	I Group	[Home] RDL Dashboard V
	៉្រារ៉ Size	2 x 1
	1 Label	LED 2
l	Tooltip	optional tooltip
1	🖾 Icon	Default
	→ Pass through	msg if payload matches valid state: ☑
	When clicked	, send:
	On Payload	▼ ^a _z 2N
	Off Payload	▼ ^a _z 2F
	Торіс	▼ ^a _z TestLED ▼

TestLed 2 : To send the switch status to MQTT Subscriber

mqtt out	3)	
Edit mqtt out nod	e	
Delete		Cancel Done
Properties		
Server 🔇		•• • •
🛢 Торіс	TestLED 2	
⊛ QoS	✓ ೨ Retain	•
Name	Name	
Tip: Leave topic properties.	c, qos or retain blank if you want	to set them via msg

VFD Speed Control 1 : Control VFD Motor Speed

slider	
Edit slider node	
Delete	Cancel Done
Properties	
I Group	[Home] RDL Dashboard V
遠 Size	2 x 4
1 Label	VFD Speed Control 1
Tooltip	optional tooltip
↔ Range	min 0 max 255 step 1
G Output	only on release 🗸
→ If msg arrives	on input, pass through to output: 🗹
☑ When change	ed, send:
Payload	Current value
Торіс	▼ msg. TestPWM

Test VFD 1 : MQTT sends data to the subscriber

mqtt out))	
Edit mqtt out noo	e	
Delete		Cancel Done
Properties		
Server 🔇	Hairdroopeneibadingit.com.100	• •
📑 Торіс	TestVFD1	
⊛ QoS	1 v 🤊 Retain	~
Name 🗣	Name	
Tip: Leave topi properties.	c, qos or retain blank if you want	to set them via msg

VFD Speed Control 2 : Control VFD Motor Speed

slide	er
Edit slider node	
Delete	Cancel Done
Properties	
I Group	[Home] RDL Dashboard 🗸 🖌 🔺
៉្រារ៉្ Size	2 x 4
1 Label	VFD Speed Control 2
Tooltip	optional tooltip
↔ Range	min 0 max 255 step 1
G Output	only on release
→ If msg arrives	s on input, pass through to output: 🗹
☑ When chang	ed, send:
Payload	Current value
Торіс	▼ msg. TestPWM

Test VFD 2 : MQTT sends data to the subscriber

e mqtt out))		
Edit mqtt out no	de		
Delete			Cancel Done
Properties			
Server	haindaanalaan	1550	• • • •
📰 Торіс	TestVFD2		
€ QoS	1 ~	🔊 Retain	•
Name	Name		
Tip: Leave top properties.	ic, qos or retain blar	nk if you want to	set them via msg

The Final connection of these created nodes will be like



Then to enter to dashboard,

			Deploy	
		< E	Edit	
Show palette	ctrl-p	>	/iew	
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TestLED 2))		S	Settings	ctrl-,
connected		k	evboard shortcuts	
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ESP32 Code :

```
#include <WiFi.h>
#include <PubSubClient.h>
// Replace these with your network credentials
const char* ssid = "yourWiFiSSID";
const char* password = "yourWiFiPASSWORD";
// MQTT Broker details
const char* mqtt server = "yourMQTTSERVER";
const int mqtt port = yourMQTTPORT;
const char* mqtt_user = "yourMQTTUSERNAME"; // For public brokers, you can
usually leave these empty
const char* mqtt_password = "yourMTTPASSWORD";
// Topics to subscribe and publish to
const char* subscribe topic = "TestData";
const char* pubTopic_TM = "TempData";
const char* pubTopic_HP = "HumPressureData";
WiFiClient espClient;
PubSubClient client(espClient);
// Function to connect to WiFi
void setup wifi() {
  delay(10);
  Serial.println();
  Serial.print("Connecting to ");
  Serial.println(ssid);
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL CONNECTED) {
   delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}
// Callback function for when a message is received
void callback(char* topic, byte* message, unsigned int length) {
  Serial.print("Message arrived on topic: ");
  Serial.print(topic);
  Serial.print(". Message: ");
  // Convert message to String
  String messageString;
  for (int i = 0; i < length; i++) {</pre>
   messageString += (char)message[i];
  }
  Serial.println(messageString);
  if (messageString.startsWith("1N")) {
   digitalWrite(15, HIGH);
  }
  else if (messageString.startsWith("1F")) {
    digitalWrite(15, LOW);
```

```
}
  else if (messageString.startsWith("2N")) {
   digitalWrite(13, HIGH);
  }
  else if (messageString.startsWith("2F")) {
    digitalWrite(13, LOW);
  }
}
void reconnect() {
  // Loop until we're reconnected
  while (!client.connected()) {
    Serial.print("Attempting MQTT connection...");
    // Attempt to connect
    if (client.connect("ESP32Client", mqtt user, mqtt password)) {
      Serial.println("connected");
      // Subscribe to topic
      client.subscribe("TestLED");
      client.subscribe("TestVFD1");
      client.subscribe("TestVFD2");
    } else {
      Serial.print("failed, rc=");
      Serial.print(client.state());
      Serial.println(" try again in 5 seconds");
      // Wait 5 seconds before retrying
      delay(5000);
    }
  }
}
void setup() {
  Serial.begin(115200);
 pinMode(13, OUTPUT);
 pinMode(15, OUTPUT);
 digitalWrite(13, LOW);
  digitalWrite(15, LOW);
  setup wifi();
  client.setServer(mqtt server, mqtt port);
  client.setCallback(callback);
}
void loop() {
  if (!client.connected()) {
    reconnect();
  }
  client.loop();
  //client.publish(publish topic, msg.c str());
  // Publish a message every 5 seconds
  static unsigned long lastMsg = 0;
  unsigned long now = millis();
  if (now - lastMsg > 3000) {
    lastMsg = now;
    randomSeed(analogRead(0)); // Seed the random number generator
    // Generate a random float between 24.0 and 32.0
    float minTemp1 = -20.0;
    float maxTemp1 = 60.0;
    float TempValue1 = minTemp1 + (float(random(10000)) / 10000.0) *
(maxTemp1 - minTemp1);
    float minTemp2 = 0.0;
```

```
float maxTemp2 = 300.0;
float TempValue2 = minTemp2 + (float(random(10000)) / 10000.0) *
(maxTemp2 - minTemp2);
float minPressure = 1010.0;
float maxPressure = 1015.0;
float PressureValue = minPressure + (float(random(10000)) / 10000.0) *
(maxPressure - minPressure);
char sensorData[20];
char HumPressureData[20];
sprintf(HumPressureData, "%d,%0.2f", random(0, 100), PressureValue);
sprintf(sensorData, "%0.2f,%0.2f", TempValue1, TempValue2);
Serial.println(sensorData);
client.publish(pubTopic_TM, sensorData);
client.publish(pubTopic_HP, HumPressureData);
}
```