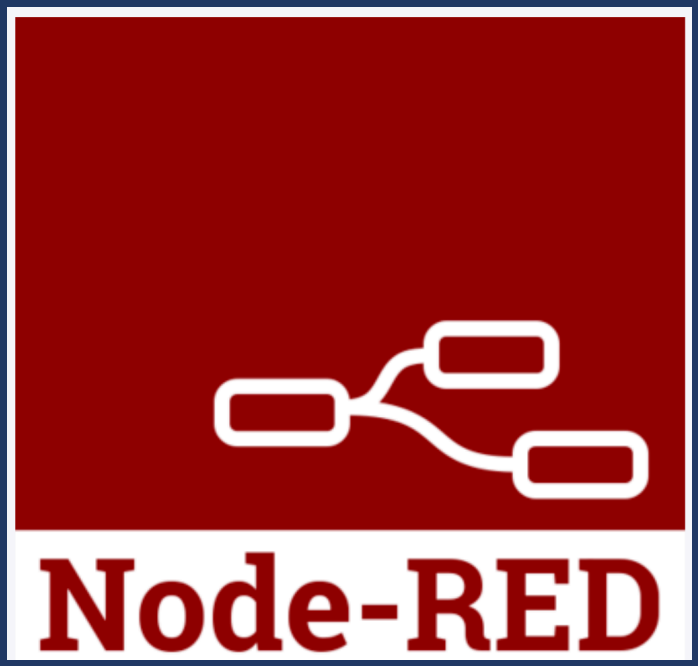

Node-RED: Case Study 1

Basic IoT Based Smart Agriculture with Remote Monitoring System using Arduino Uno & Soil Moisture Sensor

v1 mar2021 : ver1(2) mar2021

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Scenario: Develop a real time basic IoT system that will plot the soil moisture value on a dashboard (the condition are standard: higher value represent higher moisture level due to less resistance).

- when the soil was dry (~850)
- when the soil was completely wet (~400)

Status: Dry
Test Reading: ~850

Status: Completely wet
Test Reading: ~400

https://lastminuteengineers.com/soil-moisture-sensor-arduino-tutorial/

Requirement:

i. Microcontroller x 1 (Uno / Mega / NodeMCU / ESP32 / Nano…
ii. Soil Moisture Sensor x1
iii. NodeRED – PC or Pi
iv. Sketch: **nodeRed-02mac21-argiculture-v1.ino**

Methods:

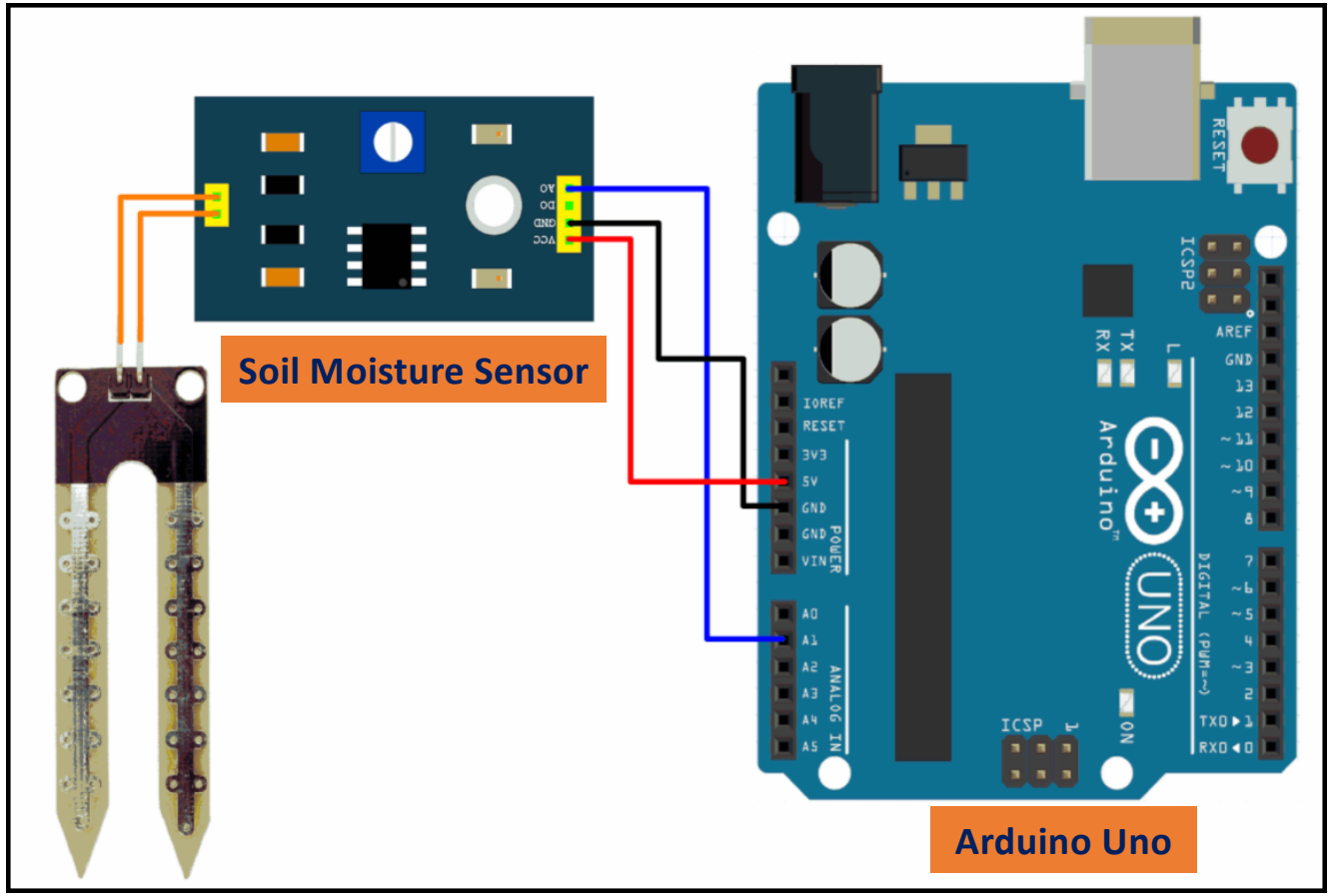
i. Do wiring connection & upload the sketch into microcontroller. Troubleshoot any errors.
ii. NodeRED configuration: Layout, Nodes & nodes properties
iii. Test the system

Microcontroller: a. The Schematic Diagram.

>Connect your board to PC / laptop.

>Make sure correct board name & port is selected.

>Always check your wiring especially the power supply. This might save your money from replacing a burnt device.



Microcontroller: b. The sketch.

```
1  //IoT Based Smart Agriculture with Remote Monitoring System
2  //v1-mac2021
3  void setup() {
4    // initialize serial communication at 9600 bits per second:
5    Serial.begin(9600);
6  }
7
8  void loop() {
9    String moist; //set moist as string
10   int sensorValue = analogRead(A0); //read incoming value from analog pin 1 & put at variable named sensorValue
11   moist = String(sensorValue); //convert sensorValue from int to string -> only to display at nodeRED dashboard
12
13   Serial.print("Moisture Level: "); //remark this line when displaying the value at nodeRED dashboard
14   Serial.print(moist);  //will print at Serial Monitor & nodeRED: debug node & serial in node
15   Serial.println(","); //delimiter -> for nodeRED -> to differentiate new data
16   delay(1000);        //pause for 1 sec
17 }
```

source: nodeRed-02mac21-argiculture-v1.ino

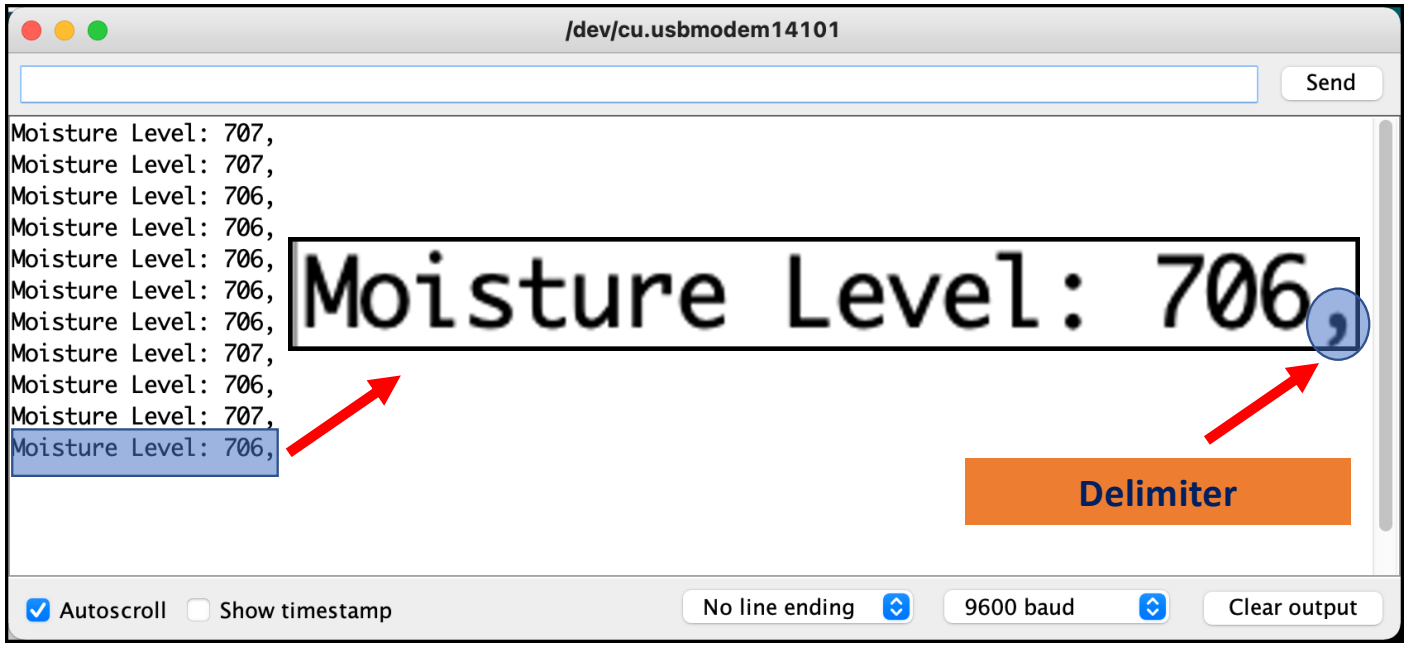
Note:

Put a remark at line number 9 when using nodeRED dashboard. The chart node cannot read the serial value.

Refer to next slide.

Microcontroller: c. Expected Output.

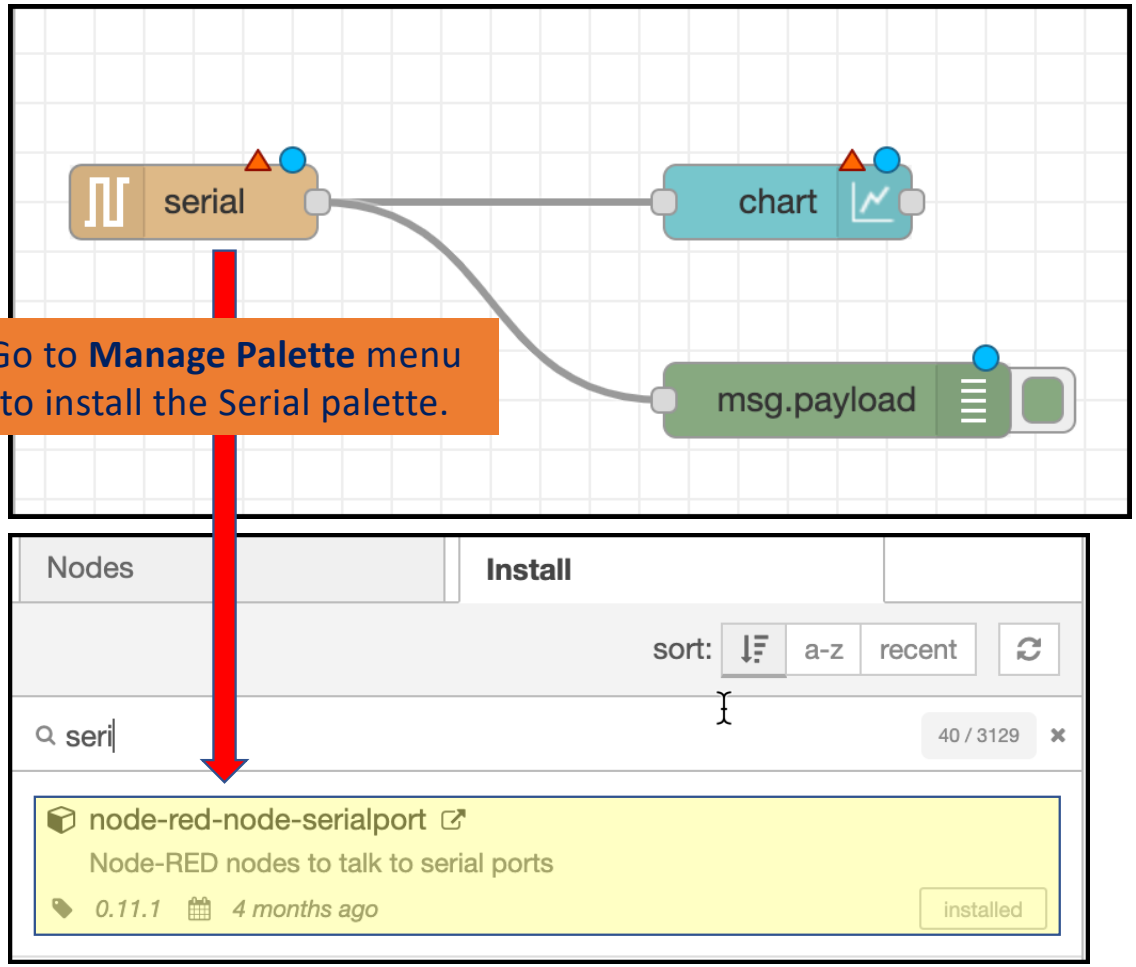
>Upload the sketch.

> 

>**Error are expected** when you copy the sketch from previous page. Check the **double quotes** symbols. (“ “). Delete and replace new **double quotes**. (Always happens when CnP text form net or pdf)

>**Delimiter** in line 15 is an indication for nodeRED to split data into array ([0],[1]…[n^{th}]).

Node-RED: d. Layout & Installation.



> The main idea is to display the moisture value over nodeRED's chart dashboard.

>**Serial in** node is used in for the microcontroller to talk (communicate) with the computer (with nodeRED installed).

>**Serial widget** is not installed by default. Go to Manage Palette to install **node-red-node-serialport**.

>  indicate nodes not properly setup.

Node-RED: e. Setting the Layout.

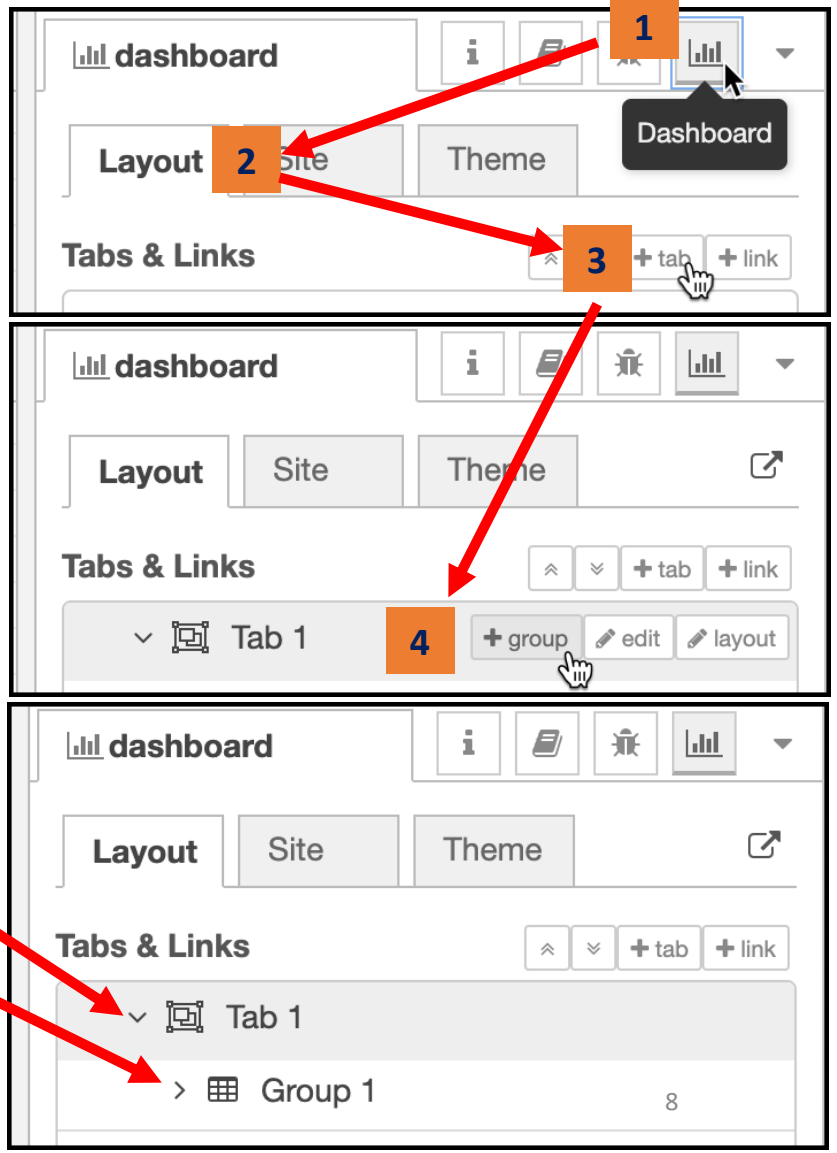
> Since the project requires dashboard UI, it is advisable to start the task by configuring the **Layout** properties located at right side panel.

> Every dashboard UI must be in a **tab** field & **group** field.

3 Click **+tab** once to create **Tab 1** field.

4 Click **+group** once to create **Group 1** field.

> Next step is to rename **Tab 1** & **Group 2** that reflect the project.

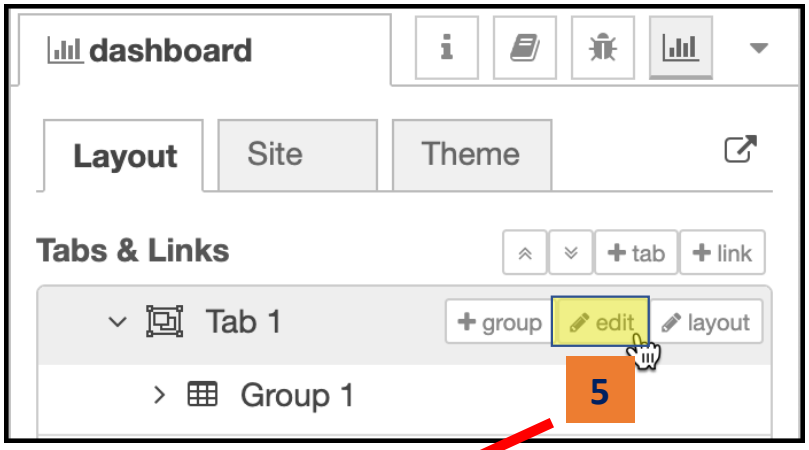


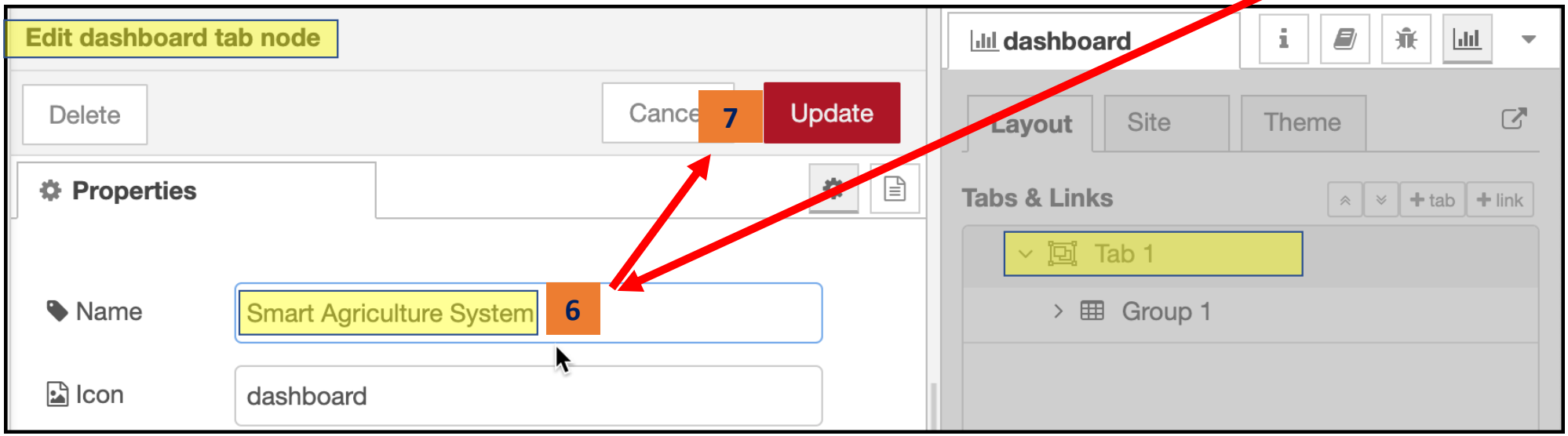
Node-RED: e. Setting the Layout.

5 Click **edit** link at **Tab 1** field to rename the **Tab 1**.

6 Change **Tab 1** to **Smart Agriculture System**.

7 Click **Update** upon completion.



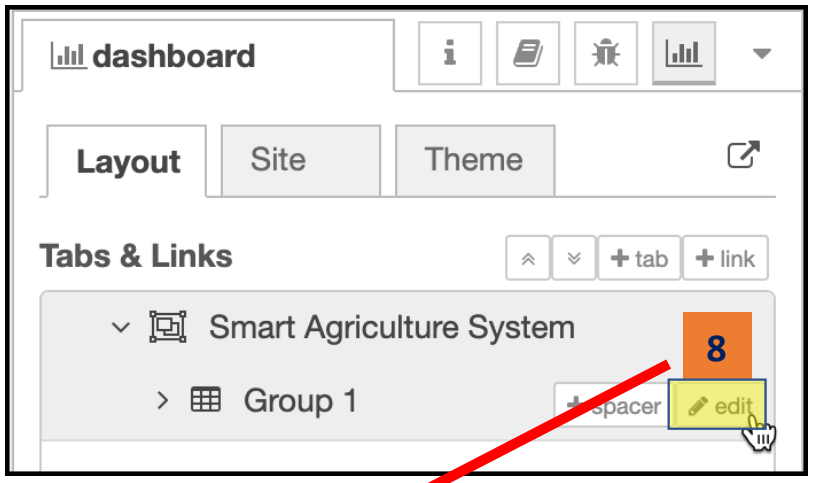


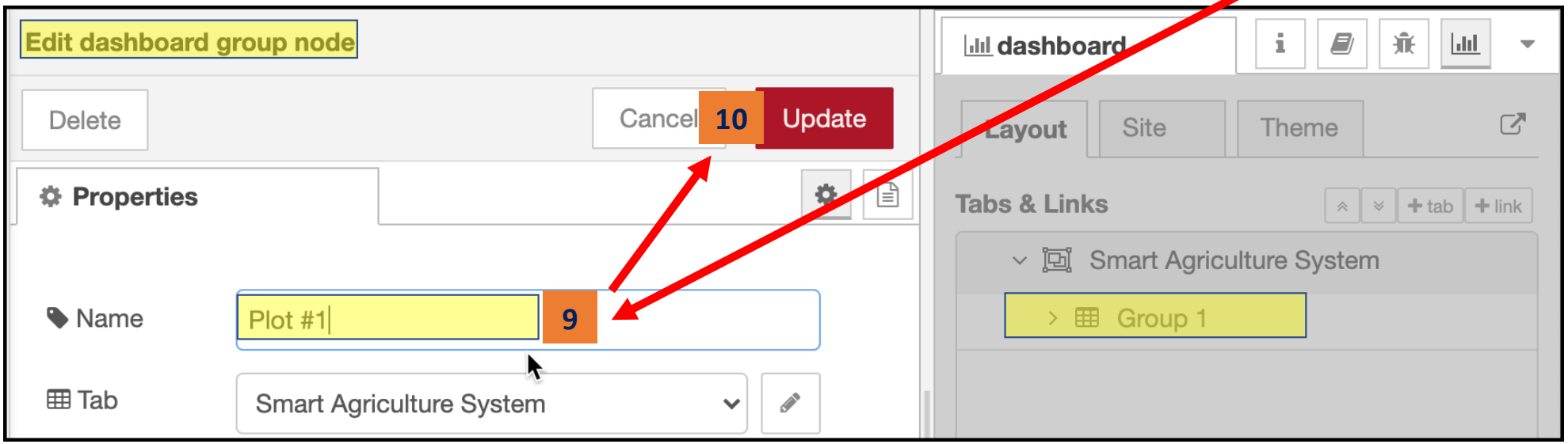
Node-RED: e. Setting the Layout

8 Click **edit** link at **Group 1** field.

9 Change **Group 1** to **Plot #1**.

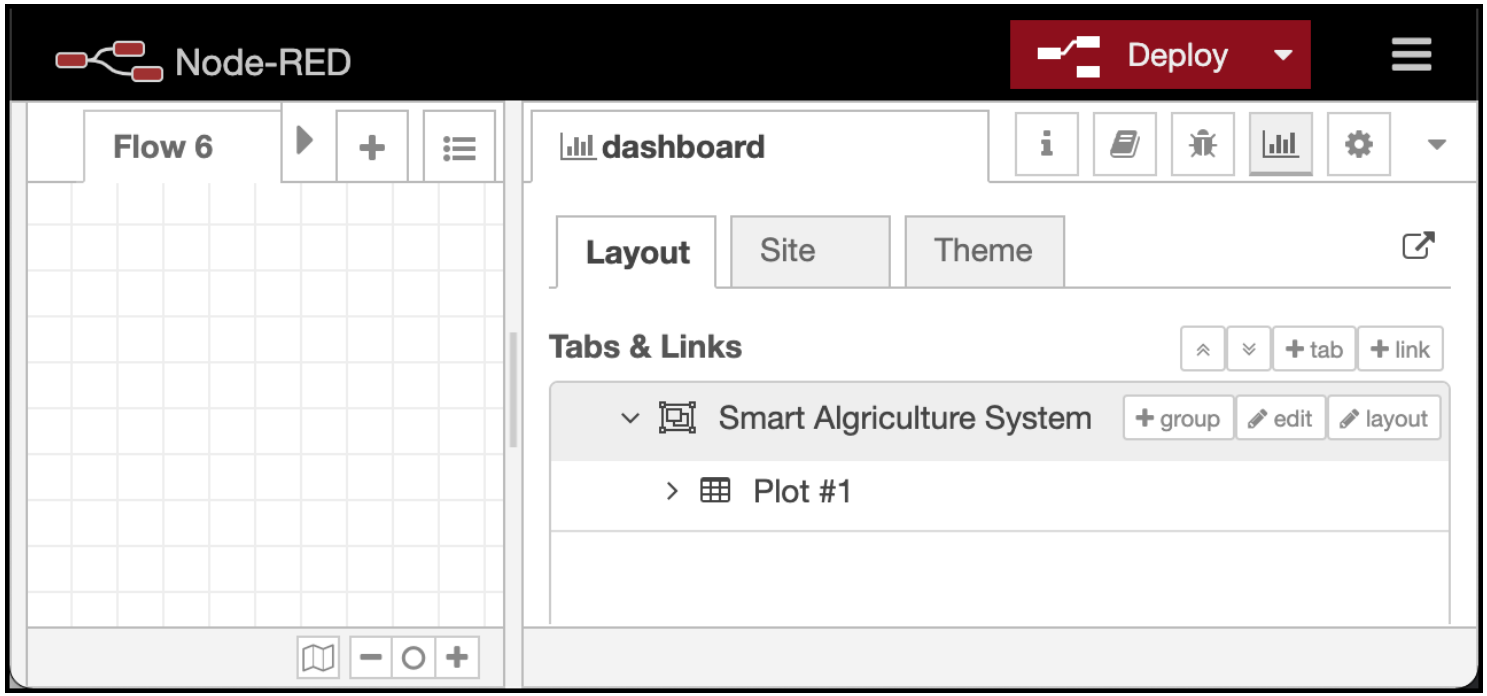
10 Click **Update** upon completion.





Node-RED: e. Setting the Layout.

> If you have multiple sensors attached at different **Plot**, just add **+group** and name it according the **Plot** number.

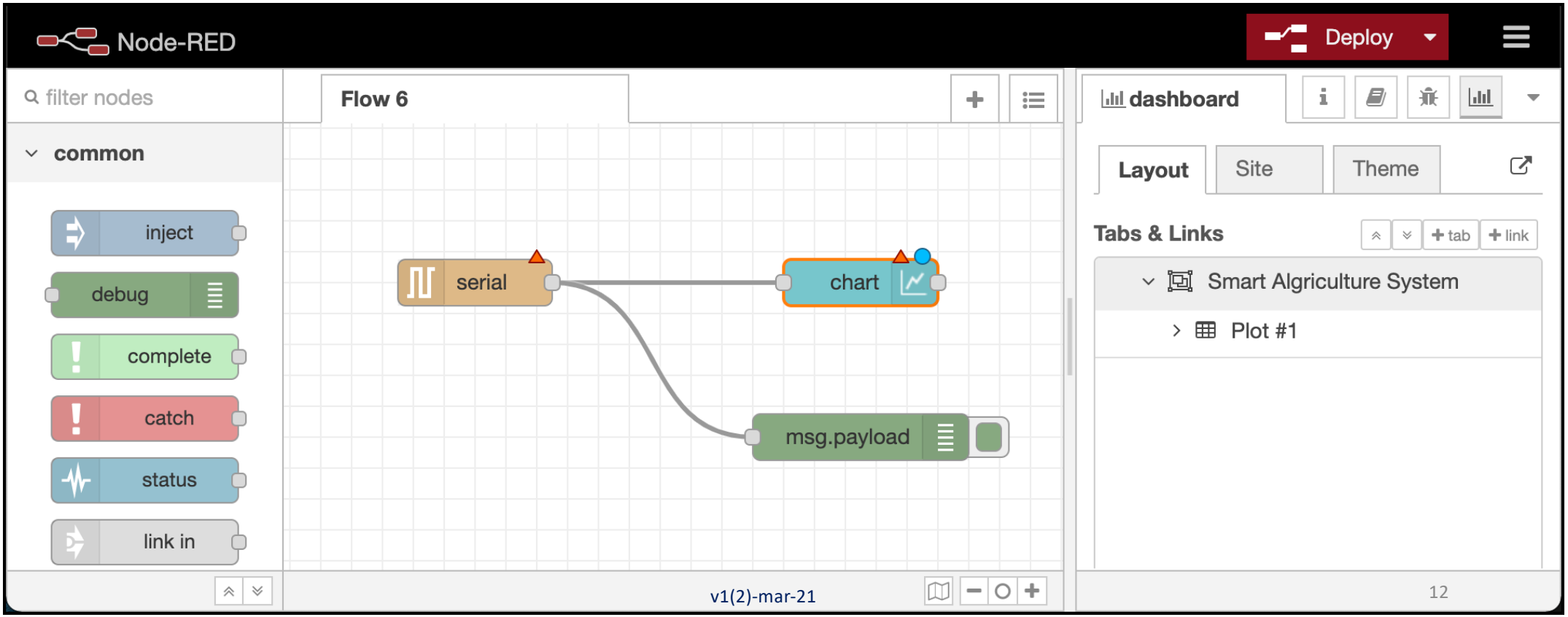


> To delete the layout, go to **edit** section and click **Delete.**

> Don’t forget to click **Deploy** after every activity, otherwise, your will lost your work.

Node-RED: f. Workspace Setup.

> Next process is to setup the **Serial in** node & assign the properties to **Chart** node.

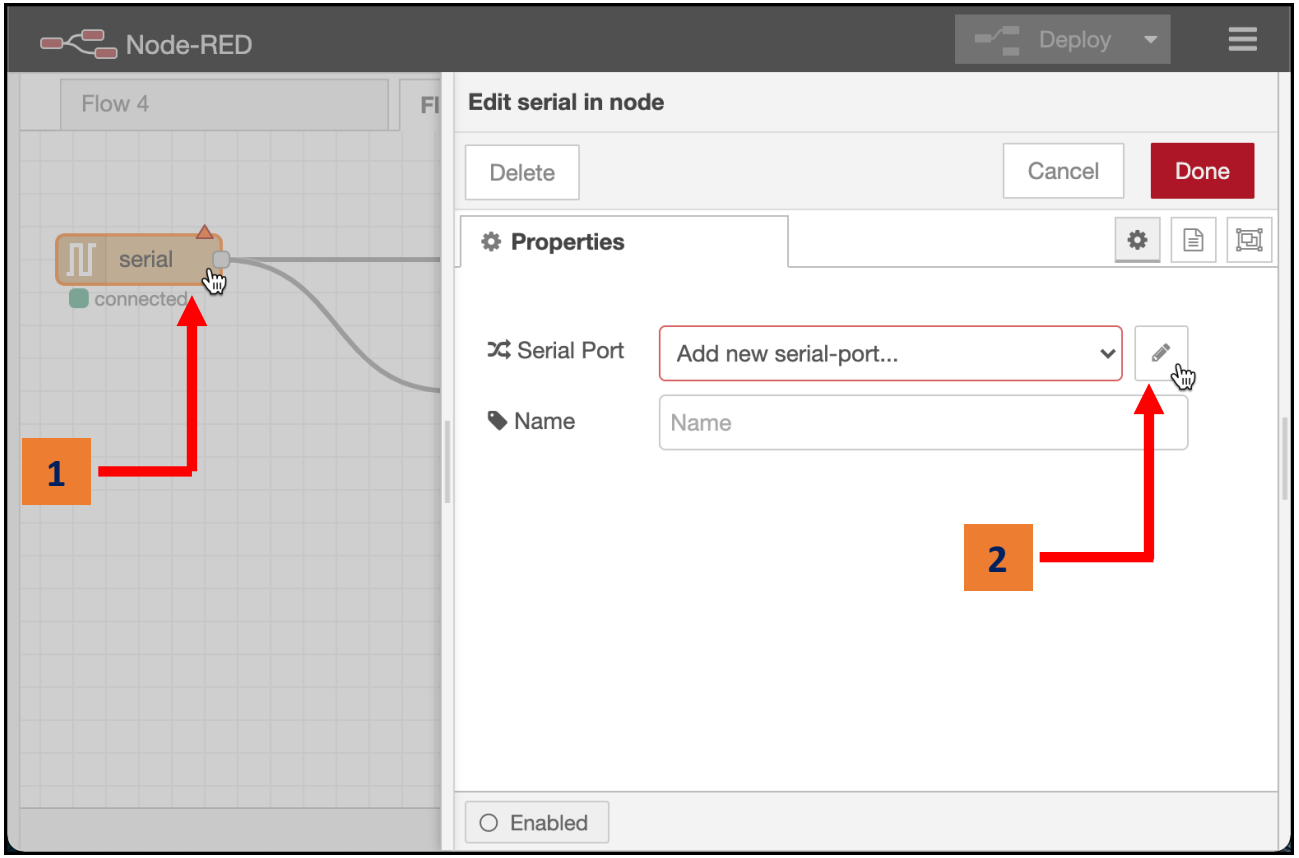


Node-RED: f. Serial in Config.

1 Double click **serial in** node.

2 Click the pencil icon to **add new serial-port config node**.

>The port number is the same with the microcontroller's (refer to **Arduino IDE** or **Device Manager>Port**)

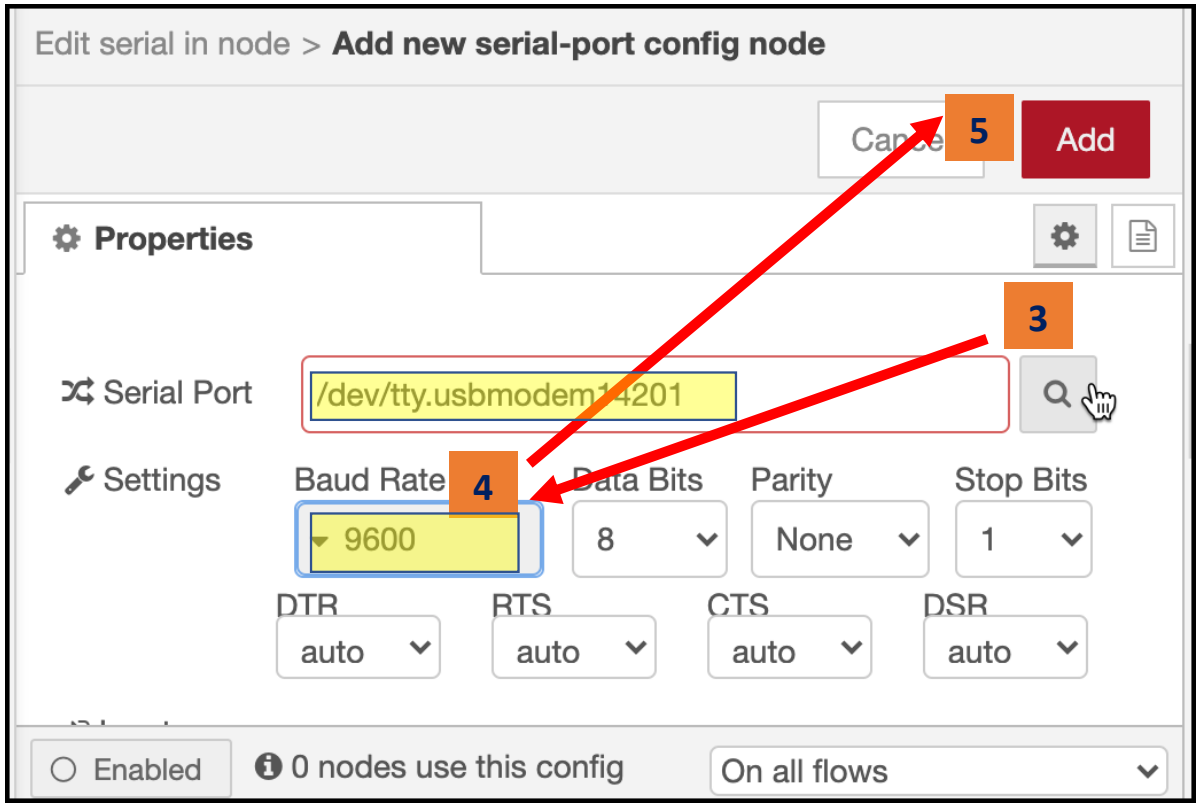


Node-RED: f. Serial in Config.

3 Click the browse port icon & select the correct serial port. Make sure the microcontroller is connected to your system.

4 Change the **Baud Rate** accordingly. Refer to **Slide 5 line#5 Serial.begin(9600)**.

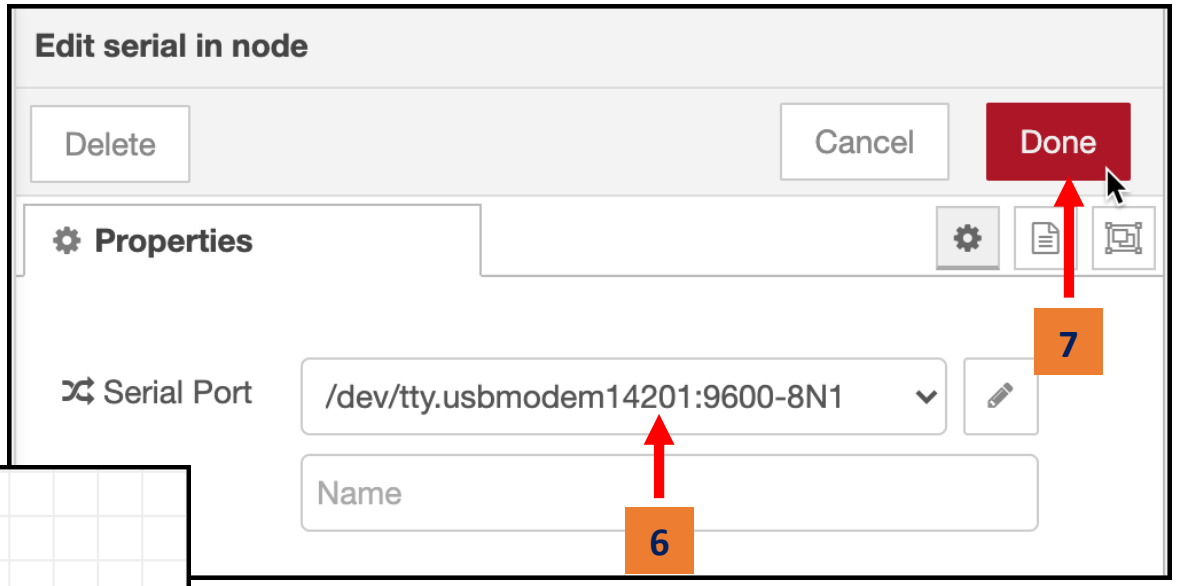
5 Click **Add** & you will be diverted to previous page

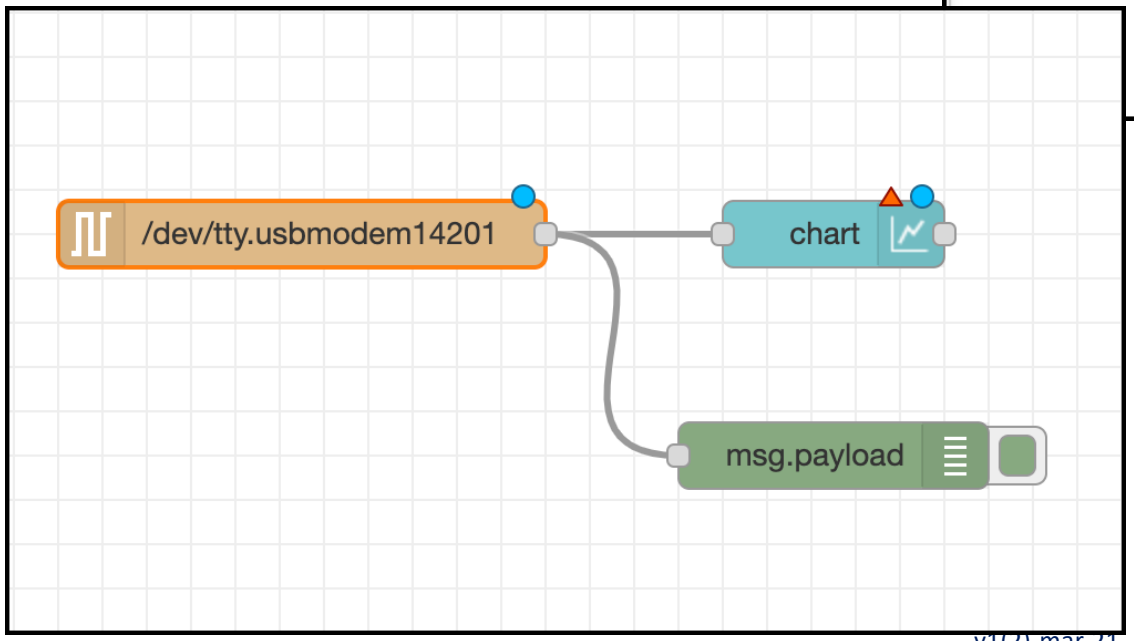


Node-RED: f. Serial in Config.

6 Confirm the setting? If not, click the **pencil icon** to edit.

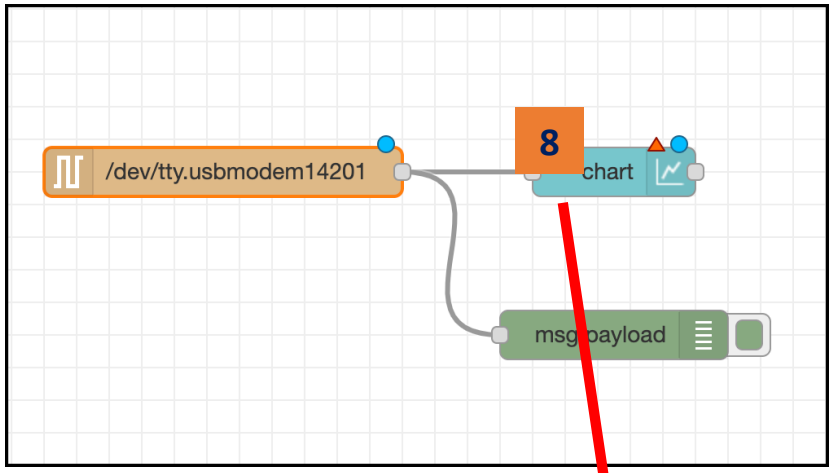
7 Click **Done** upon completion.





Node-RED: g. Chart Config.

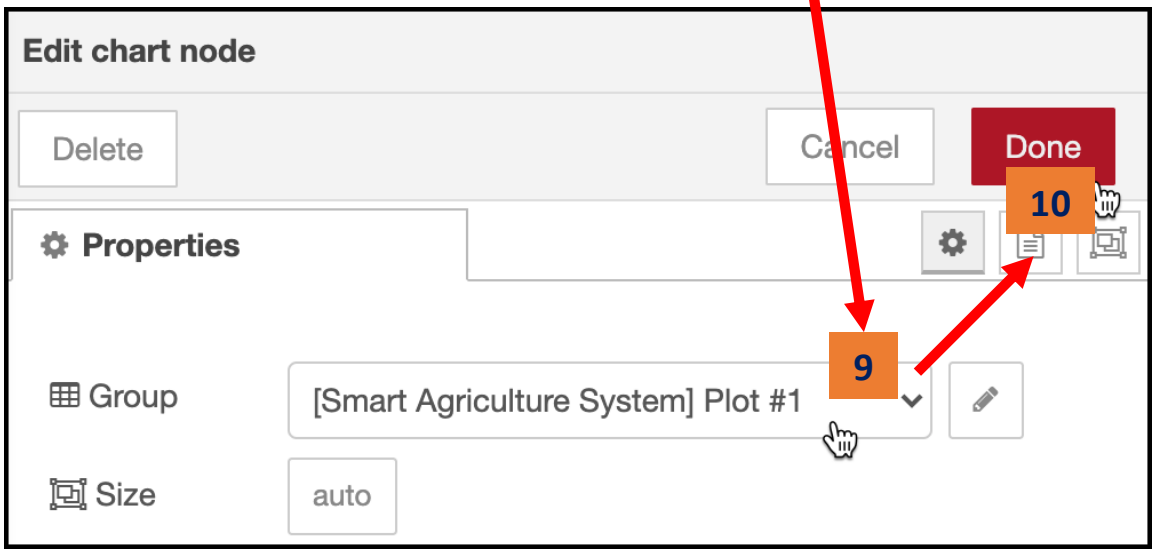
> Next step is to set up Chart's properties.



8 Double click Chart node.

9 Select **[Smart Agriculture System] Plot #1**.

10 Click **Done** upon completion.

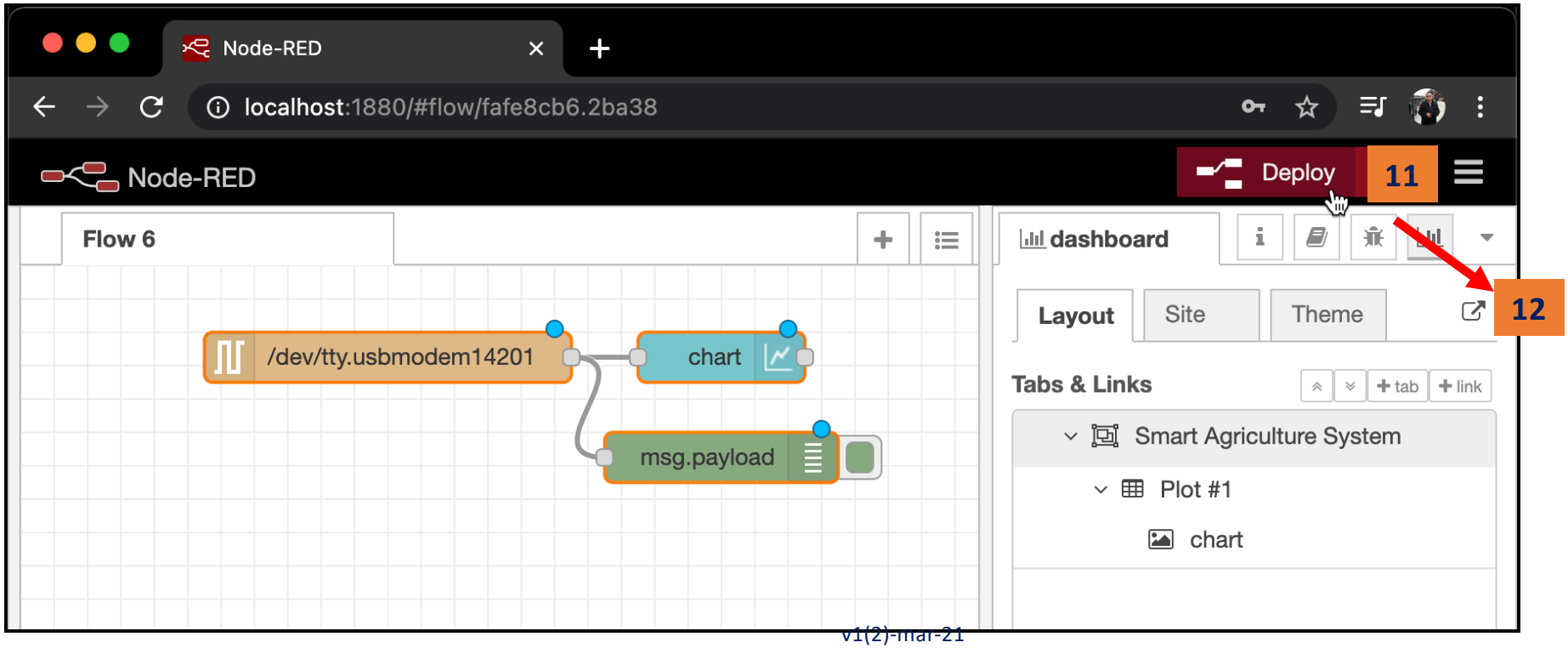


Note: Total element in group will increase if you have created series of dashboard tasks.

Node-RED: h. Prepare to Execute.

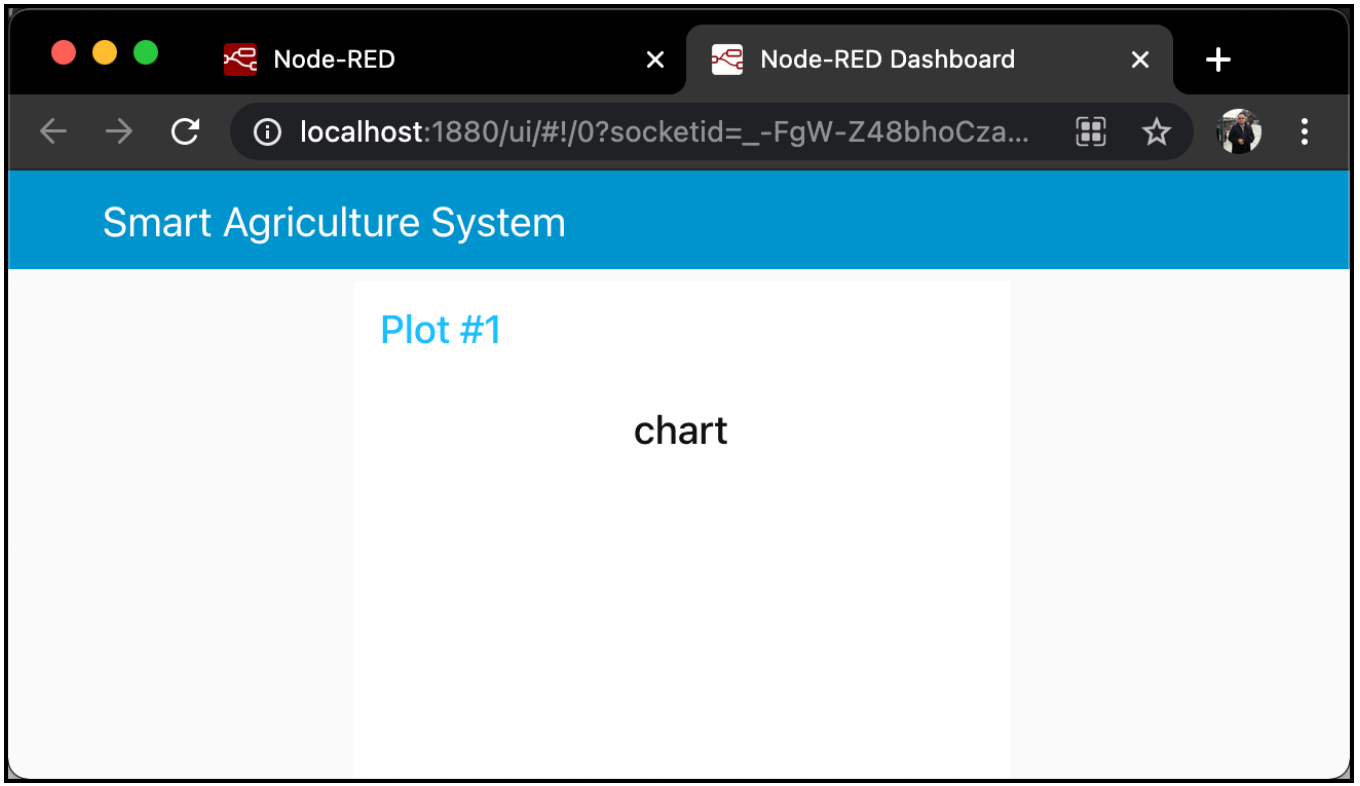
11 Click Deploy to compile the flow's update, setup and config.

12 Click  to view the UI interface aka dashboard. (http://localhost:1880/ui/)



Node-RED: i. The Output & Troubleshoot.

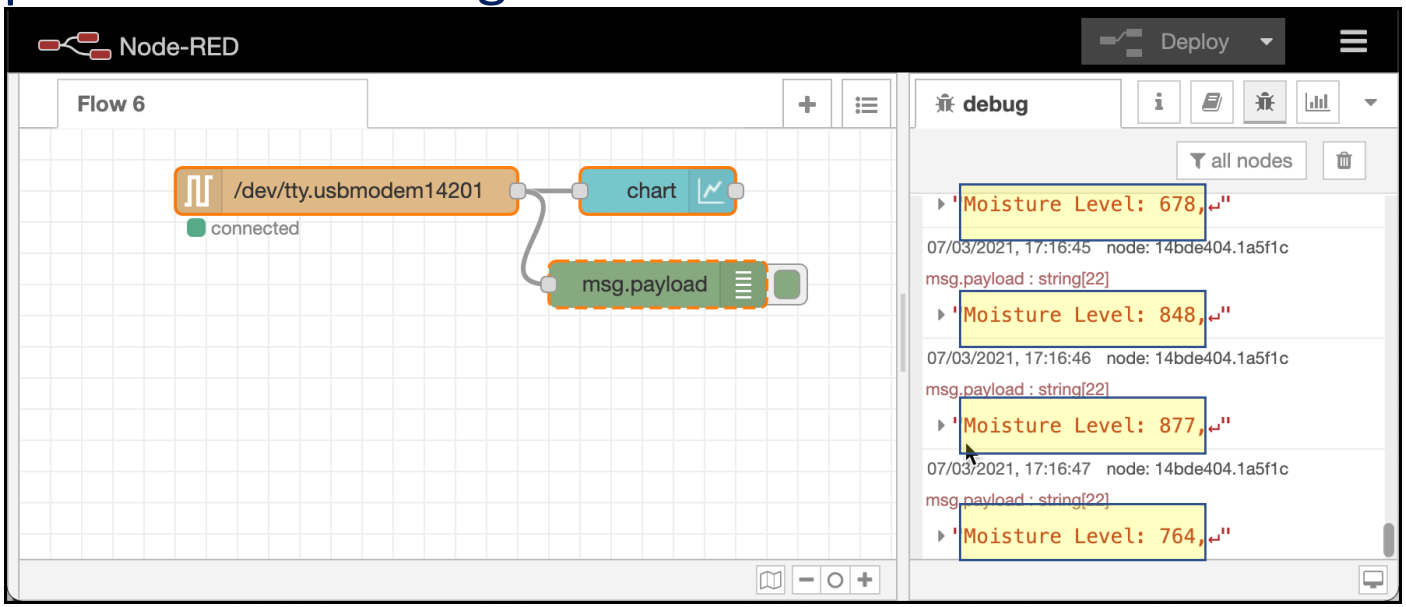
> No output produced. Go back to **nodeRED workspace editor** & click debug message to see the output tapped at **debug** node.



Node-RED: i. The Output & Troubleshoot.

> Need to omit the '**Moisture Level:** ' text. Remark line number 13 (refer slide 5).

Upload the sketch again.



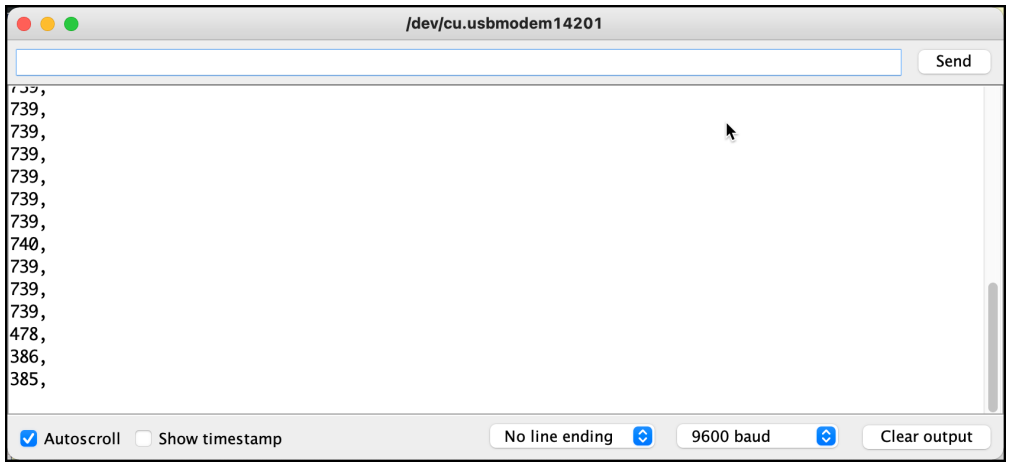
Note: You need to disconnect the board from nodeRED first, by double click the **serial in** node text & change port parameter 

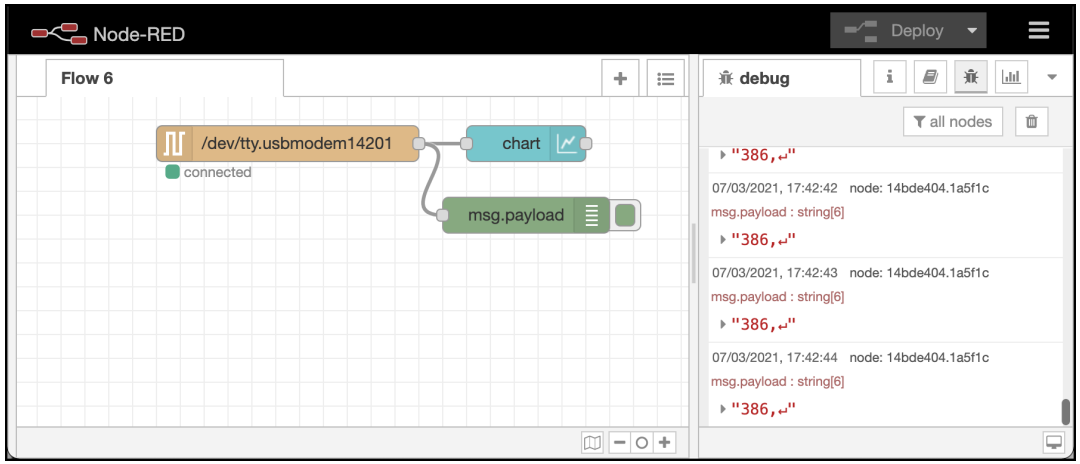
& click **Deploy**. When connect to nodeRED, close the **Serial Monitor**.

Node-RED: i. The Output & Troubleshoot.

> Output at Serial Monitor shows the reading from the sensor.

> Similar with at nodeRED, don't forget to exit Serial Monitor before triggering the nodeRED serial port again. Only one application per serial port.



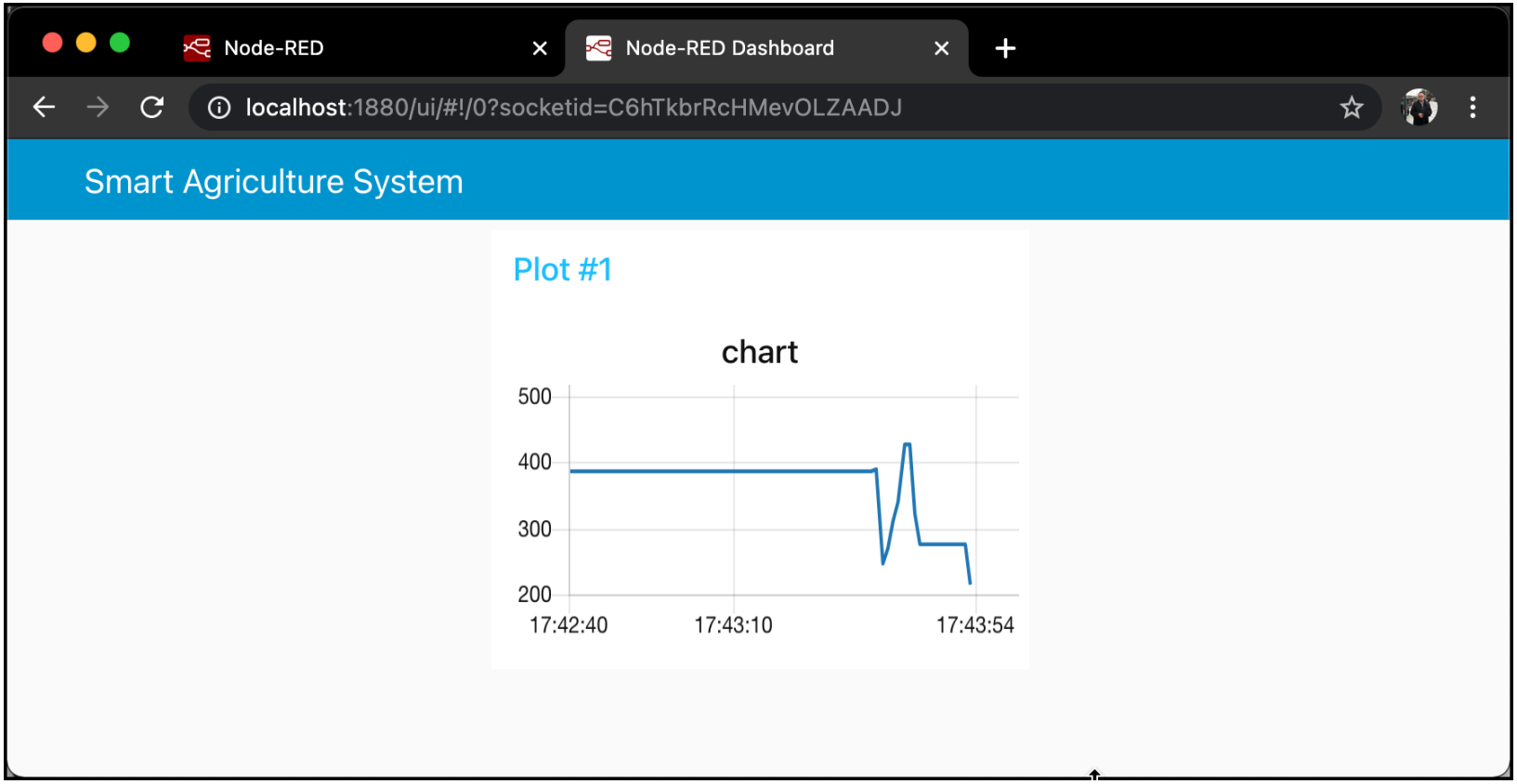


Note: You need to disconnect the board from nodeRED by double click the serial in node text & change port parameter 

& click **Deploy**. When connect to nodeRED, close the **Serial Monitor**.

Node-RED: i. The Output & Troubleshoot.

> The final output.



EXERCISE:

Add one more sensor, modify the function node and also the sketch.

Answer:


```
[{"id":"bac65c23.74b21","type":"tab","label":"Flow
2","disabled":false,"info":""},{"id":"1c057498.f326ab","type":"debug","z":"bac65c23.74b21","name":"","active":true,"tosidebar":true,"console
":false,"tostatus":false,"complete":"payload","targetType":"msg","statusVal":"","statusType":"auto","x":470,"y":100,"wires":[]},{"id":"70291b
26.ad9e44","type":"serial
in","z":"bac65c23.74b21","name":"","serial":"a674939a.de6d1","x":190,"y":220,"wires":[["8289256.014bfd8","5285227e.00726c"]]},{"id":"528
5227e.00726c","type":"function","z":"bac65c23.74b21","name":"Humid","func":"var output = msg.payload.split(\",\");\n\nvar velimp =
parseInt(output[0]);\n//var angle  = parseInt(output[0]);\n\n\nvar msg = {payload : velimp};\n//var msg2 = {payload : angle};\n\n\nreturn
msg;\n","outputs":1,"noerr":0,"initialize":"","finalize":"","x":330,"y":140,"wires":[["1c057498.f326ab","9d0bbc0b.d35ba"]]},{"id":"8289256.01
4bfd8","type":"function","z":"bac65c23.74b21","name":"Temp","func":"var output = msg.payload.split(\",\");\n\n//var velimp =
parseInt(output[0]);\nvar angle  = parseInt(output[1]);\n\n\n//var msg2 = {payload : velimp};\nvar msg = {payload : angle};\n\n\nreturn
msg;\n","outputs":1,"noerr":0,"initialize":"","finalize":"","x":310,"y":300,"wires":[["909b5194.dcfe8","dfe43fa5.09c56","88d47994.eee278"]]},
{"id":"909b5194.dcfe8","type":"debug","z":"bac65c23.74b21","name":"","active":true,"tosidebar":true,"console":false,"tostatus":false,"compl
ete":"payload","targetType":"msg","statusVal":"","statusType":"auto","x":490,"y":280,"wires":[]},{"id":"9d0bbc0b.d35ba","type":"ui_gauge","
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CL412","group":"9f246d07.8e352","order":1,"width":0,"height":0,"gtype":"gage","title":"","label":"units","format":"{{value}}%","min":0,"max
":"100","colors":["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":490,"y":200,"wires":[]},{"id":"dfe43fa5.09c56","type":"ui_chart","z"
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","chartType":"line","legend":"false","xformat":"HH:mm:ss","interpolate":"linear","nodata":"","dot":false,"ymin":"","ymax":"","removeOlder"
:1,"removeOlderPoints":"","removeOlderUnit":"3600","cutout":0,"useOneColor":false,"useUTC":false,"colors":["#1f77b4","#aec7e8","#ff7f0e"
,"#2ca02c","#98df8a","#d62728","#ff9896","#9467bd","#c5b0d5"],"useOldStyle":false,"outputs":1,"x":520,"y":320,"wires":[[]]},{"id":"88d4799
4.eee278","type":"ui_text","z":"bac65c23.74b21","group":"af20372d.328a38","order":1,"width":0,"height":0,"name":"","label":"text","format
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port","z":"","serialport":"/dev/tty.usbmodem14201","serialbaud":"9600","databits":"8","parity":"none","stopbits":"1","waitfor":"","dtr":"non
e","rts":"none","cts":"none","dsr":"none","newline":"\\n","bin":"false","out":"char","addchar":"","responsetimeout":"10000"},{"id":"9f246d0
7.8e352","type":"ui_group","z":"","name":"Humidity","tab":"ff22fd9e.4e5c3","order":1,"disp":true,"width":4,"collapse":false},{"id":"af20372d
.328a38","type":"ui_group","z":"","name":"Temperature","tab":"ff22fd9e.4e5c3","order":2,"disp":true,"width":"4","collapse":false},{"id":"ff2
2fd9e.4e5c3","type":"ui_tab","z":"","name":"lab2","icon":"dashboard","disabled":false,"hidden":false}]
```


nodeRED

```
/Variables
String data1, data2;
int d1, d2;

void setup()
{
 Serial.begin(9600);
}

void loop()
{
   //Read data from port 0 & 2, and store it to variables d1, d2 in integer mode
   d1 = analogRead(0);
   d2 = analogRead(2);
   data1 = String(d1);
   data2 = String(d2);
   //Print d1 and d2 values to serial monitor

   Serial.print(d1);
   Serial.print(",");
   Serial.print(d2);

   delay(2000); //Delay 2 sec.
}
```

arduino

QnA

END