ASSIGNMENT 3

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REGISTRATION NO: 20BEC1174

DATE: 06/06/2023

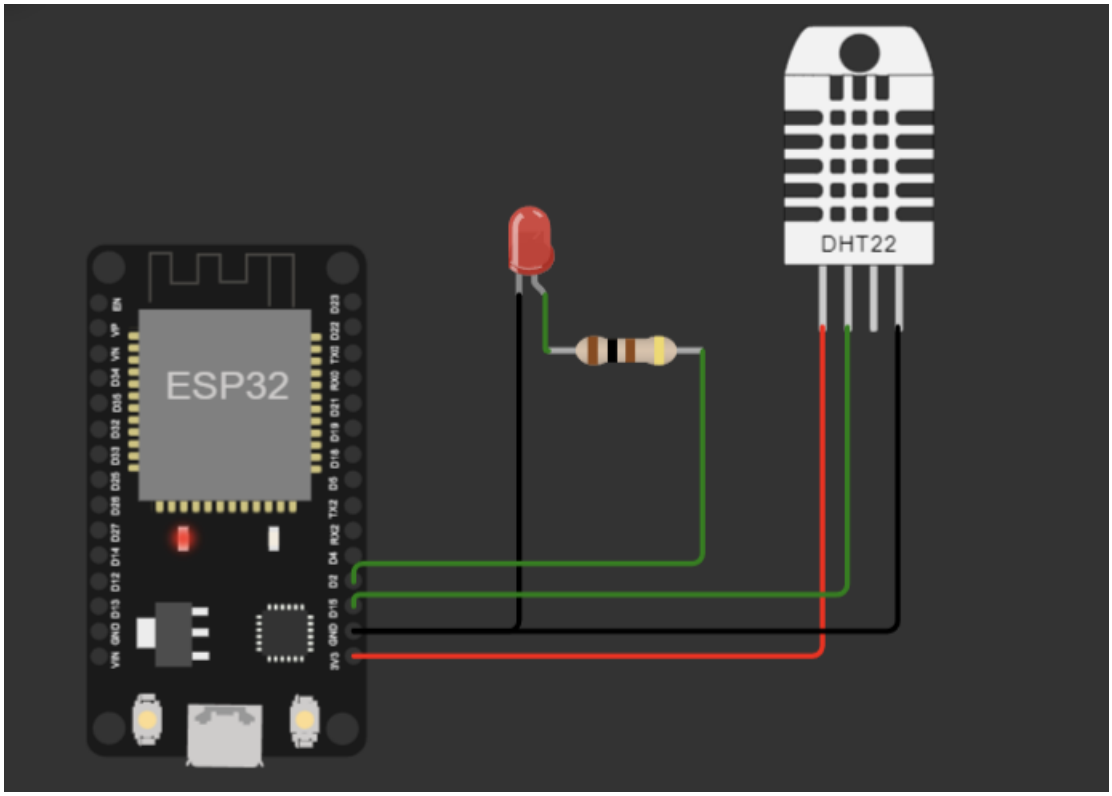
Sending Commands to WOKWI through Node-Red Dashboard using IBM Watson IoT

Aim: To construct a circuit with DHT11 Temperature Sensor and LED using ESP32 board in WOKWI and send commands to the circuit to switch on and off the LED.

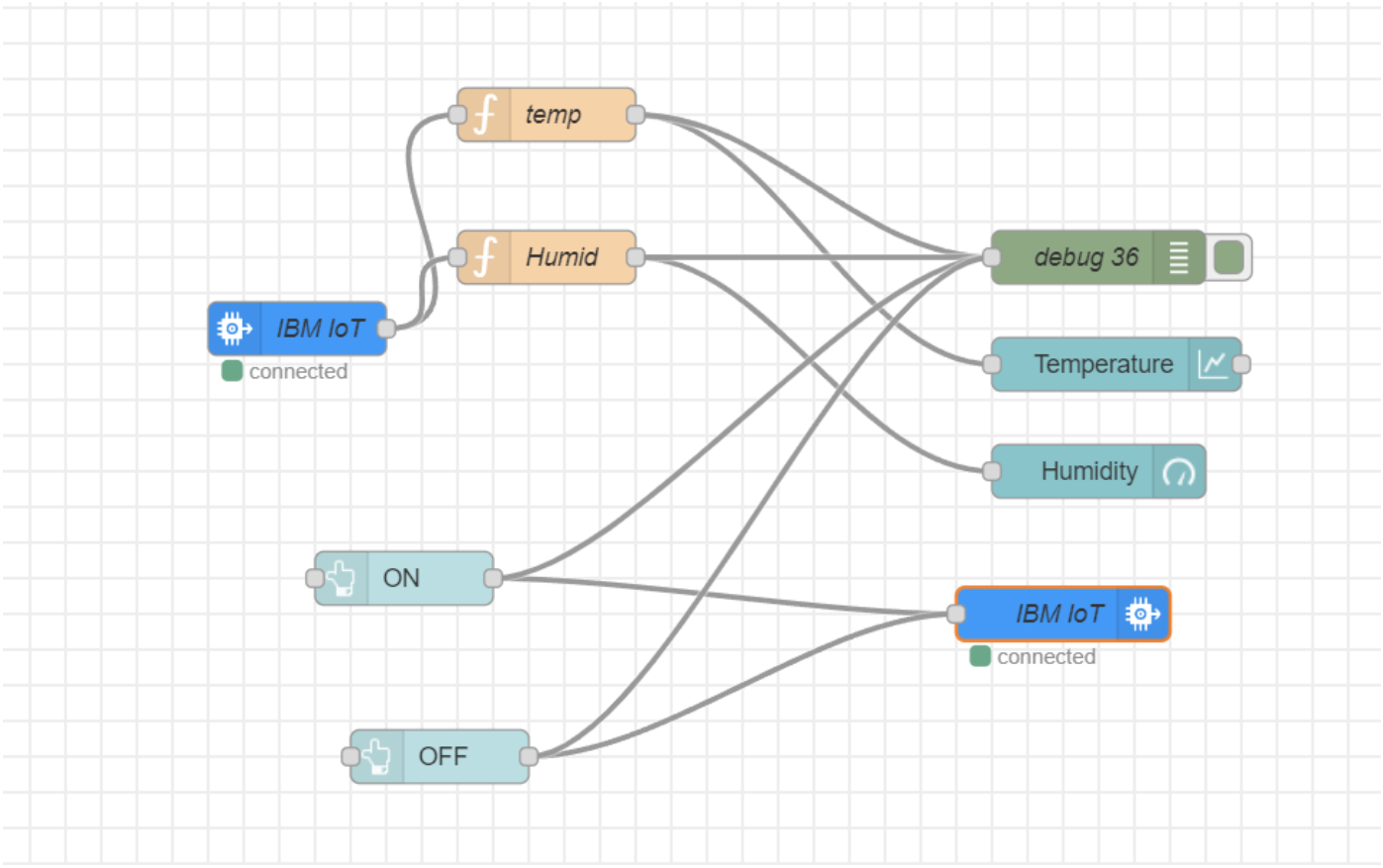
Software required: WOKWI , IBM WATSON IoT, Node Red, Node Red Dashboard

Components Required: ESP32, 1K Resistor, Push button, Connecting wires

Circuit Diagram:

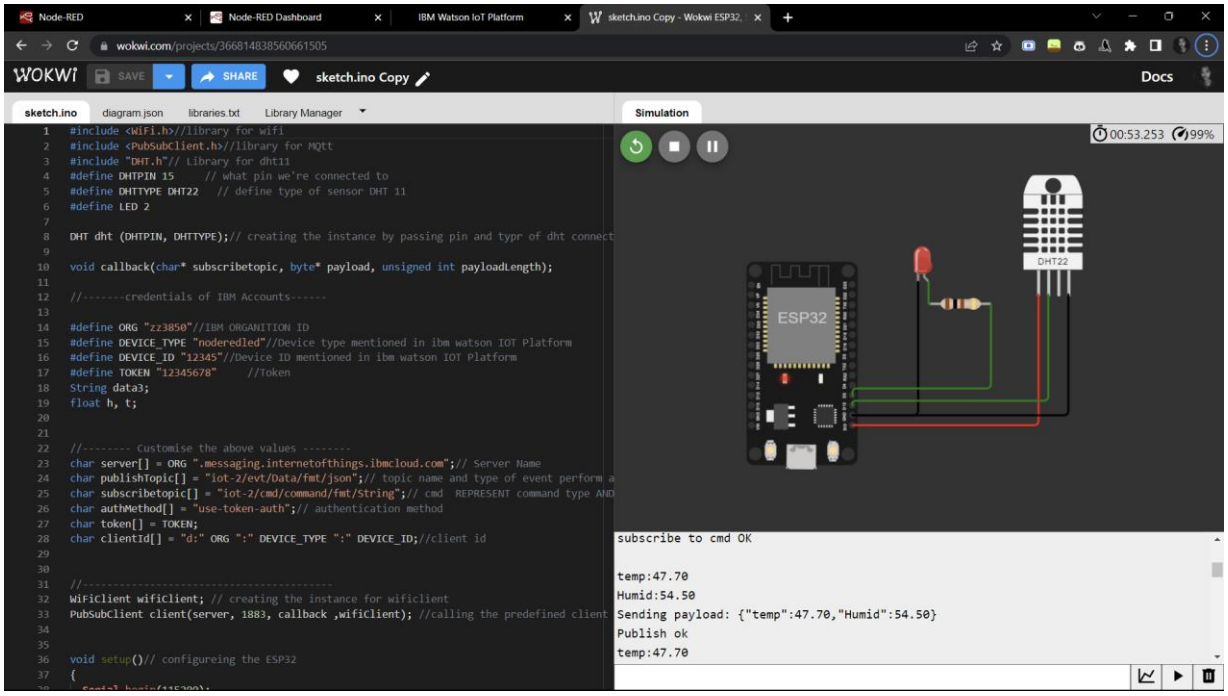


Flow:



Simulation:

WOKWI:



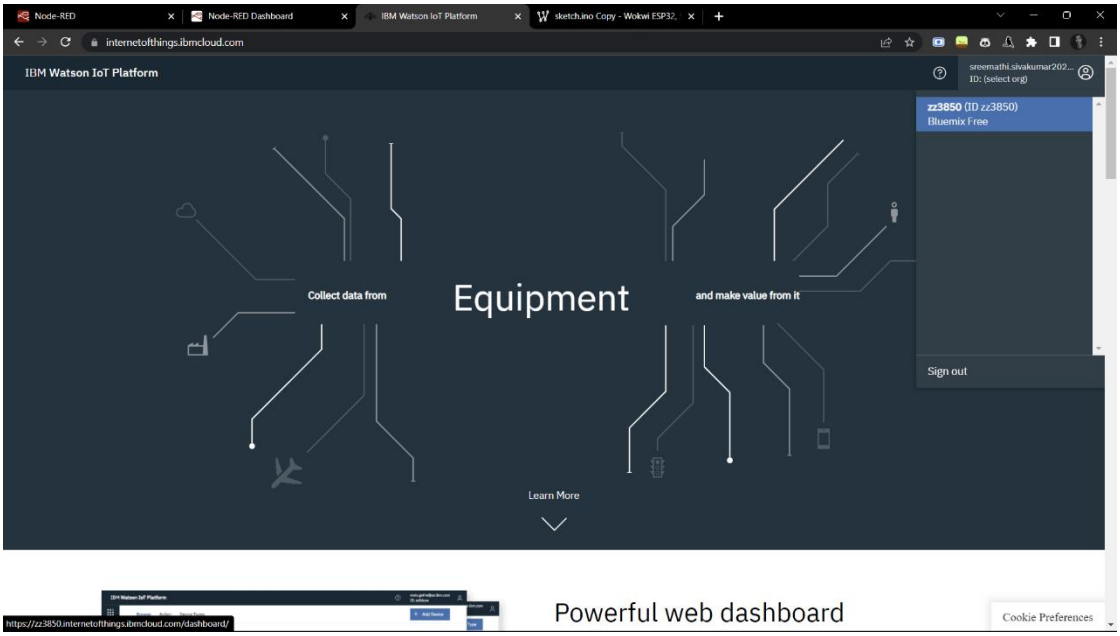
Code :

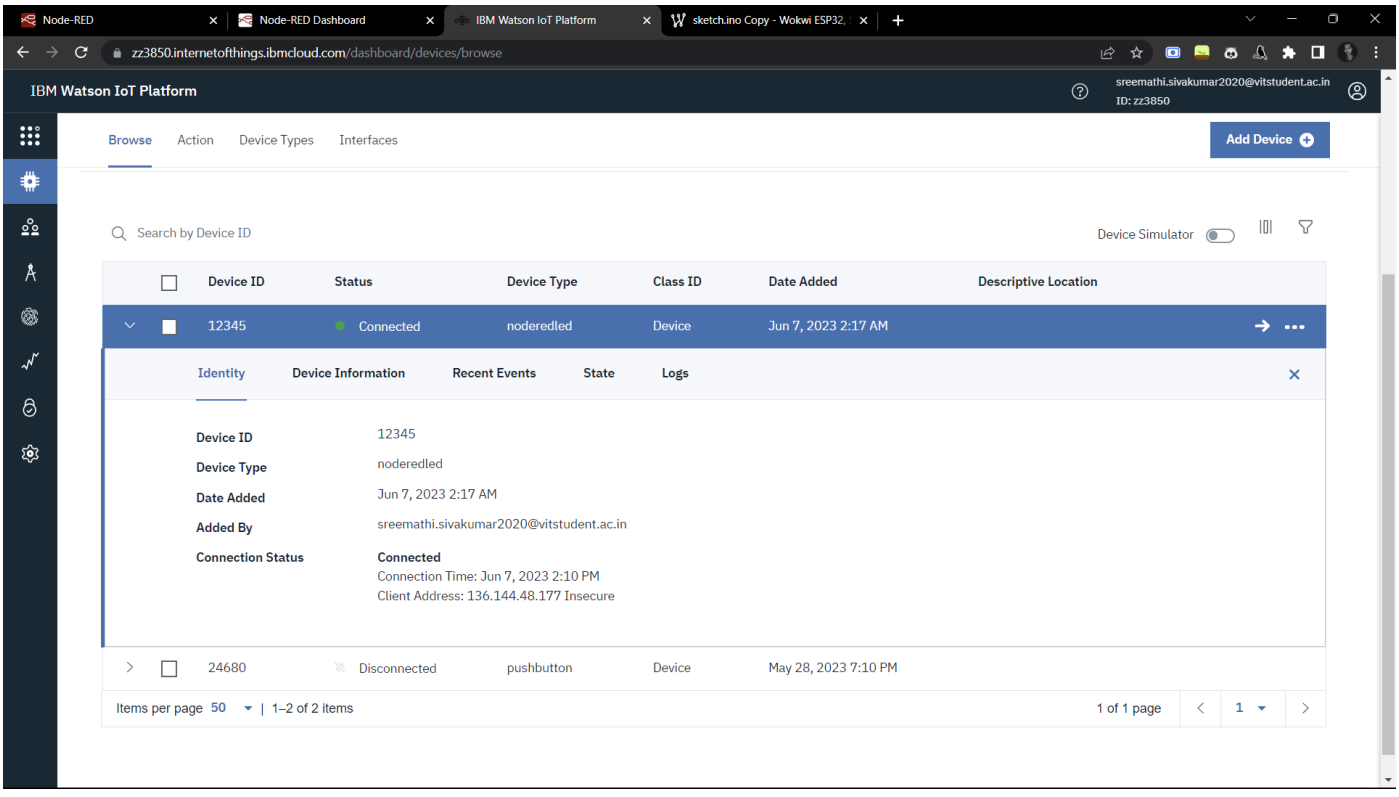
```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 15     // what pin we're connected to
#define DHTTYPE DHT22   // define type of sensor DHT 11
#define LED 2

DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht
connected

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);

//-------credentials of IBM Accounts------

#define ORG "zz3850"//IBM ORGANITION ID
#define DEVICE_TYPE "noderedled"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "12345"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "12345678"     //Token
String data3;
float h, t;

//-------- Customise the above values --------
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event
perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd  REPRESENT command type
AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id

//-----------------------------------------
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined
client id by passing parameter like server id,portand wificredential

void setup()// configureing the ESP32
{
  Serial.begin(115200);
  dht.begin();
  pinMode(LED,OUTPUT);
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();
}

void loop()// Recursive Function
{

  h = dht.readHumidity();
  t = dht.readTemperature();
```

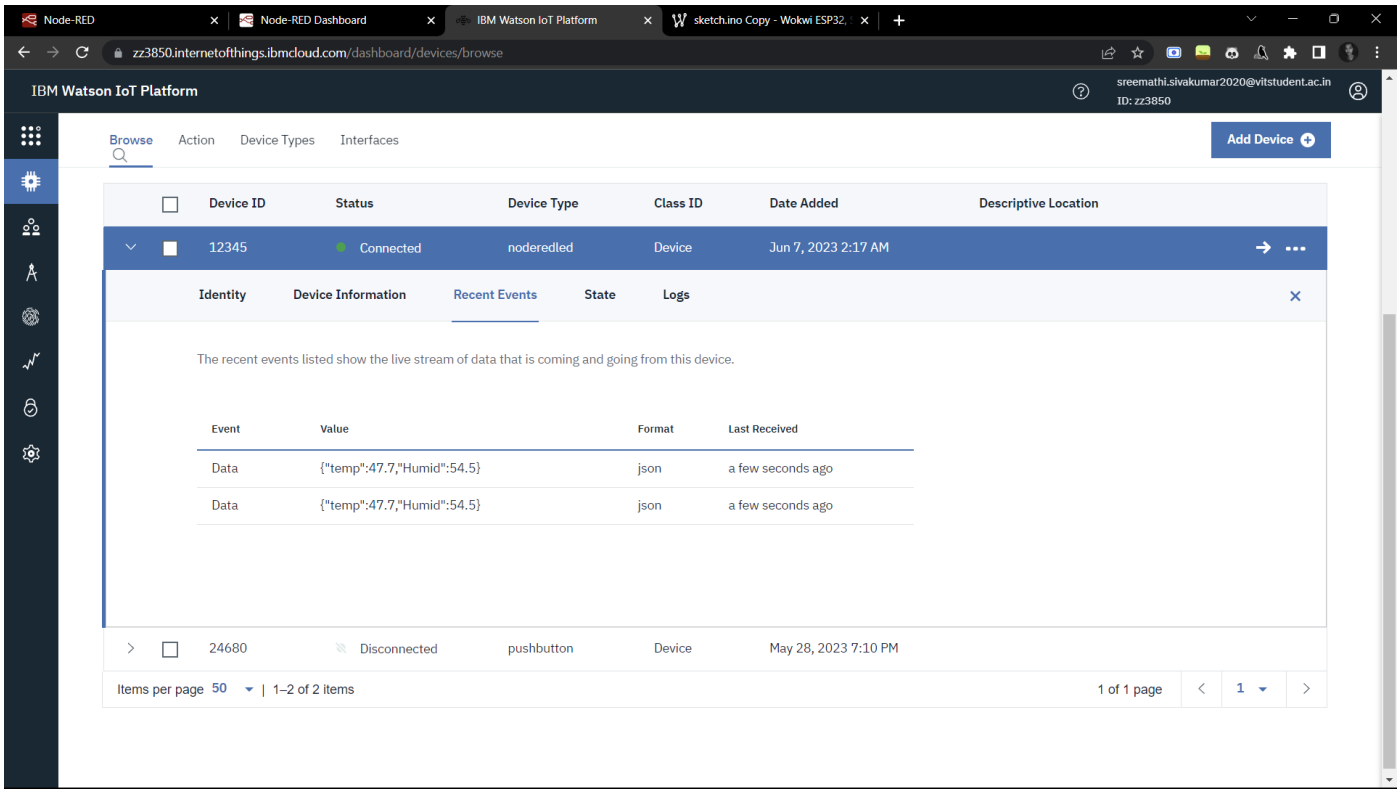
```
  Serial.print("temp:");
  Serial.println(t);
  Serial.print("Humid:");
  Serial.println(h);

  PublishData(t, h);
  delay(4000);
  if (!client.loop()) {
    mqttconnect();
  }
}


/*.....................................retrieving to
Cloud..............................*/

void PublishData(float temp, float humid) {
  mqttconnect();//function call for connecting to ibm
  /*
     creating the String in in form JSon to update the data to ibm cloud
  */
  String payload = "{\"temp\":";
  payload += temp;
  payload += "," "\"Humid\":";
  payload += humid;
  payload += "}";


  Serial.print("Sending payload: ");
  Serial.println(payload);


  if (client.publish(publishTopic, (char*) payload.c_str())) {
    Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it
will print publish ok in Serial monitor or else it will print publish failed
  } else {
    Serial.println("Publish failed");
  }

}

void mqttconnect() {
  if (!client.connected()) {
    Serial.print("Reconnecting client to ");
    Serial.println(server);
    while (!!!client.connect(clientId, authMethod, token)) {
      Serial.print(".");
      delay(500);
    }

     initManagedDevice();
     Serial.println();
  }
}
```

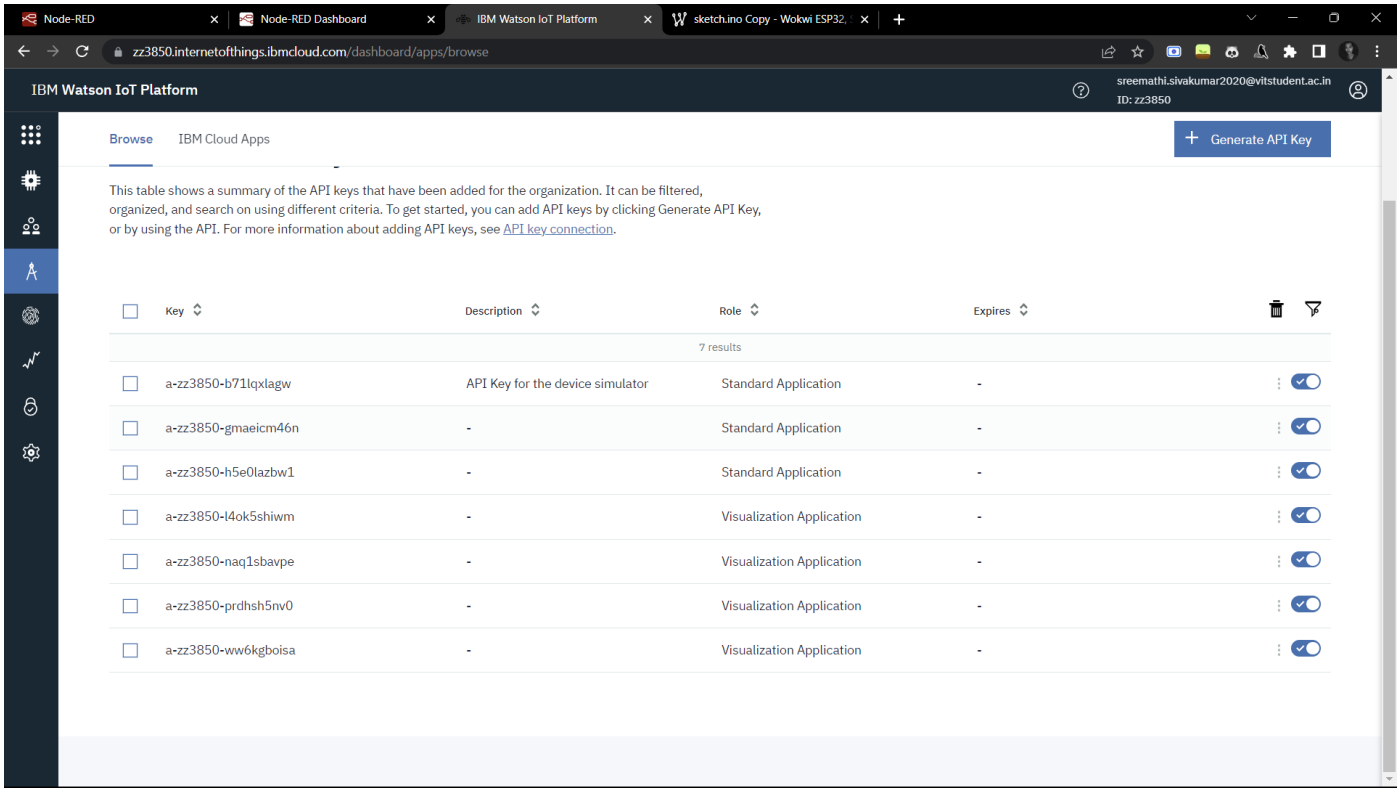
```
void wificonnect() //function defination for wificonnect
{
  Serial.println();
  Serial.print("Connecting to ");

  WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish the
connection
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}

void initManagedDevice() {
  if (client.subscribe(subscribetopic)) {
    Serial.println((subscribetopic));
    Serial.println("subscribe to cmd OK");
  } else {
    Serial.println("subscribe to cmd FAILED");
  }
}

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{

  Serial.print("callback invoked for topic: ");
  Serial.println(subscribetopic);
  for (int i = 0; i < payloadLength; i++) {
    //Serial.print((char)payload[i]);
    data3 += (char)payload[i];
  }
  Serial.println("data: "+ data3);
  if(data3=="lighton")
  {
Serial.println(data3);
digitalWrite(LED,HIGH);
  }
  else
  {
Serial.println(data3);
digitalWrite(LED,LOW);
  }
data3="";
}
```

IBM Watson Iot:






Node-RED
Node-RED Dashboard
IBM Watson IoT Platform
sketch.ino Copy - Wokwi ESP32,
zz3850.internetofthings.ibmcloud.com/dashboard/devices/browse
IBM Watson IoT Platform
sreemathi.sivakumar2020@vitstudent.ac.in
ID: zz3850
Browse
Action
Device Types
Interfaces
Add Device
Device ID
Status
Device Type
Class ID
Date Added
Descriptive Location
12345
Connected
noderedled
Device
Jun 7, 2023 2:17 AM
Identity
Device Information
Recent Events
State
Logs
The recent events listed show the live stream of data that is coming and going from this device.
Event
Value
Format
Last Received
Data
{"temp":47.7,"Humid":54.5}
json
a few seconds ago
Data
{"temp":47.7,"Humid":54.5}
json
a few seconds ago
24680
Disconnected
pushbutton
Device
May 28, 2023 7:10 PM
Items per page 50
1–2 of 2 items
1 of 1 page
1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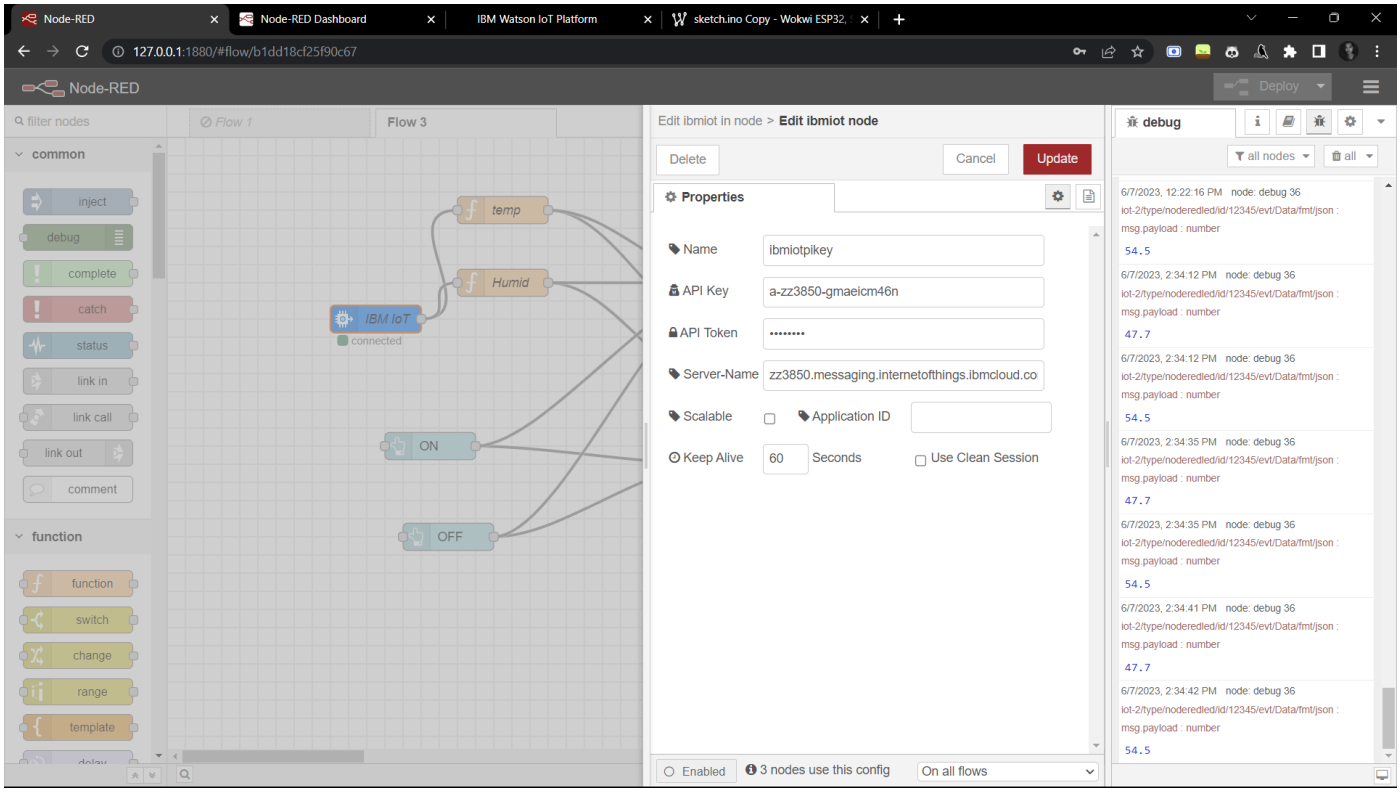
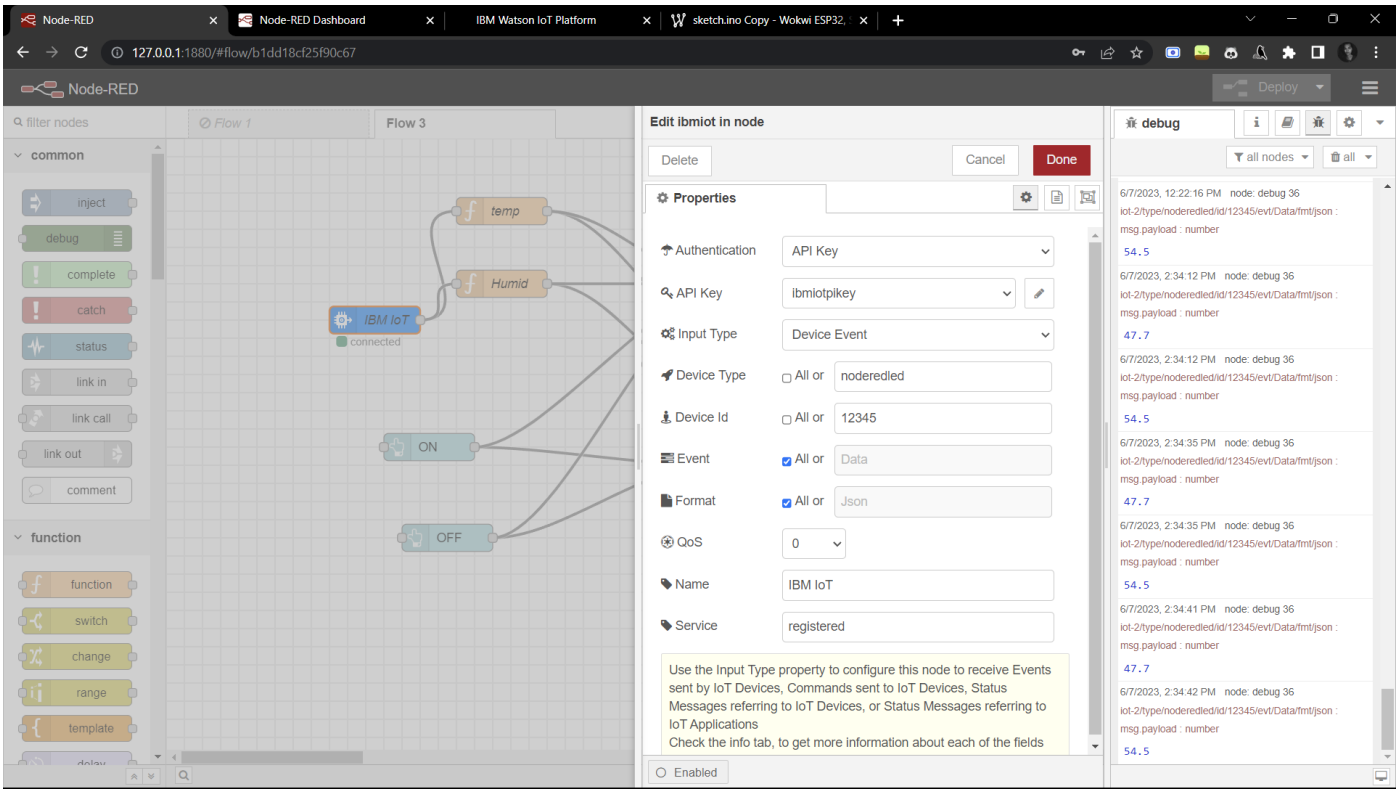
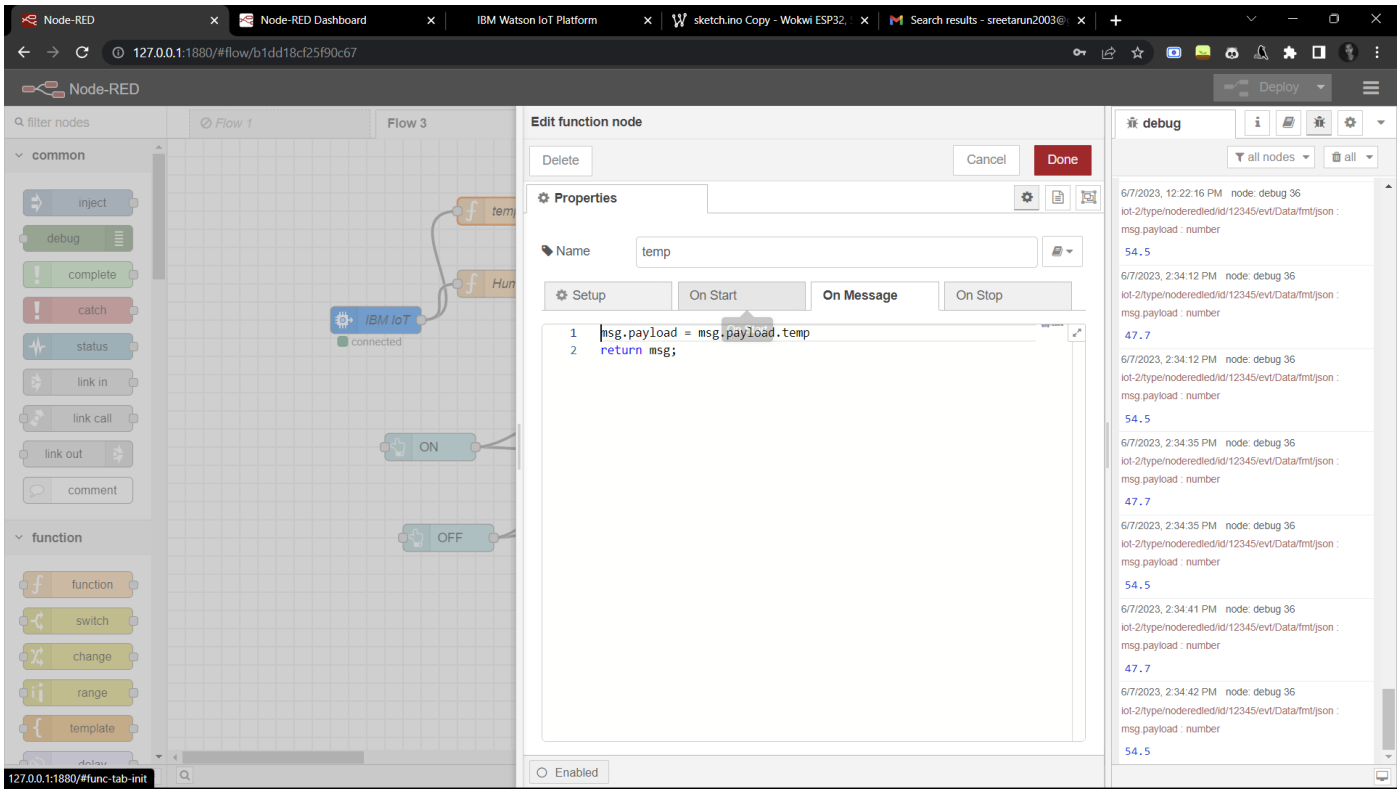
sketch.ino Copy - Wokwi ESP32,
zz3850.internetofthings.ibmcloud.com/dashboard/apps/browse
IBM Watson IoT Platform
sreemathi.sivakumar2020@vitstudent.ac.in
ID: zz3850
Browse
IBM Cloud Apps
Generate API Key
This table shows a summary of the API keys that have been added for the organization. It can be filtered, organized, and search on using different criteria. To get started, you can add API keys by clicking Generate API Key, or by using the API. For more information about adding API keys, see API key connection.
Key
Description
Role
Expires
7 results
a-zz3850-b71lqxlagw
API Key for the device simulator
Standard Application
-
a-zz3850-gmaeicm46n
-
Standard Application
-
a-zz3850-h5e0lazbw1
-
Standard Application
-
a-zz3850-l4ok5shiwm
-
Visualization Application
-
a-zz3850-naq1sbavpe
-
Visualization Application
-
a-zz3850-prdhsh5nv0
-
Visualization Application
-
a-zz3850-ww6kgboisa
-
Visualization Application
-

Node Red Nodes:






Node-RED
Node-RED Dashboard
IBM Watson IoT Platform
sketch.ino Copy - Wokwi ESP32,
Search results - sreetarun2003@
127.0.0.1:1880/#flow/b1dd18cf25f90c67
Deploy
filter nodes
Flow 1
Flow 3
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
change
range
template
IBM IoT
connected
ON
OFF
Edit function node
Delete
Cancel
Done
Properties
Name
temp
Setup
On Start
On Message
On Stop
1 msg.payload = msg.payload.temp
2 return msg;
Enabled
debug
all nodes
all
6/7/2023, 12:22:16 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
54.5
6/7/2023, 2:34:12 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
47.7
6/7/2023, 2:34:12 PM node: debug 36
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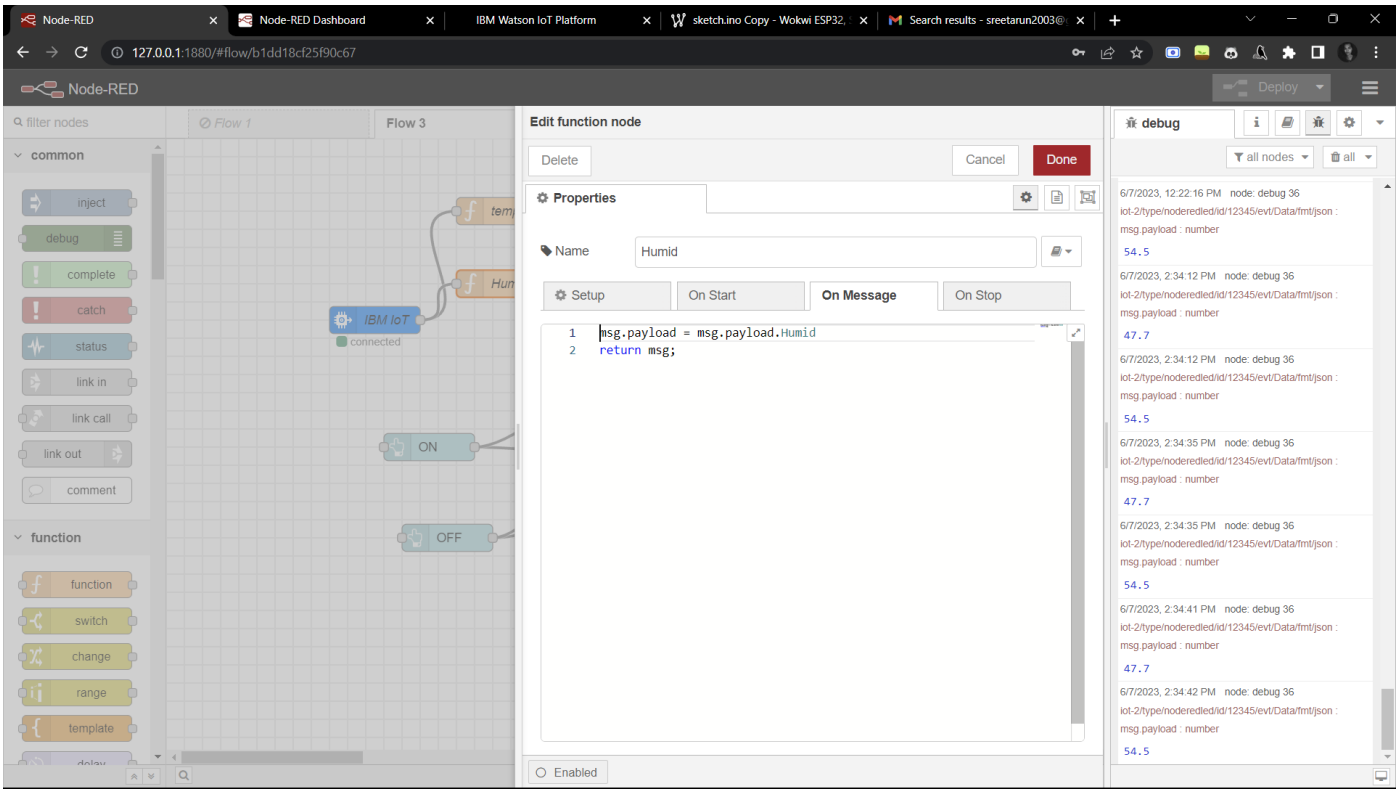
47.7
6/7/2023, 2:34:42 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
54.5
127.0.0.1:1880/#func-tab-init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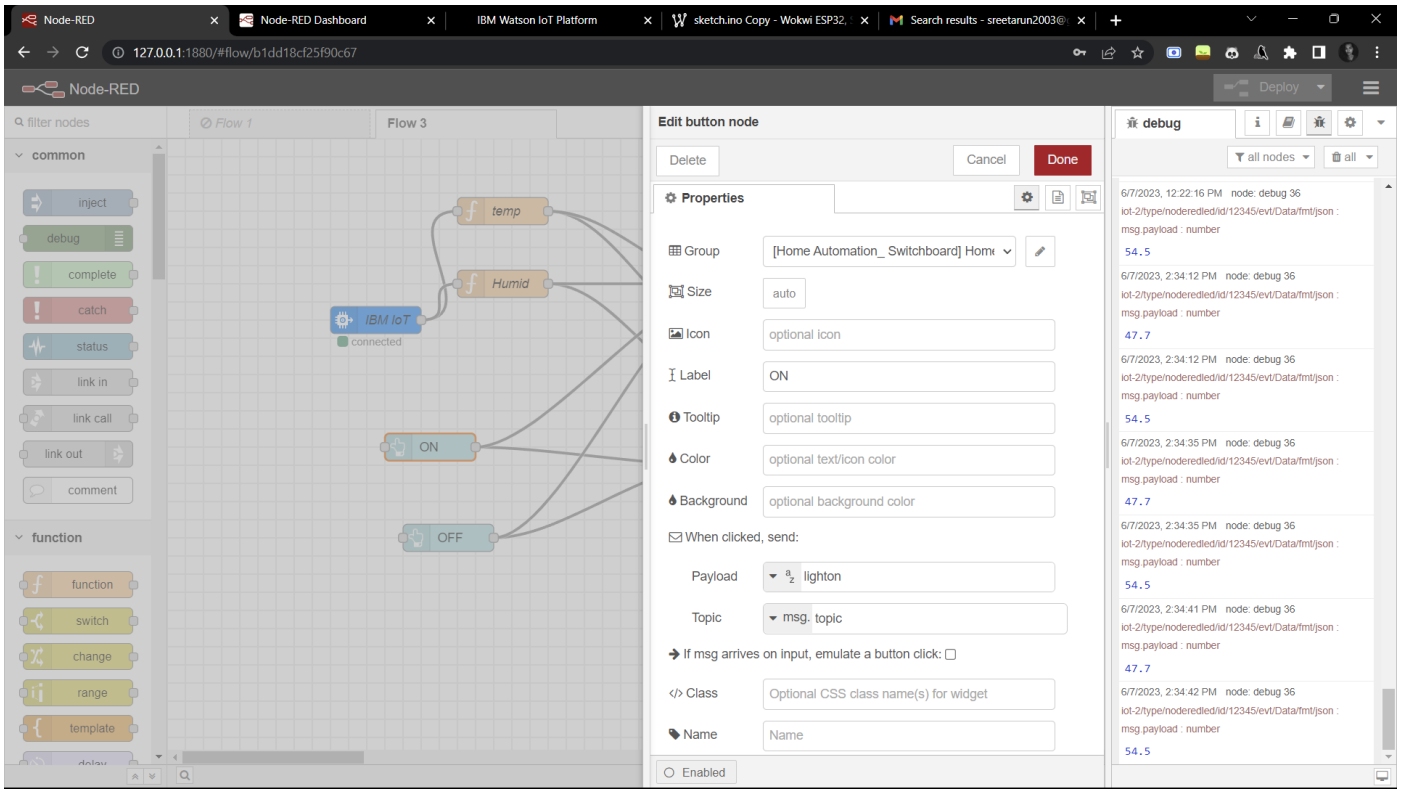
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IBM Watson IoT Platform
sketch.ino Copy - Wokwi ESP32,
Search results - sreetarun2003@
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Deploy
filter nodes
Flow 1
Flow 3
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
change
range
template
temp
Humid
IBM IoT
connected
ON
OFF
Edit button node
Delete
Cancel
Done
Properties
Group
[Home Automation_ Switchboard] Home
Size
auto
Icon
optional icon
Label
ON
Tooltip
optional tooltip
Color
optional text/icon color
Background
optional background color
When clicked, send:
Payload
lighton
Topic
msg.
topic
If msg arrives on input, emulate a button click:
Class
Optional CSS class name(s) for widget
Name
Name
Enabled
debug
all nodes
all
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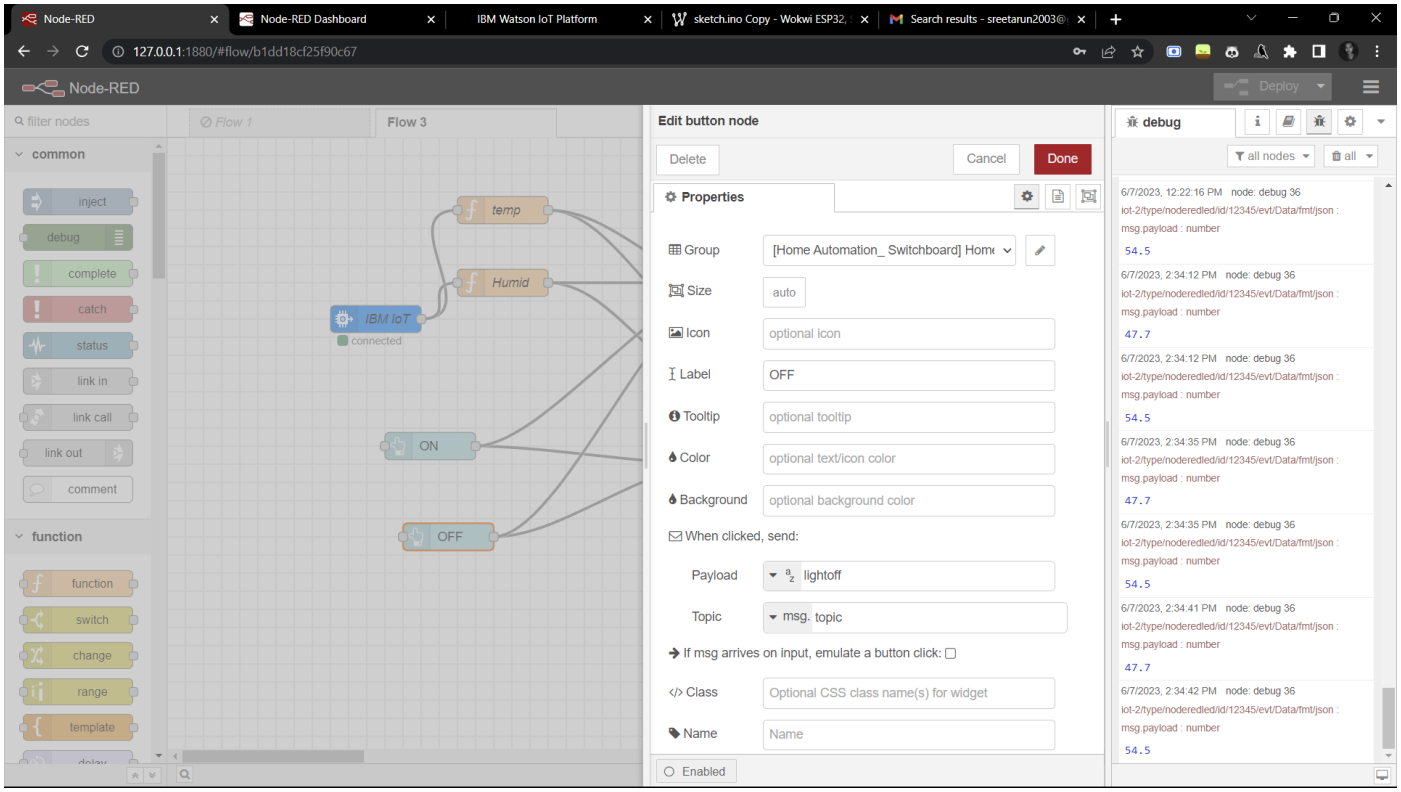
Node-RED
Node-RED Dashboard
IBM Watson IoT Platform
sketch.ino Copy - Wokwi ESP32,
Search results - sreetarun2003@
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Deploy
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Humid
IBM IoT
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ON
OFF
Edit button node
Delete
Cancel
Done
Properties
Group
[Home Automation_ Switchboard] Home
Size
auto
Icon
optional icon
Label
OFF
Tooltip
optional tooltip
Color
optional text/icon color
Background
optional background color
When clicked, send:
Payload
lightoff
Topic
msg.
topic
If msg arrives on input, emulate a button click:
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Optional CSS class name(s) for widget
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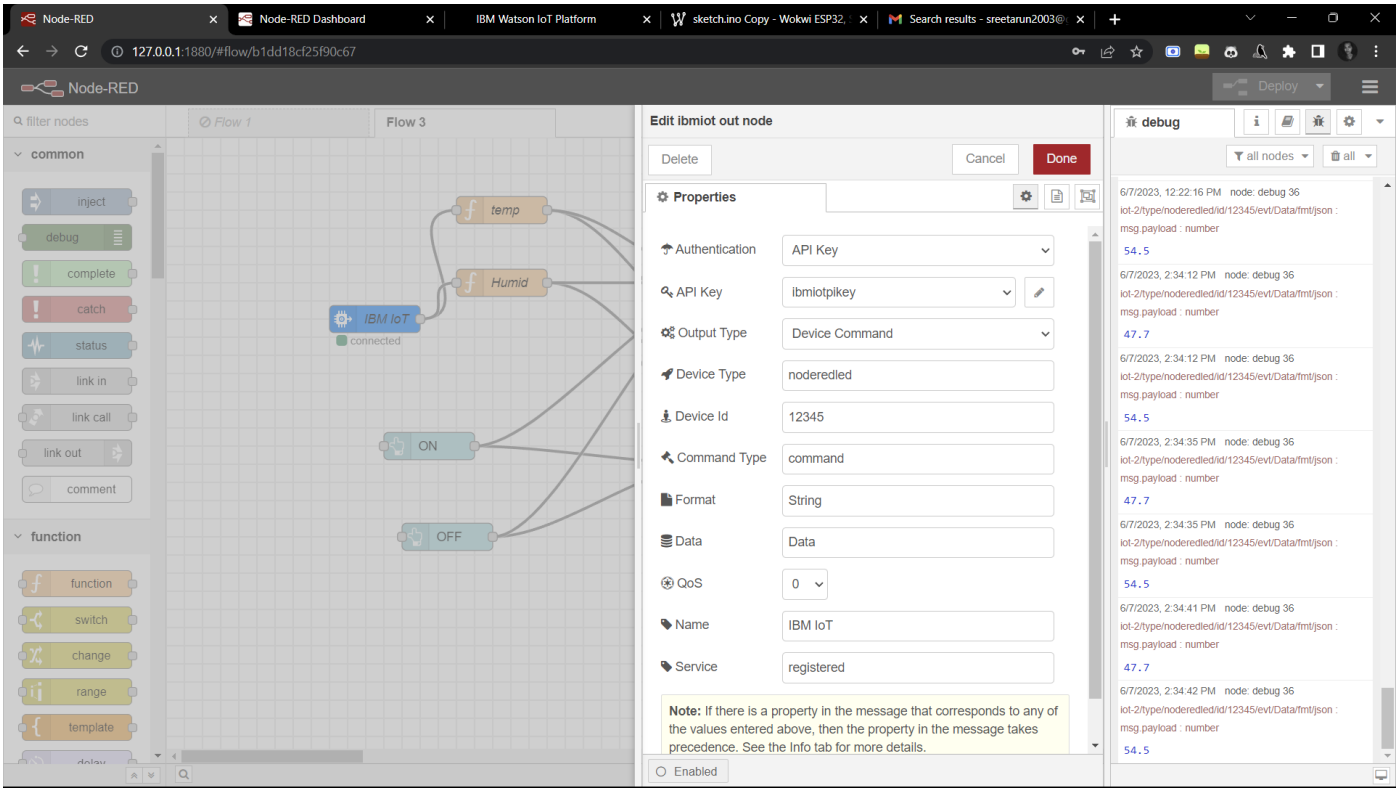
Node-RED
Node-RED Dashboard
IBM Watson IoT Platform
sketch.ino Copy - Wokwi ESP32,
Search results - sreetarun2003@
127.0.0.1:1880/#flow/b1dd18cf25f90c67
Deploy
filter nodes
Flow 1
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link in
link call
link out
comment
function
function
switch
change
range
template
temp
Humid
IBM IoT
connected
ON
OFF
Edit ibmiot out node
Delete
Cancel
Done
Properties
Authentication
API Key
API Key
ibmiotpikey
Output Type
Device Command
Device Type
noderedled
Device Id
12345
Command Type
command
Format
String
Data
Data
QoS
0
Name
IBM IoT
Service
registered
Note: If there is a property in the message that corresponds to any of the values entered above, then the property in the message takes precedence. See the Info tab for more details.
Enabled
debug
all nodes
all
6/7/2023, 12:22:16 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
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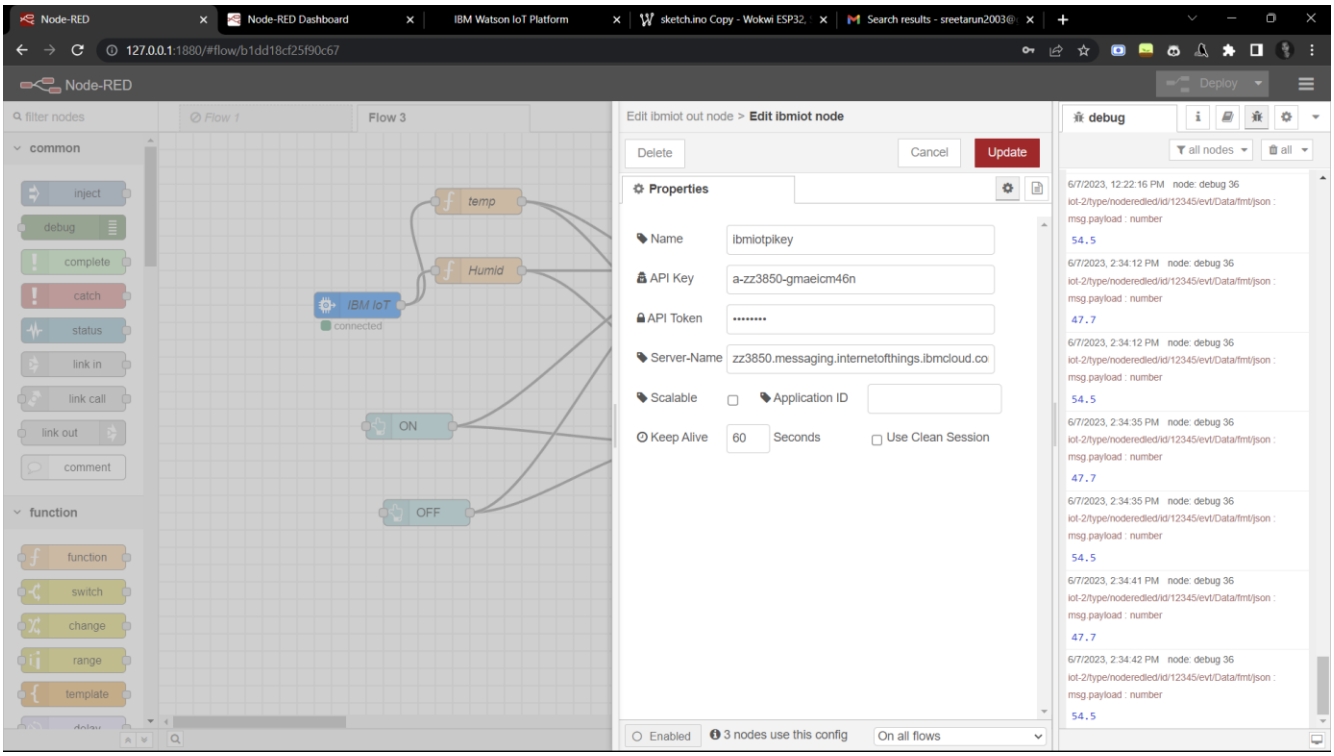
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function
function
switch
change
range
template
temp
Humid
IBM IoT
connected
ON
OFF
Edit ibmiot out node > Edit ibmiot node
Delete
Cancel
Update
Properties
Name
ibmiotpikey
API Key
a-zz3850-gmaeicm46n
API Token
Server-Name
zz3850.messaging.internetofthings.ibmcloud.co
Scalable
Application ID
Keep Alive
60
Seconds
Use Clean Session
Enabled
3 nodes use this config
On all flows
debug
all nodes
all
6/7/2023, 12:22:16 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
54.5
6/7/2023, 2:34:12 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
47.7
6/7/2023, 2:34:12 PM node: debug 36
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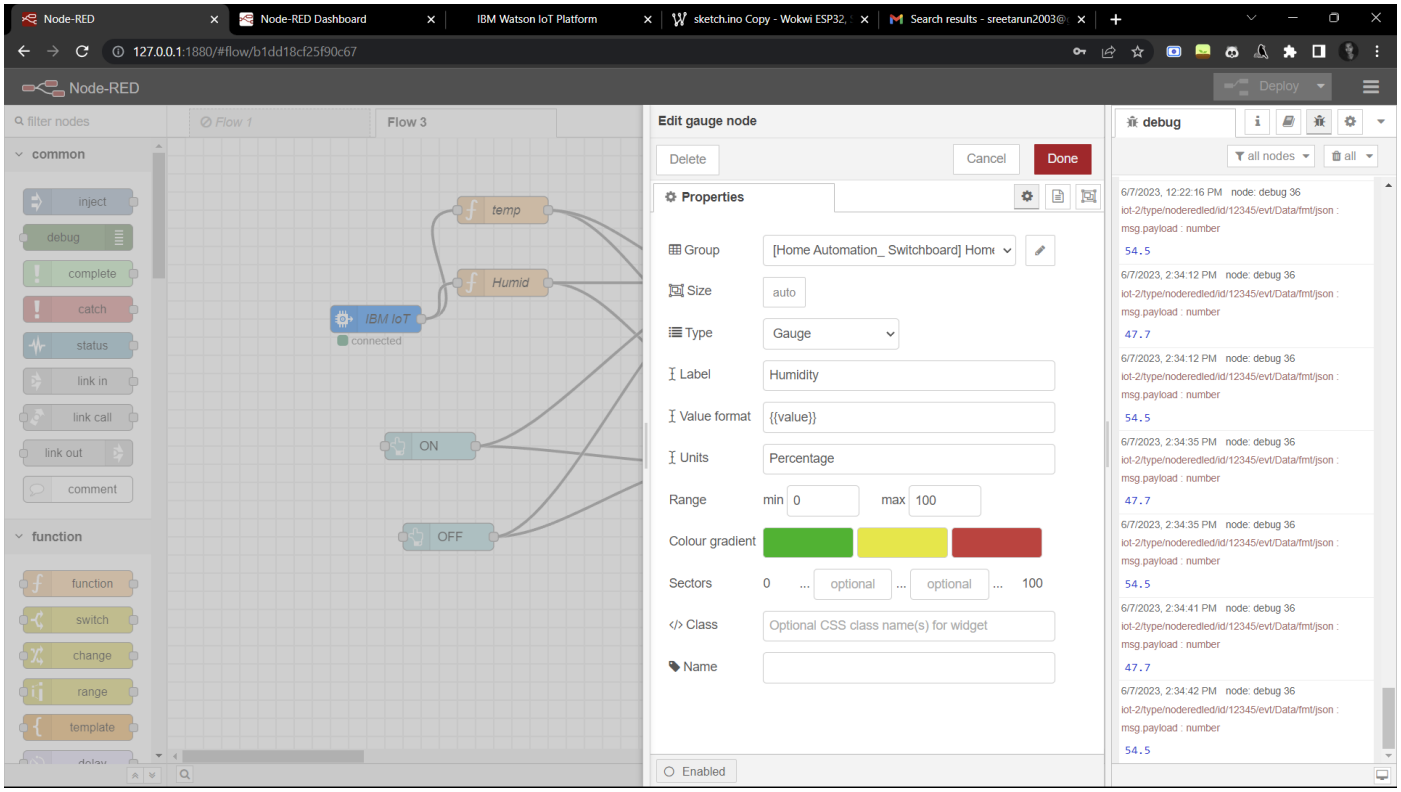
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
47.7
6/7/2023, 2:34:42 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
54.5


Node-RED
Node-RED Dashboard
IBM Watson IoT Platform
sketch.ino Copy - Wokwi ESP32,
Search results - sreetarun2003
127.0.0.1:1880/#flow/b1dd18cf25f90c67
Deploy
filter nodes
Flow 1
Flow 3
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
change
range
template
temp
Humid
IBM IoT
connected
ON
OFF
Edit gauge node
Delete
Cancel
Done
Properties
Group
[Home Automation_ Switchboard] Home
Size
auto
Type
Gauge
Label
Humidity
Value format
{{value}}
Units
Percentage
Range
min 0
max 100
Colour gradient
Sectors
0 ... optional ... optional ... 100
Class
Optional CSS class name(s) for widget
Name
Enabled
debug
all nodes
all
6/7/2023, 12:22:16 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
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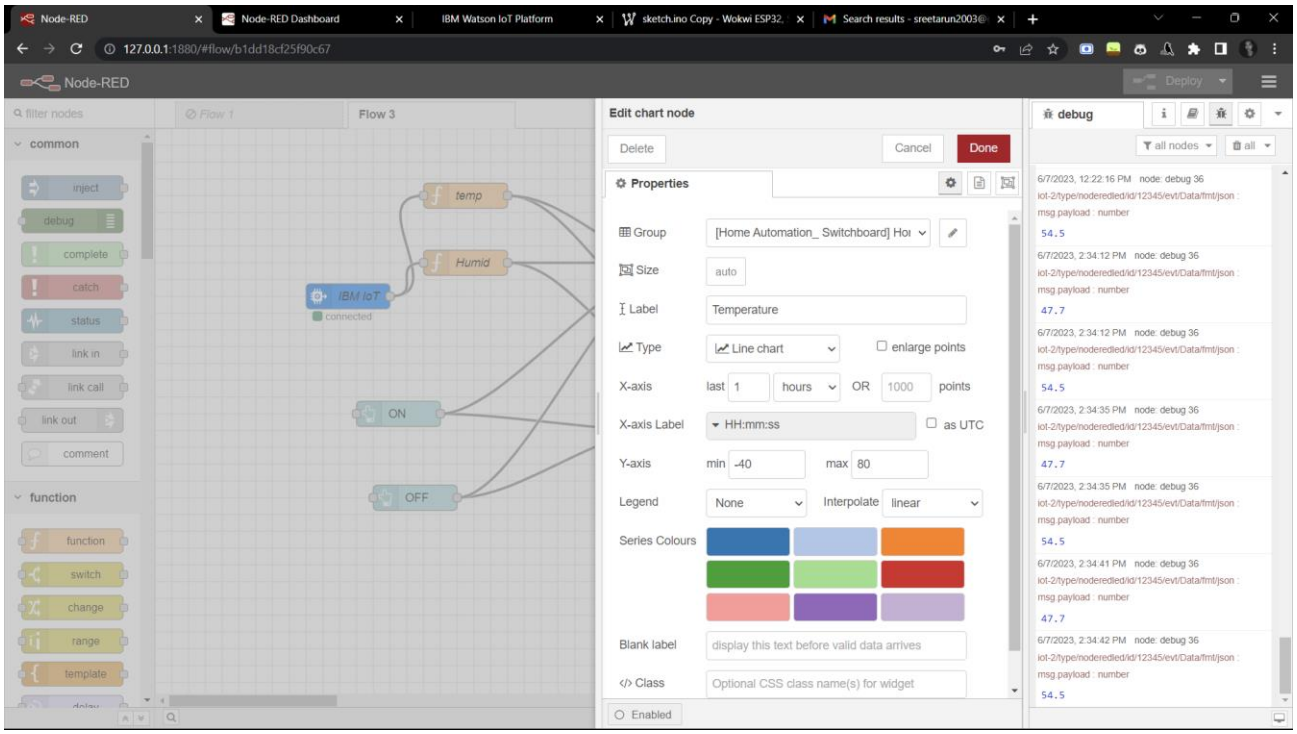
54.5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link call
link out
comment
function
function
switch
change
range
template
temp
Humid
IBM IoT
connected
ON
OFF
Edit chart node
Delete
Cancel
Done
Properties
Group
[Home Automation_ Switchboard] Hor
Size
auto
Label
Temperature
Type
Line chart
enlarge points
X-axis
last 1 hours OR 1000 points
X-axis Label
HH:mm:ss
as UTC
Y-axis
min -40
max 80
Legend
None
Interpolate
linear
Series Colours
Blank label
display this text before valid data arrives
Class
Optional CSS class name(s) for widget
Enabled
debug
all nodes
all
6/7/2023, 12:22:16 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
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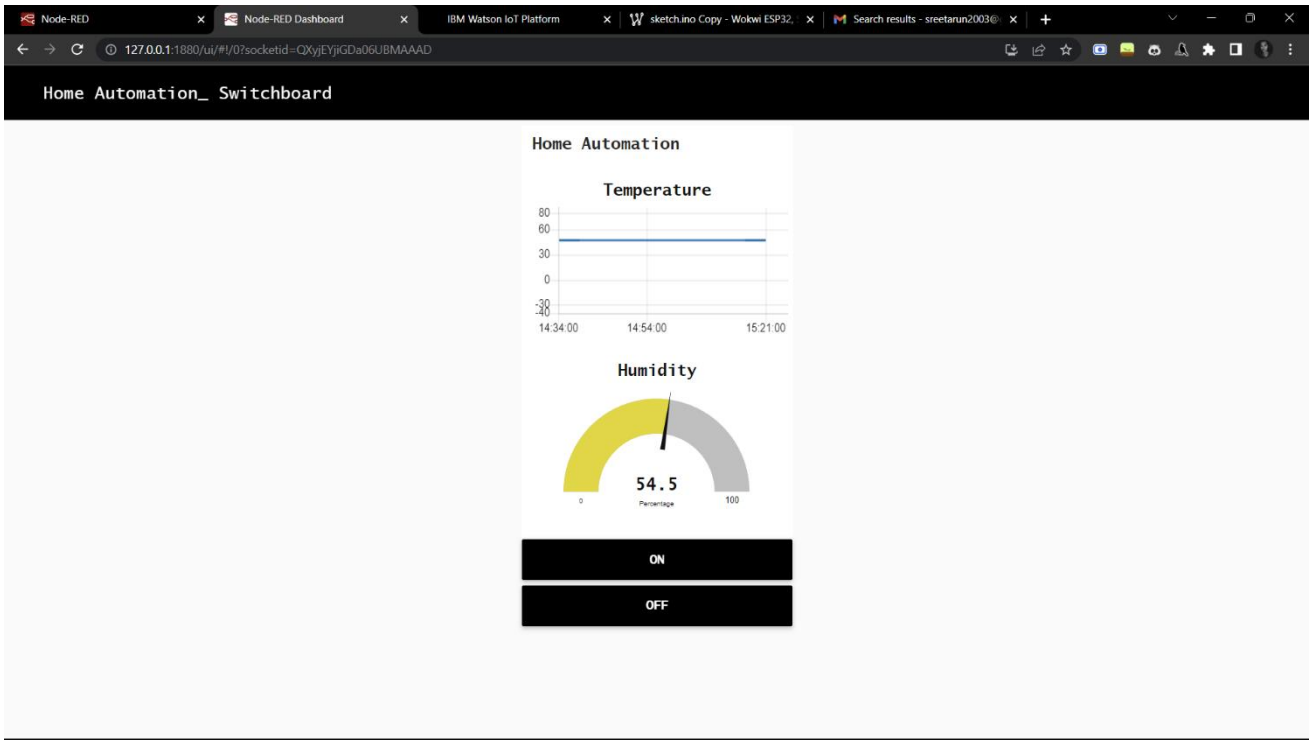
47.7
6/7/2023, 2:34:42 PM node: debug 36
iot-2/type/noderedled/id/12345/evt/Data/fmt/json : msg.payload : number
54.5

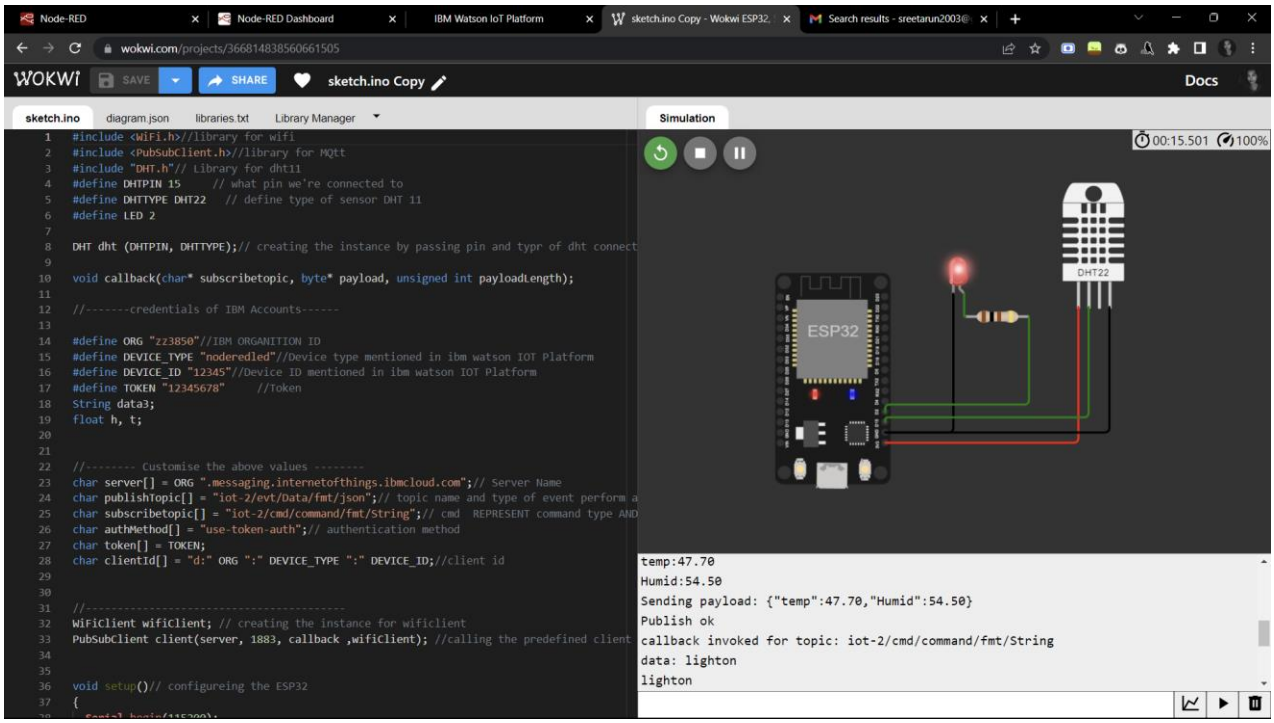
Outputs:

LIGHT ON

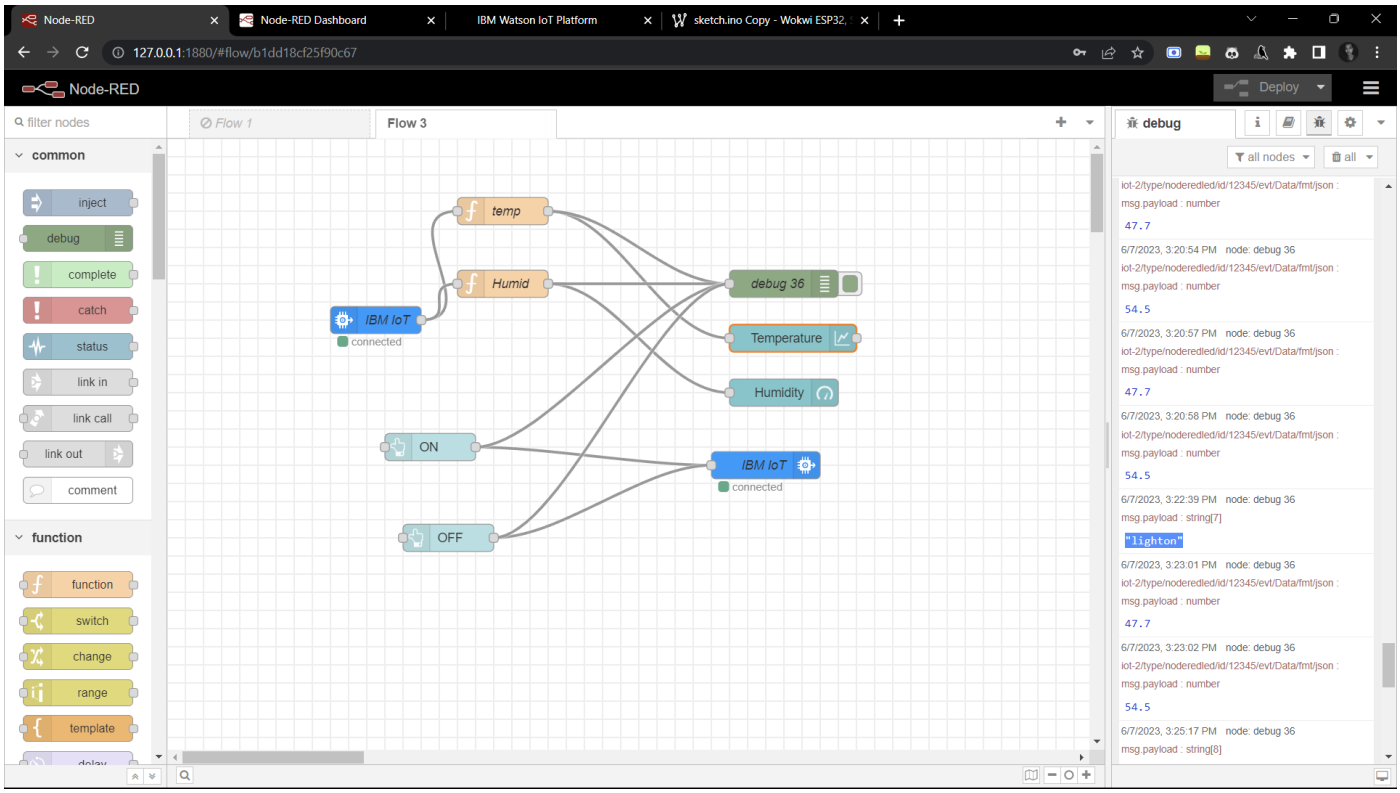
Node Red Dashboard:



WOKWI:

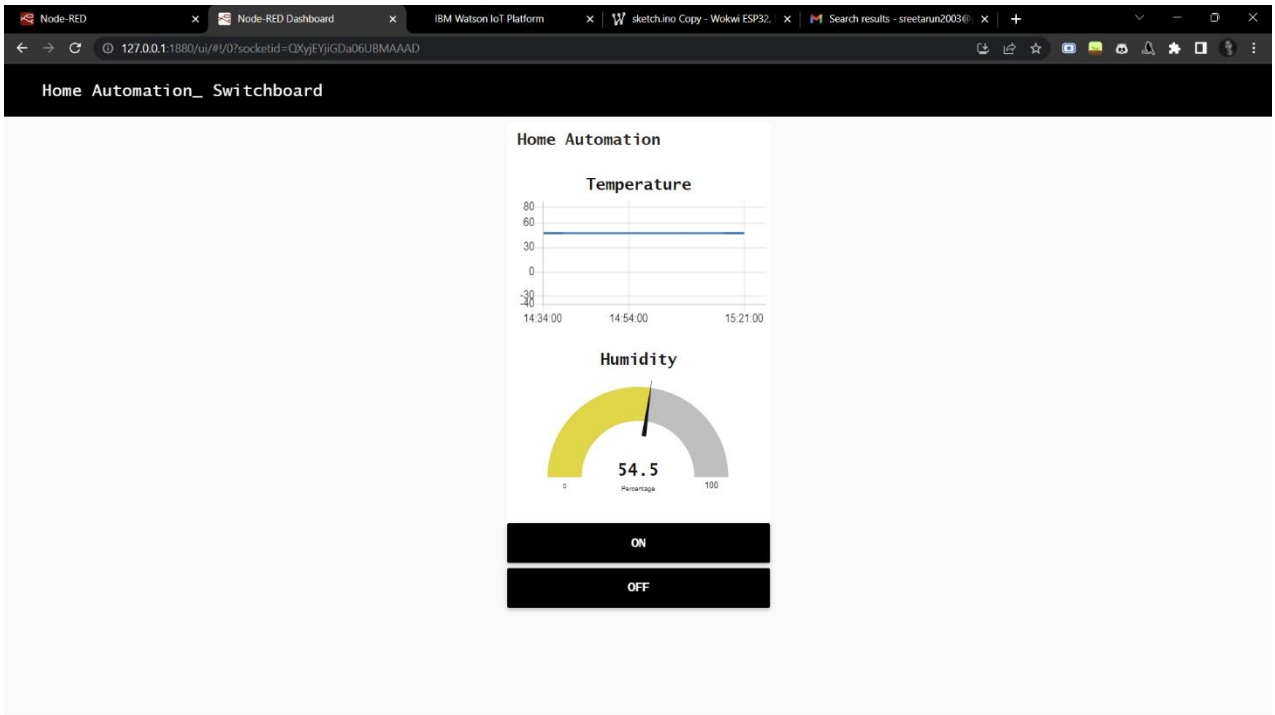


Node Red Debug:

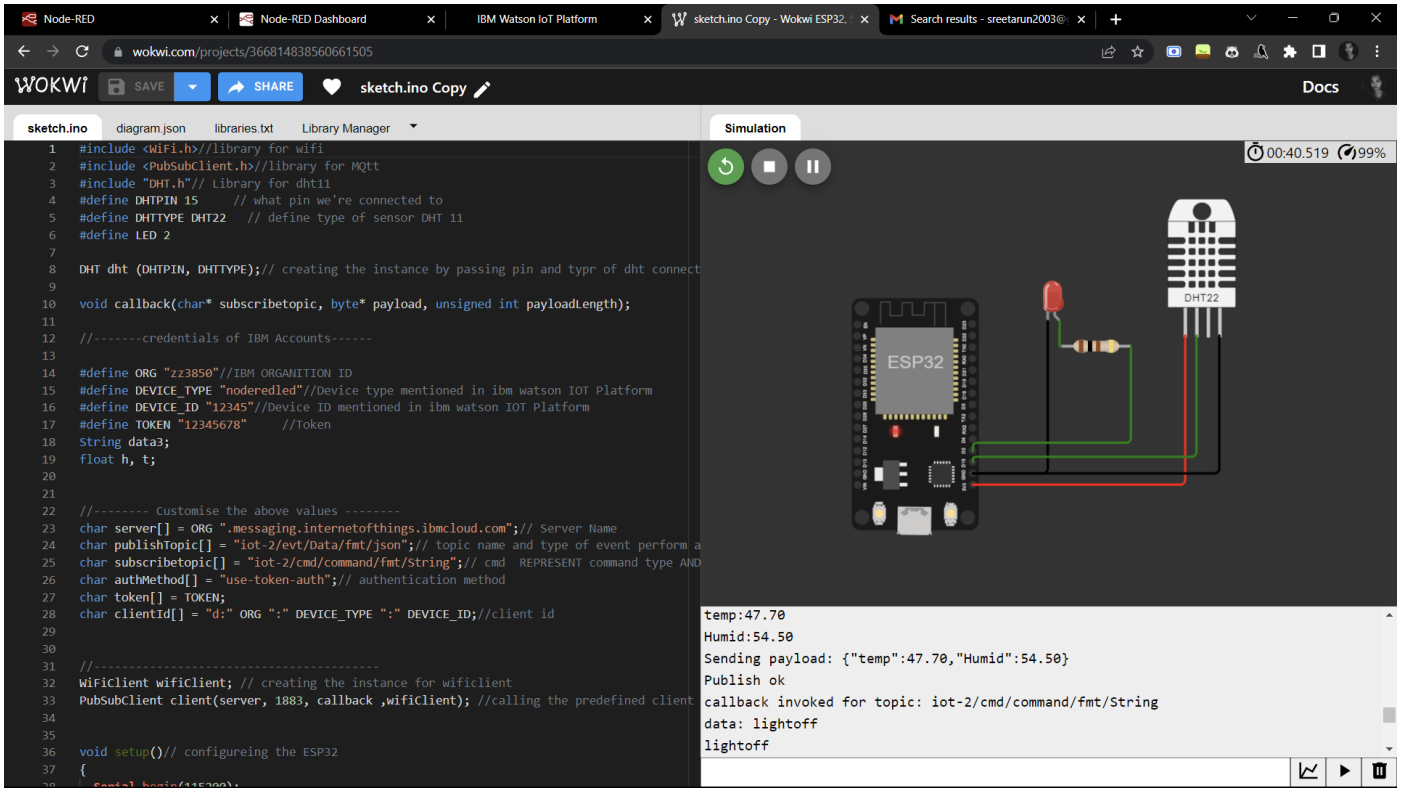


LIGHT OFF

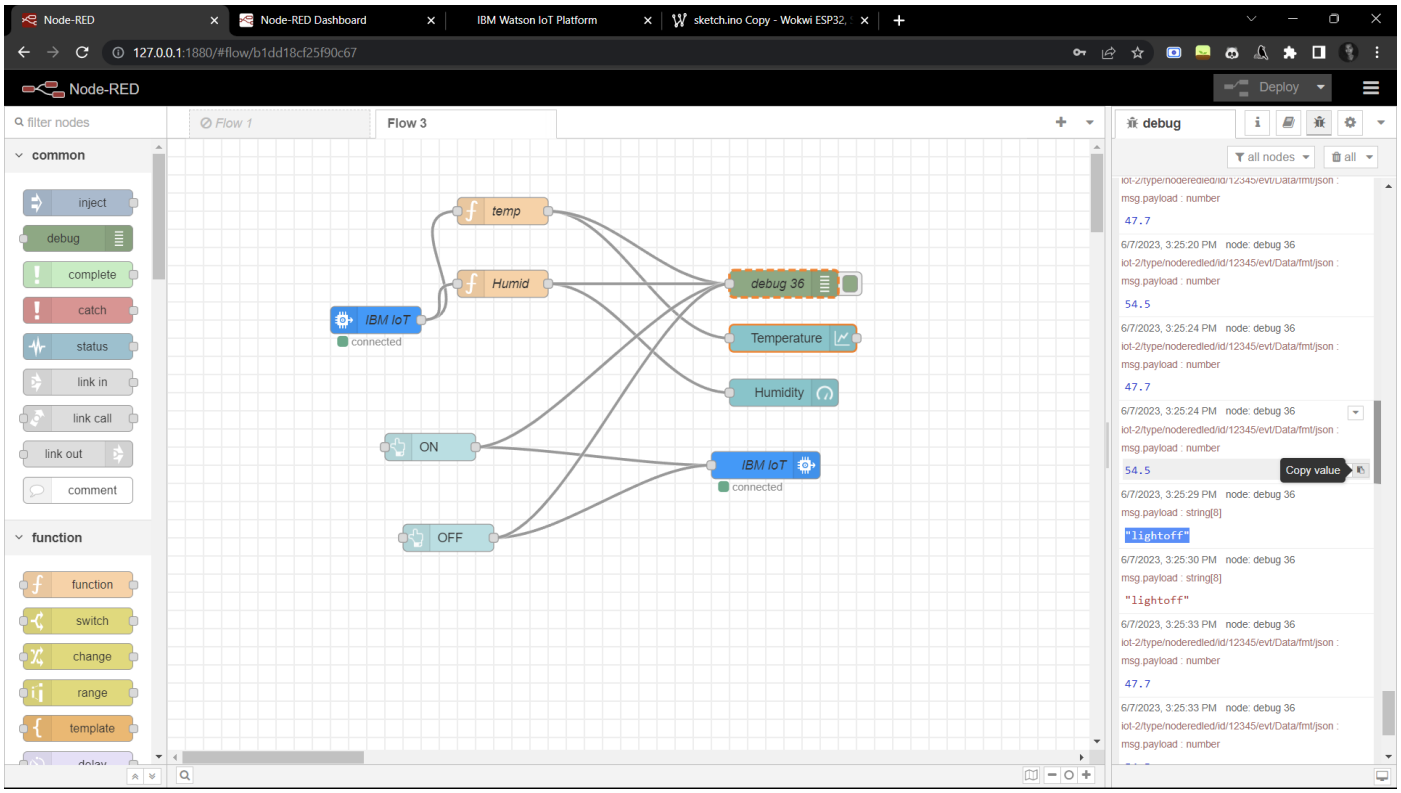
Node Red Dashboard:



WOKWI:

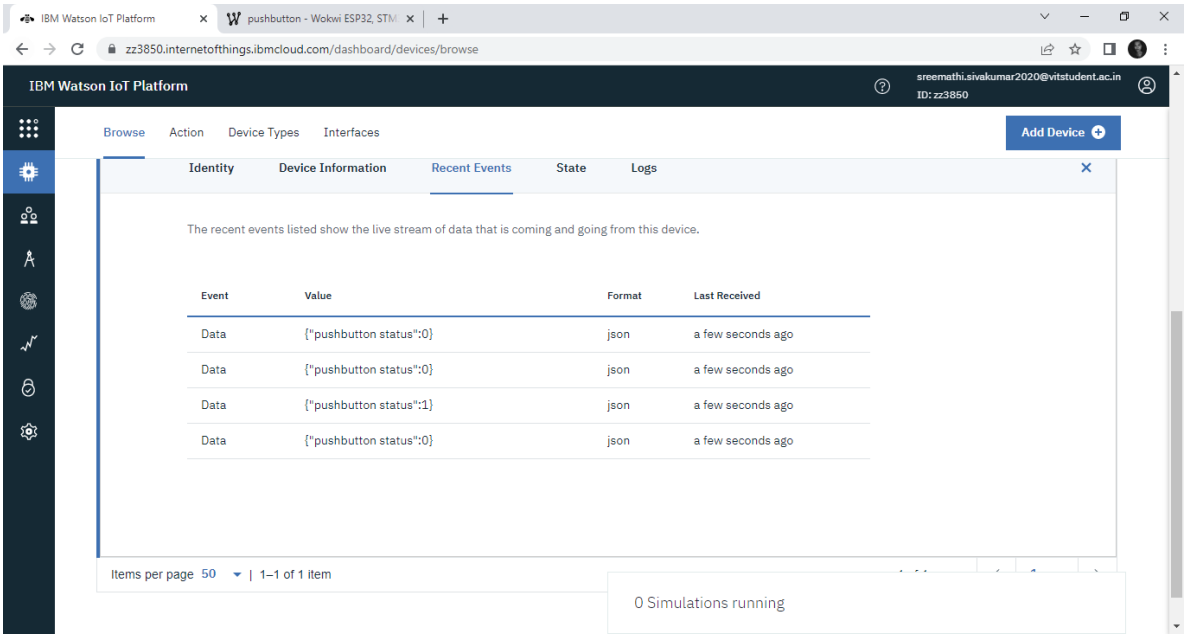


Node Red Debug:

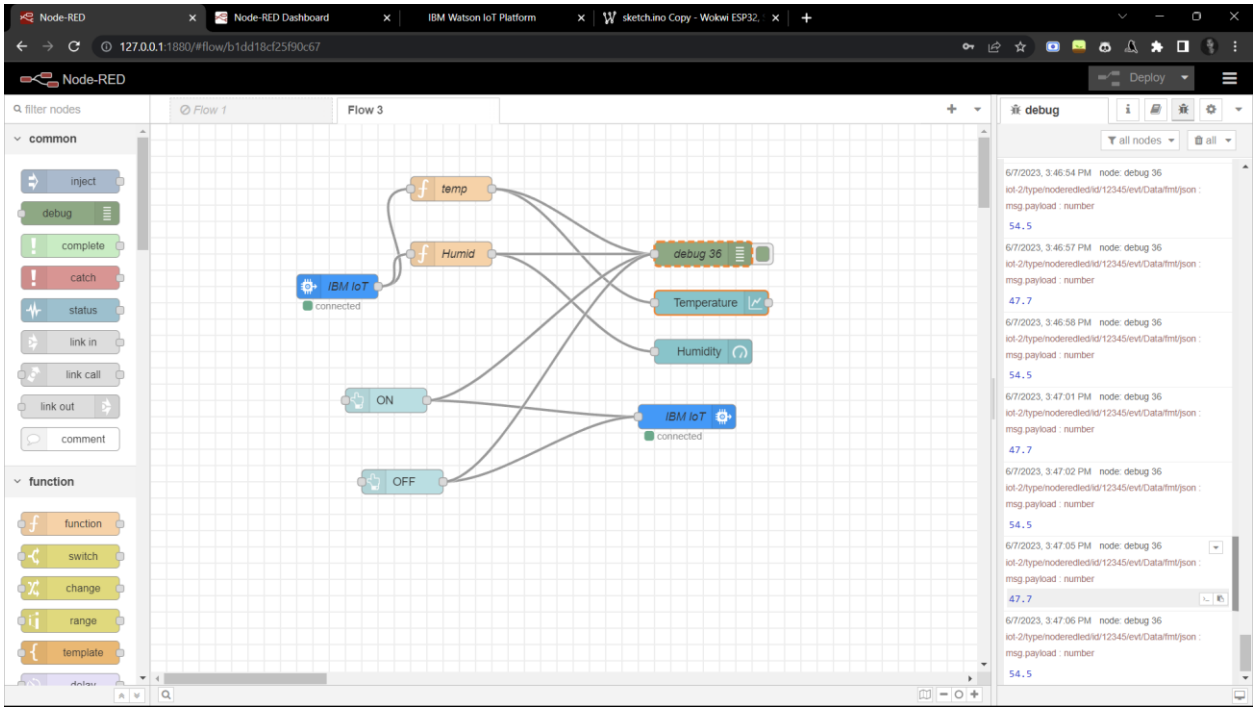


Temperature and Humidity Monitoring

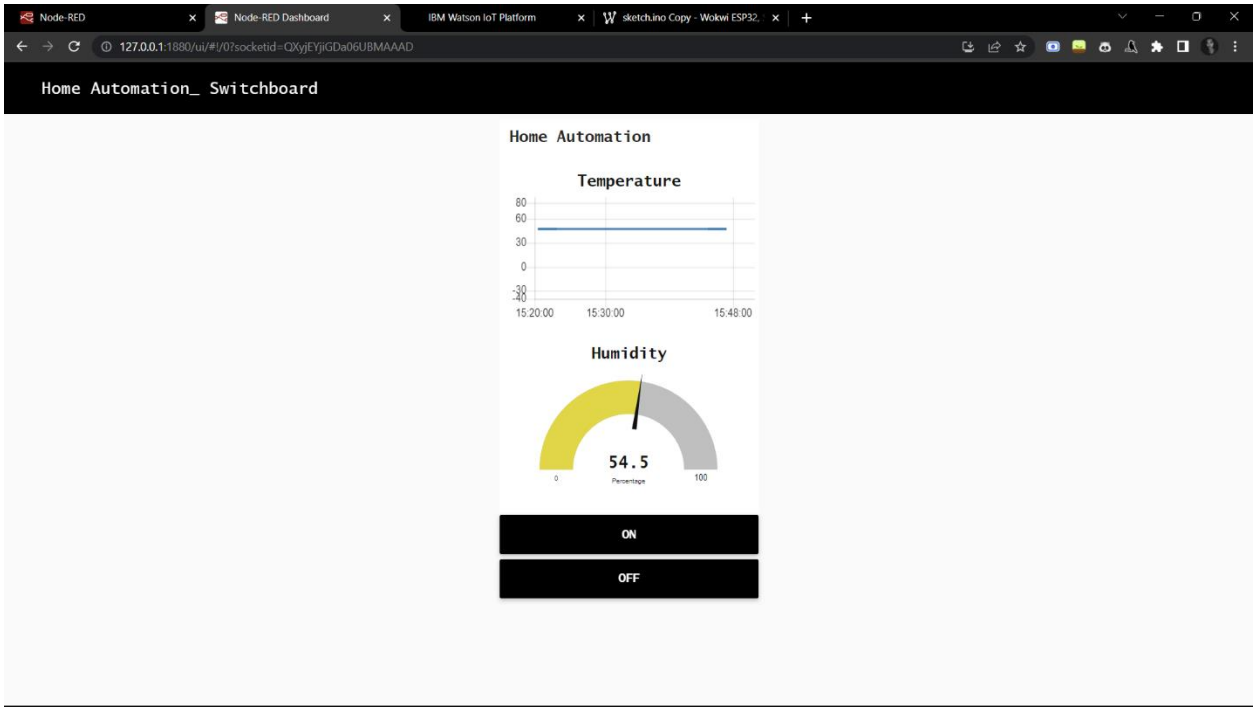
IBM Watson IOT:



Node Red Debug:



Node Red Dashboard:



Result:

Thus, the temperature and humidity values from WOKWI has been uploaded to IBM Watson Iot using wifi module of ESP32 successfully and is visualized in the Node Red Dashboard. The LED of the circuit is switched ON and OFF using the buttons in the dashboard and IBMiot out Node and is successfully verified.