

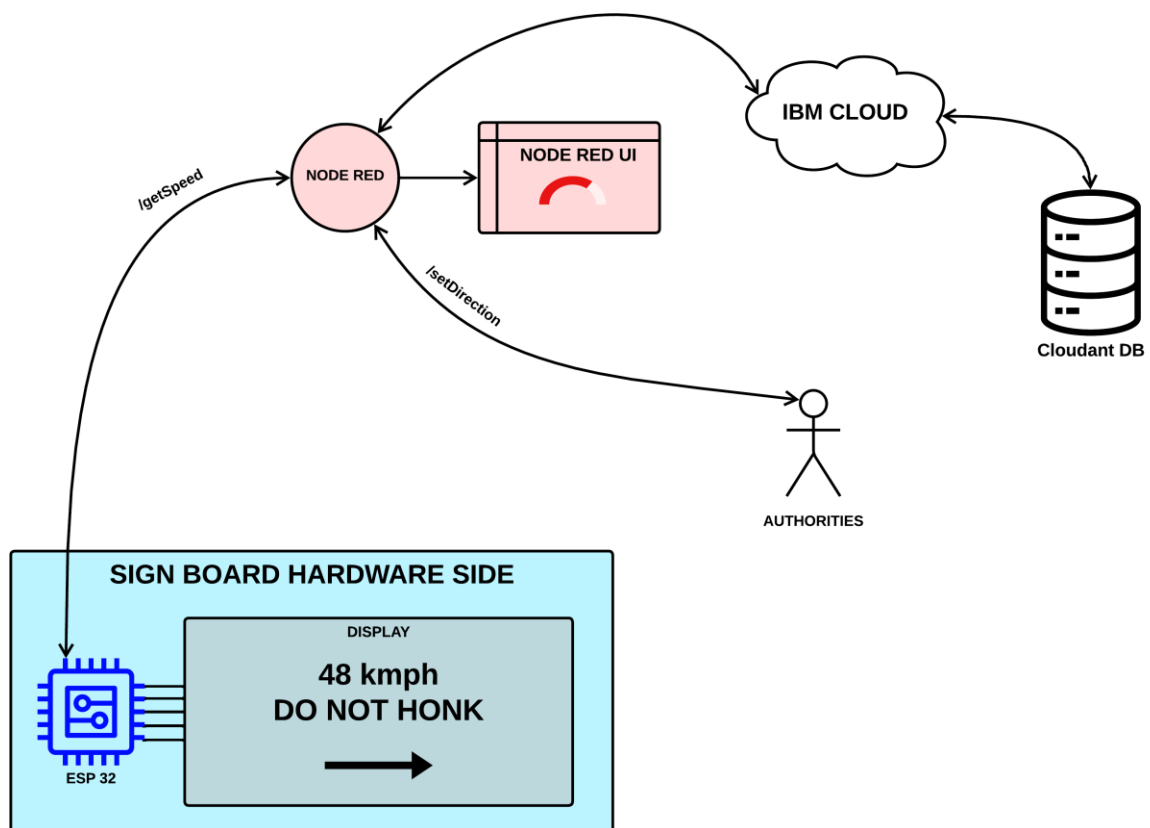
Signs with Smart Connectivity for Better Road Safety

Team ID - PNT2022TMID54258

Sprint Goals :

1. Hardware & Cloud integration

Process Flow :

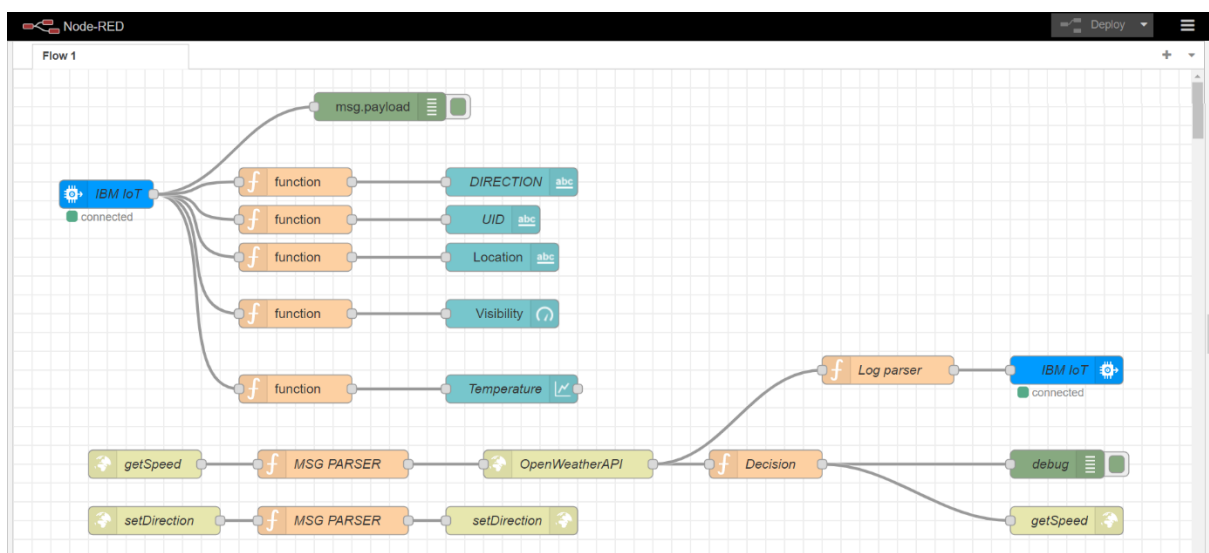


Code Flow :



Node RED :

Node RED flow :

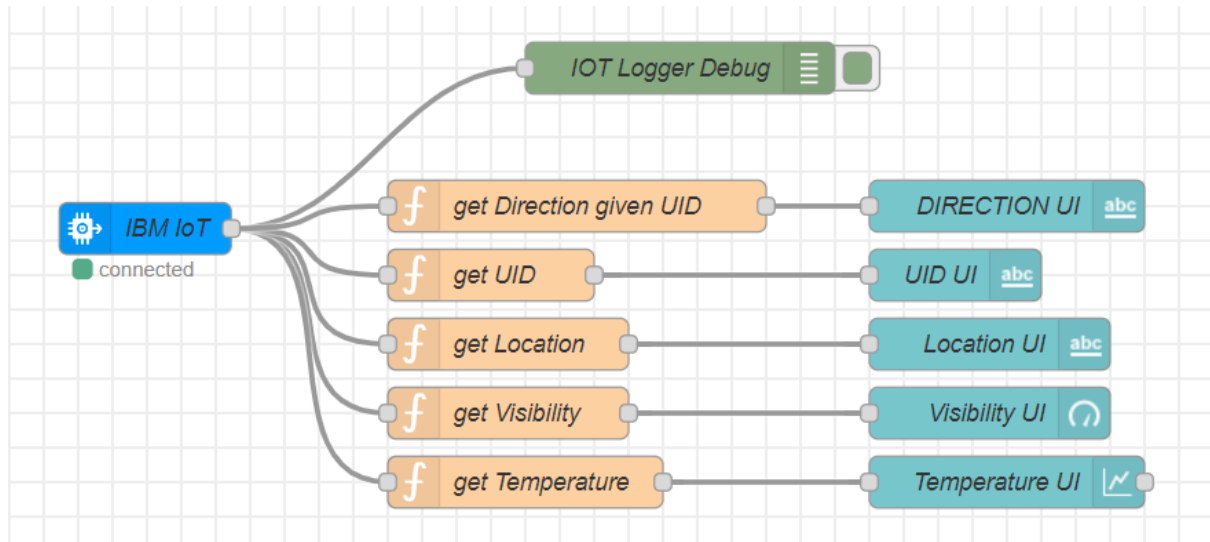


There are 3 flows in the above Node RED flow. They are

1. Node RED UI flow

2. /getSpeed API flow
3. /setDirection API flow

1. Node RED UI flow :



1. "IBM IOT" node connects the backend to Node RED UI
2. The function nodes such as "get Direction given UID", "get UID", "get Location", "get Visibility" & "get Temperature" extract the respective data out and provides them to the UI nodes "Direction UI", "UID UI", "Location UI", "Visibility UI" & "Temperature UI".

```

// get Direction given UID
msg.payload = global.get(String(msg.payload.uid));
return msg;

// get UID
msg.payload = msg.payload.uid;
return msg;

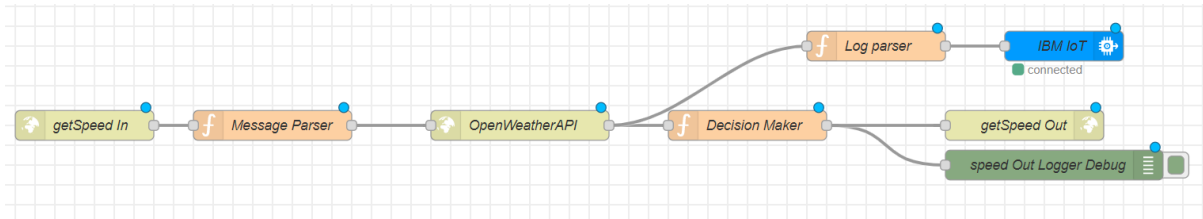
// get Location
msg.payload = msg.payload.location;
return msg;

// get Visibility
msg.payload = msg.payload.visibility;
return msg;

// get Temperature
msg.payload = msg.payload.temperature;
return msg;
  
```

3. "IOT Logger Debug" node logs the data at debugger.

2. /getSpeed API flow :



1. **"getSpeed In"** node is an http end point. It accepts parameters like microcontroller UID, location, school & hospital zones info.
2. **"Message Parser"** node parses the data and passes on only required information to the next node

```
global.set("data",msg.payload);
```

```
msg.payload.q = msg.payload.location;
msg.payload.appid = "02b79757ba32d53f08b146132b7d8eb8";
return msg;
```

3. **"OpenWeatherAPI"** node is a http request node which calls the OpenWeather API and send the data to the next node.
4. **"Log Parser"** node extracts specific parameters from the weather data and and sends it to the next node.

```
weatherObj = JSON.parse(JSON.stringify(msg.payload));
localityObj = global.get("data");
```

```
var suggestedSpeedPercentage = 100;
```

```
var preciseObject = {
  temperature : weatherObj.main.temp - 273.15,
  location : localityObj.location,
  visibility : weatherObj.visibility/100,
  uid : localityObj.uid,
  direction : global.get("direction")
};
```

```
msg.payload = preciseObject;
```

```
return msg;
```

5. **"IBM IoT"** node here (IBM IoT OUT) connects the **"IBM IoT"** node (IBM IoT IN) mentioned in the **Node RED UI flow** which enables UI updation and logging.
6. **"Decision Maker"** node processes the weather data and other information from the micro controller to form the string that is to be displayed at the Sign Board

```
weatherObj = JSON.parse(JSON.stringify(msg.payload));
localityObj = global.get("data");
```

```

var suggestedSpeedPercentage = 100;

var preciseObject = {
  temperature : weatherObj.main.temp - 273.15,
  weather : weatherObj.weather.map(x=>x.id).filter(code => code<700),
  visibility : weatherObj.visibility/100
};

if(preciseObject.visibility<=40)
  suggestedSpeedPercentage -=30

switch(String(preciseObject.weather)[-1]) // https://openweathermap.org/weather-conditions refer weather codes meaning here
{
  case "0" : suggestedSpeedPercentage -=10;break;
  case "1" : suggestedSpeedPercentage -=20;break;
  case "2" : suggestedSpeedPercentage -=30;break;
}

msg.payload = preciseObject;

var doNotHonk = 0;
if(localityObj.hospitalZone=="1"||localityObj.schoolZone=="1")
  doNotHonk = 1;

var returnObject = {
  suggestedSpeed : localityObj.usualSpeedLimit*(suggestedSpeedPercentage/100),
  doNotHonk : doNotHonk
}

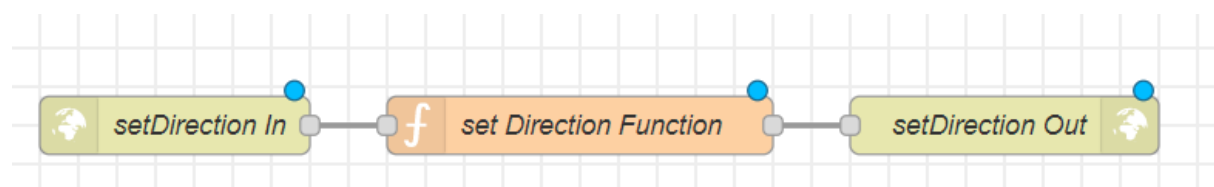
msg.payload = String(returnObject.suggestedSpeed) + " kmph \n\n" +
(returnObject.doNotHonk==1?"Do Not Honk":"" ) + "$" +
global.get(String(localityObj.uid));

return msg;

```

7. **"getSpeed Out"** node returns a http response for the request at node **"getSpeed In"**.
8. **"speed Out Logger Debug"** logs the data for debugging.

3. /setDirection API flow :



1. **"setDirection In"** node is an http end point. It accepts parameters like microcontroller UID & direction.

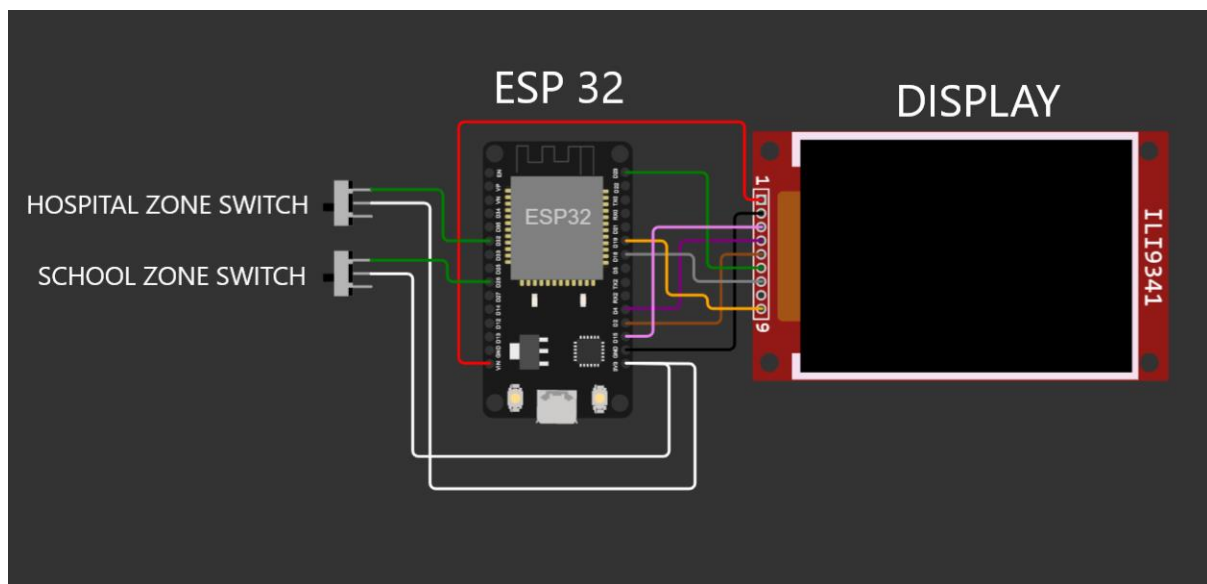
2. **"set Direction Function"** node sets the direction for the given UID.

```
global.set(String(msg.payload.uid),msg.payload.dir);  
return msg;
```

3. **"setDirection Out"** node returns a http response for the request at node **"setDirection In"**.

Wokwi Circuit :

Circuit Diagram :



ESP 32 CODE :

```
#include <WiFi.h>  
#include <HTTPClient.h>  
#include <Adafruit_GFX.h>  
#include <Adafruit_ILI9341.h>  
#include <string.h>  
  
const char* ssid = "Wokwi-GUEST";  
const char* password = "";  
  
#define TFT_DC 2  
#define TFT_CS 15  
Adafruit_ILI9341 tft = Adafruit_ILI9341(TFT_CS, TFT_DC);  
  
String myLocation = "Chennai,IN";  
String usualSpeedLimit = "70"; // kmph  
  
int schoolZone = 32;  
int hospitalZone = 26;
```

```

int uid = 2504; // ID Unique to this Micro Contoller

String getString(char x)
{
    String s(1, x);
    return s;
}

String stringSplitter1(String fullString,char delimiter='$')
{
    String returnString = "";
    for(int i = 0; i<fullString.length();i++) {
        char c = fullString[i];
        if(delimiter==c)
            break;
        returnString+=String(c);
    }
    return(returnString);
}

String stringSplitter2(String fullString,char delimiter='$')
{
    String returnString = "";
    bool flag = false;
    for(int i = 0; i<fullString.length();i++) {
        char c = fullString[i];
        if(flag)
            returnString+=String(c);
        if(delimiter==c)
            flag = true;
    }
    return(returnString);
}

void rightArrow()
{
    int refX = 50;
    int refY = tft.getCursorY() + 40;

    tft.fillRect(refX,refY,100,20,ILI9341_RED);
    tft.fillTriangle(refX+100,refY-
30,refX+100,refY+50,refX+40+100,refY+10,ILI9341_RED);
}

void leftArrow()
{
    int refX = 50;
    int refY = tft.getCursorY() + 40;

    tft.fillRect(refX+40,refY,100,20,ILI9341_RED);
    tft.fillTriangle(refX+40,refY-30,refX+40,refY+50,refX,refY+10,ILI9341_RED);
}

void upArrow()
{
    int refX = 125;
    int refY = tft.getCursorY() + 30;

```

```

    tft.fillTriangle(refX-40,refY+40,refX+40,refY+40,refX,refY,ILI9341_RED);
    tft.fillRect(refX-15,refY+40,30,20,ILI9341_RED);
}

String APICall() {
    HTTPClient http;

    String url = "https://node-red-grseb-2022-11-05-test.eu-
gb.mybluemix.net/getSpeed?";
    url += "location="+myLocation+"&";
    url += "schoolZone="+digitalRead(schoolZone)+(String)"&";
    url += "hospitalZone="+digitalRead(hospitalZone)+(String)"&";
    url += "usualSpeedLimit="+usualSpeedLimit+(String)"&";
    url += "uid="+uid;
    http.begin(url.c_str());
    int httpStatusCode = http.GET();

    if (httpStatusCode>0) {
        String payload = http.getString();
        http.end();
        return(payload);
    }
    else {
        Serial.print("Error code: ");
        Serial.println(httpStatusCode);
    }
    http.end();
}

void myPrint(String contents) {
    tft.fillScreen(ILI9341_BLACK);
    tft.setCursor(0, 20);
    tft.setTextSize(4);
    tft.setTextColor(ILI9341_RED);
    //tft.println(contents);

    tft.println(stringSplitter1(contents));
    String c2 = stringSplitter2(contents);
    if(c2=="s") // represents Straight
    {
        upArrow();
    }
    if(c2=="l") // represents left
    {
        leftArrow();
    }
    if(c2=="r") // represents right
    {
        rightArrow();
    }
}

void setup() {
    WiFi.begin(ssid, password, 6);

    tft.begin();
    tft.setRotation(1);

    tft.setTextColor(ILI9341_WHITE);

```



```

tft.setTextSize(2);
tft.print("Connecting to WiFi");

while (WiFi.status() != WL_CONNECTED) {
  delay(100);
  tft.print(".");
}

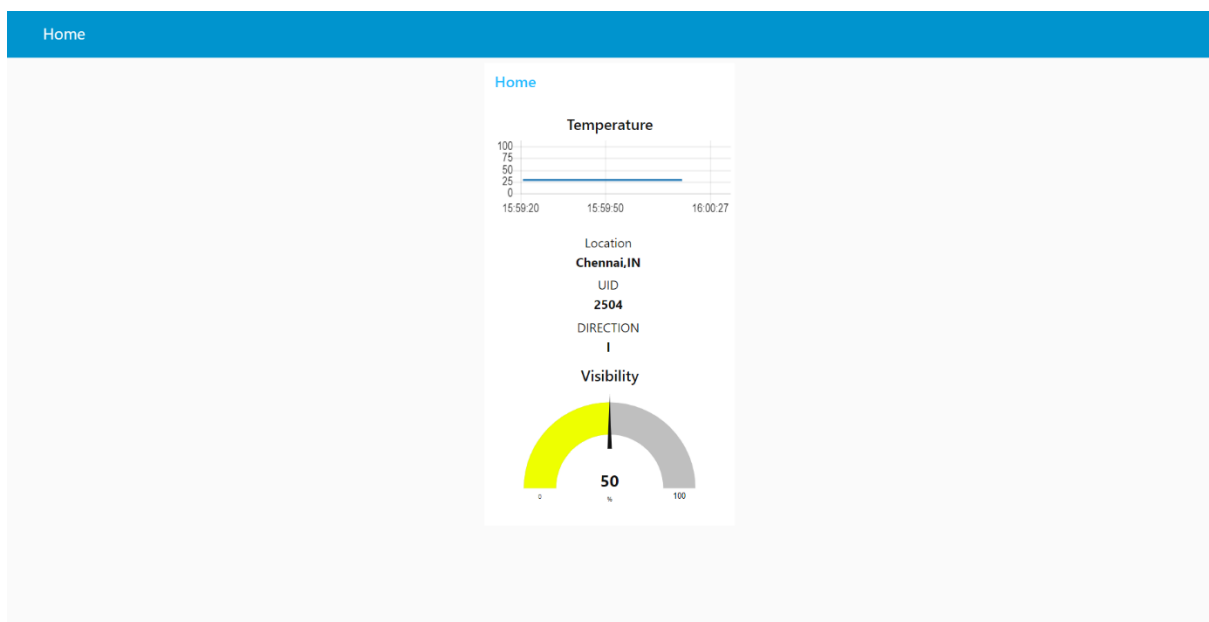
tft.print("\nOK! IP=");
tft.println(WiFi.localIP());
}

void loop() {
  myPrint(APICall());
  delay(100);
}

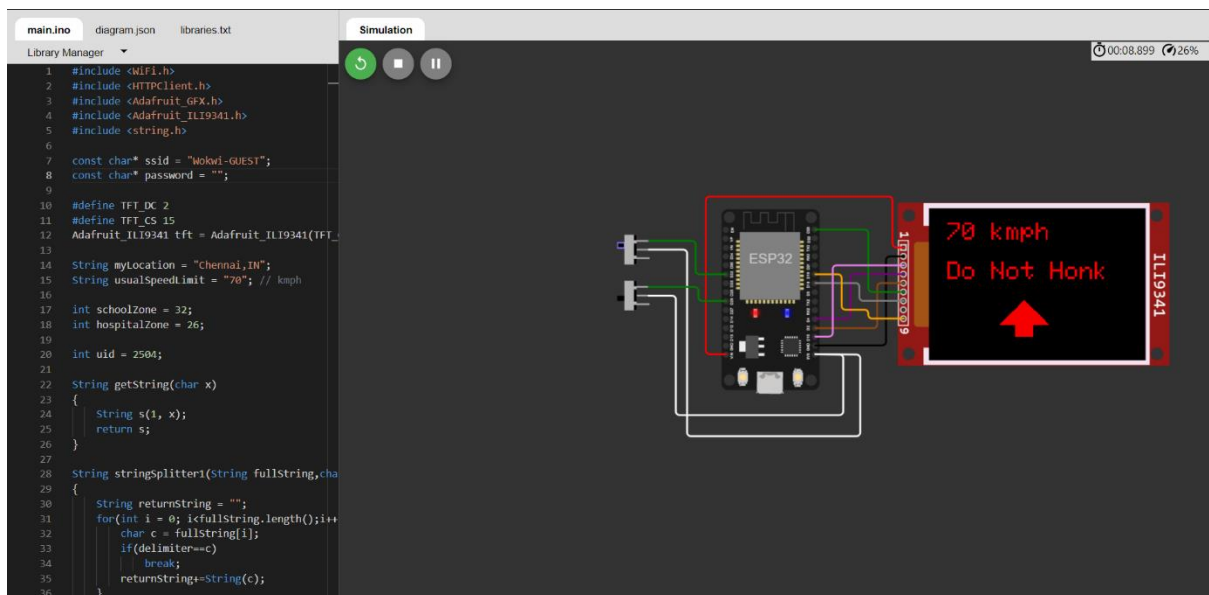
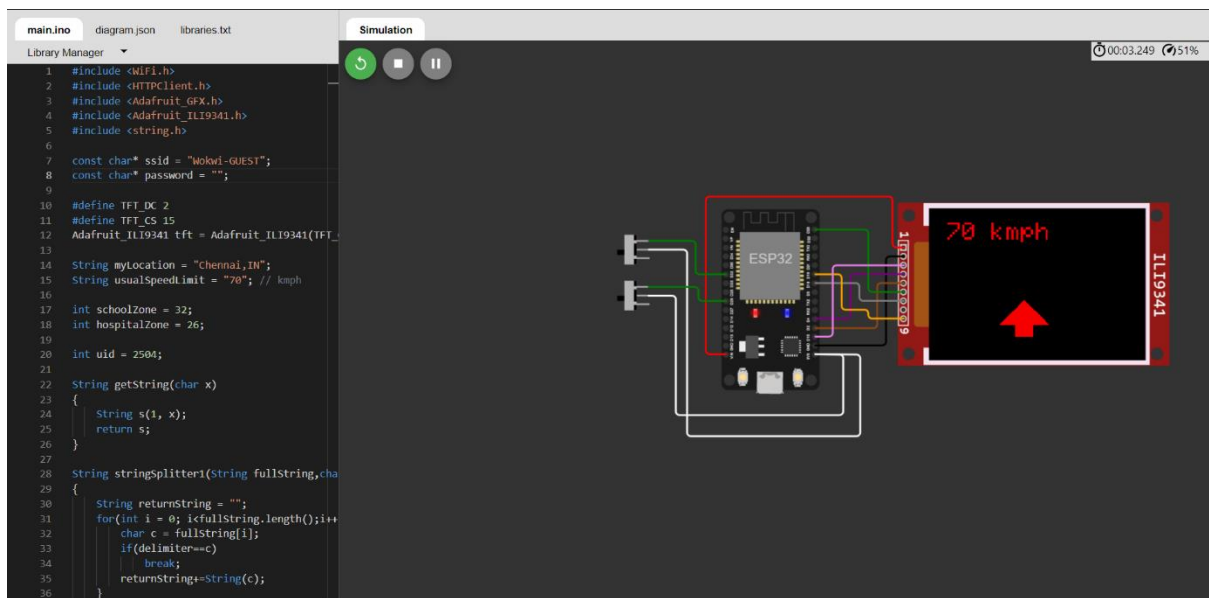
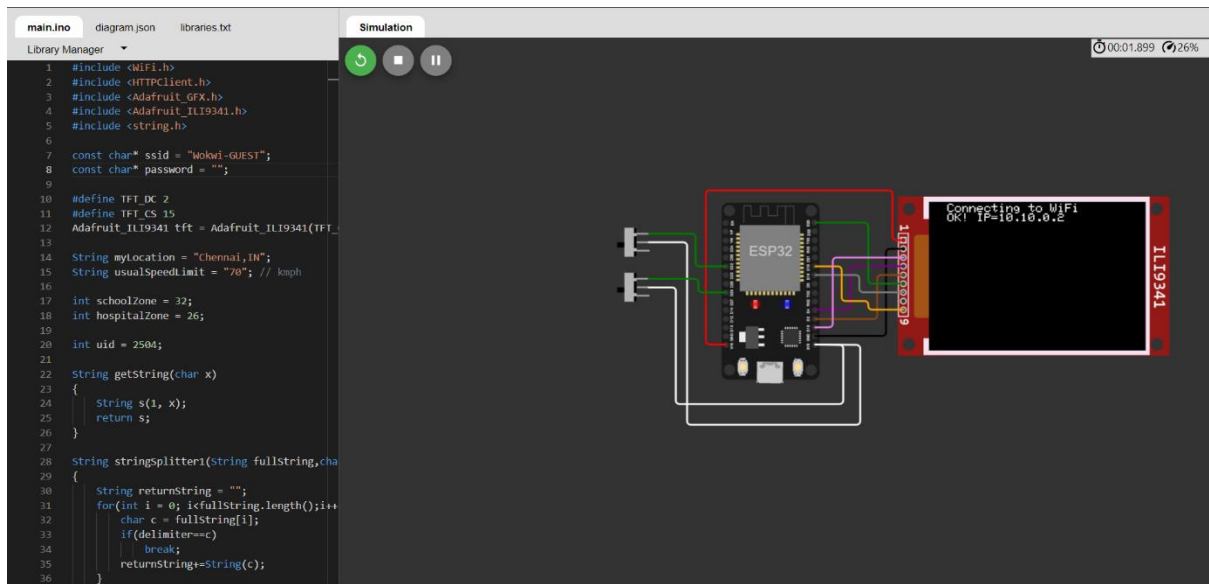
```

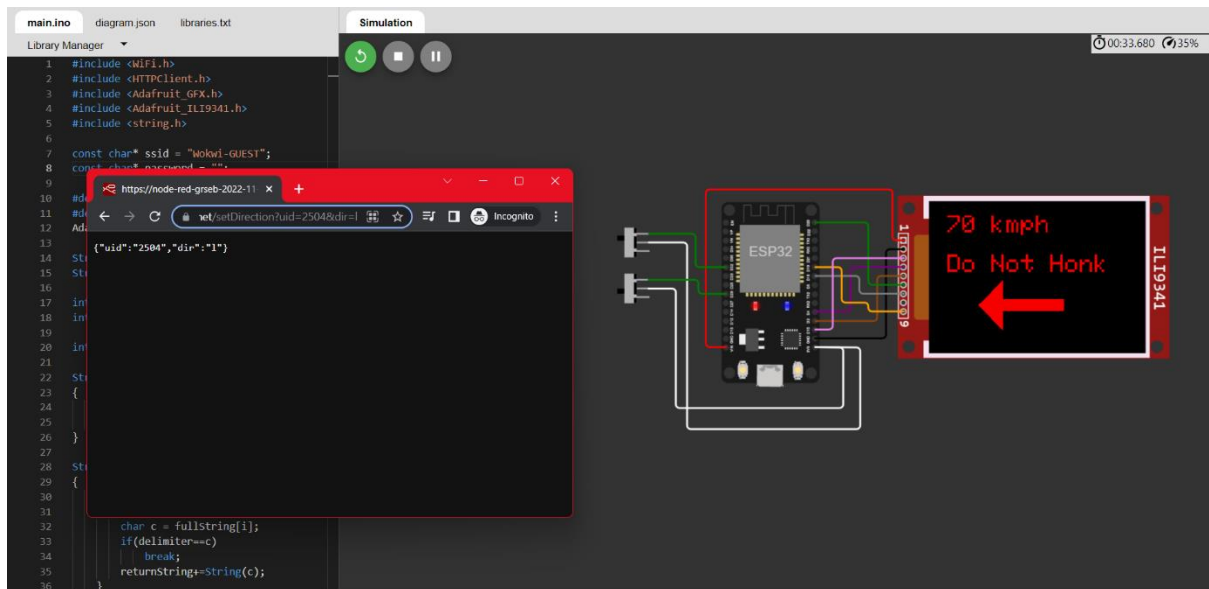
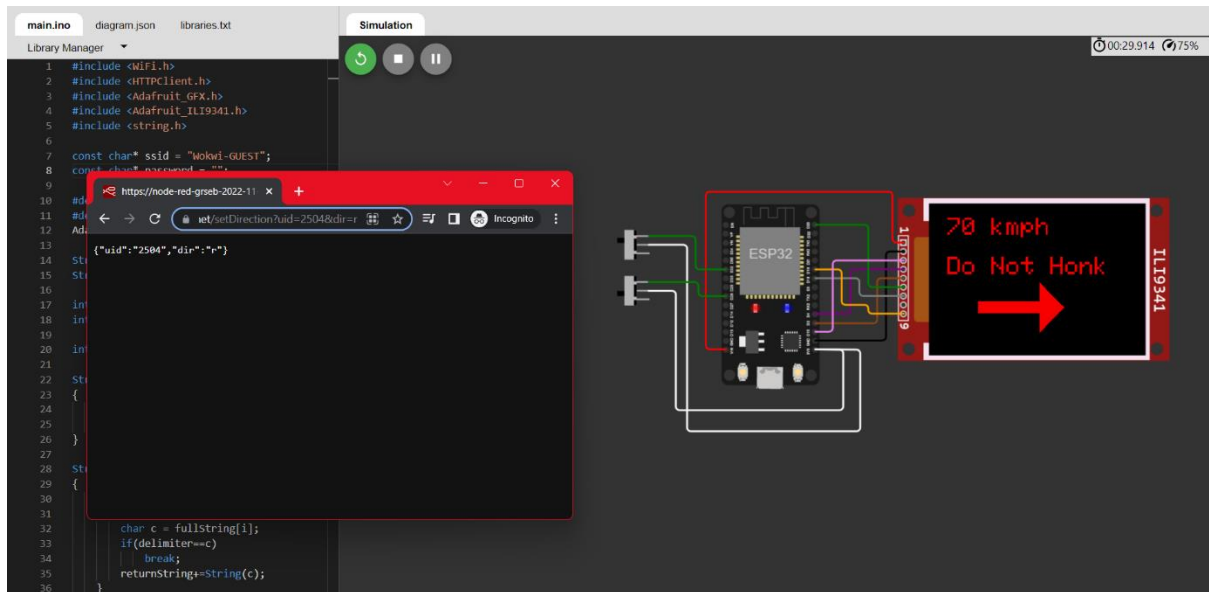
Output :

Node RED Dashboard :



Wokwi Output :





Thank You