

Date	31 October 2022
Team ID	PNT2022TMID10531
Project Name	Signs with smart connectivity for Better road safety

Sprint 04

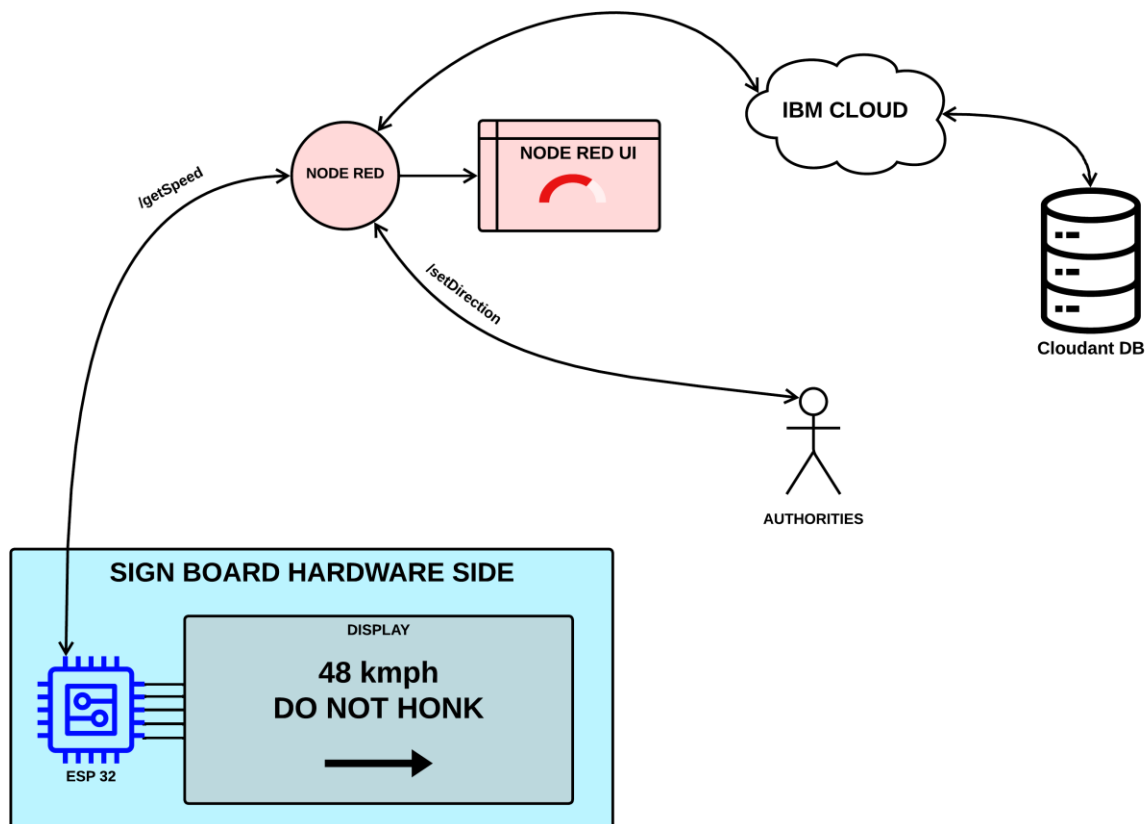
Signs with Smart Connectivity for Better Road Safety

Team ID - PNT2022TMID10531

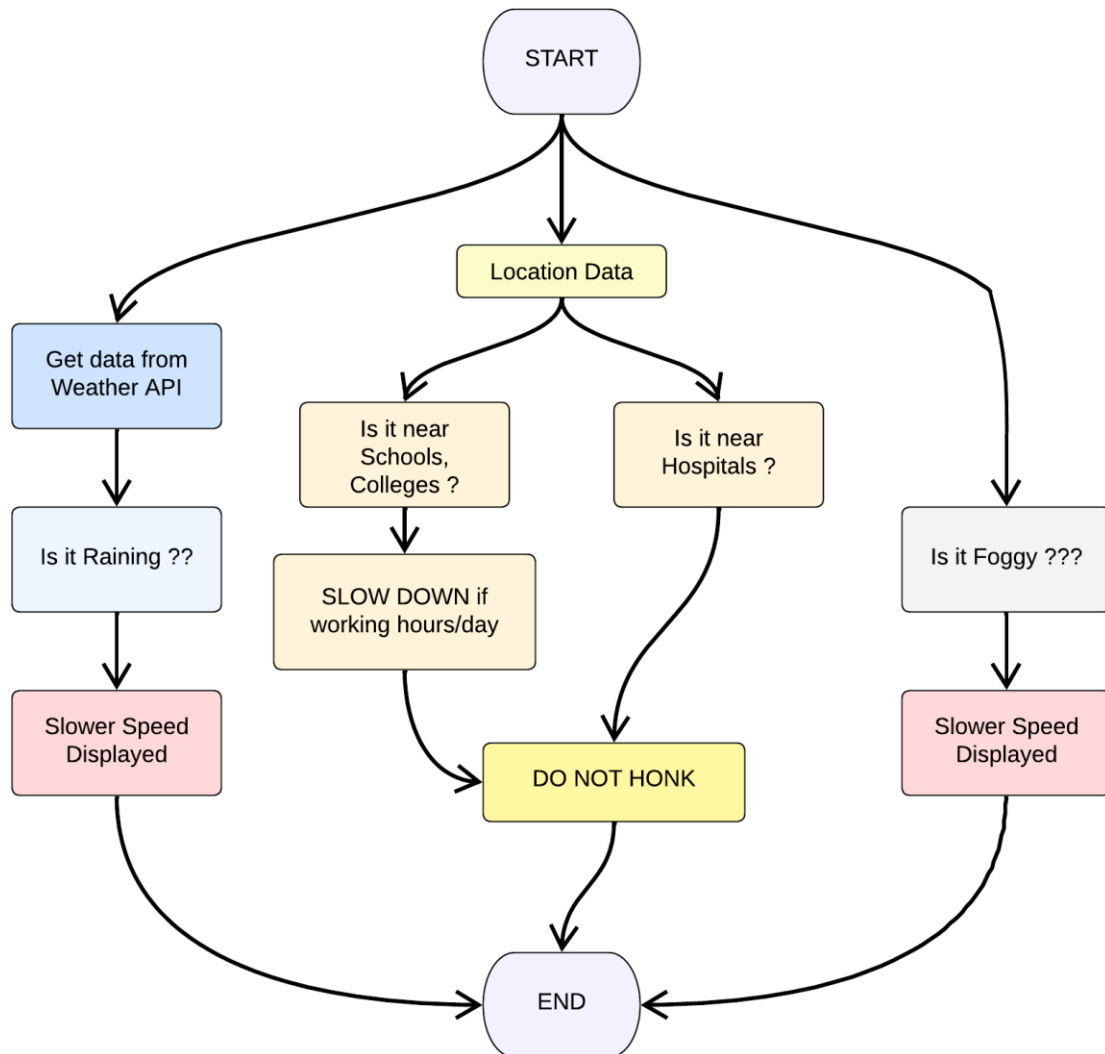
Sprint Goals :

1. Hardware & Cloud integration

Process Flow :

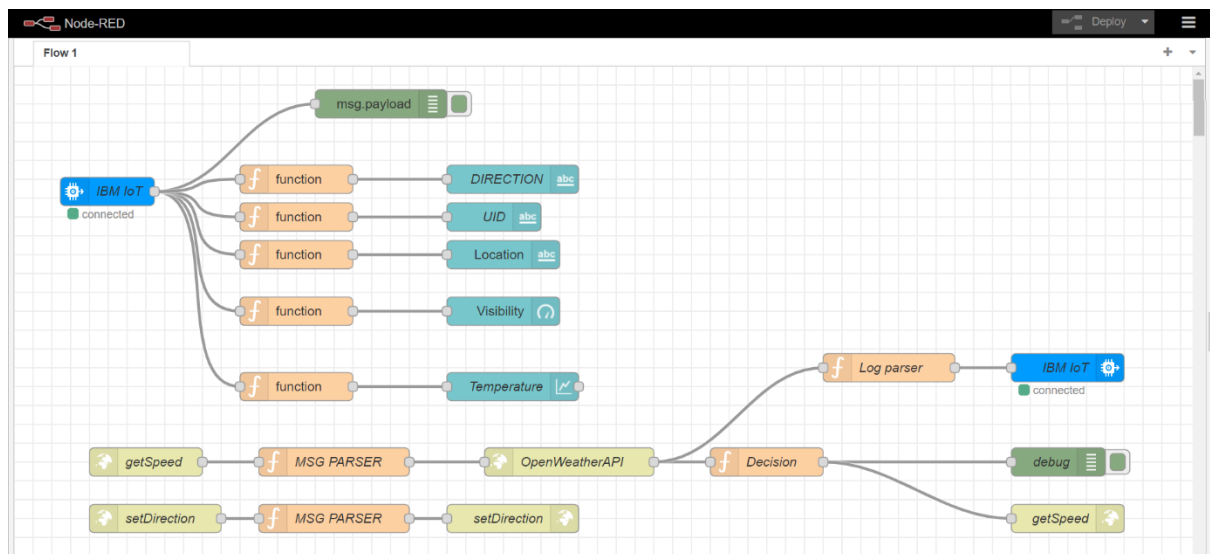


Code Flow :



Node RED :

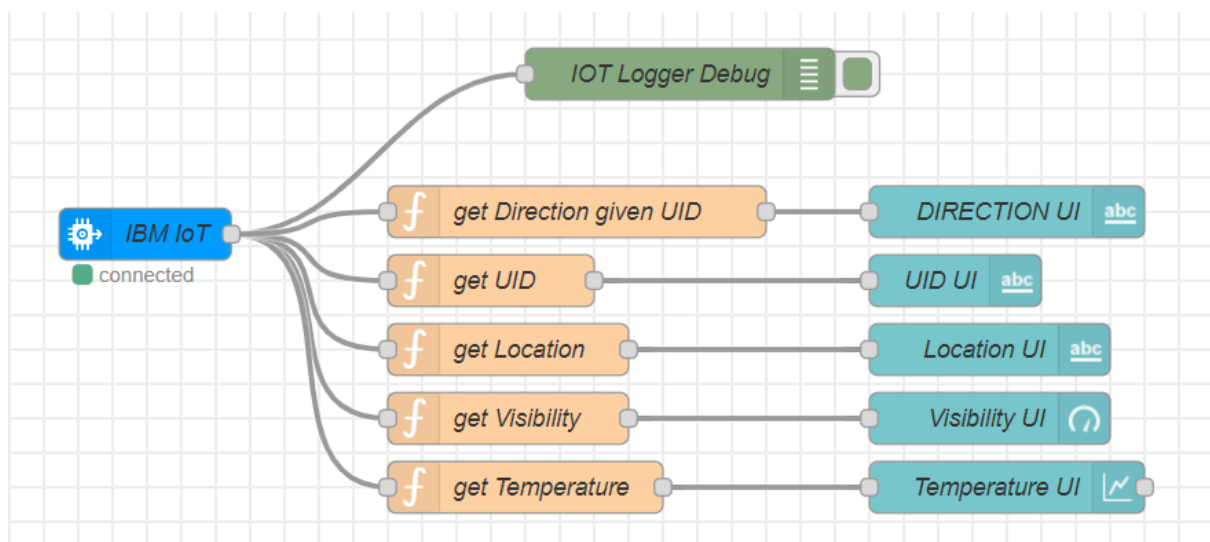
Node RED flow :



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;

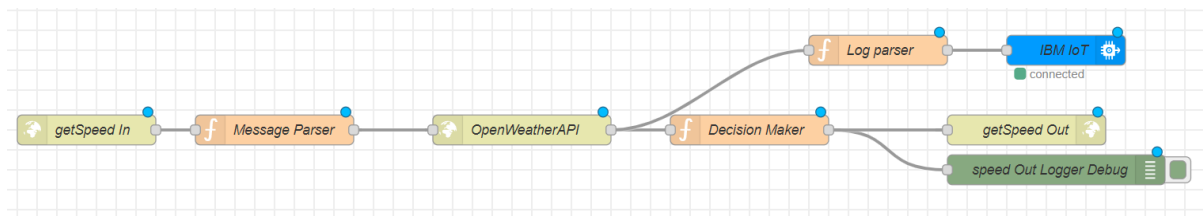
// get Location
msg.payload = msg.payload.location;
return msg;

// 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 = "bf4a8d480ee05c00952bf65b78ae826b";
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
}

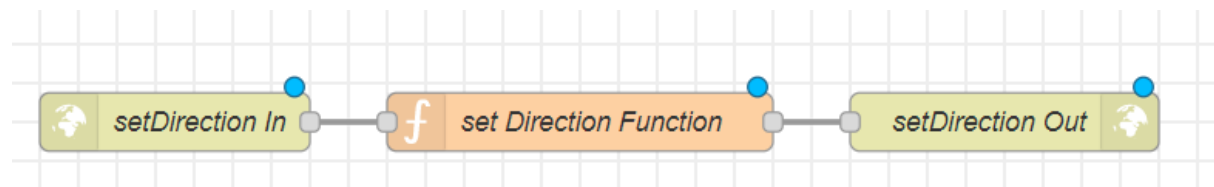
```

```
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"**.

[Click on this link to change direction to Straight](#)

[Click on this link to change direction to Left](#)

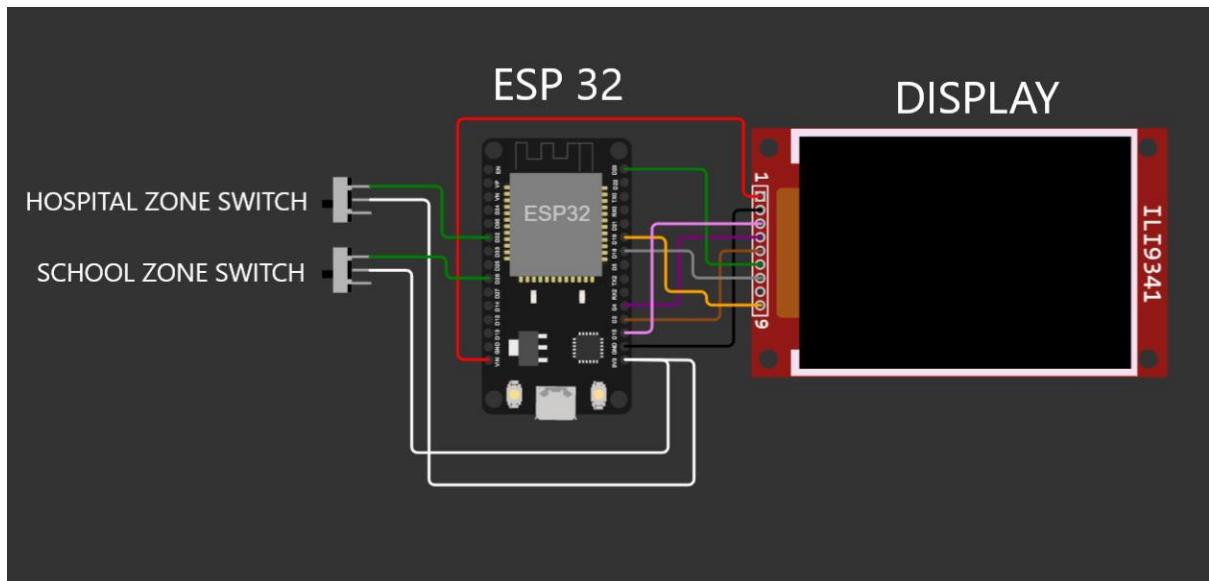
[Click on this link to change direction to Right](#)

Wokwi Circuit :

[Wokwi Code](#)

[Wokwi Link](#)

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="+String(digitalRead(schoolZone))+String("&");
    url += "hospitalZone="+String(digitalRead(hospitalZone))+String("&");
    url += "usualSpeedLimit="+String(usualSpeedLimit)+String("&");
    url += "uid="+String(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(httpResponseCode);
    }
    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(".");
    }

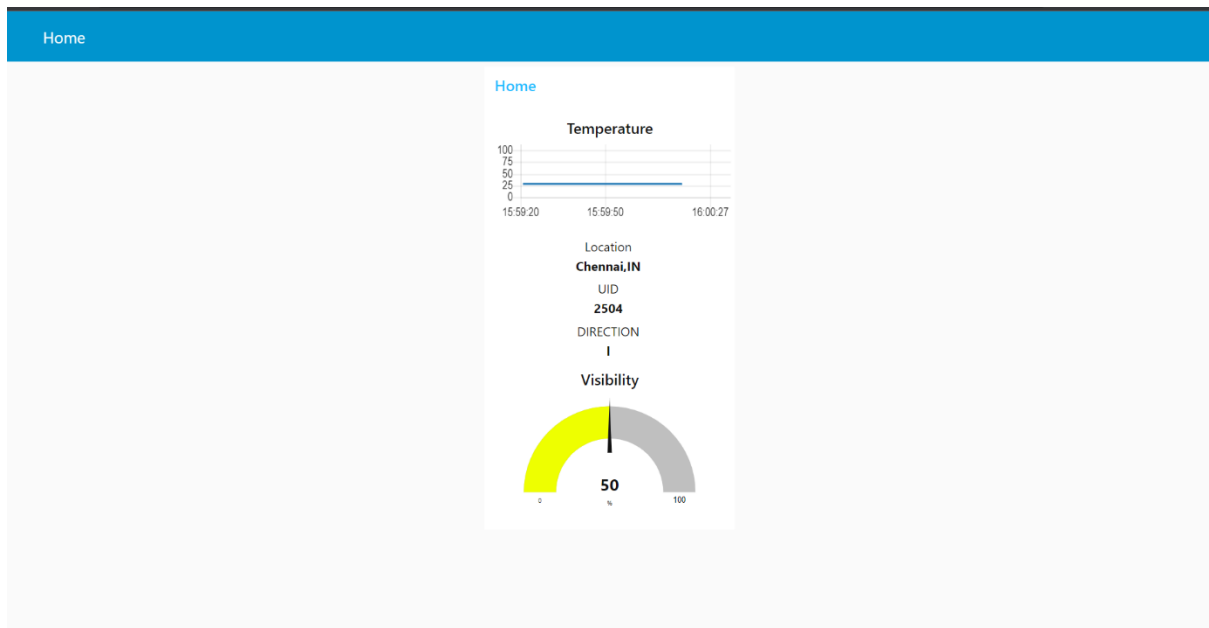
    tft.print("\nOK! IP=");
    tft.println(WiFi.localIP());
}

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

```

Output :

Node RED Dashboard :



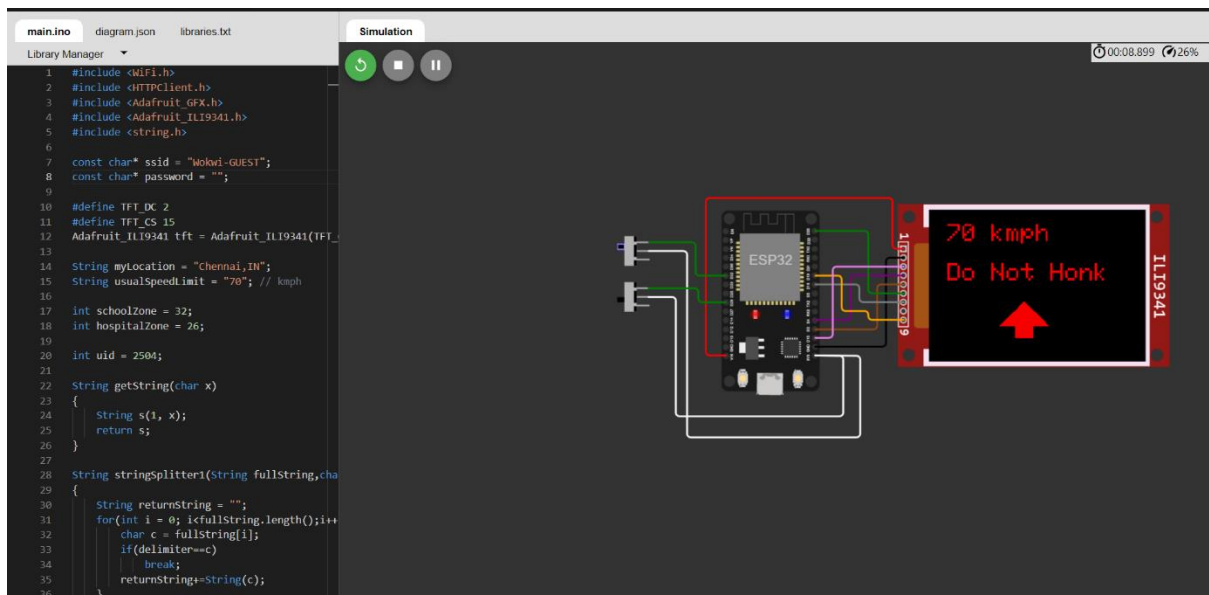
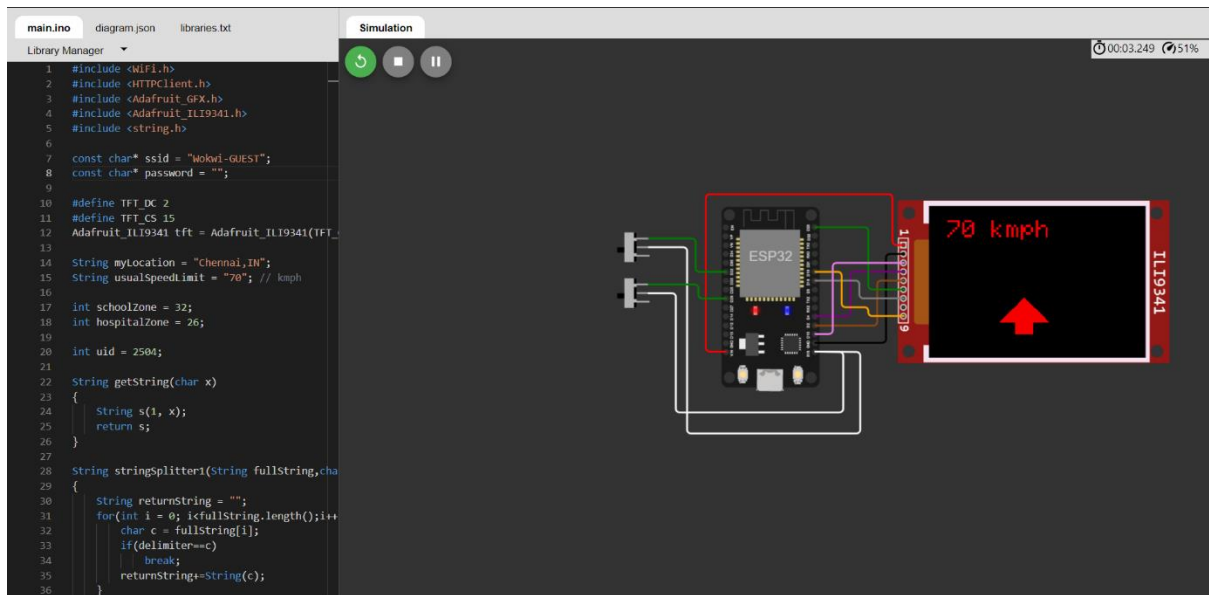
Wokwi Output :

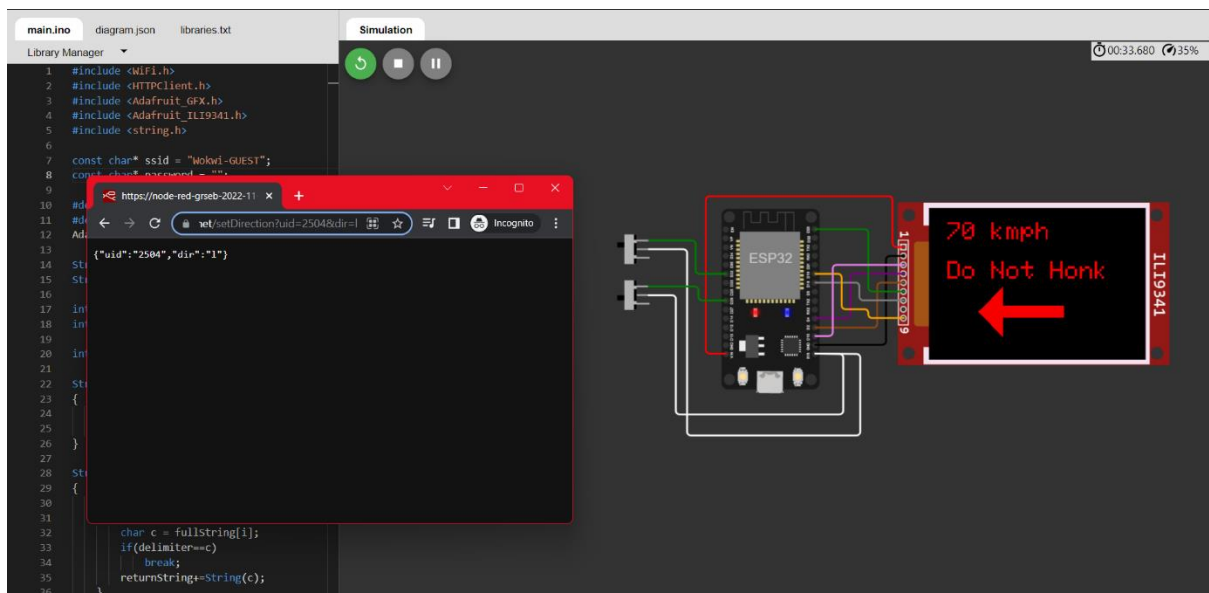
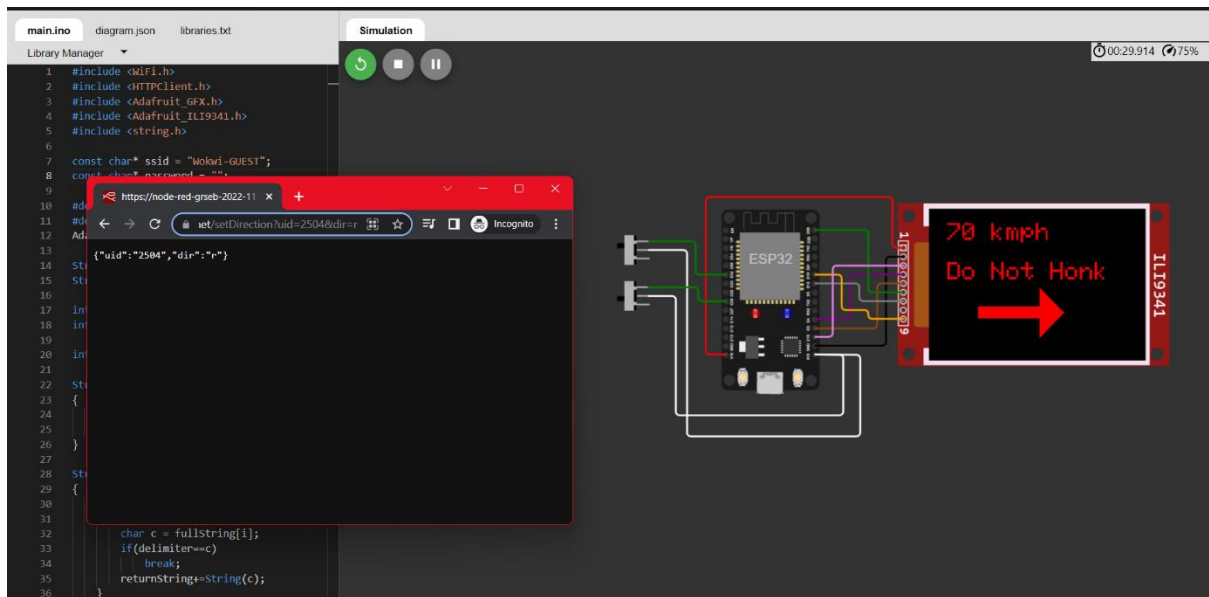
```
main.ino  diagram.json  libraries.txt  Simulation  00:01.899  26%

1 #include <WiFi.h>
2 #include <HTTPClient.h>
3 #include <Adafruit_GFX.h>
4 #include <Adafruit_ILI9341.h>
5 #include <string.h>
6
7 const char* ssid = "Wokwi-GUEST";
8 const char* password = "";
9
10 #define TFT_DC 2
11 #define TFT_CS 15
12 Adafruit_ILI9341 tft = Adafruit_ILI9341(TFT_CS, TFT_DC);
13
14 String myLocation = "Chennai,IN";
15 String usualSpeedLimit = "70"; // kmph
16
17 int schoolZone = 32;
18 int hospitalZone = 26;
19
20 int uid = 2504;
21
22 String getString(char x)
23 {
24   String s(1, x);
25   return s;
26 }
27
28 String stringsplitter1(String fullString, char delimiter)
29 {
30   String returnString = "";
31   for(int i = 0; i < fullString.length(); i++)
32   {
33     char c = fullString[i];
34     if(delimiter == c)
35     {
36       break;
37     }
38     returnString += String(c);
39   }
40 }
```

The Wokwi simulation output shows an ESP32 microcontroller connected to an ILI9341 display. The display shows the following text:

```
Connecting to WiFi
OK! IP=10.10.0.2
```





Thank You