



# **MAHENDRA INSTITUTE OF TECHNOLOGY**

**(AUTONOMOUS)**

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**Office of the Controller of Examinations**



## **A PROJECT REPORT**

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*In partial fulfilment for the award of the degree*

*of*

**BACHELOR OF ENGINEERING**

*In*

**COMPUTER SCIENCE AND ENGINEERING**

**MAHENDRA INSTITUTE OF TECHNOLOGY(AUTONOMOUS)**

**MAHENDHIRAPURI, MALLASAMUDRAM,NAMAKKAL- 637 503**

**MAHENDRA INSTITUTE OF TECHNOLOGY**  
(Autonomous)  
**Mahendhirapuri, Mallasamudram, Namakkal DT- 637 503**

**Department of Computer Science and Engineering**

**BONAFIDE CERTIFICATE**

Certified that this project report “**IoT Based SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY** ” is the Bonafide Work of our team “**DINESH P (611619104029), DINESH KUMAR S (611619104030), ELANGO N (611619104031), EZHILARASAN E (611619104032)** ”who carried out the project work under my supervision.

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**External Examiner**

**MAHENDRA INSTITUTE OF TECHNOLOGY**

**(Autonomous)**

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**CERTIFICATE OF PROJECT APPROVAL**

This is to certify that the Project report titled **“IoT Based SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY”** is the approved record of work done by **“DINESH P (611619104029), DINESH KUMAR S (611619104030), ELANGO N (611619104031), EZHILARASAN E (611619104032)”** in partial fulfillment for the award of the Degree of B.E Computer Science and Engineering during the academic year 2019-2023.

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## **INTRODUCTION**

### **1.1 Project Overview:**

The project aims to replace the static signboards with smart connected sign boards which can be changed frequently according to the purposes like weather, traffic condition, particular zones, etc., These smart connected sign boards get the speed limitations for a particular city from a web app using weather API and update automatically. Based on the weather changes the speed may increase or decrease. So, the signboards will display “slow down”, if the weather is bad. Based on the traffic and fatal situations the diversion signs are displayed. The driver can change the location pins in the map to their current location and destination location. The app shows the route and navigation instructions like “turn left on abc road”, “take U turn”. Using the location sensor, it can sense the speed of the vehicle. Sign boards near school zone, hospital zone, construction zone, uneven and narrow roads, animal zone should display appropriate signs according to the zone. Different modes of operations can be selected with the help of buttons.

### **1.2 Purpose:**

- To replace the static signboards, smart connected sign boards are used.
- These smart connected sign boards get the speed limitations from a web app using weather API and update automatically.
- Based on the weather changes the speed may increase or decrease.



- Based on the traffic and fatal situations the diversion signs are displayed.
- Guide (Schools), Warning and Service (Hospitals, Restaurant) signs are also displayed accordingly.

## **2. LITERATURE SURVEY**

### **2.1 Existing Problem:**

- ✓ Increased traffic can increase carbon emissions and other pollution.
- ✓ Land use for roads can damage built and natural environment, impose mortality on wildlife if habitats are severed.
- ✓ construction has associated environmental costs

### **2.2 References:**

W.E.Marshall,“Understanding international road safety disparities:Why is Australia so much safer than the United States?” Accident Analysis & Prevention, vol. 111, pp. 251–265, 2018

Digital signage is evolving to smart signage which provides personalized service by adaptively changing contents according to the user context. However, previous smart signage services have difficulty to expend their service because it is not easy to connect additional sensing devices. Furthermore, previous smart signage systems only consider single signage for a service. In this paper, we propose IoT based smart signage platform. The proposed platform provides IoT based connectivity between sensors and signage platform for flexible service extension. Also, we suggest IoT based signage connection, status sensing, and controlling. Therefore, our platform can make a service group of signages dynamically and enables signages to collaborate for a service in wide area. To show the performance

of proposed platform, we implemented smart nursing home service. The service shows that IoT devices and signages can be connected to the platform dynamically and collaborate together for a service in wide area.

This paper presents an approach to detect traffic signs using You Only Look Once version 4 (YOLOv4) model. The traffic sign detection and recognition system (TSDR) play an essential role in the intelligent transportation system (ITS). TSDR can be utilized for driver assistance and, eventually, driverless cars to reduce accidents. When driving an automobile, the driver's attention is usually drawn to the road. On the other hand, most traffic signs are situated on the side of the road, which may have contributed to the collision. TSDR allows drivers to view traffic sign information without having to divert their attention. Due to the existence of a large background, clutter, fluctuating degrees of illumination, varying sizes of traffic signs, and changing weather conditions, TSDR is an important but difficult process in intelligent transport systems. Many efforts have been made to find answers to the major issues that they face. The objective of this study addresses road traffic sign detection and recognition using a technique that initially detects the bounding box of a traffic sign. Then the detected traffic sign will be recognized for usage in a speeded-up process. Since safe driving necessitates real-time traffic sign detection, the YOLOv4 network was employed in this research. YOLOv4 was evaluated on our dataset, which consisted of manual annotations to identify 43 distinctive traffic signs classes. It was able to achieve an average recognition accuracy of 84.7%. Overall, the work adds by presenting a basic yet effective model for real-time detection and recognition of traffic signs.

-

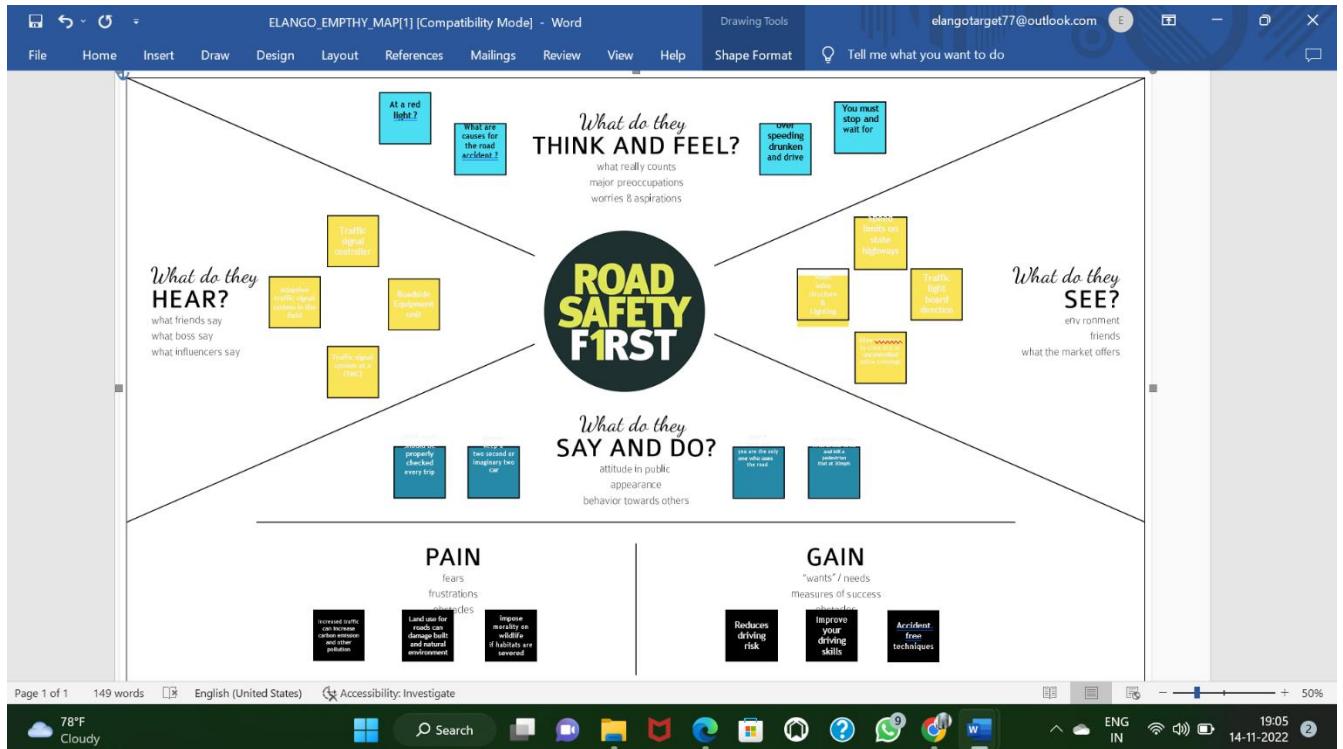
Ubiquitous nature of smart cities requires multiple technologies to be implemented in this area. To develop the smart cities in practice, there is huge need of “Smart Traffic Management”. Smart Traffic Management is a system to monitor and control the traffic signals using sensors to regulate the flow of traffic and to avoid the congestion for smooth flow of traffic. Prioritizing the traffic like ambulance, police etc. is also one application comes under smart traffic management. Traffic sign board plays important role to make the traffic in shape and to control and manage the traffic on roads. Many at times the driver misses the sign boards while driving due to various reasons like insufficient light, fog, rain, traffic etc. In this paper, a framework of the Smart Traffic Sign Boards (STSB) is proposed, which can communicate with the system deployed in all the vehicles to make the drivers of those vehicles aware of speed breakers, speed limits, schools, or ‘U’ turn ahead, etc. beforehand, to avoid the mishap due to sudden appearing of such unusual features of the road during the road journey.

### 2.3 Problem Statement Definition:

- A driver who wants to drive safely on road but there are many obstacles because of heavy traffic, weather condition, etc.,
- A driver who wants to avoid the heavy traffic roads but they are unpredictable because they change from time to time.
- A passenger who wants to travel safely but there are many road accidents because of some drivers who drive very fast and carelessly.
- A driver who wants to reach the destination but unable to choose the route and turn in wrong direction because there are no navigation instructions.

### 3. IDEATION AND PROPOSED SOLUTION:


#### 3.1 Empathy Map Canvas:



## 3.2 Ideation & Brainstorming:

### Step 1: Team Gathering, Collaboration and Select the Problem Statement

Template




## Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 2-3 people recommended

[Share template feedback](#)



### Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A

Team gathering

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B

Set the goal

Think about the problem you'll be focusing on solving in the brainstorming session.

C

Learn how to use the facilitation tools

Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#)

1

### Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

- To replace the static signboards, smart connected sign boards are used.
- These smart connected sign boards get the speed limitations from a web app using weather API and update automatically.
- Based on the weather changes the speed may increase or decrease.
- Based on the traffic and fatal situations the diversion signs are displayed.

Key rules of brainstorming

To run an smooth and productive session

Stay in topic.

Defer judgment.

Go for volume.

Encourage wild ideas.

Listen to others.

If possible, be visual.

## Step-2: Brainstorm, Idea Listing and Grouping

2

### Brainstorm

Write down any ideas that come to mind that address your problem statement.

🕒 10 minutes

#### TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

#### Elango

Receiving road sign values to the AWS IoT platform from Node-RED Web UI	Weather conditions can be viewed in the Web Application	Tamper-proof hardware prevents physical attacks
Ability to use of IoT by future to consider a user is safe area is more efficient	IoT is already working to ensure road safety in areas	Improvement in management has arrived with Internet of Things

#### Dinesh

Cooperative intelligent Transport Systems	Intelligent speed Adaptation	Smart camera crash prevention
Driver fatigue detection and warning	Collision avoidance technology systems	Intelligent system able to connect traffic, detect its own frequency, and provide road safety

#### Dinesh kumar

Software control and approval of resources used by police or autonomous vehicles	Software control and approval of resources used by police or autonomous vehicles	Surplus flow revenue to be reinvested into road safety projects
Larger term contract with capped revenue	Maintain lower financial incentive	continue to issue tickets beyond cap

#### Ezhilarasan

same object can be seen in multiple perspectives	improving the detection of objects, rightfully and detecting the area that can be perceived	transferred from the AWS to cars via 4G/LTE/5G-V2X
Highly periodic systematic collection and assessment of security goals, threats and vulnerabilities	Produce a threat model, a risk assessment, a threat intelligence and a security posture	Systematic detection and classification of objects into 3D/4D highly intelligent

#### Customer 1

Real safety data transport department to function as autonomous for data flow in the council	Collects safety data on road management data to adapt the management of accident records	Special software to protect information, data and as a data service
Driver training is effective to be regulated	Artificial roads to get star ratings for road safety index	Schools and colleges often preach about road safety to students

## Step-3: Idea Prioritization

3

### Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

🕒 20 minutes



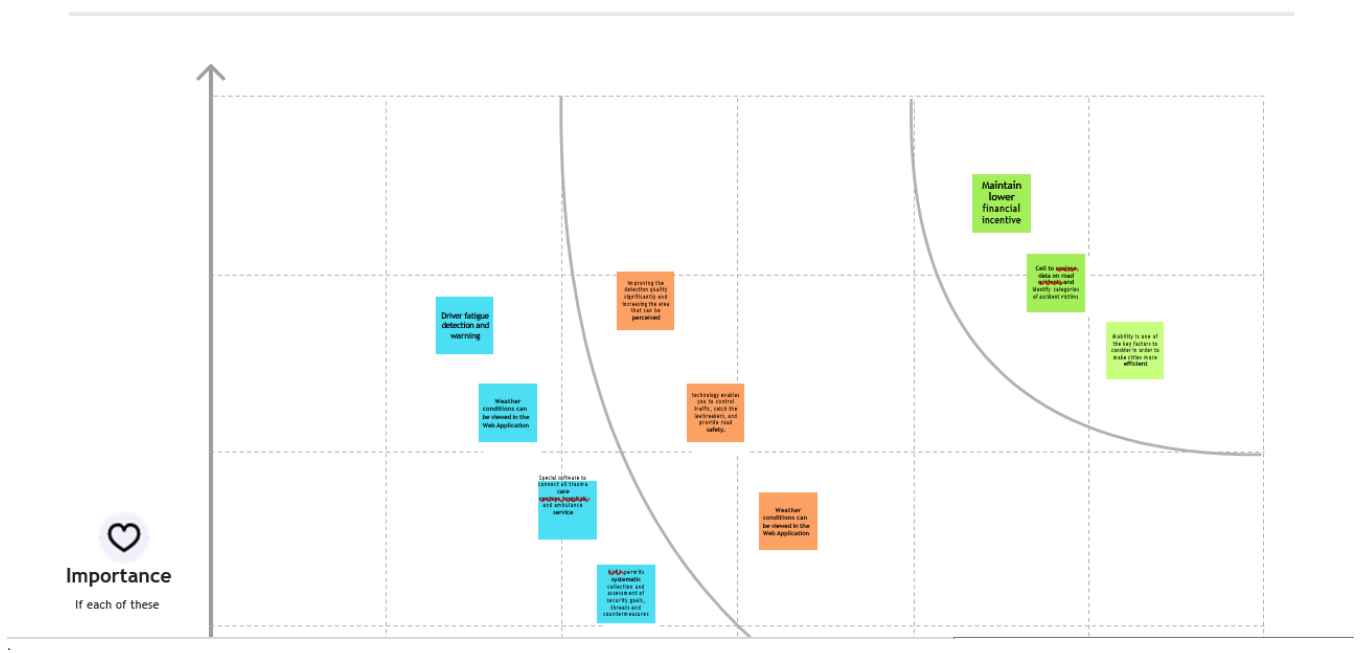
### Prioritize:

4

### Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕒 20 minutes



### 3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"> <li>✓ Fire Brigade dealing with fire incidents related to accidents on the roads</li> <li>✓ Hospitals dealing with attending to accident victims</li> <li>✓ Drivers related to driving behavior mind set, driving licenses, offences, and penalties</li> </ul>
2.	Idea / Solution description	<ul style="list-style-type: none"> <li>✓ Road safety involves the management of roads, cars, and drivers and key actors are involved in this process which is traffic police, Tanzania Roads Agency</li> <li>✓ ANROAD, Fire Brigade, TRA, SUMATRA, and Traffic Police interact in one way or another in their daily routine handling of traffic offences</li> </ul>
3.	Novelty / Uniqueness	<ul style="list-style-type: none"> <li>✓ Enforcement has therefore been a problem since information on accident incidents rely on that collected by a sole police officer manually when they arrive at the scene of the accident physically</li> <li>✓ The existing systems hosted by different stakeholders do not see each other since most of their specification were vendor-driven without integration focus even for database systems under one entity</li> </ul>
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> <li>✓ Multimodal sensors and edge computing help speed up the flow of traffic with real-time processing, reducing congestion and emissions.</li> <li>✓ Smart road technology can assist in optimizing traffic flow and managing road conditions, creating a more sustainable environment within cities</li> </ul>



5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> <li>✓ Connected vehicles could dramatically reduce the number of fatalities and serious injuries caused by accidents on our roads and highways</li> <li>✓ potential of connected vehicles, they also promise to increase transportation options and reduce travel times</li> </ul>
6.	Scalability of the Solution	<ul style="list-style-type: none"> <li>✓ The study has shown that every part of the community is affected in one way or another by road safety, be it in the developed or in developing countries</li> <li>✓ Close observations made in some of the areas that are prone to violations that result in accidents has shown that enforcement has a much higher impact in addressing road accident problem than increasing fines several folds.</li> </ul>

### 3.4 Problem Solution Fit:

Define CS, fit into CL	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> Traffic signs are necessary to give information for routes, directions, and warnings for drivers.	<b>6. CUSTOMER LIMITATIONS</b> <small>EG. BUDGET, DEVICES</small> <span>CL</span> data is retrieved and displayed on the signboards accordingly.  1) Arduino IDE 2) Embedded C 3) Hardware used	<b>5. AVAILABLE SOLUTIONS</b> <small>PLUSES &amp; MINUSES</small> <span>AS</span> According to the World Health Organization road safety report of 2018, the number of road traffic deaths increased to 1.35 million in 2016	Explore AS, differentiate
	<b>2. PROBLEMS / PAINS</b> <small>+ ITS FREQUENCY</small> <span>PR</span> 1) The long distant journey could not be possible in a short time. 2) Damages prone 3) Impact of seasons	<b>9. PROBLEM ROOT / CAUSE</b> <span>RC</span> With access to smart road devices that collect and analyze data in near-real time, cities can reduce roadway congestion, manage traffic flow, and improve pedestrian safety.	<b>7. BEHAVIOR</b> <small>+ ITS INTENSITY</small> <span>BE</span> One or more of the fundamental data to guarantee road safety of the connected cars is the geolocation.	
Identify strong TR & EM	<b>3. TRIGGERS TO ACT</b> <span>TR</span> Delay in goods transit due to loading and unloading of goods can be avoided and they can be transported	<b>10. YOUR SOLUTION</b> <span>SL</span> 1) Best for a short-distance journey  2) The cost of maintenance and construction is low	<b>8. CHANNELS of BEHAVIOR</b> <span>CH</span> <b>ONLINE:</b> These incorporate a large number of sensors that establish communication with the cloud,  <b>OFFLINE:</b> Smart connected Signs for Improved Road Safety	Extract online & offline CH of BE
	<b>4. EMOTIONS</b> <small>BEFORE / AFTER</small> <span>EM</span> Handling costs can be avoided.			

#### **4. REQUIREMENT ANALYSIS:**

##### **4.1 Functional Requirements:**

<b>FR No.</b>	<b>Functional Requirement (Epic)</b>	<b>Sub Requirement (Story / Sub-Task)</b>
FR-1	<u>USER REGISTRATION</u>	<ul style="list-style-type: none"><li>• Through google forms</li><li>• Through mail</li><li>• Through linkedin</li><li>• Through facebook</li></ul>
FR-2	<u>USER CONFIRMATION</u>	<ul style="list-style-type: none"><li>• Through verification mails</li><li>• Through OTP</li></ul>
FR-3	<u>USER APPROVAL</u>	<ul style="list-style-type: none"><li>• Through mails</li><li>• Through phone calls</li><li>• Through SMS</li></ul>
FR-4	<u>USER TRANSACTION</u>	<ul style="list-style-type: none"><li>• Through net banking</li><li>• Through UPI</li></ul>
FR-5	<u>TESTING</u>	<ul style="list-style-type: none"><li>• Testing through components</li><li>• Testing through API and UI</li></ul>
FR-6	<u>END RESULT</u>	<ul style="list-style-type: none"><li>• End result through product features</li><li>• By using the technology</li></ul>

##### **4.2 Non-Functional Requirements:**

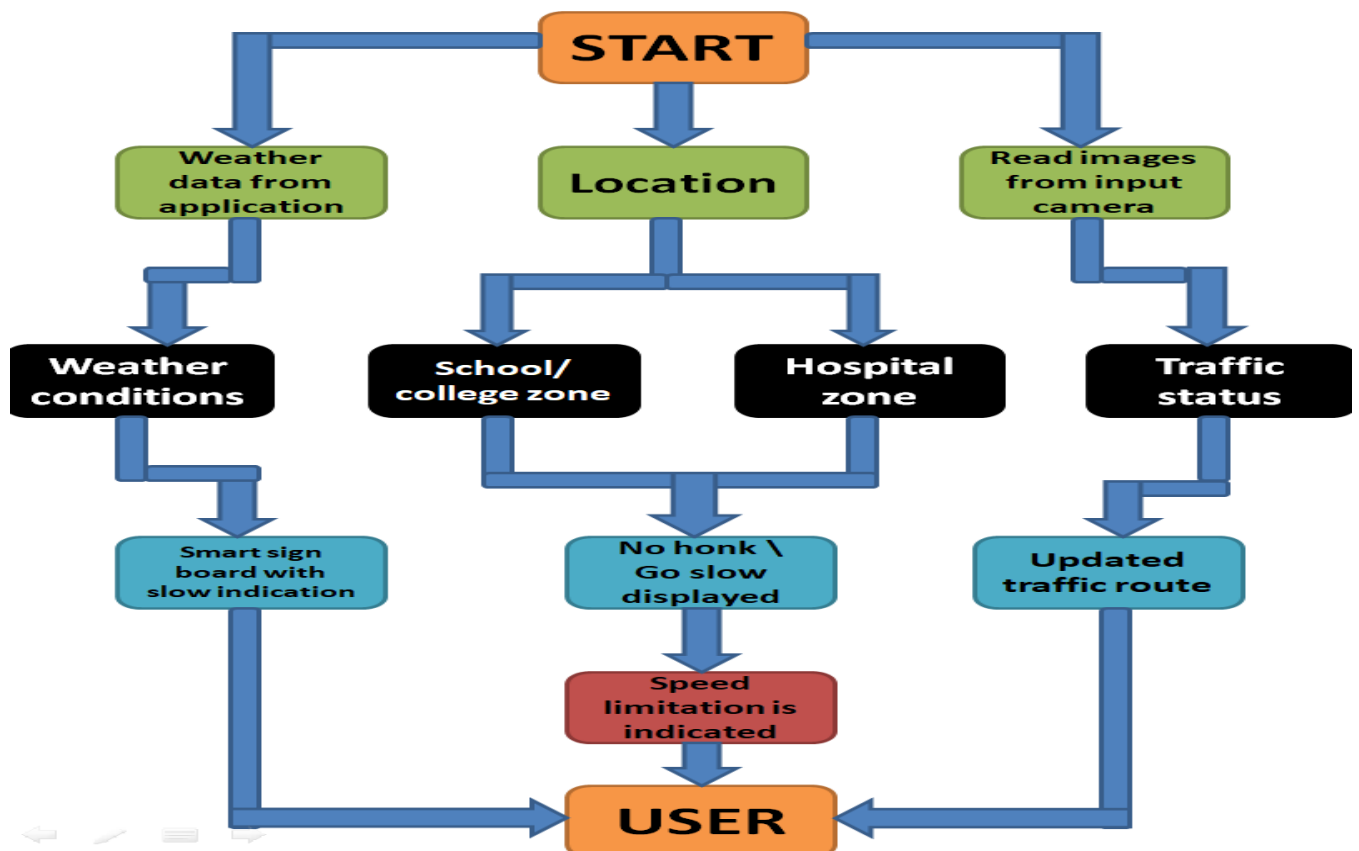
<b>FR No.</b>	<b>Non-Functional Requirement</b>	<b>Description</b>
NFR-1	Usability	<ul style="list-style-type: none"><li>• Situations never remain the same. Therefore there must be a constant check of the conditions prevailing and accordingly there must be changes made in these boards.</li><li>• Sign boards with caution or alerts must be placed well in advance so that the drivers could be more alert with the journey.</li><li>• The text content must be available in different languages to help the drivers.</li></ul>

		<ul style="list-style-type: none"> <li>• Boards must be large and clear for better visibility.</li> <li>• Sign boards should be bright coloured so that it catches the drivers' sight.</li> <li>• The illustrations or the symbols used in the boards must be easily understandable.</li> </ul>
NFR-2	Security	<ul style="list-style-type: none"> <li>• The security system should be strong enough that no one can modify it other than the authority.</li> <li>• No one should be able to enter into the network to change, delete or manage the intimations or messages delivered through the sign boards.</li> </ul>
NFR-3	Reliability	<ul style="list-style-type: none"> <li>• There should not be any miscommunications or confusions regarding the messages displayed.</li> <li>• Maximum accuracy must be ensured.</li> <li>• All the information displayed must be checked periodically and updated if any changes are needed for error-free intimation.</li> </ul>
NFR-4	Performance	<ul style="list-style-type: none"> <li>• The efficiency and the accuracy of the information hence calculated should be maximum.</li> <li>• It should be ensured that minimum amount of energy, time and cost is required for the operation.</li> </ul>
NFR-5	Availability	<ul style="list-style-type: none"> <li>• These should be available anytime and everywhere that is 24/7.</li> <li>• Sign boards should be located in places which has direct view from the road. It should not present amidst bushes, trees, building etc</li> <li>• It should be properly monitored that no sign boards are damaged, repaired or malfunctioning at any time.</li> </ul>

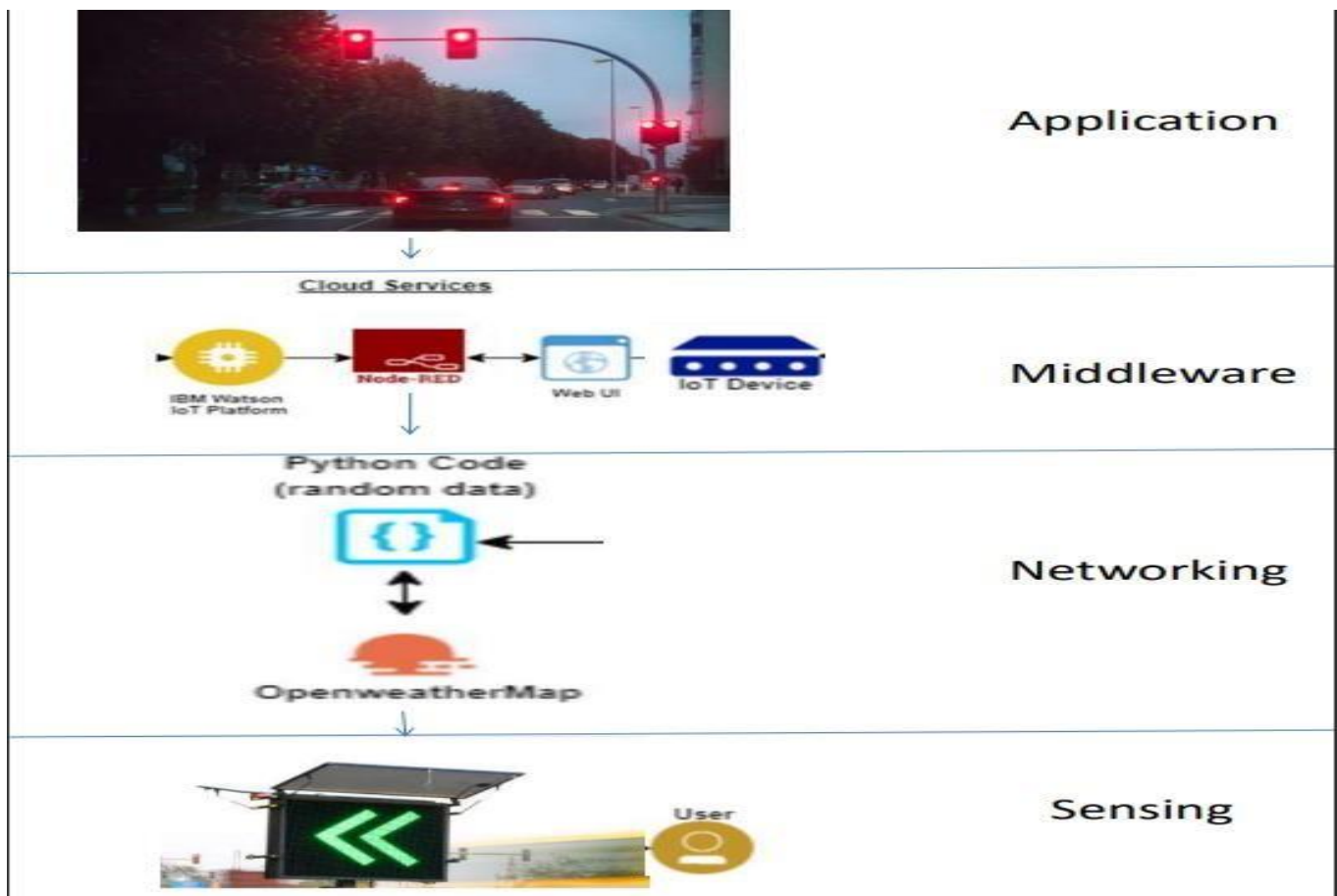
		<ul style="list-style-type: none"> <li>The sign boards should be made available only in places where they are required the most. Frequent availability of boards may lead to confusion and mistakes.</li> </ul>
NFR-6	Scalability	<ul style="list-style-type: none"> <li>It should be easy to scale according to the requirement.</li> <li>It should be in such a way that the network at any time of period should be ready to be expanded and implemented on a wider scale.</li> </ul>

## 5. PROJECT DESIGN:

### 5.1 Data Flow Diagrams:



## 5.2 Solution & Technical Architecture:



## 5.3 User Stories:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	<b><u>User Visibility</u></b>	Sign Boards should be made with LED's which are bright colored and are capable of attracting the drivers' attention but it should also not be too distracting or blinding cause it may lead to accidents.
FR-2	<b><u>User Need</u></b>	The smart sign boards should be placed frequently in places it is needed and less in places where it is not needed much to avoid confusion for the user during travel.
FR-3	<b><u>User Understanding</u></b>	For better understanding of the driver, the signs should be big, clear and legible and it can also include illustrations which will make it easily understandable to the driver.

FR-4	<b><u>User Convenience</u></b>	The display should be big enough that it should even be visible from far distance clearly.
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## **6.PROJECT PLANNING & SCHEDULING:**

### **6.1Sprint Planning & Estimation:**

<b>Sprint</b>	<b>Functional Requirement (Epic)</b>	<b>User Story Number</b>	<b>User Story / Task</b>	<b>Story Points</b>	<b>Priority</b>	<b>Team Members</b>
Sprint-1	Login	USN-1	As a weather data controller, I log into my profile and start monitoring the weather updates	3	High	EZHIL
Sprint-1	dashboard	USN-2	I receive all the information about weather at a particular city from web from	2	High	EZHIL

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
			weather API. Whenever there is change in weather, corresponding updates about speed limits are made on sign boards.			
Sprint-2	Login	USN-1	As a image controller, I keep note of all the images received from various areas and detect traffic in that particular area.	3	High	DINESH
Sprint-2	Dashboard	USN-2	With traffic, distance between the vehicles is detected by ultrasonic sensor and the vehicle will be automatically stopped if the distance is below the limit.	2	Medium	DINESH
Sprint-3	Login	USN-1	As a traffic controller, I keep note of all the vehicle's speed received from various areas using location sensor.	2	High	DINESHKUMAR
Sprint-3	Dashboard	USN-2	I ensure that the boards display "slow down" if high speed is detected.	2	Medium	DINESHKUMAR
Sprint-3	Login	USN-3	As a user, I move the marker to my current location and the destination location.	1	Medium	DINESH
Sprint-3	Dashboard	USN-4	I receive the fastest route to the destination and navigation instructions like "Turn left", "Turn right" will be displayed.	1	Medium	DINESHKUMAR
Sprint-4	Login	USN-1	As a zonal officer, I ensure that boards near school display "slow down" and near hospitals display "no horn".	3	High	ELANGO

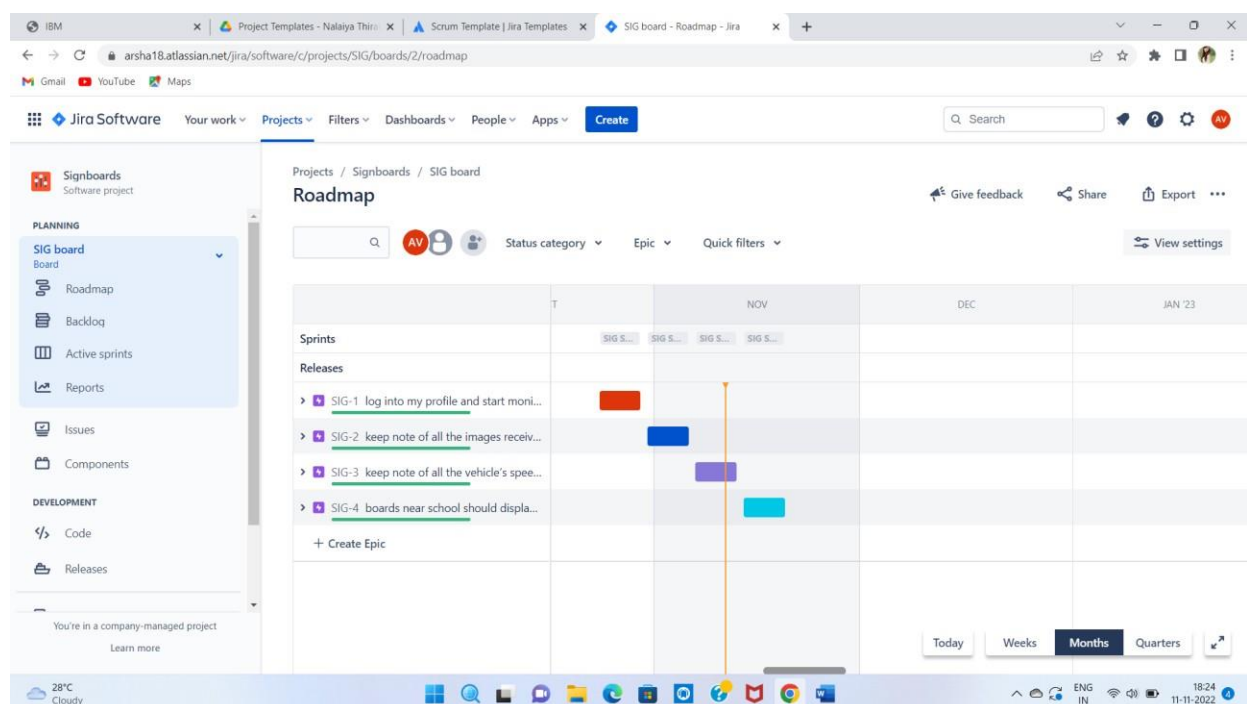
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Login	USN-2	As an administrator, I ensure that the boards display “drive carefully” near construction site, narrow and uneven roads.	2	Medium	ELANGO

## 6.2 Sprint Delivery Schedule:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

## 6.3 Reports From JIRA:

### ROADMAP:

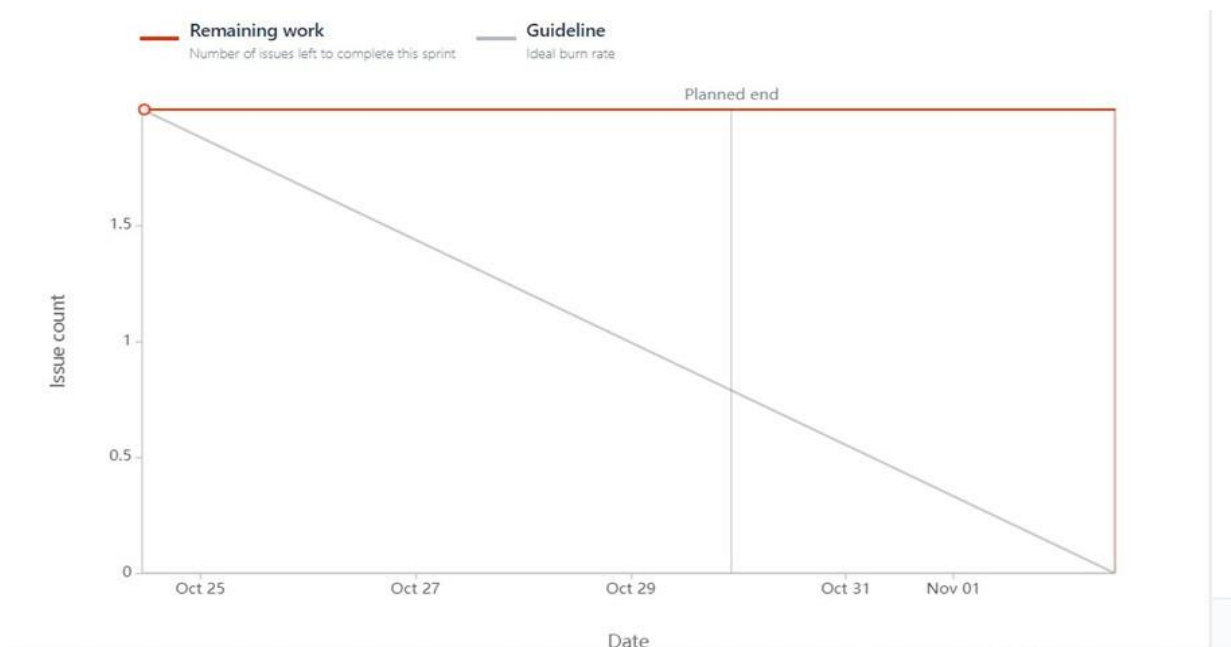




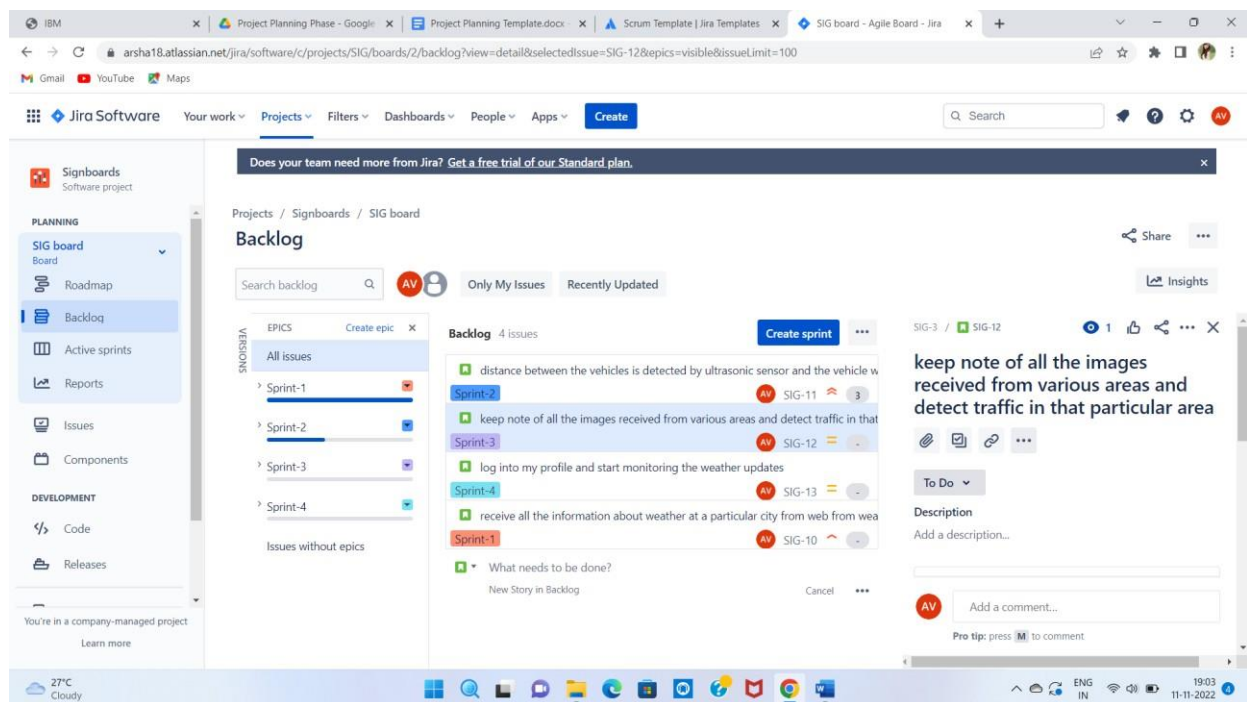
## ISSUE:

The screenshot shows a Jira Software issue page. The browser address bar indicates the URL is [arsha18.atlassian.net/jira/software/c/projects/SIG/issues/SIG-8](https://arsha18.atlassian.net/jira/software/c/projects/SIG/issues/SIG-8). The Jira interface includes a top navigation bar with 'Jira Software', 'Your work', 'Projects', 'Filters', 'Dashboards', 'People', 'Apps', and a 'Create' button. A search bar is also present. The left sidebar shows 'Signboards' as the current project, with options to 'Back to project' and a list of filters: 'All issues', 'My open issues', 'Reported by me', 'Open issues', 'Done issues', 'Viewed recently', 'Resolved recently', and 'Updated recently'. The main content area displays the issue 'boards display "drive carefully" near construction site, narrow and uneven roads.' with a description: 'Sign boards near construction site, uneven roads should display "slow down" or "drive carefully"'. The activity log shows a comment by 'Arsha Varshinee' logged 1w 2 days ago. The right sidebar contains a 'Done' button, 'Pinned fields', 'Details' (Assignee, Reporter, Labels, Epic...), and 'More fields' (Story Points, Original esti...). The bottom status bar shows the weather as 28°C Cloudy and the system clock as 18:34 on 11-11-2022.

## BURNDOWN CHART:



## BACKLOG:



## 7 CODING & SOLUTIONING:

### Code Explanation:

### Libraries:

Including all libraries like json, random, time, sys, ibmiotf etc.

PROJECTFINALDND.py - D:/1ibm/PROJECTFINALDND.py (3.7.0)

File Edit Format Run Options Window Help

```
import requests #importing a library
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys
```

## Credentials:

Entering all the credentials corresponding to IoT watson device in order to publish data to it.

```
# watson device details

organization = "2s7yy7"
devicType = "project"
deviceId = "projectid"
authMethod= "token"
authToken= "projecttoken"
```

## MIT Inventor Interruption:

Receiving commands as inputs when buttons are pressed in MIT inventor in order to perform separate functions.

```
def myCommandCallback(cmd):
    global a
    #print("command recieved:%s" %cmd.data['command'])
    #status=cmd.data['command']
    print("command recieved:%s" %cmd.data['command'])
    control=cmd.data['command']
    print(control)

try:
    deviceOptions={"org": organization, "type": devicType,"id": deviceId,"auth-method":authMethod,"auth-token":authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
    print("caught exception connecting device %s" %str(e))
    sys.exit()
```

## Exception Handling:

To handle exception if occurs while connecting with IBM IOT WATSON device

```
try:
    deviceOptions={"org": organization, "type": devicType,"id": deviceId,"auth-method":authMethod,"auth-token":authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
    print("caught exception connecting device %s" %str(e))
    sys.exit()
```

## Main Body:

- Connecting to IBM IoT device.
- Getting temperature and humidity values in json format from openweathermap as inputs.
- Accessing the values using their corresponding keys.
- Generating random values for distance since hardware sensors are not implemented.
- Passing a warning “stating please slow down” when humidity is less than 100 in order to promote safe driving experience.
- Passing instruction when distance is less than 20 in order to avoid accidents and clashes.

```
*PROJECTFINALDND.py - D:/1ibm/PROJECTFINALDND.py (3.7.0)*
File Edit Format Run Options Window Help

#connect and send a datapoint "temp" with value integer value into the cloud as a type of event for every 10 seconds
deviceCli.connect()

while True:

#get sensor data from DHT11

a = "https://api.openweathermap.org/data/2.5/weather?q=Chennai,%20IN&appid=e2bea247ed9ad643a04d9a8e55499d5f"
r=requests.get(url=a)
data=r.json()

Temp= data['main']['temp']
Humd= data['main']['humidity']
data= {'temp':Temp,'humid':Humd}
dist=random.randint(0,50)
dis={'dista':dist}

if(Humd<100):
    warn={'alert':'PLEASE SLOW DOWN!!!!!!'}
if(dist<20):
    insta={'inst':'stop'}
```

## Publish Data To IBM IOT WATSON Platform:

Passing all the data(temperature, humidity, warning, instruction) to ibm iotwatson.

Disconnecting the connection established with IoT Watson device.

```
PROJECTFINALDND.py - D:\ibm\PROJECTFINALDND.py (3.7.0)
File Edit Format Run Options Window Help

#data= {'temp':Temp,'humid':Humid}
#dist=random.randint(0,20)
#dis= {'dista':dist}

if (Humid<100):
    warn= {'alert':'PLEASE SLOW DOWN!!!!!!'}
if (dist<20):
    insta= {'inst':'stop'}

def myOnPublishCallback():

    print("published Temperature = %s c" %Temp,"humidity:%s %% " %Humid)
    print(warn)
    print(dis)
    print(insta)

success=deviceCli.publishEvent ("IoTSensor","json",insta,qos=0,on_publish= myOnPublishCallback)
success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish= myOnPublishCallback)
success=deviceCli.publishEvent ("IoTSensor","json",warn,qos=0,on_publish= myOnPublishCallback)
success=deviceCli.publishEvent ("IoTSensor","json",dis,qos=0,on_publish= myOnPublishCallback)

if not success:
    print("not connected to ibmiot")
    time.sleep(5)

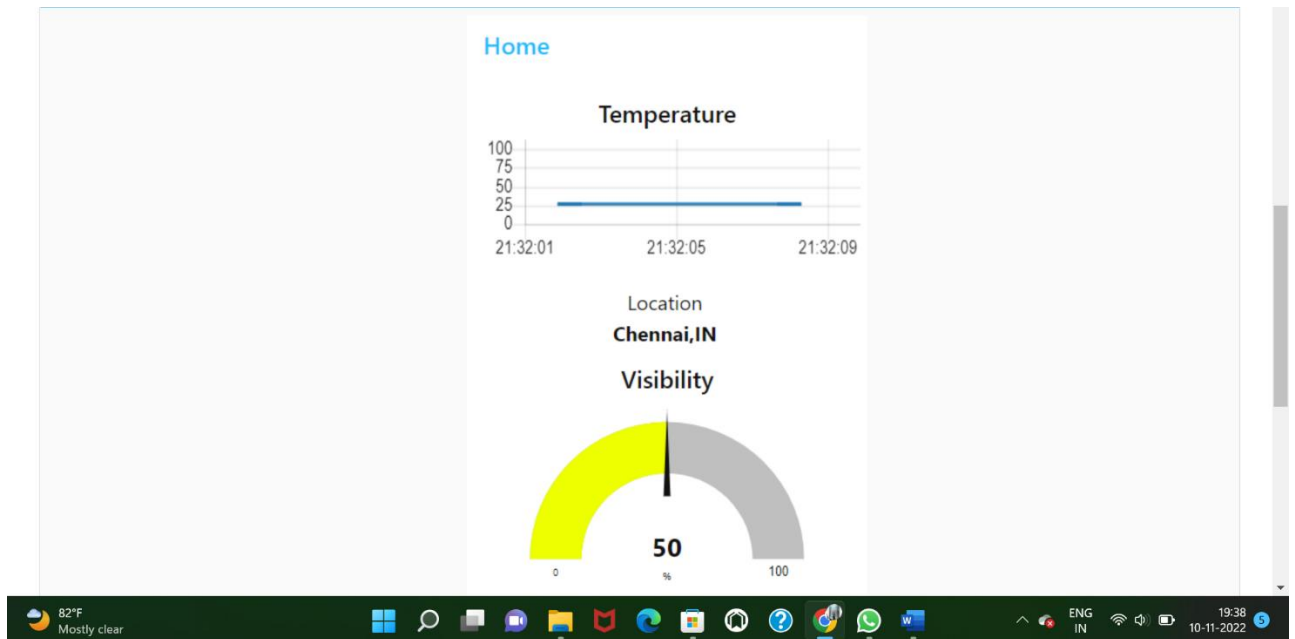
deviceCli.commandCallback=myCommandCallback
#disconnect the device
deviceCli.disconnect()
```

## 7.1 Feature 1:

### WEATHER UPDATE AND CORRESPONDING COMMAND:

Getting temperature and humidity from OpenWeatherMap for a particular city and displaying warning regarding the speed





when humidity is below 100.

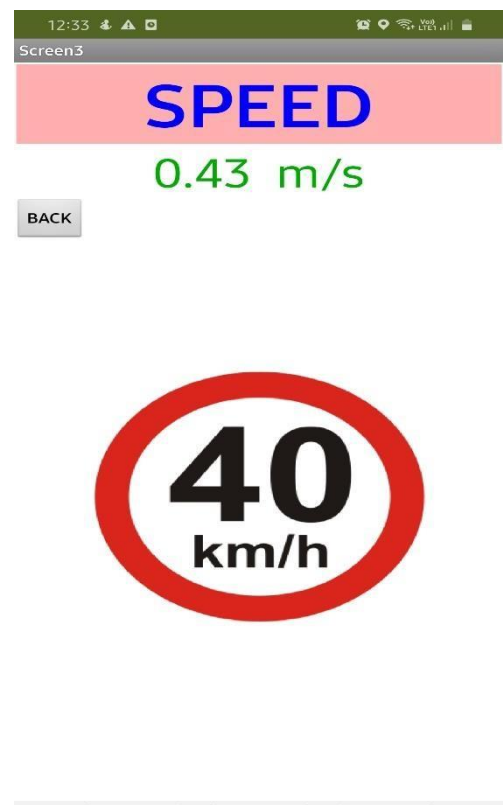
## 7.2 Feature 2:

### SPEED DETECTION:

7.2.1 By implementing a location sensor in MIT APP INVENTOR, with changes in the location with respect to time, speed can easily be detected and displayed in the app to the user

7.2.2 This requires location settings from user's phone to be active.

7.2.3 An image of normal speed limit is also displayed which means that, travelling within that range would be safe.



## 7.3 Feature 3:

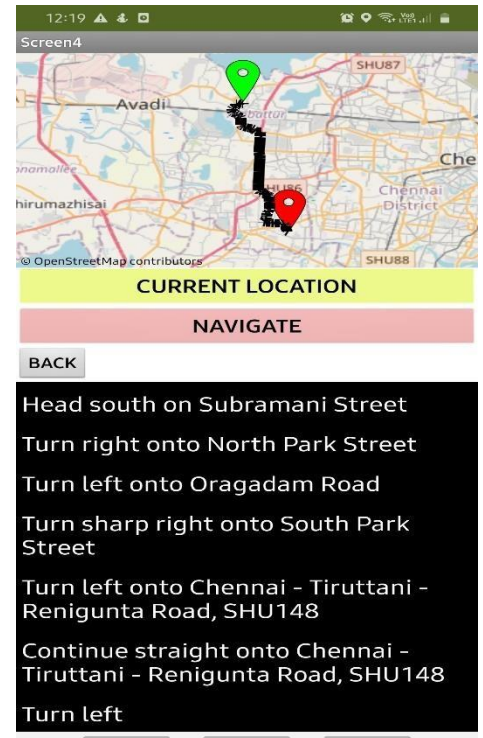
### MAP AND NAVIGATION:



7.3.1 By implementing same location sensor, current location can be detected. This also requires location settings in user's phone to be active.

7.3.2 By dragging the green marker to start location and red marker to the destination location to be reached and clicking on the navigate button, displays the street path that connects the start and end point specified.

7.3.3 In addition to this, it also displays the directions to be followed to reach the destination.



#### 7.4 Feature 4: ZONAL CLASSIFICATION:

7.4.1 Here, displays few sign boards indicating different zones like school zone, hospital zone, railway track etc. By clicking on the button below the sign displays the meaning and instruction to be followed in the particular region.

7.4.2 This provides the user with better understanding about the sign boards and to act accordingly.

#### 7.5 Feature 5: DETERMINING TRAFFIC:

7.5.1 Since hardware sensors are not implemented, we have used random function to generate values for the



distance between the user and the vehicle ahead.

7.5.2 If the distance is below 20, it instructs the driver or the user to stop immediately and try moving forward with different direction or to take diversion.

7.5.3 This helps in avoiding accidents and clashes while driving.

```
dist=random.randint(0,50)
dis={'dista':dist}
```

```
if(dist<20):
    insta={'inst':'stop'}
```

## 8 TESTING:

### 8.1 Test Cases

The test case is defined as a group of conditions under which a tester determines whether a software application is working as per the customer's requirements or not. Test case designing includes preconditions, case name, input conditions, and expected result. A test case is a first level action and derived from test scenarios

Test case gives detailed information about testing strategy, testing process, preconditions

and expected output These are executed during the testing process to check whether the software application is performing the task for that it was developed or not.



Test case helps the tester in defect reporting by linking defect with test case ID. Detailed test case documentation works as a full proof guard for the testing team because if developer missed something, then it can be caught during execution of these full-proof test cases

To write the test case, we must have the requirements to derive the inputs, and the test scenarios must be written so that we do not miss out on any features for testing. Then we should have the test case template to maintain the uniformity, or every test engineer follows the same approach to prepare the test document.

#### **Testcase performed:**

1. Sprint 01  
[Click Here](#)
2. Sprint 02  
[Click Here](#)
3. Sprint 03  
[Click Here](#)
4. Sprint 04  
[Click Here](#)

## **8.2 User Acceptance Testing:**

### **1. Purpose of Document**

The purpose of this document is to briefly explain the test coverage and open issues of the Smart Fashion Recommender Application project at the time of the release to User Acceptance Testing (UAT).

### **2. Defect Analysis**

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	3	2	2	17
Duplicate	1	1	3	0	5
External	2	1	1	1	5
Fixed	9	2	3	18	32
Not Reproduced	1	1	1	0	3
Skipped	1	1	2	1	5
Won't Fix	0	2	1	2	5
Totals	24	11	13	24	72

### 3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	4	0	1	3
Client Application	42	0	4	38
Security	3	0	1	2
Outsource Shipping	3	0	0	3
Exception Reporting	12	0	3	9
Final Report Output	6	0	2	4
Version Control	2	0	0	2

## 9. RESULTS

### Performance Metrics:

Based on the IBM pack we chose, the performance of the website varies. Built upon NodeJS, a light and high performance engine, Node RED is capable of handling up to

10,000 requests per second. Moreover, since the system is horizontally scalable, an even higher demand of customers can be served.

### **10.ADVANTAGES:**

- Signs with smart connectivity are an inexpensive and flexible medium that can help transmit information according to particular situation and entertain passengers.
- The digital signboards help in reducing the air pollution due to the emission of vehicles in heavy traffic area.
- The drivers can be able to know about the weather condition and accordingly follow the speed limit displayed on the sign boards.
- The increased flexibility of these digital sign boards makes it easy for any private or government department to change the message as per the need of the hour.
- The driver can easily find the route and navigation instructions to reach the destination.
- The speed of the vehicle can be identified using location sensor.
- The digital sign boards and the app are user-friendly.

### **DISADVANTAGES:**

- The digital signboards involve high Installation Costs.
- Getting digital signboards up and running is a far more involved

process than print media.

- If the people managing the screens are not graphic designers, it can be difficult to update the content regularly on the screen.
- The digital signboards are still new and developing technology in the road safety sector,
- While digital sign boards require power and therefore can't claim to be green, there is high energy use in the printing, erecting and replacement of traditional print media.

## **11 CONCLUSION:**

Digital road signs are an important part of modern infrastructure and are becoming increasingly common. Digital road signs are becoming more common as technology improves and more states adopt them. The use of digital road signs is expected to continue to grow in the future as it would be observed user-friendly, economic, environment friendly, profitable promoting road safety. Digital road signs are designed to improve road safety and efficiency by providing real-time information to drivers. These signs can display a variety of information, including speed limits, traffic conditions, and weather warnings. Digital road signs can help drivers by providing information that is not always available from traditional signs.

## **12 FUTURE SCOPE:**

One of the benefits of digital road signs is that they can be updated in real-time, which means that they can be used to provide motorists with up-to-the-minute information about conditions on the road ahead. This can be particularly useful in the case of accidents or other incidents that might cause delays. In the future, digital road signs could also be used to provide information about alternative routes that might be available in the event of a problem on the road. This could be particularly useful in the case of major incidents, such as road closures due to bad weather. Finally, digital road signs could be used to provide motorists with information about the best times to travel in order to avoid traffic congestion. This could be particularly useful in areas where there is a lot of traffic.

## **13   APPENDIX:**

### Source Code:

```
import requests #importing a library
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys

# watson device details

organization = "2s7yy7"
```

```
devicType = "project"  
deviceId = "projectid"  
authMethod= "token"  
authToken= "projecttoken"
```

```
#generate random values for random variables (temperature&humidity)
```

```

def myCommandCallback(cmd):
    global a
    #print("command recieved:%s" %cmd.data['command'])
    #status=cmd.data['command']
    print("command recieved:%s" %cmd.data['command'])
    control=cmd.data['command']
    print(control)

try:
    deviceOptions={"org": organization, "type": devicType,"id": deviceId,"auth-
method":authMethod,"auth-token":authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
    print("caught exception connecting device %s" %str(e))
    sys.exit()

#connect and send a datapoint "temp" with value integer value into the cloud as a type of
event for every 10 seconds
deviceCli.connect()

while True:

    #get sensor data from DHT11

    a =
    "https://api.openweathermap.org/data/2.5/weather?q=Chennai,%20IN&appid=e2bea247e
d9ad643a04d9a8e55499d5f"
    r=requests.get(url=a)
    data=r.json()

    Temp= data['main']['temp']

```

```

Humd= data['main']['humidity']
data= {'temp':Temp,'humid':Humd}
dist=random.randint(0,20)
dis={'dista':dist}

if(Humd<100):
    warn={'alert':'PLEASE SLOW DOWN!!!!!!'}
if(dist<20):
    insta={'inst':'stop'}

def myOnPublishCallback():

    print("published Temperature = %s c" %Temp,"humidity:%s %" %Humd)
    print(warn)
    print(dis)
    print(insta)
    success=deviceCli.publishEvent ("IoTSensor","json",insta,qos=0,on_publish=
myOnPublishCallback)
    success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish=
myOnPublishCallback)
    success=deviceCli.publishEvent ("IoTSensor","json",warn,qos=0,on_publish=
myOnPublishCallback)
    success=deviceCli.publishEvent ("IoTSensor","json",dis,qos=0,on_publish=
myOnPublishCallback)

    if not success:
        print("not connected to ibmiot")
        time.sleep(5)

    deviceCli.commandCallback=myCommandCallback
#disconnect the device
deviceCli.disconnect()

```



**Github Link:**

**GITHUB LINK:**

<https://github.com/IBM-EPBL/IBM-Project-29684-1660128503>