



SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY



NALAIYA THIRAN PROJECT BASED LEARNING ON PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

A PROJECT REPORT

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Approved by AICTE, New Delhi, Accredited with 'A' Grade by NAAC
(An Autonomous Institution, Affiliated to Anna University, Chennai)

COIMBATORE – 641 032

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Hindusthan College of Engineering And Technology

Approved by AICTE, New Delhi, Accredited with 'A' Grade by

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INDUSTRY MENTOR

SANTHOSHI

IBM

1.INTRODUCTION:

1.1 Project Overview:

In present systems the road signs and the speed limits are static. But the road signs can be changed in some cases. We can consider some cases when there are some road diversions due to accidents then we can change the road signs accordingly if they are digitalized. This project proposes a system which has digital sign boards on which the signs can be changed dynamically. If there is rainfall then the roads will be slippery and the speed limit would be decreased. When crowd or accident occur, it guides the travellers to choose best path. And it intimates the speed range depending upon roadway condition. Overall it helps to the traveller behaviour towards awareness of travel.

1.2 Purpose:

- 1.To replace the static sign boards, smart connected sign boards are used.
- 2.These smart connected sign boards get the speed limitations from a web app using weather API and update automatically.
- 3.Based on the weather changes the speed may increase or decrease.
- 4.Based on the traffic and fatal situations the diversion signs are displayed.
5. Guide(Schools), warning and service(Hospitals, Restaurant)signs are also displayed accordingly.
6. Different modes of operations can be selected with the help of buttons

2.LITERATURE SURVEY:

2.1 Existing Problem:

One of the main causes of accidents in sensitive public areas like schools, colleges, hospitals, etc. and sharp turning points in the over speed of vehicles avoiding the speed limit indicated in the traffic sign board. Road accidents have now become a national catastrophe for overpopulated developing countries. By not reducing their vehicle speed in these delicate public areas, drivers put the lives of passengers, pedestrians, and other drivers at danger. The suggested system's primary goal is to run the vehicles at a safe speed in vital areas while reducing the potential danger of unintentional accidents and casualties. This project establishes a mechanism to notify drivers of speed limitations in particular locations and to slow down vehicles in sensitive public areas.

2.2 References :

1.Chai K. Toh, Juan-Carlos Cano, Carlos Fernandez-Laguia, Pietro Manzoni, Carlos T. Calafate, Wireless digital traffic signs of the future, The Institution of Engineering and Technology(IET)

Description : In this architecture notify the sign can be narrated via voice to driver, in addition to displaying on the dashboard. , Changing a sign is easy as reprogramming it with advanced electronics and radio hardware embedded into poles, will be present to transmit programmed traffic signs wirelessly on the road.

2.Bhumika.R, Harshita. S.A, Meena. D, Asha. N, Accident Prevention and Road Safety in Hilly Region using IOT Module, International Research Journal of Engineering and Technology(IRJET). – 2021

Description : Stay away from mishap & forestall clog in sloping region & hairclip twist. As a significant part of street mathematical plan bended street portion.

3. Pooja Pawar, SuvarnaLangade, MohiniBandgar , IOT Based digital Notice Board using Arduino ATmega 328, International Research Journal of Engineering and Technology(IRJET). - 2019.

Description : Circulates notice regularly & reduce physical efforts. Send message at any distant location within a second.

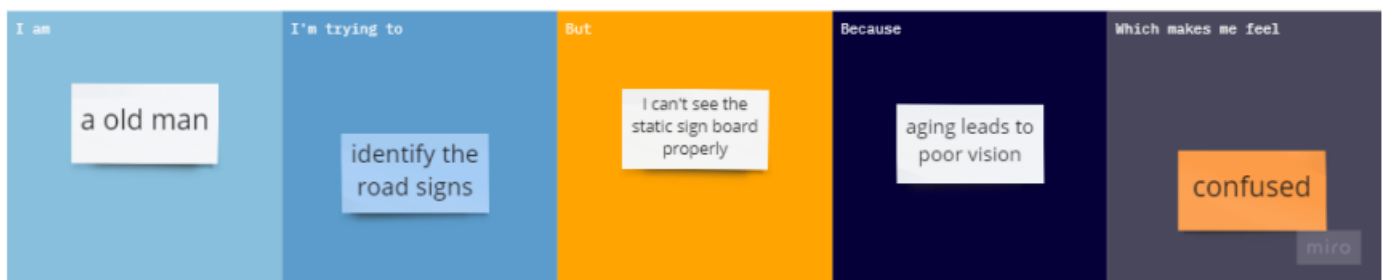
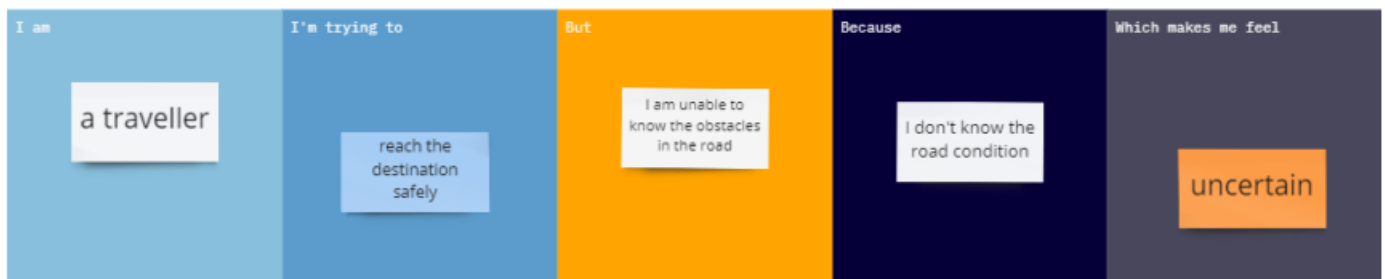
4. Sandeep Chaware, TrushithaChaware, Proposed Algorithm for Smart Traffic Control using Ultrasonic Sensor, International Journal of Engineering and Advanced Technology(IJEAT). - 2019.

Description : The outcome of the project is to learn insights of the traffic controlling and management at the signal with the dynamically changing in timing of timer as per need.

5. Deepika K. N, SangeethaThirumoorthy, Internet Of Things Based Notifications using Smart Notice Board, Sri Krishna College of Technology. - 2018

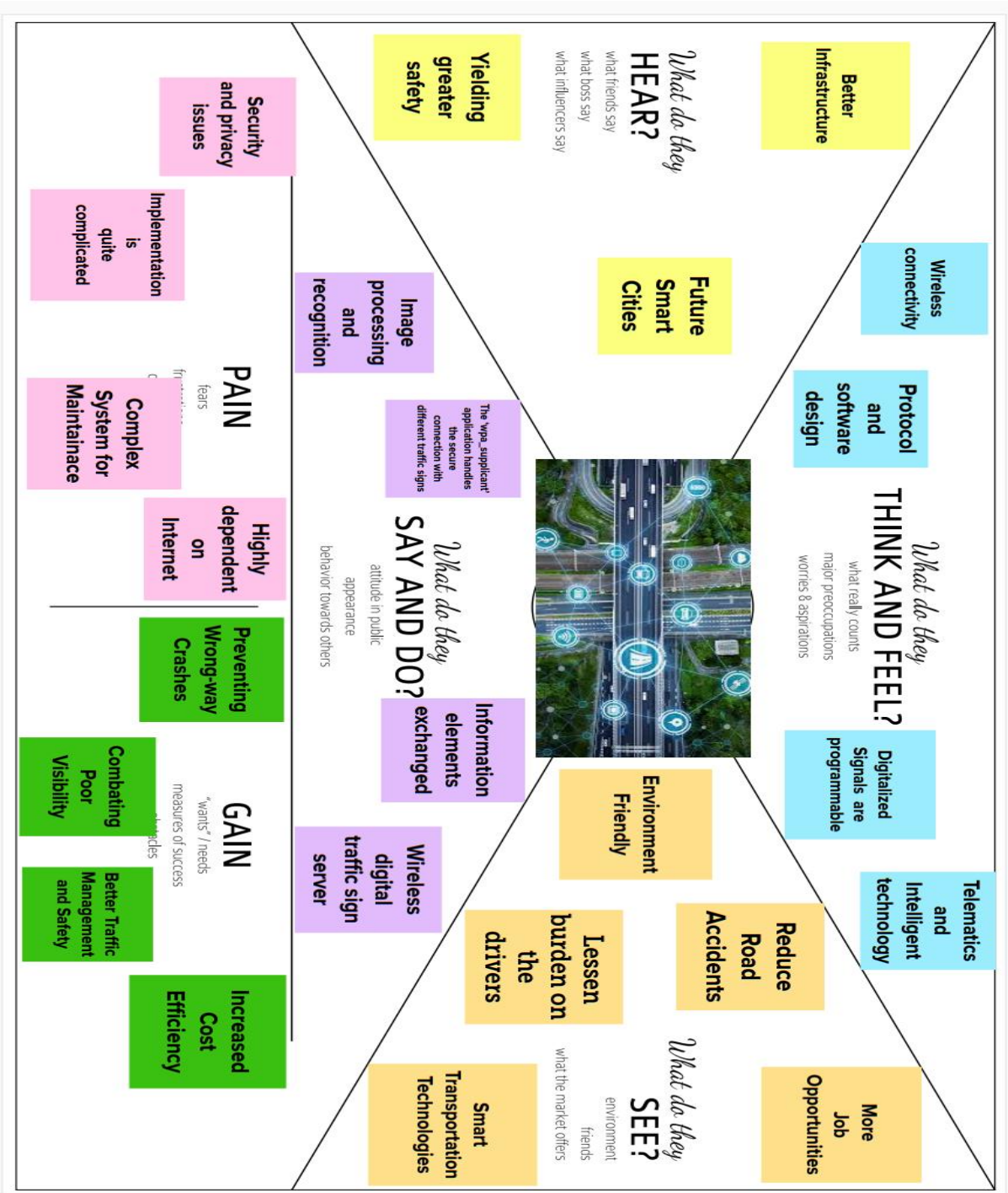
Description : By using this system in the field of wireless communication we can make communication more effective, fast and very easy handling method. With the help of this, displaying of notices can be updated by every second from anywhere and anytime through a mobile phone.

2.3 Problem Statement Definition:



3.IDEATION &PROPOSED SOLUTION:

3.1 Empathy Map:



3.2 Ideation & Brainstorming:

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.

1 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.

2 Define your problem statement
What problem are you trying to solve? Frame your problem as often (right) the statement. This will be the focus of your brainstorm.

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

4 Group ideas
Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, go back closer to examine the ideas. For clusters, bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

5 Prioritize
You have shared all the ideas on the same page about what's important, exciting, feasible. These are ideas on the page to determine which ideas are important and which are feasible.

Team ID: PNT2022TMD10209
Team Lead: Syed Sharukh
Team Members: Valluri Venkata Manju Vardhan Kumar Vikram Dammu Shahith S

PROBLEM
Traffic road signs have been implemented well in our city. But when it comes to digital signs, we are still in the early stages of implementation. It is a challenge to implement digital signs that are easy to use, secure, and reliable. We need to develop a system that can handle the challenges of digital signs. We need to develop a system that can handle the challenges of digital signs. We need to develop a system that can handle the challenges of digital signs.

Key values of brainstorming
Encourage creative and innovative ideas.

Syed Sharukh
Image processing and recognition
Wireless digital traffic sign server
Wireless connectivity
yielding greater safety

Vikram Dammu
Wireless connectivity
smart traffic violation detection
Regulations on hardware
Cost Efficiency

UI Design
Web Application
Beacon
Mobile App
Sign Data
Machine Learning
Wifi Technology
Raspberry Pie
Additional Features
Traffic Management
smart traffic violation detection

Valluri Venkata Manju Vardhan Kumar
smart intersections
Information elements exchanged
automatic computation of traffic volume
Programmable signs

Shahith S
Web applications
Data Accuracy
Monitoring and Surveillance
Accurate Outcomes
Weather
Security and Protection

Technologies
Machine Learning
Wifi Technology
Raspberry Pie

Features
Monitoring and Surveillance
Accurate Outcomes
Weather
Security and Protection

Additional Features
Traffic Management
smart traffic violation detection

Prioritize
A grid showing the prioritization of ideas based on Importance (Y-axis) and Feasibility (X-axis). Ideas are plotted as sticky notes on the grid.

3.3 Proposed Solution:

S. No	Parameter	Description
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"> The actual problem is that drivers are unable to know whether the road conditions is safe to travel or not. Hence there will be a need of guidance data for providing safety and to avoid travelling inconvenience to reach destination.

2.	Idea / Solution description	<ul style="list-style-type: none"> ▪ This problem can be overcome by introducing the GPRS Module, IR Sensor with Camera to sense the traffic intensity even in dark areas. ▪ Rain drop sensor to indicate the accumulation of rain has occurred. ▪ And also collecting information from the local peoples and decision made by controller, who controls display manually(Manpower).
3.	Novelty / Uniqueness	<ul style="list-style-type: none"> ▪ Voice indicators are placed in near, the display board location adjusted to that traffic signal area. It will indicate the road dangers to the public as it senses the nearby vehicles. ▪ Speed limit changes according to the weather condition using rain drop sensor.
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> ▪ Large number of accidents may be minimized by replacing smart signs instead of static signs. ▪ Obvious information only displayed. ▪ Reports severity. ▪ Sign changes dynamically depending upon the upcoming events.
5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> ▪ Systematic reduces manpower. ▪ The systems can be used in public and private sectors which gives good revenue. ▪ This type of system is helpful for education and medical institutions.
6.	Scalability of the Solution	<ul style="list-style-type: none"> ▪ User friendly interface. ▪ Accessibility of data is easy from source.

Precise information in sign boards can be easily captured.

3.4 Problem Solution Fit:

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS <ul style="list-style-type: none"> Awareness towards road infrastructure Data is useful in understanding the road user behavior & flow of traffic 	6. CUSTOMER CONSTRAINTS CC <ul style="list-style-type: none"> Customers no need to spend any power (or) Network connection If they fail to obey traffic rules, then their money were marked as charged fines as per the court 	5. AVAILABLE SOLUTIONS AS <ul style="list-style-type: none"> Record traffic offenses & provide existing data to collect, monitor, analyze with the periodic maintenance Monitoring the road events even in low light (or) in bad weather conditions 	Explore AS, differentiate
	2. JOBS-TO-BE-DONE / PROBLEMS J&P <ul style="list-style-type: none"> Keep providing of valid data through dynamic sign board system helps to allow people predicting day to day complexities face along the roadway Flow of data updating is quick & speedy, convenient and flexible 	9. PROBLEM ROOT CAUSE RC <ul style="list-style-type: none"> Especially most of the people busy with their mobile phone actions leads to get distracted & they lose attention of traffic Simply, road accidents either due to carelessness(or)due to lack of road safety awareness 	7. BEHAVIOUR BE <ul style="list-style-type: none"> Customer need to make consciousness With regard to publicized instructions Obey the traffic signs & restrictions 	

3. TRIGGERS TR <ul style="list-style-type: none"> Creating a note that gives a direction on how to recognize that system effectively 	10. YOUR SOLUTION SL <ul style="list-style-type: none"> Pre-functional record of specific voice record mode of data along with LED display provide in waiting time at traffic signs In this proposed system is interface with Rain drop sensor check if it rainy there, to transmit data over IOT helps to display on LED to along with WIFI connection of internet changing data dynamically with current reporting of event sensing flow of data 	8. CHANNELS of BEHAVIOUR CH <ul style="list-style-type: none"> Voice note Visual note
4. EMOTIONS: BEFORE / AFTER EM <ul style="list-style-type: none"> Before: Already existing of man-made static boards raising challenges due to un updated real-time issues & current changes of road events After: This system is better than existing method, of having automation of road signs & communication strategy in the manner of smart city to alert the drivers to reduce relay & congestion while travelling time 		

4.REQUIREMENT ANALYSIS:

4.1 Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Visibility	<ul style="list-style-type: none">• Informations can be written in short form in the sign boards so that it can be very easily captured by drivers.• Place sign boards on popular places.• Symbols can be used so that drivers can save some amount of time in reading.• Static signs can be replaced by smart signs to reduce accidents.
FR-2	User convenience	<ul style="list-style-type: none">• Display should be larger which can be visible from far distance.
FR-3	User need	<ul style="list-style-type: none">• Awareness programmes should be conducted to bring awareness among the users about road safety.• Road safety education is essential for users.

4.2 Non-functional Requirements:

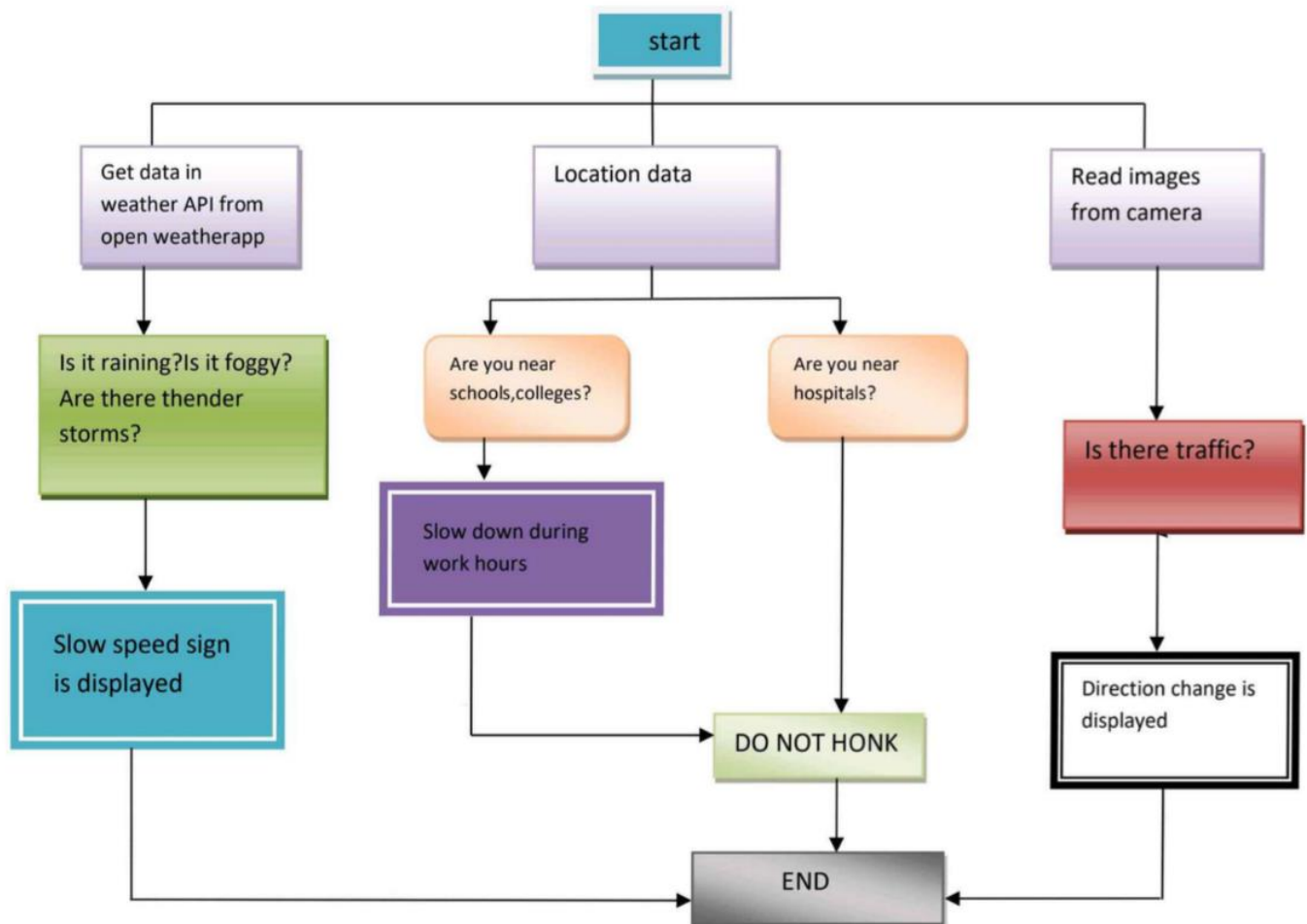
Following are the non-functional requirements of the proposed solution.

FR No	Non-Functional Requirement	Description
NFR-1	Usability	<ul style="list-style-type: none">• When crowd on accident occur it guides the travellers to choose best path.• Intimates the speed range depending upon roadway condition.• Ensure the vehicles are redirected to right path without causing much trouble for other drivers.

		<ul style="list-style-type: none"> • Easy to follow instructions based on given data on the digital board.
NFR-2	Security	<ul style="list-style-type: none"> • Prediction of data gives them a fair and better road understanding about their upcoming of toad events.
NFR-3	Reliability	<ul style="list-style-type: none"> • Helps to travellers behaviour towards awareness of travel.
NFR - 4	Performance	<ul style="list-style-type: none"> • Pre -functional record of voice record along with LED display provide in waiting time at traffic signs. • There is a rain drop sensor which checks whether there is a rain, to transmit data over IOT helps to display on LED along with wifi connection of internet changing data dynamically with current reporting of event sensing flow of data
NFR - 5	Availability	<ul style="list-style-type: none"> • Monitors the road events even in low light on poor weather conditions . • Record traffic offenses
NFR - 6	Scalability	<ul style="list-style-type: none"> • It is user friendly interface. • Data accessibility is easy from source.

5. PROJECT DESIGN:

5.1 Data Flow Diagrams:



5.2 Solution and Technical Architecture:

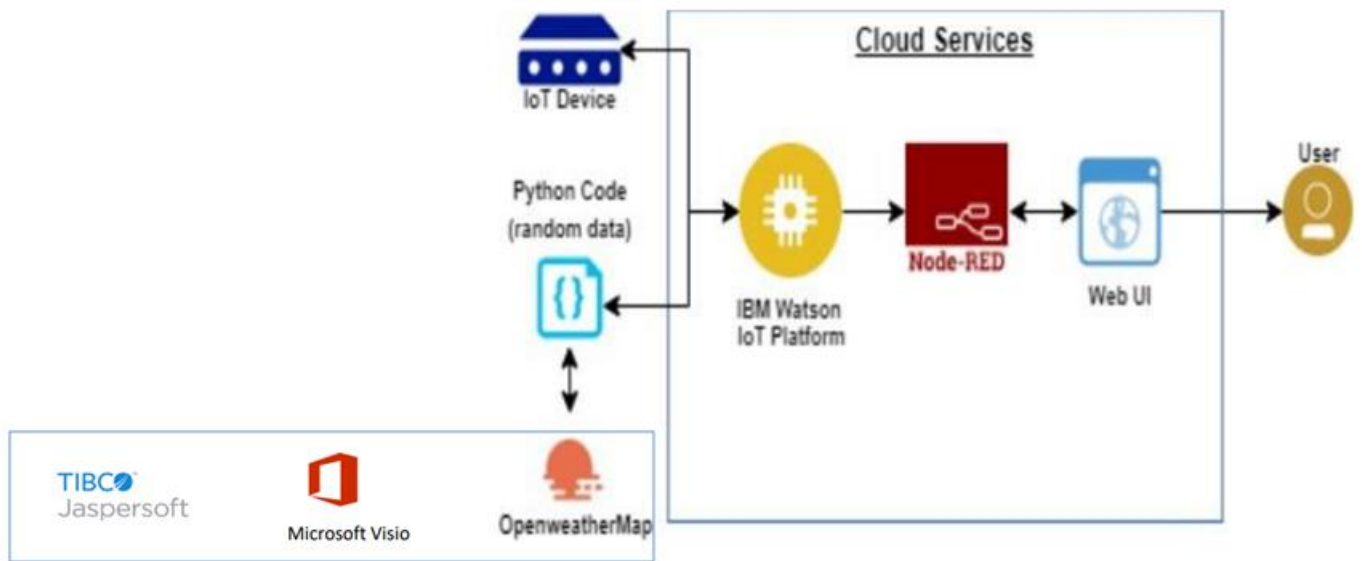


Table-1: Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	In what way we have to interact with the application	Python
2.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
3.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
4.	Cloud Database	Cloud which has database service	IBM DB2, IBM Cloudant etc.,
5.	External API-1	Purpose of External API used in the application	IBM Weather API
6.	External API-2	Purpose of External API used in the application	TIBSCO JasperSoft REST API

7.	External API-3	Purpose of External API used in the application	Visio JavaScript API
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Table 2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Security Implementations	Here no one will be able to access without login credentials in a very strong security system	Firebase, Firewall, Cyber resiliency strategy
2.	Scalable Architecture	By increasing the bandwidth the operating range can be increased	IOT Internet
3.	Availability	Available 24/7	IBM Cloud
4.	Performance	It can support a large amount of users to access the technology	IBM Cloud

5.3 User Stories:

User Type	Functional Requirement(epic)	User Story Number	User Story/Task	Acceptance Criteria	Priority	Release
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Customer (Drivers)	Distractions & Safety aspects	USN-1	The user don't know the road speed limit in the case of rainy or any other weather condition. So that they want to know appropriate speed limit for ensure safety.	The weather sensor sense the weather condition& the data send to the server.	High	Sprint-1
	Registration	USN-2	Login into the application	I can access dashboard	High	Sprint-1
		USN-3	I will receive email once I have registered for the application	Receive email & confirm	High	Sprint-1
	Login	USN-4	User can login into the application by entering email and password	I can login to my account	High	Sprint -2
	Dashboard	USN-5	Through sensor, speed limitation is monitored	Decrease the speed limit	High	Sprint-2
		USN-5	I can get info about road accidents	I can use the alternative route to reach my destination	Medium	Sprint-2
Web users	usage	USN-1	Use of Node Red	Connect devices	High	Sprint-3
Customer	Working	USN-1	User can access the features	I can select the destination, speed Alert etc	High	Sprint-3
		USN-2	User can get alert and required action to take during the process	I can act according to the alert displayed on the dashboard	High	Sprint-4

Customer care executive	Action	USN-1	User can solve the problem faced during the procedure	I can solve problem faced when someone fails to understand the process	High	Sprint-4
Administrator	Analysis data & sending	USN-7	Monitoring & updating the information	Monitoring the sensor data & sign board	Medium	Sprint-4

6. PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning & Estimation:

TITLE	DESCRIPTION	DATE
Literature Survey on The Selected Project and Information Gathering	A Literature Survey is a compilation summary of research done previously in the given topic. Literature survey can be taken from books, research paper online or from any source.	25 September 2022
Prepare Empathy Map	Empathy Map is a visualization tool which can be used to get a better insight of the customer	19 September 2022
Ideation-Brainstorming	Brainstorming is a group problem solving session where ideas are shared, discussed and organized among the team members.	20 September 2022

Define Problem Statement	A Problem Statement is a concise description of the problem or issues a project seeks to address. The problem statement identifies the current state, the desired future state and any gaps between the two.	17 September 2022
Problem Solution Fit	This helps us to understand the thoughts of the customer their likes, behaviour, emotions etc.	02 October 2022
Proposed Solution	Proposed solution shows the current solution and it helps is going towards the desired result until it is achieved.	19 September 2022
Solution Architecture	Solution Architecture is a very complex process I.e. it has a lot of sub- processes and branches. It helps in understanding the components and features to complete our project.	19 September 2022
Customer Journey	It helps us to analyse from the perspective of a customer, who uses our project.	15 October 2022
Functional Requirement	Here functional and nonfunctional requirements are briefed. It has specific features like usability, security, reliability, performance, availability, and scalability.	16 October 2022

Data Flow Diagrams	Data Flow Diagram is a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement.	15 October 2022
Technology Architecture	Technology Architecture is a more well defined version of solution architecture. It helps us analyze and understand various technologies that needs to be implemented in the project.	17 October 2022
Prepare Milestone & Activity List	It helps us to understand and evaluate our own progress and accuracy so far.	29 October 2022
Spring Delivery Plan	Sprint planning is an event in scrum that kicks off the sprint. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved.	09 November 2022

6.2 Sprint Delivery Schedule:

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint1	Resources Initialization	Create and initialize accounts in various public APIs like Open Weather API.	13	LOW	Syed Sharukh, Valluri Venkata Manju Vardhan Kumar

Sprint1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location.	1	MEDIUM	Syed Sharukh, Valluri Venkata Manju Vardhan Kumar
Sprint2	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	MEDIUM	Syed Sharukh, Valluri Venkata Manju Vardhan Kumar, Vikram Dammu , Shahith S
Sprint3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH	Syed Sharukh, Valluri Venkata Manju Vardhan Kumar, Vikram Dammu , Shahith S
Sprint4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW	Syed Sharukh, Valluri Venkata Manju Vardhan Kumar, Vikram Dammu , Shahith S

PROJECT TRACKER:

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	02 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	09 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	17 Nov 2022

Velocity:

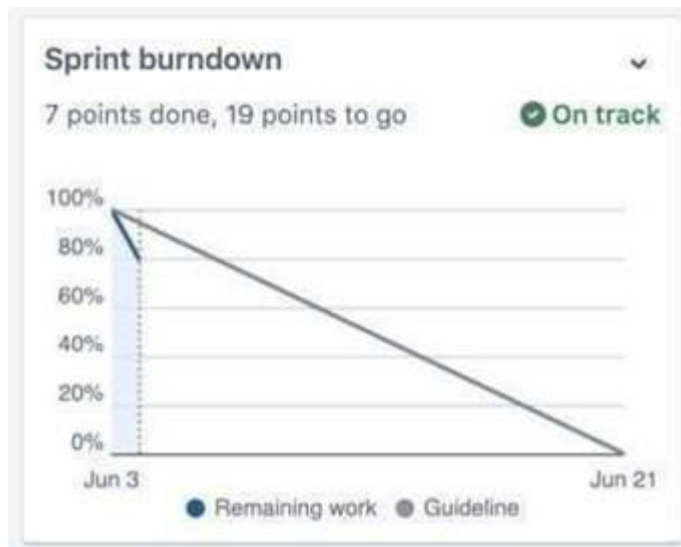
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{\text{sprint duration}}{\text{velocity}} = \frac{20}{10} = 2$$

Given: Sprint duration=6Days velocity=20AV=6/20=0.3
AV=0.3

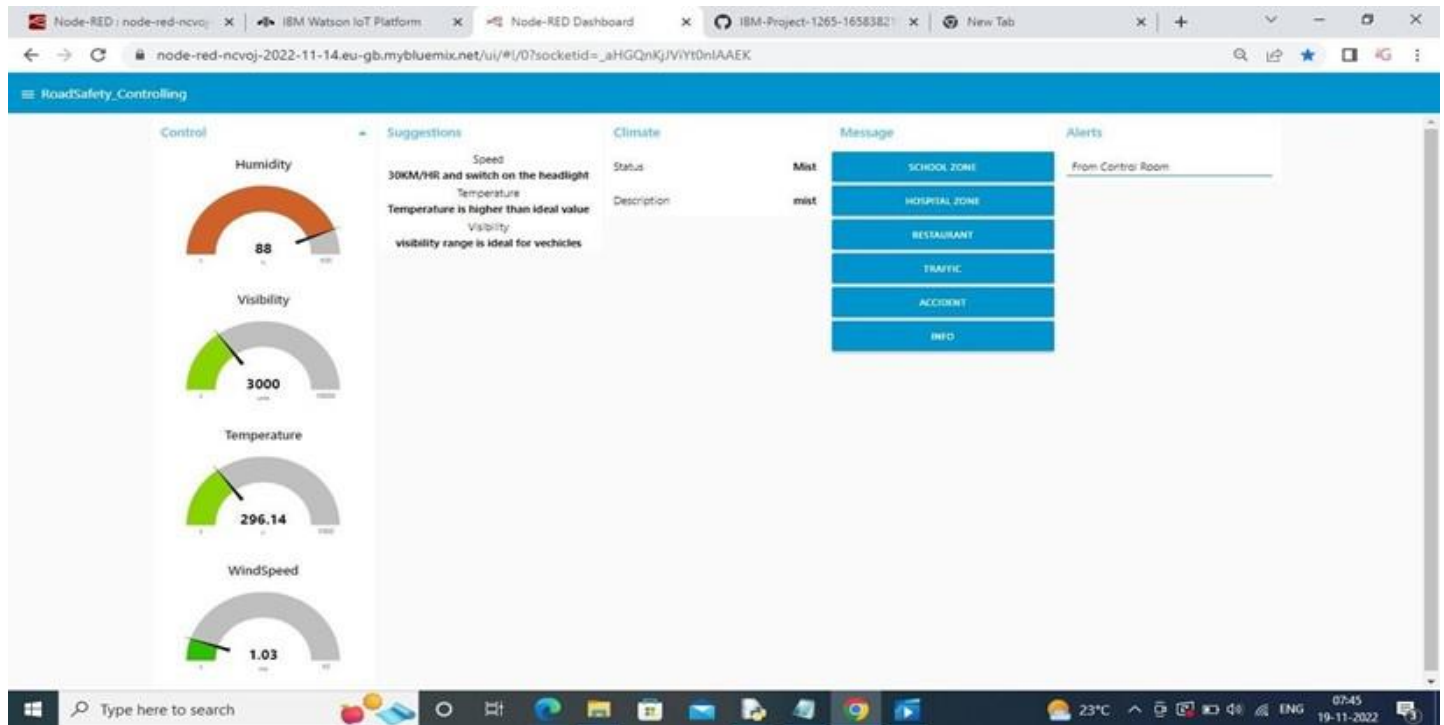
Burndown Chart:

A burndown chart is a graphical representation of work left to do versus time. However, burndown charts can be applied to any project containing measurable progress overtime.

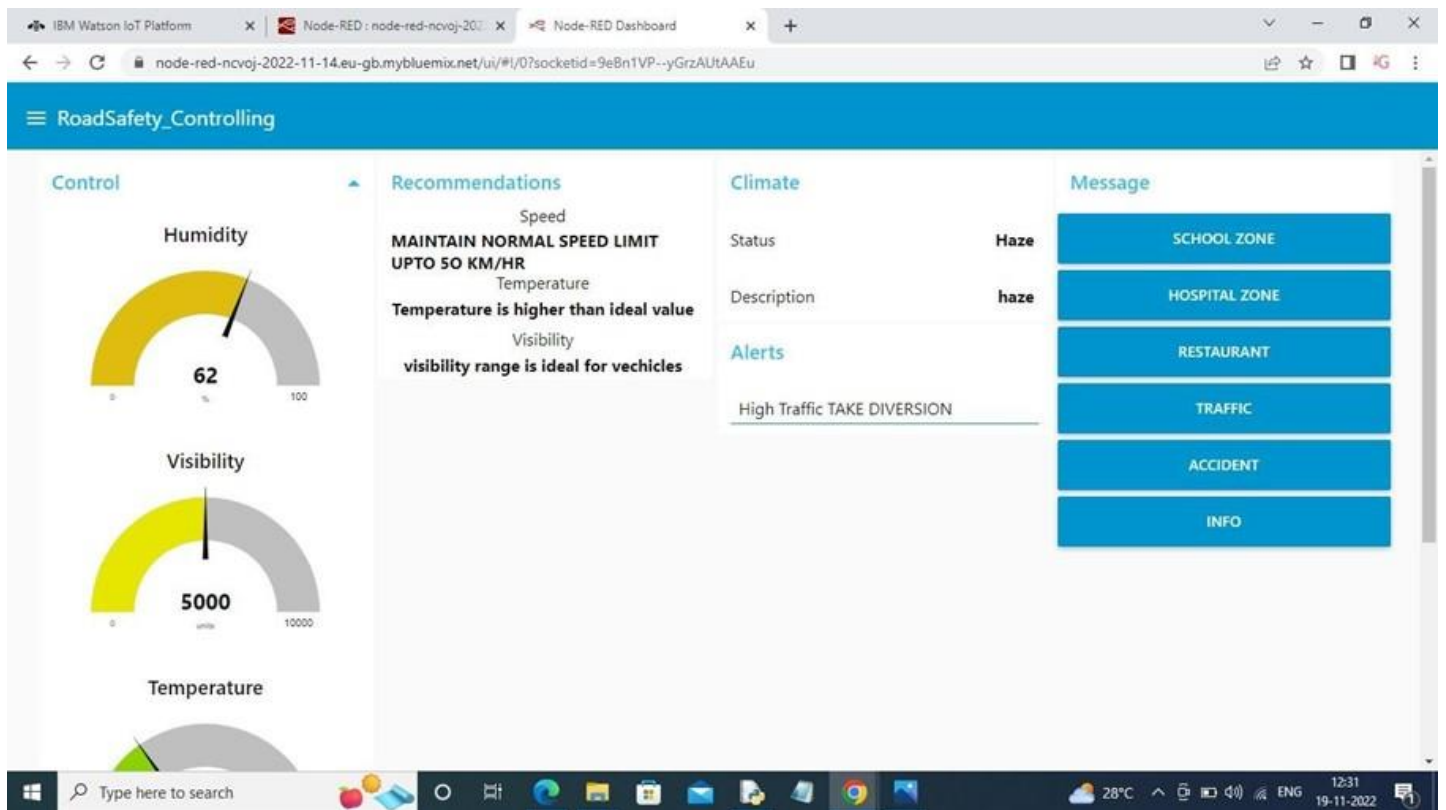
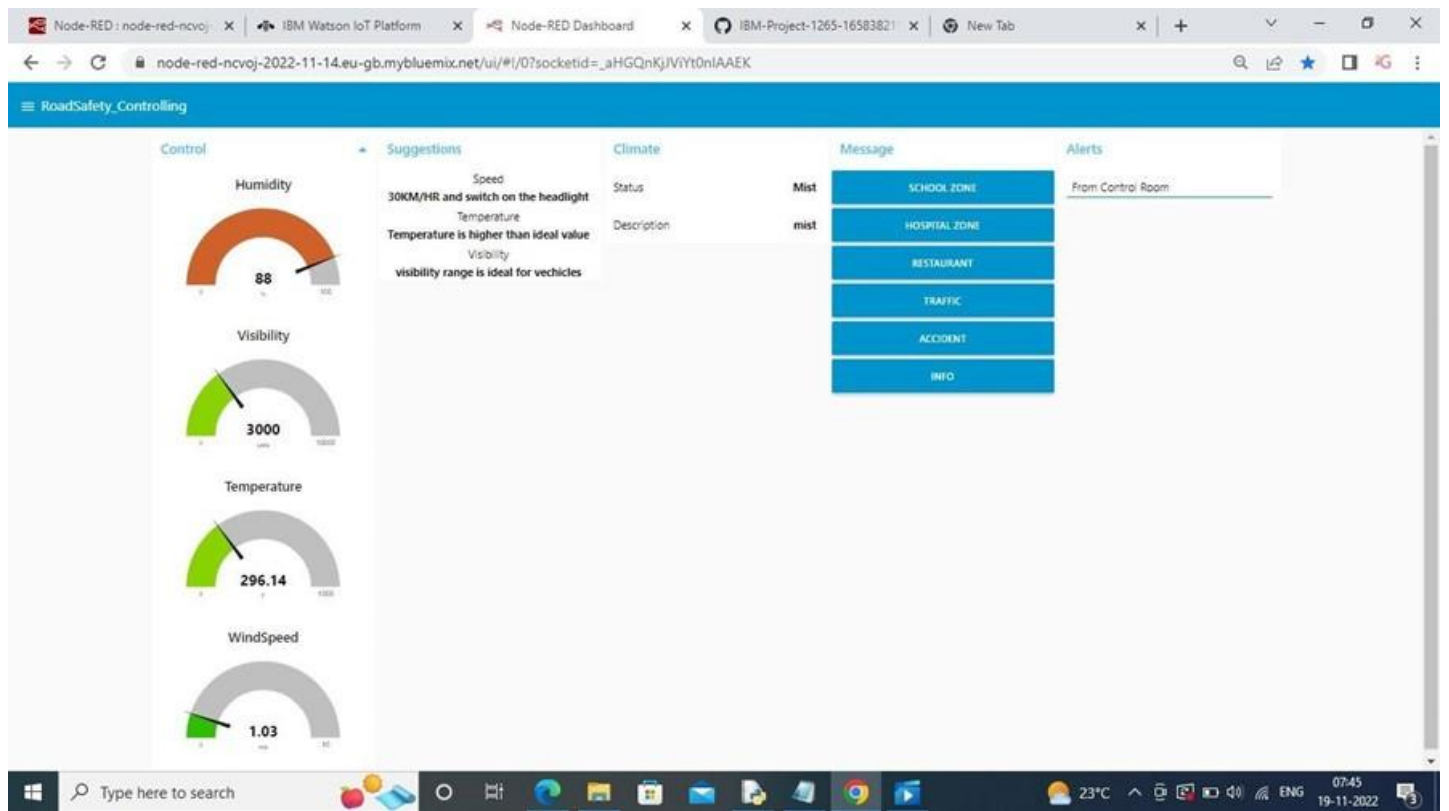


7. CODING & SOLUTIONING :

7.1 Feature 1



7.2 Feature 2 :



8 TESTING:

8.2 Test Cases

Testcases Report - Excel								
Syed Sharukh								
File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do								
Clipboard Font Alignment Number Styles Cells Editing								
N15 Syed Sharukh Manju Vardhan								
A B C D E F G H								
1				Date	14-Nov-22			
2				Team ID	PNT2022TMID10209			
3				Project Name	s with smart connectivity for better			
4				Maximum Marks	4 marks			
Test case ID	Feature Type	Component	Test Scenario	Pre-Requirement	Steps To Execute	Test Data	Expected Result	Actual Result
6 LoginPage_TC_01	UI	Home	Verify whether user is able to login	URL	https://node-red-ncoj-2022-11-14.eu-1.console.aws.amazon.com/lambda/home?region=eu-west-1#/functions/lambda-node-red-ncoj-2022-11-14-01	URL	Able to access the URL	Failed
7 LoginPage_TC_02	UI	Home	Verify whether user is able to login	URL	https://node-red-ncoj-2022-11-14.eu-1.console.aws.amazon.com/lambda/home?region=eu-west-1#/functions/lambda-node-red-ncoj-2022-11-14-02	URL	Now User able to access the URL	Able to access
8 CloudStorage_TC_01	Functional	CLOUD	Verify the temperature and humidity	CLOUD	1. Temperature and Humidity	Temperature in Celsius	Speed levels and range of	Does not
9 CloudStorage_TC_02	Functional	CLOUD	Verify the temperature and humidity	CLOUD	1. Temperature and Humidity	Temperature in Celsius	Now speed levels and range	Now it
10 Response_TC_01	Functional	IOT	Verify Traffic clearance if	IOT Device	1. Check whether any accident or	Accident - "TAKE	Displayed Instructions	Does not
11 Response_TC_02	Functional	IOT	Verify Traffic clearance if	IOT Device	1. Check whether any accident or	Accident - "TAKE	Displayed Instructions	Now
12 Output_TC_007	Functional	CLOUD	Verify the location and indicates if any school/Hospital/Restaurant are there	CLOUD	1. Take the location data 2. Pinned the nearby school/Hospital/Restaurants	School/Hospital/Restaurant's location data	Indication for School/Hospital/Restaurants as per pinned location	Does not include location
13 Output_TC_008	Functional	CLOUD	Verify the location and indicates if any school/Hospital/Restaurant are there	CLOUD	1. Take the location data 2. Pinned the nearby school/Hospital/Restaurants	School/Hospital/Restaurant's location data	Indication for School/Hospital/Restaurants as per pinned location	Location data included

Testcases Report - Excel								
Syed Sharukh								
File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do								
Clipboard Font Alignment Number Styles Cells Editing								
F3 Project - Signs with smart connectivity for better road safety								
F G H I J K L M N O P								
1	14-Nov-22							
2	PNT2022TMID10209							
3	s with smart connectivity for better							
4	4 marks							
Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
6 https://node-red-ncoj-2022-11-14.eu-1.console.aws.amazon.com/lambda/home?region=eu-west-1#/functions/lambda-node-red-ncoj-2022-11-14-01	URL	Able to access the URL	Failed to	Fail	Wrong browser	NO	101	Syed Sharukh
7 https://node-red-ncoj-2022-11-14.eu-1.console.aws.amazon.com/lambda/home?region=eu-west-1#/functions/lambda-node-red-ncoj-2022-11-14-02	URL	Now User able to access the	Able to access	Pass	Able to access in	yes	102	Syed Sharukh
8 1. Temperature and Humidity	Temperature in Celsius	Speed levels and range of	Does not	Fail	Could not connected	NO	107	Manju vardhan
9 1. Temperature and Humidity	Temperature in Celsius	Now speed levels and range	Now it	Pass	Could connected	YES	108	Vikram Dammu
10 1. Check whether any accident or	Accident - "TAKE	Displayed Instructions	Does not	Fail	Check the inputs	NO	116	Shahith S
11 1. Check whether any accident or	Accident - "TAKE	Displayed Instructions	Now	Pass	Now verified	YES	117	Shahith S
12 1. Take the location data 2. Pinned the nearby school/Hospital/Restaurants	School/Hospital/Restaurant's location data	Indication for School/Hospital/Restaurants as per pinned location	Does not include the location data	Fail	School - speed limit should below 40km/hr Hospital - Don't use horn	NO	129	Syed Sharukh Manju Vardhan
13 1. Take the location data 2. Pinned the nearby school/Hospital/Restaurants	School/Hospital/Restaurant's location data	Indication for School/Hospital/Restaurants as per pinned location	Location data included	Pass	Verified indications School - speed limit should below 40km/hr Hospital - Don't use horn	YES	130	Syed Sharukh Manju Vardhan

8.3 User Acceptance Testing:

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the web UI which provides signs with smart connectivity for better road safety at the time of the release to user acceptance testing.

2. Defect analysis

Section	Total Cases	Not tested	Fail	Pass
Print Engine	20	0	0	10
Client application	21	0	0	20
Security	4	0	0	4

This report shows the no.of resolved or closed bugs at each severity level, and how they were resolved.

Resolution	Severity 1	Severity2	Severity 3	Severity 4	Subtotal
By design	7	3	2	2	14
Duplicate	4	0	4	0	8
External	4	2	0	2	8
Fixed	6	1	3	8	18
Not reproduced	0	0	0	0	0
Skipped	2	1	2	1	6
Won't fix	0	2	1	1	4
Totals	23	9	12	14	58

Test Case Analysis

This report shows the no.of test cases that have passed ,failed, untested.

Outsource shipping	4	0	0	4
Exception reporting	5	0	0	5
Final report output	4	0	0	4
Version control	3	0	3	3

9 RESULTS

9.1 Performance Metrics

Performance Testing (1) - Excel									
File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do									
Clipboard Font Alignment Number Styles Cells Editing									
A1									
NFT - Risk									
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volume Changes	Risk Score	Justification
1	Signs with smart connectivity for better road safety	Existing	Moderate	No Changes	Low	It Causes minor delay in runtime and some of display boards in static method.	>10 to 30%	GREEN	As we have seen the changes, it adds the setup time
NFT - Detailed									
S.No	Project Overview	NFT Test approach	Assumptions/Dependencies/Risks	Approvals/SignOff					
1	Signs with smart connectivity for better road safety	LOAD	Requirement of Alternates in hardware, Imposed Accuracy	SignOff					
End Of Test									
S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff	
1	providing accurate instructions for road users as per situation using smart signs LCD display	LOAD	NFR	Weather, Traffic and fatal situations are displayed with respect to the location.	GO	To have advanced versions in browsers uri accessible method	Closed	Approval	

10.ADVANTAGES & DISADVANTAGES :

Advantages:

- Enable a better way for drivers to access the information.
- Smart intersection help to address increasing traffic density and improve road safety.
- Can also help cities adapt for long term sustainable transportation needs.
- It enables you to control traffic, catch lawbreakers, and provide road safety.

Disadvantages:

- May give faulty results.
- Not the best option for long distance.
- Not practical for all roads.

11.CONCLUSION :

Road accidents cannot be eliminated but can be reduced by enhancing the safety of the drivers. This study developed a smart mobile-based application that uses in-built sensors to alert drivers with voice and image notifications. The application provides a voice alert to a needed action that enhances the driver's attention. The smartphone is used to avoid the need for onboard devices to detect and recognize road signs, sensors on road infrastructure, and the use of WLAN. According to the experimental results, the proposed methodology has the benefits of high accuracy within a user radius of 10 meters, minimum bandwidth, and low-cost application. All notifications are released in a close range of 250 meters before the actual signs. Furthermore, the system administrator can monitor the system by using a cloud dashboard. The dashboard provides reports such as the number of requests made by users, errors, and traffic responses. Moreover, the system is secured to avoid unauthorized access to sensitive information. The security key was generated and added to the manifest file of the application and only requests made with the API key authenticate each user of the system.

12.FUTURE SCOPE:

- To create traffic free city
- To maintain zero accidents
- Spread all the road rules to all road user.

13. APPENDIX :

SOURCE CODE :

```
import time
import sys

import
ibmiotf.application

import ibmiotf.device

import random
import requests

from pprint import pprint
```

```
#Provide your IBM Watson Device Credentials
```

```
organization = "uaortj"
```

```
deviceType = "weatherapptype"
```

```
deviceId = "weatherappid"
```

```
authMethod = "token"
```

```
authToken = "app12345678"
```

```
city = input('Enter your city : ')
```

```
url = 'http://api.openweathermap.org/data/2.5/weather?q={}&appid=b23b5fad240356d80f95242dcf1d6cad'.format(city)
```

```

res = requests.get(url)

data = res.json()

temp = data['main']['temp']
humidity = data['main']['humidity']

wind_speed = data['wind']['speed']

latitude = data['coord']['lat']
longitude = data['coord']['lon']

visibility = data['visibility']

main = data['weather'][0]['main'] description
= data['weather'][0]['description']

print('Temperature : {} degree celcius'.format(temp))
print('Humidity : {} %'.format(humidity))

print('Wind Speed : {} m/s'.format(wind_speed))

print('Latitude : {}'.format(latitude))
print('Longitude : {}'.format(longitude))

print('Visibility : {}'.format(visibility))

print('Main : {}'.format(main))
print('Description : {}'.format(description))

#TRAFFIC AND FATAL SITUATION ALERT BY ROADSAFETY CONTROL
OFFICE(SPRINT 3) - {REQUIREMENT 2 OF THE PROJECT TO DISPLAY
THE ALERT AND DIVERSION MESSAGE THAT WAS FROM ROAD
SAFETY OFFICE

import wiotp.sdk.device
#importing library files for connecting with CLOUD,sdk=software developement
kit import requests #for API request import json
#converting it to json(key:values)
myConfig = {
"identity": {
"orgId": "uaortj",

```

```

"typeId": "Monitor_devicetype",
#configuration with CLOUD, finding identity
"deviceId": "Monitor_deviceid"
},
"auth": {
    "token": "sngs123monitor" #authenticating with cloud device
}
}

```

#TRAFFIC AND FATAL SITUATION ALERT MESSAGE DISPLAYING IN WEB UI
WHEN THE

```

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
#initialising device client with above myconfig detail
client.connect() def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" %cmd.data['command'])
    m=cmd.data['command']
    ALERT=""

```

#THIS IF CONDITION BLOCK IS FOR TRAFFIC AND FATAL SITUATION ALERT
MESSAGE DISPLAYING IN WEB UI WHEN THE MESSAGE WAS RECEIVED FROM THE ROAD SAFETY OFFICE
if (m=="TRAFFIC"):

```

    ALERT="TRAFFIC - TAKE DIVERSION"
    print("*****//TAKE DIVERSION//*****")
elif(m=="ACCIDENT"):
    ALERT="ACCIDENT - TAKE DIVERSION"
    print("*****//TAKE DIVERSION//*****")
else: ALERT="HAVE A NICE DAY!" print("HAVE A NICE DAY!")
mydata1={"SITUATION":ALERT,}
client.publishEvent("Monitor_deviceid","json",mydata1)
while True:
    print("=====")

```

```

weatherData =
requests.get('https://api.openweathermap.org/data/2.5/weather?q=Chennai,IN&appid=b23b5fad 2
40356d80f95242dcf1d6cad')
b = weatherData.json() temp =
b["main"]["temp"] humi =
b["main"]["humidity"]
= b["weather"][0]["main"] #0th index is taken from the object
description = b["weather"][0]["description"]
visibility = b["visibility"]
Windspeed = b["wind"]["speed"]
TemperatureRecommendation = ""
SpeedRecommendation = ""
RecommendationForVisibilty = ""
#print("Temperature(celcius) :",
b["main"]["temp"])

```

```

if(temp > 33):

    TemperatureRecommendation="Temperature is higher than ideal value"
    print("Temperature is higher than ideal value")    elif(temp<19):

        TemperatureRecommendation="Temperature is lower than ideal
        value"    print("Temperature is lower than ideal value")    else:
        TemperatureRecommendation="Temperature is ideal"
        print("Temperature is ideal ")

        #print("Humidity :",b["main"]["humidity"])

        #print("WeatherCondition",(b["weather"][0]["main"]))
    if(main == "Rain"):

        rain = b["rain"]["1h"]

        SpeedRecommendation = "30KM/HR ,ROAD WILL BE SLIPPERY"

    #print("Rain:",b["rain"]["1h"])

    #print("SPEED RECOMMENDATION : 30KM/HR ,ROAD WILL BE SLIPPERY")    elif(main == "Drizzle"):

        SpeedRecommendation = "30KM/HR"

    #print("SPEED RECOMMENDATION : 30KM/HR")
    elif(main == "Mist"):

        SpeedRecommendation = "30KM/HR and switch on the headlight"

    #print("SPEED RECOMMENDATION : 30KM/HR and switch on the Headlight") elif(main ==
        "Thunderstorm"):

        SpeedRecommendation = "30KM/HR and stay away in the open place" #print("SPEED
        RECOMMENDATION : 30KM/HR and stay away in the open place")

    #print("Description of weather :",b["weather"][0]["description"]))

    #print("visibility",(b["visibility"]))
    if(visibility<1000):

        RecommendationForVisibilty = "SPEED RECOMMENDATION : 30KM/HR and SWITCH ON
        THE HEAD LIGHT"    else:

        RecommendationForVisibilty = "Visibility range is ideal for vehciles"

    #print("SPEED RECOMMENDATION : 30KM/HR and SWITCH ON THE HEAD LIGHT")
    mydata={"temperature":temp,

    "TemperatureRecommendation":TemperatureRecommendation,"humidity":humi,"WeatherCond
    ition":main,"SpeedRecommendation":SpeedRecommendation

```

```
, "DescriptionOfWeather":description, "visibility":visibility, "RecommendationForVis
ibility":RecommendationForVisibilty, "WindSpeed":Windspeed}    print(mydata)
client.publishEvent("Monitor_deviceid", "json", mydata)    client.commandCallback
= myCommandCallback
```

#HOSPITAL, SCHOOL AND PEOPLE CROWDED AREA LIKE RESTAURANT
 SIGNS DISPLAYED SPEED RECOMMENDATION ARE PROVIDED (SPRINT
 4) - {REQUIREMENT 3 OF THE PROJECT TO DISPLAY HOSPITAL AND
 SCHOOL REGION BY THE ROAD SAFETY CONTROL OFFICE}

#OPENWEATHER MAP (SPRINT 2) - {REQUIREMENT 1 OF THE PROJECT TO GET
 WEATHER DATA}

```
import wiotp.sdk.device #importing library files for connecting with CLOUD, sdk=software
development kit import requests #for API request import json #converting it to
json(key:values) import sys myConfig = {
```

```
    "identity": {
        "orgId": "uaortj",
        "typeId": "Monitor_devicetype", #configuration wit CLOUD, finding identity
    "deviceId": "Monitor_deviceid"
    },
    "auth": {
        "token": "sngs123monitor" #authenticating with cloud device
    }
}
```

#TRAFFIC AND FATAL SITUATION ALERT MESSAGE DISPLAYING IN WEB UI WHEN THE

```
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None) #initialising device client
with above myconfig detail client.connect() ALERT="" NOTIFY="" def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
m=cmd.data['command']
```

#THIS IF COMDITION BLOCK IS FOR TRAFFIC AND FATAL SITUATION ALERT
 MESSAGE DISPLAYING IN WEB UI WHEN THE MESSAGE WAS RECEIVED FROM
 THE ROAD SAFETY OFFICE


```

        ALERT="TRAFFIC - PLEASE WAIT OR PREFER ANOTHER ROUTE"    print("*****///PLEASE WAIT OR
PREFER ANOTHER ROUTE///*****")    elif(m=="ACCIDENT"):

        ALERT="ACCIDENT          -          TAKE          DIVERSION"
print("*****///TAKE          DIVERSION///*****")
elif(m=="MESSAGE"):          ALERT="HAVE A NICE DAY!"
print("HAVE A NICE DAY!")          #THE BELOW CONDITION BLOCK
IS TO DISPLAY
HOSPITAL ,SCHOOL, AND RESTAURANT
REGIONED AREA AND SPEED
RECOMMENDATION    if(m=="SCHOOL"):

        NOTIFY="SCHOOL REGION MAINTAIN SPEED LIMIT BELOW 40KM/HR"    print("SCHOOL REGION
MAINTAIN SPEED LIMIT BELOW 40KM/HR")    elif(m=="HOSPITAL"):

        NOTIFY="HOSPITAL REGION DONT USE HORN"    print("HOSPITAL REGION
DONT USE HORN")    elif(m=="RESTAURANT"):

        NOTIFY="CROWDED AREA PLEASE MAINTAIN SPEED LIMIT"
print("CROWDED AREA PLEASE MAINTAIN SPEED LIMIT")    mydata1={}
if(m=="TRAFFIC" or m=="ACCIDENT" or m=="MESSAGE"):

        mydata1={"SITUATION":ALERT}    elif(m=="SCHOOL"or m=="HOSPITAL" or
m=="RESTAURANT" ):

        mydata1={"CAUTION":NOTIFY}
client.publishEvent("Monitor_deviceid","json",mydata1)
while True:

print("=====
====")    AREA = "Chennai,%20IN"    weatherData
=

requests.get("https://api.openweathermap.org/data/2.5/weather?q=Chennai,IN&appid=b23b5fad

        main = b["weather"][0]["main"]    #0th index is taken from the object    description =
b["weather"][0]["description"]

        visibility = b["visibility"]

        Windspeed = b["wind"]["speed"]

        TemperatureRecommendation = ""

        SpeedRecommendation = ""

        RecommendationForVisibilty = ""

```

```

    #print("Temperature(celcius)
: ",b["main"]["temp"])    if (temp>33):

        TemperatureRecommendation="Temperature is higher than ideal value"

        #print("Temperature is higher than
ideal value")    elif (temp<19):

            TemperatureRecommendation="Temperature is lower than ideal value"

            #print("Temperature is lower than
ideal value")    else:

                TemperatureRecommendation="Temperature is ideal"

                #print("Temperature is ideal ")

                #print("Humidity : ",b["main"]["humidity"])

#print("WeatherCondition",(b["weather"][0][
"main"]))    if (main == "Rain"):

    rain = b["rain"]["1h"]

    SpeedRecommendation = "30KM/HR ,ROAD WILL BE SLIPPERY"

    #print("Rain:",b["rain"]["1h"])

    #print("SPEED RECOMMENDATION : 30KM/HR ,ROAD WILL BE SLIPPERY")    elif (main == "Drizzle"):

        SpeedRecommendation = "30KM/HR"

        #print("SPEED RECOMMENDATION :
30KM/HR")    elif (main == "Mist"):

            SpeedRecommendation = "30KM/HR and switch on the headlight"

            #print("SPEED RECOMMENDATION : 30KM/HR and switch on the Headlight")    elif (main ==
"Thunderstorm"):

                SpeedRecommendation = "30KM/HR and stay away in the open place"

                #print("SPEED RECOMMENDATION : 30KM/HR and stay away in the open place")    elif (main ==
"Clouds" or "Haze"):

                    SpeedRecommendation = "MAINTAIN NORMAL SPEED LIMIT UPTO 50 KM/HR"

                    #print("SPEED RECOMMENDATION : 30KM/HR and stay away in the open place")

                    #print("Description of weather :",(b["weather"][0]["description"]))

                    RecommendationForVisibilty = "SPEED RECOMMENDATION : 30KM/HR and SWITCH
ON THE HEAD LIGHT"    else:

```

```
RecommendationForVisibilty = "visibility range is ideal for vechicles"
```

```
#print("SPEED RECOMMENDATION : 30KM/HR and SWITCH ON THE HEAD LIGHT")
mydata={"temperature":temp,
"TemperatureRecommendation":TemperatureRecommendation,"humidity":humi,"WeatherCondition":main,"SpeedRecommendation":SpeedRecommendation
,"DescriptionOfWeather":description,"visibility":visibility,"RecommendationForVisibilty":RecommendationForVisibilty,"WindSpeed":Windspeed,"LOCATION":AREA} print(mydata)
client.publishEvent("Monitor_deviceid","json",mydata) client.commandCallback = myCommandCallback
```

GITHUB LINK:

<https://github.com/IBM-EPBL/IBM-Project-33963-1660230011>

DEMO LINK:

<https://youtu.be/GFtM7ENzXSo>