SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

PROJECT REPORT

Submittted by

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1. Introduction

Project Overview

This goal of this project is to replace the static signboards with smart connected

sign boards to get the speed limitations from a web app using weather API and update with automatically based on the weather conditions , set diversions throughAPI and warn drivers for school zones and hospital zones.

Purpose

To replace the static signboards , smart connected sign boards are used.

- These smart connected sign boards get the speed limitationsfrom a web app using weather API and update automatically.
- Based on the weather changes the speed may increase or decrease .
- Traffic diversion signs are displayed.
- Messages indicating school , hospital , police station zones arealso displayed.

2. Literature Survey

Existing problem

A phenomenon in transportation known as traffic congestion may involve large crowds ,slowed vehicle speeds ,and even longer vehicle lengths . when there is a high demand for traffic ,the interaction of the moving cars slows down the of trafficwhich eventually leads to the congestion. Smart traffic management systems can beimplemented in the correct situation to address these issues ,and we are now researching ways to create cities with no traffic .this system aids in traffic monitoring.

References

S.No	Paper Title	AUTHOR NAME	PUBLICATION YEAR

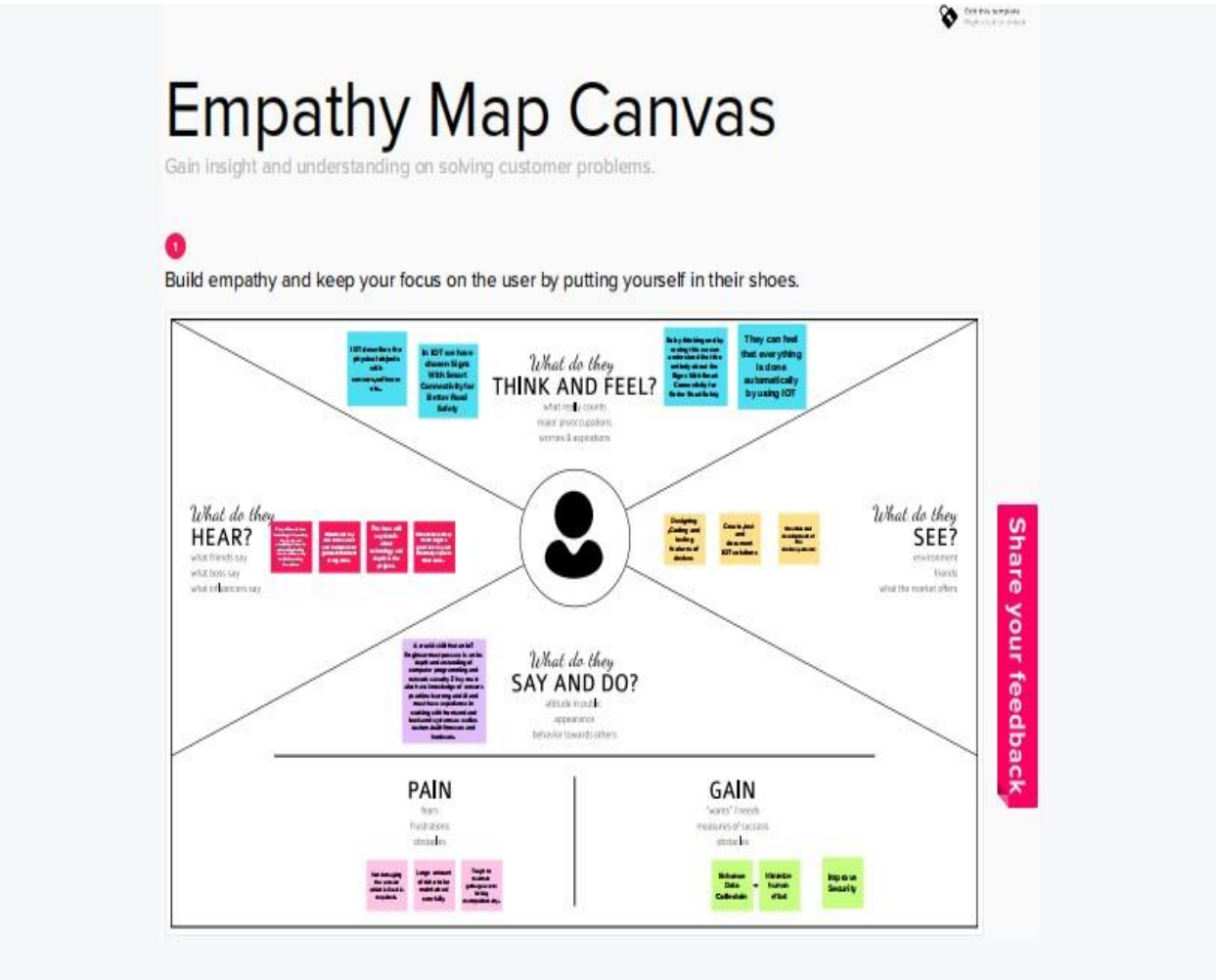
1.	**European road assement program(Euro Rap)**	**European Road safety Atlas**	**2020**
2.	**Save LIVES-A road safety technical package**	**World Health Oraganization**	**2017**
3.	**Global Status report on Road safety**	**World Health Oraganization**	**2015**

Problem Statement Definition

Many factors increase both the risk of road traffic crashes and the risk of death or injury they result in. Driving at speed significantly increases both the likelihood of a crash occurring, and the severity of it's consequences. For every 1% increase in mean speed there is a 4% increase in fatal crash risk.

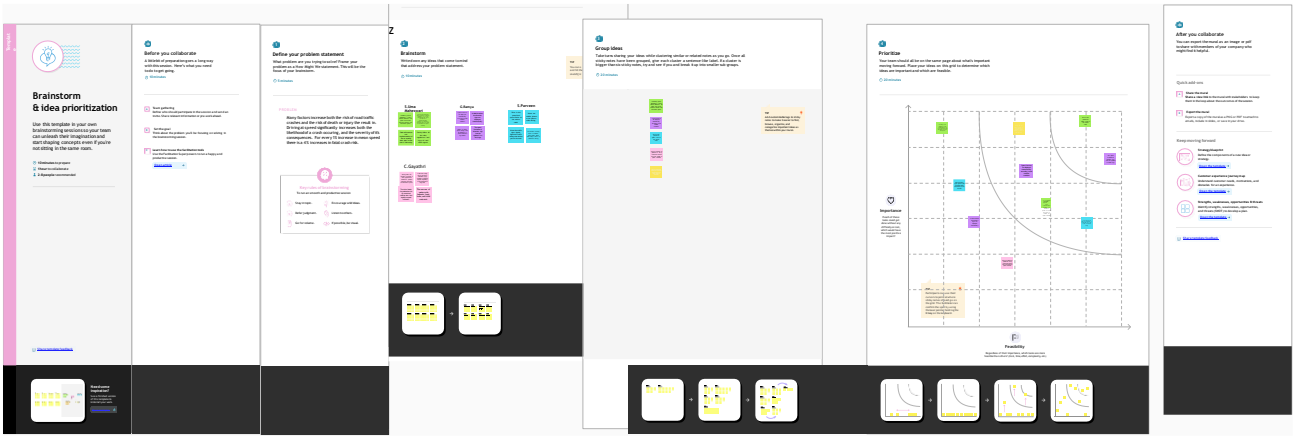
3. Ideation and Proposed Solution

Empathy Map Canvas



Ideation & Brainstorming

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


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.
Before you collaborate
Define your problem statement
Brainstorm
Group ideas
Prioritize
After you collaborate
Importance
Feasibility

Proposed Solution

SI.NO	Parameters	Description
1.	Problem Statement (problem to be solved)	Many factors increase both the risk of road traffic crashes and the risk of death or injury they result in. Driving at speed significantly increases both the likelihood of a crash occurring. People failure to understand signs and violation of rules. Traffic management is an essential part of modern mobility, and traffic signals help optimize the existing network in the best possible way. It monitors and controls various modes of traffic in order to avoid congestion and to improve traffic flow.
2.	Idea/Solution description	Smart traffic lights can also be synced to the movement of larger vehicles or conditioned to respond appropriately to situations like gridlock or blockage. Simple programming modes of traffic in

		order to avoid congestion and to improve traffic Smart programming and digitization can be used to control traffic light operations in both larger and small urban areas When traffic lights co-ordinate ideally and respond to demand in real-time, Road capacity can be maximized quickly. All of this programming can be done with expert knowledge.
3.	**Novelty/Uniqueness**	**A display via smart phone is also possible. This improves convenience for drivers and leads to beter traffic flow and less air pollution.** **Dynamic of sign board.** **Gives more detailed information to the road drivers.**
4.	**Social Impact/Customer Satisfaction**	**Reduced accident rates.** **Increase travel speeds.** **Increase operational efficiency. Real time information management.Create a platform for sharing traffic to other systems.** **Environment friendly.**

5.	**Business Model(Revenue Model)**	**LED signal lamp which compiles the European standards EN12368 and IP65 grade with 5 years performance warranty. Selling project to the highway departments. It will provide service where the accidents avoid is play vital role in road.**
6.	Scalability of the Solution	Adaptive traffic control system (ATCS) considers developing countries traffic scenarios, vehicular movements and responds in real time. It uses downstream detection and provides user friendly interface to.

Problem

Project design phase -1- solution fit template

Project Title: Signs with Smart Connectivity for Better Road Safety
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1.CUSTOMER SEGMENT(S)

People say road kills one person every 24 seconds

6. CUSTOMER CONSTRAINTS

Identify accidents because over 50% fatal crashes on roadways with speed limit 55mph.

5. AVAILABLE SOLUTIONS

Speed limit to be displayed automatically according to the weather condition.

In fatal solutions the diversion signs are displayed automatically.

2. JOBS-TO-BE-DONE / PROBLEMS J/P

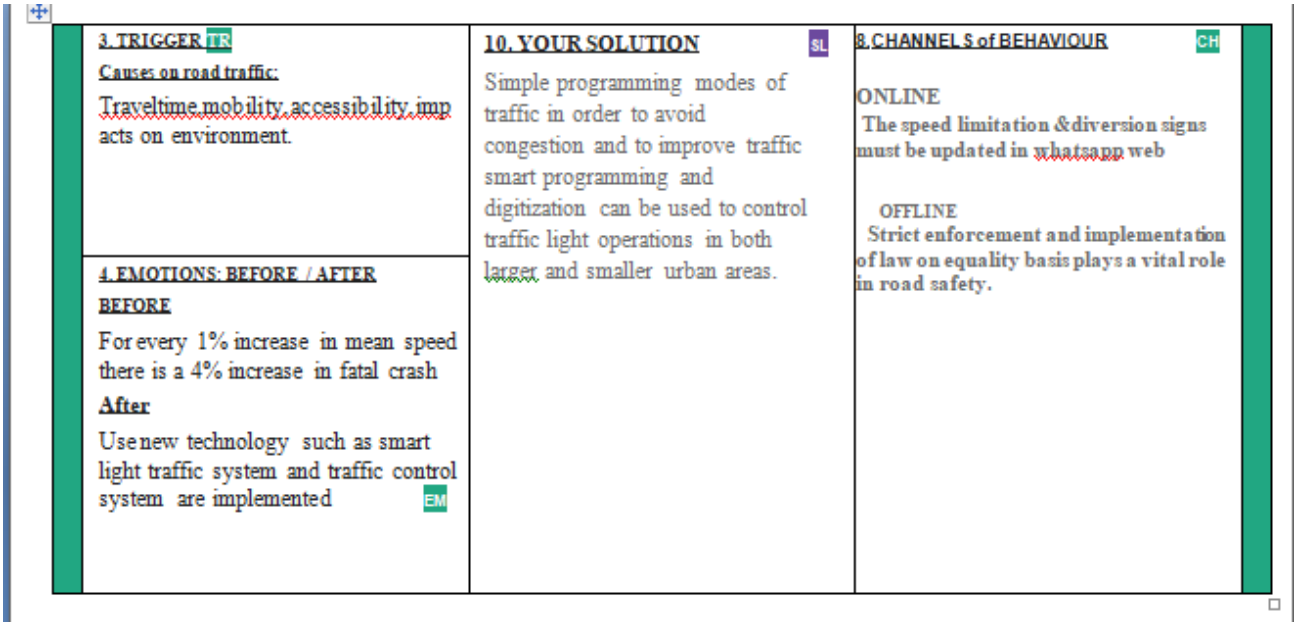
Determine the speed limit for the road on the vehicles with auto break system.

9. PROBLEM ROOT CAUSE RC

The higher speed the higher accident risk and the more severe the accident consequences.

7. BEHAVIOUR BE

Protect the persons from accidents.



4. Requirement Analysis

Functional Requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story/Sub-Task)
FR-1	User tracking	Speed Limit To be displayed automatically according to the weather

		condition. In fatal situations the diversion signs are displayed automatically.
FR-2	**Weather**	**Using open weather Map**
FR-3	**User interface**	**Open API (application programming interface) Keys**
FR-4	**Data processing**	**The speed limitation & diversion sign must be updated in a web App.**
FR-5	**Sensor**	**Stand -alone-safety sensor GPS Sensor**

Non-functional Requirements

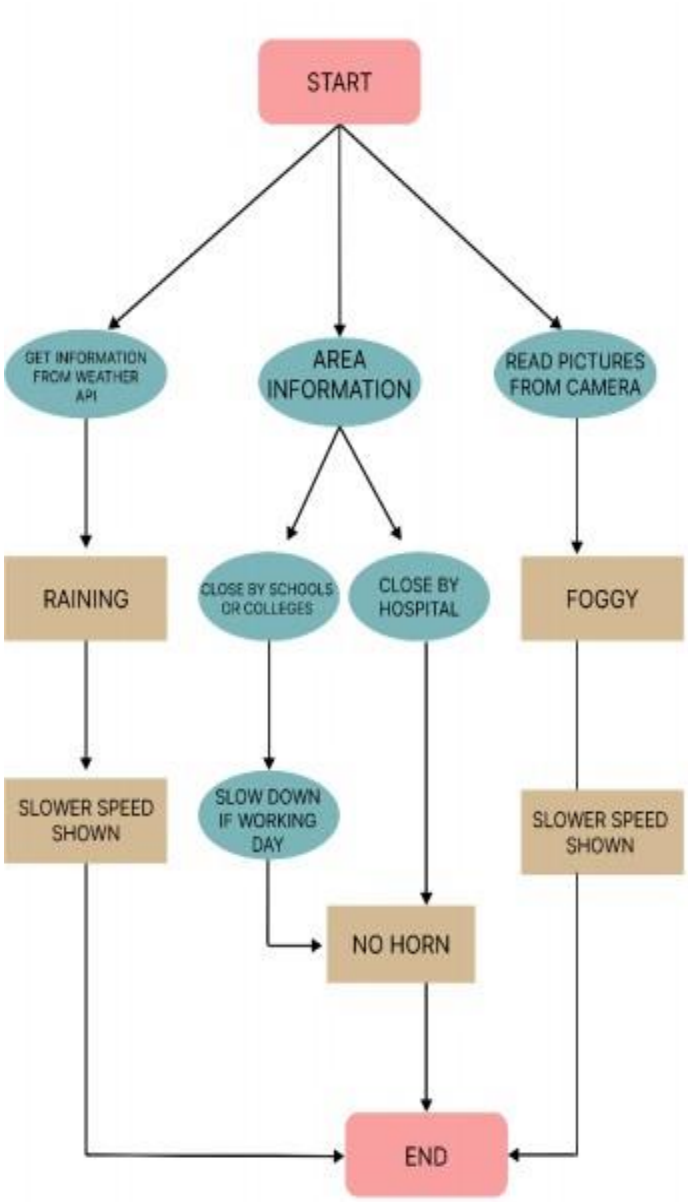
FR NO.	**Non-Functional Requirement**	**Description**
NFR-1	**Usability**	**Indicates how framework should operate for the Customer or end-user**
NFR-2	**Security**	**Focuses on how the framework is kept secure, store information and react to the attacks**
NFR-3	**Reliability**	**Characterizes the frameworks accessibility**

		and the tolerance for disappointment.
NFR-4	**Performance**	**Focuses on the system speed, efficiency and workload.**
NFR-5	**Availability**	**It could be a metric that measures the probability that a framework is not failed or experiencing a repair activity when it should be utilized.**
NFR-6	**Scalability**	**Ensures the framework can react to changes in request.**

5. Project Design

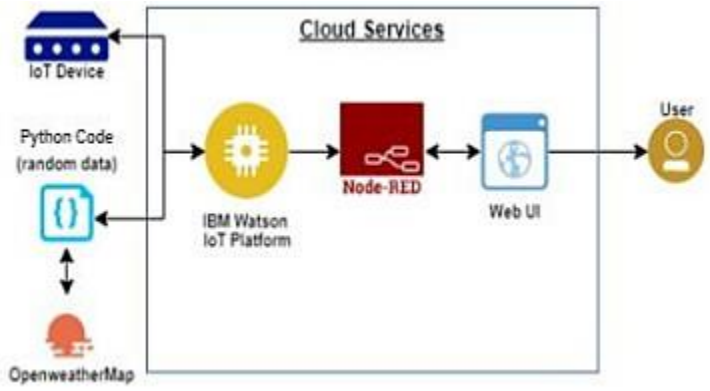
Data-Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



Solution & Technical Architecture

Components & Technologies



User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story/Task	Acceptance criteria	Priority
Customer (Mobile User)	Registration	USN-1	I can get my speed imperative using climate application	I can get speed limitations.	High
		USN-2	As a client, I can enlist for the application by entering my e-mail,	I can get to my account/dash board	Medium

			mystery phrase and affirming my mystery phrase		
		USN-3	As a client, I can increment or lessening my speed as demonstrated by the climate conditions change	I can increase or decrease my speed	High
		USN-4	As a client, I may I at any point get my activity redirection signs depending upon the activity and deadly circumstances	I can get to my traffic status ahead in my development	Medium
	Login	USN-5	As a client, I can sign out from the dim climate	I can get to the application through my Gmail	High

			outline by entering e-mail and mystery key	login	
	Interface	USN-6	As a client the association point got to be straight forward and succeefully open	I can get to the point interaction without any issue	High
Customer (Web User)	Data generation	USN-7	As a client I use open climate application to get to the data in respects	I can get to the data concerning through the application	High
Director	Problem solving Fault Clearance	USN-8	As an in specialist charge for the authentic working of the sign sheets have to be keep up with it through periodic watching	Specialist can screen the sign sheets for genuine working	Medium

6. Project planning & scheduling

Sprint planning & Estimation

Sprint	Functional Requireme	User Story/Task	Story Points	priority
Sprint-1	Initializing the resources	Create an account in Open Weather API	5	LOW
Sprint-1	Code in Software is written	Write a python script using the inputs given from Open Weather API	5	MEDIUM
Sprint-2	Sending the software to cloud	The python code from sprint 1 should be sent to cloud so that it is easily accessible	5	MEDIUM
Sprint-3	Initializing the connection between hardware and cloud	The hardware should be integrated for the easy access of the cloud functions	5	HIGH
Sprint-4	User input output optimization and error	Rectify all the shortcomings/ errors and initiate the	5	HIGH

	identification and rectification	optimization for better usage		

Sprint Delivery Schedule

Sprint	Total story points	Duration	Story points completed
Sprint-1	20	4 Days	20
Sprint-2	20	4 Days	20
Sprint-3	20	4 Days	20
Sprint-4	20	4 Days	20

Velocity:

We have a 4 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= Sprint duration/Velocity = 20/4=5

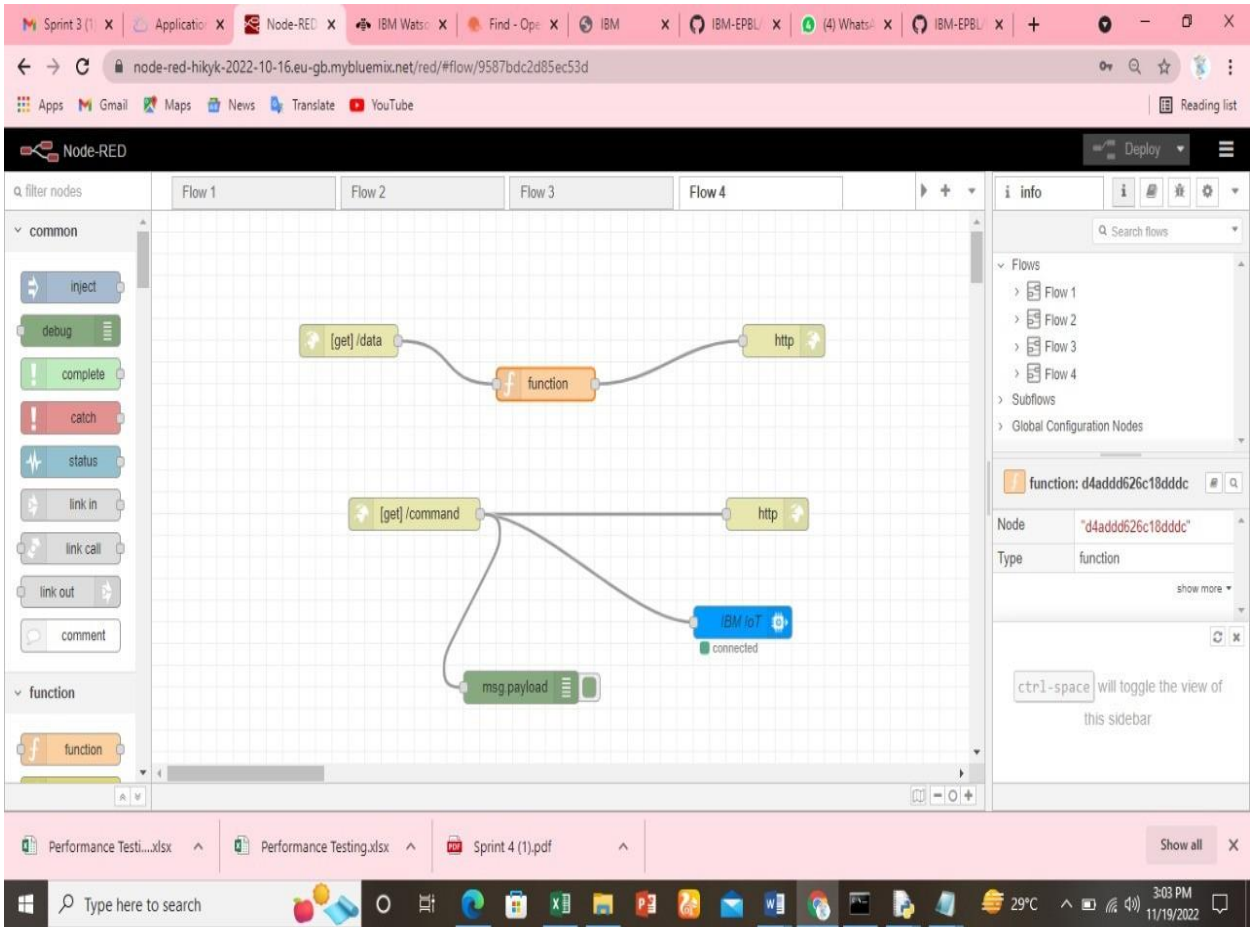
Burndown Chart:

A burndown chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burndown charts can be applied to any project containing measurable progress overtime.

7. Coding and Solutioning

Feature 1

GET WEATHER DETAILS FOR GIVEN LOCATION



8. Testing

Test cases

TEST CASE 1

Temperature': 303.03, 'Humidity': 51, 'Pressure': 1010, 'Message': 'SLOW DOWN , SCHOOLIS NEAR', 'Sign': '', 'Speed': '', 'Visibility': 'Clear Weather'

- TEST CASE 2

Temperature': 303.03, 'Humidity': 51, 'Pressure': 1010, 'Message': '', 'Sign': 'Left Diversion <-', 'Speed': 'SLOW DOWN , Speed Limit Exceeded', 'Visibility': 'Clear Weather'

- TEST CASE 3

Temperature': 303.03, 'Humidity': 51, 'Pressure': 1010, 'Message': 'SLOW DOWN , HOSPITAL NEARBY', 'Sign': 'Left Diversion <-', 'Speed': '', 'Visibility': 'Clear Weather'

- TEST CASE 4

Temperature': 303.03, 'Humidity': 51, 'Pressure': 1010, 'Message': 'NEED HELP, POLICE STATION NEARBY', 'Sign': 'U Turn', 'Speed': 'Moderate Speed', 'Visibility': 'Clear Weather'.

User Acceptance Testing

Dynamic speed & divertion variations based on the weather and traffic helps userto avoid traffic and have a safe journey home. The users would welcome this idea to be implemented everywhere.

9. Results

Performance Metrics

The performance of the website varies based on the software chosen for implementation .

Built upon NodeJS, a light and high performance engine, NodeRED is capable of handling upto 10,000 requests per second. Moreover, since the system is horizontallyscalable, a even higher demand of customers can be served.

10. Advantages and Disadvantages

Advantages

- Lower battery consumption since processing is done mostly by Node RED servers inthe cloud.
- Cheaper and low requirement micro controllers can be used since processing requirementsare reduced.
- Longer lasting systems.
- Dynamic Sign updation.
- School/Hospital Zone alerts

Disadvantages

- The size of the display determines the requirement of the micro controller.
- Dependent on OpenWeatherAPI and hence the speed reduction is same for a large areain the scale .

11. Conclusion

Our project is capable of serving as a replacement for static signs for comparatively lower cost and can be implemented in the very near future. This will helpreduce a lot of accidents, traffics and maintain a peaceful environment.

12. Future Scope

Introduction of intelligent road sign groups in real life scenarios could have great impact on increasing the driving safety by providing the end-user with the most accurateinformation regarding the current road and traffic conditions. Even displaying the information of a suggested driving speed and road surface condition (temperature, icy, wet or dry surface) could result in smoother traffic flows and, what is more important, inincreasing a driver's awareness of the road situation.

13. Appendix

Github Link : https:/ github.com/IBM-EPBL/IBM-Project-2366-1658470402

Project Demonstration Link:
https://drive.google.com/file/d/1ZOKnA9yvLOqV4AP8BWEA-2WjZv3UzNI7/view?usp=share_link