

**PROJECT BASED EXPERIENTIAL LEARNING
PROGRAM (NALAIYA THIRAN)**

**SIGNS WITH SMART CONNECTIVITY
FOR BETTER ROAD SAFETY**

A PROJECT REPORT

Submitted by

SOWMYA B	(111719106149)
SHAMYUKDHA P V	(111719106142)
VAISHNAVI N	(111719106166)
VIJAYALAKSHMI C V	(111719106173)

TEAM ID: PNT2022TMID16188

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

R.M.K.ENGINEERING COLLEGE

(An Autonomous Institution)
R.S.M. Nagar, Kavaraipettai-601 206



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1.INTRODUCTION :

Based on current research and development efforts, we can all be fairly certain that smart road signs will be broadly utilized in the years to come. They serve as one of the major components of an emerging system designed to enhance the current infrastructure. These indicators are useful tools, and they can have a positive impact on all who share the roads. Most importantly, this PtType of signage has the potential to improve our way of life.

When vehicles approach such a sign on the roadway, vital information is imparted to their drivers via their dashboard or their head-up display. Along with the visual data, voice narration may also be used to indicate changing roadway conditions. Instead of trying to read passing road indicators, drivers are thus better able to pay attention to the road. The road signage of the future might also be used to transmit crucial data to driverless cars. These signs may appear to humans to be conventional road indicators.

However, the information transmitted from a given sign is “visible” to the vehicle’s infrared light. The sign alerts oncoming cars to slow down due to a change in the roadway. This sort of transmission can even help autonomous vehicles to stay in their lanes.

Smart signs provide :

- Preventing wrong way crashes
- Better traffic management and safety
- Increased cost efficiency
- Combating poor visibility

1.1 PROJECT OVERVIEW :

The primary aim for developing these route placards is to make the roads safer for all of us. The enhanced signage creates a more efficient experience for drivers. It can also complement the system designs of driverless cars and to help people automate the roads by providing them with a Web App through which they can monitor the parameters of the road like temperature, speed limit, and visibility of the road. They also show guides for schools and provide services of displaying hospitals, and restaurant signs accordingly.

1.2 PURPOSE :

Clearly, intelligent roadway smart signs can be a vital part of our driving experience. They enable a better way for drivers to access the information they need in real time on the roads. These signs can increase awareness of upcoming issues, which people might otherwise discover too late.

They may also augment the functionality of driverless vehicles. The value of implementing this technology should not be underestimated. Smart roadway indicators have the potential to increase cost-efficiency, which eases the burden on governments and taxpayers. They facilitate a smoother driving process for both human drivers and autonomous vehicles.

The smart signs can be more user-friendly than the analog route signs we currently employ. Above all, they may ultimately lead to a safer network of roads for everyone.

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. Different modes of operation can be selected with the help of buttons.

2. LITERATURE SURVEY :

2.1 EXISTING PROBLEM :

Static signage can be costly in the long term. Once a sign is printed/produced and installed in place, it can't be modified, so any changes you need to make require a new sign. Some signs bypass this difficulty by providing a rotating platform for displays in which you only need to replace the individual posters – although these are being largely superseded on the high street and in-store by digital displays, which are far easier to modify and update.

Certain static designs can go out of fashion or become outdated, which means they'll get limited attention from potential customers. Additionally, if you're environment-conscious, you'll probably have issues with sign waste and the chemicals used in printing.

2.2 REFERENCES:

S.N O	PAPER TITLE	JOURNAL	AUTHOR	YEAR	WORK EXPLAIN
1	Smart Vehicle	IEEE	Usha Devi Gandhi, Arun Singh	2014	This Project Focuses on V2V communication, once cars are connected which is able to share data with other cars on the road and which help to reduce Highway accidents. Ultimately vehicles are connect via multiple complementary technologies of vehicle to vehicle

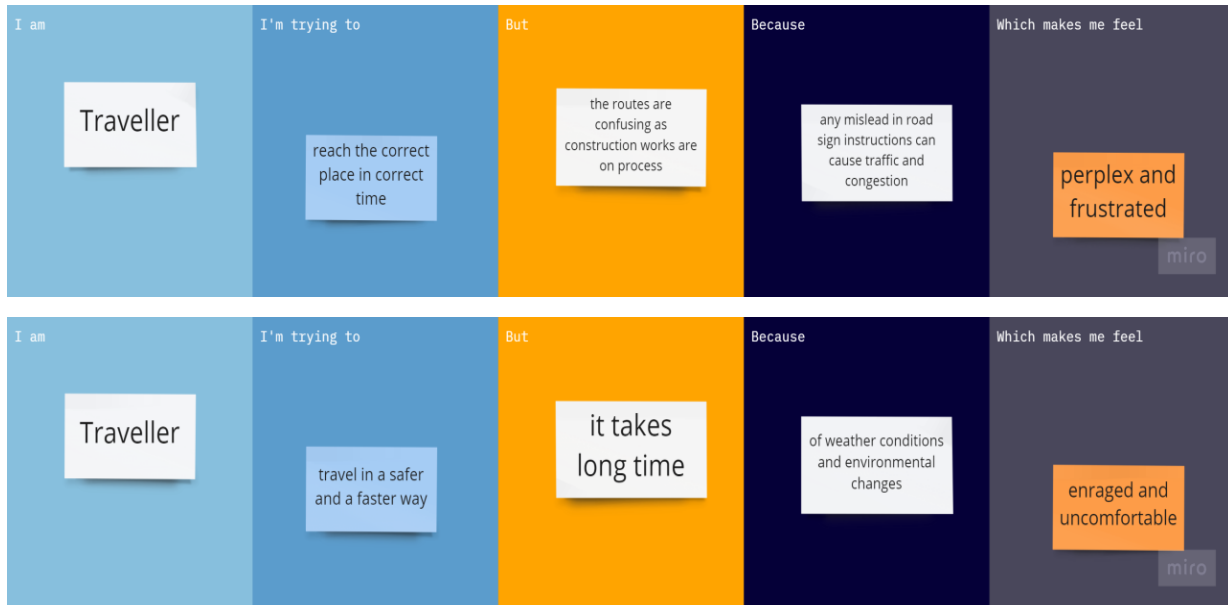
					(V2V) and vehicle-to-infrastructure(V2I) connectivity based on Wi-Fi, GPS, Dedicated Short Range Communication(DRS C)
2	An efficient real-time traffic sign recognition system for intelligent vehicles with smart phones.	IEEE	Ching-hao Lai,Chia-chenyu	2010	The proposed scheme can integrate in-vehicle computing devices and smart phones to construe an in-vehicle traffic sign recognition system. This scheme contains four major stages: video frame capturing and transmitting, image preprocess, traffic sign detection, and character/icon extraction and recognition.
3	Automatic road traffic signs detection and recognition using “You only look once” version 4(YOLOv4)	IEEE	W.H.D.Fernando, S.Sotheeswaran	2021	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

					<p>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 collision</p>
4	<p>Communication system for intelligent road sign networks</p>	IEEE	<p>Janusz Gozdecki; Krzysztof Łoziak; Andrzej Dziech; Wojciech Chmiel; Joanna Kwiecień; Jan Derkac</p>	2019	<p>The most important issue in the process of building the trust between the road signalling infrastructure and the end user is the information significance and its value. The ongoing NCBiR project - InZnak - aims to introduce a new type of the road signalling subsystem which relies on intelligent</p>

					road signs equipped with variety of sensors and adaptive led displays. Sensors feed the autonomous algorithms with data necessary to take decisions on how to react to current road conditions.
5.	Smart traffic management system	IEEE	Abubakar M.Miyim, Mansur A. Muhammed	2019	In this paper, the proposed system serves as an alternative to the existing traffic management system with an intersection control station that communicates with vehicles approaching the intersection through the V2I network
6	An efficient and safe road condition monitoring authentication scheme based on fog computing	IEEE	Mingming Cui; Dezhi Han; Jun Wang	2019	In this paper, a new certificateless aggregate signcryption scheme (CLASC) is proposed by using a fog computing framework that supports mobility, low latency, and location awareness .

2.3 PROBLEM STATEMENT DEFINITION :

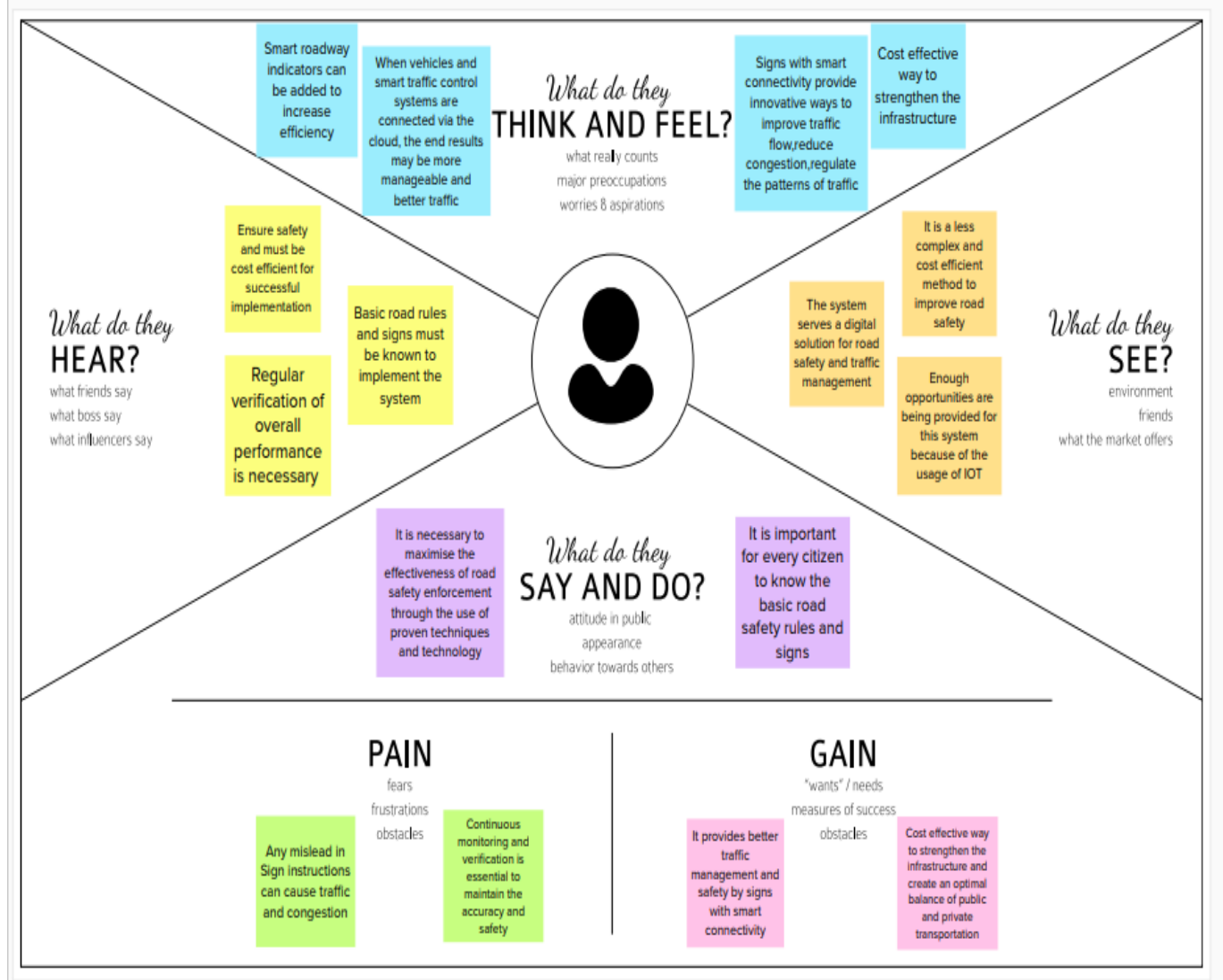
In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are road diversions due to heavy traffic or due to accidents then we can change the road signs accordingly if they are digitalized.



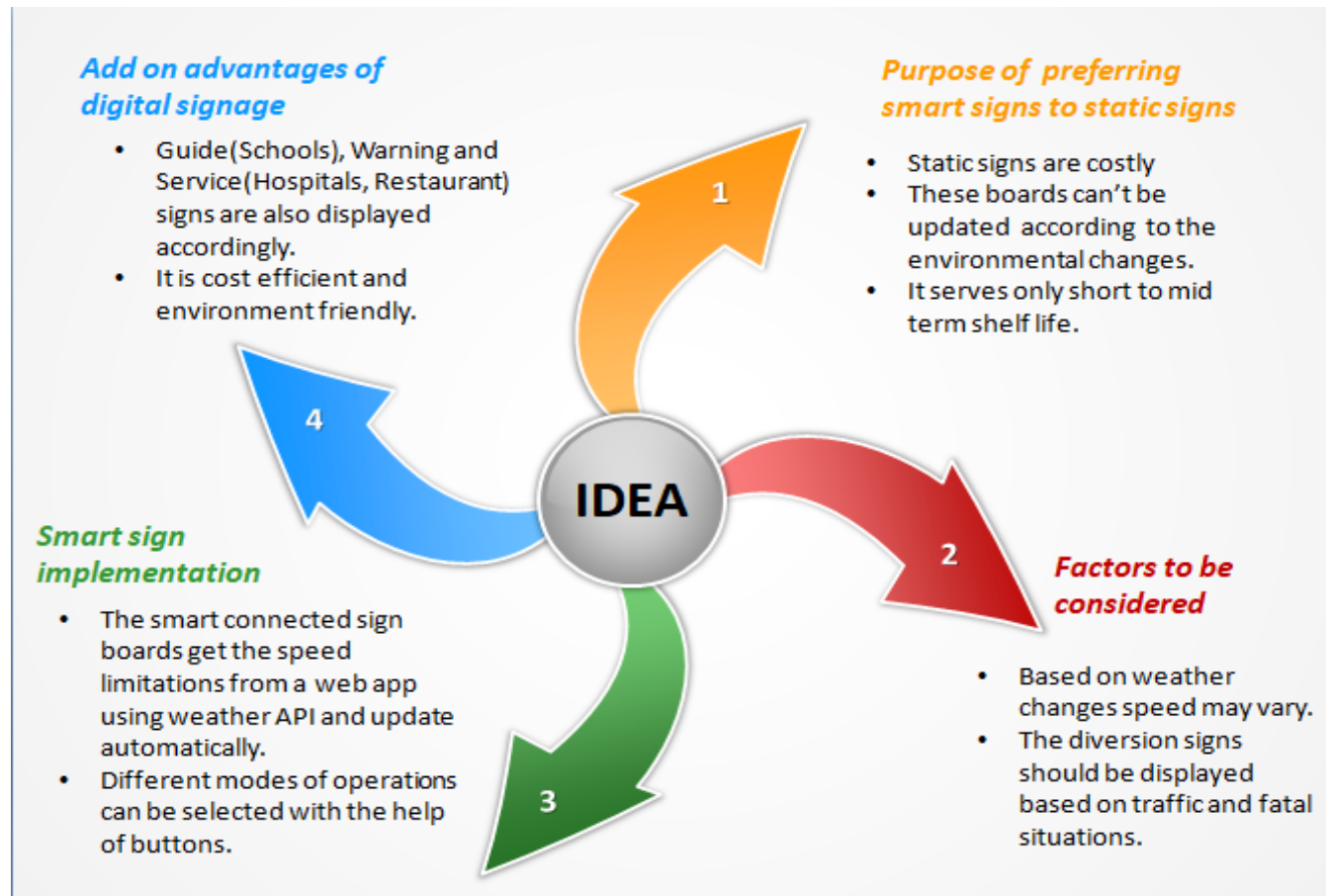
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Traveller	Reach the correct place in correct time	The routes are confusing as construction works are on process	Any mislead in road sign instructions can cause traffic and congestion	Perplex and frustrated
PS-2	Traveller	Travel in a safer and a faster way	It takes long time	Of weather conditions and environmental changes	Enraged and uncomfortable

3.IDEATION & PROPOSED SOLUTION :

3.1 EMPATHY MAP CANVAS :



3.2 IDEATION AND BRAINSTORMING :



3.3 PROPOSED SOLUTION :

S.NO	PARAMETER	DESCRIPTION
1	Problem statement	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. Different modes of operations can be selected with the help of buttons.
2	Idea description	The weather and temperature details are obtained from the OpenWeatherMap API. Using these details, the speed limit will be updated automatically in accordance with the weather conditions. Also, the details regarding any accidents and traffic congestion faced on the particular road are obtained .Based on this,the traffic is diverted followed by a change in map path and the traffic is cleared. So in the traffic sign board , some buttons will be placed which will be used to make it generic; where each button will be given a functionality such as changing the warning signs, which are predefined and separate signs will be present for

		both school and hospital zones. By activating this button, either through the web application or the physical buttons, sign of the board can be changed accordingly, and the speed limit will also be set depending upon the zones. Also, the pedestrians are given an option to change the traffic signs if they want to cross the road. If the pedestrian presses the button that is present on the post at the end of the road, then the traffic will be analyzed immediately. Accordingly, the sign of the traffic signal will be changed. This in turn reduces the frequent changing of the traffic signs even if the pedestrians are not present.
3	Novelty	Generic Sign board for all applications that uses both buttons and web service for updation Pedestrians are given the access to request the sign change of the signal to cross the road
4	Customer satisfaction	Diversion reasons will be displayed If there is no traffic, pedestrians can cross the street without waiting. Customer can reach the destination before the expected time
5	Business model	Since APIs are used to actively monitor the customer's environment, this project employs a business strategy in which revenue will be generated on the basis of the length of time in which the customers actively interact with the product. This product

		<p>is aimed to be free of cost to the public, but the revenue will be generated by selling this product to the government at a low cost, so there will be less accidents and the public will be aware of the discrepancies or accidents in the particular road. The public will also gain all the information about the road, even if they are checking for an alternate path because of some mishaps that happen on the roads and these functionalities will increase the value of the product in the global market</p>
6	Scalability of the solution	<p>In the future, if any update is required either on the hardware or software side, it can be easily implemented. The hardware components can be directly interfaced with the microcontroller and small modifications can be made in the programming of the existing product. In case of the software, the website application has to be updated with the additional functionality by creating a new section for the updated hardware. So this will not affect the existing functionality of the product and new functionality can be easily integrated. In addition, a separate circuit will be kept along with the hardware to detect any problem which informs the web application. Also a notification will be sent to the product service department</p>

3.4.PROBLEM SOLUTION FIT:

<p>Define CS, fit into CC</p> <p>1. CUSTOMER SEGMENT(S) Who is your customer? CS</p> <ul style="list-style-type: none"> Traffic police Highway division Passenger / drivers. 	<p>6. CUSTOMER CONSTRAINTS What constraints prevent your customers from taking action or limit their choices CC</p> <p>The impact of the network on the tests was a significant and unexpected element. Given the quantity of sensors, this IoT-based system was successful in simulating a large-scale smart agricultural setting.</p>	<p>5. AVAILABLE SOLUTIONS Which solutions are available to the customers when they face the problem AS</p> <p>or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking</p> <p>Not only the road ways but also clear directions are given.</p>	<p>Explore AS, differentiate</p>
<p>2. JOBS-TO-BE-DONE / PROBLEMS Which jobs-to-be-done (or problems) do you address for your customers? CC</p> <p>It is mandatory to have a regular check on speed limit of the driver on temperature of the surrounding.</p>	<p>9. PROBLEM ROOT CAUSE What is the real reason that this problem exists? What is the back story behind the need to do this job? RC</p> <p>No sensor readings from the weather would alter the speed restriction if there was no internet connection. Unnecessary pressing of the accident indicator button by some people could lead to problems.</p>	<p>7. BEHAVIOUR What does your customer do to address the problem and get the job done? BE</p> <p>The IOT cloud updates the smart board on the condition of the road on a regular basis.</p>	<p>Focus on J&P, tap into BE, understand RC</p>
<p>3. TRIGGERS TR</p> <p>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. Poor weather condition prevails. The vehicle should be moving at threshold speed. The sensor value should be shown on the smart board to alert the customer.</p>	<p>10. YOUR SOLUTION SL</p> <p>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.</p> <p>We employ smart linked sign boards as an alternative to static signboards. With the help of a web app and weather API, these intelligent connected sign boards automatically update with the current speed limits. The speed may rise or fall in response to variations in the weather. The display of diversion signs is determined by traffic and potentially fatal situations. As appropriate, there are also signs that read "Guide (Schools), Warning, and Service" (Hospitals, Restaurants).</p>	<p>8. CHANNELS of BEHAVIOUR CH</p> <p>8.1 ONLINE What kind of actions do customers take online? The department can receive direct mails or messages from public.</p> <p>8.2 OFFLINE What kind of actions do customers take offline? By using the smart board signs, drivers can know the state of the road from wherever they are.</p>	<p>Identify strong TR & EM</p>
<p>4. EMOTIONS: BEFORE / AFTER EM</p> <p>How do customers feel when they face a problem or a job and afterwards? It will be helpful for the drivers to follow the instruction on the smartboard.</p>			<p>Id e nt if y st r o n g TR & EM</p>

4. REQUIREMENT ANALYSIS:

4.1. FUNCTIONAL REQUIREMENT:

Following are the functional requirements of the proposed solution.

FR No.	Non Functional Requirement (Epic)	Sub Requirement (Story/Sub-Task)
FR-1	User Registration	Static signboards will be replaced with smart linked sign boards that meet all criteria
FR-2	User Confirmation	hone Confirmation Email confirmation OTP authentication
FR-3	User Registration	User Registration can be done through a Website or Gmail
FR-4	Payments Options	Bank transfer Paytm Netbaking
FR-5	Product Delivery and installation	The installation fee will be depend upon the length of the road
FR-6	Product Feedback	Will be shared through a website via Gmail

4.2.NON–FUNCTIONAL REQUIREMENTS:

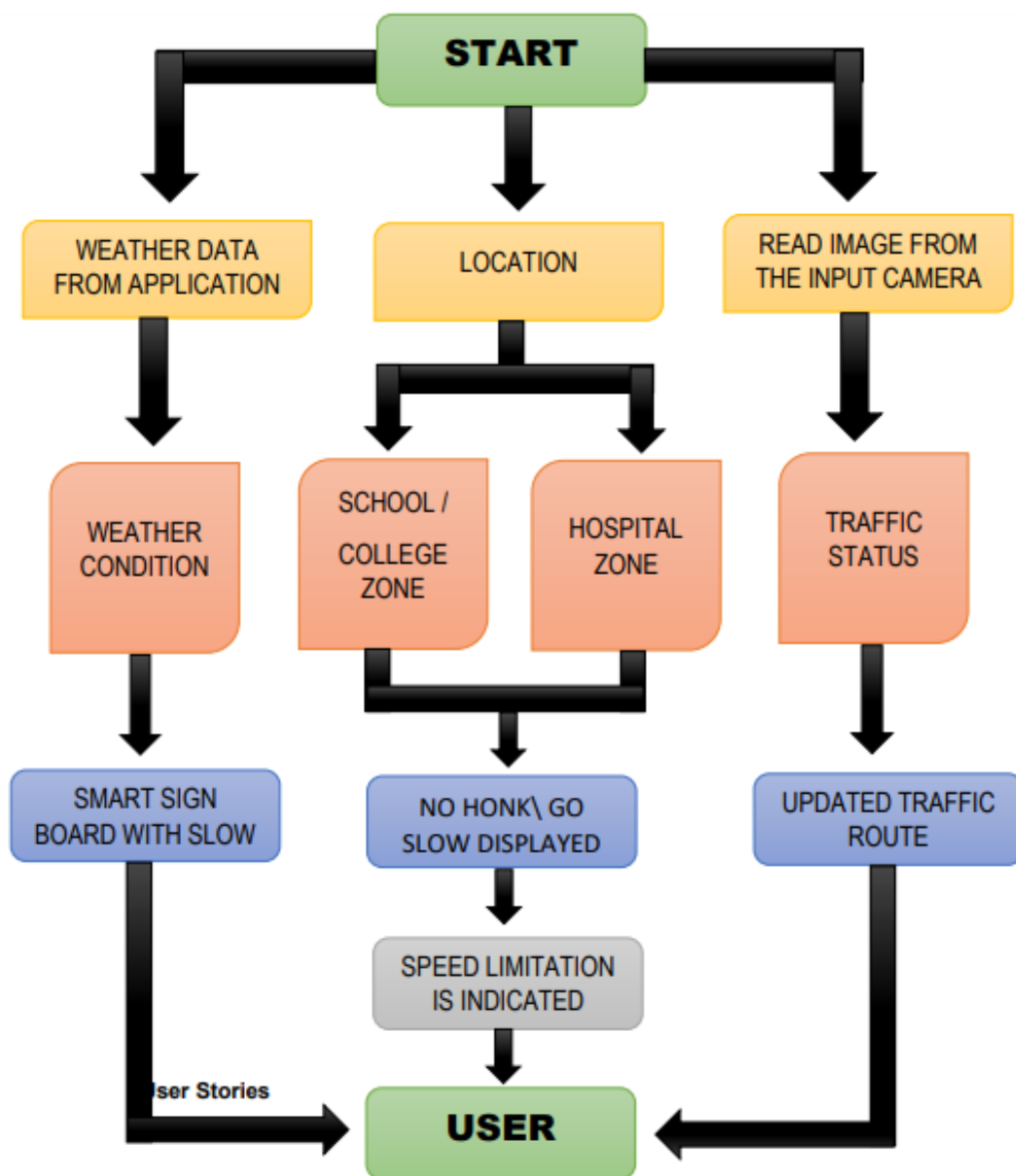
Following are the non-functional requirements of the proposed solution.

NFR No.	Non Functional Requirement	Description
NFR-1	Usability	Will provide the clear product instructions and a self -explanatory product which is simple to use.
NFR-2	Security	Cloud data must be contained within the network, collapsing to be the real-time avoidance should be avoided and the board will be monitored constantly.
NFR-3	Reliability	Hardware will be frequently used
NFR-4	Performance	The smart board must provide a better user experience and deliver the accuracy output.
NFR-5	Availability	All of the functions and the user demands will be provided, depend upon the customer needs
NFR-6	Scalability	The product is based on road safety and should cover the entire highway system.

5.PROJECT DESIGN

5.1. 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.



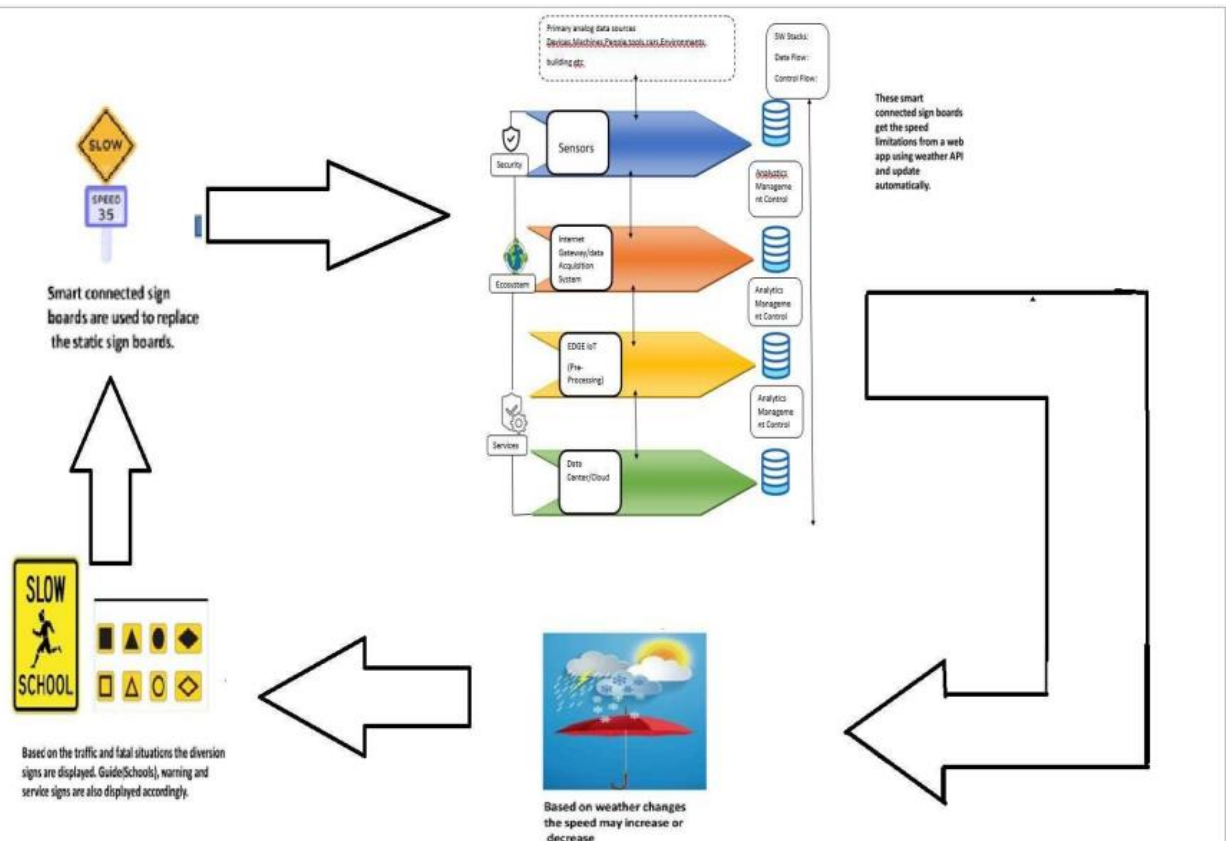
5.2 SOLUTION AND TECHNICAL ARCHITECTURE

SOLUTION ARCHITECTURE:

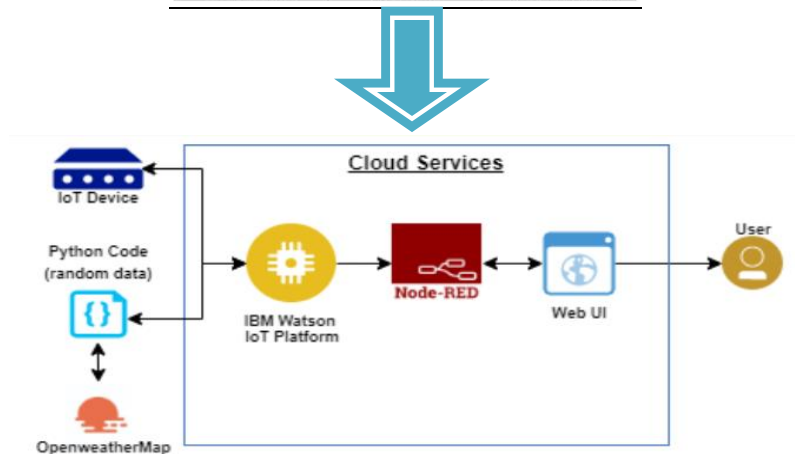
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions.

Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.



TECHNICAL ARCHITECTURE:



COMPONENTS AND TECHNOLOGIES:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
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	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
5.	External API-1	Purpose of External API used in the application	IBM Weather API, etc

APPLICATION CHARACTERISTICS:

S.No	Characteristics	Description	Technology
1.	Security Implementations	Strong security system that anyone without login credentials and hackers are not allowed to enter the network.	Firewall, Firebase, cyber resiliency strategy
2.	Scalable Architecture	Easy to expand the operating range by increasing the bandwidth of the network.	IoT, internet.
3.	Availability	Available anytime and everywhere 24/7 as long as the user is signed into the network.	IBM Cloud
4.	Performance	Supports a large number of users to access the technology simultaneously.	IBM Cloud

5.3 USER STORIES:

User Type	Functional Requirement (Epic)	User story No.	User Story	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	I can get my speed limitation using weather application	I can receive speed limitations	High	Sprint-1
		USN-2	As a user, I can register for the application by entering my email, password, and confirming my password. As a user	I can access my account / dashboard	Medium	Sprint-2
		USN-3	As a user, I can increase or decrease my speed according to the weather change	I can increase or decrease my speed	High	Sprint-1
		USN-4	As a user, I can I get my traffic diversion signs depending on the traffic and fatal stn.	I can access my traffic status ahead in my travel	Medium	Sprint-1

	Login	USN-5	As a user, I can log into the open weather map by entering email & password	I can access the application through my Gmail login	High	Sprint-2
	Interface	USN-6	As a user the interface should be simple and easily accessible	I can access the interface easily	High	Sprint-1
Customer (Webuser)	Data generation	USN-7	As a user I use open weather application to access the data regarding the weather changes	I can access the data regarding the weather through the application	High	Sprint-1
Administration (officials)	Problem solving/ Fault clearance	USN-8	As an official who is in charge for the proper functioning of the sign boards have to maintain it through periodic monitoring.	Officials can monitor the sign boards for proper functioning.	Medium	Sprint-2

CUSTOMER JOURNEY:

<div>1 Phases</div> <div>High-level stage your user needs to accomplish from start to finish</div>	<div>The user must have the knowledge about the traffic signs (start signal)</div>		<div>The NFC tag should be made compulsory to all the vehicles</div>		<div>Use sensor to detect the status of the driver</div>		<div>In order to reduce the occurrence of accidents, it is vital to drive the vehicles properly</div>	
<div>2 Steps</div> <div>Detailed actions your user has to perform</div>	<div>The drivers must have the knowledge about the rules and regulations</div>	<div>The drivers must compulsorily have driving license</div>	<div>Identify and tracking using radio waves.</div>	<div>Install a speed tracking device and use NFC tags to communicate with NFC devices</div>	<div>Use ultrasonic sensors to detect the distance of the object</div>	<div>Traffic congestion are displayed using LCD display placed and GPS sensors are placed in the vehicles</div>	<div>To maintain oil coolant at a proper level</div>	<div>Immediate actions should be taken by the drivers when warning lights are displayed.</div>
<div>3 Feelings</div> <div>What your user might be thinking and feeling at the moment</div>	<div></div> <div>This technology avoids the accidents due to the weather conditions</div>	<div>Accident free techniques are provided</div>	<div>Provide better smart signs instead of static signs</div>	<div>Cheapest and most efficient method</div>	<div>Speed limits can be detected as soon as possible.</div>	<div>Less risk of damage as a result of more strategic traffic management</div>	<div>Flexible services can be provided</div>	<div>NFC technology brings more benefits.</div>
<div></div>	<div>Human error are the cause of frequent accidents that are taking place.</div>	<div>Vehicle damage leads to financial problems</div>	<div>Huge economic losses may occur</div>	<div>There will be violation and toll charges</div>	<div>Can lead to emotional injuries and medical charges</div>	<div>Traffic congestion may lead to lost of time</div>	<div>When the speed of vehicle remains high after certain amount of time it may lead to accidents.</div>	<div>Major causes are environmental and mechanical factor.</div>
<div>4 Pain points</div> <div>Problems your user runs into</div>	<div>Direct consequences of property damage</div>	<div>Roads are inadequate and in bad conditions</div>	<div>The volume of traffic and passengers are large</div>	<div>Driving would be affected due to bad weather conditions</div>	<div>Lack of coordination</div>	<div>Carbon emission may occur due to increase in traffic</div>	<div>Severe air pollution in metropolitan cities like delhi</div>	<div>The presence of many roads may irritate the drivers.</div>
<div>5 Opportunities</div> <div>Potential improvements or enhancements to the experience</div>	<div>Reduce the vehicle speed</div>	<div>Accidental death rates are reduced</div>	<div>The latest NFC techniques can be implemented</div>	<div>Improve the road safety measures</div>	<div>Provides data transfer through smart phones</div>	<div>Location tracking and identity verification can be implemented easily</div>	<div>NFC tags are available at affordable prices</div>	<div>Drain are very less and tags have a long life span.</div>

6. PROJECT PLANNING AND SCHEDULING:

6.1 SPRINT PLANNING & ESTIMATION:

SPRINT	FUNCTIONAL REQUIREMENTS (EPIC)	USER STORY/TASK	STORY POINTS	PRIORITY	TEAM MEMBERS
Sprint-1	Hardware utilization	Integrate the hardware to be able to access the cloud functions	2	Medium	Sowmya B, Shamyukdha PV, Vijayalakshmi C V, Vaishnavi N
Sprint-2	UI/UX optimization & debugging	Optimize all the shortcomings and provide better user experience.	1	Medium	Sowmya B, Shmayukdha PV, Vijayalakshmi C V, Vaishnavi N
Sprint-3	Resource initialization	Create and initialize accounts in various public APIs like OpenWeather API.	1	Low	Sowmya B, Shamyukdha PV, Vijayalakshmi C V, Vaishnavi N
Sprint-4	Local server/software run	Write a Python program that outputs results given the inputs like weather and location.	2	Medium	Sowmya B, Shamyukdha PV, Vijayalakshmi C V, Vaishnavi N
Sprint-4	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	Medium	Sowmya B, Shamyukdha PV, Vijayalakshmi C V, Vaishnavi N

6.2 SPRINT DELIVERY SCHEDULE:

TITLE	DESCRIPTION	DATE
Literature survey & Information gathering	A literature review is a comprehensive summary of previous researches on the topic. The literature review surveys scholarly articles, books, and other sources relevant to a particular area of research.	5 September 2022
Prepare empathy map	An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. It helps us to understand the customers' pain, gain and difficulties from their point of view.	12 September 2022
Ideation – brainstorming	Brainstorming is a group problem-solving method that helped us to gather and organize various ideas and thoughts from team members.	17 September 2022
Define problem statement	The Customer Problem Statement helps us to focus on what matters to create	19 September 2022

	experiences people will love. A well-articulated customer problem statement allowed us to find the ideal solution for the challenges customers face.	
Problem solution fit	It helped us understand and analyze all the thoughts of our customer, their choice of options, problems, root cause, behavior and emotions.	26 September 2022
Proposed solution	It helped us analyze and examine our solution more in the grounds of uniqueness, social impact, business model, scalability etc.	28 September 2022
Solution architecture	Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. It helped us understand the features and components used to complete the project.	1 October 2022

Customer journey map	It helped to analyze the various steps, interactions, goals and motivation, positives, negatives and opportunities.	7 October 2022
Solution requirements	It briefs about functional and non-functional requirements. It involves the various steps in the entire process. It also specifies features usability, security, reliability, performance, availability and scalability.	12 October 2022
Technology stack	A tech stack is the combination of technologies a company uses to build and run an application or project. It helps us analyze and understand various technologies that needs to be implemented in the project.	15 October 2022
Data flow	A Data Flow Diagram (DFD) is a traditional visual representation of the information	20 October 2022

	flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enter and leaves the system, what changes the information, and where data is stored.	
Sprint delivery plan	Sprint Planning is an event in scrum that defines what can be delivered in the upcoming sprint and how that work will be achieved. It helps us to organize and complete the work effectively and efficiently.	22 October 2022
Prepare milestone and activity list	Helps us understand and evaluate our progress and accuracy so far.	23 October 2022
Project development – delivery of sprint 1	Develop and submit the developed code by testing it.	3 November 2022

6.3 REPORTS FROM JIRA:

Jira Software

Your work

Projects

Filters

Dashboards

People

Apps

Create

smart solutions for rail...

Software project

PLANNING

Roadmap

Backlog

Board

DEVELOPMENT

Code

Project pages

Add shortcut

Project settings

You're in a team-managed project

Learn more

Does your team need more from Jira? Get a free trial of our Standard plan.

Projects / smart solutions for railways

Backlog

H

Epic

SSFR Sprint 1

24 Oct – 29 Oct

(5 issues)

Complete sprint

SSFR Sprint 2

31 Oct – 5 Nov

(7 issues)

Complete sprint

SSFR Sprint 3

7 Nov – 12 Nov

(6 issues)

Complete sprint

SSFR Sprint 4

14 Nov – 19 Nov

(6 issues)

Complete sprint

Backlog

(0 issues)

Create sprint

Your backlog is empty.

+ Create issue

Quickstart

Does your team need more from Jira? Get a free trial of our Standard plan.

Projects / smart solutions for railways

SSFR Sprint 1

Node red service and generation of QR

H

Epic

GROUP BY

None

Insights

TO DO 1 ISSUE

IBM node fix

SSFR-18

IN PROGRESS 2 ISSUES

programming nodes

SSFR-2

deployment of nodes

SSFR-3

IN REVIEW 2 ISSUES

node red flow

SSFR-1

generation of qr

SSFR-4

DONE

Quickstart

	OCT						NOV						NOV						NOV									
	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
Sprints	SSFR Sprint 1						SSFR Sprint 2						SSFR Sprint 3						SSFR Sprint 4									
SSFR-14 python programming																												
SSFR-15 mit app inventor																												
SSFR-16 node red application																												

Velocity:

Imagine we have 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)

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

Burndown chart:

A burn-down chart is graphical representation of work left to do versus time. It is often used in agile software development methodologies such as scrum. However, burn-down charts can be applied to any project containing measurable progress over time.

7. CODING AND SOLUTIONING:

7.1 FEATURE 1:

```
import wiotp.sdk.device
import time
import random
import ibmiotf.application
import ibmiotf.device
import requests, json
```



```
myConfig = { #Configuration
    "identity": {
        "orgId": "d5zx56",
        "typeId": "Connectivity123", "deviceId":"ESP32"},
    #API Key
    "auth": {
        "token": "9514598766"
    }
}
```

#Receiving callbacks from IBM IOT platform

```
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" %
        cmd.data['command'])
    m=cmd.data['command']
```

```
client =
    wiotp.sdk.device.DeviceClient(config=myConfig,logHandlers=None)
    client.commandCallback= myCommandCallback client.connect()
```

#OpenWeatherMap Credentials

```
BASE_URL = "https://api.openweathermap.org/data/2.5/weather?"
```

```
CITY = "Chennai"
```

```
URL = BASE_URL + "q=" + CITY + "&units=metric"+"&appid=" +  
"9cca583812b638930cefd580106f6c58"
```

```
while True:
```

```
    response = requests.get(URL)    if response.status_code ==200:
```

```
        data = response.json()    main = data['main']    temperature  
=main['temp']    humidity = main['humidity']    pressure =  
main['pressure']
```

```
        report = data['visibility']
```

```
#messge part    msg=random.randint(0,5)    if msg==1:
```

```
        message="SLOW DOWN, SCHOOL IS NEAR"    elif msg==2:  
        message="NEED HELP, POLICE STATION AHED"    elif  
msg==3:
```

```
        message="EMERGENCY, HOSPITAL NEARBY"    elif  
msg==4:
```

```
        message="DINE IN, RESTAURENT AVAILABLE"    else:
```

```
        message="" #Speed Limit part    speed=random.randint(0,150)  
    if speed>=100:    speedMsg=" Limit Exceeded"    elif speed>=60  
and speed<100:
```

```
        speedMsg="Moderate"    else:
```

```
speedMsg="Slow"
```

```
#Diversion part    sign=random.randint(0,5)    if sign==1:
signMsg="Right Diversion"    elif sign==3:
    signMsg="Left Diversion"    elif sign==5:
    signmsg="U Turn"    else:
signMsg=""
```

```
#Visibility    if temperature < 24:
    visibility="Fog Ahead, Drive Slow"    elif temperature < 20:
    visibility="Bad Weather"    else:
    visibility="Clear Weather"
```

```
else:
```

```
    print("Error in the HTTP request")
```

```
    myData={'Temperature':temperature, 'Message':message,
'Sign':signMsg, 'Speed':speedMsg,
'Visibility':visibility}
```

```
    client.publishEvent(eventId="status", msgFormat="json",
data=myData, qos=0, onPublish=None)
```

```
#PUBLISHING TO IOT WATSON
```

```
    print("Published data Successfully: %s", myData)
```

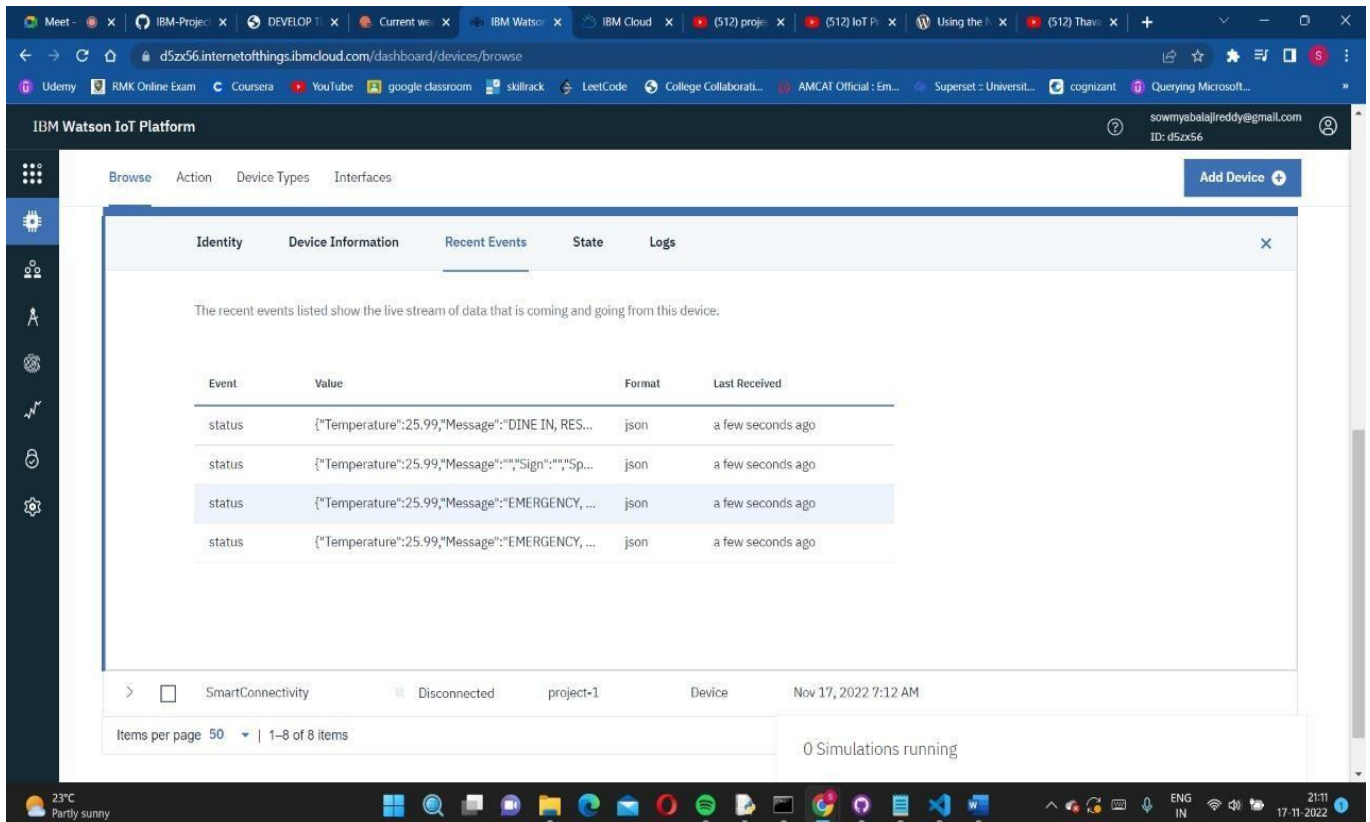
```
client.disconnect()
```

OUTPUT:

[illegible]

7.2 FEATURE 2:

By running the python code, the data will be published in the IBM Cloud.



The screenshot displays the IBM Watson IoT Platform interface. The top navigation bar includes tabs for 'Meet', 'IBM-Proje...', 'DEVELOP...', 'Current wi...', 'IBM Watson', 'IBM Cloud', '(512) proje...', '(512) IoT P...', 'Using the I...', and '(512) Thavi...'. The main content area shows the 'Recent Events' tab for a device. A table lists the following events:

Event	Value	Format	Last Received
status	{"Temperature":25.99,"Message":"DINE IN, RES..."}	json	a few seconds ago
status	{"Temperature":25.99,"Message":"","Sign":"","Sp..."}	json	a few seconds ago
status	{"Temperature":25.99,"Message":"EMERGENCY, ..."	json	a few seconds ago
status	{"Temperature":25.99,"Message":"EMERGENCY, ..."	json	a few seconds ago

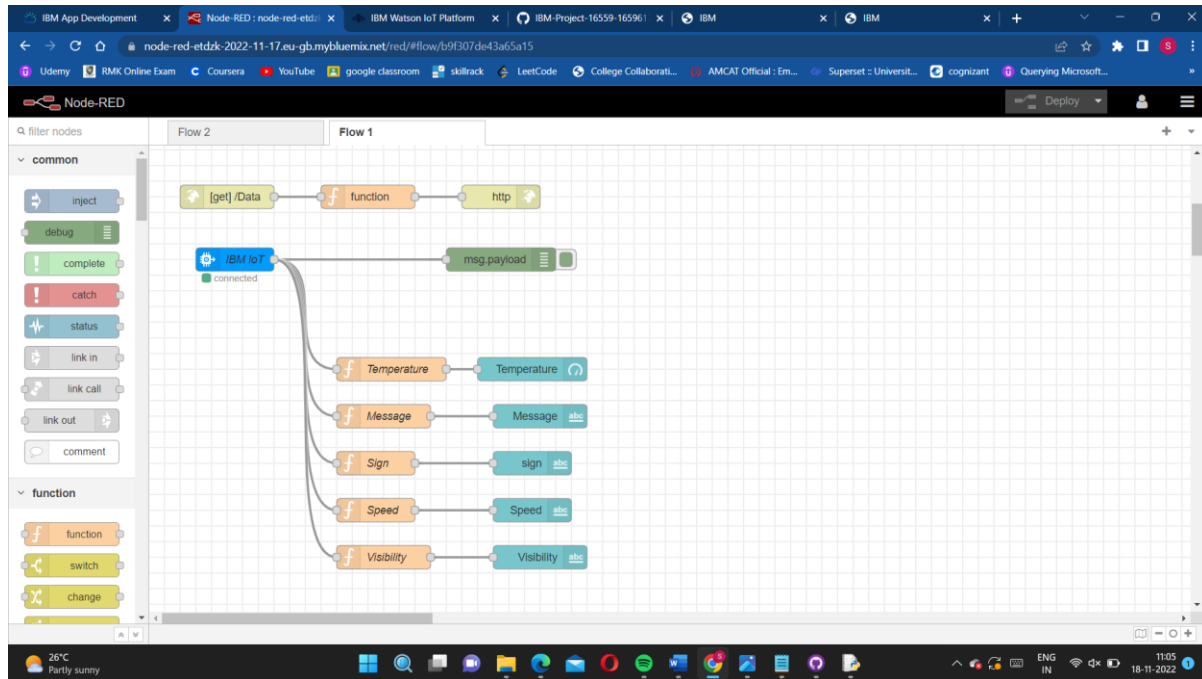
Below the table, the device status is shown as 'Disconnected' for 'project-1'. The bottom status bar indicates '0 Simulations running' and the time '17-11-2022 21:11'.

8. TESTING:

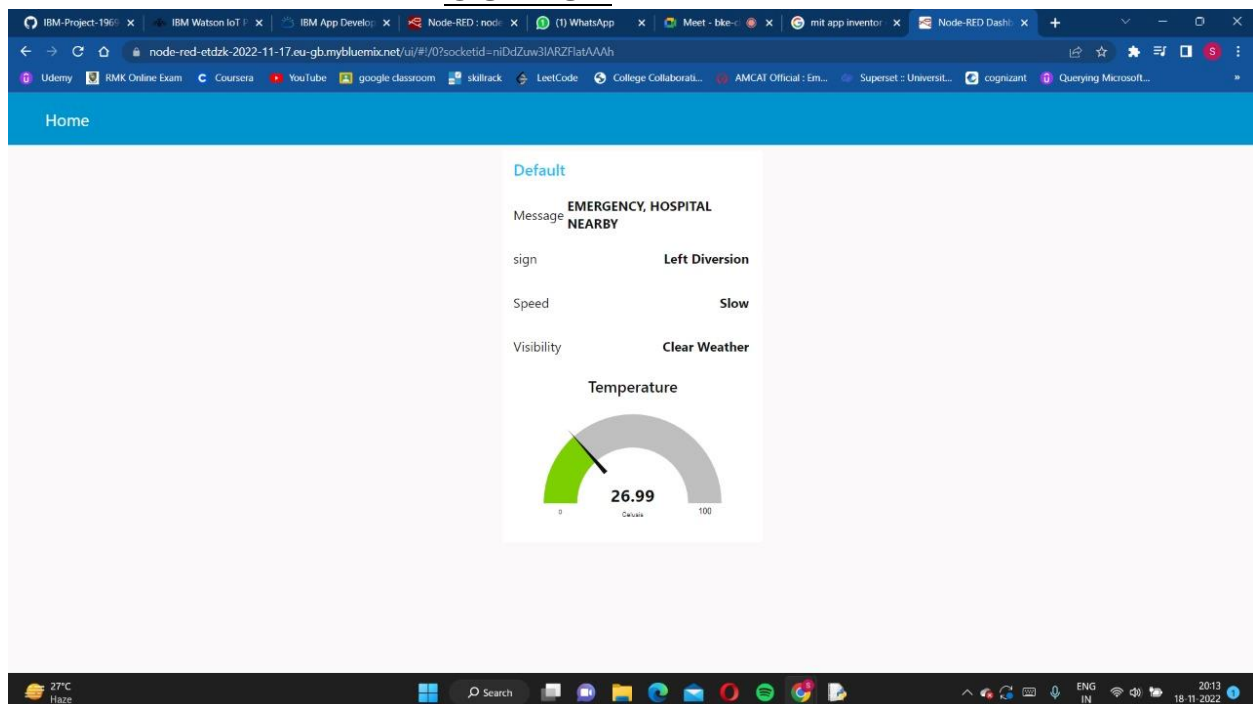
Test cases help guide the tester through a sequence of steps to validate whether a software application is free of bugs, and working as required by the end-user. Learning how to write test cases for software requires basic writing skills, attention to detail, and a good understanding of the application under test (AUT).

8.1 TEST CASES:

NODE RED

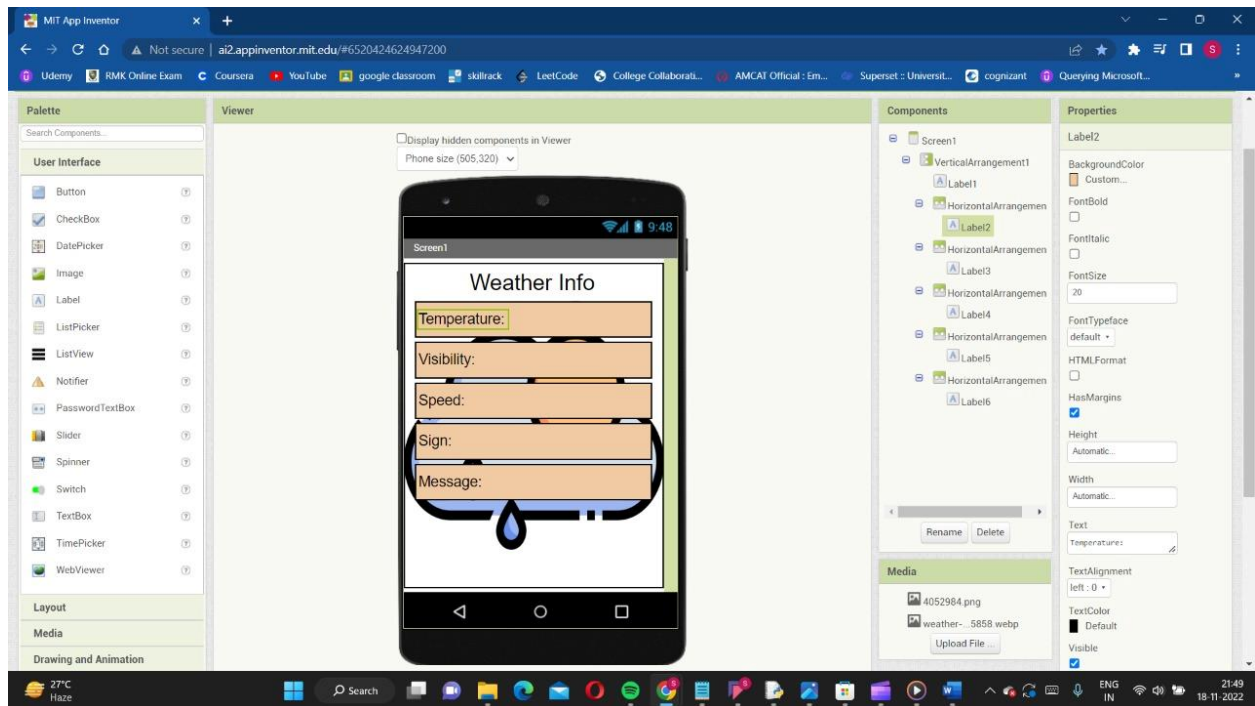


OUTPUT



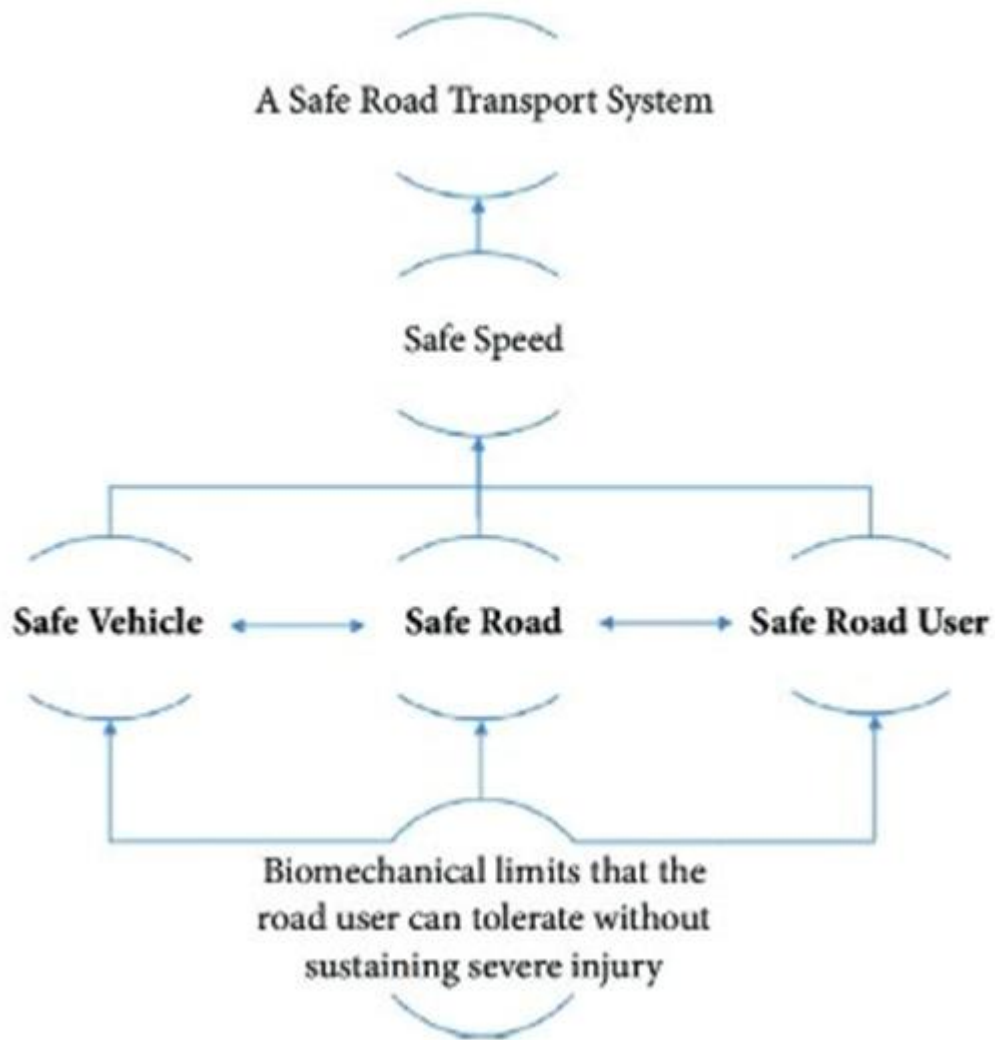
8.2 USER ACCEPTANCE TESTING:

MIT APP INVENTOR



9. RESULTS:

9.1 PERFORMANCE METRICS:



10. ADVANTAGES:

- **Preventing Wrong-way Crashes**

The National Highway Traffic Safety Administration has stated that hundreds of lives are lost annually to wrong-way crashes. In addition, thousands of people sustain injuries in such accidents. Based on research and field tests performed by the Florida Department of Transportation, certain kinds of intelligent road indicators may effectively catch the attention of people driving the wrong way on a roadway. The indicators that were tested included blank indicators that light up when they detect the presence of wrong-way vehicles. Another type of sign was designed with lights that light up in an asynchronous manner. Once a driver is alerted by the lights and can see the “Wrong Way” lettering, that person can turn around and proceed in the correct direction. This could save numerous lives and prevent countless injuries.

- **Better Traffic Management and Safety**

Through refined telematics and intelligent technology, it can be easier to “read” the locations and speeds of vehicles, such as those in a fleet. When vehicles and smart traffic control systems are connected via the cloud, the end results may be more manageable traffic, decreased gridlock, and better traffic

- **Increased Cost Efficiency**

We need to explore more cost-effective ways to strengthen the infrastructure. Building roads is expensive. While there is no substitution for new and upgraded roads, smart roadway indicators can be added to increase efficiency. They provide innovative ways to improve traffic flow, reduce congestion, regulate the patterns of traffic, and create an optimal balance of public and private transportation.

- **Combating Poor Visibility**

Road placards cannot help us if we are unable to read them. Many factors may cause drivers to misinterpret roadside signage or to miss it altogether. Aging drivers can have difficulty seeing roadway signs as they drive past them. Inexperienced drivers can easily misunderstand their meanings. Even those of us who have driven for years may find it challenging to remember the messages conveyed by conventional road signs. Additionally, bad lighting and weather can further decrease our capacity to use the signage as intended. Smart road indicators make it easier for us to detect and implement their alerts and instructions.

DISADVANTAGES:

- **Important investment:**

Buying a screen is much more expensive than putting up a poster and the solutions to control screens are rarely free. In the long run, it is possible to make the screen more profitable but it will take months or years depending on your needs.

- **Editing and renewing the content can be complex:**

If the people managing the screens are not graphic designers, it can be difficult to update the content regularly on the screen.

- **Return on investment:**

ROI can be hard to calculate. There is a high initial spend in installing digital signage and the ROI can become complex when you try and calculate sale's increases with incidents such as screen damage and repair. However, the vulnerability of digital

signage screens can be protected with an LCD enclosure preventing the need for additional repair costs.

- **Still new and improving:**

As such there is always going to be a better, cheaper and more effective solution around the corner. Prices for the technology are still falling too which may be leading to many potential installers playing the waiting game until the price and technology is just right.

- **May require multiple partners:**

With hardware such as LCD enclosures, screens, media players, content and networking involved in many campaigns there may be four or five different companies involved in a single project.

- **Lack of understanding:**

There are many common mistakes made because of a lack of understanding. Poor content, the wrong location and the wrong screen are particularly common especially with outdoor digital signage where demands can differ.

- **Environment:**

While digital screens 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.

- **Lack of a clear purpose behind many campaigns:**

Many people embark on digital signage without a clear purpose in mind which can affect the effectiveness of the system.

11. CONCLUSION:

Smart signs offer crucial information to drivers as well as other common road users. They not only save the lives of those driving the vehicle, but also those using the road on foot. Neglecting their installation is dangerous for both car drivers as well as pedestrians. Maintaining order and reducing accidents, these speed limit signs are the lifeline of today's road networks across the globe. No smart road transport system can be imagined without these devices.

The world doesn't change on its own but we humans can change the world to be safe, better, and harmless. Since the road isn't said to be safe let's make it safer with the technologies present and available to us. The Internet of Things is one of the technologies that can lead us to travel on enhanced safe roads. So let's come together to create a better world with no accidents and a smart road for the future generation.

12. FUTURE SCOPE:

IOT obtains the majority of its data with the help of connected cars. These incorporate a large number of sensors that establish communication with the cloud, other vehicles, and devices.

It provides data and information of great utility for the improvement of road safety. The safe system approach to road safety emphasizes safety by design ensuring safe vehicles, road networks, and road users. Evolving towards the future, the road needs to boil with advanced sensors and antenna systems to have peace with the new era.

13. APPENDIX:

13.1 SOURCE CODE:

```
import wiotp.sdk.device
import time
import random
import ibmiotf.application
import ibmiotf.device
import requests, json

myConfig = { #Configuration
    "identity": {
        "orgId": "d5zx56",
        "typeId": "SMARTBOARD", "deviceId": "SMARTCONNECTIVITY"},
    #API Key
    "auth": {
        "token": "957846465"
    }
}

#Receiving callbacks from IBM IOT platform
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" %
        cmd.data['command'])
    m=cmd.data['command']

client =
wiotp.sdk.device.DeviceClient(config=myConfig,logHandlers=None)
client.commandCallback= myCommandCallback
client.connect()

#OpenWeatherMap Credentials
BASE_URL ="https://api.openweathermap.org/data/2.5/weather?"
CITY = "Chennai"
```

```
URL = BASE_URL + "q=" + CITY + "&units=metric"+"&appid=" +  
"9cca583812b638930cefd580106f6c58"
```

```
while True:
```

```
    response = requests.get(URL)  
    if response.status_code ==200:  
        data = response.json()  
        main = data['main']  
        temperature =main['temp']  
        humidity = main['humidity']  
        pressure = main['pressure']  
        report = data['visibility']
```

```
#messge part
```

```
    msg=random.randint(0,5)  
    if msg==1:  
        message="SLOW DOWN, SCHOOL IS NEAR"  
    elif msg==2:  
        message="NEED HELP, POLICE STATION AHED"  
    elif msg==3:  
        message="EMERGENCY, HOSPITAL NEARBY"  
    elif msg==4:  
        message="DINE IN, RESTAURENT AVAILABLE"  
    else:  
        message=""
```

```
#Speed Limit part
```

```
    speed=random.randint(0,150)  
    if speed>=100:  
        speedMsg=" Limit Exceeded"  
    elif speed>=60 and speed<100:  
        speedMsg="Moderate"  
    else:  
        speedMsg="Slow"
```

```
#Diversion part
```

```

sign=random.randint(0,5)
if sign==1:
    signMsg="Right Diversion"
elif sign==3:
    signMsg="Left Diversion"
elif sign==5:
    signmsg="U Turn"
else:
    signMsg=""

#Visibility
if temperature < 24:
    visibility="Fog Ahead, Drive Slow"
elif temperature < 20:
    visibility="Bad Weather"
else:
    visibility="Clear Weather"

else:
    print("Error in the HTTP request")
    myData={'Temperature':temperature, 'Message':message,
'Sign':signMsg, 'Speed':speedMsg, 'Visibility':visibility}
    client.publishEvent(eventId="status", msgFormat="json",
data=myData, qos=0, onPublish=None)
#PUBLISHING TO IOT WATSON
print("Published data Successfully: %s", myData)
client.commandCallback= myCommandCallback
time.sleep(5)

client.disconnect()

```

GitHub Link:

Project Demo Link: