PROJECT-BASED EXPERIENTIAL LEARNING PROGRAM (NALAIYA THIRAN)
SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

A PROJECT REPORT

Submitted by

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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 type 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 :

Road traffic safety refers to the methods and measures used to prevent road users from being killed or seriously injured. Growth in population has led to growth in technology. People use cars in large numbers and the number of accidents taking place is increasing daily. Road accidents are undoubtedly the most frequent happening cases and overall, the cause of the most damage. There are many dangerous roads in the world like mountain roads, narrow curve roads, and T roads. Some mountain roads are very narrow and they have many curves. The problem with these curve roads is that the drivers are not able to see the vehicle or obstacles coming from another end of the curve. If the vehicles inatreat speed then it is difficult to control and there are chances of falling off a cliff. Hence there is a fored of many road safety systems. By us advanced technology to create smart connectivity for better road safety.

2.2 REFERENCES:

BOOK/ JOURNAL	TOPIC	AUTHOR NAME	YEAR	INFERENCE
THE ROYAL SOCIETY PUBLISHING	Advances in smart roads for future smart cities	Chai K.Toh, Julio A. Sanguesa, Juna C. Cano and Francisco J.	2020	In the paper,they discussed therecent 10 technological advances and

		Martinez		developments in the area of smart roads. They include: (i) energy-harvesting road, (ii) musical road, (iii) automatic- weighing road, (iv) electrifiedroad, (v) roadswith wireless digital traffic signs, (vi) roads with automatic traffic violation detection and notification, (vii) roads that talk (V2X), (viii) roads with smart intersections, (ix) roads with fast emergency rescue, and (x) roads with smart street lights. These advances will aid in the progress, development and realization of smart transport for future smart cities.
ICT INNOVATIONS	Internet of Things Based Solutions for Road Safety and Traffic Management in	Arnav Thakur, Reza Malekian,		Vehicle to vehicle communication and vehicle to infrastructure based channels are studied. Wireless the

2017	Intelligent Transportation Systems	Dijana Capeska Bogatinoska	2017	suitable for communication technologies channels are
				studied. Additional benefits and services that can be

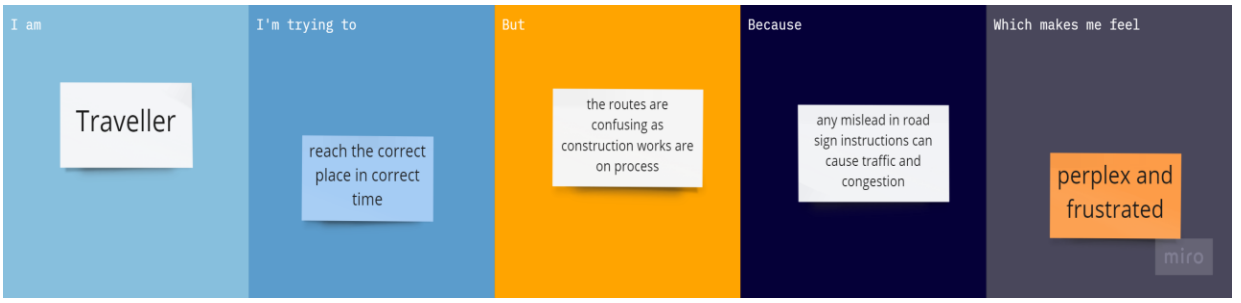
				added to a system with the IoT approach are also studied. The effectiveness of such a system is studied with the use of validation framework. Multiple case studies of current and future IoT based ITS along with the challenges in the application is discussed.
JOURNAL O F ADVANCED TRANSPORTATIO N	Development and Testing of Road Signs Aler t System Using a Smart Mobile Phone	Eric M Masatu, Ramadhani Sinde, Anael Sam	2022	In this study a system for alerting drivers about road signs has been developed and tested using a smart mobile phone.
SAGE JOURNALS	Reading Vehicular Messages from Smart Road Signs: A Novel Method to Support Vehicle-to-Infrastructure	Enes Karaaslan, Burak Sen, Tolga Ercan,Haluk Laman,James pol	2021	The objective of this paper is to investigate the operational challenges of the proposed low-cost solution in different V2I

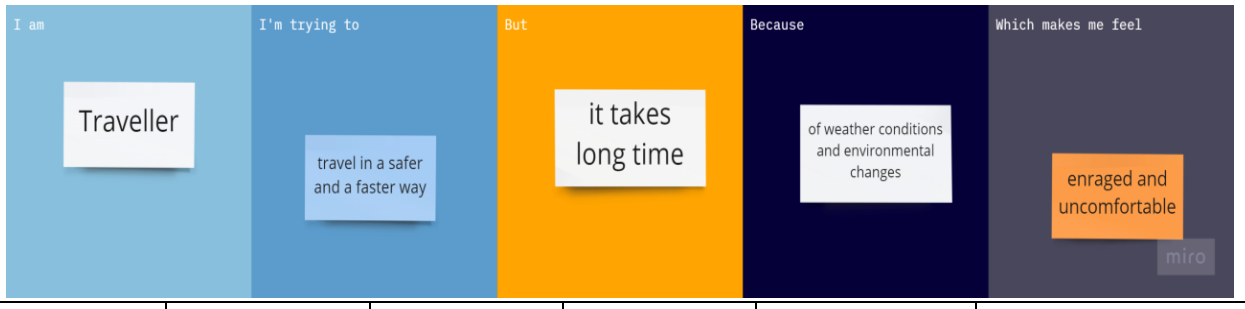
	in Rural Settings			applications, including a Map Data message in an unsignalized traffic intersection, traveler information message in a work zone, and a red-light violation

				warning with the help of a smart sign. The proposed system showed some important advantages, such as invulnerability to third-party alterations and robust operation under harsh environmental conditions.

2.3 PROBLEM STATEMENT DEFNITION :

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.

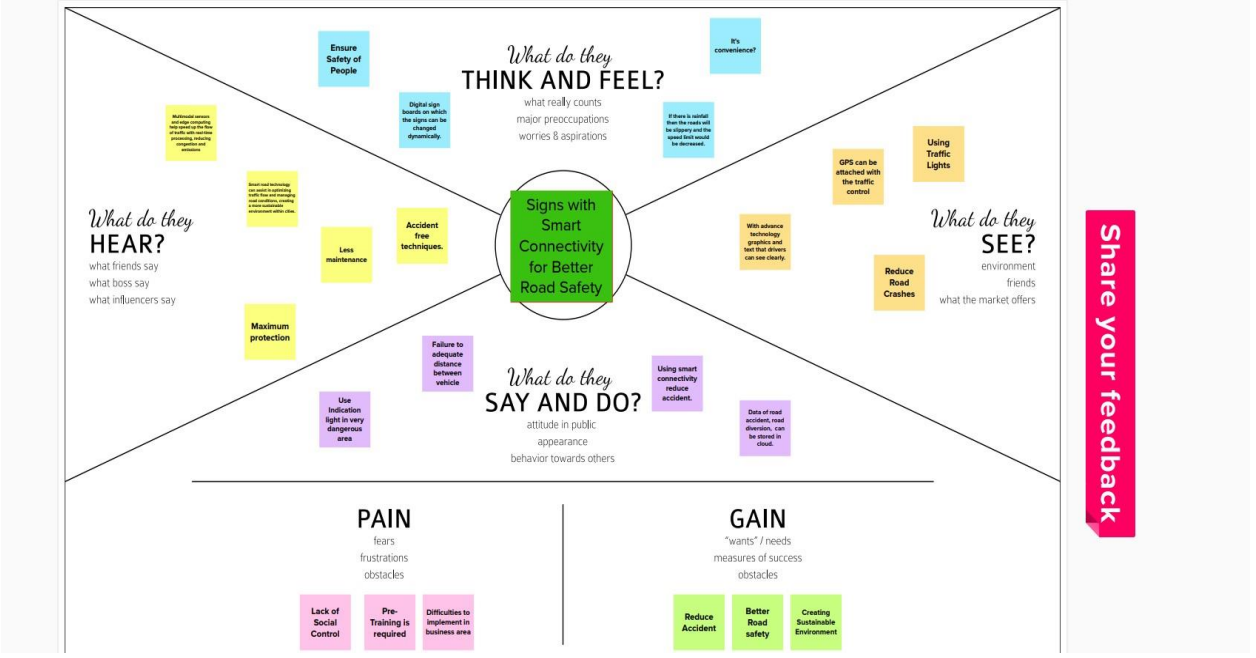




Problem Statement (PS)	**I am (Customer)**	**I'm trying to**	**But**	**Because**	**Which makes me feel**
PS-1	Traveller	Reach the correct place in correct time	The routes are confusing as construction works are on process	Any mislead in road sign instructions can cause traffic and congestion	Perplex 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 :

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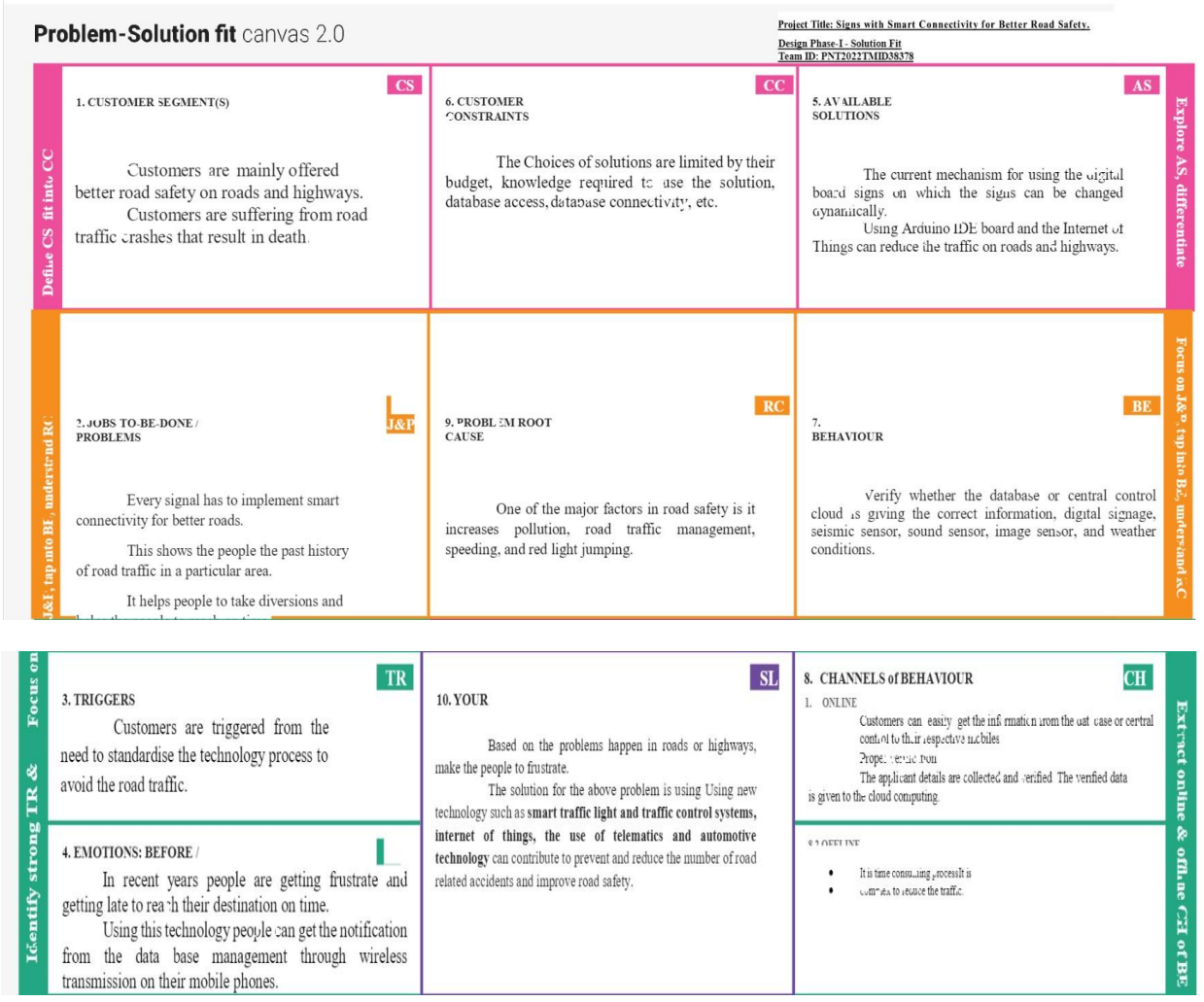
3.3 PROPOSED SOLUTION :

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Road safety management refers to the process of identifying safety problems, devising potential strategies to combat those safety problems, and selecting and implementing the strategies. Effective safety management is also proactive and looks for ways to prevent safety problems before they arise. High-quality safety data should be used to determine the nature of road safety problems and how best to solve them.
		These data can be used to identify large-scale or small safety problems. Other data, such as roadway characteristics, traffic volume, citations, and driver history, can be integrated with crash data to assist in identifying safety trends and highpriority locations.

2.	Idea / Solution description	Connectivity also allows monitoring the flow velocity in real-time so you can **warn drivers on the screen of their cars that they are exceeding the speed limit**. They also warn the pilot to park in prohibited areas or other behaviors that do not comply with the law, thus avoiding penalties for drivers.
3.	Novelty / Uniqueness	It proposes a system that has digital signboards 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. There is a web app through which you can enter the data of road diversions, and accident-prone areas, and the information sign boards can be entered through the web app. This data is retrieved and displayed on the signboards accordingly.
4.	Social Impact / Customer Satisfaction	From speed limits to directions on where and when to turn, traffic signs provide a wealth of information. Following traffic signs helps to keep everyone on the road safe by **reducing the chances of drivers colliding with other vehicles, pedestrians, or cyclists**.
5.	Business Model (Revenue Model)	IoT is already working to ensure road safety in areas such as vehicle maintenance, improved circulation, navigation, and monitoring of environmental conditions or the state of the roads. 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.
6.	Scalability of the Solution	Traffic management networks for improving safety and reducing congestion. The network uses speed cameras to provide warning signs for hazardous conditions and sends automated traffic diversion signals that control traffic.

3. 4.PROBLEM SOLUTION FIT:



4. REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENT:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Web App Installation Register with Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP

FR-3	Proof of Identity	Customers can register one mail account on their respective mobile.
FR-4	Credit Score and History	Purchaser has to get the premium package to access the information. Customers can check the history of the road signals.

4.2.NON–FUNCTIONAL REQUIREMENTS:

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

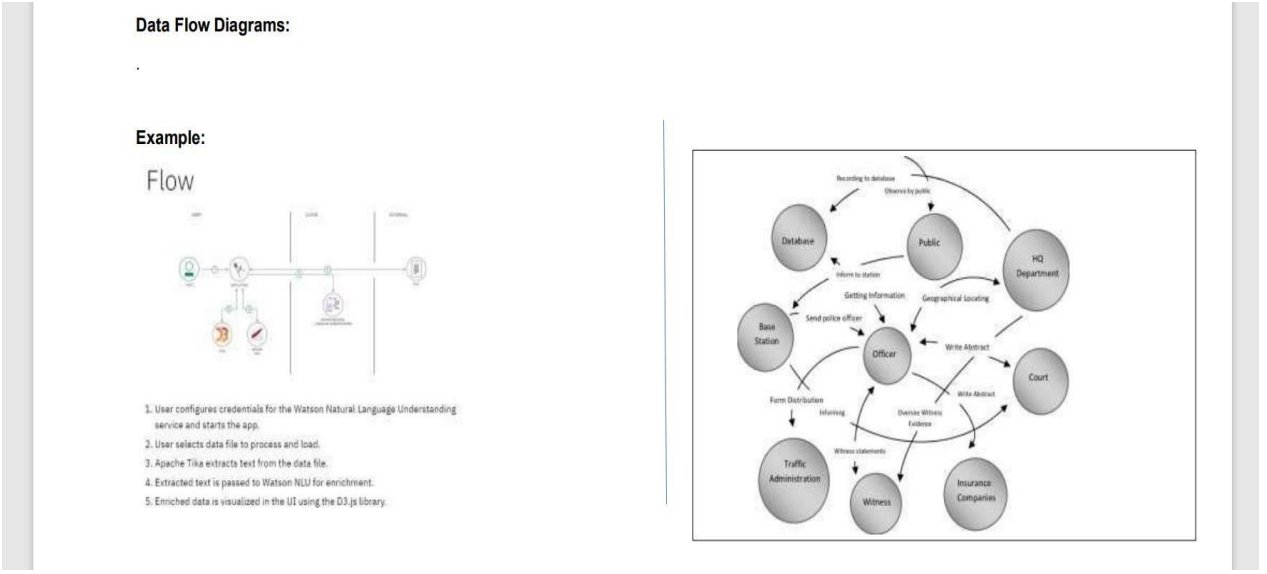
FR No.	**Non-Functional Requirement**	**Description**
NFR-1	**Usability**	Customers can use the application in almost all web browsers. It will indicate the people through audio or notifications about road safety, and weather conditions.
NFR-2	**Security**	Customers are asked to create an account for themselves using their email which is protected with an 8character-long password, making it more
NFR-3	**Reliability**	Customers can raise their queries and will be replied with a valid reply, as soon as possible, making the application even more reliable and trustworthy.

NFR-4	**Performance**	Customers will have a smooth experience while using the application, as it is simple and well- optimized.
NFR-5	**Availability**	Application is available 24/7 as it is hosted on IBM Cloud
NFR-6	**Scalability**	In the future, maybe crossplatform mobile applications can be developed as the user base grows. secure.

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:

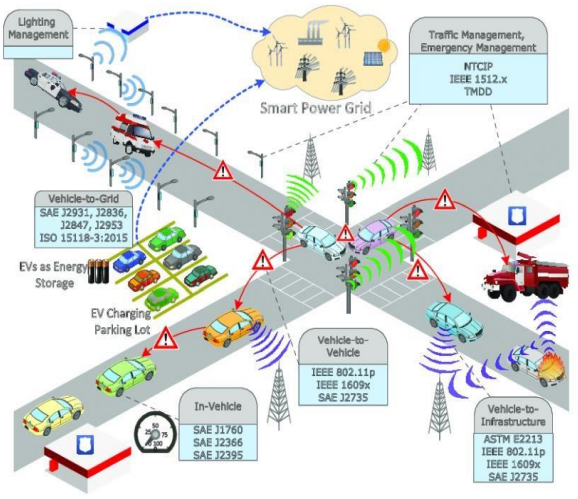
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions.

Its goals are to:

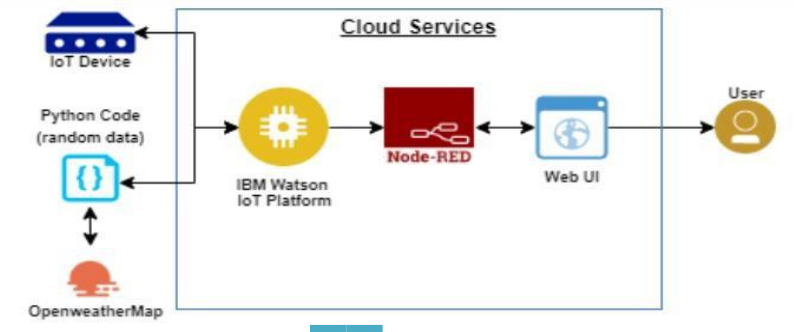
- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution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

Technical Architecture:

Signs with Smart Connectivity for Better Road Safety



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

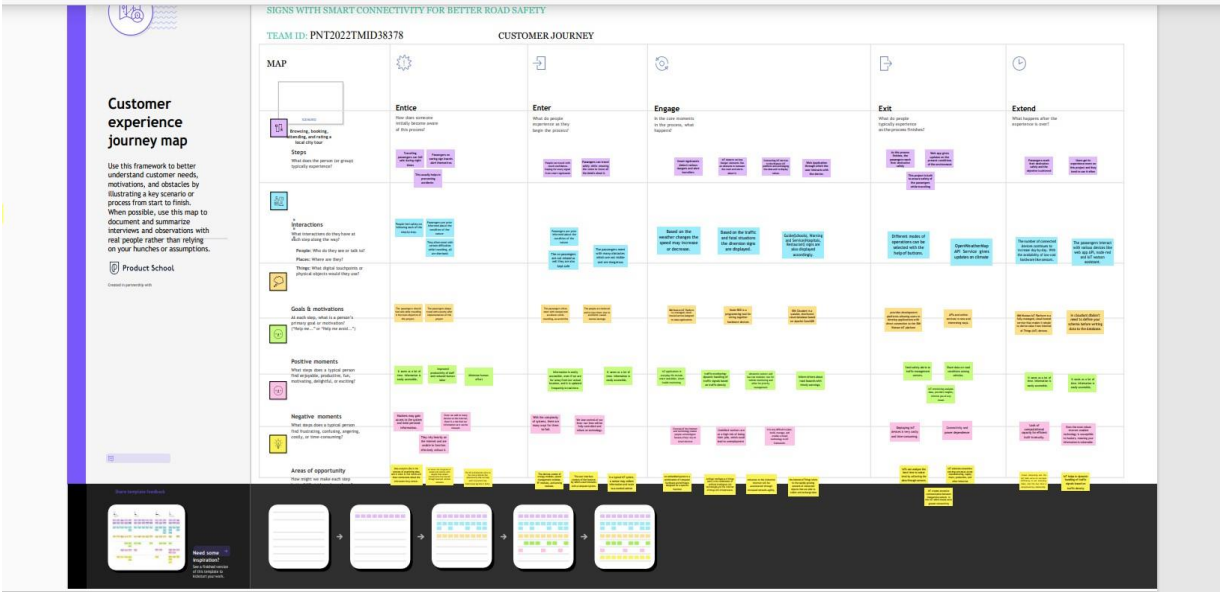
5.3 USER STORIES:

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	I can access the interface easily	High	Sprint-1

			easily accessible			
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:



6. PROJECT PLANNING AND SCHEDULING:

6.1 SPRINT PLANNING & ESTIMATION:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Login	USN-1	As a weather data controller, I log into my profile and start monitoring the weather	3	High	JANANI

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, and password, and confirmingmy password.	2	High	SOWMIYAA
Sprint-1		USN-2	As a user, I will receive a confirmation email onceI have registered for the application	1	High	JANANI
Sprint-1		USN-3	As a user, I can register for the application through Facebook	2	Low	ANANDHI
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	JENIFER
Sprint-1	Login	USN-5	As a user, I can log into the application by entering my email & password	1	High	PAVITHRA
Sprint-1	Dashboard	USN-6	As a user, I can log into the application by entering my email & password and access all the resources and services available	2	High	SOWMIYAA

			updates			
Sprint-2	Dashboard	USN-2	I receive all the information about weather from web from weather API. Whenever there is change in weather, corresponding updates are made on sign boards.	2	Medium	ANANDHI
Sprint-3	Login	USN-1	As a image controller, I keep note of all the images received from various areas and detect traffic in that particular area.	3	High	JANANI
Sprint-3	Dashboard	USN-2	With the traffic, updates I change the status of sign board as “take diversion”.	2	Medium	JENIFER
Sprint-4	Login	USN-1	As a zonal officer, I ensure that boards near school display “slow down” and near hospitals display “no horn”.	3	High	PAVITHRA
Sprint-4	Login	USN-1	As an administrator, I ensure that all departments work coordinated and ensure the accuracy and efficiency.	2	Medium	ANANDHI

6.2 SPRINT DELIVERY SCHEDULE:

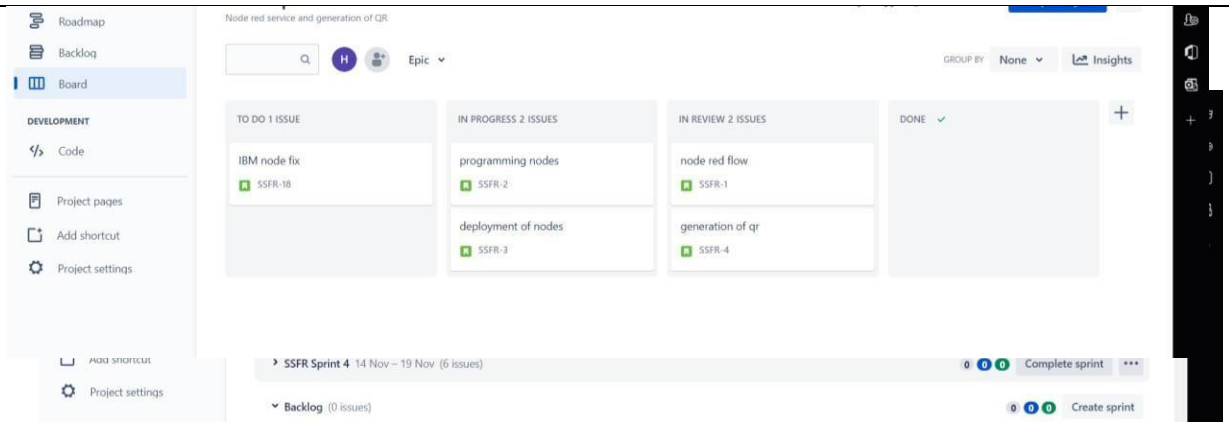
TITLE	DESCRIPTION	COMPLETED DATE
Literature Survey & Information Gathering	Prepare a Literature survey forthe selected project & gathering information	29 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	25 SEPTEMBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	26 SEPTEMBER 2022

Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	24 SEPTEMBER 2022

Problem Solution Fit	Prepare problem - solution fit document.	30 SEPTEMBER 2022
Solution Architecture	Prepare solution architecture document.	29 SEPTEMBER 2022
Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	17 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	15 OCTOBER 2022

Technology Architecture	Prepare the technology architecture diagram.	14 OCTOBER 2022
Prepare Milestone & Activity List	Prepare the milestones & activity **list** of the project.	22 OCTOBER 2022
Sprint delivery plan	Prepare the sprint delivery plan of the project	22 OCTOBER 2022
Project Development - Delivery of Sprint-1	Develop & submit the developed code by testing it.	IN PROGRESS..
Project Development - Delivery of Sprint2	Develop & submit the developed code by testing it.	IN PROGRESS..
Project Development - Delivery of Sprint3	Develop & submit the developed code by testing it.	IN PROGRESS..
Project Development - Delivery of Sprint4	Develop & submit the developed code by testing it.	IN PROGRESS..

6.3 REPORTS FROM JIRA:



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)

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

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": "fvh76j",

"typeId": "Connectivity123", "deviceId":"ESP32"},
```

#API Key

"auth": {

"token": "12345678"

}

}

#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"

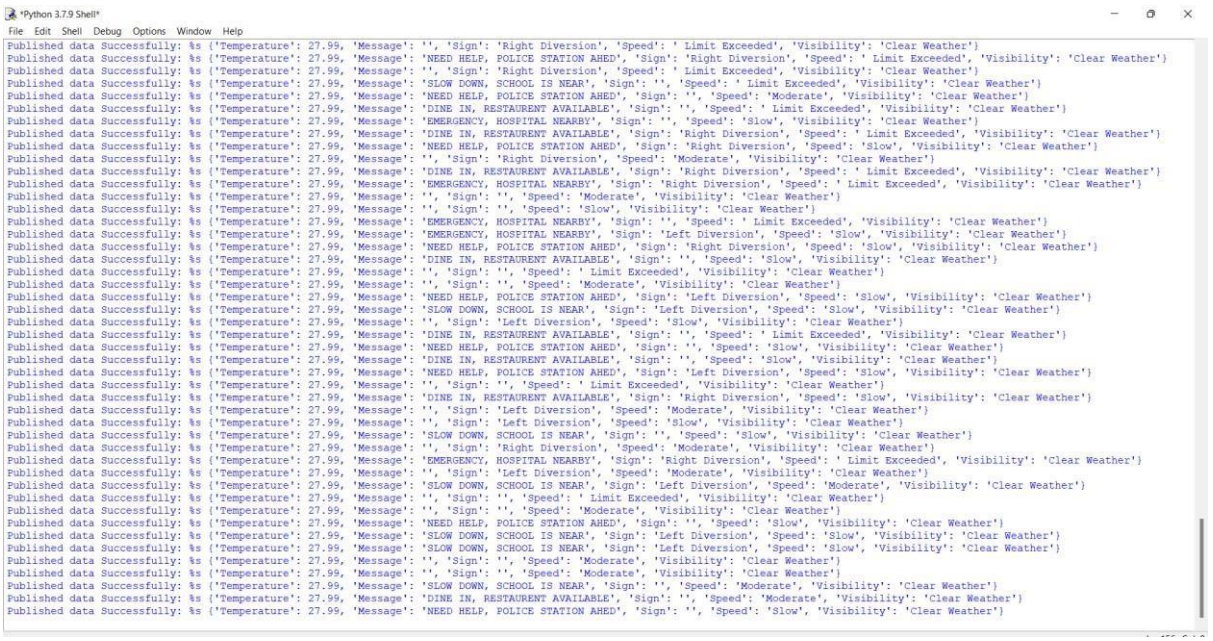
URL = BASE_URL + "q=" + CITY + "&units=metric"+"&appid=" +

" aacfd527963a5d91a8b5db80c6fe67b4"

```
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=""
```

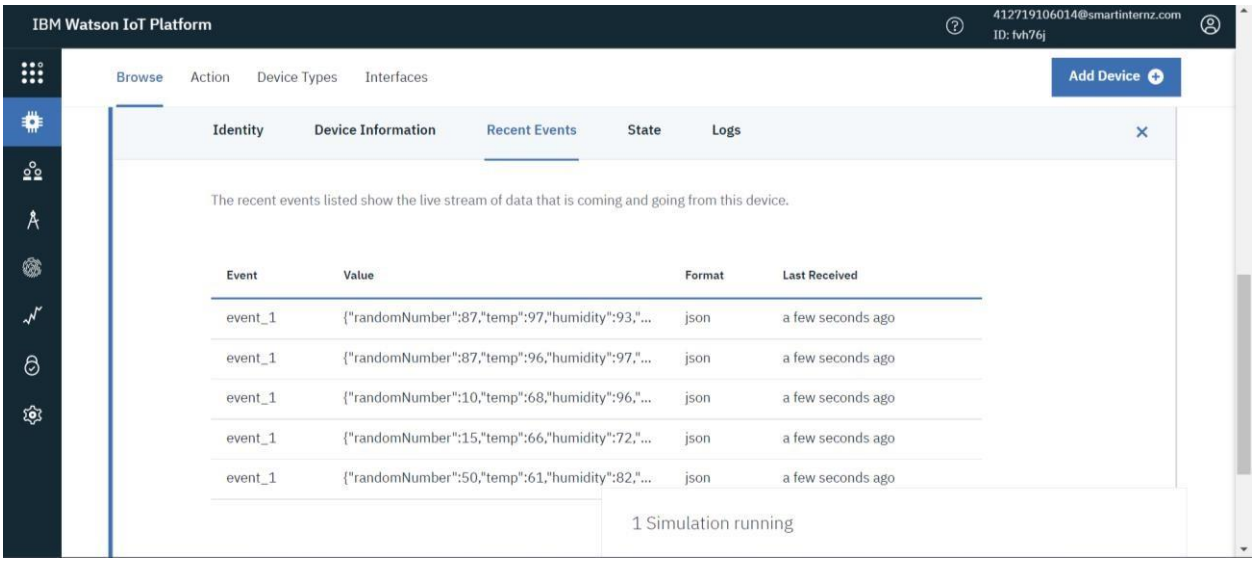
```
#Visibility       if temperature < 24:          visibility="Fog Ahead,
Drive Slow"       elif temperature < 20:
        visibility="Bad Weather"       else:
        visibility="Clear Weather"

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:



7.2 FEATURE 2:

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

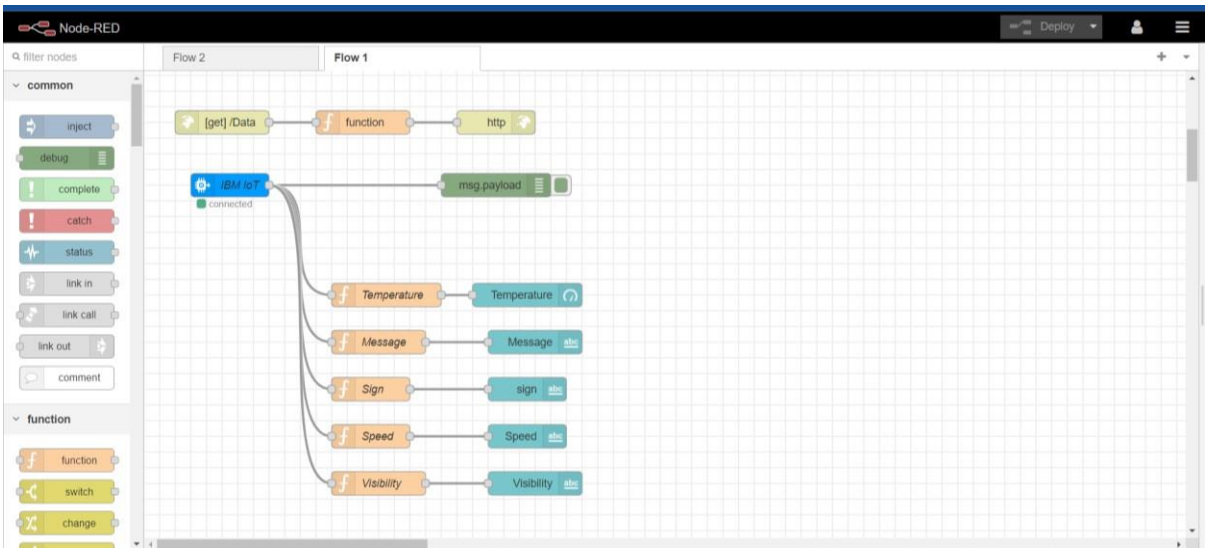


8. TESTING:

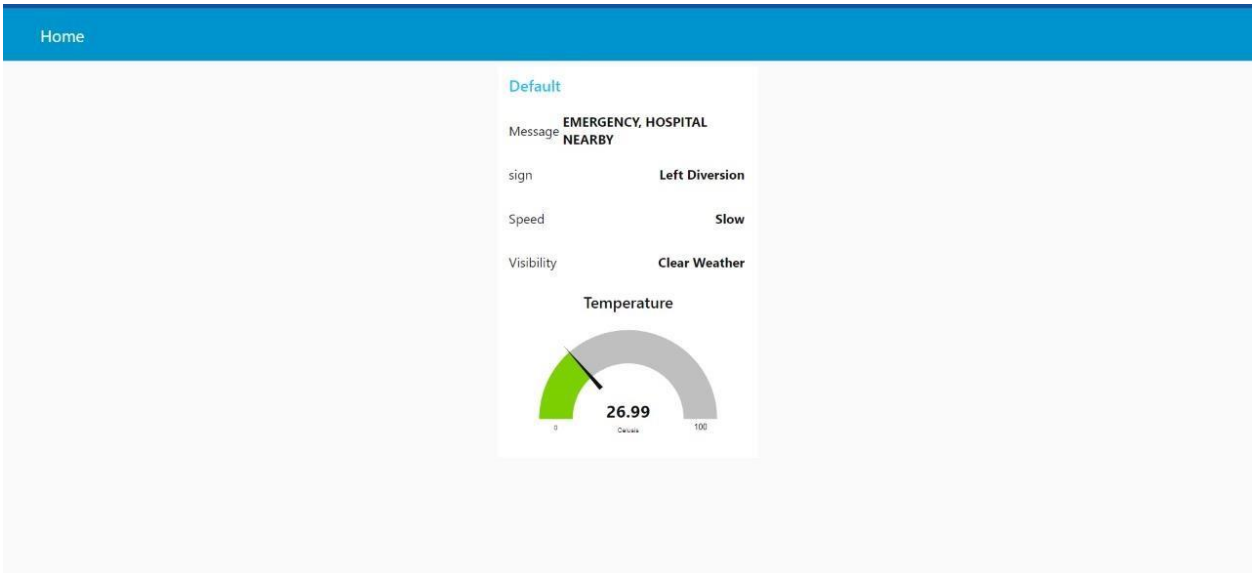
Test cases help guide the tester through a sequence of steps to validate whether a software application is free of bugs, and working as required by the end-user. Learning how to write test cases for software requires basic writing skills, attention to detail, and a good understanding of the application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

8.1 TEST CASES:

NODE RED

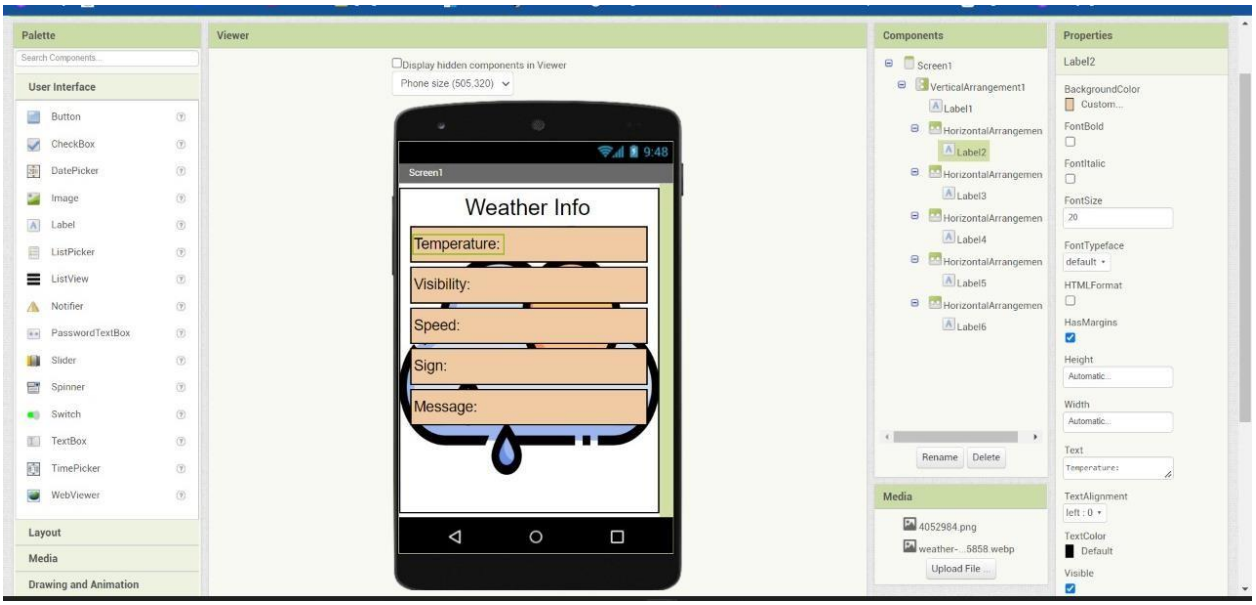


OUTPUT



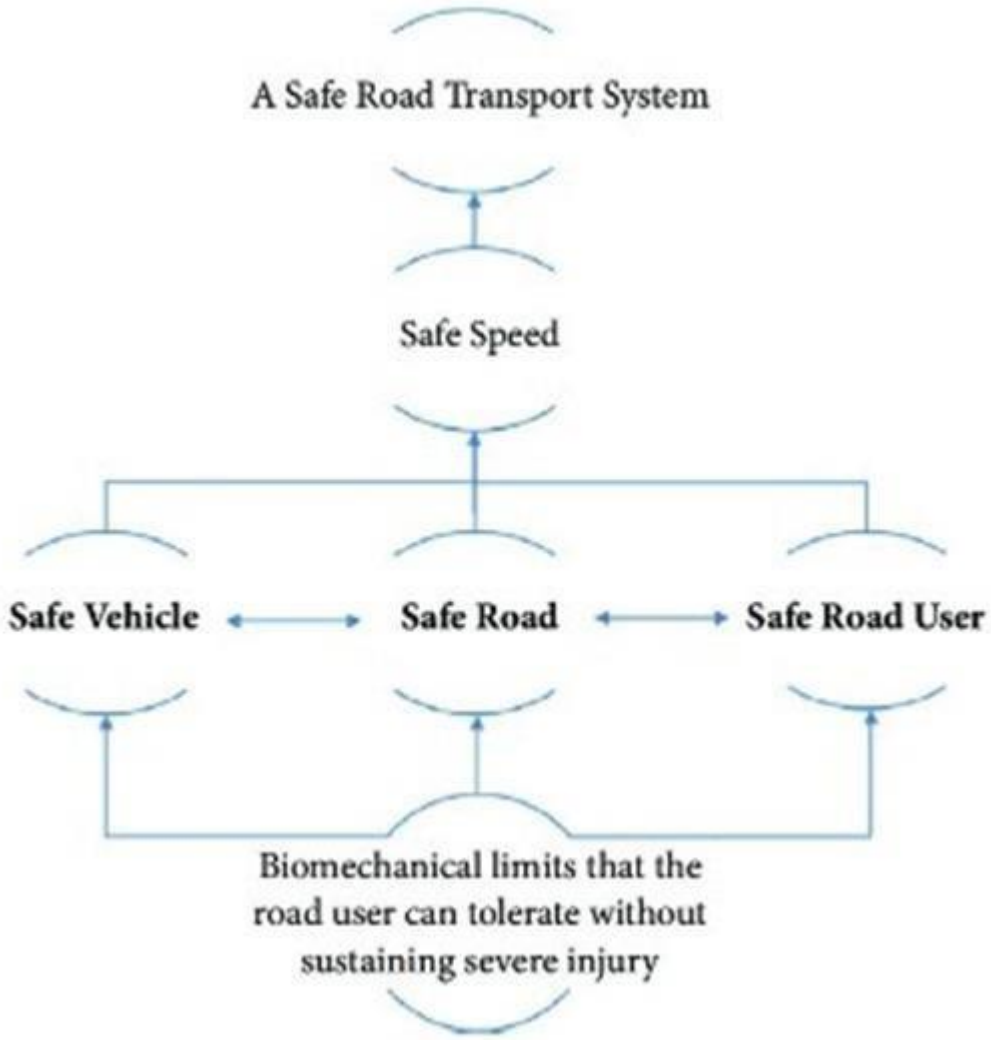
8.2 USER ACCEPTANCE TESTING:

MIT APP INVENTER



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": "fvh76j",
"typeId": "SMARTBOARD", "deviceId":"SMARTCONNECTIVITY"},
```

```
#API Key
"auth": {
"token": "12345678"
}
}

#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=" + "
aacfd527963a5d91a8b5db80c6fe67b4"

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: https://github.com/IBM-EPBL/IBM-Project-20798-1659763505

Project Demo Link:

https://drive.google.com/file/d/1rSehGW0VPe6yQN9WYFsAMr33_mWRuIL/view?usp=share_link