PNT2022TMID54446

IBM PROJECT REPORT

COLLEGE NAME	SRM EASWARI ENGINEERING COLLEGE
TEAM ID	PNT2022TMID54446
PROJECT NAME	SIGN WITH SMART CONECTIVITY FOR BETTER ROAD SAFETY

SUBMITTED BY,

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PROJECT REPORT FORMAT

1.INTRODUCTION

1.1 PROJECT OVERVIEW

Signs with smart connectivity for better road safety is connected vehicle technology aim to solve some of the biggest challenges in the transportation in the areas of safety, mobility and environment. The safety application for Intelligent Transport System (ITS) is one of the main objectives in this project. Safety application is research and industrial initiative which aim to contribute to the global advancement of automobile industry.

Automobile manufacturers all over the world are currently developing, exhibiting, producing and promoting new vehicle features that make possible the exchange of information with the Internet via specific interfaces, bringing the Internet into the automobile world. The vision of the Project is to provide the Multi-modal transportation system that gives inter-connection of transportation environment giving help to millions of vehicles inter-communication traffic problems and safety issue.

1.2 PURPOSE

Highway security and safety is one of major open health Challenges for any nation. The amount of highway casualty is still unacceptably high. Traffic profusion is a billion dollar waste of the country's economy. People waste billions of hours in traffic congestion each year. As the amount of on road vehicles increases, bringing about more traffic hazard and loss of economy from auto collisions. Previously, security frameworks have kept measures on diminishing driver injury if there should be an occurrence of a crisis. Consequently the settings of seat belts, airbags and so on which can reduce the injury of the person's on board but cannot inform him earlier to avoid the accident. The present drift in security is not just to moderate the impacts of car crashes, but to prevent their

occurrence all together. This includes making vehicles and roadways more perceptive through propelled engineering called Intelligent Transportation Systems (ITS) [3]. The Objective of the Project is vehicles and infrastructure can freely communicate, interact and bringing benefits of greater safety and efficiency, improved mobility and to make transportation safer, smarter, and enhance livability for human beings. In this project, we describe on application for passenger safety on the basis of V2V technique using VANET network simulator and Dedicated Short Range Communications (DSRC) for vehicle

2 LITERATURE SURVEY

2.1EXISTING PROBLEM

Analysis of crash data has suggested a link between roadside advertising signs and safety. ▪ Research suggests that crash risk increases by approXimately 25–29% in the presence of digital roadside advertising signs compared to control areas.

▪ On the other hand, static roadside advertising signs have not been linked with differences in the crash count.

The quantity and quality of available evidence limit our conclusion.

▪ Fixed object, side swipe and rear end crashes are the most common types of crashes in the presence of roadside advertising signs.

▪ In addition, drivers showed increased eye fixations and increased drifting between lanes on the road.

2.2 REFERENCES

1] A. Mogelmose, M. M. Trivedi, and T. B. Moeslund, “Vision-based traffic sign detection and analysis for intelligent driver assistance systems: Perspectives and survey,” IEEE Transactions on Intelligent Transportation Systems, vol. 13, no. 4, pp. 1484–1497, 2012.

[2] K. Eykholt, I. Evtimov, E. Fernandes, B. Li, A. Rahmati, C. Xiao, A. Prakash, T. Kohno, and D. Song, “Robust physical-world attacks on deep learning visual classification,” in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2018.

[3] J. Jin, K. Fu, and C. Zhang, “Traffic sign recognition with hinge loss trained convolutional neural networks,” IEEE Transactions on Intelligent Transportation Systems, vol. 15, no. 5, pp. 1991– 2000, 2014. [4] A. Gonzalez, L. M. Bergasa, and J. J. Yebes, “Text detection and ´ recognition on traffic panels from street-level imagery using visual appearance,” IEEE Transactions on Intelligent Transportation Systems, vol. 15, no. 1, pp. 228–238, 2014.

2.3 PROBLEM STATEMENT DEFINITION

This project will replace the static boards to smart signed boards that will change the speed limits according to the weather climate and show diversion messages if there are accidents in the road and alert messages if there is hospital, schools or any roadworks.

3. IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

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3.2.BRAIN STROMING

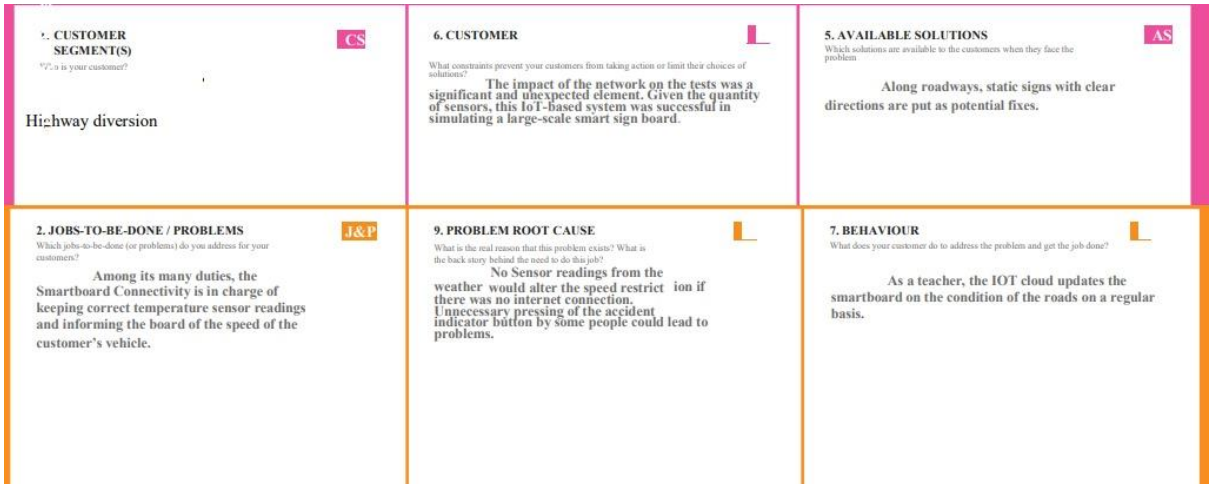
SUHAIL AHMED Based on current research and development efforts, we can all be fairly certain that smart road signs will be broadly utilized in the years to come. They serve as one of the major components of an emerging system	**VAARAGHI** The road signage of the future might also be used to transmit crucial data to driverless cars. These signs may appear to humans to be conventional road indicators
VISHWA Let's start by exploring the concept of the "Wireless Digital Traffic Sign Post." This term refers to a traffic sign embedded with information. By way of firmware, microchips, and radios, the sign transmits data wirelessly to drivers and driverless cars. When vehicles approach such a sign on the roadway, vital information is imparted to their drivers	**ROHIT KUMAR** 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.

3.3PROPOSED SOLUTION

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To replace the static signboards, smart connected sign boards are used.
2.	Idea / Solution description	• Smart connected sign boards get the speed limitations from a web app using weather API and update automatically. • Guide(Schools), Warning and Service(Hospitals, Restaurant) signs are also displayed accordingly. • Different modes of operations can be selected with the help of buttons.
3.	Novelty / Uniqueness	• Based on the weather changes the speed may increase or decrease. • Based on the traffic and fatal situations the diversion signs are displayed.
4.	Social Impact / Customer Satisfaction	• Speed limitations using web application . • Alert the drivers during emergency. • Divergency signs are displayed during emergency.
5.	Business Model (Revenue Model)	Subscription provided to customer and advertising .
6.	Scalability of the Solution	8/10

3.4 PROBLEM SOLUTION FIT



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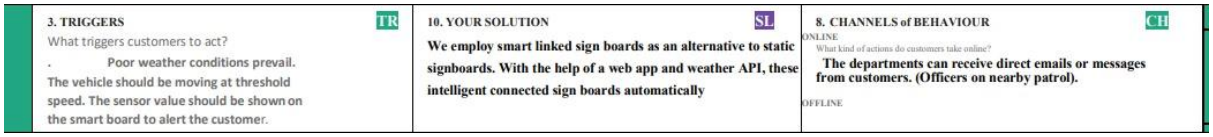
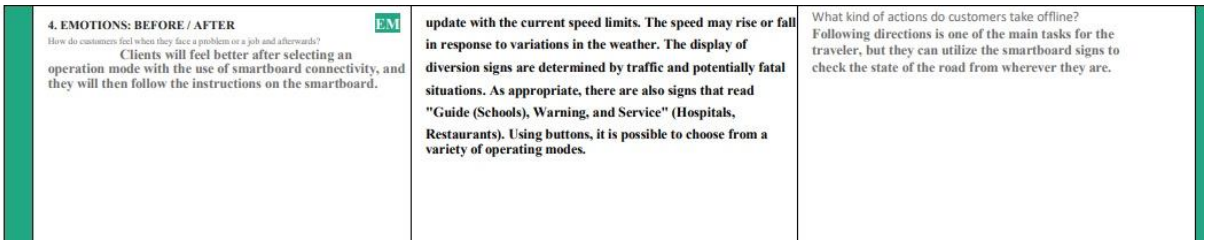




4.REQUIREMENT ANALYSIS

4.1.FUNCTIONAL REQUIREMENT

FR-1	INTEROPERABILIY	Requirement describes whether a software system is interoperable across different systems.
FR-2	SECURITY	The functional requirement describes the security aspect of software requirements.
FR-3	ACCURACY	Accuracy defines a data entered into the system is correctly calculated and used by the system and that the output is correct.

FR -4	COMPLIANCE	Compliance functional requirements validate that the developed system is compliant to Industrial standards..

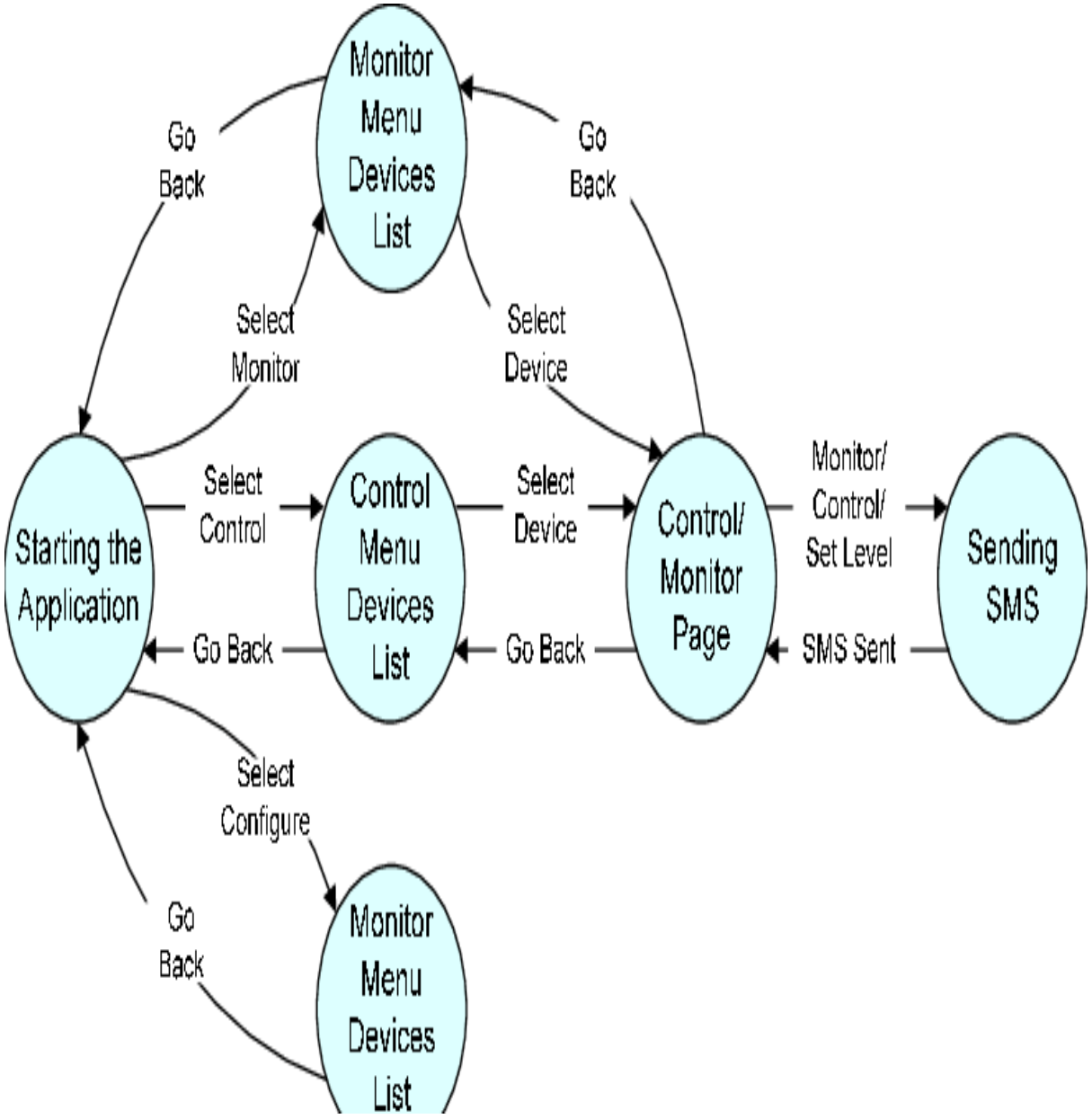
4.2.NON FUNCTIONAL REQUIREMENT

NFR-1	PRFORMANCE AND SCALABILITY	How fast does the system return results? How much will this performance change with higher workloads?
NFR-2	PORTABILITY AND COMPATABILITY	Which hardware, operating systems, and browsers, along with their versions does the software run on?
NFR-3	REALIABILITY,MAINTAINABIITY ,AVAILABILITY	How often does the system experience critical failures? How much time does it take to fix the issue

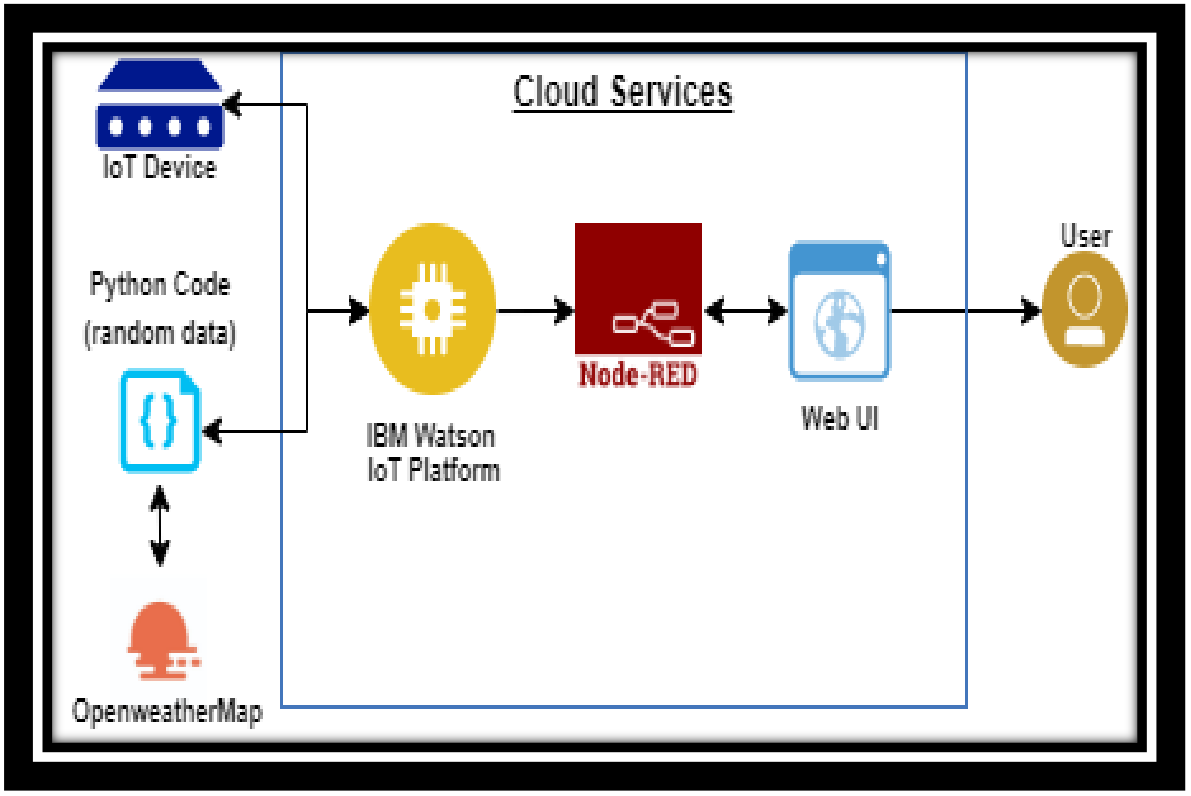
		when it arises?

5.PROJECT DESIGN

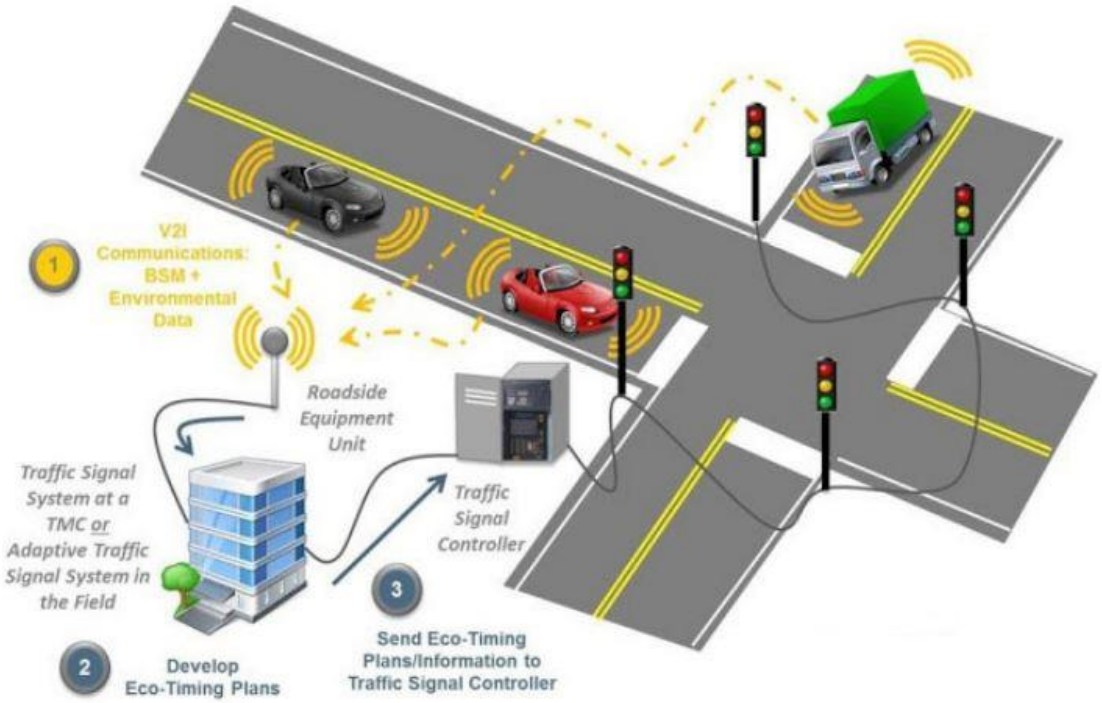
5.1.DATA FLOW DIAGRAM



5.2.SOLUTION TECHNICAL ARCHITECTURE



5.3 USER STORIES



- Cooperative Intelligent Transport Systems Intelligent
- Speed Adaptation
- Smart signs
- Smart camera crash prevention
- Roadside collision avoidance
- Night vision

6.PROJECT PLANNING AND SCHEDULING

6.1.Sprint Planning & Estimation

Sprint	Functional Requirements	User Story/Task	Story Point	priority	Team members

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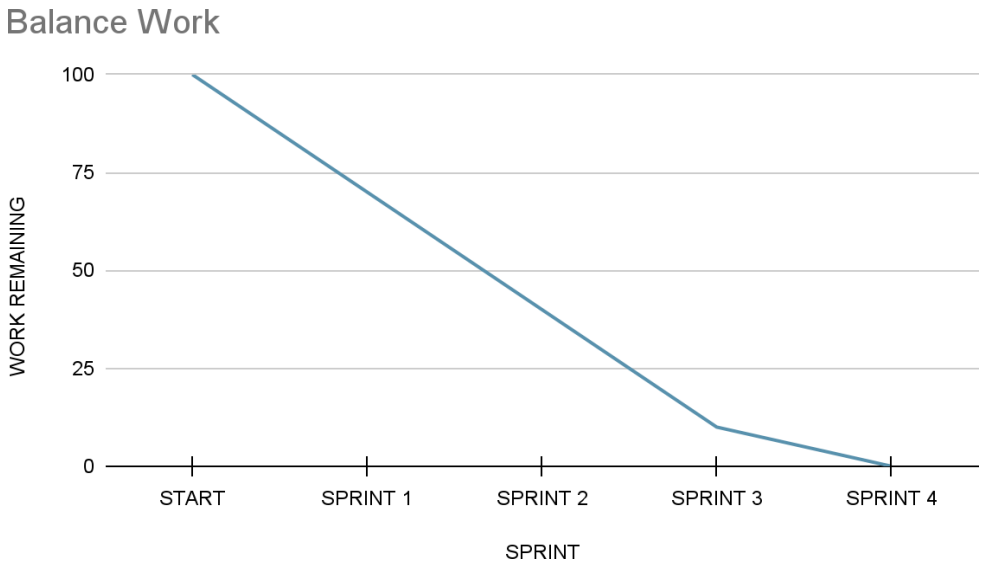
	(Epic)		**s**		
Sprint-1	Initializing the resources	Create an accountin Open Weather API	5	MEDIUM	VAARAGHI.M.S SUHAIL AHMED.S VISHWA. S ROHIT KUMAR.S
Sprint-2	Code in Software iswritten	Write a python script using the inputs given from Open WeatherAPI	4	MEDIUM	VAARAGHI.M.S SUHAIL AHMED.S VISHWA. S ROHIT KUMAR.S
Sprint-3	Sending the software tocloud	The python code from sprint 1 should be sent to cloudso that it is easily accessible	5	MEDIUM	VAARAGHI.M.S SUHAIL AHMED.S VISHWA. S ROHIT KUMAR.S
Sprint-4	Initializing the connection	The hardware should be integrated for the easy access of the cloud functions	5	HIGH	VAARAGHI.M.S SUHAIL AHMED.S VISHWA. S ROHIT KUMAR.S

6.2.Sprint Delivery Schedule

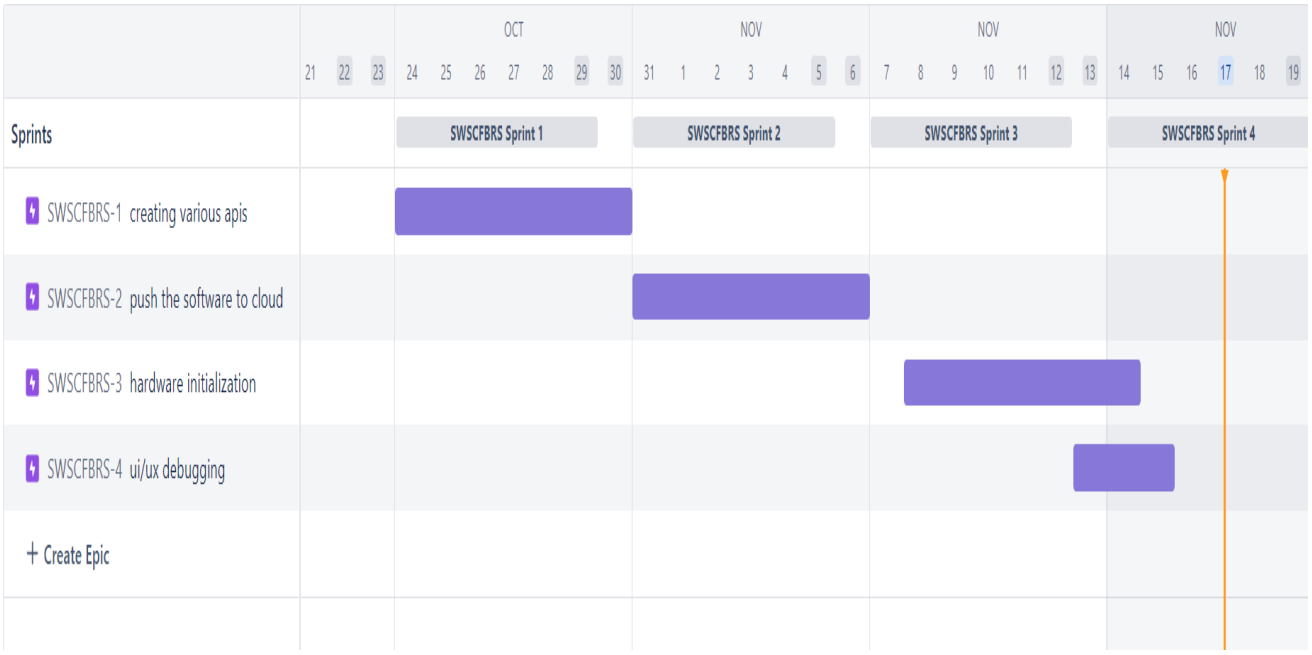
Project Tracker, Velocity & Burndown Chart:

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

Burndown Chart:



6.3 Reports from JIRA Software

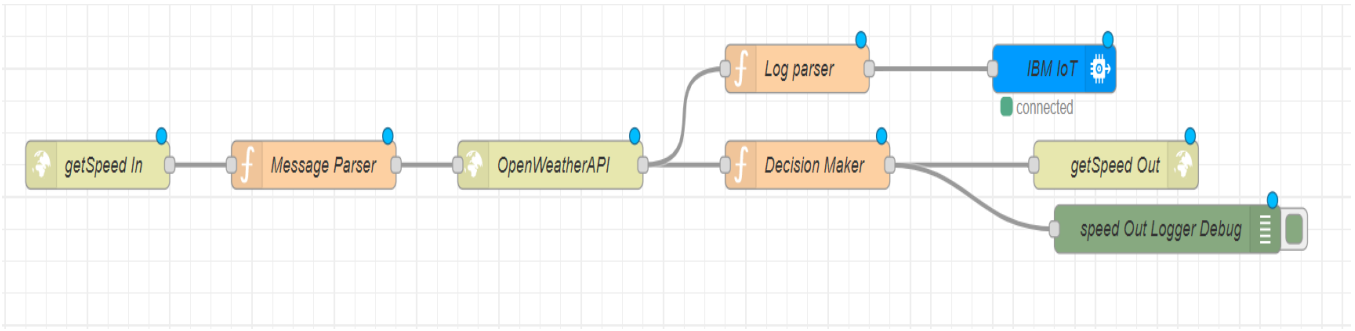


For Better Tracking of JIRA Reports **visit the below link**

https://smartsignboards.atlassian.net/jira/software/projects/SWSCFBRS/boards/1/roadmap?shared=&atlOrigin=eyJpIjoiNThmZjMyYjc4Yj

7.CODING AND SOLUTIONING

7.1.Feature 1 - GET SPEED FOR GIVEN LOCATION& CLIMATE



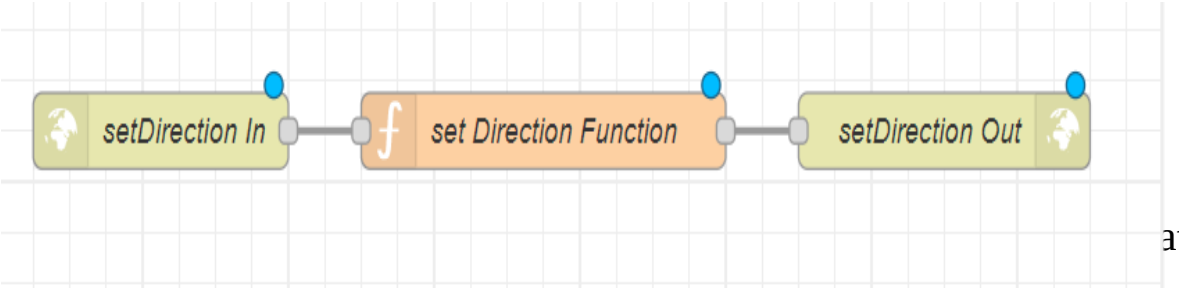
This part of Node RED flow accepts an http GET end point at "**/getSpeed**" from which the location, uid, hospital/school zone info are passed.

Message parser sets the required APIKEY for **OpenWeatherAPI** for the next block.

This data is then passed onto Decision Maker which makes all the decisions regarding the message to be output at the display and sends it as a http response.

This data is displayed at the microcontroller. Thus, a lot of battery is saved due to lesser processing time.

7.2.Feature 2 - SET DIRECTION REMOTELY FOR AGIVEN SIGN BOARD



at

/setDirection from which the did and direction information are passed by the respective authorities**. Set Direction** Function block adds the direction information to the database and returns the sameas an http response. This data is sent to the microcontroller along with the **"/getSpeed"** path and the microcontroller displays it.

A detailed documentation of all the workflows is available at the **following link**:

https://github.com/IBM-EPBL/IBM-Project-47838-1664170967/tree/main/Project%20Development%20Phase

8.TESTING

8.1Test Cases

❖TEST CASE 1

Clear weather - Usual Speed Limit.

❖TEST CASE 2

Foggy Weather - Reduced Speed Limit.

❖TEST CASE 3

Rainy Weather - Further Reduced Speed Limit.

❖TEST CASE 4

School/Hospital Zone - Do not Honk sign is displayed.

8.2User Acceptance Testing

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

9. RESULTS

We have presented a system, to alert the driver about the speed limits in specific areas and reduce the speed of the vehicles in sensitive public zones without any interference of the drivers where controls are taken automatically by the use of a wireless local area network. In the initial phase, we designed the basic block and circuit diagram for the system. In the implementation phase, we executed the hardware with the help of IoT connecting technologies such as Blynk app. Extensive experiments conducted on IoT and other connecting technologies.

10. ADVANTAGES

- Smart road technology can assist in optimizing traffic flow an d managing road condition
- Reducing the congestion and emissions
- It helps traffic light to operate in real-time condition.

11.CONCLUSION

Our project is capable of serving as a replacement for static signs for a comparatively lower cost and can be implemented in the very near future. This will help reduce a lot of accidents and maintain a more peaceful traffic atmosphere in the country.

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 (car driver) with the most accurate information 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, in increasing adriver’s awareness of the road situation.

13.APPENDIX

- **GITHUB AND PROJECT DEMO LINK**
  IBM-EPBL/IBM-Project-41617-1660643384
- **PROJECT DEVELOPMENT PHASE LINK**
  https://github.com/IBM-EPBL/IBM-Project-47838-
- **DEMO VIDEO DOWNLOAD LINK**
  https://youtu.be/cjFPekA8Gc

SOURCE CODE:

```
# IMPORT SECTION STARTS import weather

from datetime importdatetime as dt # IMPORT

SECTIONENDS # UTILITY LOGICSECTION

STARTS def

processConditions(myLocation,APIKEY,localit

yInfo): weatherData =

weather.get(myLocation,APIKEY) finalSpeed =

localityInfo["usualSpeedLimit"] if "rain" notin
```

```
weatherData else
localityInfo["usualSpeedLimit"]/2 finalSpeed =
finalSpeed if weatherData["visibility"]>35
elsefinalSpeed/2
if(localityInfo["hospitalsNearby"]): # hzone of
the hospital doNotHonk = True else:
if(localityInfo["schools"]["schoolZone"]==Fals
e): # neither hospital zone nor school
doNotHonk = False else: # schoolzone now =
[dt.now().hour,dt.now().minute] activeTime =
[list(map(int,_.split(":"))) for _ in
localityInfo["schools"]["activeTime"]]
doNotHonk =
activeTime[0][0]<=now[0]<=activeTime[1][0]
and
activeTime[0][1]<=now[1]<=activeTime[1][1]
return({ "speed" : finalSpeed, "doNotHonk" :
doNotHonk }) import brain
# IMPORT SECTION ENDS 22
```

```
# USER INPUT SECTION STARTS

myLocation = "Chennai,IN"

APIKEY = "c7388b7d0d823ee0ee0be65c6fd40

411" localityInfo = { "schools" : {

"schoolZone" : True,

"activeTime" : ["7:00","17:30"] # schools active

 from 7 AM till 5:30 PM },

"hospitalsNearby" : False,

"usualSpeedLimit" : 40 # in km/hr } import

requests as reqs def get(myLocation,APIKEY):

apiURL =

"https://api.openweathermap.org/data/2.5/weath

er?q={myLocation}&appid={APIKE Y}"

responseJSON = (reqs.get(apiURL)).json()

returnObject = { "temperature" :

responseJSON['main']['temp'] - 273.15,

"weather" :

[responseJSON['weather'][_]['main'].lower() for

_ in range(len(responseJSON['weather']))],
```

```
"visibility": responseJSON['visibility']/100, }
if("rain" in responseJSON):
returnObject["rain"] =
[responseJSON["rain"][key] for keyin
responseJSON["rain"]] return(returnObject)
        #include #include #include #include
#include const char* ssid = "Wokwi23
GUEST";const char* password = ""; #define
TFT_DC2 #define TFT_CS 15
Adafruit_ILI9341 tft =
Adafruit_ILI9341(TFT_CS, TFT_DC); String
myLocation = "Chennai,IN";
StringusualSpeedLimit = "70"; // kmph int
schoolZone = 32; inthospitalZone = 26; intuid =
2504; // ID Unique to this Micro
ContollerString getString(char x) { String s(1,
x);returns; } String stringSplitter1(String
fullString,char delimiter='$') { String
returnString = ""; for(int i = 0; i0) { String
```

```
payload = http.getString(); http.end();
return(paylo ad); 25 }              else {
Serial.print("Error code: ");
Serial.println(httpResponseCo de); } http.end();
} void myPrint(String contents) {
tft.fillScreen(ILI9341_BLAC
K);tft.setCursor(0, 20); tft.setTextSize(4);
tft.setTextColor(ILI9341_RE D);
//tft.println(contents);
tft.println(stringSplitter1(contents));String
c2 =stringSplitter2(contents); if(c2=="s") //
represents Straight { upArrow(); } if(c2=="l") //
represents left { leftArrow(); } if(c2=="r") //
represents right { rightArrow(); } } void setup()
{ WiFi.begin(ssid, password, 6); tft.begin();
tft.setRotation(1);
tft.setTextColor(ILI9341_WHIT
E);tft.setTextSize(2); tft.print("Connecting to
WiFi"); while (WiFi.status() !=
```

```
WL_CONNECTED) {delay(1 00); tft.print(" 26
."); } tft.print("\nOK! IP=");
tft.println(WiFi.localIP()); } void loop(){
myPrint(APICall (
));
```

THANK YOU