Signs with Smart Connectivity for Better Road Safety

A MINI PROJECT REPORT

Submitted by

SNEHA P	**(AC19UCS109)**
SWAPNA V	**(AC19UCS123)**
SWITHIN ASIR S	**(AC19UCS125)**
THEJESHKUMAR S	**(AC19UCS129)**

in partial fulfilment for the award of the degree
of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING

ADHIYAMAAN COLLEGE OF ENGINEERING
DR. M.G.R NAGAR, HOSUR-635130

ANNA UNIVERSITY: CHENNAI 600 025
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BONAFIDE CERTIFICATE

Certified that this mini project report **"Signs with Smart Connectivity for Better Road Safety"** is the bonafide work of **"SNEHA P(AC19UCS109), SWAPNA V(AC19UCS123), SWITHIN ASIR S(AC19UCS125), THEJESHKUMAR S(AC19UCS129)"** who carried out the project under my supervision.

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Submitted for the Mini project VIVA-VOCE Examination held on _____ at **Adhiyamaan College of Engineering (Autonomous), Hosur-635 130.**

INTERNAL EXAMINER **EXTERNAL EXAMINER**

ACKNOWLEDGEMENT

It is one of the most efficient tasks in life to choose the appropriate words to express one's gratitude to the beneficiaries. We are very much grateful to God who helped us all the way through the project and how moulded us into what we are today.

We are grateful to our beloved Principal **Dr. G. RANGANATH, M.E., Ph.D.,** Adhiyamaan College of Engineering (Autonomous), Hosur for providing the opportunity to do this work in premises.

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ABSTRACT

In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. This data is retrieved and displayed on the sign boards accordingly. A Road Safety International task force, comprising leading international experts in road safety and connected mobility, has focused on the relation between interconnected mobility and road safety.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 traffics and maintain a peaceful environment.

CONTENTS

CHAPTER 1

1.Introduction:

1.2 Project Overview:

In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are some road diversions due to heavy traffic or due to accidents then we can change the road signs accordingly if they are digitalized.This project proposes a system which has digital sign boards on which the signs can be changed dynamically.If there is rainfall then the roads will be slippery and the speed limit would be decreased.There is a web app through which you can enter the data of the road diversions, accident prone areas and the information sign boards can be entered through web app. This data is retrieved and displayed on the sign boards accordingly.

1.2 Purpose:

A Road Safety International task force, comprising leading international experts in road safety and connected mobility, has focused on the relation between interconnected mobility and road safety

CHAPTER 2

2.Literature Survey:

2.1 Existing Problem:

The Existing road system and connectivity, emphasis on the traffic and route reckoning features which cordially provisions the user acceptability to have better connectivity management. But, this often results in nonparallel road conditions and high noise ratios through the calibrations. It reiterates various subjections in its compilation and leading to segmentation error throughout. It penetrates the various unit cases in order to subsequently manifest the output. This alternatively symbolizes the ineffectively programmed web user interface. The IOT based model of our project complies of the verdict to specify the soft zone in the path. It manually ask the user to turn off the horn, which in variably decreases the decibel level of the power output. Illustratively, it confides the work schematics of the precedent evaluation under the system and allows the user to access the terminals of the app nodes variably. IBM Cloud indefinitely helps in reviving the data sets required in web application. MIT app inventor segments the creation of the user interface

2.2 Reference:

Ashish Dhar: **Traffic and road condition monitoring system** Indian Institute of Technology, Mumbai. - 2008.

•Reports severity, intensity and dimension of a damaged road segment.

• Proposed a different solution using AMR Magnetic Sensor.

2. Pooja Pawar, Suvarna Langade, Mohini Bandgar**: IOT Based digital Notice Board using Arduino ATMega 328.**

International Research Journal of Engineering and Technology(IRJET).- 2019.

•Circulates notice regularly & reduce physical efforts.

• Send message at any distant location within a second.

3. Sandeep Chaware, Trushitha Chaware: **Proposed Algorithm for Smart Traffic Control using Ultrasonic Sensor.**

International Journal of Engineering and Advanced Technology (IJEAT).- 2019.

•The outcome of the project is to learn insights of the traffic controlling and management at

the signal with the dynamically changing in timing of timer as per need.

4. KamnaSingh, Deepa Bura**: IOT distinct algorithms for the Sensor Connectivity with Comparative Study between node MCU and Arduino MCU.**

NVEO Journal– 2021

• Presents different algorithms for the connection between different types of sensors.

•Brief description of node MCU & Arduino MCU.

• Step by step solution to provide connectivity with IOT technology.

5. Jack Greenhaigh: **Recognizing Text Based Traffic Signs.**

IEEE – 2015

• Detect all possible Road sign candidates.

•Reduce total regions based on contextual constraints.

• A Novel System for the automatic detection and recognition of text in traffic sign based on MSER & MSV.

6. Bhumika.R, Harshita. S.A, Meena. D, Asha. N: **Accident Prevention and Road Safety in Hilly Region using IOT Module**

International Research Journal of Engineering and Technology (IRJET) – 2021

• Stay away from mishap & forestall clog in sloping region & hairclip twist.

• As a significant part of street mathematical plan bended street portion

7. Sowparnika: **IOT Road Safety**

•This project paves a system to alert the driver about the speed limit in specific areas and to

reduce the speed of vehicles in sensitive public zones without any interference of drivers where

controls are taken automatically by use of wireless local area network.

8. S.S. Sugania, D. S. Vishalis Hwaran, J. Vignesh Kumar: **Automated System for Road Safety Enhancement using big data reports.**

• The speed is controlled accordingly to situations to give suggestions.

• The suggested system can control the vehicle but at same time can collect data and

manipulate it using the big data technologies.

9**. IOT Based Smart Road Safety & Vehicle Accident prevent System for Mountain roads**.

•This system is divided into 2 half (Accident Detection & Prevention) and alerting the members of family by causation message and placement of accidental place.

10. Shweta Vyas, Pooja Awhale, Shreya Kukdeja, Prashant Jawalkar: **A Modern Approach to identify Traffic Sign Symbols in Color Images.**

•In this technique proposed more reliable and robust method of Traffic Sign Detection Recognition (TSDR).

Literature survey on Signs with Smart Connectivity for Better Road Safety

Cyberabad Traffic Police (2017) Data from the official website about Nehru Outer Ring Road: It reveals some guidelines like, the maximum speed on Lane 1 and Lane 2 of the ORR will be 120 KM per hour and minimum speed will be 80 KM per hour. (Lane1 is the one closest to the central median) The maximum speed on Lane 3 and Lane 4 of the ORR will be 80 KM per hour and minimum speed will be 40 KM per hour. The minimum speed on ORR will be 40 KM per hour. No vehicle is permitted to travel on ORR below this speed. Faster moving vehicles should move in Right Lanes (Lane 1 and 2) and slow-moving vehicles should move in Left lanes (Lane 3 and 4) within the above speed ranges. Heavy vehicles should move in Lane 3 or Lane 4 only. All vehicles which change their speed shall have to go to the lane having the concerned speed range and No Zig – Zag movement between the lanes is permitted. All vehicles wanting to change lanes as per the above speeds should do so only after using indicator lights and all precautions shall be taken while changing lanes. No Vehicle shall stop on any of the 4 lanes of ORR.ZarulazamEusofe et al. Assessment of Road Safety Management at Institutional Level in Malaysia, IATSS Research This paper had examined the current institutional arrangements for the management of road safety in Malaysia in a systematic manner. It focused on road safety funding and seemed to provide an insight into how funding factors may affect both the effectiveness and the efficiency or road safety management. The study followed an exploratory approach based on semi-structured interviews targeting key stakeholders in road safety management such as policy makers from various government agencies, private sector representatives and academia. The analysis revealed that the efficiency and effectiveness of the road safety management system in Malaysia may be sustainably improved by addressing the current dependence of funding solely on government sources, the fragmentation of the decision-making process of this de facto multi-disciplinary area, the road safety legislative framework, public awareness, local needs and institutional capacity. An institutional model based on 2nd generation

road funds is tentative suggested to this effect. The paper presented a systematic analysis for the assessment of road safety management applicable in countries where financial resources are limited or reduced, focusing on road safety funding and seeking to provide an insight into how appropriately designed funding mechanisms may affect both the effectiveness and the efficiency of road safety management.[1] Francis John Gichaga etal. Road Safety and Road Safety Audit in India: A Review. ISSN: 2347 - 4718 This paper had reviewed the concept of the road safety audit and its stages. Objective of the RSA is to evaluate ventures for potential mishaps end/lessening on the premise of road client learning, characteristics and aptitudes, day/night, wet/dry road conditions. It suggested on outline and before planning of agreement archives, to evaluate itemized intersection design, markings, signs, signals, lighting points of interest, Detail Design of junctions, Design of geometrics, Cross-fall Marking and Signs, Side drains, Embankment slopes, Presence of clear zone, Traffic Signals Lighting.[2] Shalini Kanugantietal. Road Safety Analysis Using Multi Criteria Approach, A Case Study in India: World Conference on Transport Research - WCTR 2016 Shanghai. 10-15 July 2016 In this paper a study was carried out to determine the priority of safety requirements of a certain category of rural roads, viz., Pradhan Mantri Gram Sadak Yojana (PMGSY) roads in the Jhunjhunu district of Rajasthan, India. Multi-criteria techniques were used to quantify the safety levels. Further analysis was done on the road having the worst safety features to rank various stretches. The parameters vital for safety have been selected and quantified using three multi- criteria decisionmaking analysis tools: Simple Additive Weightage (SAW), Analytical Hierarchy Process (AHP) and Fuzzy AHP methods and results are compared. Analysis has been done in two phases. In the first phase the prioritization of roads for safety provision was carried out considering the total length of each road as an alternative and the most critical road was identified. The parameters in the road were measured and rated (on a scale of 1-5). In the second phase, the road found critical from the first phase was considered for detail analysis. The entire stretch of the road was divided into stretches of 1 km and the stretch-wise prioritization of roads for safety provision was determined. The average values per km for the

severity score of the parameters were obtained like the first phase. The methodology suggested can be used to determine the level of contribution of parameters towards safety hazard.[3]

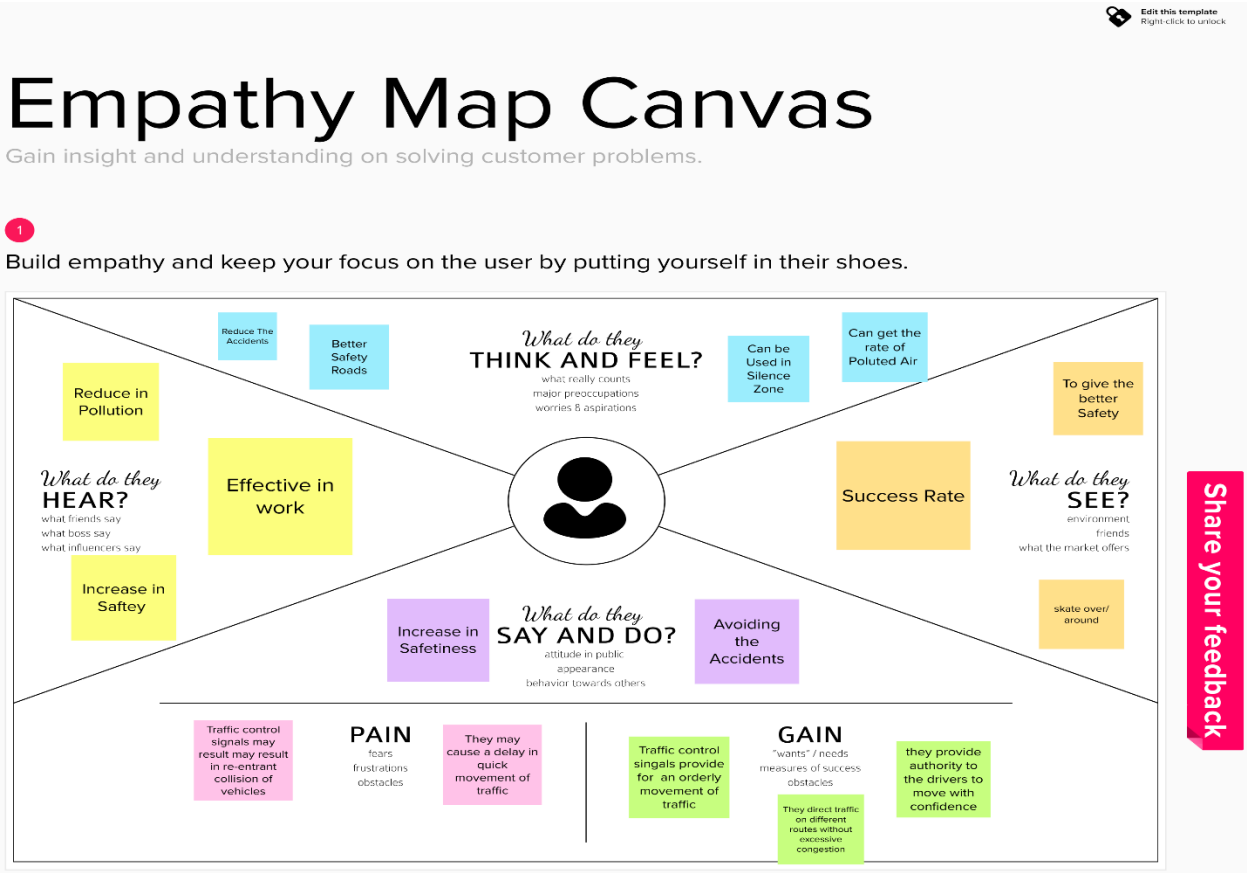
2.3 Problem Statement Definition:

In this, we collected public comments and studied numerous results from the review of the public. So that it is easy for us to build the project

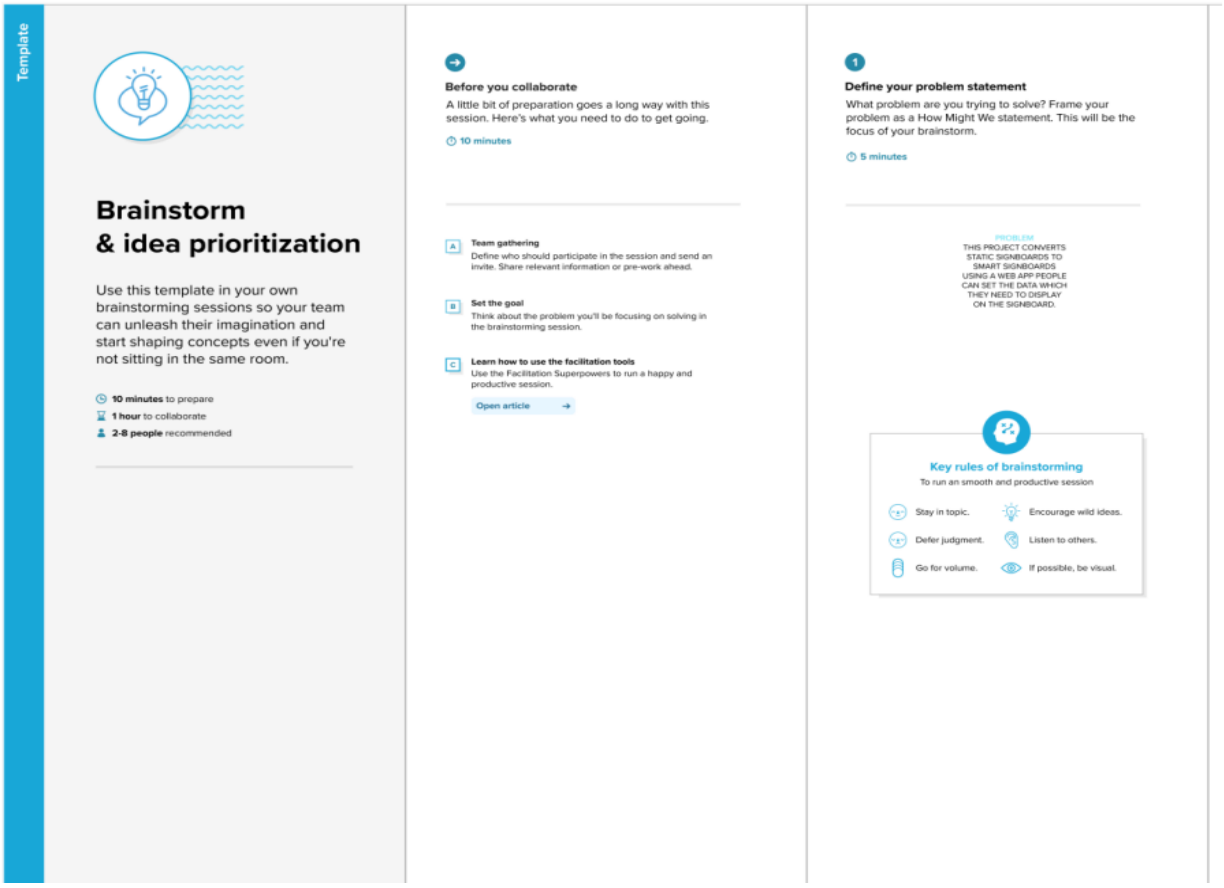
CHAPATER 3

3.Ideation & Proposed Solution:

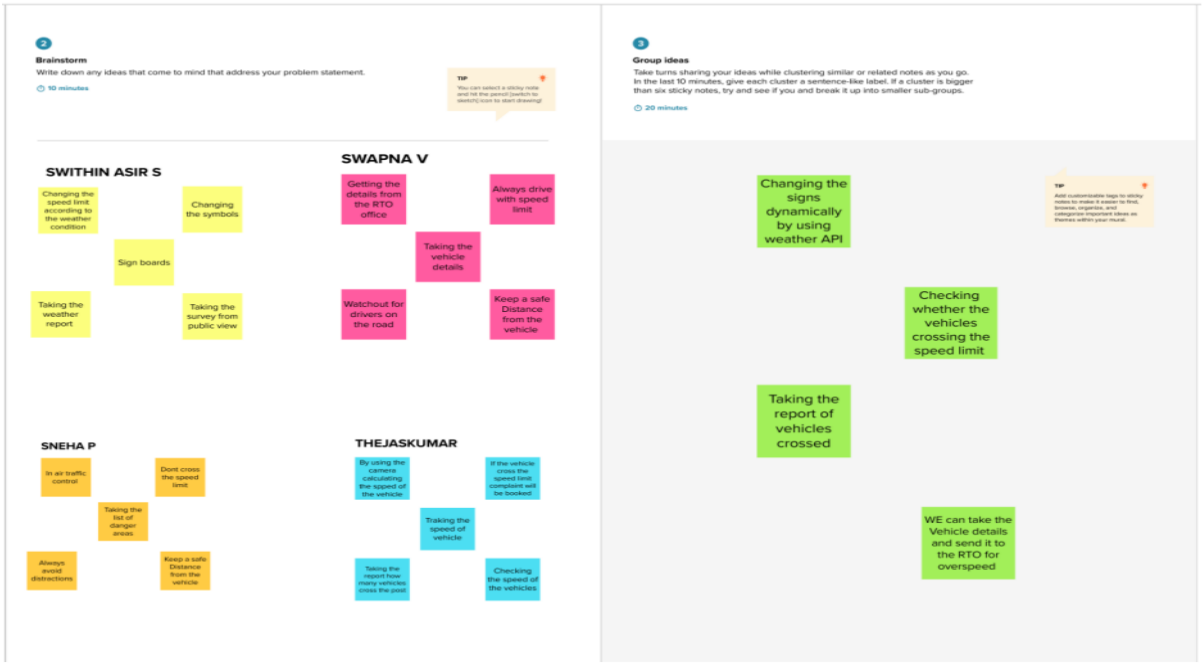
3.1 Empathy Map Canvas:



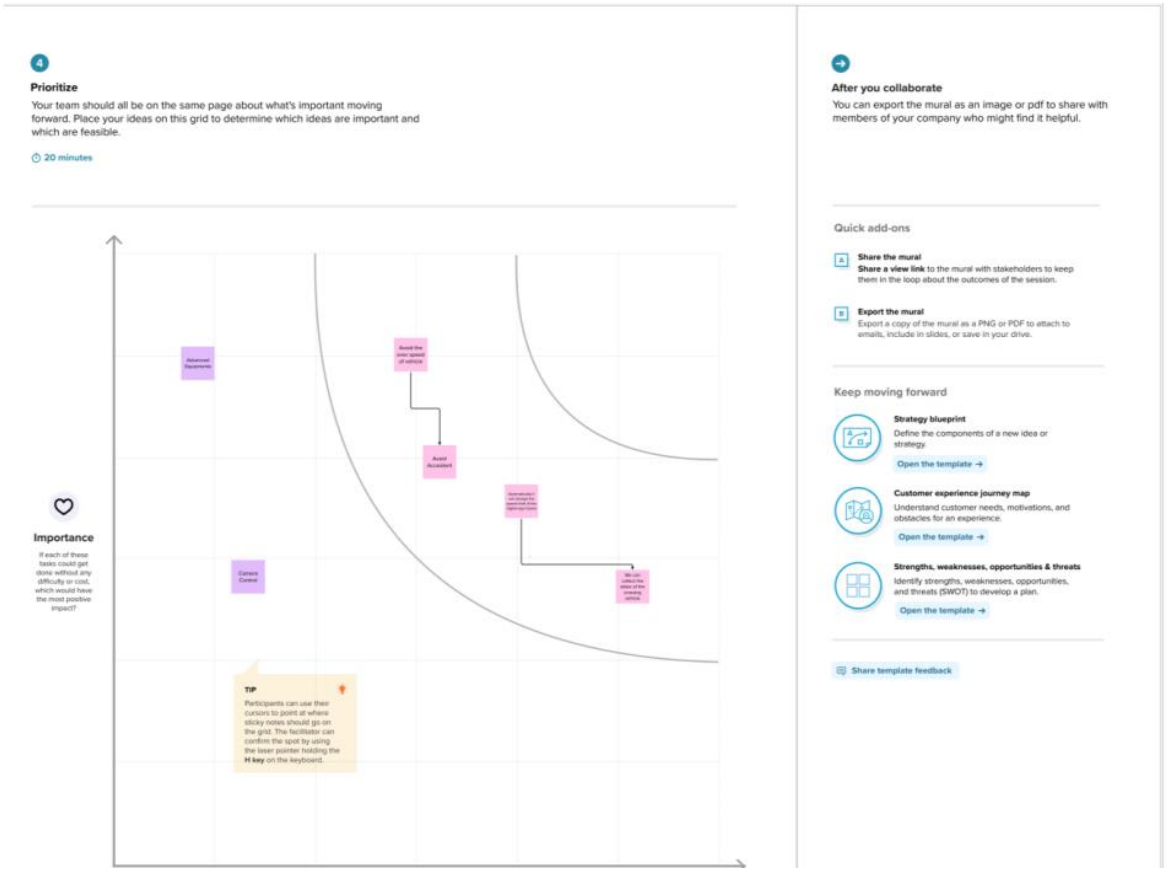
3.2 Ideation and brainstorming:



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization

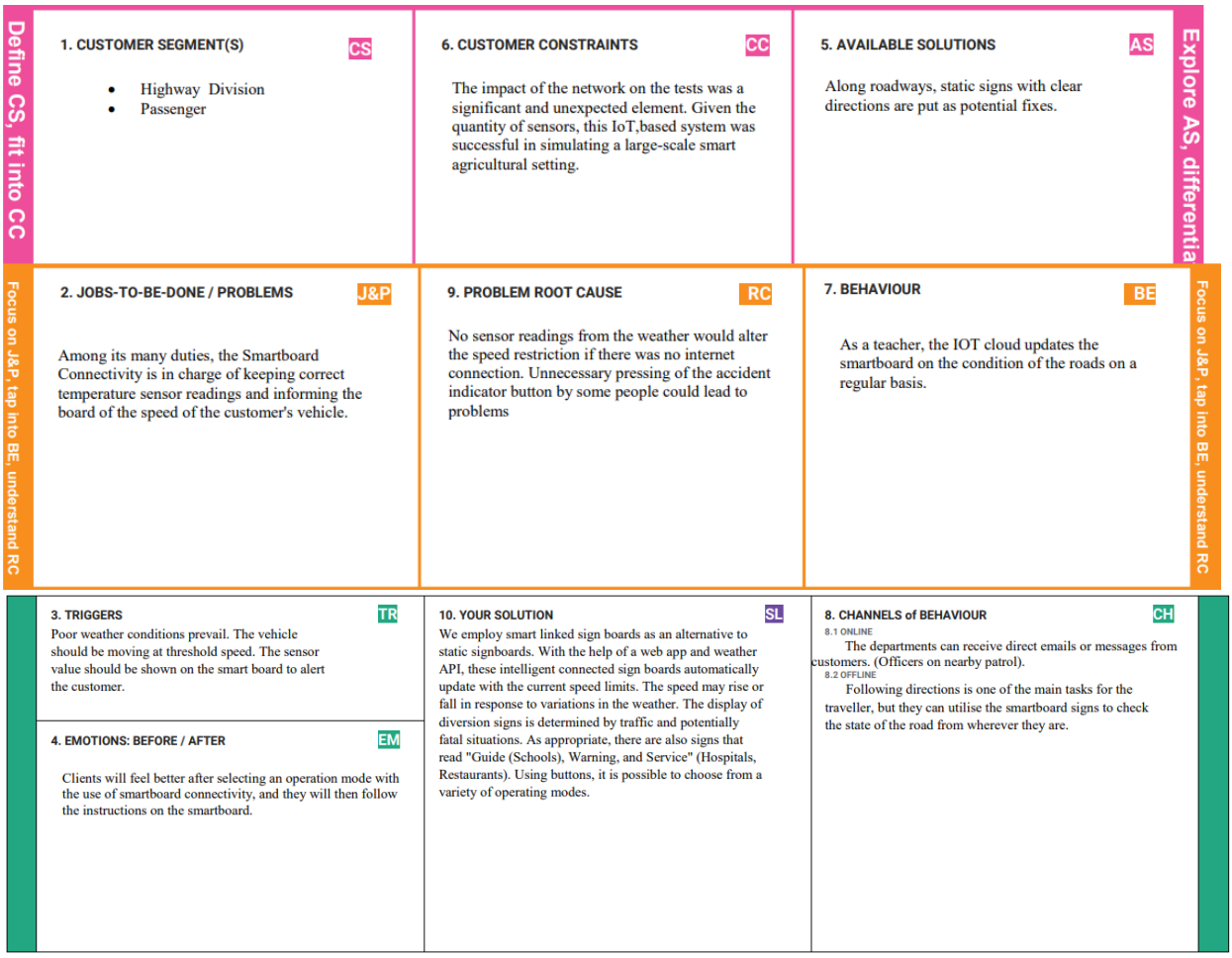


3.3 Proposed Solution:

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	Avoid the over speed and to decrease the accidents
2.	Idea / Solution description	• 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.
3.	Novelty / Uniqueness	Sign boards are converted to digitals

4.	Social Impact / Customer Satisfaction	Reduce the accidents , Control the vehicles in speed
5.	Business Model (Revenue Model)	In this we can get good no of users ,so that the business can get profit
6.	Scalability of the Solution	We can scalable the project by schools and colleges as our customer

Problem Solution fit:



CHAPATER 4

4.Requirement Analysis:

4.1 Functional Requirements:

FR No.	Liberation Serif Regular	Liberation Serif Regular
FR-1	User Registration	Sign boards should be made with LEDs that are brightly coloured and capable of attracting the attention of drivers, but they should not be too distracting or blinding as this may lead to accidents.
FR-2	User Understanding	The signs should be large, clear, and legible in order for the motorist to comprehend them, and they can also incorporate images.
FR-3	User Convenience	The signs should be large, clear, and legible in order for the motorist to comprehend them, and they can also incorporate images.

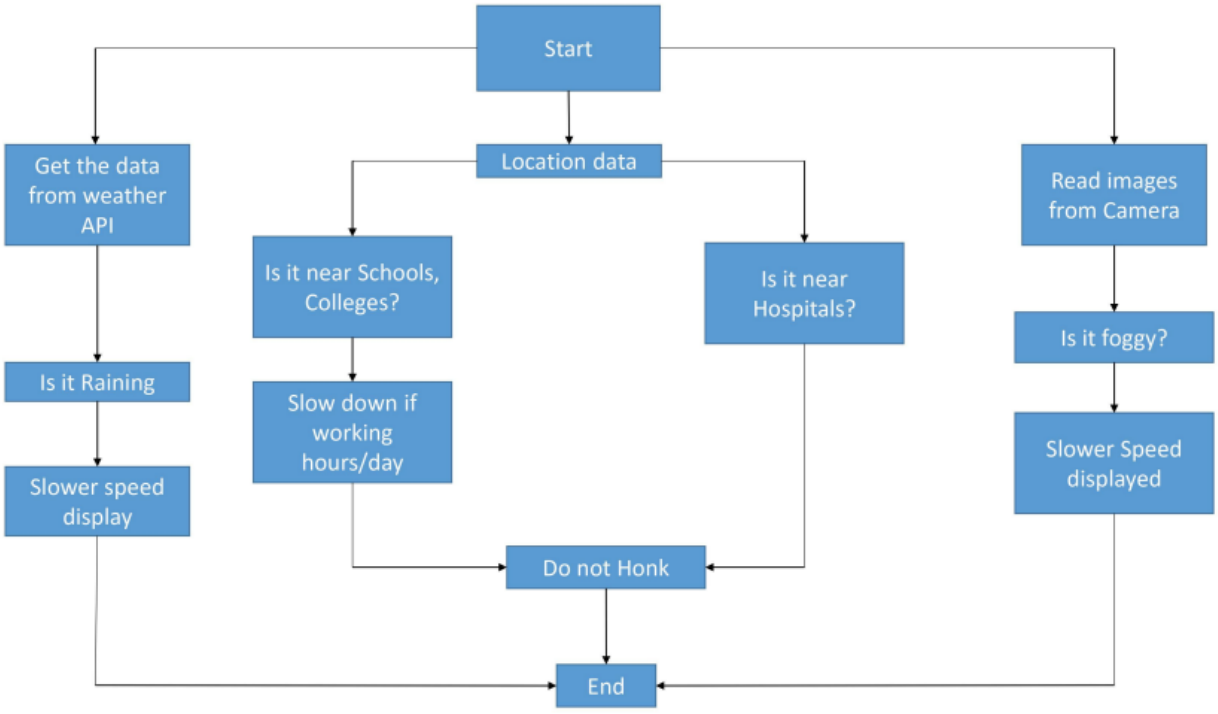
4.2 Non Functional Requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	When necessary, it should be able to upgrade and update.
NFR-2	**Security**	When necessary, it should be able to upgrade and update.
NFR-3	**Reliability**	It should be able to show information appropriately and without errors.
NFR-4	**Performance**	It should be able to update itself automatically when a weather or traffic problem happens.
NFR-5	**Availability**	It should be accessible 24 hours a day, seven days a week in order to benefit the consumer, i.e. the driver.
NFR-6	**Scalability**	It should be simple to update and upgrade in response to changes in the requirements.

CHAPTER 5

5.Project Design:

5.1 Data Flow Diagrams:

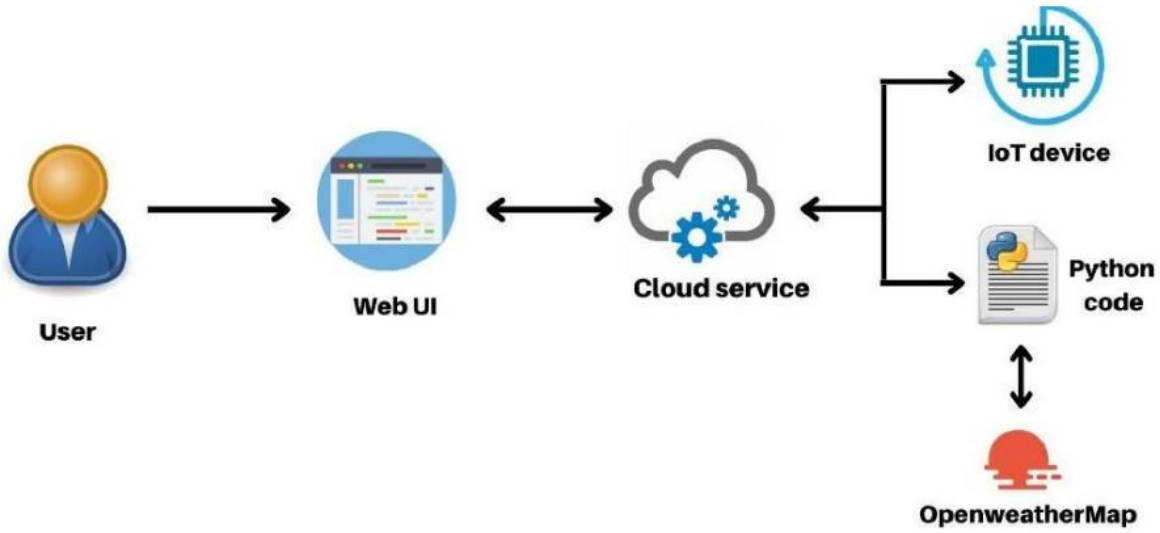


5.1.2 User Stories:

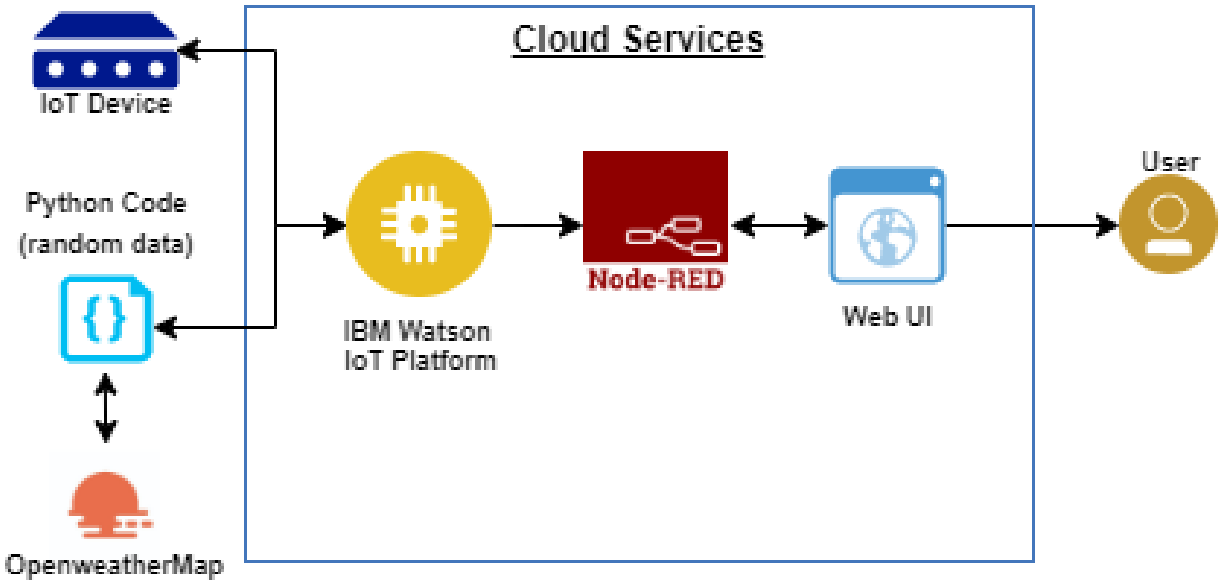
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority
Customer (Mobile user)	Registration	USN-1	I may use a climate programme to determine my speed limit,	I may obtain speed limits.	High
		USN-2	I may sign up for the application as a client by entering my email, my secret phrase, and verifying my secret phrase.	I can access my dashboard and account.	Medium
		USN-3	As a customer, I am free to increase or decrease my speed in response to changing weather circumstances.	I am able to increase or decrease my speed.	High
		USN-4	As a customer. Depending on the flow of traffic and the potentially fatal	I can access my traffic situation while moving forward.	Medium

			situations, I may at any time get my traffic redirection signals		
	Login	USN-5	I may log out of the dark climate map as a client by inputting my email and secret key	I can access the programme using my Gmail login.	High
	Dashboard	USN-6	The connection point should be clear and functional for the client.	I have no trouble getting to the point of interaction.	High
Customer (Web user)	Data generation	USN-7	As a customer, I use the open climate application to get information on changes in the weather.	Through the programme, I may get information on the climate	High
Administrator	Problem solving/ Fault clearance	USN-8	As an in-charge for the proper operation of the sign sheets, you must occasionally observe it to stay on top of it.	The sign sheets can be checked by authorities for genuine employment.	Medium

5.2.1 Solution:



5.2.2 Technical Architecture:



CHAPTER 6

6.Project Planning & Scheduling:

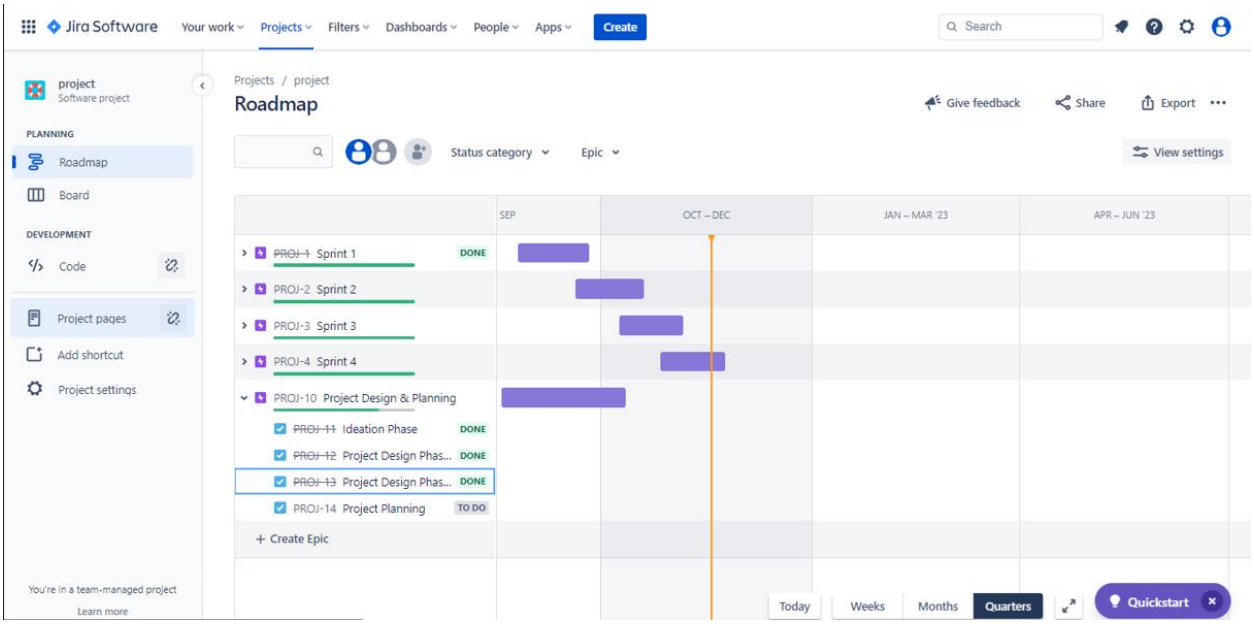
6.1 Sprint Planning & Estimation:

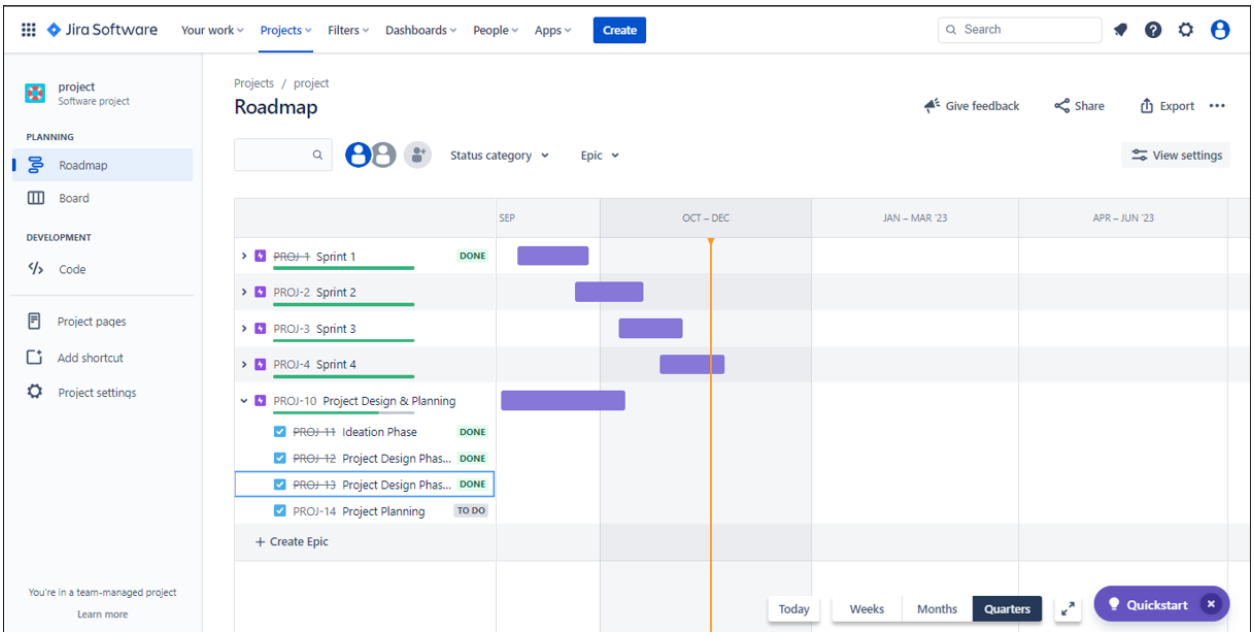
Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority
Sprint-1	Resources Initialization	Create and initialize accounts in various public APIs like Open Weather API.	1	LOW
Sprint-1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location.	1	MEDIUM
Sprint-2	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	MEDIUM
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW

6.2 Sprint Delivery Schedule:

Sprint	Total story points	Duration	Sprint Start date	Sprint end date	Story Points Complete
Sprint-1	20	6	24 oct 2022	19 Nov 2022	20
Sprint-2	20	6	05 Nov 2022	19 Nov 2022	20
Sprint-3	20	6	07 Nov 2022	19 Nov 2022	20
Sprint-4	20	6	14 Nov 2022	19 Nov 2022	20

6.3 Reports from JIRA:

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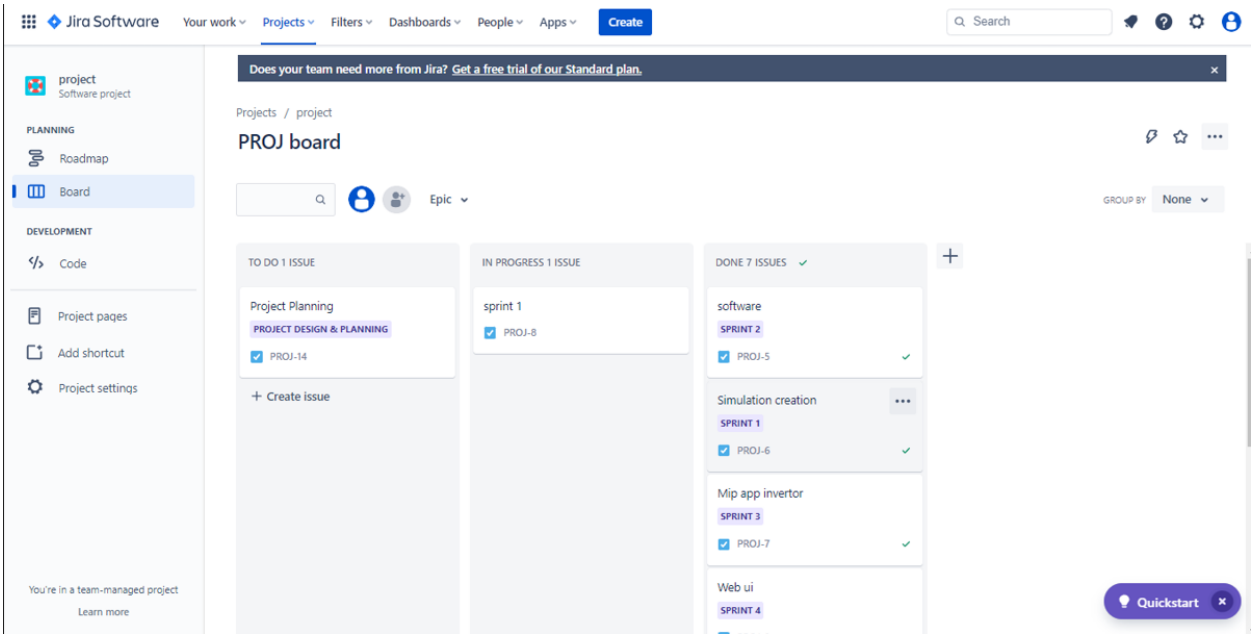
Dashboards
People
Apps
Create
Search
project
Software project
PLANNING
Roadmap
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Projects / project
Roadmap
Give feedback
Share
Export
Status category
Epic
View settings
SEP
OCT – DEC
JAN – MAR '23
APR – JUN '23
PROJ-1 Sprint 1 DONE
PROJ-2 Sprint 2
PROJ-3 Sprint 3
PROJ-4 Sprint 4
PROJ-10 Project Design & Planning
PROJ-11 Ideation Phase DONE
PROJ-12 Project Design Phas... DONE
PROJ-13 Project Design Phas... DONE
PROJ-14 Project Planning TO DO
Create Epic
Today
Weeks
Months
Quarters
Quickstart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Project Planning
PROJECT DESIGN & PLANNING
PROJ-14
Create issue
IN PROGRESS 1 ISSUE
sprint 1
PROJ-8
DONE 7 ISSUES
software
SPRINT 2
PROJ-5
Simulation creation
SPRINT 1
PROJ-6
Mip app invertor
SPRINT 3
PROJ-7
Web ui
SPRINT 4
Quickstart

CHAPTER 7

7.Coding & Solutioning:

7.1 Feature 1:

```
#include<ESP826h>

#include<PubSubh> const

char* ssid = "SB-IOT1";

const char*

password= "sb@iot11";

String

command1,command2;

#defineORG "bhip5y"

#defineDEVICE_TYPE "Vamsi"

#defineDEVICE_ID"8500"

#define TOKEN "8500913778"

String command;

char server[] = ORG

".messaging.internetofthings.ibmcloud.com"; char

topic[] = "iot-2/cmd/home/fmt/String";

char authMethod[] = "use-token-auth";char token[] = TOKEN;

char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;

// Serial.println(clientID);
```

```
#include <Wire.h>
#include
<Adafruit_SSD1306.h>
#include
<Adafruit_GFX.h>
#define
SSD1306_LCDHEIGH
T 64
// OLED display TWI
address #define
OLED_ADDR 0x3C
Adafruit_SSD1306
display(-1);
#if (SSD1306_LCDHEIGHT != 64)
#error("Height incorrect,please fix Adafruit_SSD1306.h!");
#endif
void callback(char* topic,byte* payload, unsignedint
payloadLength); WiFiClient wifiClient;
PubSubClient client(server,
1883,callback, wifiClient);
 void setup() {
  display.begin(SSD1306_SWITCHCAPVCC,
 OLED_ADDR);Serial.begin(115200);
```

```
 Serial.println();
 pinMode(D1,OUTPUT);
 wifiConnect();
 mqttConnect();
}
void loop() {
 if
  (!client.l
  oop()) {
  mqttCon
  nect();
 }
delay(100);
}
void wifiConnect() {
 Serial.print("Connecting to ");
 Serial.print(ssid); WiFi.begin(ssid,
 password);
 while (WiFi.status() !=
  WL_CONNECTED) {delay(500);
  Serial.print(".");
 }
 Serial.print("nWiFi connected, IP address: ");Serial.println(WiFi.localIP());
}
void mqttConnect() {
```

```
 if (!client.connected()) {
  Serial.print("Reconnecting MQTT client to ");
  Serial.println(server); while
  (!client.connect(clientId, authMethod, token)) {
  Serial.print(".");
   delay(500);
  }
  initManagedDevice();
  Serial.println();
 }
}
void
 initManagedDevic
 e() { if
 (client.subscribe(to
 pic)) {
  Serial.println("subscribeto cmd OK");
 } else {
  Serial.println("subscribe to cmd FAILED");
 }
}
```

```
void callback(char* topic, byte* payload, unsigned int
payloadLength) {Serial.print("callback invokedfor topic:
");Serial.println(topic);
for (int i = 0; i < payloadLength; i++) {
// Serial.println((char)payload[i]);
command += (char)payload[i];
}
Serial.println(command);
command1=getValue(command,',',0);
command2=getValue(command,',',1);
if(command1=="1"){
display.clearDisplay();

// display a line of text display.setTextSize(1);
display.setTextColor(WHITE);
display.setCursor(0,10);
display.print(command);
//  updatedisplay with all of the above
graphicsdisplay.display();
}
commad="";
command1 ="";
command2="";
```

```
}
String getValue(String data, char separator, int index)
{
  int found = 0;
  int strIndex[] = { 0, -1 };
  int maxIndex = data.length() - 1;
  for (int i = 0; i <=maxIndex && found<= index; i++) {
  if (data.charAt(i) == separator || i == maxIndex)
   {
       found++;
       strIndex[0] = strIndex[1] + 1;
       strIndex[1] = (i == maxIndex) ? i+1 : i;
    }
   }
  return found > index ? data.substring(strIndex[0], strIndex[1]) : "";
}
```

7.2 Feature 2:

```
#include<ESP8266WiFi.h>
#include<PubSubClient.h>
const char* ssid = "SB-IOT1";
const char* password=
"sb@iot11";String
```

```
command1,command2;
#defineORG "bhip5y"
#defineDEVICE_TYP
E "Vamsi"
#defineDEVICE_ID
"8500"
#define TOKEN "8500913778"
String command;
char server[] = ORG
".messaging.internetofthings.ibmcloud.com"; char
topic[] = "iot-2/cmd/home/fmt/String";
char authMethod[] = "use-
token-auth";char token[] =
TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;
 Serial.println(clientID);
#include <Wire.h>
#include
<Adafruit_SSD1306.h>
#include
<Adafruit_GFX.h>
#define
SSD1306_LCDHEIGHT
64
```

```
/ OLED display TWI
address #define
OLED_ADDR 0x3C
Adafruit_SSD1306
display(-1); #if
(SSD1306_LCDHEIG
HT != 64)
#error("Heightincorrect, please fix
Adafruit_SSD1306.h!"); #endif


void callback(char* topic,byte* payload, unsignedint
payloadLength); WiFiClient wifiClient;
PubSubClient client(server,
1883,callback, wifiClient); void setup() {
  display.begin(SSD1306_SWITCHCAPVCC, OLED_ADDR);
 Serial.begin(115200);
 Serial.println();
 pinMode(D1,OUT
 PUT);
 wifiConnect();
 mqttConnect();
}
void loop() {
```

```
 if
  (!client.l
  oop()) {
  mqttCon
  nect();
 }
delay(100);
}
void wifiConnect() {
 Serial.print("Connecting to ");
 Serial.print(ssid); WiFi.begin(ssid,
 password);
 while (WiFi.status() !=
  WL_CONNECTED) {delay(500);
  Serial.print(".");
 }
 Serial.print("nWiFi connected, IP address: ");Serial.println(WiFi.localIP());
}
void mqttConnect() {
 if (!client.connected()) {
  Serial.print("Reconnecting MQTT clientto "); Serial.println(server);

  while (!client.connect(clientId, authMethod,
   token)){Serial.print(".");
   delay(500);
```

```
   }
   initManagedDevice
   (); Serial.println();
  }
}
void initManagedDevice() { if
 (client.subscribe(topic)) {
   Serial.println("subscribeto cmd OK");
  } else {
   Serial.println("subscribe to cmd FAILED");
  }
}
void callback(char* topic, byte* payload, unsigned int payloadLength) {
 Serial.print("callback invokedfor topic: ");Serial.println(topic);
 for (int i = 0; i < payloadLength; i++) {
   /
   Serial.println((char)paylo
   ad[i]); command +=
   (char)payload[i];
  }
Serial.println(command);
command1=getValue(com
mand,',',0);
command2=getValue(com
mand,',',1);
```

```
if(command1=="2"){
display.clearDisplay();
/ display a line of text
 display.setTextSize(
 1);
 display.setTextColor
 (WHITE);


 display.setCursor(0,10);
 display.print(command2);
 //updatedisplay with all of the above
 graphicsdisplay.display();
}
command ="";
command1 ="";
command2="";
}
String getValue(String data, char separator, int index)
{
   int found = 0;
   int strIndex[] = { 0, -1 };
   int maxIndex = data.length() - 1;
   for (int i = 0; i <=maxIndex && found<= index; i++) {
   if (data.charAt(i) == separator || i == maxIndex) {
```

```
        found++;
        strIndex[0] = strIndex[1] + 1;

        strIndex[1] = (i == maxIndex) ? i+1 : i;
      }
    }
    return found > index ? data.substring(strIndex[0], strIndex[1]) : "";
}
```

7.3 Database Schema:

```
#include <ESP8266WiFi.h> #include
<PubSubClient.h>

const char* ssid = “SB-IOT1”;
const char* password= “sb@iot11”;String
command1,command2; #defineORG “bhip5y”
#defineDEVICE_TYPE “Vamsi”
#defineDEVICE_ID “8500”
#define TOKEN “8500913778”
String command;
char server[] = ORG
“.messaging.internetofthings.ibmcloud.com”;
```

```
char topic[] = “iot-2/cmd/home/fmt/String”;
char authMethod[] = “use-
token-auth”;char token[] =
TOKEN;
char clientId[] = “d:” ORG “:” DEVICE_TYPE “:” DEVICE_ID;
/ /Serial.println(clientID);
#include <Wire.h>
#include
<Adafruit_SSD1306.h>
#include
<Adafruit_GFX.h>
#define
SSD1306_LCDHEIGH
T 64
/ OLED display TWI
address #define
OLED_ADDR 0x3C
Adafruit_SSD1306
display(-1); #if
(SSD1306_LCDHEIG
HT != 64)
#error(“Height incorrect, please fix Adafruit_SSD1306.h!”);

#endif
```

```
void callback(char* topic,byte* payload, unsignedint payloadLength);
WiFiClient wifiClient;
PubSubClient client(server,
1883,callback, wifiClient); void setup() {
  display.begin(SSD1306_SWITCHCAPVCC,
 OLED_ADDR);Serial.begin(115200);
 Serial.println();
  pinMode(D1,OUTPUT);
  wifiConnect();
  mqttConnect();
}
void loop() {
 if (!client.loop()) {
   mqttConnect();
 }
delay(100);
}
void wifiConnect() {
 Serial.print("Connecting to ");
 Serial.print(ssid); WiFi.begin(ssid,
 password);
 while (WiFi.status() != WL_CONNECTED) {
 delay(500);
```

```
  Serial.print(“.”);
 }
 Serial.print(“nWiFi connected, IP address: “);Serial.println(WiFi.localIP());
}

void mqttConnect() {
 if (!client.connected()) {
  Serial.print(“Reconnecting MQTT client to “);
  Serial.println(server); while
  (!client.connect(clientId, authMethod, token)) {
  Serial.print(“.”);
   delay(500);
  }
  initManagedDevice();
  Serial.println();
 }
}
void
 initManagedDevic
 e() { if
 (client.subscribe(to
 pic)) {
  Serial.println(“subscribeto cmd OK”);
 } else {
```

```
   Serial.println("subscribe to cmd FAILED");
  }
}
void callback(char* topic, byte* payload, unsigned int payloadLength) {
  Serial.print("callback invokedfor topic: ");Serial.println(topic);
  for (int I = 0; I < payloadLength; i++) {
    /
    Serial.println((char)payloa
    d[i]); command +=
    (char)payload[i];
  }
Serial.println(command);
command1=getValue(command,',',0);
command2=getValue(command,',',1);
if(command1=="3"){
display.clearDisplay();


/ display a line of text display.setTextSize(1);
  display.setTextColor(WHITE);
  display.setCursor(0,10);
  display.print(command2);
  //  updatedisplay with all of the above
  graphicsdisplay.display();
}
```

```
command =””;

command1 =””;

command2=””;
}
String getValue(String data, char separator, int index)
{
  int found = 0;
  int strIndex[] = { 0, -1 };
  int maxIndex = data.length() – 1;
  for (int I = 0; I <=maxIndex && found<= index; i++) {
    if (data.charAt(i) == separator || I == maxIndex) {
      found++;
      strIndex[0] = strIndex[1] +
      1; strIndex[1] = (I ==
      maxIndex) ? i+1 : I;
    }
  }return found > index ? data.substring(strIndex[0], strIndex[1]) : “”;
```

CHAPTER 8

8.Testing:

8.1 Test cases:

- *TEST CASE 1 Temperature': 303.03, 'Humidity': 51, 'Pressure': 1010, 'Message': 'SLOW DOWN, SCHOOL IS NEAR', 'Sign': '', 'Speed': '', 'Visibility': 'Clear Weather*

- *TEST CASE 2 Temperature': 303.03, 'Humidity': 51, 'Pressure': 1010, 'Message': '', 'Sign': 'Left Diversion <-', 'Speed': 'SLOW DOWN, Speed Limit Exceeded', 'Visibility': 'Clear Weather*

- *TEST CASE 3 Temperature': 303.03, 'Humidity': 51, 'Pressure': 1010, 'Message': 'SLOW DOWN, HOSPITAL NEARBY', 'Sign': 'Left Diversion <-', 'Speed': '', 'Visibility': 'Clear Weather*

- *TEST CASE 4 Temperature': 303.03, 'Humidity': 51, 'Pressure': 1010, 'Message': 'NEED HELP, POLICE STATION NEARBY', 'Sign': 'U Turn', 'Speed': 'Moderate Speed', 'Visibility': 'Clear Weather'.*

8.2 User Acceptance Testing:

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	3	4	7	2	16
Duplicate	0	3	0	1	4
External	2	1	0	3	6
Fixed	10	18	3	2	33
Not Reproduced	1	0	0	0	1
Skipped	0	1	0	1	2
Won't Fix	5	0	2	1	8

CHAPTER 9

9.Results:

9.1Performance Metrics:

The performance of the website varies based on the software chosen for implementation. Built upon NodeJS, a light, and high-performance engine, NodeRED is capable of handling up to 10,000 requests per second. Moreover, since the system is horizontally scalable, an even higher demand of customers can be served.

CHAPTER 10

10.Advantages:

- *Lower battery consumption since processing is done mostly by Node-RED servers in the cloud.*
- *Cheaper and low-requirement microcontrollers can be used since processing requirements are reduced.*
- *Longer lasting systems.*
- *Dynamic Sign updation.*
- *School/Hospital Zone alerts*

Disadvantages:

- *The size of the display determines the requirement of the microcontroller.*
- *Dependent on OpenWeatherAPI and hence the speed reduction is the same for a large area in the scale of cities.*

CHAPTER 11

11.Conclusion:

Smart connected Signs for Road Safety, These conclusions and guidelines are addressed to policy makers and private companies that are willing to use innovative solutions to decrease road-related fatalities and injuries amidst populations. Both chapterstake into account the potential users of connected technologies: individual drivers,commercial drivers, pedestrians, cyclists and motorcyclists. The task force decided to study first the potential of connected technologies in high- and middle-income countries. Indeed middle-income countries represent 72% of the World population, 80% of road traffic deaths and 47% of registered motorized vehicles, while high income countries are leaders in development of connected vehicles

CHAPTER 12

12.Future Scope:

1. Solar powered roadways

Photovoltaic cells are embedded within hexagonal panels made of tempered glass, which are used to pave roads. These panels contain LEDs, microprocessors, snow-melting heating devicesand inductive chargingcapability for electricvehicles when driving.Glass is renewable and can be engineered to be stronger than steel, and to allow cars to stop safely even when traveling at high speeds. While this idea has gained widespread support, scalability is a challenge as it remains expensive.

2.Smart Roads:

Speciallyengineered roadways fitted with smart features, including sensorsthat monitor and report changing road conditions, and WiFi transmitters that provide broadband services to vehicles, homes and businesses. The smart road can also charge electriccars as they drive.

3.Glow in the dark roads:

Glowing markers painted onto existing roadway surfaces use a photo-luminescent powder that absorbs and stores daylight. The 500m long strips glow for 8 hours after dark. This technology is still in the testing phase,and the glow is not yet consistent, but it could be more cost-effective than traditional road lighting technologies.

4.Interactive lights:

Road lights activated by motion sensors to illuminate a particular section of the road as cars approach. The lights dim once the car passes.Suited for roadswith less traffic,interactive lights provide night visibility as needed and reduce energy wastage when there are no cars. One design, developed in Holland, uses the wind generated by passing vehiclesto power lights.

5.Electric priority lane for chargingelectric vehicles:

Embedded cablesgenerate magnetic fieldsthat charge electricvehicles while driving.A receiver coil in the vehicle picks up electromagnetic oscillations from a transmitter coil embedded in the road and converts them to AC, which can then powerthe car. Inductivecharging technology alreadyexists for staticcars, but futurewireless technology could charge batteries while in motion, providing distance range solutions for electric vehicles which travel longerjourneys.

6.Weather detection:

Networks of AI-integrated sensors detect weather conditions that impact road safety. Road Weather Information Systems (RWIS) in use today are limited because they only collect data from a small set of weather stations. A larger future network could use automated weather stationsto collect atmospheric and weather data and instantly upload it to the cloud. Dynamic temperature-sensitive paint could be used to highlight invisible roadway conditions like blackice.

7.Traffic detection

Data that helps travelers plan their routes. Sensors lining highways monitor traffic flow and weight load, warn drivers of traffic jams, and automatically alert the authorities about accidents. Fiber-optic cables embedded in the road detect wear and tear, and communication between vehicles and roads can improve traffic management. For example, rapid flow technologies useartificial intelligence (AI) to managetraffic lights, which respond to each other and to cars.Traditional systems were pre-programmed to optimize flow around peak journey times, new technologies are able to processand optimize flows in real time.

CHAPTER 13

13.Appendix:

Source Code:

main.py

```
#IBM Watson IOT Platform
#pip install wiotp-sdk import wiotp.sdk.device
import time
import random
myConfig = {
"identity": {
 "orgId": "2r52ij",
"typeId": "Roadsafety",
 "deviceId":"1234" },
"auth": { "token": "12345678" }
}
 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.connect()
while True:
 temp=random.randint(-20,125)
hum=random.randint(0,100)
 myData={'temperature':temp, 'humidity':hum}
client.publishEvent(eventId="status", msgFormat="json",
data=myData, qos=0, onPublish=None)
 print("Published data Successfully: %s", myData)
client.commandCallback = myCommandCallback time.sleep(2)
client.disconnect()
```

weather.py

```
import requests as reqs
 def get(myLocation,APIKEY):
apiURL =
f"https://api.openweathermap.org/data/2.5/weather?q={myLocation}&a
ppid={APIKEY}"
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, # visibility in percentage
where 10km is 100% and 0km is 0% }
if("rain" in responseJSON):
returnObject["rain"] = [responseJSON["rain"][key] for key in
responseJSON["rain"]]
return(returnObject)
```