PROJECT DOCUMENT

Signs with Smart Connectivity for Better Road Safety

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1.INTRODUCTION:

The sustainability and smartness of the smart city concept rely on the technologies adopted to improve the people's quality of life. The smart city governance is one significant aspect of smart city initiatives, which will facilitate the planning techniques for better decision making. One of the key elements of the smart city governance framework is the public value generated out of the smart services provided.

1.2 PROJECT OVERVIEW:

A significant amount of research work carried out on traffic management systems, but intelligent traffic monitoring is still an active research topic due to the emerging technologies such as the Internet of Things (IoT) and Artificial Intelligence (AI). The integration of these technologies will facilitate the techniques for better decision making and achieve urban growth. This research proposes an IoT based system model to collect, process, and store real-time traffic data for such a scenario. The objective is to provide real-time traffic updates on traffic congestion and unusual traffic incidents through roadside message units and thereby improve mobility. These early-warning messages will help citizens to save their time, especially during peak hours. The study is part of the Omani-funded research project, investigating Real-Time Feedback.

1.2 PURPOSE:

Smart traffic infrastructure is an essential component of smart city initiatives because traffic congestion is a severe issue that grows along with city development. Smart traffic management includes intelligent transport systems with integrated components like adaptive traffic signal controls, freeway management, emergency management services, and roadside units. Such systems collect real-time traffic data and take necessary measures to avoid or minimize any social issue created as part road congestions. For example, access to real-time traffic maps will assist the residents in selecting appropriate route to save time and effort.

2.LITRATURE SURVEY:

Real-time traffic monitoring systems play a key role in the transition toward smart cities. A considerable amount of literature has been published on intelligent traffic management systems based on the IoT paradigm. Autonomous traffic sensing is at the heart of smart city infrastructures, wherein smart wireless sensors are used to measure traffic flow, predict congestion, and adaptively control traffic routes.

based real-time traffic monitoring system is proposed for dynamic handling of traffic signals based on traffic density. The proposed system uses a set of ultrasonic sensors and has two Most of the recent developments in delivering real-time traffic updates used the congestion estimates to dynamically control the traffic signal. An IoT modules:

2.1 EXISTING PROBLEM:

section discusses the proposed system model, different software and hardware components required, and algorithms to implement the proposed system. The proposed system communication model is presented in which has components installed at the roadside and a cloud-based central server. The roadside setup includes sensors and message boards. The sensors and boards will be installed between two road segment intersections. The central server includes data storage, cloud services, and interfaces. The components can communicate with each other using WiFi.

2.2 REFERENCES:

1. Centers for Disease Control and Prevention. Achievements in public health, 1900-1999 motor-vehicle safety: a 20th century public health achievement MMWR. 1999;48(18):369-74. Accessed October 18 2014. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm48181.htm

2. WHO Global Status Report on Road Safety, Accessed October 18 2014 http://whqlibdoc.who.int/publications/2009/9789241563840_eng.pdf

3. Public Health Agency of Canada. Injury in review, 2012 Edition: spotlight on road and transport safety. Accessed October 18: 2014. http://www.parachutecanada.org/downloads/research/reports/InjuryinReview2012_EN.pdf

4. Ontario, Ministry of Transportation. Ontario road safety annual report 2010, Toronto, ON: Queen's Printer for Ontario, 2013.Accessed October 18 2014. http://www.mto.gov.on.ca/english/safety/orsar/orsar10/DRSAR10.pdf

5. Canadian Motor Vehicle Traffic Collision Statistics (2011 Report). Accessed October 18 2014, http://c.ymcdn.com/sites/www.alphaweb.org/resource/resmgr/comoh_section/trafficcollisionstatisites_2.pdf

6. Preventing Motor Vehicle Occupant Injuries in Manitoba. A review of best practices. Prepared for Manitoba Health byIMPACT: the injury prevention Centre of children's hospital.http://www.gov.mb.ca/healthyliving/hip/docs/injury/injuries_motorvehicle.pdf.

7. Statistics Canada. Mortality, Summary List of Causes. Accessed October 18 2014.http://www.statcan.gc.ca/pub/8410209x/84/0209x2008000-eng.pdf

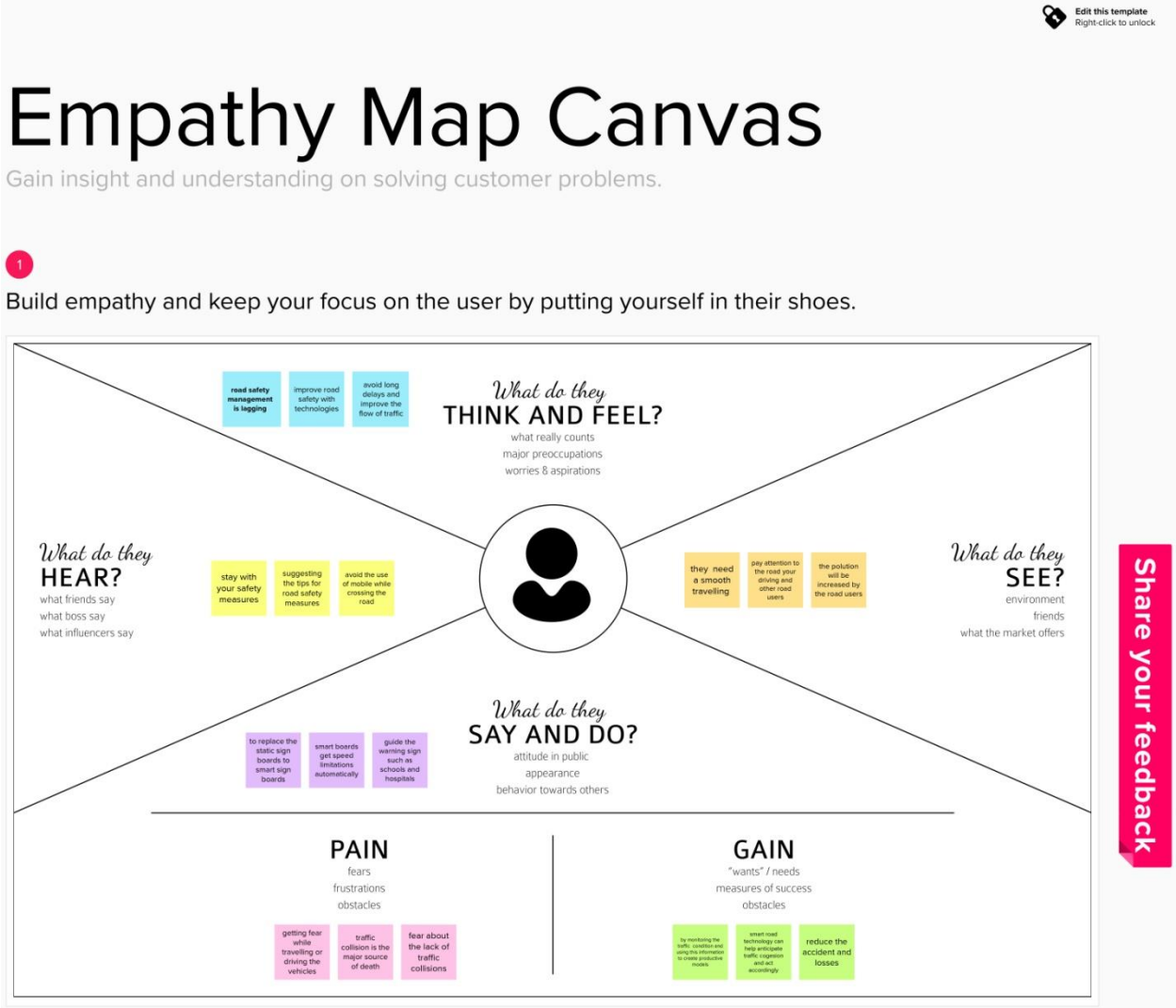
2.3 PROBLEM STATEMENT:

Preventing road trauma on public roads and in the course of work is a core responsibility for government, its agencies and employers and requires shared responsibility and leadership.The scale of the road safety challenge and the diversity of the effects of road traffic injury underline the importance of exploring synergies with other societal goals and priorities. A UN Decade of Action for Road Safety 2011–2020 has been announced with an ambitious global target and plan to reduce deaths in road traffic crashes.

3. IDEATION & PROPOSED SOLUTION:

3.1 EMPATHY MAP:

An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. Much like a user personal, an empathy map can represent a group of users, such as customer segment. The empathy map was originally created by Dave Gray and has gained much popularity within the agile community.



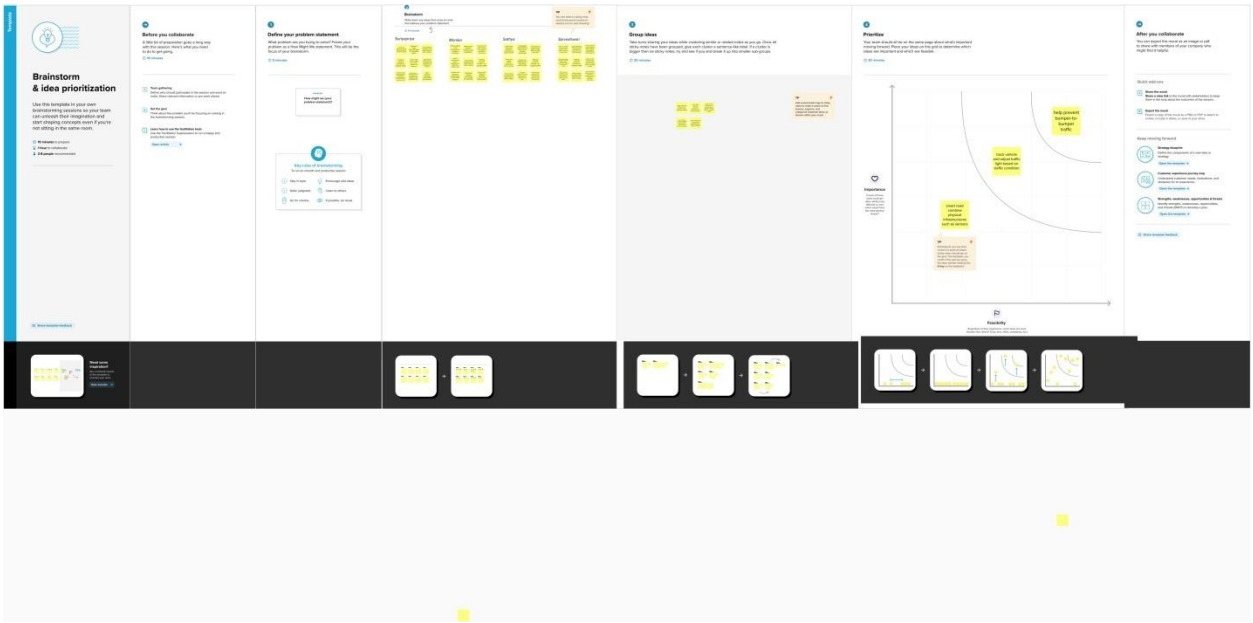
3.2 IDEATION & BRAINSTORMING:

Brainstorming is a group creativity technique by which efforts are made to find a conclusion for a specific problem by gathering by list of ideas spontaneously contributed by its members.

Pick an appropriate facilitator.

Set the agenda.

Holdingthsession.



3.3 PROPOSED SOLUTION:

Roads are the arteries through which the economy sustains. Roads link producers to markets, workers to jobs, students to school, and the sick to hospitals, hence are vital to any development agenda. However, roads can only contribute if they are safe for commuters and government's main thrust of accident prevention and control has been **on 4 E's (i) Education; (ii) Enforcement; (iii) Engineering; (iv) Environment and Emergency care** of road accident victims.

UN has announced 2011-2020 as the **'Decade of Action for Road Safety'** with an aim to **reduce fatalities by 50%** by focusing on five

pillarsroad safety management, safer roads and mobility, safer road users, post-crash response, and safer vehicles.

3.4 PROBLEM SOLUTION FIT:

Project Title: signs with smart connectivity for better road safety **Project Design Phase-I - Solution Fit Template** **Team ID:** PNT2022TMIDxxxxxx

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

1. Who are all driving vehicles, driving peoples, travellers,passengers.

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

1. More then half of all road traffic deaths and injuries involve vulnerable road users.
2. for eg:pedestrians,cyclists and motorcyclists and their passengers.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

1. To replace the static sign boards to smart sign boards.
2. Smart sign boards get speed limitations automatically.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

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

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

1. Avoid the use of mobile while crossing the road.
2. Stay with your safety measures while driving a vehicle.

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists? What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

1. Lack of proper information or training,unsafe systems of work,poorly maintained or unsuitable equipment.
2. And these underlying failures are the symptoms of failure of management control which is the root cause of majority of accidents.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

1. Always pay attention and listen to warnings.
2. Building infrastructure like traffic signals does not mean people will always follow them.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

1. The focus should be on creating infrastructure that is safe and accessible for all.

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

Before:
People get fear to driving vehicles or travelling long distance

After:
They are feeling very confident and to be secure while driving the vehicles

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

1. Send safety alerts to traffic management activities.
2. Share data on road conditions among vehicles.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

1. Displaying the seconds remaining for the traffic signals to turn green,is likely to reduce the number of peoples who breaks the signal.
2. Behavioural solutions that take human biases and irrational behaviour into considerations.

Identify strong TR & EM

4. REQUIREMENT ANALYSIS:

FUNCTIONAL REQUIREMENTS:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Visibility	Sign Boards should be made of bright coloured LEDs capable of attracting driver's attention Not too distracting to cause accidents
FR-2	User Understanding	Should display information through means like images/illustrations with text so that the user can understand the signs correctly
FR-3	User Convenience	Display should be big enough to display all the signs correctly so that it is visible even to far away drivers

NON FUNCTIONAL REQUIREMENTS:

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

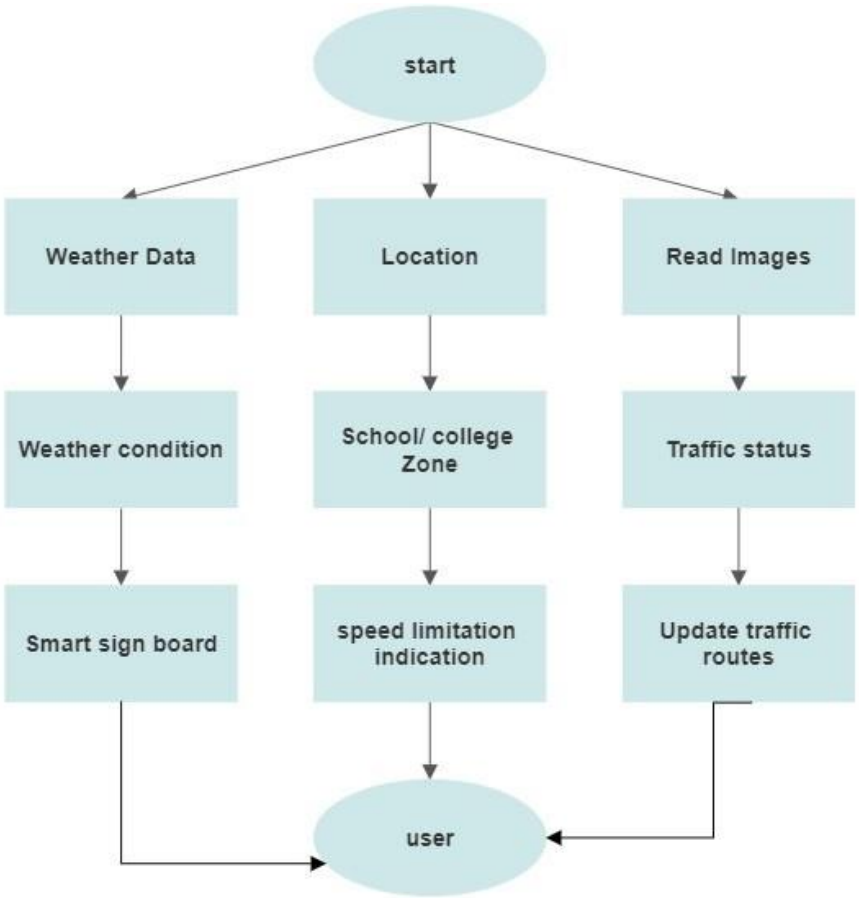
FR.NO	Non-Functional Requirement	Description
NFR-1	Usability	Should be able to dynamically update with respect to time.
NFR-2	Security	Should be secure enough that only the intended messages are displayed in the display.
NFR-3	Relaibility	Should convey the traffic information correctly
NFR-4	Performmence	Display should update dynamically whenever the weather or traffic values are updated

NFR-5	Availability	Should be on service 24/7

5. project Design:

5.1 DATA FLOW DIAGRAM:

It's easy to understand the flow of data through systems with the right data flow diagram software. Thisguide provides everything you need to know about data flow diagrams, including definitions, history, and symbolsand notations. You'll learn the different levels of a DFD, the difference between a logical and a physical DFD andtips for making a DFD.



5.2 USER STORIES:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	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 applicationby 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 myspeed 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 the fatalsituations.	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 weathermap by entering email & password	I can access the application through my Gmail login	High	Sprint-2
Customer (Webuser)	Data generation	USN-6	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
Administrator (Officials)	Problem solving/ Fault clearance	USN-7	As an official who is in charge for the proper functioning of the sign boards have to maintain itthrough periodic monitoring.	Officials can monitor thesign boards for proper functioning.	Medium	Sprint-2

5.3 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.

1.Describe the structure, characteristics, behavior, and otheraspects of the software to project stakeholders.
2.Define features, development phases, and solution requirements.

3. Provide specifications according to which the solution is defined, managed, and delivered.

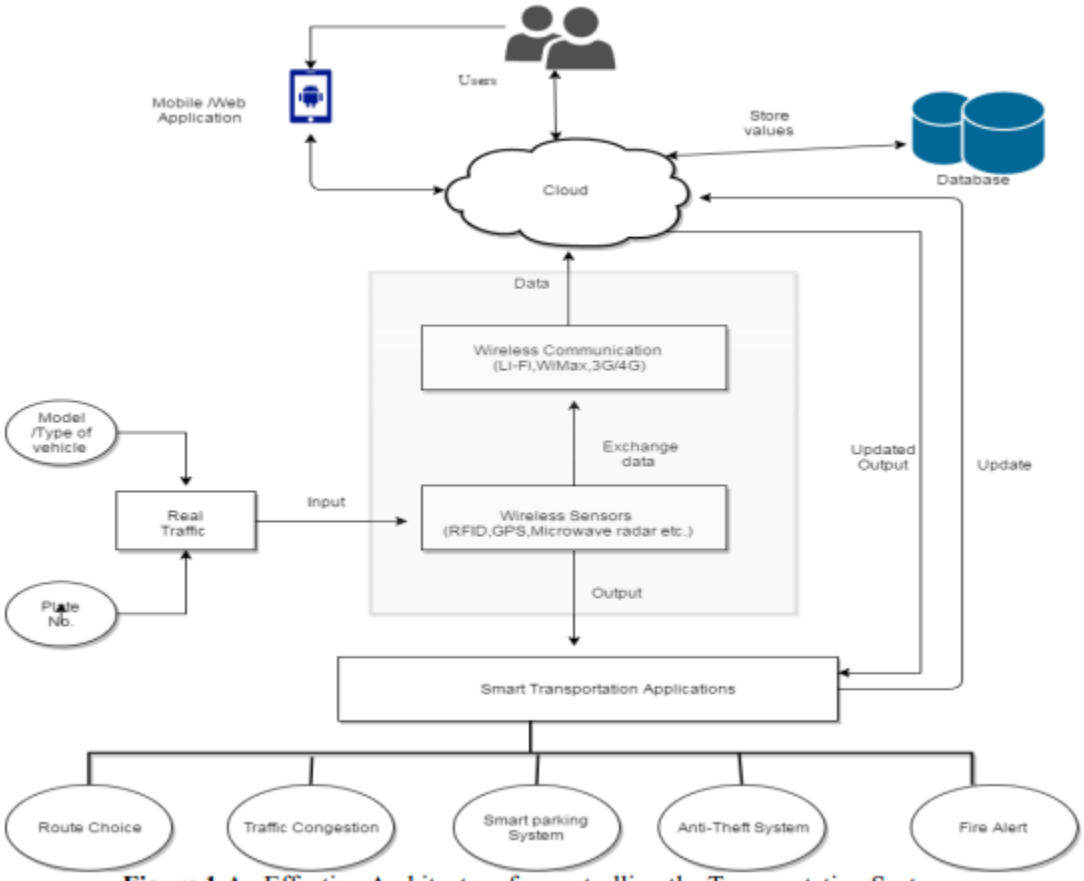


Figure 1 An Effective Architecture for controlling the Transportation System.

6.PROJECT PLANNING:

6.1 SPRINT PLAN:

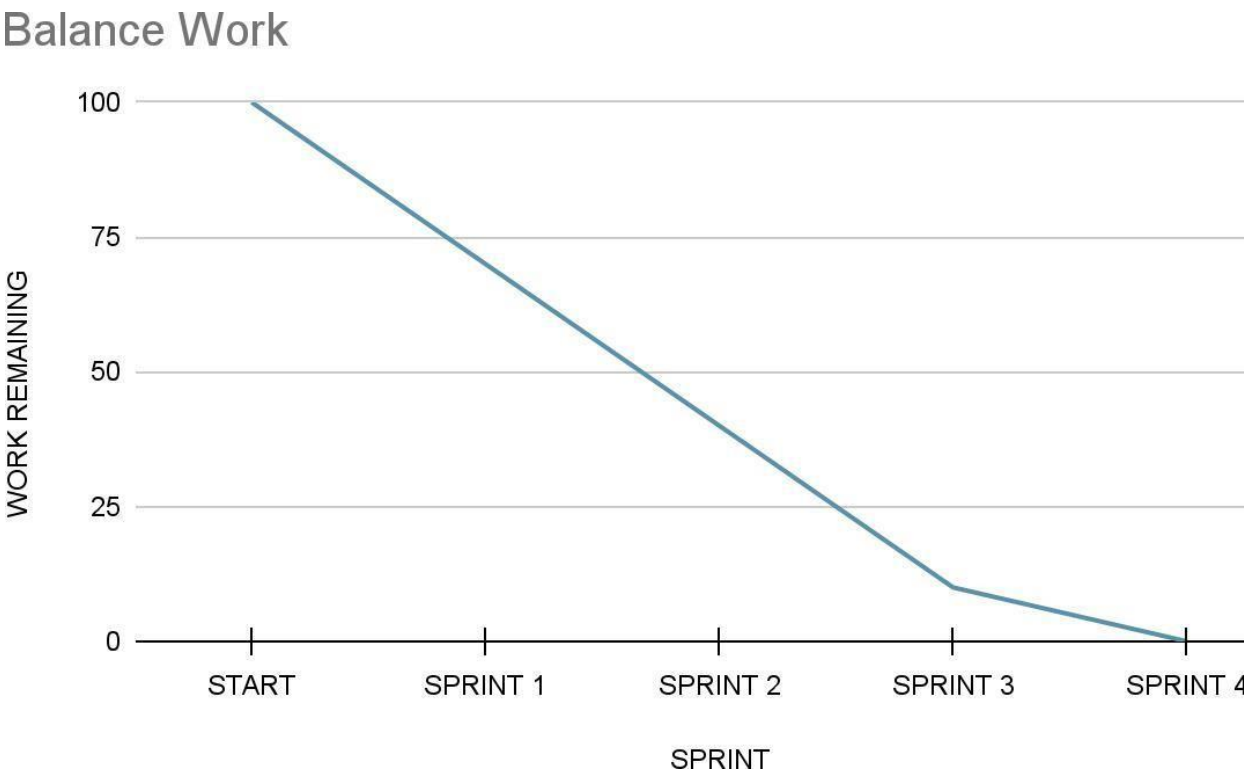
Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	Create and initialize accounts in various public APIs like OpenWeatherMap API.	1	LOW	Suriyapriya, Monika, Sarveshwari, Sathya
Sprint-2	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	MEDIUM	Suriyapriya, Monika, Sarveshwari, Sathya
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH	Suriyapriya,Monika, Sarveshwari, Sathya
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW	Suriyapriya, Monika, Sarveshwari, Sathya

6.2 SPRINT DELIVERY:

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	16 Nov 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	16 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	16 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	16 Nov 2022

BROWN CHART:

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



7. CODING AND SOLUTION:

PUBLISH THE DATA TO IBM CLOUD (HUMIDITY & TEMPRATURE):

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 5    // what pin we're connected to
#define DHTTYPE DHT22   // define type of sensor DHT 11
```

```
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht connected

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);

//-------credentials of IBM Accounts------

#define ORG "psh4py"//IBM ORGANITION ID
#define DEVICE_TYPE "alert-device"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "4571"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "12345678"     //Token
String data3;
float h, t;


//-------- Customise the above values --------
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd  REPRESENT command type AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id


//-------------------------------------
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined client id by passing parameter like server id,portand wificredential
```

```
void setup()// configureing the ESP32
{
  Serial.begin(115200);
  dht.begin();
  pinMode(33, INPUT); //North
  pinMode(25, INPUT); // South
  pinMode(26, INPUT); // East
  pinMode(27, INPUT); // West
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();
}

int n, s, e, w;

void loop()// Recursive Function
{

  h = dht.readHumidity();
  t = dht.readTemperature();
  Serial.print("temp:");
  Serial.println(t);
  Serial.print("humidity:");
  Serial.println(h);

  n = digitalRead(33);
  s = digitalRead(25);
  e = digitalRead(26);
  w = digitalRead(27);

  PublishData(t, h, n, s, e, w);
  delay(1000);
  if (!client.loop()) {
    mqttconnect();
```

```
  }
}



/*.....retrieving to Cloud.....*/

void PublishData(float temp, float humid, int n, int s, int e, int w) {
  mqttconnect();//function call for connecting to ibm
  /*
     creating the String in in form JSon to update the data to ibm cloud
  */
  String payload = "{\"temp\":";
  payload += temp;
  payload += "," "\"humidity\":";
  payload += humid;
  payload += "," "\"North\":";
  payload += n;
  payload += "," "\"South\":";
  payload += s;
  payload += "," "\"East\":";
  payload += e;
  payload += "," "\"West\":";
  payload += w;
  payload += "}";


  Serial.print("Sending payload: ");
  Serial.println(payload);


  if (client.publish(publishTopic, (char*) payload.c_str())) {
    Serial.println("Publish ok");// if it sucessfully upload data on the cloud
then it will print publish ok in Serial monitor or else it will print publish
failed
  } else {
    Serial.println("Publish failed");
```

```
  }

}


void mqttconnect() {
  if (!client.connected()) {
    Serial.print("Reconnecting client to ");
    Serial.println(server);
    while (!!!client.connect(clientId, authMethod, token)) {
      Serial.print(".");
      delay(500);
        }

          initManagedDevice();
     Serial.println();
  }
}
void wificonnect() //function defination for wificonnect
{
  Serial.println();
  Serial.print("Connecting to ");

  WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to
establish the connection
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}

void initManagedDevice() {
  if (client.subscribe(subscribetopic)) {
```

```
   Serial.println((subscribetopic));
   Serial.println("subscribe to cmd OK");
  } else {
   Serial.println("subscribe to cmd FAILED");
  }
}

void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength)
{

  Serial.print("callback invoked for topic: ");
  Serial.println(subscribetopic);
  for (int i = 0; i < payloadLength; i++) {
    //Serial.print((char)payload[i]);
    data3 += (char)payload[i];
  }
  Serial.println("data: "+ data3);
//   if(data3=="lighton")
//   {
// Serial.println(data3);
// digitalWrite(LED,HIGH);
//   }
//   else
//   {
// Serial.println(data3);
// digitalWrite(LED,LOW);
//   }
// data3="";
}
```

CODING FOR CHANGING THE DIRECTION:

```
#include <WiFi.h>
#include <HTTPClient.h>
#include <Adafruit_GFX.h>
```

```
#include <Adafruit_ILI9341.h>
#include <string.h>

const char* ssid = "Wokwi-GUEST";
const char* password = "";

#define TFT_DC 2
#define TFT_CS 15
Adafruit_ILI9341 tft = Adafruit_ILI9341(TFT_CS, TFT_DC);

String myLocation = "Chennai,IN";
String usualSpeedLimit = "70"; // kmph

int schoolZone = 32;
int hospitalZone = 26;

int uid = 2504; // ID Unique to this Micro Contoller

String getString(char x)
{
  String s(1, x);
  return s;
}

String stringSplitter1(String fullString,char delimiter='$')
{
  String returnString = "";
  for(int i = 0; i<fullString.length();i++) {
    char c = fullString[i];
    if(delimiter==c)
      break;
    returnString+=String(c);
  }
  return(returnString);
}

String stringSplitter2(String fullString,char delimiter='$')
```

```
{
  String returnString = "";
  bool flag = false;
  for(int i = 0; i<fullString.length();i++) {
    char c = fullString[i];
    if(flag)
      returnString+=String(c);
    if(delimiter==c)
      flag = true;
  }
  return(returnString);
}

void rightArrow()
{
 int refX = 50;
 int refY = tft.getCursorY() + 40;

 tft.fillRect(refX,refY,100,20,ILI9341_RED);
 tft.fillTriangle(refX+100,refY-
30,refX+100,refY+50,refX+40+100,refY+10,ILI9341_RED);
}

void leftArrow()
{
 int refX = 50;
 int refY = tft.getCursorY() + 40;

 tft.fillRect(refX+40,refY,100,20,ILI9341_RED);
 tft.fillTriangle(refX+40,refY-
30,refX+40,refY+50,refX,refY+10,ILI9341_RED);
}

void upArrow()
{
 int refX = 125;
 int refY = tft.getCursorY() + 30;
```

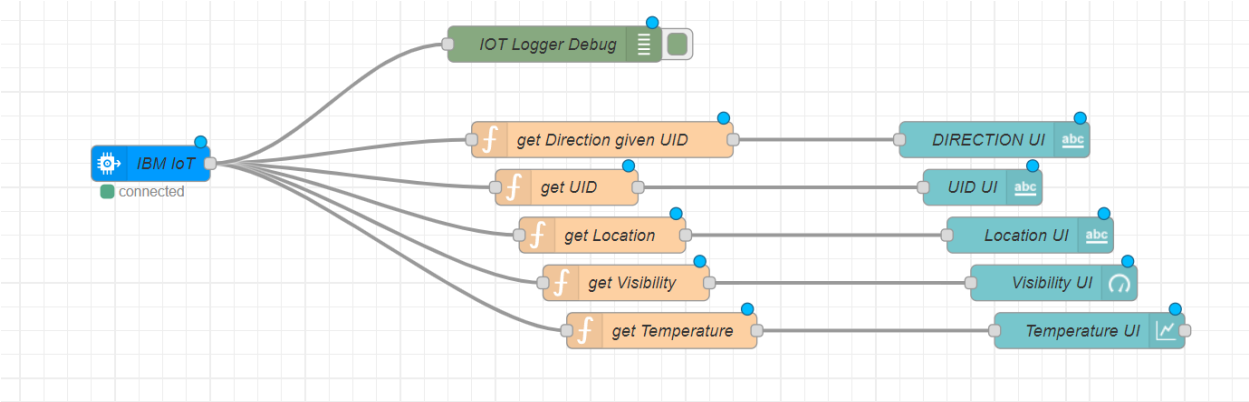
```
  tft.fillTriangle(refX-
40,refY+40,refX+40,refY+40,refX,refY,ILI9341_RED);
  tft.fillRect(refX-15,refY+40,30,20,ILI9341_RED);
}

String APICall() {
  HTTPClient http;

  String url = "https://node-red-nwmrt-2022-11-04.eu-
gb.mybluemix.net/getSpeed?";
  url += "location="+myLocation+"&";
  url += "schoolZone="+(String)digitalRead(schoolZone)+(String)"&";
  url += "hospitalZone="+(String)digitalRead(hospitalZone)+(String)"&";
  url += "usualSpeedLimit="+(String)usualSpeedLimit+(String)"&";
  url += "uid="+(String)uid;
  http.begin(url.c_str());
  int httpResponseCode = http.GET();

  if (httpResponseCode>0) {
    String payload = http.getString();
    http.end();
    return(payload);
  }
  else {
    Serial.print("Error code: ");
    Serial.println(httpResponseCode);
  }
  http.end();
}

void myPrint(String contents) {
  tft.fillScreen(ILI9341_BLACK);
  tft.setCursor(0, 20);
  tft.setTextSize(4);
  tft.setTextColor(ILI9341_RED);
  //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_WHITE);
  tft.setTextSize(2);
  tft.print("Connecting to WiFi");

  while (WiFi.status() != WL_CONNECTED) {
    delay(100);
    tft.print(".");
  }

  tft.print("\nOK! IP=");
  tft.println(WiFi.localIP());
}

void loop() {
```

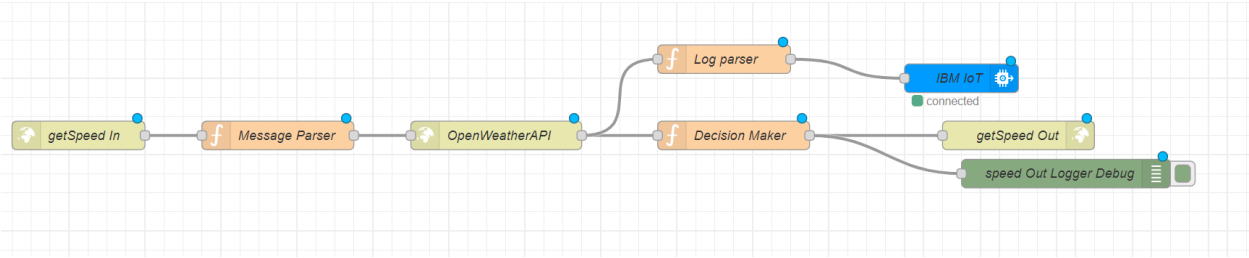
```
  myPrint(APICall());
  delay(100);
}
```

NODERED SERVICES:

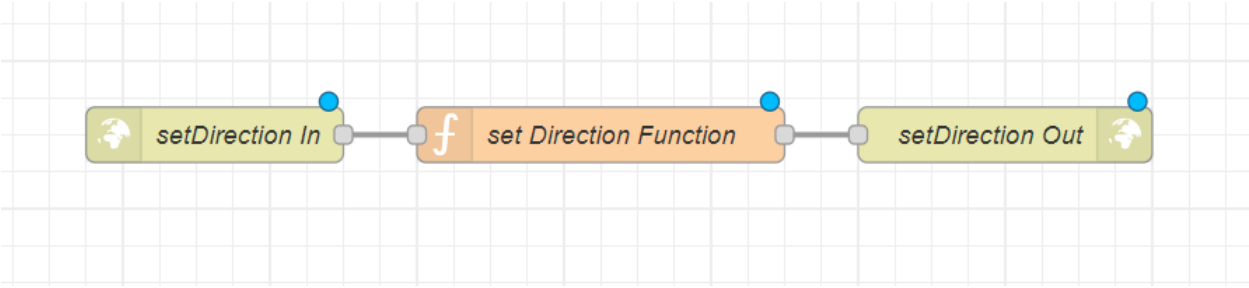
1. NODERED UI FLOW:



2. GET SPEED API FLOW:

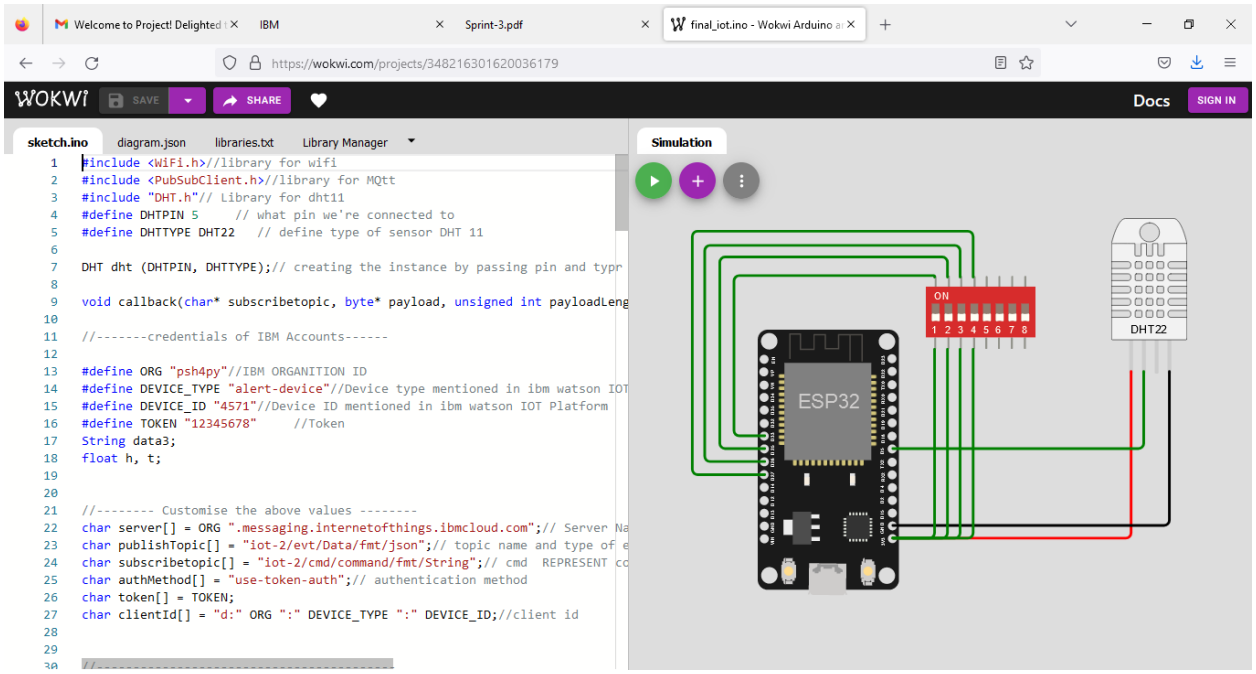


3. SET DIRECTION API FLOW:

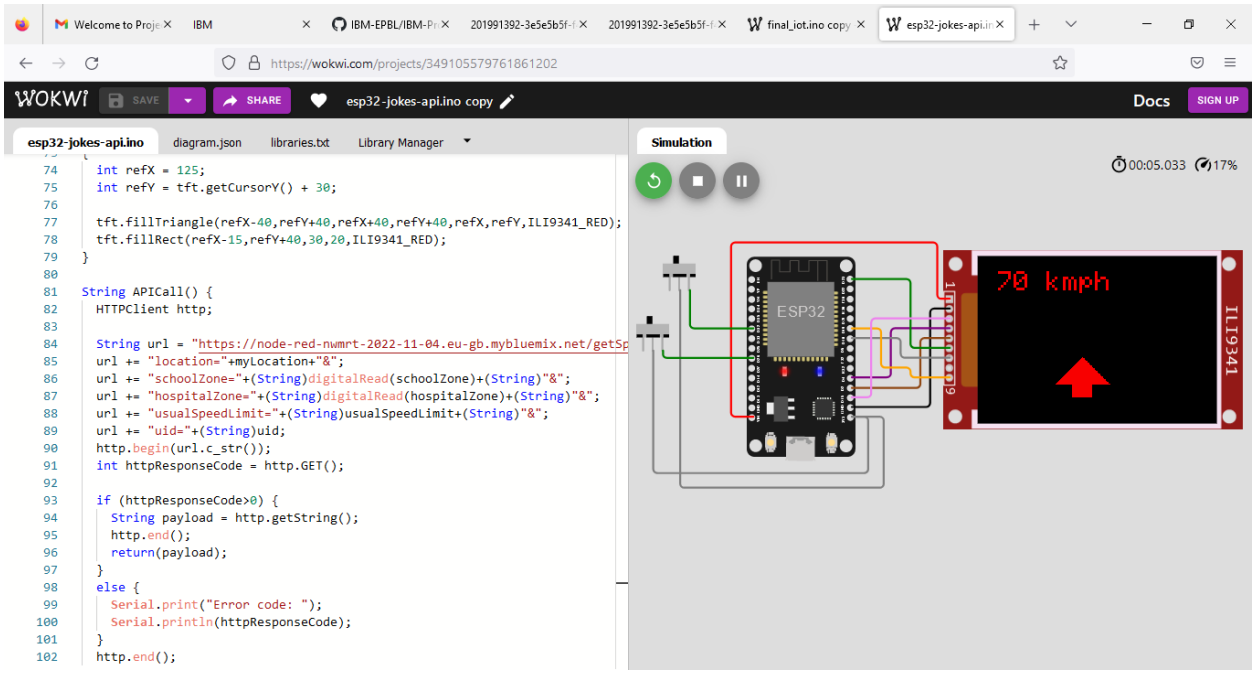


8.TESTING:

OUTPUT FOR BUBLISHING DATA TO IBM CLOUD:



OUTPUT FOR CHANGING DIRECTIONS:



9. RESULTS:

We have successfully learning a IOT deep learning project on **Signs with Smart Connectivity for Better Road Safety** .We have built the web app using the MIT app inventer which is used to the traffic control and monitoring to help to reducing the traffic , traffic controlling and improve the road safty.

10. ADVANTAGE & DISADVANTAGE;

ADVANTAGES:

1. It can assist in the smarter control of homes and cities via mobilephones. It enhances security and offers personal protection.
2. By automating activities, it saves us a lot of time.
3. Information is easily accessible, even if we are far away from our actual location, and it is updated frequently in real time.
4. Electric Devices are directly connected and communicate with a controller computer, such as a cell phone, resulting in efficient electricity use. As a result, there will be no unnecessary use of electricity equipment.

DISADVANTAGES:

1. Hackers may gain access to the system and steal personal information. Since we add so many devices to the internet, there is a risk that our information as it can be misused.
2. They rely heavily on the internet and are unable to function effectively without it.
3. With the complexity of systems, there are many ways for them to fail.

4. We lose control of our lives—our lives will be fully controlled and reliant on technology.

11. CONCLUSION:

This research proposed an IoT based system model to collect, process, and store real-time traffic data. This research provided real-time traffic monitoring for traffic updates through roadside message units. The traffic authorities can also broadcast messages on VIP visits, medical emergencies, accidents, etc. to corresponding message units, which will assist the public in decision making and save their time on roads. The proposed system uses magnetic sensor nodes to collect real-time vehicle information. The real-time data is processed by WiFi-enabled microcontrollers and sends to an IoT platform for further actions. Whereas, the proposed system does not expect any smart equipped devices with the driver of the car or within the car such as sensors, GPS, WiFi, etc. and which makes this model unique. The traffic administration can send priority messages to the citizens; hence, the traffic congestion due to accidents or any such unusual incidents can be avoided.

12. FUTURE SCOPE:

Improving driving behaviour using AI to detect drowsiness and track driving behaviour to incentivize by rewarding good driving scores. Improving School Zones by training children and creating social awareness through children. Improving enforcement system by detecting traffic violations using IoT, AI, cameras and automated penalty tickets on PPP model. Improving emergency service availability within golden hours using IoT, AI, QR codes for emergency help services and alerting before blackspot. All these pilots are running well with the support of partners and giving good results.

13. APPENDIX:

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-28718-1660115449

DEMO LINK:

https://youtu.be/GqZBhGv7wks