SIGNS WITH SMART CONNECTIVITY FOR IBM PROJECT REPORT

Team ID - PNT2022TMID42771

SUBMITTED BY

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Final Deliverables Report

DATE	19/11/2022
TEAM ID	PNT2022TMID42771
PROJECT NAME	Signs With Smart Connectivity For Better Road Safety

Team members and their Contributions:

Name	Roll no	Contribution
S.SARANYA	711619104043	CREATED SOURCE CODE FOR THE WOKWI SIMULATOR AND MIT APP CODE.
K.NANDHINI	711619104030	CREATED NODE RED AND IOT WATSON PLATFORM .
N.G.KOWSHIKA	711619104023	PROJECT REPORT MAKING PROCESS AND GATHERING IDEAS FOR CREATING PROJECT.
M.KAVIYA	711619104021	WORKINGS IN NODE RED FLOW AND IBM CLOUD DEPLOYMENT. DEPLOYMENT.

Introduction:

1. Sprint 1 – Create and initialize accounts in various public APIs like OpenWeatherMap API, and write a Python program that outputs results given the inputs like weather and location.
2. Sprint 2 – Push data from local code to cloud
3. Sprint 3 – Hardware & Cloud integration
4. Sprint 4 – UI/UX Optimization & Debugging

Project Report Format

CHAPTER 1

INTRODUCTION

1.1 Project Overview

The objective of this project is to help the people for growing global crisis of road traffic injury and the substantial value of preventing death and serious injury in road crashes. It also introduces the key road safety concepts that underpin this manual's guidance for implementing affordable and effective interventions to achieve results that may be required in any given context. The first of these concepts is the challenging Safe System long-term goal and strategy, which is recommended to all countries regardless of their socioeconomic status and level of infrastructure development. Secondly, this chapter highlights the planned, systematic approach needed for effective road safety management to produce successful road safety results. The chapter highlights the importance of aligning road safety with other important societal objectives, given the significant potential for shared benefits and in order to maximise cost-effective investment.

1.2 Purpose

Road safety is something important that has to be followed at all times to ensure the safety of the operators of a vehicle, passengers, and pedestrians. In fact, road traffic injuries are the leading cause of death among people aged between 15 and 29 years. Traffic rules and guidelines have to be set in place and strictly followed so that serious accidents and injuries can be averted. The measures and methods taken to establish road safety include the use of various road safety products. Well-

designed and uniquely engineered road safety products ensure the constant safety of vehicles and pedestrians.

CHAPTER 2

LITERATURE SURVEY

2.1 Existing Problem

2.1.1 Syed misbahuddin," IoT dynamic road traffic management"2015

All metropolitan cities face traffic congestion problems especially in the downtown areas. Normal cities can transformed into "smart cities" by exploiting the Information and communication technologies (ICT).The paradigm of Internet of Thing (IoT) can play an important role in realization of smart cities. This paper proposes an IoT based traffic management solutions for smart cities where traffic flow can be dynamically controlled by onsite traffic officers through their smart phones or can be centrally monitored or controlled through Internet. We have used the example of the holy city of Makkah Saudi Arabia, where the traffic behavior changes dynamically due to the continuous visitation of the pilgrims throughout the year. Therefore, Makkah city requires special traffic controlling algorithms other than the prevailing traffic control systems. However the scheme proposed is general and can be used in any Metropolitan city without the loss of generality.

2.1.2 Y.patel, A thakkar"Trafficcontrol management system"2019

In this work we present computer system that was adopted to regulate traffic signals in realtime with smartphoneconnected and vehicles as the only source of information. Connectivity has improved and road transportation has become a focus of rapid development. Roads are providing better access to services, ease of transportation and freedom of movement to people. But in metropolitan cities traffic congestion is increasing rapidly, it results in chronic situation in dense downtown areas. Traffic signals play a significant role in the urban transportation

system. They control the movement of traffic on urban streets by determining the appropriate signal timing setting.

2.1.3 Yuvaraj Natarajan & udhayakumar easwaran “Deep Neural Network with IoTBased Bat Agents for Traffic Management “2021

The former is used to route vehicles across highly congested paths to enhance efficiency, with a lower average latency. The latter is combined with 88.71% Internet of Things and it moves across the VANETs to analyze the traffic congestion status. In this paper, Deep Neural Networks (DNN) with Bat Algorithms (BA) offer a dynamic form of traffic control in Vehicular Adhoc Networks (VANETs). The former is used to route vehicles across highly congested paths to enhance efficiency, with a lower average latency. The latter is combined with the Internet of Things (IoT) and it moves across the VANETs to analyze the traffic congestion status between the network nodes. The experimental analysis tests the effectiveness of DNN-IoT-BA in various machine or deep learning algorithms in VANETs. DNN-IoT-BA is validated through various network metrics, like packet delivery ratio, latency and packet error rate. The simulation results show that the proposed method provides lower energy consumption and latency than conventional methods to support real-time traffic conditions.

2.1.4 F. Wegman"Traffic Control Systems"2017

Road infrastructure has improvement in last few years Connectivity has Improved transport on development Roads are providing better access to services. Traffic signals play a significant role in the urban transportation system. They control the movement of traffic on urban streets by determining the appropriate signal timing settings. Adaptive traffic signal controllers as the principle part of intelligent transportation systems has a primary role to effectively reduce traffic congestion by making a real time adaptation in response to the changing traffic network dynamics. Many methods used for traffic signal timing optimization under different criteria's. In this paper different methods are proposed by

reviewing different research papers for traffic signal control, which gives best adaptability & optimization ideas in traffic signal control.

2.1.5 Mohammed Shinoy ,Mohammed kharbeche" Urban traffic Monitoring and Modeling System"2019

In this paper, an IoT based solution to facilitate such a study in Qatar is proposed. Different data points from a driver are collected and recorded in an unobtrusive manner, such as trip data, GPS coordinates, compass heading, minimum, average, and maximum speed and his driving behavior, including driver's drowsiness level. Analysis of these data points will help in prediction of crashes and road infrastructure improvements to reduce such events. It will also be used for drivers risk assessment and to detect extreme road user behaviors. To tackle this problem, Naturalistic Driver Behavior can be utilised Which will collect and analyze data to estimate the current qatar traffic system, including traffic data infrastructure, safety planning, and engineering practices and standard .

2.2 References

D. J. Rose and R. A. Willoughby, "University of Florida (UF) David Gleich's Sparse Matrix Page," https://www.cise.ufl.edu/research/sparse/matrices/Gleich/.
New York City Open Data Portal, NYPD Motor Vehicle Collisions," https://data.cityofnewyork.us/Public-Safety/NYPD-Motor-Vehicle-Collisions/h9gi-nx95

PCI Geomatics (software), "PCI Geomatics (software)," http://www.pcigeomatics.com/software/geomatica/professional.

World Health Organization, "Global status report on road safety 2015," https://www.who.int/violence_injury_prevention/road_safety_status/2015/en/.

World Health Organization, "Decade of Action for Road Safety 2011-2020 seeks to save millions of lives," http://www.who.int/roadsafety/decade_of_action/en/.

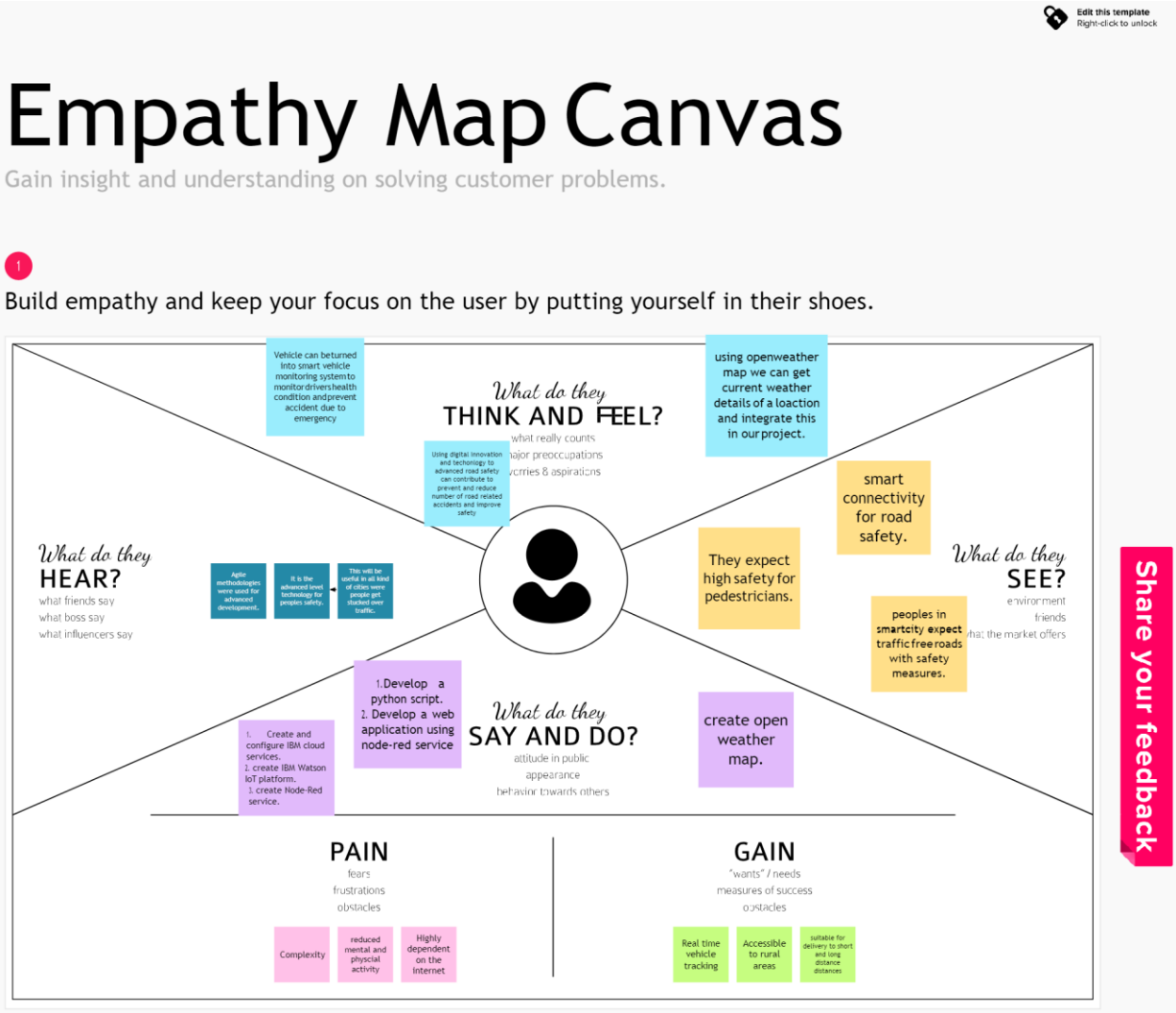
2.3 PROBLEM STATEMENT DEFINITION

In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are 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. Integrating weather and road condition monitoring into Intelligent Transport Systems (ITS) helps in reducing road accidents by 12-16%. Air quality monitoring on the roadways and tunnels ensures human exposure to vehicular emission is within the permissible limits. smart device to be used at accident-prone zones on the roads and highways. The intelligent road sensors monitor critical parameters like road visibility, road surface temperature, and rainfall in real-time. Identifying a vehicle's location through an on -board GPS (whether dedicated or through a smartphone). The system identifies whether a smartphone holder (a) has entered a vehicle; (b) has boarded the vehicle from the left or the right. The sensed data from in -vehicle setups synced with information on traversed roads, utilized vehicles, traffic conditions, and weather conditions. The dynamic speed limit is then served to the drivers in the form of push notifications through maps, and Visual Messaging Displays . it is possible to identify behaviors such as "exceeded speed limit", "rolling stops", "drowsy", "sleepy", "asleep", and "fatigued

CHAPTER 3
IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

An **empathy map** is a collaborative visualization used to articulate what we know about a particular type of user. It externalizes knowledge about users in order to 1) create a shared understanding of user needs, and 2) aid in decision making. An empathy map canvas serves as a foundation for outstanding user experiences, which focus on providing the experience customers want rather than forcing design teams to rely on guesswork. Empathy map canvases help identify exactly what it is that users are looking for so brands can deliver. They can be particularly beneficial for getting teams on the same page about who users are and what they want from the brand. An empathy map canvas is a more in-depth version of the original empathy map, which helps identify and describe the user's needs and pain points. And this is valuable information for improving the user experience. Teams rely on user insights to map out what is important to their target audience, what influences them, and how they present themselves. This information is then used to create personas that help teams visualize users and empathize with them as individuals, rather than just as a vague marketing demographic or account number.



3.2 Ideation & Brainstorming

Brainstorming combines a relaxed, informal approach to problem solving with lateral thinking. It encourages people to come up with thoughts and ideas that can, at first, seem a bit crazy. Some of these ideas can be crafted into original, creative solutions to a problem, while others can spark even more ideas. This helps to get

people unstuck by "jolting" them out of their normal ways of thinking. Therefore, during brainstorming sessions, people should avoid criticizing or rewarding ideas. You're trying to open up possibilities and break down incorrect assumptions about the problem's limits. Judgment and analysis at this stage stunts idea generation and limit creativity. Brainstorming is a method of generating ideas and sharing knowledge to solve a particular commercial or technical problem, in which participants are encouraged to think without interruption. Brainstorming is a group activity where each participant shares their ideas as soon as they come to mind. At the conclusion of the session, ideas are categorized and ranked for follow-on action. When planning a brainstorming session it is important to define clearly the topic to be addressed. A topic which is too specific can constrict thinking, while an ill-defined topic will not generate enough directly applicable ideas. The composition of the brainstorming group is important too. It should include people linked directly with the subject as well as those who can contribute novel and unexpected ideas. It can comprise staff from inside or outside the organization

3.3 Proposed Solution

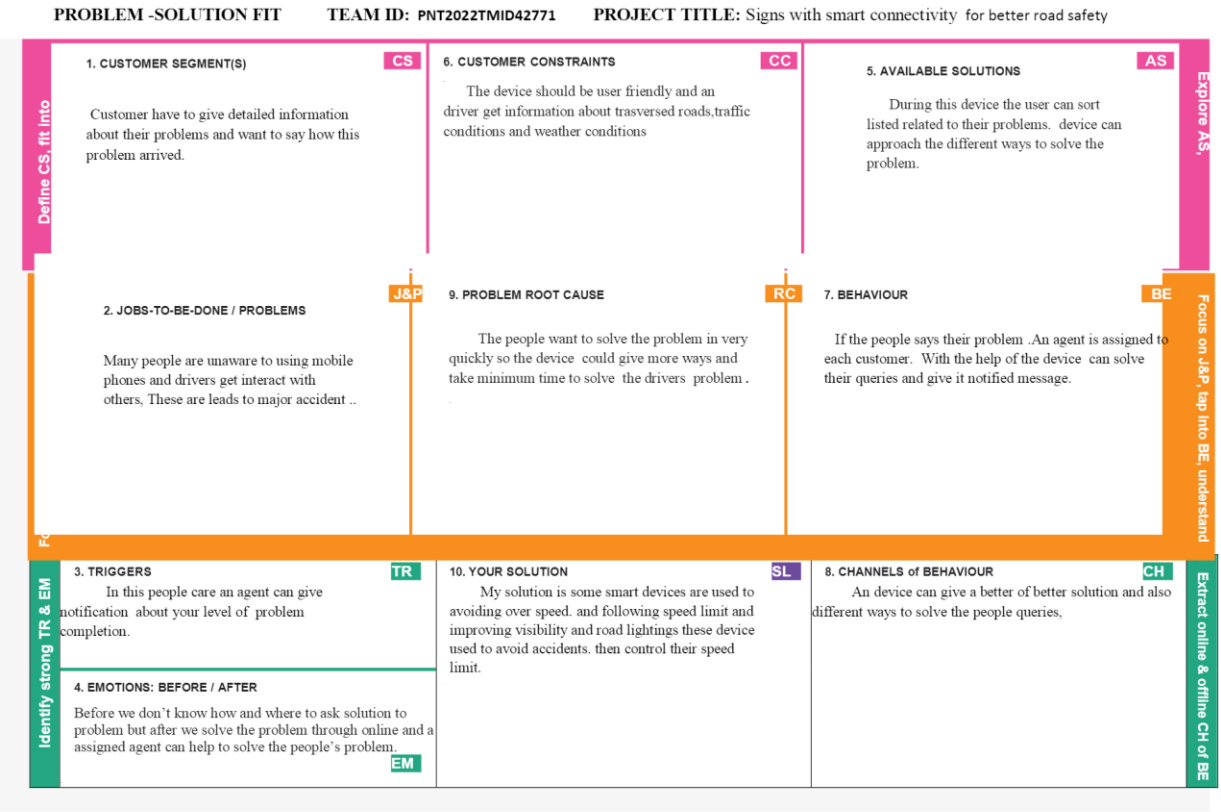
Your proposed solution section should offer your solution specifically, with enough detail so that your reader understands exactly what you're proposing. Indicate how your proposed solution will solve the problem and provide tangible benefits. Specifically, explain how it will meet the objectives and abide by the constrains outlined in the problem definition.

Proposed Solution Template:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Static signs delay the traffic by stopping vehicles at the intersection during peak hours.
2.	Idea / Solution description	The project includes features like suggesting alternative way and easy access to traffic system.
3.	Novelty / Uniqueness	If there is huge traffic jam in intersections or in fogging areas, then they can take alternative way to reach the destination.
4.	Social Impact / Customer Satisfaction	It helps people to reach their destination on time and also helps to know the traffic situation.
5.	Business Model (Revenue Model)	It gives friendly access to traffic system. Takes constant follow up till signs light is replaced.
6.	Scalability of the Solution	Feels frustrated about the traffic office situations.

3.4 Problem Solution Fit

The Problem-Solution Fit canvas is based on the principles of Lean Startup, LUM (Lazy User Model) and User Experience design. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why. It is a template to help identify solutions with higher chances of solution adoption, reduce time spent on testing and get a better overview of the current situation. My goal was to create a tool that translates a problem into a solution, taking into account customer behavior and the context around it. None of the existing canvases or frameworks were giving me an overview and insight into the real customer situation during his/her decision-making process. With this template you will be able to take important information into consideration at an earlier stage and look at problem solving in depth. It increases your chances of finding problem-solution and product-market fit.



CHAPTER 4

REQUIREMENTS ANALYSIS

4.1 Functional requirements

Functional requirements are product features or functions that developers must implement to enable users to accomplish their tasks. So, it's important to make them clear both for the development team and the stakeholders. Generally, functional requirements describe system behavior under specific conditions. For example: The system sends an approval request after the user enters personal information. A search feature allows a user to hunt among various invoices if they want to credit an issued invoice. The system sends a confirmation email when a new user account is created. These are the requirements that the end user specifically demands as basic facilities that the system should offer. All these functionalities need to be necessarily incorporated into the system as a part of the contract. These are represented or stated in the form of input to be given to the system, the operation performed and the output expected

4.2Non Functional Requirements

These are basically the quality constraints that the system must satisfy according to the project contract. The priority or extent to which these factors are implemented varies from one project to other. They are also called non-behavioral requirements. They basically deal with issues like: Portability ,Security Maintainability, Reliability ,Scalability.

Functional Requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Login mail	Login mail id
FR-4	Confirmation login mail	Check the confirmation mail
	Confirmation verification code	Check the verification code
	Confirm registration	Check the registration

Non-functional Requirements:

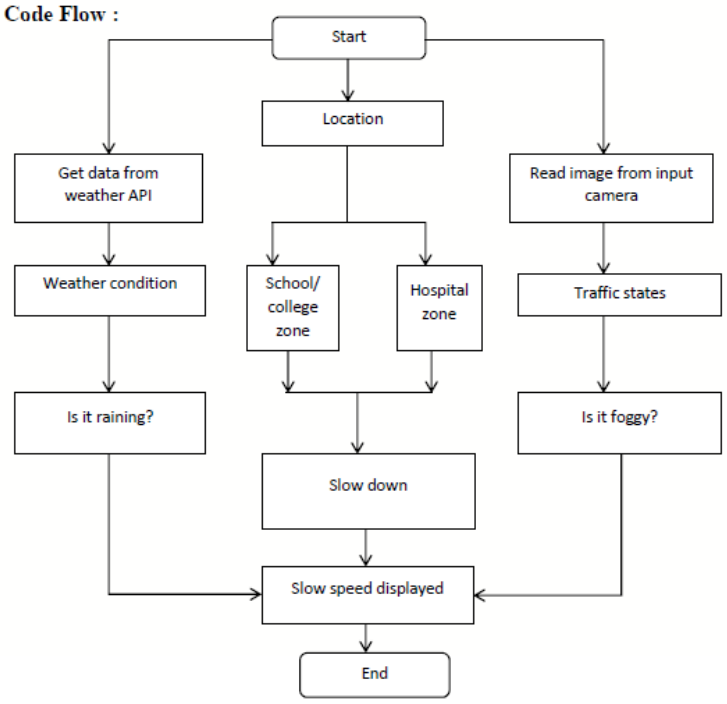
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Newly sensed data can facilitate an understanding of the road context, the road network map, and establish severity of turns, the presence of shoulders, and whether the road is on a hillside. Identifying a vehicle's location through an on-board GPS (whether dedicated or through a smartphone) would thereby provide for a first level of this understanding.
NFR-2	**Security**	The software is protected from unauthorized access to the system for drivers, the growing maturity of DBM will facilitate identifying unsafe or distracted driving behaviour. It will also enable the recognition of localized driving

CHAPTER 5

PROJECT DESIGN

5.1 Data Flow Diagrams

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one. Like all the best diagrams and charts, a DFD can often visually “say” things that would be hard to explain in words, and they work for both technical and nontechnical audiences, from developer to CEO. That’s why DFDs remain so popular after all these years. While they work well for data flow software and systems, they are less applicable nowadays to visualizing interactive, real-time or database-oriented software or systems

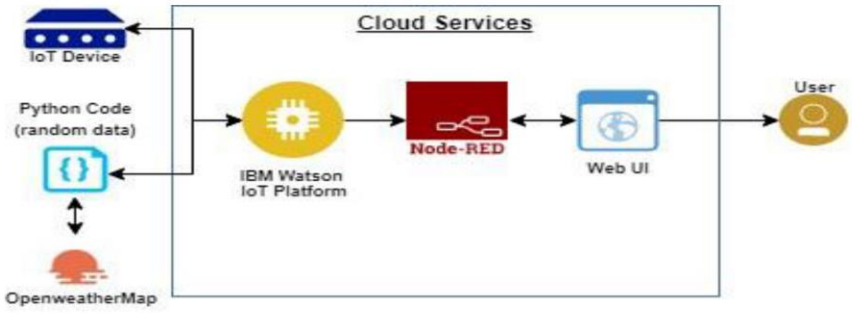


5.2 Solution & Technical Architecture

Technical architecture—which is also often referred to as application architecture, IT architecture, business architecture, etc.—refers to creating a structured software solution that will meet the business needs and expectations while providing a strong technical plan for the growth of the software application through its lifetime. IT architecture is equally important to the business team and the information technology team. Technical architecture includes the major components of the system, their relationships, and the contracts that define the interactions between the components. The goal of technical architects is to achieve all the business needs with an application that is optimized for both performance and security.IT architects plan for things they know are coming in the future and for things they don’t yet envision or dream. Taking the time to design the architecture at the start will prevent major design changes, code refactoring, and expensive rework later in the project.

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2



5.3 User Stories

A user story is the smallest unit of work in an agile framework. It’s an end goal, not a feature, expressed from the software user’s perspective. A user story is an informal, general explanation of a software feature written from the perspective of the end user or customer. The purpose of a user story is to articulate how a piece of work will deliver a particular value back to the customer. Note that "customers" don't have to be external end users in the traditional sense, they can also be internal customers or colleagues within your organization who depend on your team. User stories are a few sentences in simple language that outline the desired outcome. They don't go into detail. Requirements are added later, once agreed upon by the team. Stories fit neatly into agile frameworks like scrum and kamban. In scrum,

user stories are added to sprints and “burned down” over the duration of the sprint. Kanban teams pull user stories into their backlog and run them through their workflow. It’s this work on user stories that help scrum teams get better at estimation and sprint planning, leading to more accurate forecasting and greater agility. Thanks to stories, kamban teams learn how to manage work-in-progress (WIP) and can further refine their workflows. User stories are also the building blocks of larger agile frameworks like epics and initiatives. Epics are large work items broken down into a set of stories, and multiple epics comprise an initiative. These larger structures ensure that the day-to-day work of the development team (on stores) contributes to the organizational goals built into epics and initiatives.

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register through Gmail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can log through Gmail and password	High	Sprint-1
	Dashboard		Show information about user	I can access my account and see the dashboard	medium	Sprint-2
Customer (Web user)	homepage	USN-6	User can see the home page and get information	I can access my account and see the homepage	high	Sprint-3
Customer Care Executive	logout	USN-7	User can use the application and get information about road safety and logout the application	I can get the information about road condition and logout the page	high	Sprin-4t
Administrator	admin	USN-8	Admin can check the user details.	Admin can continuously check the user details.	low	Sprint-5

CHAPTER 6
PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning & Estimations

Sprint planning is an event in scrum that kicks off the sprint. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole scrum team. In scrum, the sprint is a set period of time where all the work is done. However, before you can leap into action you have to set up the sprint. You need to decide on how long the time box is going to be, the sprint goal, and where you're going to start.

The sprint planning session kicks off the sprint by setting the agenda and focus. If done correctly, it also creates an environment where the team is motivated, challenged, and can be successful. Bad sprint plans can derail the team by setting unrealistic expectations.As described in the Scrum Guide, Sprint Planning initiates the Sprint by laying out the work to be performed for the Sprint. This resulting plan is created by the collaborative work of the entire Scrum Team. The product owner ensures that attendees are prepared to discuss the most

important product backlog items and how they map to the Product Goal.

Project Name	Signs with Smart Connectivity for Better Road Safety	
Title	**Description**	**Date**
Literature Survey and Information Gathering	Gathering Information by referring the technical papers, research publications etc	1 SEPTEMBER 2022
Prepare Empathy Map	To capture user pain and gains Prepare List of Problem Statement	11 SEPTEMBER 2022
Ideation	Prioritise a top 3 ideas based on feasibility and Importance	18 SEPTEMBER 2022
Proposed Solution	Solution include novelty,feasibility,business model,social impact and scalability of solution	24 SEPTEMBER 2022
Problem Solution Fit	Solution fit document	1 October 2022
Solution Architecture	Solution Architecture	1 0ctober 2022
Customer Journey	To Understand User Interactions and experiences with application	9 0ctober 2022
Functional Requirement	Prepare functional Requirement	15 October 2022
Data flow Diagrams	Data flow diagram	15 October 2022
Technology Architecture	Technology Architecture diagram	16 October 2022
Project Development-Delivery of sprint 1,2,3 &4	Develop and submit the developed code by testing it	24 October 2022 – 19 November 2022

6.2 Sprint Delivery Schedule

The main event during agile methodology is the sprint, the stage where ideas turn into innovation and valuable products come to life. On one hand, agile sprints can be highly effective and collaborative. At the same time, they can be chaotic and inefficient if they lack proper planning and guidance. And for this reason, making a sprint schedule is one of the most important things you can do to ensure that your efforts are successful. If you're looking to schedule your next sprint, you've come to the right place. Keep reading to learn everything you need to know about sprint scheduling, including some tips to drive the best results. Since sprints take place over a fixed period of time, it's critical to avoid wasting time during planning and development. And this is precisely where sprint scheduling

enters the equation. In case you’re unfamiliar, a sprint schedule is a document that outlines sprint planning from end to end. It’s one of the first steps in the agile sprint planning process—and something that requires adequate research, planning, and communication

Sprint	Functional Requirement	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	USN-1	Create and initialize accounts in various public APIs like Open Weather API.	1	Low	Kaviya M
Sprint-1	Local Server/Software Run	USN-2	Write a Python program that outputs results given the inputs like weather and location.	1	Medium	Kowshika NG
Sprint-2	Push the server/software to cloud	USN-3	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	Medium	Kaviya M Kowshika NG Nandhini K Saranya S
Sprint-3	Hardware initialization	USN-4	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	High	Kaviya M Kowshika NG Nandhini K Saranya S
Sprint-4	UI/UX Optimization	USN-5	Optimize all the shortcomings and provide	2	Medium	Kaviya M Kowshika NG Nandhini K Saranya S

Sprint	Functional Requirement	User Story Number	User Story / Task	Story Points	Priority	Team Members
	& Debugging		better user experience.			Kaviya M Kowshika NG Nandhini K Saranya S

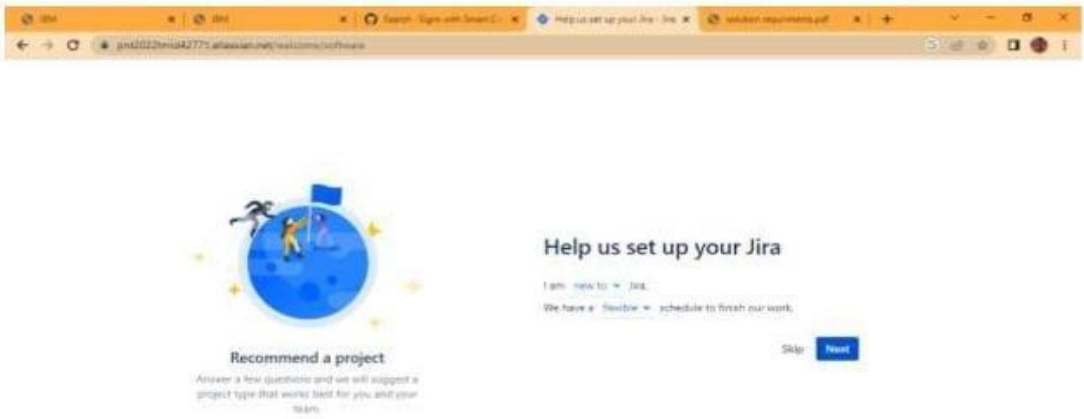
Project Tracker, Velocity & Burndown Chart : (4 Marks)

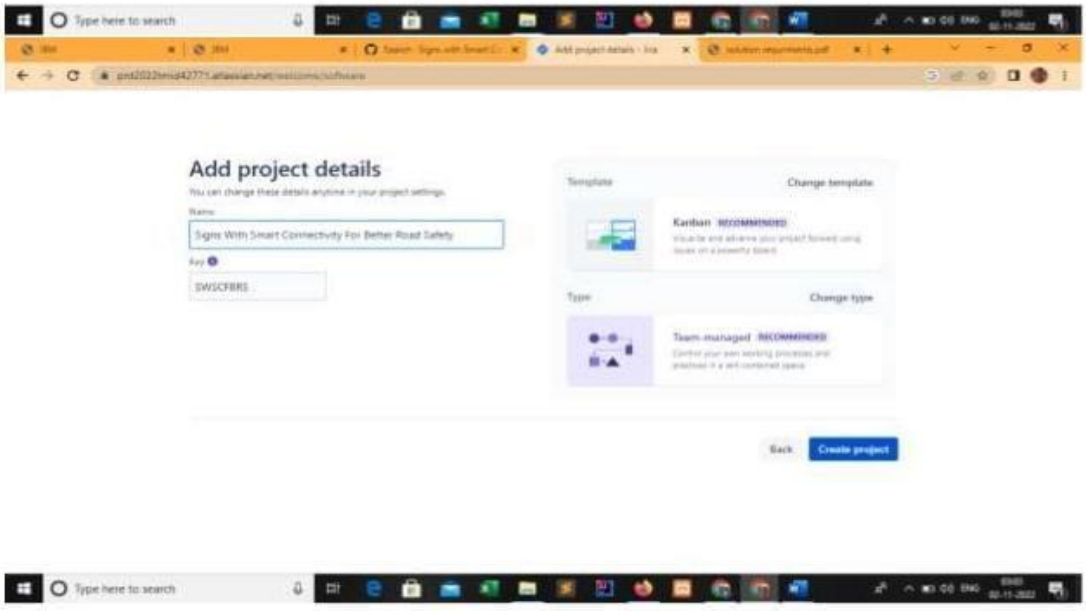
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	31 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022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

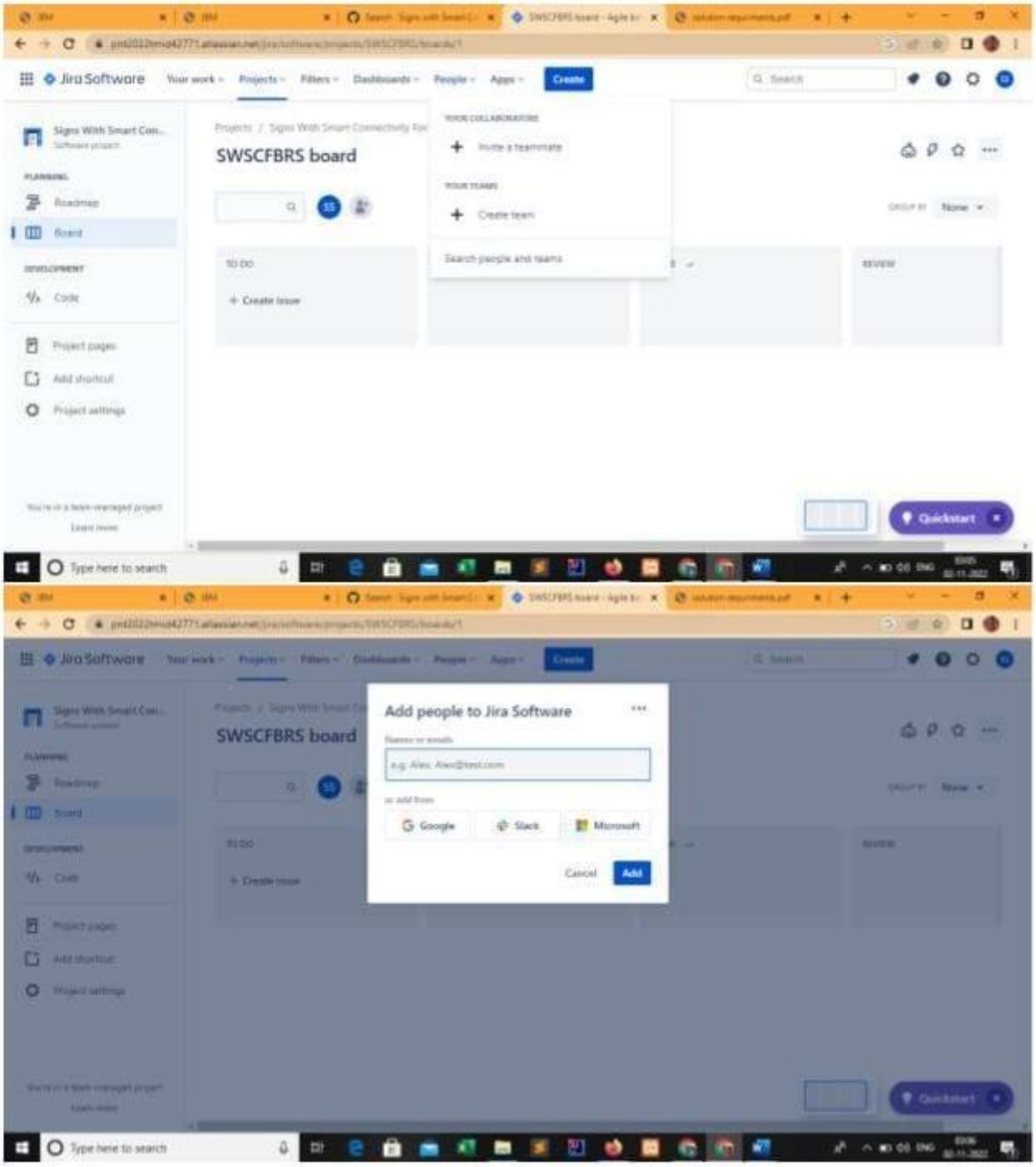
6.3 Reports from JIRA

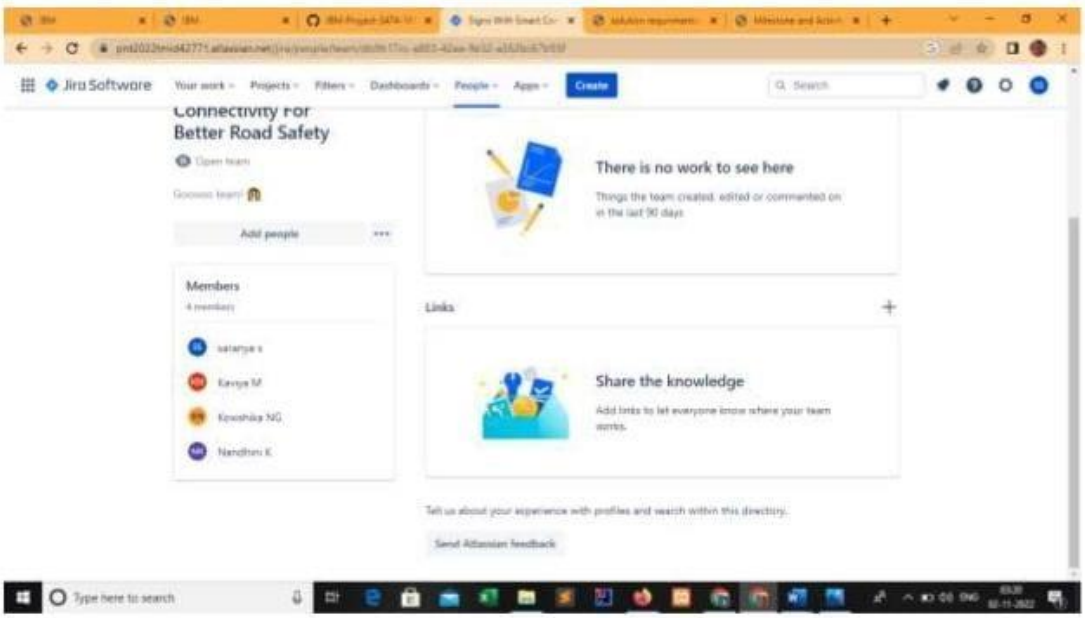
One part of ensuring the success and smooth operations of your projects in JIRA is reporting. It involves gaining the knowledge about the health, progress and overall status of your JIRA projects through Gadgets, report pages or even third party applications. The goal of this guide is to provide an overview of the tools available to JIRA users today and how they can be used to fulfill the different types of reporting needs that users face today. JIRA offers reporting in a number of different formats. Project reports that are available from the home screen of the selected project, Gadgets that can be added and arranged in Dashboards and for each filter, the issue navigator offers various output formats that can be used in third party reporting software. Additionally, we will mention some advanced methods that customers have been using. In JIRA, a project will automatically offer standard reports available to the user without any necessary configuration. These standard reports comprise a wide range of reporting applications such as time tracking, workload and also abstract reports like Pie Charts that can be used in various ways.

The basis of almost any custom reporting is the Issue Navigator that enables you to slice and dice the data in JIRA in almost any way imaginable. The queries in the Issue Navigator can be created by using either a simple search or a JQL statement in the advanced search. Most important for reporting is that the searches can be saved as filters which can be shared to an individual user, group, the entire organization and with a reporting Gadget. This allows a plug-and-play configuration of reporting gadgets with Filters created by the user itself or those shared with her/him. Issues resulting from filters are displayed in the Browser but can also be exported using various formats like Excel, XML, etc.


Recommend a project
Help us set up your Jira
Skip
Next


Add project details
Signs With Smart Connectivity For Better Road Safety
SWSCFBRS
Change template
Kanban
Change type
Team-managed
Back
Create project


Jira Software
SWSCFBRS board
Add people to Jira Software
Google
Slack
Microsoft
Cancel
Add
Type here to search


Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Better Road Safety
Add people
Members
There is no work to see here
Links
Share the knowledge
Send Atlassian feedback
Type here to search

CHAPTER 7

CODING & SOLUTIONING

7.1 FEATURE 1

7.1.1 PYTHON SCRIPT:

Generally, prototypes or real-life Internet of Things (IoT) systems have to be designed and developed swiftly and competently. Whenever this occurs, two activities instantly come to life: One is to program the IoT devices, and another is to organize a backend to interact with these devices. In both activities, we can utilize the Python programming language for their development. Or we can utilize a functional and practical edition of python idle 3.7 version in order to work on devices with small computing resources, and accordingly, at a very low price.

For many developers, Python is considered as the language of preference in the market. It is simple to learn, has clean syntax, and has a large online community supporting it. Python becomes a great choice when it comes to IoT. We can either use it for the backend side of development or the software development of devices. Moreover, Python is available to work on Linux devices, and we can make use of MicroPython for microcontrollers.Python is the coding language that we can use to reduce the volume of data that we need to deal with, accessible in the cloud. Python recognizes the needs regardless of whether we create the IoT project from scratch or interact with actuators, sensors, and accessories.Some of the many benefits of working with Python for IoT devices are a large number of libraries for all types of platforms and the speed it offers at which we can develop the code.

Some of the best solutions for IoT in the Python programming language are as follows:

1. Python on Raspberry Pi

2. ESP32

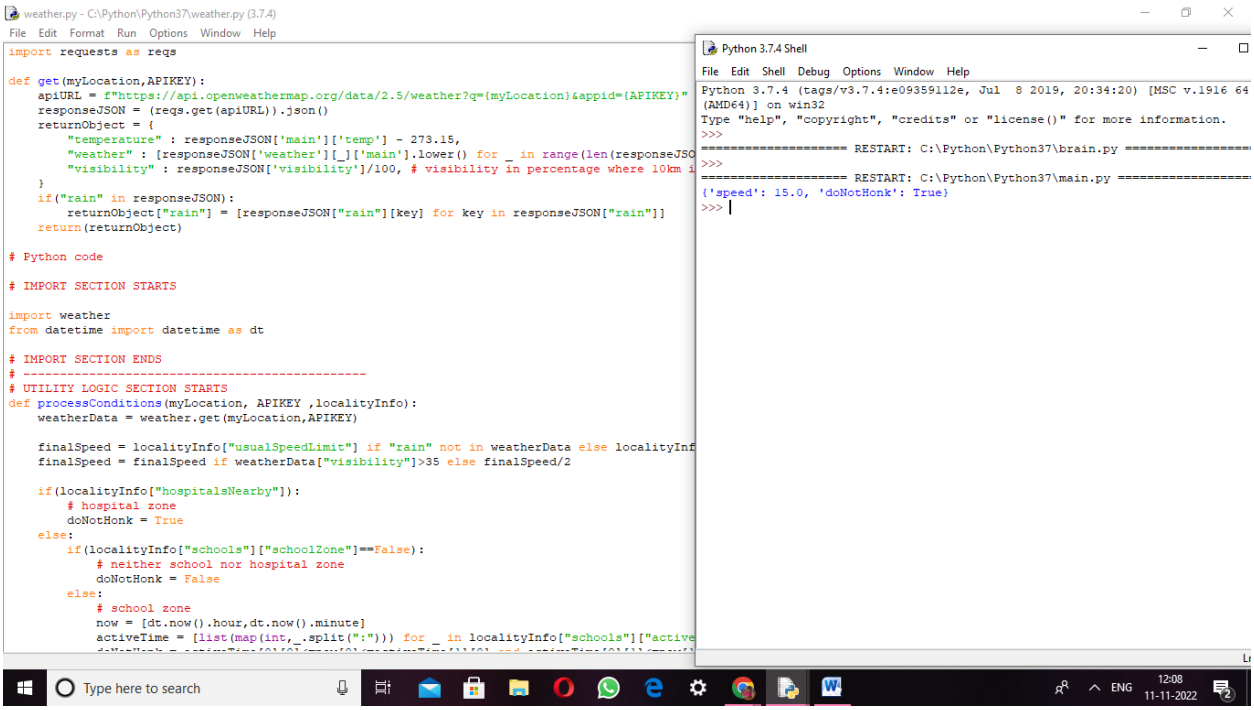
weather.py:

```
import requests as reqs


def get(myLocation,APIKEY):
    apiURL = f"https://api.openweathermap.org/data/2.5/weather?q={myLocation}&appid={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)
```

main.py

```
import brain
# IMPORT SECTION ENDS
#
# USER INPUT SECTION STARTS
```

```
myLocation = "Chennai,IN"
APIKEY = "92eedd4b0b4cd6c543c365f562a59ab3"
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
}
# USER INPUT SECTION ENDS
#
# MICRO-CONTROLLER CODE STARTS
while True : print(brain.processConditions(myLocation,APIKEY,localityInfo))
'''
MICRO CONTROLLER CODE WILL BE ADDED IN SPRINT 3 AS PER OUR PLANNED
SPRINT SCHEDULE
'''
```

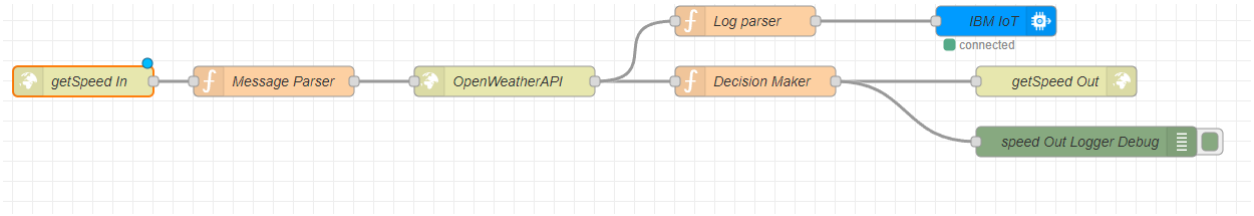


7.2 FEATURE 2

7.2.1 NODE RED:

Node-RED provides **a browser-based flow editor that makes it easy to wire together flows using the wide range of nodes in the palette**. Flows can be then deployed to the runtime in a single-click. PythonScript functions can be created within the editor using a rich text editor.

The preliminary reason for **NodeJS being most preferable for IoT applications is because of its fast and real-time execution**. It comes with Node Packaged Modules (NPM) that meet all the IoT requirements. Additionally, it runs on Google's V8 engine that compiles the data into a native machine code with faster execution.



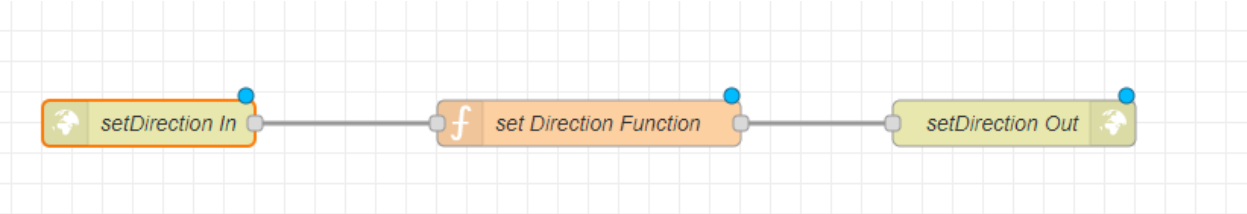
This part of Node RED flow accepts an http GET end point at "/getSpeed" from which the location, uid, hospital/school zone info are passed.

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.

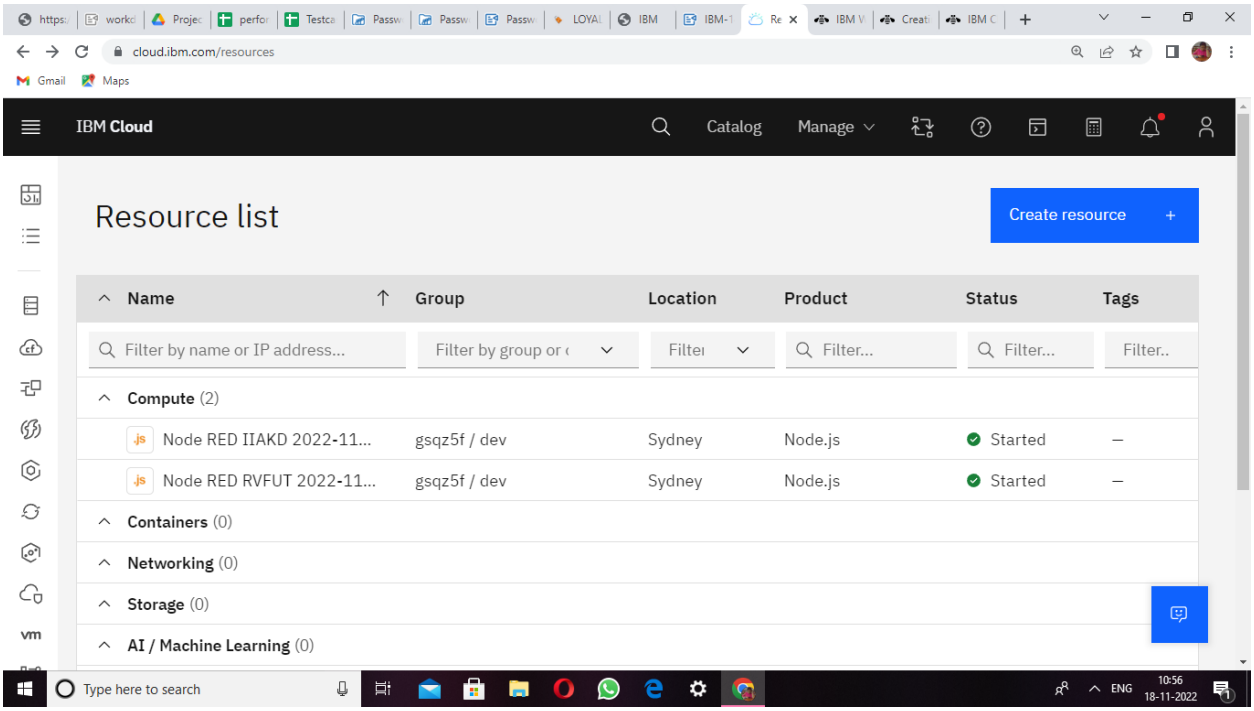
FEATURE 7.2.2- SET DIRECTION REMOTELY FOR A GIVEN SIGN BOARD



This part of Node RED flow accepts an http GET end point at "/setDirection" from which the uid and direction information are passed by the respective authorities. Set Direction Function block adds the direction information to the database and returns the same as 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-14939-1659592462/tree/main/Project%20Development%20Phase

7.3 DATABASE SCHEMA:



CHAPTER 8
TESTING

8.1 Test 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.

8.2 User 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

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

TEST CASE ANALYSIS

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2

1/2

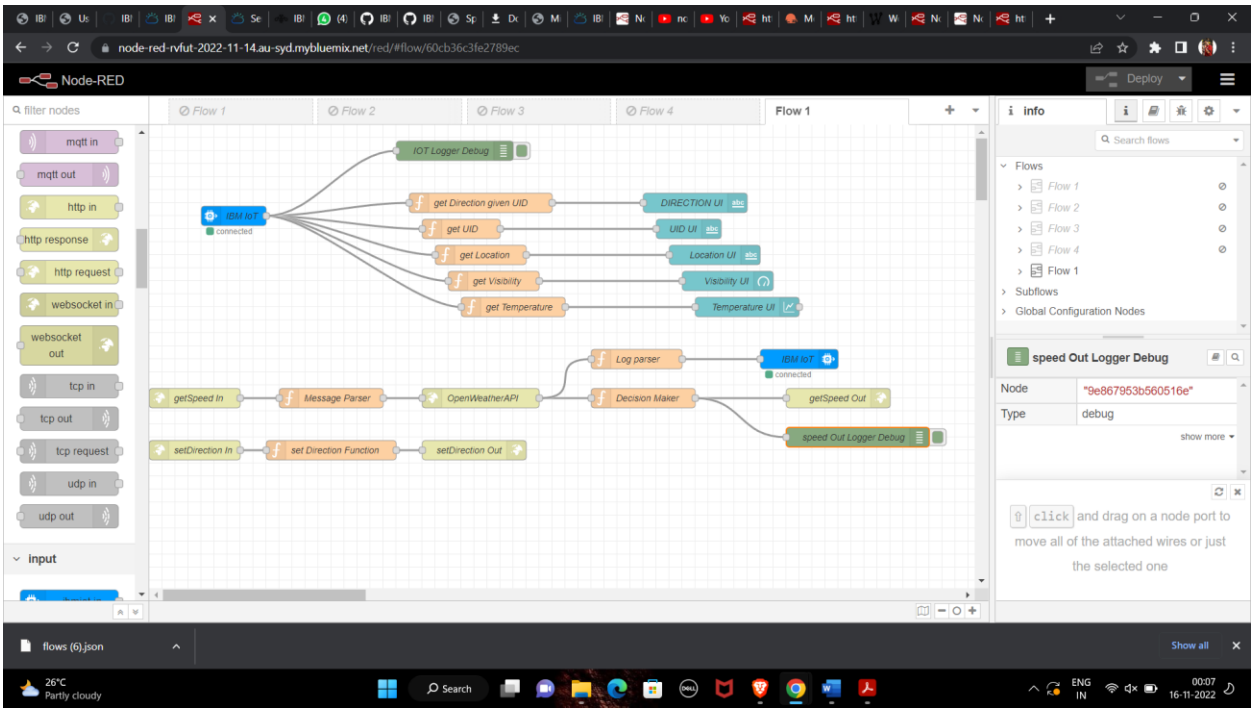
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

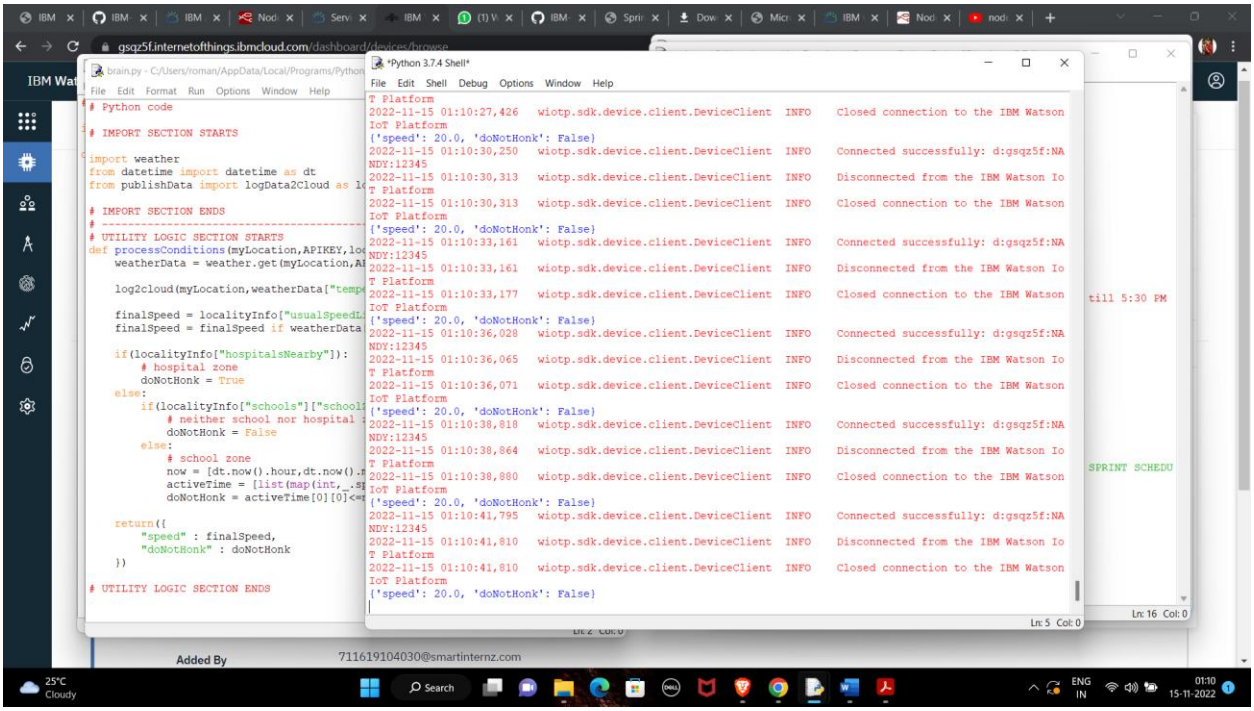
CHAPTER 9

RESULTS

9.1 Performance metrics

Based on the IBM pack we chose, the performance of the website varies. Built upon NodeJS, a light and high performance engine, Node RED 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

ADVANTAGES:

- IoT is already working to ensure road safety in areas such as vehicle maintenance, improved circulation, navigation, and monitoring 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.
- Thanks to this it provides data and information of great utility for the improvement of road safety . The connected cars allow the constant monitoring of basic aspects of the vehicle to ensure its maintenance 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 parking in prohibited areas or other behaviors that do not comply with the law, thus avoiding penalties for drivers.
- One or more of the fundamental data to guarantee road safety of the connected cars is the geolocation.
- The connected cars can communicate with each other, so that, depending on the speed and position of each vehicle, collisions are avoided, like maneuvers involving emergency braking.
- The geolocation also provides a constant update of traffic conditions, which makes it possible to send notifications about incidents on the roads, as well as the proposing the most efficient route.
- In addition to the state of the traffic, thanks to IoT drivers can receive updated information on the state of the roads (potholes, ice, grade changes, black spots, etc.).

DISADVANTAGES:

- 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.

- They rely heavily on the internet and are unable to function effectively without it. With the complexity of systems, there are many ways for them to fail.
- We lose control of our lives—our lives will be fully controlled and reliant on technology.
- Overuse of the Internet and technology makes people unintelligent because they rely on smart devices instead of doing physical work, causing them to become lazy.
- Unskilled workers are at a high risk of losing their jobs, which could lead to unemployment.
- Smart surveillance cameras, robots, smart ironing systems, smart washing machines, and other facilities are replacing security guards ironmen, and dry-cleaning services etc.

CHAPTER 11

CONCLUSION:

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.

CHAPTER 12

FUTURE SCOPE :

We can be enhanced this system by implementing camera using Raspberri pi, GSM module in case of network unavailability and low RAM module/zigbee module for long range communication.

CHAPTER 13

APPENDIX:

SOURCE CODE:

weather.py:

```
import requests as reqs


def get(myLocation,APIKEY):
    apiURL = f"https://api.openweathermap.org/data/2.5/weather?q={myLocation}&appid={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)
```

brain.py:

```
# Python code


# IMPORT SECTION STARTS


import weather

from datetime import datetime as dt


# IMPORT SECTION ENDS

# -----------------------------------------------

# UTILITY LOGIC SECTION STARTS

def processConditions(myLocation,APIKEY,localityInfo):

    weatherData = weather.get(myLocation,APIKEY)


    finalSpeed = localityInfo["usualSpeedLimit"] if "rain" not in
weatherData else localityInfo["usualSpeedLimit"]/2

    finalSpeed = finalSpeed if weatherData["visibility"]>35 else
finalSpeed/2
```

```
    if(localityInfo["hospitalsNearby"]):
        # hospital zone
        doNotHonk = True
    else:
        if(localityInfo["schools"]["schoolZone"]==False):
            # neither school nor hospital zone
            doNotHonk = False
        else:
            # school zone
            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
    })
```

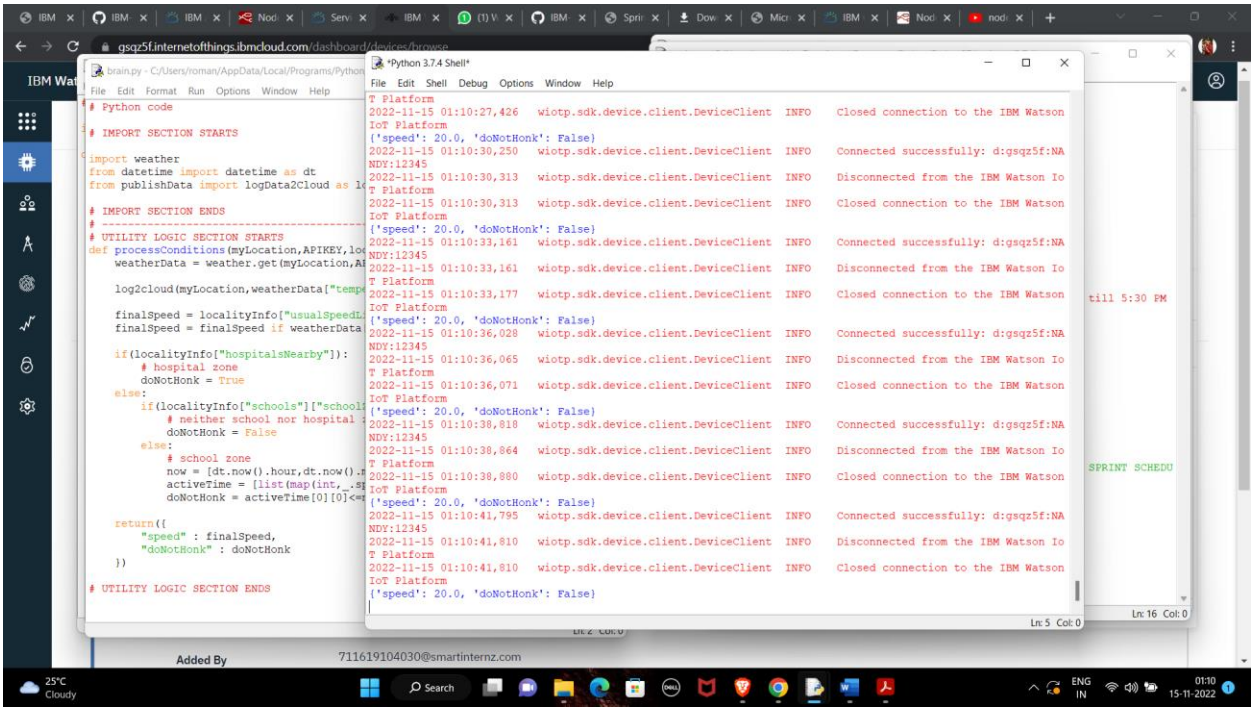
UTILITY LOGIC SECTION ENDS

main.py:

```
import brain
# IMPORT SECTION ENDS
#
# USER INPUT SECTION STARTS
myLocation = "Chennai,IN"
APIKEY = "92eedd4b0b4cd6c543c365f562a59ab3"
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
}
# USER INPUT SECTION ENDS
#
```

MICRO-CONTROLLER CODE STARTS

while True :
print(brain.processConditions(myLocation,APIKEY,localityInfo))



wokwi.code:

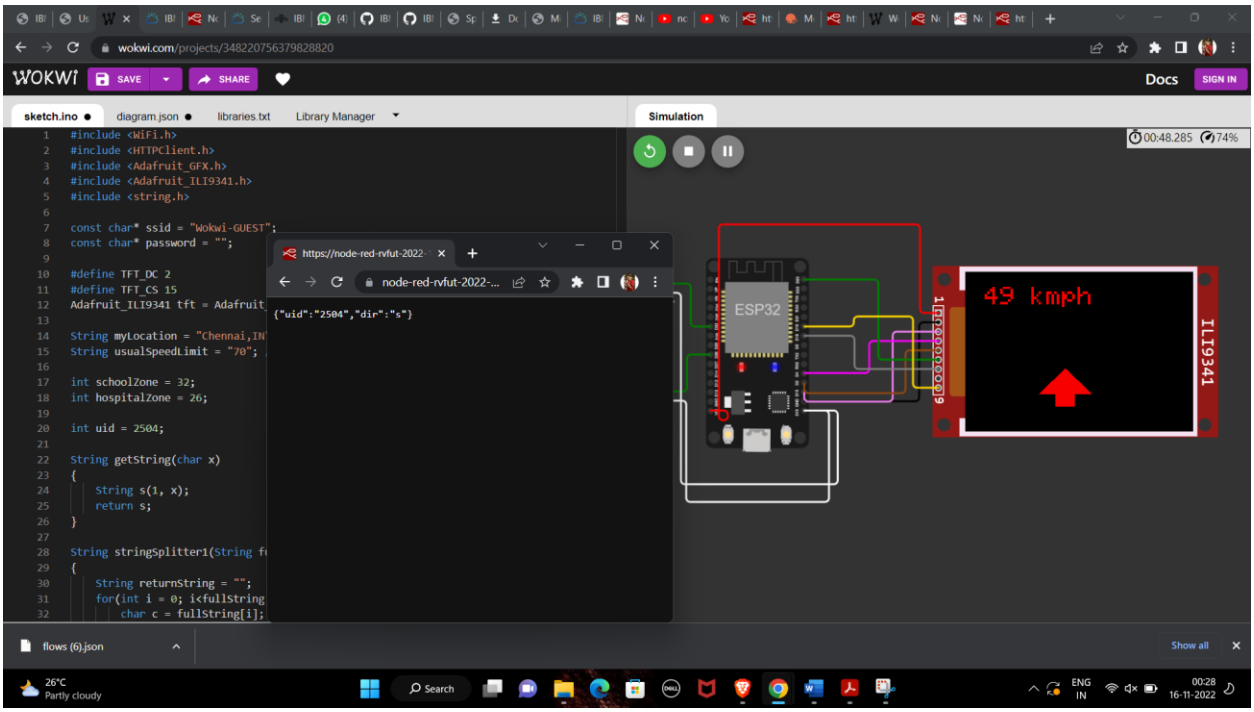
```
#include <WiFi.h>
#include <HTTPClient.h>
#include <Adafruit_GFX.h>
#include <Adafruit_ILI9341.h>
#include <string.h>

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);
```

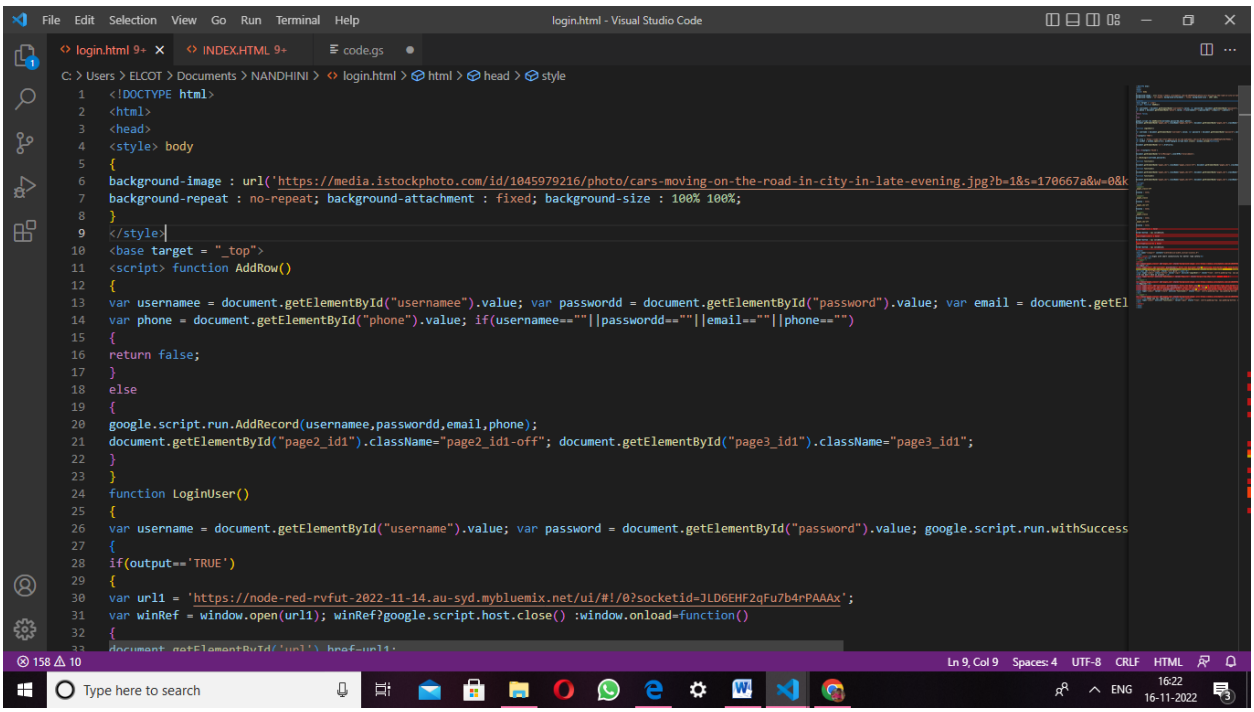
```
      if(delimiter==c)
         flag = true;
   }
   return(returnString);
}

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?";
```

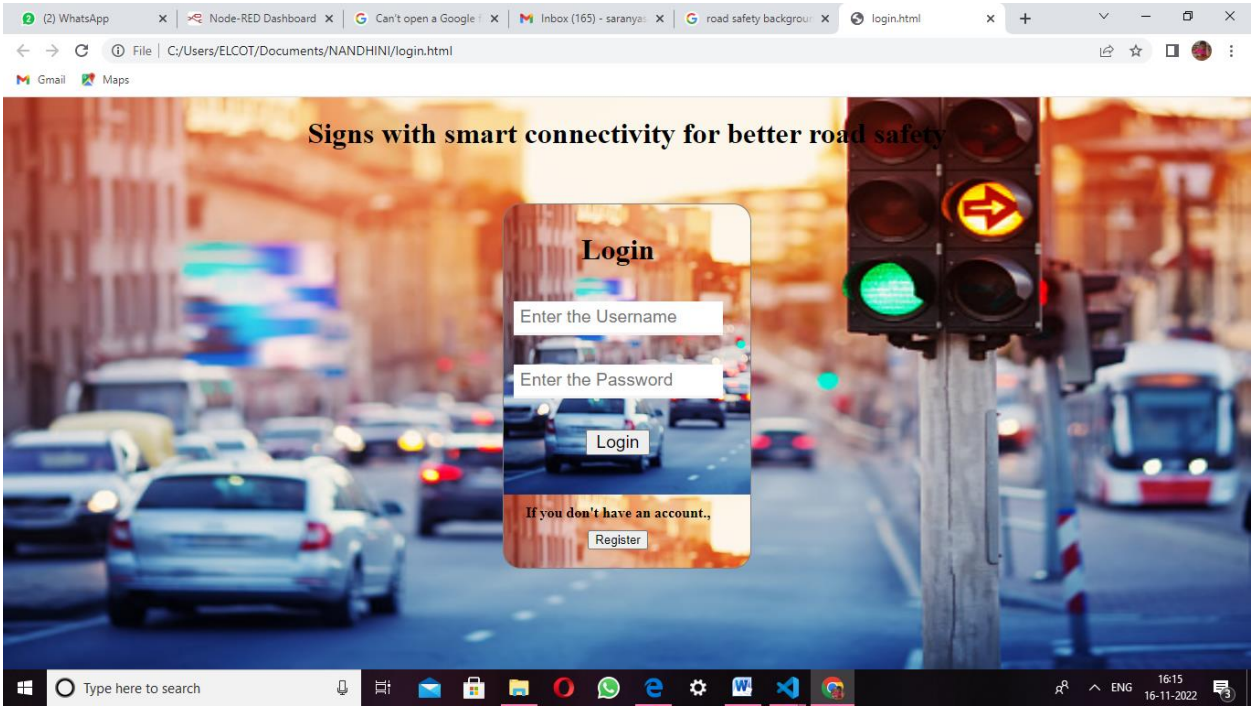
```
  url += "location="+myLocation+"&";
  url += "schoolZone="+(String)digitalRead(schoolZone)+(String)"&";
  url += "hospitalZone="+(String)digitalRead(hospitalZone)+(String)"&";
  url += "usualSpeedLimit="+(String)usualSpeedLimit+(String)"&";
  url += "uid="+(String)uid;
  http.begin(url.c_str());
  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);
}
```


wokwi.com/projects/348220756379828820
WOKWI
SAVE
SHARE
Docs
SIGN IN
sketch.ino
diagram.json
libraries.txt
Library Manager
Simulation
00:48.285
74%
#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
String myLocation = "Chennai,IN
String usualSpeedLimit = "70";
int schoolZone = 32;
int hospitalZone = 26;
int uid = 2504;
String getString(char x)
{
String s(1, x);
return s;
}
String stringSplitter1(String f
{
String returnString = "";
for(int i = 0; i<fullString
char c = fullString[i];
https://node-red-rvfut-2022-
node-red-rvfut-2022-...
{"uid":"2504","dir":"s"}
ESP32
49 kmph
ILI9341
flows (6).json
Show all
26°C
Partly cloudy
Search
ENG
IN
00:28
16-11-2022

login.code:


File Edit Selection View Go Run Terminal Help
login.html - Visual Studio Code
login.html 9+
INDEX.HTML 9+
code.gs
C: > Users > ELCOT > Documents > NANDHINI > login.html > html > head > style
<!DOCTYPE html>
<html>
<head>
<style> body
{
background-image : url('https://media.istockphoto.com/id/1045979216/photo/cars-moving-on-the-road-in-city-in-late-evening.jpg?b=1&s=170667a&w=0&k
background-repeat : no-repeat; background-attachment : fixed; background-size : 100% 100%;
}
</style>
<base target = "_top">
<script> function AddRow()
{
var usernamee = document.getElementById("usernamee").value; var passwordd = document.getElementById("password").value; var email = document.getEl
var phone = document.getElementById("phone").value; if(usernamee==""||passwordd==""||email==""||phone=="")
{
return false;
}
else
{
google.script.run.AddRecord(usernamee,passwordd,email,phone);
document.getElementById("page2_id1").className="page2_id1-off"; document.getElementById("page3_id1").className="page3_id1";
}
}
function LoginUser()
{
var username = document.getElementById("username").value; var password = document.getElementById("password").value; google.script.run.withSuccess
{
if(output=='TRUE')
{
var url1 = 'https://node-red-rvfut-2022-11-14.au-syd.mybluemix.net/ui/#!/0?socketid=JLD6EHF2qFu7b4rPAAAx';
var winRef = window.open(url1); winRef?google.script.host.close() :window.onload=function()
{
158 10
Ln 9, Col 9
Spaces: 4
UTF-8
CRLF
HTML
Type here to search
ENG
16:22
16-11-2022



WOKWI LINK:

https://wokwi.com/projects/348420917875966547

GIT HUB LINK:

https://github.com/IBM-EPBL/IBM-Project-14939-1659592462

DEMO VIDEO LINK:

https://drive.google.com/file/d/17ZgaLSeDMIjJkxRxf-Ba-Lnx_W4FnXZD/view?usp=drivesdk