PROJECT REPORT

SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

In this modern world with increased road facilities And advancements in transportation infrastructures, traffic is creating a challenge to day to day passengers . To Lead people, workers , pedestrians and drivers freely and safe travel along the roads under proper traffic regulations. These guide in crossing roads to all the passengers and pedestrians to travel through the sign board directions.

In order to take a well defined solution for the problem, the drivers should have the detailed knowledge about the type of issues and should have the lot experience to make actual decisions.

To over come the above problem, an application on IoT based signs with smart connectivity for better road safety using raspberry pi & openweatherapi to predict weather in earlier stage leading to help the people to slow down the speed, indicating signs using infra red sensors detecting the traffic density, alerting drivers of respected vehicles to avoid accidents, which helps to take diversions in other possible ways.

1.2 PURPOSE

This system recommends us the best suitable techniques to avoid accidents and mechanisms to be used. And also the system used to predict and provides the solution for the Violations of traffic rules, over speed driving, fatigue, drunk & drive, rash driving causes the people to lead death. It also effects the time, efficient work & increase the collision in environment that problems are over come by using smart connectivity for better road safety.

2. LITERATURE SURVEY

2.1 Existing problem

In times of rainfall the roads get slippery leading To Accidents and death. There are few cases where Accidents occurring due to heavy traffic and violations of traffic rules.

2.2 References

Algorithms like, Min Max Fairness Algorithm, Additive Increase Multiplicative Decrease (Aimd) Algorithm, Principal Component Analysis. The first two Algorithms are based on TCP congestion and implementation of control rates.

2.3 Problem Statement Definition

i) Kanna is an employee of a MNC who needs digitalized smart sign boards because in some cases when there are some road diversions due to heavy traffic or due to accidents.

ii) How to overcome accidents in traffic.

The purposed solution for the problem is, An automated system is introduced to identify different issues on the traffic by checking the symptoms shown on the roads. Internet Of Things's techniques are used to identify the issues and suggest the precautions that can be taken for the prevention of accidents.
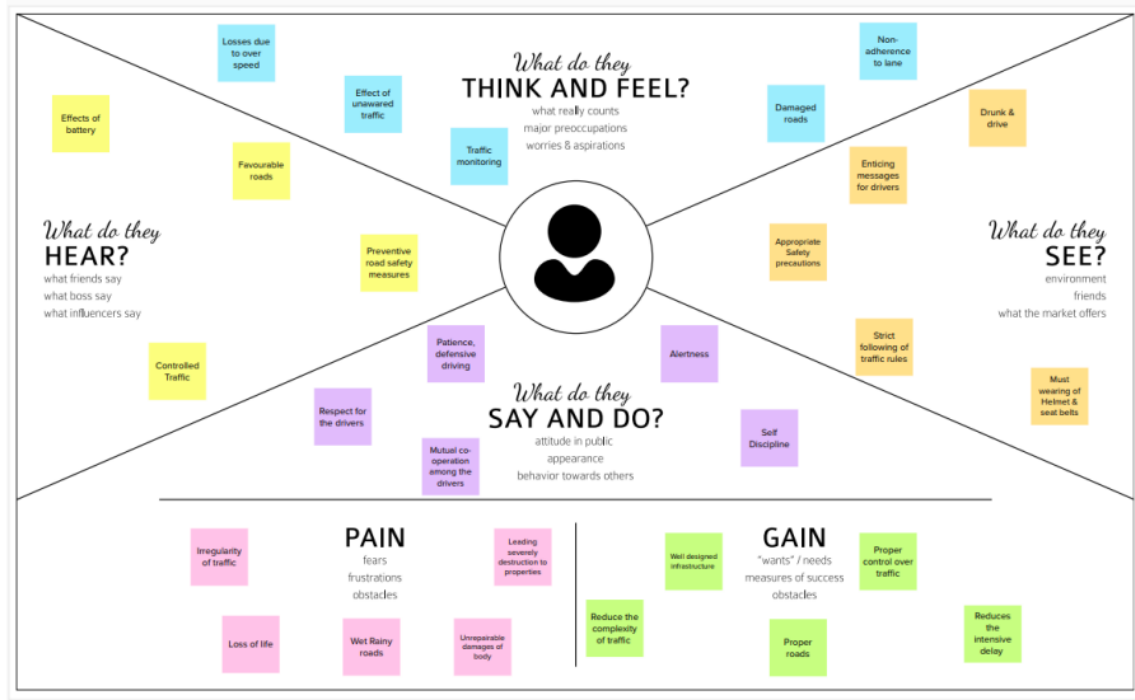
3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

3.2 Ideation & Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Step-2: Brainstorm, Idea Listing and Grouping

Step-3: Idea Prioritization

④

Decide your focus

Give each person two icons to vote which idea should your team focus on.

🕒 5 minutes

Person 1

👍

Person 2

👍 👍

Person 3

👍 👍 👍

Person 4

👍 👍 👍 👍

➡

After you collaborate

A brainstorm like this typically results in a handful of promising ideas that you can carry forward and act upon.

Quick add-ons

A **Cluster related ideas**
Look for patterns or similarities in the standout ideas. Could any be combined together to form a stronger concept? Cluster similar ideas and label each cluster with a theme.

B **Vote on the most promising ideas**
Narrow your focus to only the strongest few ideas by holding a **Voting Session**. Give each person 2 votes

---

Keep moving forward

2x2 Prioritization matrix
Build shared understanding and make collective decisions for moving ideas forward.

Open the template →

Storyboarding
Show existing and/or future consumer experiences through the act of sketching.

Open the template →

Pre-mortem
Harness the collective experience and wisdom of the team, before the project even starts.

Open the template →

💬 Share template feedback

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The problem statement aims at developing a accident prone recognition system using Internet Of Things . The accident prone recognition system is a way to tackle the problem which is caused by vehicles and unawareness of drivers on roads in traffic.
2.	Idea / Solution description	Developing an IoT predictive model to predict the accidents and to alert the drivers with a signal in either LED or sound buzzer in measuring distace to nearby hospitals.
3.	Novelty / Uniqueness	This system achieves to reduce the death rates occured due to accidents from vehicle to vehicle and prevents passengers and pedestrians from accidents.
4.	Social Impact / Customer Satisfaction	The minimum threshold distance of the vechicles and passesngers can be recognized easily without any strenuous efforts. This reduces the chance of occurance of accidents.
5.	Business Model (Revenue Model)	It is used in the detection of the distances from vehicles , giving an alarm signal prevents accidents.

6.	Scalability of the Solution	To attain higher performances in the domain of objects like vehicles or passengers detection due to its excellence in detection, accidents are reduced on large scale.

3.4 Problem Solution fit

1. CUSTOMER SEGMENT(S) [CS]

Who is your customer?

In this modern world with increased road facilities And advancements in transportation infrastructures Leading people & workers freely & safely travel along the roads under proper traffic regulations. These guide in crossing roads to all the passengers And pedestrians to travel through the sign board directions

6. CUSTOMER [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.

Smart connectivity has enabled for road & people safety with with the help of digital sign board, openweatherapi & web Application used to user can know the weather conditions anywhere. IoT based signs with smart connectivity for better road safety is more effective for people

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

Infrared sensor alternative we used to detect the traffic in road.
MERITS : predict traffic in earlier stages will be useful to divert in any other way.
DEMERITS : people neglecting sign board leads to Accidents.

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.

In times of rainfall the roads get slippery leading To Accidents and death. There are few cases where Accidents occurring due to heavy traffic.

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

Unauthorised traffic leading loss of many lives Unaware routes of damaged and wet roads, high dense traffic is unmonitored to the user.

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)

Traffic management was considered in earlier methods but not the traffic density.
Workers are not applicable to traffic rules because

They always thinks about run the family by their Job done by on time.

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.

Violations of traffic rules, over speed driving, fatigue, drunk & drive , rash driving causes the people to lead death. It also effects the time, efficient work & increase the collision in environment that problems are over come by using smart connectivity for better road safety

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.

Traffic in road causing people to wait for long time, lagging to reach the destination , Increased collisions of traffic leading to many issues. To over come these traffic issues , using smart connectivity for better road safety and decrease speed limit while raining , reducing death rate.

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.

IoT based signs with smart connectivity for better road safety using raspberry pi & openweatherapi to predict weather in earlier stage leading to help the people to slow down the speed , indicating signs using infra red sensors detecting the traffic density which helps to take diversions in other possible ways.

8. CHANNELS of BEHAVIOUR [CH]

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

We notify the information about weather / traffic in web application

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

Using digital sign boards indicating information about road safety

4. REQUIREMENT ANALYSIS

4.1 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	User Input	Input as program and sensor
FR-4	Processing of user input	Image acquisition, Voice note ,Image Segmentation
FR-5	Feature extraction of sensor	Data mapping, Machine learning
FR-6	Result of user input	Display the sensor density of traffic .

4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The proposed system gives good results for detecting vechicls and passengers and prevent accidents.
NFR-2	**Security**	Any vechile user is allowed to use this application such that safety is ensured.
NFR-3	**Reliability**	It is frequently updated with the senses of passengers and vechicles. it is user friendly.
NFR-4	**Performance**	The proposed system is advantageous as it uses fewer features to sense and detect.
NFR-5	**Availability**	The system functionality and services are available for use with all operations.
NFR-6	**Scalability**	The website traffic limit must be scalable enough to support 2 lakhs users at a time

5. PROJECT DESIGN

5.1 Data Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.
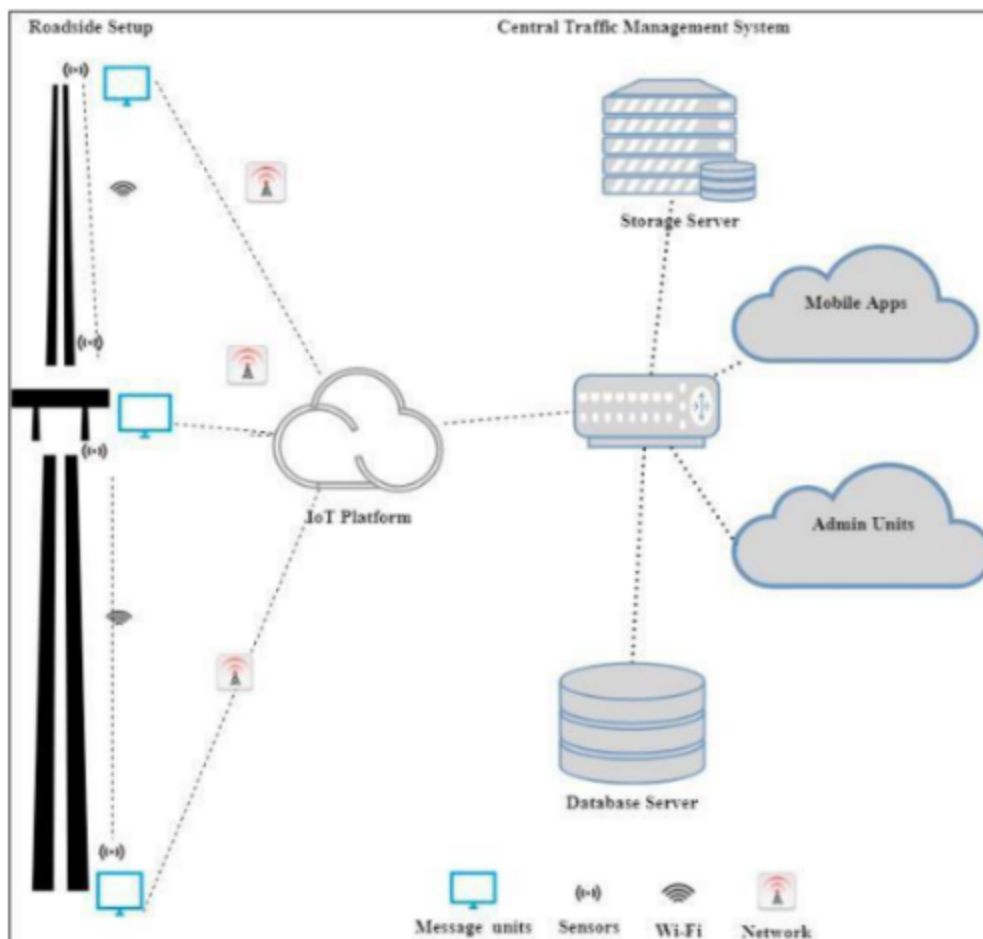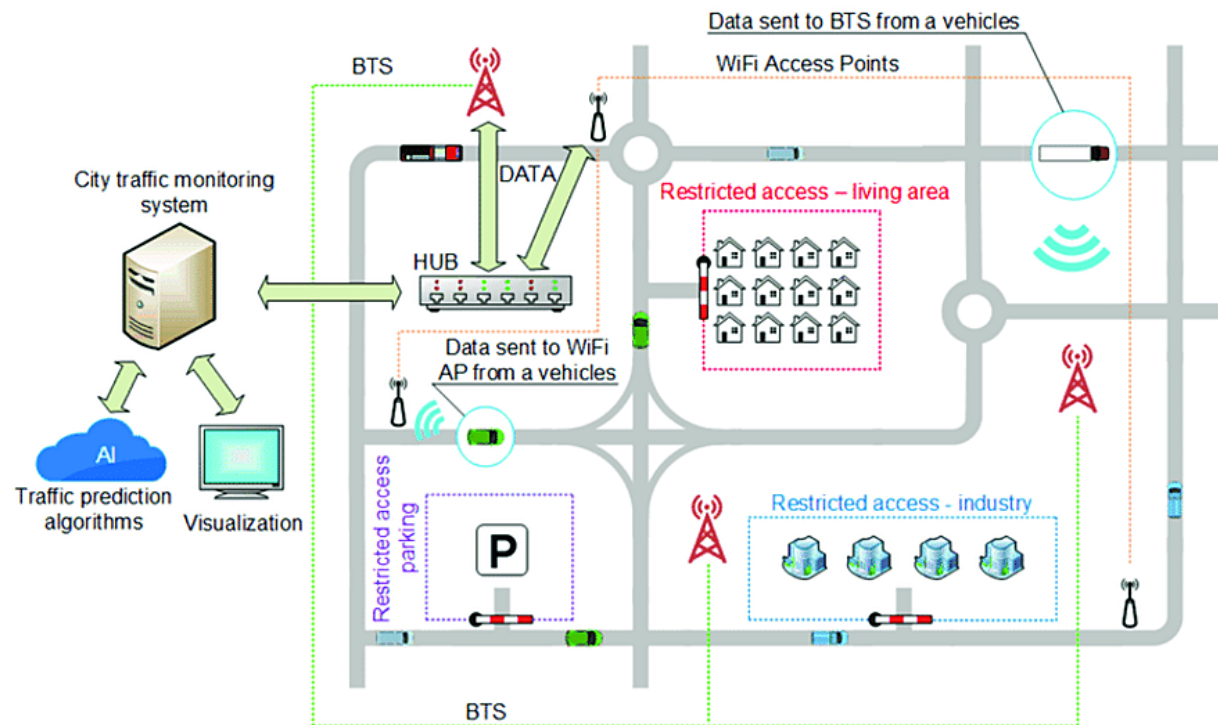
5.2 Solution & Technical Architecture

5.3 User Stories

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g., Mobile Application	HTML, CSS, JavaScript
2.	Application Logic-1	Logic for a process in the application	Java / Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on AI in cloud	IBM DB2
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or local file system

8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
9.	Internet of Things Model	Purpose of IoT Model is for integrating the sensors with a user interface	IBM AI Platform
10.	Machine Learning Model	Purpose of Machine Learning Model	sensor detection Model

User Story / Task	Acceptance criteria	Release
As a user, I can register for the application by entering my email, password, and confirming my password.	Access my account / dashboard	Sprint-1
As a user,I want to check the weather of that location	Get the weather of that location	Sprint-1
As a user,I ant to use IoT devices for automation purpose	Get the workdone without manually	Sprint-2

As a user,I want to give some input to the devices for performing some action to complete the tasks very easily	Get the data workflow	Sprint-1	
As a user,I want to deploy these application for public version	Useful for all domain users	Sprint-1	
As a user,I want to integrate the applications with hardware	To precise for linear workflow	Sprint-3	
As a user,I want to interact with the digital products	To interact with the users	Sprint-2	
As a user,I can check the ability and accuracy of the model in obtaining the required information	Check the capability of the model	Sprint-2	
As a user,I can retrieve the result data from the application for data storage for further uses	Download the result in the form of data	Sprint-3	

Sprint	User Story / Task	Function al	User Story Number

		Requirement (Epic)	
Sprint-1	As a user, I can register for the application by entering my email, password, and confirming my password.	Registration	USN-1
Sprint-1	As a user,I want to check the weather of that location	openweathermap	USN-2
Sprint-2	As a user,I ant to use IoT devices for automation purpose	Automation	USN-3
Sprint-1	As a user,I want to give some input to the devices for performing some action to complete the tasks very easily	Random data	USN-4
Sprint-1	As a user,I want to deploy these application for public version	Cloud services	USN-5
Sprint-3	As a user,I want to integrate the applications with hardware	Integration	USN-6
Sprint-2	As a user,I want to interact with the digital products	Intraction	USN-7
Sprint-2	As a user,I can check the ability and accuracy of the model in obtaining the required information	Checking accuracy	USN-8
Sprint-3	As a user,I can retrieve the result data from the application for data storage for further uses	Obtaining the data	USN-9

Technologies and components

S. No	Component	Description	Technology
1.	User Interface feature	How user interacts with application e.g. Web UI	HTML, CSS, JavaScript (Web application)
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service (Cloud)
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant (Cloud)
5.	Database	Data Type, Configurations etc.	MySQL
6.	Cloud Database	Database Service on Cloud	IBM DB2
7.	File Storage	File storage requirements	Local Filesystem

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requireme nt (Epic)	User Story/Task	Story Points	Priority
Sprint-1	Registrati on	As a user, I can register for the application by entering my email ,password, and confirming my password	2	High
Sprint-1	Confirmation	As a user, I will receive confirmation email once I have registered for the application	1	High
Sprint-2	Login	As a user, I can log into the application by entering email &password	2	High

| Sprint-2	Interface	The user interface needs to be straight forward and simple to use	1	Medium
Sprint-3	Coding	Coding is a set of instructions used to manipulate information so that a certain input results in a particular output.	2	High

6.2 Sprint Delivery Schedule

| Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed(Planned End Date)	Sprint Release Date(Actual)
Sprint-1	20	6Days	24Oct 2022	29Oct 2022	20	29Oct 2022
Sprint-2	20	6Days	31Oct 2022	05Nov2022	20	05Nov2022
Sprint-3	20	6Days	07Nov2022	12Nov2022	20	12Nov2022
Sprint-4	20	6Days	14Nov2022	19Nov2022	20	19Nov2022

6.3 Reports from JIRA
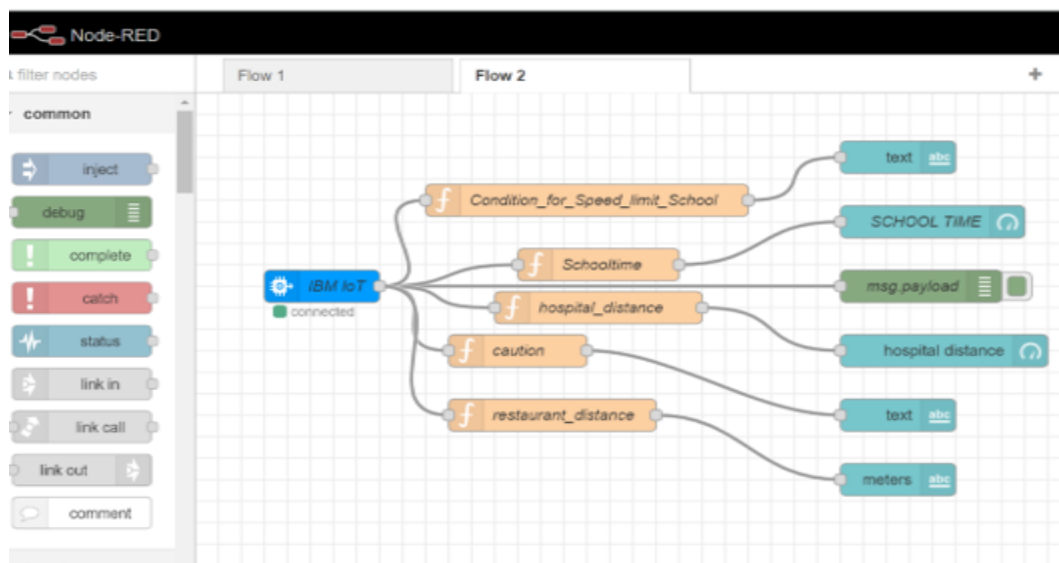
7. CODING & SOLUTIONING

7.1 Feature 1
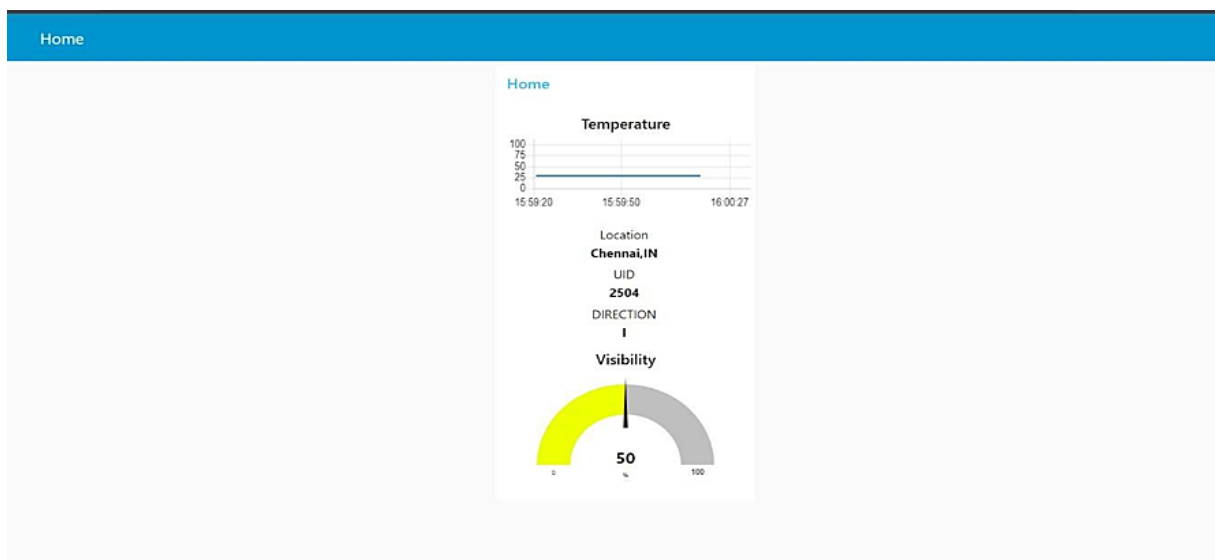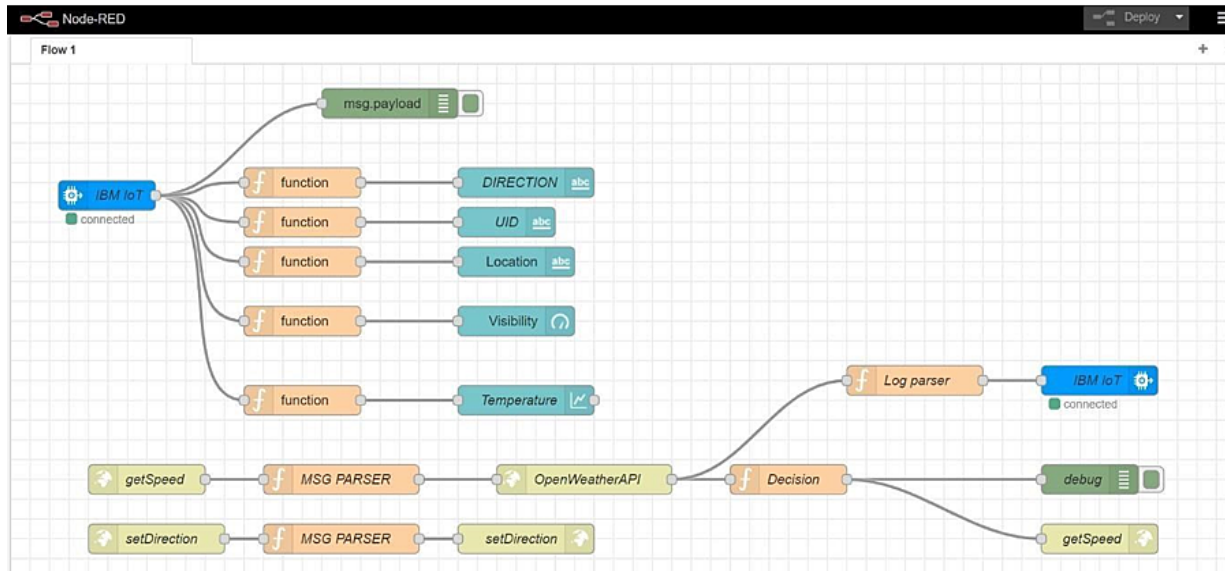
7.2 Feature 2
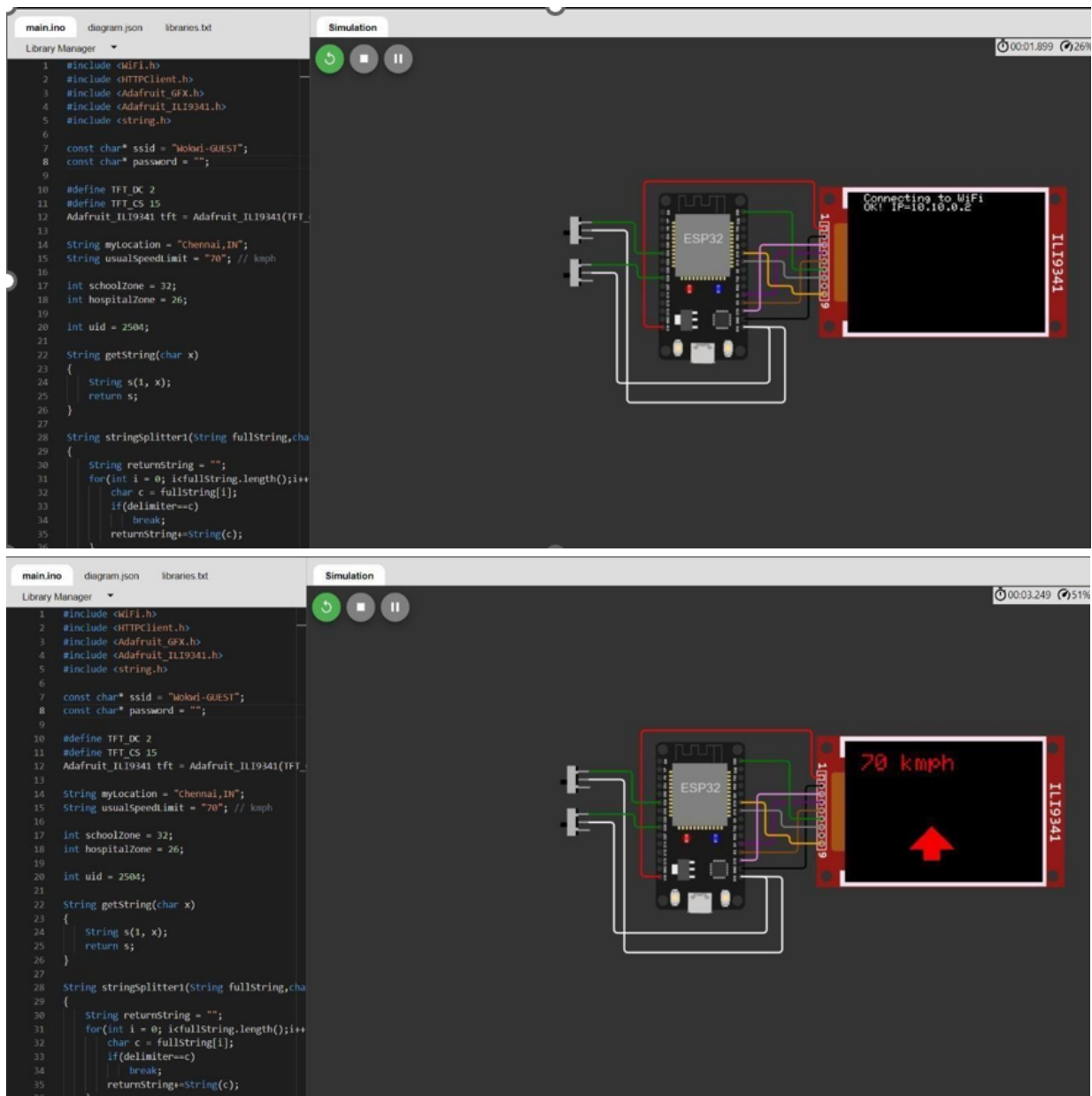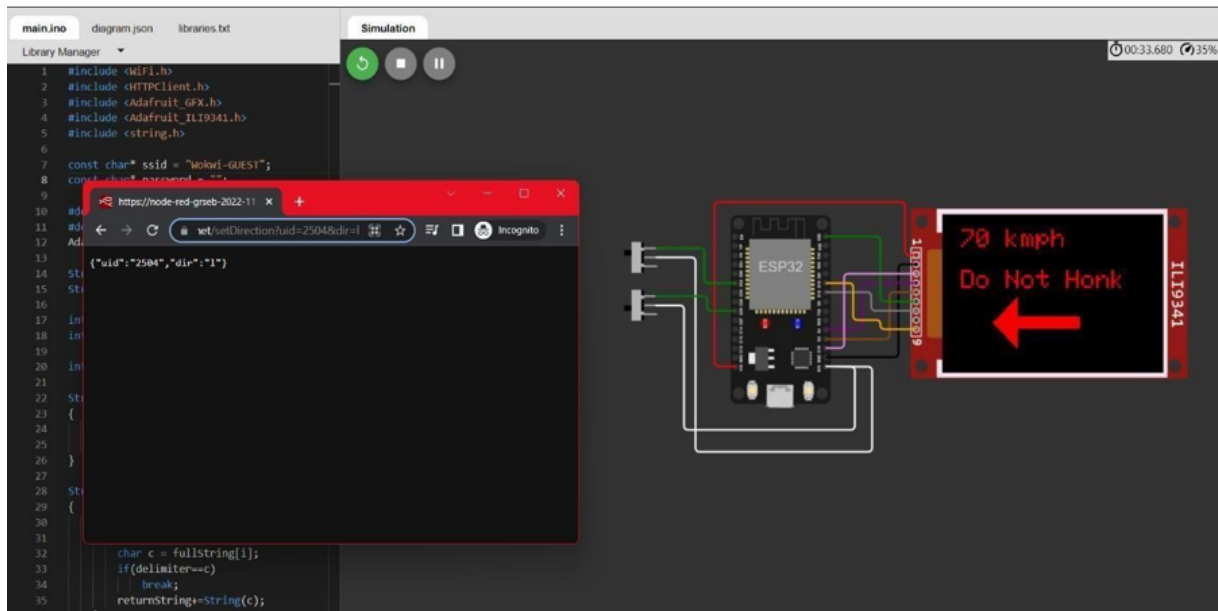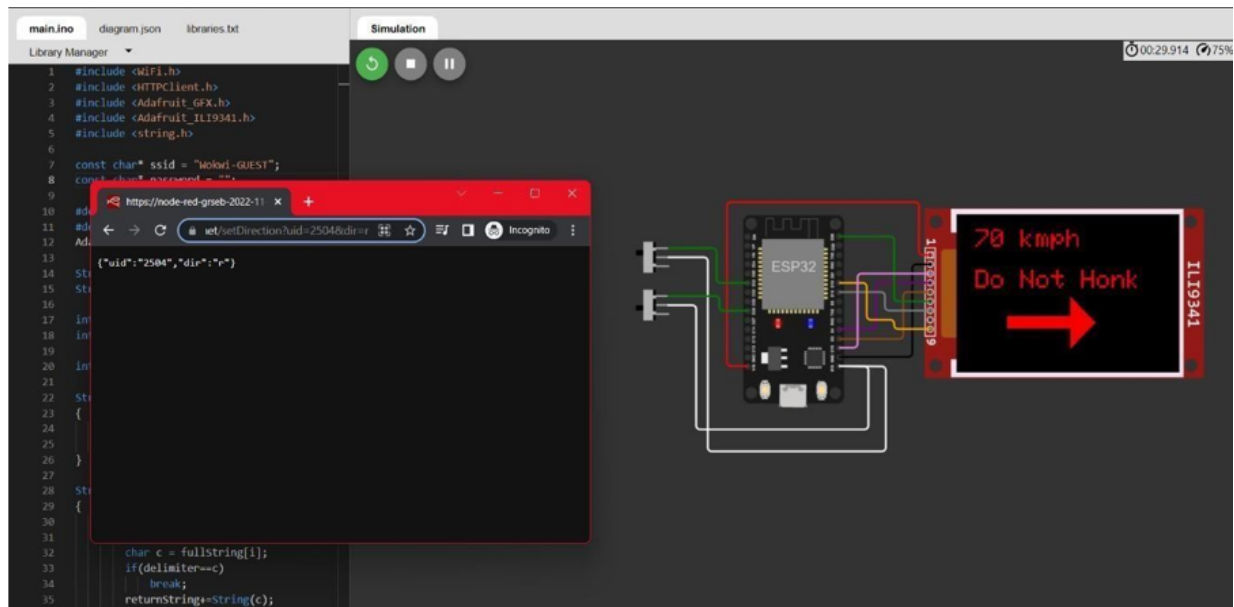
8. TESTING

8.1 Test Cases
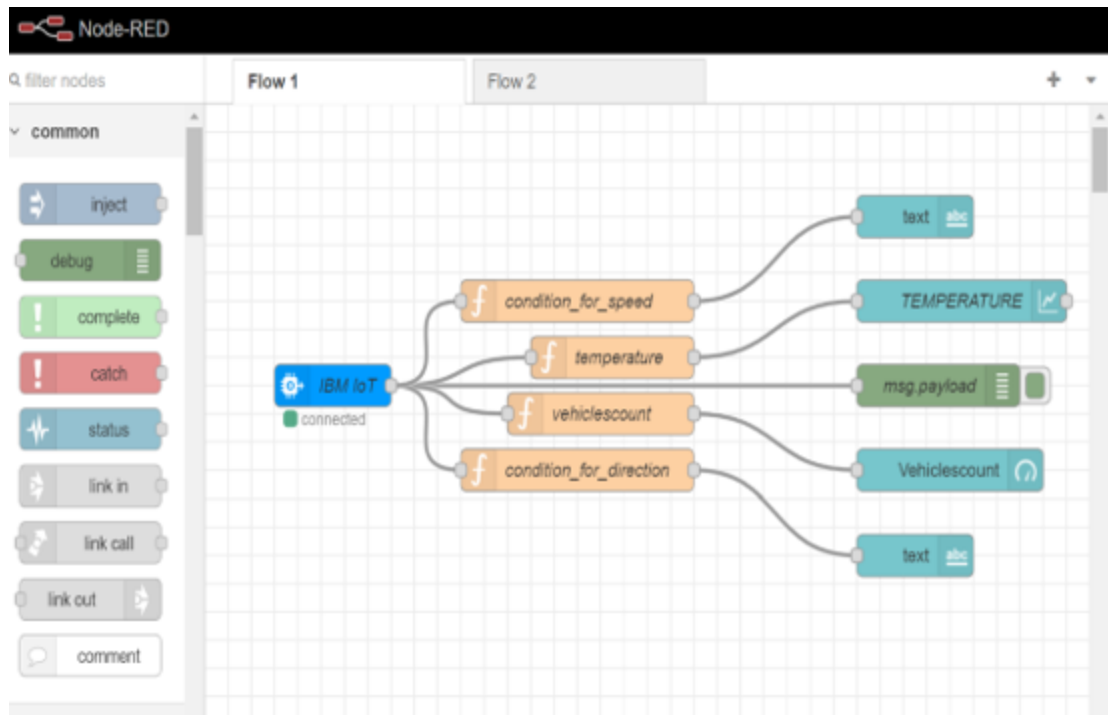
≡ Dynamicboard mode 1

Vehiclescount

Condition_for_direction

Vehiclescount

90

0   numbers   100
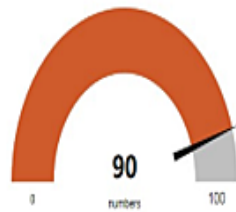
As Your Wish

≡ Dynamicboard mode 2

Temperature

condition for speed

Temperature Of Environment

70
60
50
40
30
20
10
0
-10
-20
15:00:00   19:00:00   23:00:00
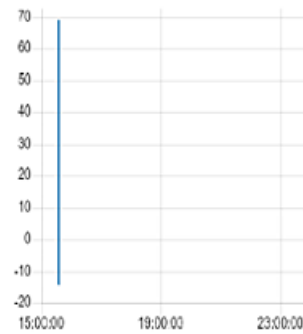
Your Prefered Speed

≡ Dynamicboard mode 3

school time

school time

4

1   units   24

condition for speed limit near school

Your Prefered Speed

≡ Dynamic board mode 4

Hospital distances in meters

hospital distance

87

0   numbers   500
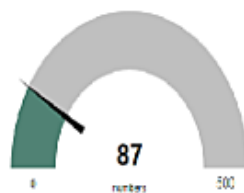
condition for horn

No Horn

restaurant_distance

meters	99

9. RESULTS

9.1 Performance Metrics

1. Functional Requirements
2. Non-Functional RequirementsImplementation result
3. System Implementation results
4. Results of web application ImplementationResource utilization results
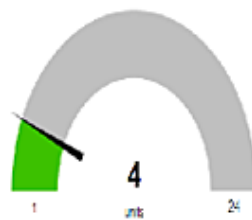5. Foreground activities results
6. Memory usage
7. Energy usage Background activities results.

We have presented a system, to alert the driver about the speed limits in specific areas and reduce the speed of the vehicles in sensitive public zones without any interference of the drivers where controls are taken automatically by the use of a wireless local area network.

10. ADVANTAGES

1. Smart road technology can assist in optimizing traffic flow and managing road condition.
2. Reducing the congestion and emissions.
3. It helps traffic light to operate in real-time condition.
4. Senses and monitors the traffic.
5. User friendly.
6. Energy Efficient.
7. Hands - free convenience.
8. Enhanced security.
9. Save time with Automated Tasks.

DISADVANTAGES

1. Cost.
2. Internet Reliance.
3. Setup and Configuration.
4. More Technical Security Threats.
5. Different Protocols are used.
6. Additional wires and plugs.
7. Additional device on wifi is nedded.

11. CONCLUSION

On increasing and growing technologies on a large, coping up with time and balancing work are utmost challenges that any individual face, in addition traffic is targetting each one of the passenger , pedestrian , drivers and all vechicle holders with delay in traffic and some leading to serious deaths.

Using Internet Of Things ,we can change the average waiting time by monitoring the number of vehicles in a lane. The data will be sent to central system through internet, which will decide the timing for signal according to the dumped program. It also, suggests implementing congestion lights at previous intersections, so that drivers can change lanes at the situation of congestion. This is useful in emergencies and also, helps in reducing pollution and traffic congestion.

There are many end user are available for this project. Rather than using static sign boards it has high adaptability and significant protocols. The random values are used instead of imported from weather API .All other cloud credentials are created and verified with displaying them in Web UI. This project was completely IOT related and API also required. This improves the road safety even either small or large Transport system. The weather update are received from the wear API these values are imported into the python script . this code will execute the condition we used and sends the data to the cloud .The

node rerd deals with filtering the required data from cloud and display them in Web UI. After all these process the Web UI linked with mobile app we created to also display in your mobile . This will helps you to get information even after the boards had any technical issues.

12. FUTURE SCOPE

The Safe System goals and strategies focus on providing a road traffic system free from death and serious injury. The Safe System guides the planning, design, management, operation and use of the road traffic system so as to provide safety in spite of human fallibility.

One among the revised and defined systems of IoT are, The ultrasonic sensors will be placed to the vehicles , producing an alarm buzzing and or an LED light signal alerting drivers to be cautions on roads and with co passengers , pedestrians and other vehicles in identifying accidents areas and any sort of other clashes to take them to hopsitals nearby on roads to prevent deaths making a smart connectivity sign for better road safety.

1. The real-time sign upgradation helps people to survive in ubdrup road condition

2. It will helps people as well as the roads and transport system with traffic clearance

3. The user friendly interface achieved with these signage system

4. Due to its Implementation in various region can be achieved faster.

13. Appendix

13.1 Source code

```
#IBM Watson
IOT Platform
#pip install
wiotp-sdk
import
wiotp.sdk.devi
ce import time
import random
myConfig = {
    "identity": {
        "orgId": "mpt0iq",
        "typeId": "dynamic board",
        "deviceId":"888"
    },
    "auth": {
        "token": "0987654321"

    }
}

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:
    temperature=random.randint(-20,125)
    vehicles count=random.randint(0,100)
    rest=random.randint(0,100)
    hospital_distance=random.randint(0,500)
    school-time=random.randint(1,24)
    a="Your Preferred Speed"
    b="Speed Limit is 30 km\hr"
    c="Take Diversion"
    d="As Your Wish"
    x={'Condition_for_Speed':a}
    y={'Condition_for_Speed':b}
    k={'Condition_for_Speed_limit_School':a}
    l={'Condition_for_Speed_limit_School':b}
    z={'Condition_for_Direction':c}
    w={'Condition_for_Direction':d}
    p="No Horn"
    q={'caution':p}
    Z={'caution':d}
    distance1={'Distance_for_Hospital':hospital_distance}
    myData1={'Temperature':temperature}
    myData2={'Vehiclescount':vehiclescount}
    myData3={'Restaurant_distance': rest}
    myData5={'Hospital_distance':hospital_distance}
    myData4={'Schooltime':schooltime}

client.publishEvent(eventId="status",msgFormat="json",data=myData1,qos=0,onPublish
=None)    print("Published:%s",myData1)
    if temperature>=20:

        client.publishEvent(eventId="status",
msgFormat="json",data=x,qos=0,onPublish=None)
        print(x)
        print("\n")
    else :
        client.publishEvent(eventId="status",
msgFormat="json",data=y,qos=0,onPublish=None)
        print(y)
```

```python
        print("\n")


client.publishEvent(eventId="status",msgFormat="json",data=myData2,qos=0,onPublish
=None)    print("Published:%s",myData2)
    if vehiclescount>=50:

client.publishEvent(eventId="status",msgFormat="json",data=z,qos=0,onPublish=None)
print(z)

print("\
n")
else:

client.publishEvent(eventId="status",msgFormat="json",data=w,qos=0,onPublish=None)
        print(w)
        print("\n")



client.publishEvent(eventId="status",msgFormat="json",data=myData4,qos=0,onPublish
=None)
    print("Published:%s",myData4)

    if  8<=schooltime and schooltime<=10 or 15<=schooltime and schooltime<=18:

client.publishEvent(eventId="status",msgFormat="json",data=l,qos=0,onPublish=None)
        print(l)
        print("\n")

    else :

client.publishEvent(eventId="status",msgFormat="json",data=k,qos=0,onPublish=None)
        print(k)
        print("\n")



client.publishEvent(eventId="status",msgFormat="json",data=myData5,qos=0,onPublish
=None)
```

```
    if 0<=hospital_distance and hospital_distance<=200:

client.publishEvent(eventId="status",msgFormat="json",data=distance1,qos=0,onPublish
=None)        print(distance1)

client.publishEvent(eventId="status",msgFormat="json",data=q,qos=0,onPublish=None)
        print(q)

print("\
n")
else:

client.publishEvent(eventId="status",msgFormat="json",data=distance1,qos=0,onPublish
=None)        print(distance1)

client.publishEvent(eventId="status",msgFormat="json",data=Z,qos=0,onPublish=None)
        print(Z)
        print("\n")


client.publishEvent(eventId="status",msgFormat="json",data=myData3,qos=0,onPublish
=None)        print("Published:%s",myData3)
    client.commandCallback=myCommandCallback
    time.sleep(10)
client.disconnect()
```

13.2 GIT REPO AND DEMO LINK

GIT REPO

https://github.com/IBM-EPBL/IBM-Project-25436-1659963418

DEMO LINK

https://photos.app.goo.gl/cGdiCmwhSR6Uvy24A