SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

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BONAFIDE CERTIFICATE

Certified that this project report **"SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY"** is the bonafide work of "**ADHITHYAN.M.S(211419106010), DHARUN ANTONY(211419106066), BHARATH WAJ(211419106046), DINESH RAM (211419106069)** who carried out the project work under my supervision.

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1. Introduction:

Roads are the foremost source of linking between cities and villages. Due to the ease of traveling by road, vehicles have become the main way people travel. The chances of vehicular accidents (Vas) have increased with the growing number of vehicles on the roads. During a journey, one does not know what will happen on the next road, particularly during bad weather conditions (BWC). In such a situation, driving can be difficult due to bad visibility, which can lead to an accident. It was also noticed that in BWC, multiple vehicle collisions (MVCs) can occur owing to delays in receiving information about an incident. According to one study by the Islamabad police, there were 9582 accidents from 2016 to 2017 all over Pakistan, involving 11,317 vehicles, leading to 5047 fatalities and 12,696 persons injured

Digital technologies like the Internet of Things (IoT) are reshaping road safety measures. Many technology initiatives are undertaken the world over to make smarter and safer roads, the ones that can interact with traffic and pedestrians. Assuming that by giving in vehicle technology information to the driver, accidents can be averted, several technology-based products have been developed. The latest technology researchers are working on is based on the Internet of Things (IoT). IoT is all about data. Data is becoming a valuable resource for our world.

Many sectors and industries have adopted IoT to reduce errors and improve performance in manufacturing, energy, health care, and communication. The WHO describes different measures that can be implemented with minimal economic impacts in its “Save LIVES: Road Safety Technical Package”. A cornerstone of these steps is realizing economic systems for “monitoring road safety by strengthening data systems”. Meanwhile, a key theme in the package is motivating the adoption of a Safe System approach, which is a holistic approach to road safety that parts from traditional management solutions by emphasizing safety by design.

Mobile-phone-based applications use built-in sensor data to detect the speed limit based on environmental situations.

The main contributions of this research are

1. Abriefsurveyonthestateoftheartrelatedtopre-accidentaswellaspost-accident models, frameworks, andtechniques;

2.Identificationandreportingoflimitationsinpreviousstudiesrelatedtoaccident detection;

3.The concept of a smart road with an event-sensing capability, plus implementation and testing through variousexperiments;

4. Demonstrationofanewandmodernwaytoquicklydetectaccidentsand communicate with nearby vehicles andEOCs.

The risks for loss of life, injuries, and other damage may increase if an incident is not reported to an EOC in a timely fashion. Lives can be saved by sending timely information about an accident through an automated mechanism. Moreover, quick automobile accident detection and an alert system are required to protect approaching vehicles against an MVC. Several methods have been implemented in advanced vehicles (Avs) for avoiding an accident. An accident threat is detected through sensors installed in vehicles or by using smartphone sensors. Previous researchers have used accelerometers, smoke detectors, infrared (IR) obstacle sensors, proximity sensors, and biosensors to detect an accident.

1.1. Project Overview:

The main aim of this project is to help people automate the roads by providing them with a Web App through which they can monitor the parameters of the road like temperature, speed limit, and visibility of the road.They also show guides for schools and provide services of displaying hospitals, and restaurant signs accordingly.

1.2Purpose:

A large amount of research is being carried out in the domain of accident avoidance and accident alarms by a large number of researchers and practitioners. To avoid accidents, many approaches are utilized to enhance safety. For ease of reference, the literature on accident detection and avoidance is separated into three approaches: stand-alone, cooperative, and hybrid. Stand-alone approaches use sensors, such as radar and light detection and ranging (LiDAR), for accident avoidance and detection, whereas cooperative approaches rely on V2X technology and hybrid approaches.

2. LITERATURE SURVEY:

Abstract:

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 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 that has digital signboards 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 on road diversions, accident-prone areas, and information sign boards can be entered through the web app. This data is retrieved and displayed on the signboards accordingly

Introduction:

An automated deep learning (DL)-based system was developed for detecting accidents from video data. The system uses visual components in temporal order to represent traffic collisions. As a result, the model architecture is composed of a visual-features-extraction phase followed by transient pattern identification. Convolution and recurrent layers are used in the training phase to learn visual and temporal features. In public traffic accident datasets, an accuracy of 98% was attained in the detection of accidents, demonstrating a strong capacity for detection independent of the road structure. The solution is limited to automobile crashes, not motorbikes, bicycles, and pedestrians. Furthermore, the model makes mistakes when determining accident segments under poor illumination (e.g., at night), at low resolutions, and when there are occlusions.

An accident management system was proposed in that makes use of cellular technology in public transportation. This method enables communication across various components, including those in ambulances, RSUs, and servers. Furthermore, in this system, an optimal route-planning algorithm (ORPA) is proposed to optimize aggregate spatial utilization of road networks while lowering the travel cost to operate a vehicle. The ORPA was evaluated through simulations, and findings were compared with other current algorithms. In congested areas, the proposed method can also be used to offer fast routes for ambulances. All vehicles, including ambulances, are required to have a route indicator installed, as well as the ability to use remote correspondence. The ORPA outperformed in terms of average speed and travel duration, according to the evaluation data. The proposed system only works for predicted patterns and can fail due to the unpredicted behavior of traff

Existingproblem:

The Safe System Approach

The Safe System (SS) approach to transport networks originated with the “Safe Road Transport System” model developed by the Swedish Transport Agency. In its essence, the approach migrates from the view that accidents are largely and

automatically the driver's fault to a view that identifies and evaluates the true causes of accidents. Through the categorization of safety into the safety of three elements (vehicle, road, and road user), SS minimizes fatalities and injuries by controlling speeds and facilitating prompt emergency response. The model has been widely adopted since its introduction and is currently motivated by the WHO as a basis for road safety planning, policy-making, and enforcement

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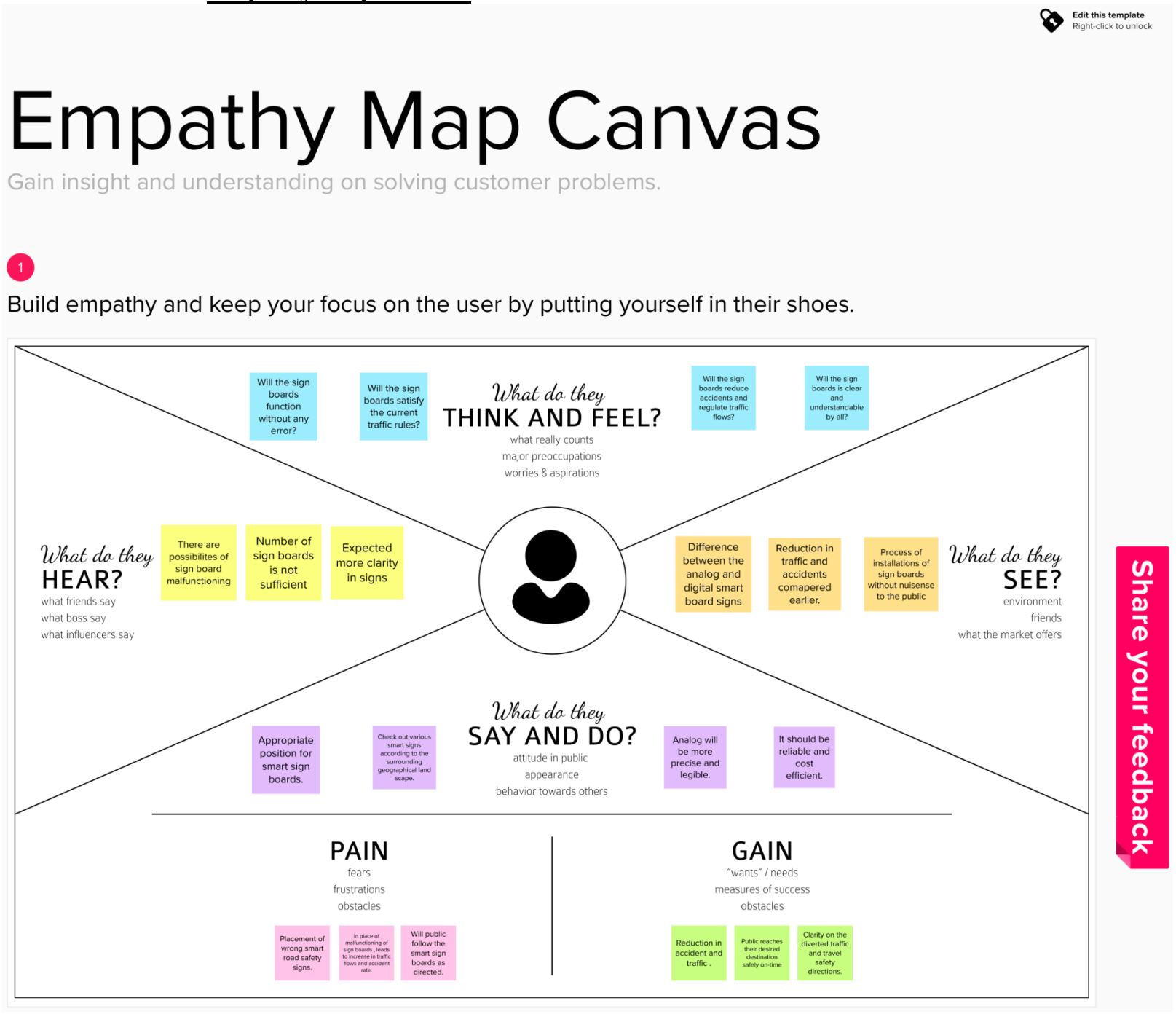
Problem StatementDefinition

A problem statement is a concise description of an issue to be addressed or a condition to be improved upon. It identifies the gap between the current (problem) state and desired (goal) state of a process or product. Focusing on the facts, the problem statement should be designed to address the Five Ws. The first condition of solving a problem is understanding the problem, which can be done by way of a problem statement.

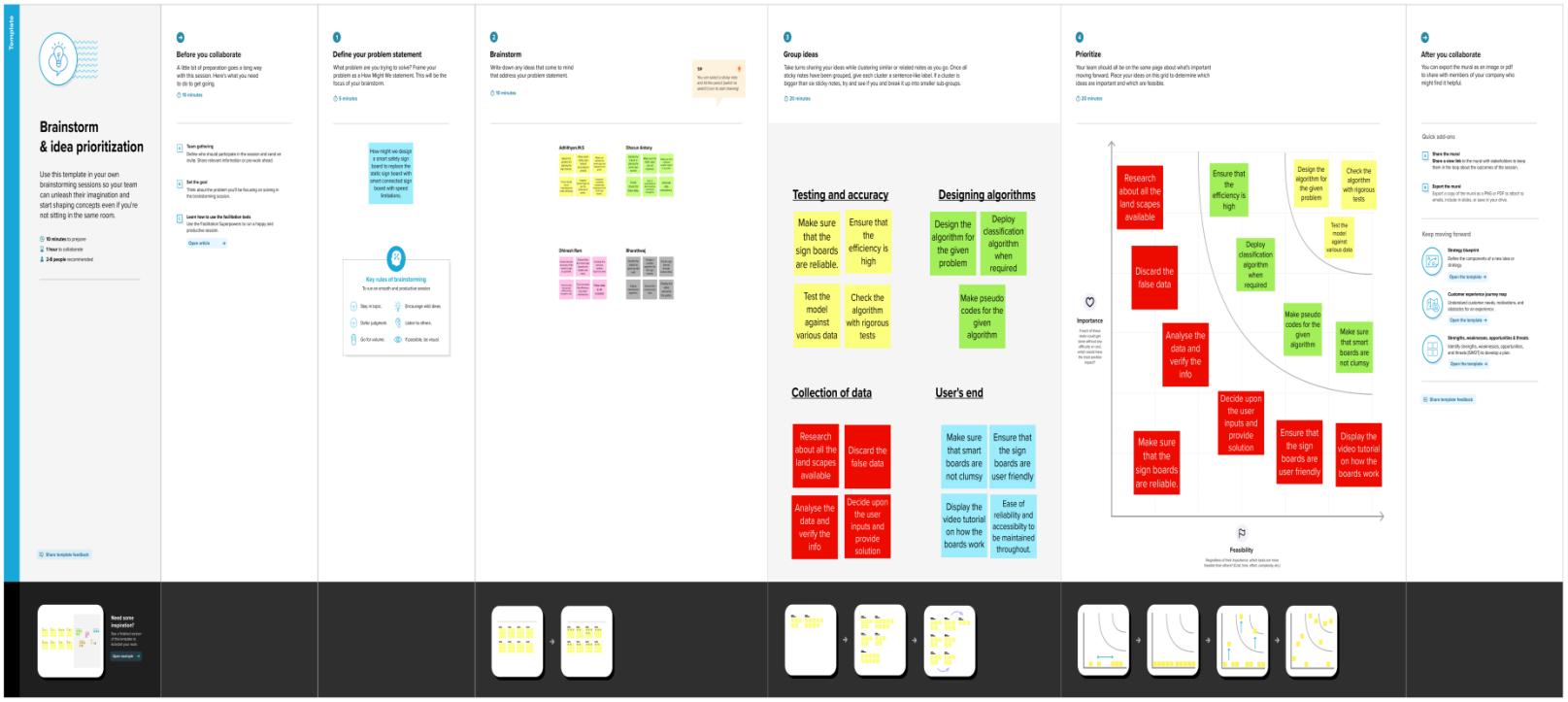
In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are road diversions due to heavy traffic or due to accidents then we can change the road signs accordingly if they are digitalized. This project proposes a system that has digital signboards 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 on road diversions, accident-prone areas, and information sign boards can be entered through the web app. This data is retrieved and displayed on the signboardsaccordingly.

3. IDEATION & PROPOSED SOLUTION:

Empathy MapCanvas:



Ideation &Brainstorming:



Proposed Solution:

The project team shall fill in the following information in the proposed solution template.

S.No.	Parameter	Description
1.	ProblemStatement(Problemtob esolved)	To replace the static signboards, smart connected sign boards are used which get the speed limitations from a web app using weather API and update automatically.
2.	Idea/Solutiondescription	Predicting the speed limit from data acquired through weather map and pass through a web user interface which in turn used by user
3.	Novelty/Uniqueness	Controllingthe speed limit by weather map.

4.	SocialImpact/CustomerSatisfaction	Based on traffic diversion signs ,guide signs and warning signs are displayed to the public.
5.	BusinessModel(RevenueModel)	Smart connectivity and better road safety model.
6.	ScalabilityoftheSolution	Theprocessof understanding and operatingthisModeliseasy and its highly scalable with proper efficiency.

Problem Solutionfit:

Problem-Solution fit canvas 2.0

Purpose / Vision

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) — CS

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

- Public who uses transport
- Officers who maintain and regulate road safety

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.

- Public who have/use automobiles(any type)
- Government Transport
- The vehicle should have digitally supported sensors which canbe compatible with the smart sign boards

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

- Already available analog road safety signs which are ineffective
- Signs painted on walls and roads by the corporation which disappeared or perished in a period of time
- Non reliable and rigid road safety signs which gets damaged during natural disaster or calamity

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.

- Hard to maintain data accuracy
- Choosing the position of placing the smart sign board
- Possibility of malfunction of sensors placed in the smart sign boards
- Damage of the sign boards due to external/ internal factors

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.

- Position of static sign boards is not visible and is inappropriate
- There is no way to predict the weather in the desired destination through the static boards

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)

- As public use various routes for travelling, prediction of the desired routes should be on hand with the weather there
- Static boards are not reliable to find weather in the destination

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.

- People want to make their travel easier and comfortable
- Public are aware of the traffic situations around them

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.

- Public are not aware of the static sign boards, so the smart sign boards are introduced which is more attractive
- People get more info about the needful resources in the route

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.

- Connect the smart sign boards to access the applications provided by them such as speed limitations and weather predictions

8. CHANNELS of BEHAVIOUR — CH

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

- Video tutorial is made to educate the public about the smart sign board
- Online influencers can advertise the smart sign boards through their influencing medium

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

- Traffic law maker should give awareness programs to the public

Extract online & offline CH of BE

4. REQUIREMENTANALYSIS

Functionalrequirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**User Visibility**	Sign Boards should be made with LED's which are bright colored and are capable of attracting the drivers attention but it should also not be too distracting or blinding cause it may lead to accidents.
FR-2	**User Need**	The smart sign boards should be placed frequently in places it is needed and less in places where it is not needed much to avoid confusion for the user during travel.
FR-3	**User Understanding**	For better understanding of the driver, the signs should be big, clear and legible and it can also include illustrations which will make it easily understandable to the driver.
FR-4	**User Convenience**	The display should be big enough that it should even be visible from far distance clearly.

Non-Functionalrequirements:

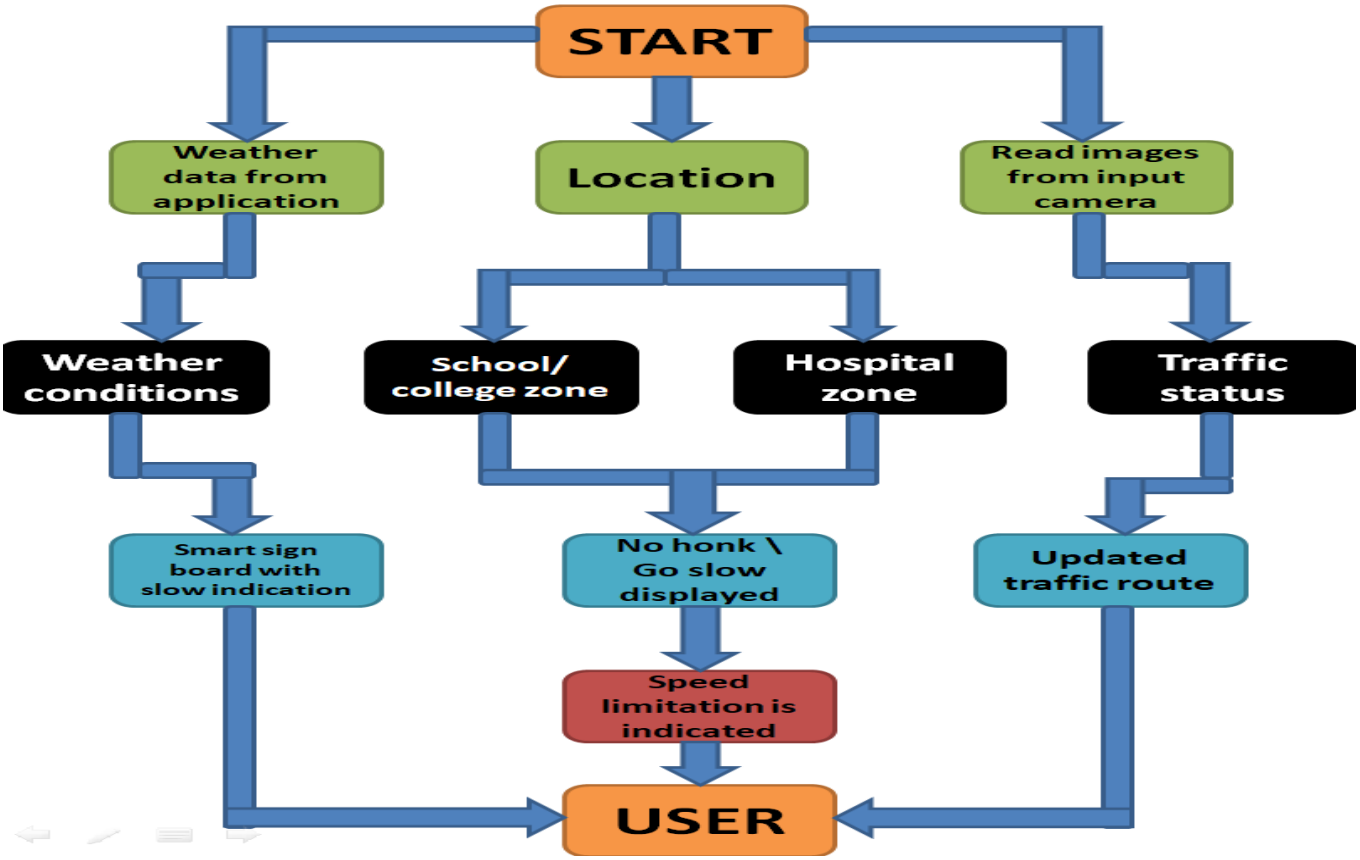
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It should be able to Upgrade and Update when there is a need for it.
NFR-2	**Security**	It should have good security system so that no other person is able to hack and display their own directions.
NFR-3	**Reliability**	It should be able to display to information correctly and error-free.
NFR-4	**Performance**	It should be able to automatically update itself when certain weather or traffic problem occurs.
NFR-5	**Availability**	It should be available 24/7 so that it can be beneficial to the customer i.e the driver.
NFR-6	**Scalability**	It should be able to easily change and upgrade according to change and need in requirement.

5. PROJECTDESIGN:

Project design is an early phase of the project lifecycle where ideas, processes, resources, and deliverables are planned out. A project design comes before a project plan as it's a broad overview whereas a project plan includes more detailed information.

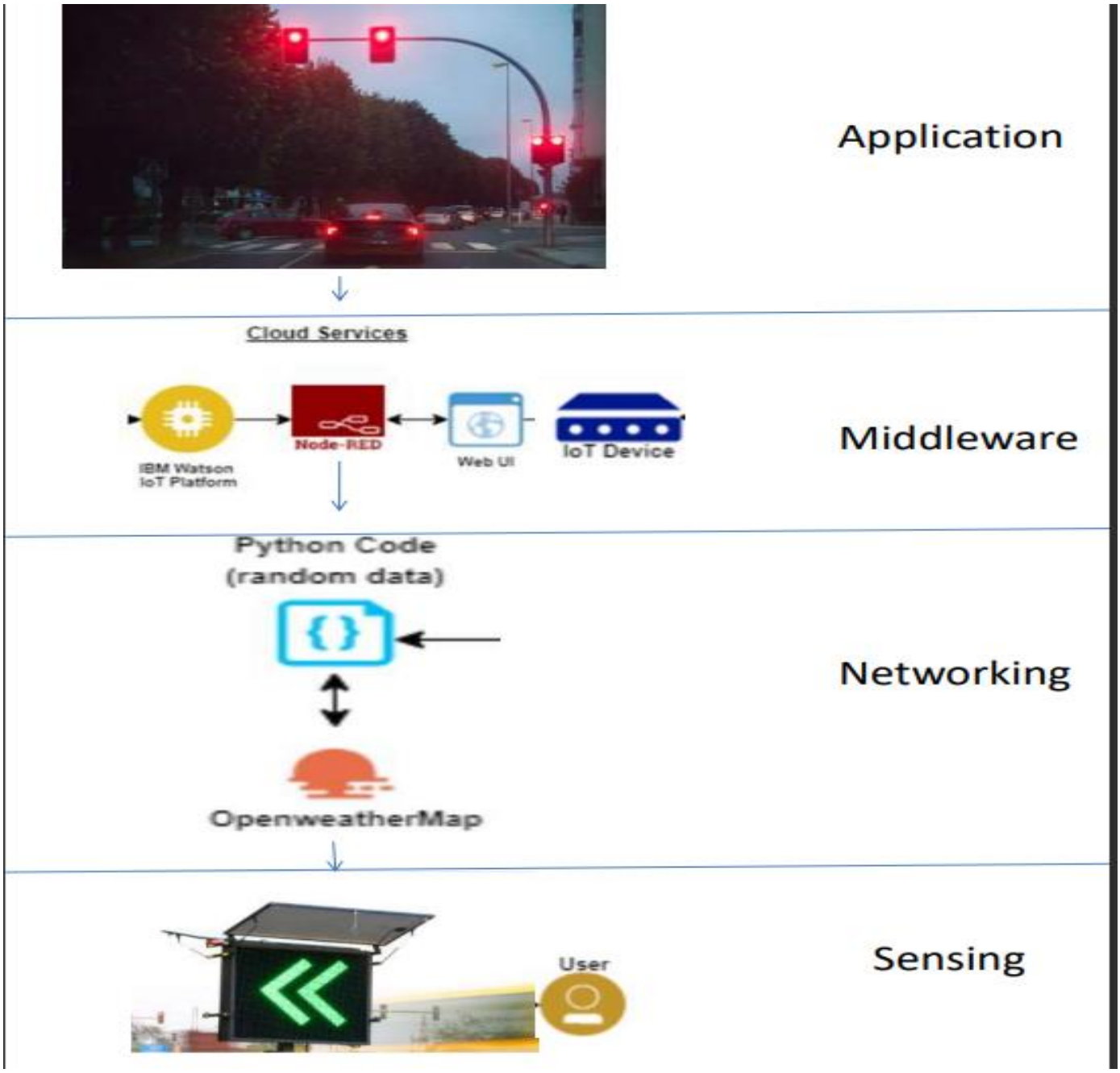
Data FlowDiagrams:

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.



Solution &TechnicalArchitecture:

6.



Userstories:

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

User Type	Functional Requirement (Epic)	User Story Number	UserStory/Task	Acceptancecriteria	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 application by 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 my speed 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 fatal situations.	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 weather map by entering email & password	I can access the application through my Gmail login	High	Sprint-2
	Interface	USN-6	As a user the interface should be simple and easily accessible	I can access the interface easily	High	Sprint-1
Customer (Web user)	Data generation	USN-7	As a user I use open weather application to access the data regarding the	I can access the data regarding the weather through the	High	Sprint-1

			weather changes.	**application**		
Administrator (Officials)	Problem solving/ Fault clearance	USN-8	**As an official who is in charge for the proper functioning of the sign boards have to maintain it through periodic monitoring.**	**Officials can monitor the sign boards for proper functioning.**	Medium	Sprint-2
			entering my email, password, and confirming my password	**dashboard**		

7. PROJECT PLANNING &SCHEDULING

The definition of a sprint is a dedicated period in which a set amount of work will be completed on a project. It's part of the agile methodology, and an Agile projectwill be broken down into a number of sprints, each sprint taking the project closer to completion**.**

Sprint Planning &Estimation:

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement(Epic)	User Story Number	UserStory/Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application byentering my email, password, and confirmingmypassword.	2	High	ADHITHYAN
Sprint-1		USN-2	As a user, I will receive confirmation email onceIhave registeredforthe application	1	High	ADHITHYAN
Sprint-1		USN-3	As a user, I can register for the applicationthroughFacebook	2	Low	ADHITHYAN
Sprint-1		USN-4	Asa user,Icanregisterforthe application throughGmail	2	Medium	DHARUN ANTONY
Sprint-1	Login	USN-5	As a user, I can log into the application byenteringemail & password	1	High	DHARUN ANTONY
Sprint-1	Dashboard	USN-6	As a user, I can log into the application byenteringemail& passwordandaccessallthe resourcesandservicesavailable	2	High	DHARUN ANTONY

Sprint Delivery Schedule:

Project Tracker, Velocity & Burndown Chart:

TITLE	DESCRIPTION	DATE
Literature Survey&InformationGathering	A literature review is acomprehensive summaryofpreviousresearchesonthe topic. The literaturereview surveys scholarlyarticles, books, and othersourcesrelevantto a particular area ofresearch.	3September2022
PrepareEmpathyMap	Anempathymapisacollaborative tool teamscan use to gain a deeperinsight into theircustomers. It helps us tounderstandthecustomers' pain,gainanddifficulties fromtheir pointofview.	10September2022

Ideation-Brainstorming	Brainstorming is agroupproblem-solving method that helped us togather and organizevarious ideas andthoughts fromteam members.	17September2022
DefineProblems tatement	TheCustomerProblemStatementhelpsustofocus on what matters tocreate experiences peoplewill love. A well-articulatedcustomer problem statementallowedustofindthe idealsolutionforthechallengescustomersface.	19September2022
Problem Solution Fit	It helped us understandand analyze all thethoughtsofourcustomer,their choice of options,problems,rootcause, behaviorandemotions.	26September2022
Proposed solution	It helped us analyze andexamine our solution morein the grounds ofuniqueness, social impact,businessmodel,scalability etc.	28 September2022

Solution Architecture	Solution architecture is acomplex process – withmany sub-processes – that bridges the gapbetween businessproblems and technologysolutions. It helped usunderstand the featuresandcomponentsused to completetheproject.	1 October2022
Customer journey map	It helped to analyse thevarious steps, interactions,goals and motivation,positives,negativesand opportunities.	7 October2022
Solution requirements	It briefs about functionaland non-functionalrequirements. It involvesthe various steps in theentire process. It alsospecifies featuresusability,security, reliability, performance,availabilityand scalability.	12October2022
Technology stack	A tech stack is the combination of technologies a company uses to build and run an application or project. It helps us analyse and understand various technologies that needs to be implemented in the project.	15October2022

Dataflow	A Data Flow Diagram(DFD)isatraditional visualrepresentationof	11October2022
	theinformationflowswithin a system. A neatand clear DFD can depictthe right amount of thesystem requirementgraphically. It shows howdataentersandleavesth esystem, what changes theinformation, and wheredataisstored.	
SprintDeliveryplan	Sprint Planning is an eventin scrum that defines whatcan be delivered in theupcomingsprint andhowthat work will be achieved.It helps us to organise andcomplete the workeffectivelyandefficiently.	22 October2022
Preparemilestoneanda ctivitylist	Helps us understand andevaluate our progress andaccuracy so far.	23October2022
ProjectDevelopment-DeliveryofSprint-1	Develop and submit thedeveloped code by testingit.	7 november 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown 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 such as scrum. However, burn-down charts can be applied to any project containing measurable progress over time.

8.CODING & SOLUTIONING:

(Explain the features added in the project along with code):

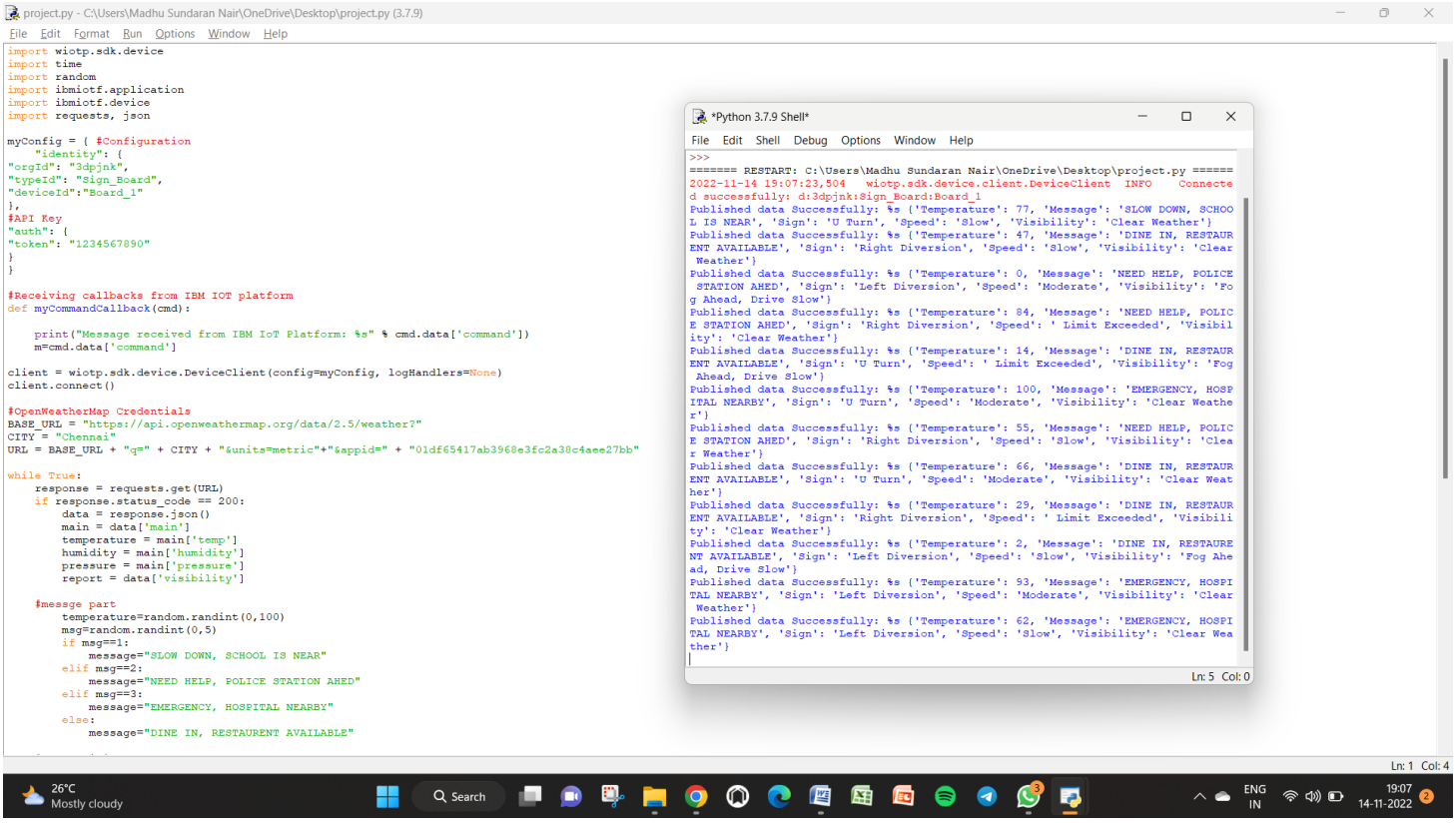
Feature 1 (coding andresult):

```
importwiotp.sdk.device
import time
import random
importibmiotf.application
import ibmiotf.device
import requests, json

myConfig = {
   #Configuration
   "identity": {
      "orgId": "3dpjnk",
      "typeId": "Sign_Board",
      "deviceId":"Board_1"},
   #API Key
   "auth": {
      "token": "1234567890"
   }
}

#Receiving callbacks from IBM IOT platform
defmyCommandCallback(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()

#OpenWeatherMap Credentials
BASE_URL ="https://api.openweathermap.org/data/2.5/weather?"
```

```
CITY = "Nagercoil"
URL = BASE_URL + "q=" + CITY + "&units=metric"+"&appid=" +
"01df65417ab3968e3fc2a38c4aee27bb"

while True:
   response = requests.get(URL)
   if response.status_code ==200:
      data = response.json()
      main = data['main']
      temperature =main['temp']
      humidity = main['humidity']
      pressure = main['pressure']
      report = data['visibility']

      #messge part
      msg=random.randint(0,5)
      if msg==1:
         message="SLOW DOWN, SCHOOL IS NEAR"
      elifmsg==2:
         message="NEED HELP, POLICE STATION AHED"
      elifmsg==3:
         message="EMERGENCY, HOSPITAL NEARBY"
      elifmsg==4:
         message="DINE IN, RESTAURENT AVAILABLE"
      else:
         message=""

       #Speed Limit part

      speed=random.randint(0,150)
      if speed>=100:
         speedMsg=" Limit Exceeded"
      elif speed>=60 and speed<100:
         speedMsg="Moderate"
      else:
          speedMsg="Slow"

       #Diversion part
      sign=random.randint(0,5)
      if sign==1:
         signMsg="Right Diversion"
      elifsign==3:
         signMsg="Left Diversion"
      elifsign==5:
         signmsg="U Turn"
```

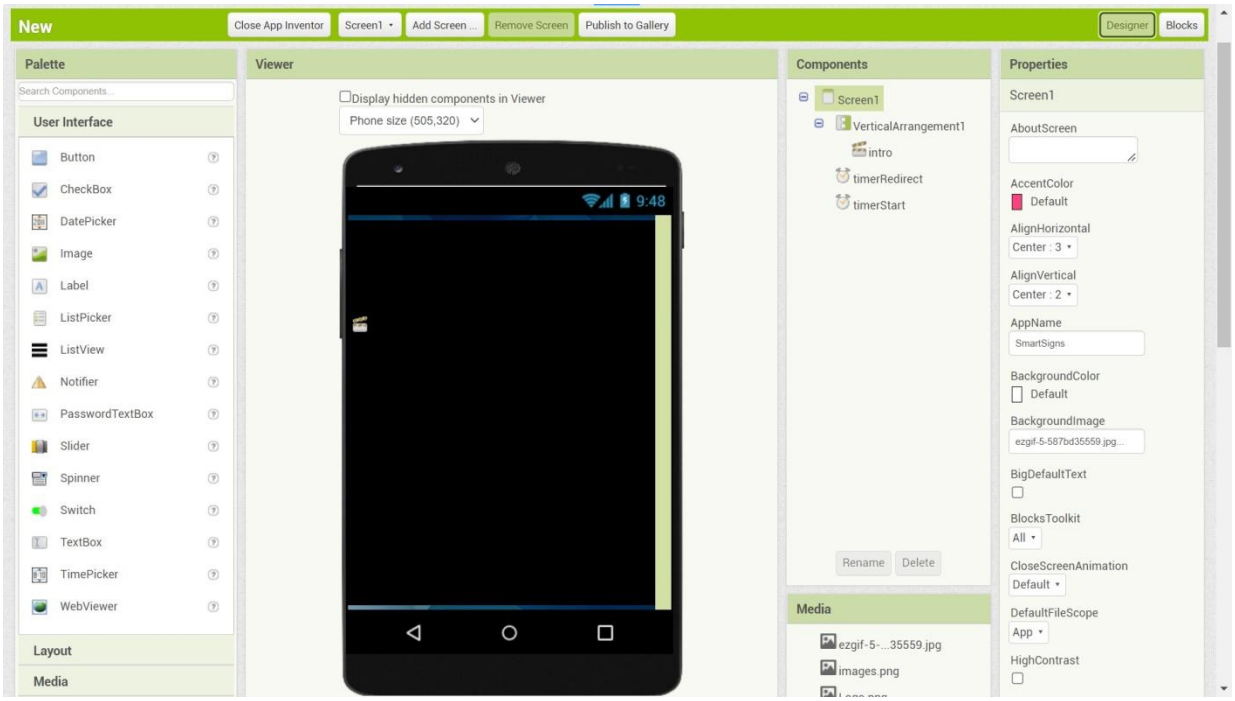
```
        else:
            signMsg=""

         #Visibility
        if temperature < 24:
            visibility="Fog Ahead, Drive Slow"
        elif temperature < 20:
            visibility="Bad Weather"
        else:
            visibility="Clear Weather"

    else:
        print("Error in the HTTP request")
    myData={'Temperature':temperature, 'Message':message, 'Sign':signMsg, 'Speed':speedMsg,
'Visibility':visibility}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
#PUBLISHING TO IOT WATSON
    print("Published data Successfully: %s", myData)
    client.commandCallback                                =
    myCommandCallbacktime.sleep(5)
client.disconnect()
```

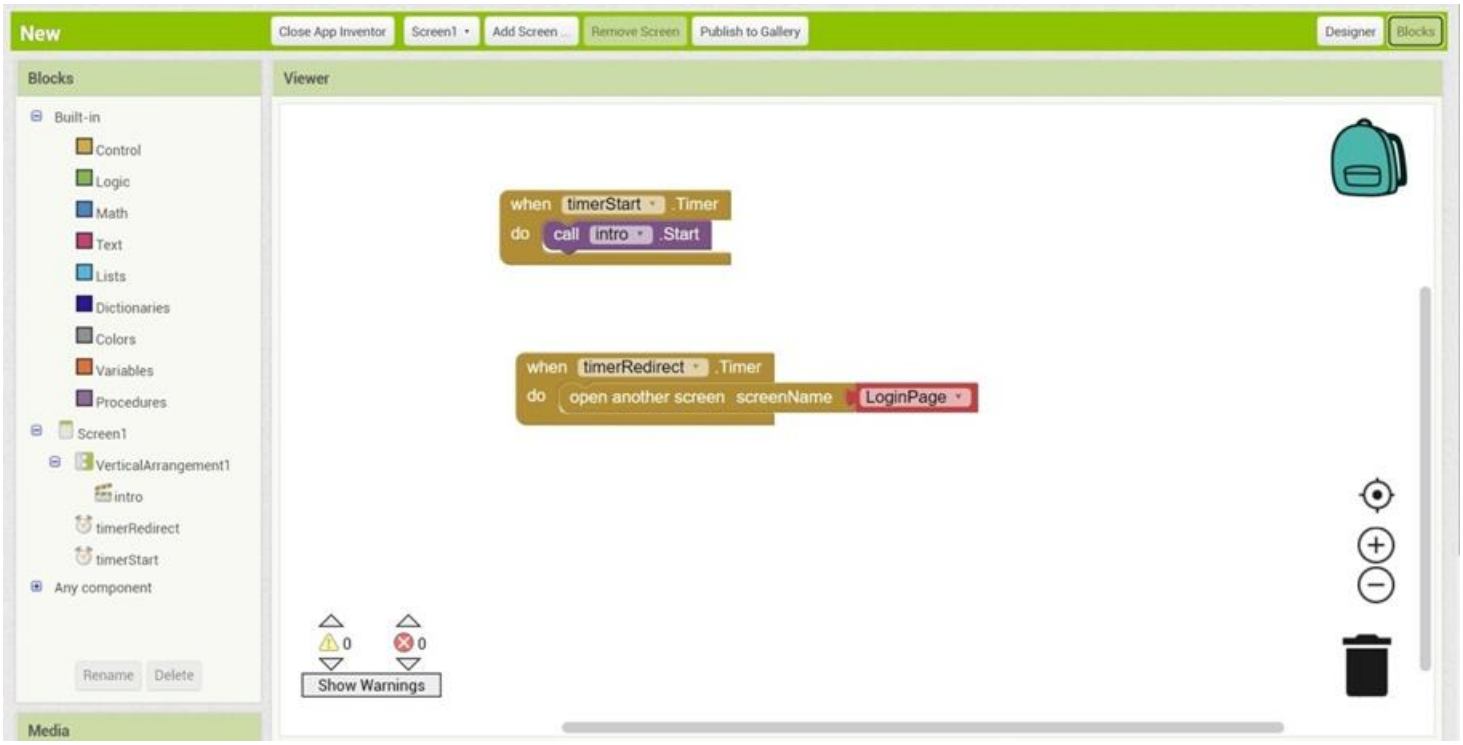
Output:


project.py - C:\Users\Madhu Sundaran Nair\OneDrive\Desktop\project.py (3.7.9)
File Edit Format Run Options Window Help
import wiotp.sdk.device
import time
import random
import ibmiotf.application
import ibmiotf.device
import requests, json
myConfig = { #Configuration
"identity": {
"orgId": "3dpjnk",
"typeId": "Sign_Board",
"deviceId":"Board_1"
},
#API Key
"auth": {
"token": "1234567890"
}
}
#Receiving callbacks from IBM IOT platform
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()
#OpenWeatherMap Credentials
BASE_URL = "https://api.openweathermap.org/data/2.5/weather?"
CITY = "Chennai"
URL = BASE_URL + "q=" + CITY + "&units=metric"+"&appid=" + "01df65417ab3968e3fc2a38c4aee27bb"
while True:
response = requests.get(URL)
if response.status_code == 200:
data = response.json()
main = data['main']
temperature = main['temp']
humidity = main['humidity']
pressure = main['pressure']
report = data['visibility']
#messge part
temperature=random.randint(0,100)
msg=random.randint(0,5)
if msg==1:
message="SLOW DOWN, SCHOOL IS NEAR"
elif msg==2:
message="NEED HELP, POLICE STATION AHED"
elif msg==3:
message="EMERGENCY, HOSPITAL NEARBY"
else:
message="DINE IN, RESTAURENT AVAILABLE"
Ln: 1 Col: 4
Python 3.7.9 Shell
File Edit Shell Debug Options Window Help
>>>
======= RESTART: C:\Users\Madhu Sundaran Nair\OneDrive\Desktop\project.py ======
2022-11-14 19:07:23,504 wiotp.sdk.device.client.DeviceClient INFO Connected successfully: d:3dpjnk:Sign_Board:Board_1
Published data Successfully: %s {'Temperature': 77, 'Message': 'SLOW DOWN, SCHOOL IS NEAR', 'Sign': 'U Turn', 'Speed': 'Slow', 'Visibility': 'Clear Weather'}
Published data Successfully: %s {'Temperature': 47, 'Message': 'DINE IN, RESTAURENT AVAILABLE', 'Sign': 'Right Diversion', 'Speed': 'Slow', 'Visibility': 'Clear Weather'}
Published data Successfully: %s {'Temperature': 0, 'Message': 'NEED HELP, POLICE STATION AHED', 'Sign': 'Left Diversion', 'Speed': 'Moderate', 'Visibility': 'Fog Ahead, Drive Slow'}
Published data Successfully: %s {'Temperature': 84, 'Message': 'NEED HELP, POLICE STATION AHED', 'Sign': 'Right Diversion', 'Speed': ' Limit Exceeded', 'Visibility': 'Clear Weather'}
Published data Successfully: %s {'Temperature': 14, 'Message': 'DINE IN, RESTAURENT AVAILABLE', 'Sign': 'U Turn', 'Speed': ' Limit Exceeded', 'Visibility': 'Fog Ahead, Drive Slow'}
Published data Successfully: %s {'Temperature': 100, 'Message': 'EMERGENCY, HOSPITAL NEARBY', 'Sign': 'U Turn', 'Speed': 'Moderate', 'Visibility': 'Clear Weather'}
Published data Successfully: %s {'Temperature': 55, 'Message': 'NEED HELP, POLICE STATION AHED', 'Sign': 'Right Diversion', 'Speed': 'Slow', 'Visibility': 'Clear Weather'}
Published data Successfully: %s {'Temperature': 66, 'Message': 'DINE IN, RESTAURENT AVAILABLE', 'Sign': 'U Turn', 'Speed': 'Moderate', 'Visibility': 'Clear Weather'}
Published data Successfully: %s {'Temperature': 29, 'Message': 'DINE IN, RESTAURENT AVAILABLE', 'Sign': 'Right Diversion', 'Speed': ' Limit Exceeded', 'Visibility': 'Clear Weather'}
Published data Successfully: %s {'Temperature': 2, 'Message': 'DINE IN, RESTAURENT AVAILABLE', 'Sign': 'Left Diversion', 'Speed': 'Slow', 'Visibility': 'Fog Ahead, Drive Slow'}
Published data Successfully: %s {'Temperature': 93, 'Message': 'EMERGENCY, HOSPITAL NEARBY', 'Sign': 'Left Diversion', 'Speed': 'Moderate', 'Visibility': 'Clear Weather'}
Published data Successfully: %s {'Temperature': 62, 'Message': 'EMERGENCY, HOSPITAL NEARBY', 'Sign': 'Left Diversion', 'Speed': 'Slow', 'Visibility': 'Clear Weather'}
Ln: 5 Col: 0
26°C
Mostly cloudy
Search
ENG
IN
19:07
14-11-2022

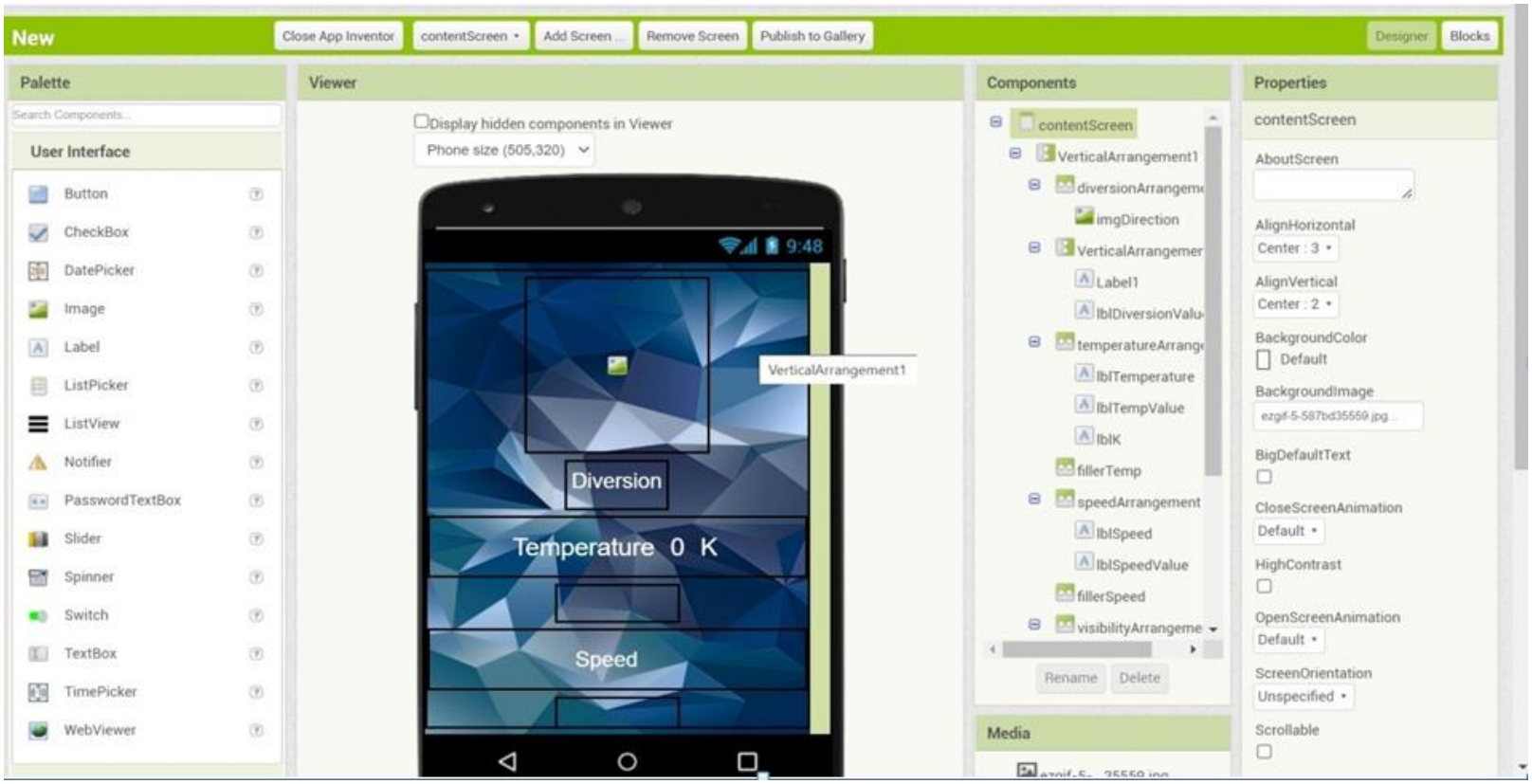
Feature 2: (MITAPPINVENTER):

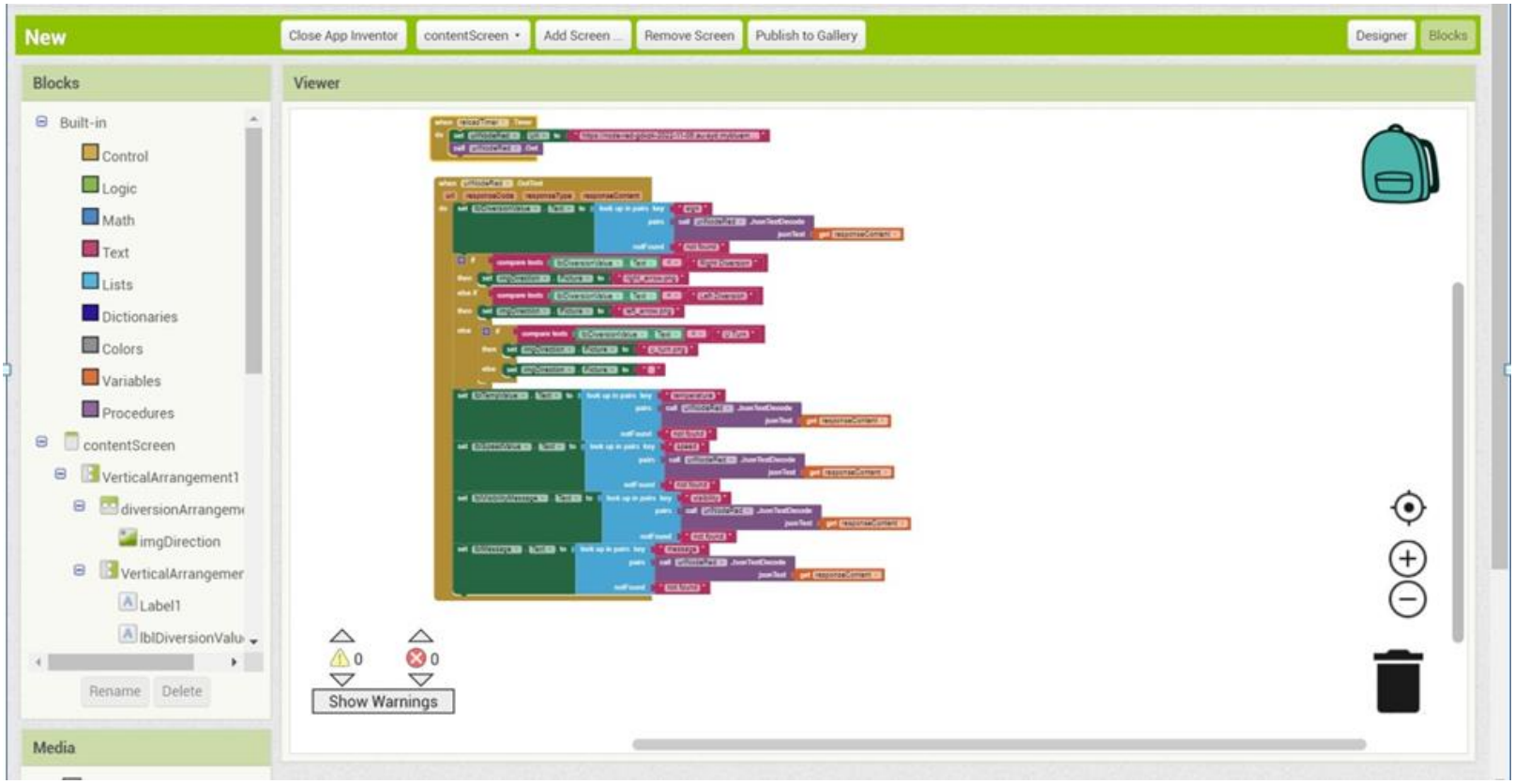
MIT APP INVENTOR: ICON PAGE:






New
Close App Inventor
LoginPage
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Blocks
Built-in
Control
Logic
Math
Text
Lists
Dictionaries
Colors
Variables
Procedures
LoginPage
loginPageArrangemen
loginArrangement
imgLogo
fillerAfterLogo
usernameArrangem
lblUsername
Rename
Delete
Media
Viewer
when btnLogin .Click
do if
txtUsername . Text = " admin " and txtPassword . Text = " admin "
then open another screen screenName contentScreen
else call checkCred .ShowAlert
notice " Admin for both "
0
0
Show Warnings


New
Close App Inventor
contentScreen
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Palette
Search Components...
User Interface
Button
CheckBox
DatePicker
Image
Label
ListPicker
ListView
Notifier
PasswordTextBox
Slider
Spinner
Switch
TextBox
TimePicker
WebViewer
Viewer
Display hidden components in Viewer
Phone size (505,320)
9:48
VerticalArrangement1
Diversion
Temperature 0 K
Speed
Components
contentScreen
VerticalArrangement1
diversionArrangem
imgDirection
VerticalArrangemer
Label1
lblDiversionValu
temperatureArrang
lblTemperature
lblTempValue
lblK
fillerTemp
speedArrangement
lblSpeed
lblSpeedValue
fillerSpeed
visibilityArrangeme
Rename
Delete
Media
Properties
contentScreen
AboutScreen
AlignHorizontal
Center : 3
AlignVertical
Center : 2
BackgroundColor
Default
BackgroundImage
ezgif-5-587bd35559.jpg...
BigDefaultText
CloseScreenAnimation
Default
HighContrast
OpenScreenAnimation
Default
ScreenOrientation
Unspecified
Scrollable

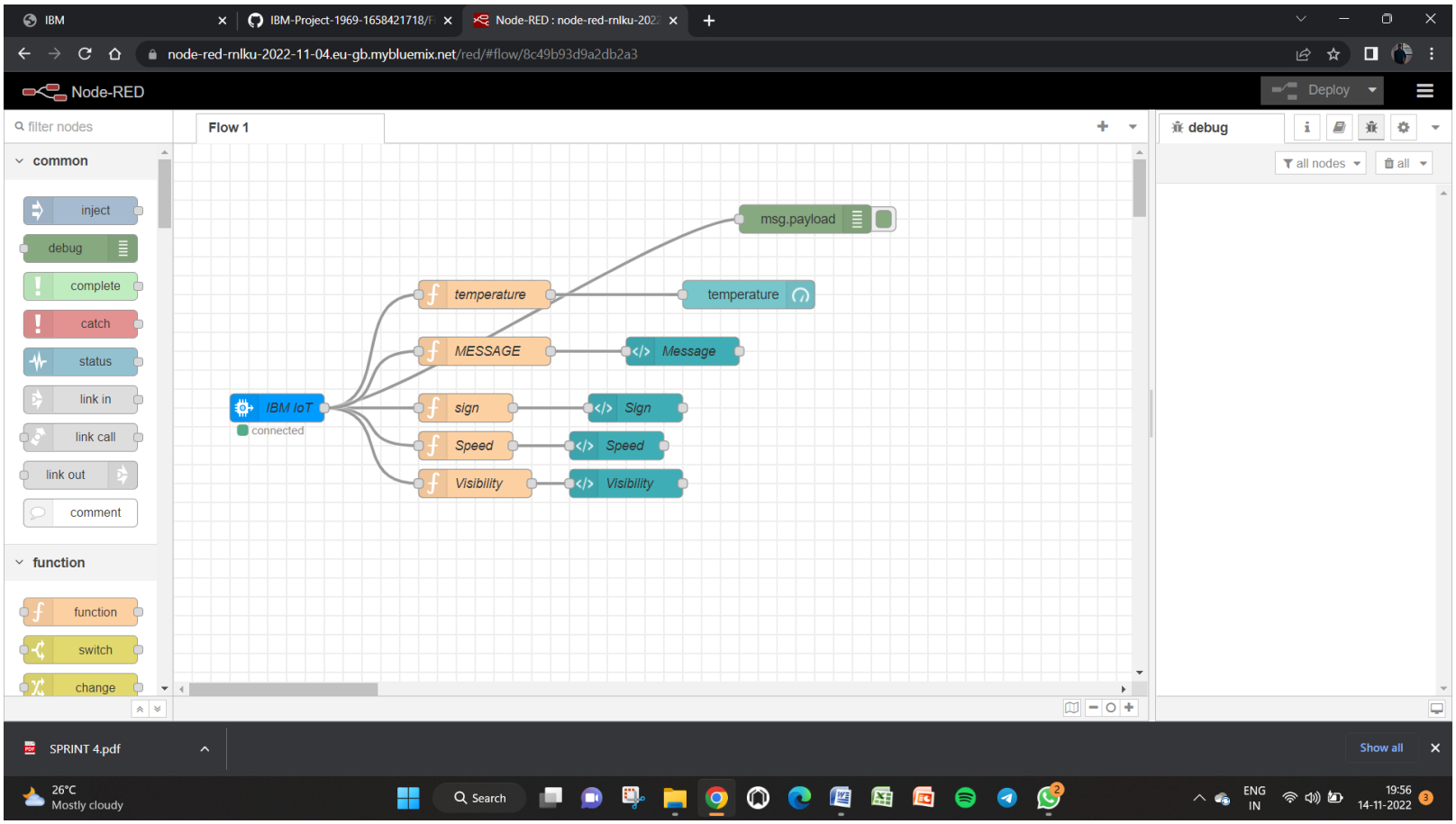

New
Close App Inventor
contentScreen
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Blocks
Built-in
Control
Logic
Math
Text
Lists
Dictionaries
Colors
Variables
Procedures
contentScreen
VerticalArrangement1
diversionArrangem
imgDirection
VerticalArrangemer
Label1
lblDiversionValu
Rename
Delete
Media
Viewer
0
0
Show Warnings

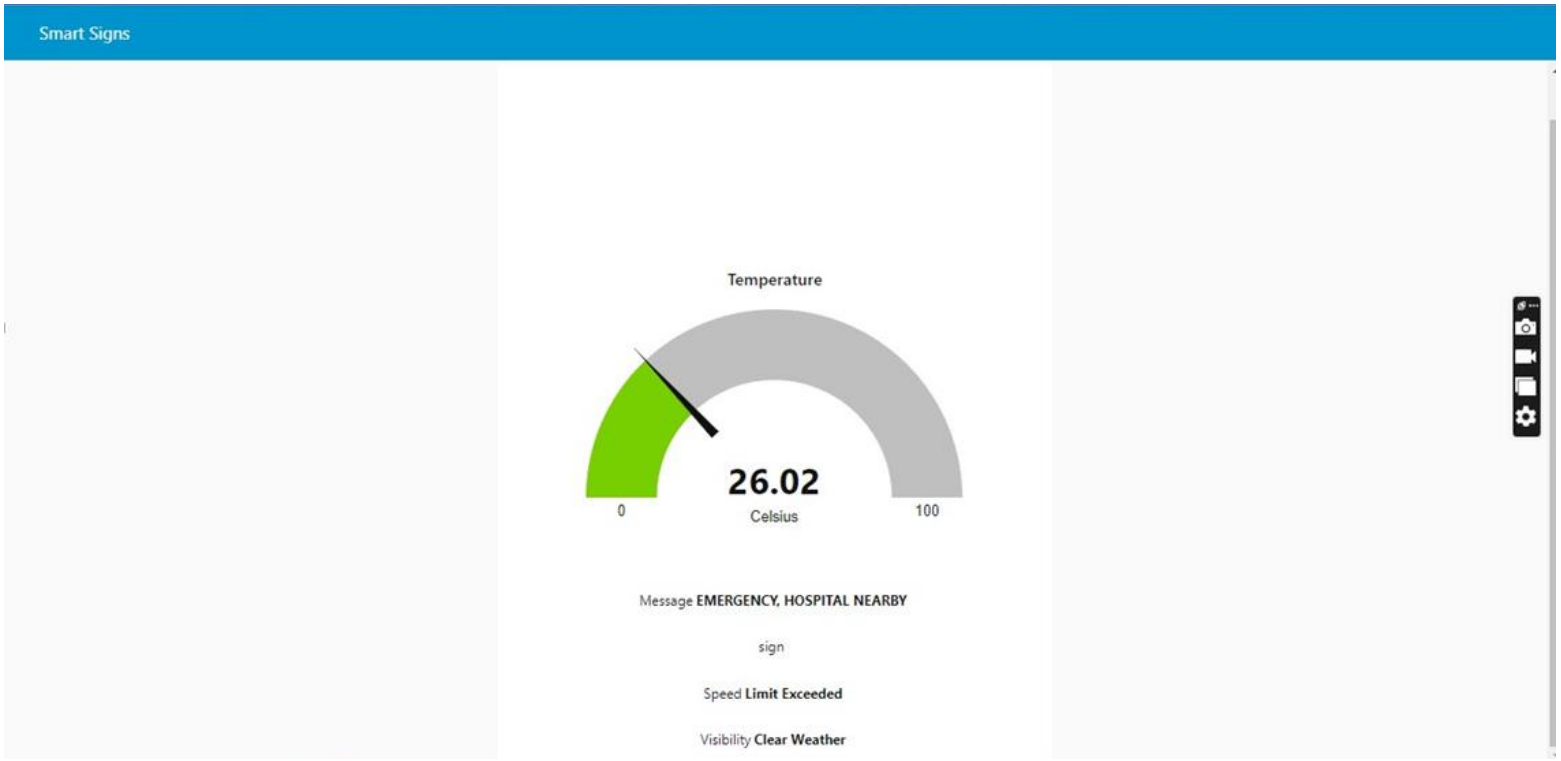
8. TESTING:

Test cases help guide the tester through a sequence of steps to validate whether a software application is free of bugs, and working as required by the end-user. Learning how to write test cases for software requires basic writing skills, attention to detail, and a good understanding of the application under test (AUT).

TestCases:

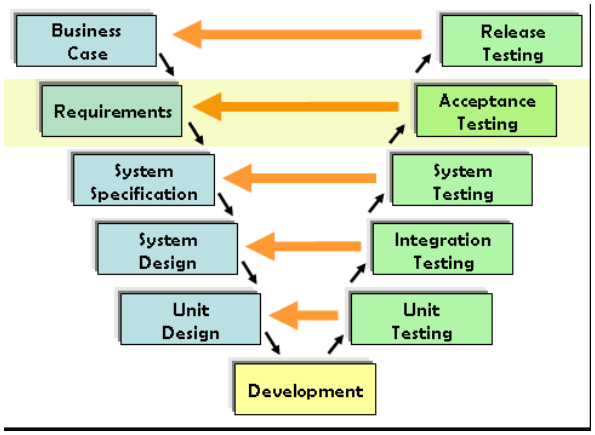
UI : https://node-red-rnlku-2022-11-04.eu-gb.mybluemix.net/ui/#!/0?socketid=45tMkCVwyfqy0tETAABh





User AcceptanceTesting:

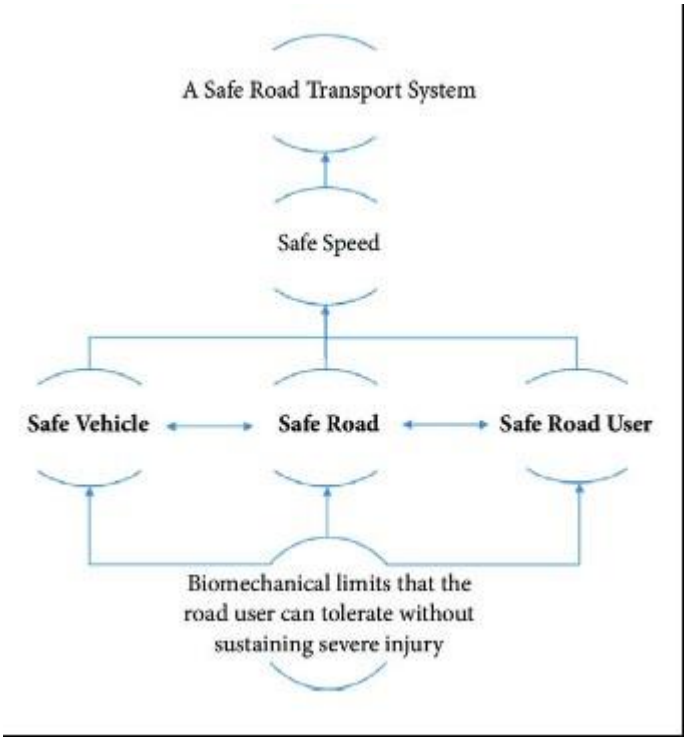
UAT consists, in practice, of people from the target audience using the application. The defects they find are then reported and fixed. This scenario is what most closely resembles "the real world." The process allows users to "get their hands dirty" with the application. They can see if things work as intended.



The main purpose of UAT is to validate end-to-end business flow. It does not focus on cosmetic errors, spelling mistakes, or system testing. User Acceptance Testing is carried out in a separate testing environment with a production-like data setup. It is a kind of black box testing where two or more end-users will be involved.

9. RESULTS:

PerformanceMetrics:



10. ADVANTAGES & DISADVANTAGES

Advantages:

Connected vehicles have various benefits such as

- Multimodalsensorsandedgecomputinghelpspeeduptheflowoftrafficwithreal-time processing, reducing congestion andemissions.
- Smart road technology can assist in optimizing trafficflow
- It will manage road conditions, creating a more sustainable environment withincities.
- Improved control and safety can be achieved through IoT-enabled cars. In case of over-speeding, the notification getsdisplayed.
- Ensuring a safe driving experience with real-time assistance, navigation, and even monitoring driving patterns and any emergency. Additionally, along with the state of the traffic, IoT drivers can receive updated information on the state of the roads, i.e., potholes, ice, grade changes, black spots,etc.

DISADVANTAGES:

- Security and privacy. Keeping the data gathered and transmitted by IoT devices safe is challenging, as they evolve and expand in use....
- Technical complexity....
- Connectivity and power dependence....
- Integration....
- Higher costs (time andmoney)

CONCLUSION:

The world doesn’t change on its own but we humans can change the world to be safe, better, and harmless. Since the road isn’t said to be safe let’s make it safer with the technologies present and available to us. The Internet of Things is one of the technologies that can lead us to travel on enhanced safe roads. So let's come together to create a better world with no accidents and a smart road for the future generation.

11. FUTURESCOPE:

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 safe system approach to road safety emphasizes safety by desigh ensuring safe vehicles, road networks, and road users. Evolving towards the future, the road needs to boil with advanced sensors and antenna systems to have peace with the new era.

12. APPENDIX:

Source Code:

```
importwiotp.sdk.device
import time
import random
importibmiotf.application
import ibmiotf.device
import requests, json

    myConfig = {
        #Configuration
```

```
    "identity": {
       "orgId": "3dpjnk",
       "typeId": "Sign_Board",
       "deviceId":"Board_1"},
    #API Key
    "auth": {
       "token": "1234567890"
    }
  }

#Receiving callbacks from IBM IOT platform
defmyCommandCallback(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()

#OpenWeatherMap Credentials
BASE_URL ="https://api.openweathermap.org/data/2.5/weather?"
CITY = "Chennai"
URL = BASE_URL + "q=" + CITY + "&units=metric"+"&appid=" +
"01df65417ab3968e3fc2a38c4aee27bb"

while True:
  response = requests.get(URL)
  if response.status_code ==200:
    data = response.json()
    main = data['main']
    temperature =main['temp']
    humidity = main['humidity']
    pressure = main['pressure']
    report = data['visibility']

    #messge part
    msg=random.randint(0,5)
    if msg==1:
      message="SLOW DOWN, SCHOOL IS NEAR"
    elifmsg==2:
      message="NEED HELP, POLICE STATION AHED"
    elifmsg==3:
      message="EMERGENCY, HOSPITAL NEARBY"
    elifmsg==4:
```

```
        message="DINE IN, RESTAURENT AVAILABLE"
    else:
        message=""

     #Speed Limit part
    speed=random.randint(0,150)
    if speed>=100:
        speedMsg=" Limit Exceeded"
    elif speed>=60 and speed<100:
        speedMsg="Moderate"
    else:
         speedMsg="Slow"


     #Diversion part
    sign=random.randint(0,5)
    if sign==1:
        signMsg="Right Diversion"
    elifsign==3:
        signMsg="Left Diversion"
    elifsign==5:
        signmsg="U Turn"
    else:
         signMsg=""

     #Visibility
    if temperature < 24:
        visibility="Fog Ahead, Drive Slow"
    elif temperature < 20:
        visibility="Bad Weather"
    else:
        visibility="Clear Weather"

  else:
    print("Error in the HTTP request")
  myData={'Temperature':temperature, 'Message':message, 'Sign':signMsg, 'Speed':speedMsg,
'Visibility':visibility}
  client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
#PUBLISHING TO IOT WATSON
  print("Published data Successfully: %s", myData)
  client.commandCallback                    =
  myCommandCallbacktime.sleep(5)
client.disconnect()
```

GitHub Link :

https://github.com/IBM-EPBL/IBM-Project-1969-1658421718

Project demo link :
https://youtu.be/iJvhOudqiV4