



**OM SAKTHI**

# **ADHIPARASAKTHI COLLEGE OF ENGINEERING**



**G. B. Nagar, Kalavai - 632 506, Ranipet District, Tamil Nadu.**

## **NALAIYATHIRAN**

### **SMART SOLUTION FOR RAILWAYS USING IOT**

**Team ID: PNT2022TMID39421**

**Faculty Mentor: Prabhatharan. D**



**Submitted by:-**

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- 4 . YOKESHWARI.S(510119104023)**

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# 1.INTRODUCTION

## 1.1 PROJECT OVERVIEW

Smart Solutions For Railways is to manage Indian Railways is the largest railway network in Asia and additionally world's second largest network operated underneath a single management. Due to its vast network it is difficult to monitor all the sectors of railways. This paper deals with the problem to locate the exact location of the train and to provide a ticket confirmation through QR code which helps in reducing the usage of paper. GPS module connected with the Arduino UNO to simulate the process. A mobile application has been developed for the end users to track their exact train location. This is the application of IOT, is a cost effective system. This effective methodology of GPS tracking helps the Users to detect their exact location.

## 1.2 PURPOSE

GPS tracking is the surveillance of location through use of the Global Positioning System (GPS) to track the location of an entity or object remotely. The technology can pinpoint longitude, latitude, ground speed, and course direction of the target.

The GPS is a "constellation" of 24 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 100 to 10 meters for most equipment. Accuracy can be pinpointed to within one meter with special military-approved equipment. GPS equipment is widely used in science and has now become sufficiently low-cost so that almost anyone can own a GPS and many do in a smartphone, tablet or GPS navigation device.

GPS tracking is invaluable for police, firefighters, military personnel and large courier businesses. Many of these use automatic vehicle locator (AVL) systems. AVL systems generally include a network of vehicles that are each equipped with a mobile radio receiver, a GPS receiver, a GPS modem and a GPS antenna. This network connects with a base radio consisting of a PC computer station as well as a GPS receiver and interface. GPS uses interactive maps rather than static map images on the Web. AVL systems can be used to increase the accountability of field personnel and boost the efficiency of a company's dispatching procedure through tracking and communication.

Other GPS tracking technologies include GPS guns that law enforcement can fire at a fleeing car, avoiding a dangerous pursuit. In some places, law enforcement representatives also use GPS dust, which consists of GPS trackers so small they might be blown or rubbed on a target's clothing.

GPS devices in smartphones and other mobile devices are often used to track employee location. Privacy advocates warn that the technology can also make it possible for advertisers, government, hackers and cyberstalkers to track users through their mobile devices.

## **2. LITERATURE SURVEY**

### **2.1 Existing problem**

GPS receivers rely on signals from at least four satellites. If they only connect with three, the positioning is not entirely accurate. When obstacles such as walls, buildings, skyscrapers, and trees obstruct a signal, problems can arise.

Geomagnetic storms and other extreme atmospheric conditions can also cause problems. Furthermore, the mapping technology used in conjunction with the GPS may be inaccurate or out of date, resulting in navigational errors.

Relying solely on GPS can be problematic if there is a signal failure or you are using a battery-powered device that runs out of power (GPS devices are almost always power-hungry). Unless you have a backup plan, such as hard copy maps, you could easily get lost and have no idea which way to go.

Another issue is that the position can be significantly off at times, especially when the number of satellites is limited. Satellites use atomic clocks, which are very precise, but there are sometimes discrepancies and thus time measurement errors. The satellites must preserve their predefined orbital positions, but gravitational pulls (from the earth, moon, and sun) do occur.

GPS devices are, by definition, distracting. In theory, they will relay audio instructions to you, and all you have to do is glance over at the map from time to time. In practice, however, you may end up fiddling with your smartphone or other devices while driving, attempting to change the destination, enter data, or change other settings. It's a recipe for disaster.

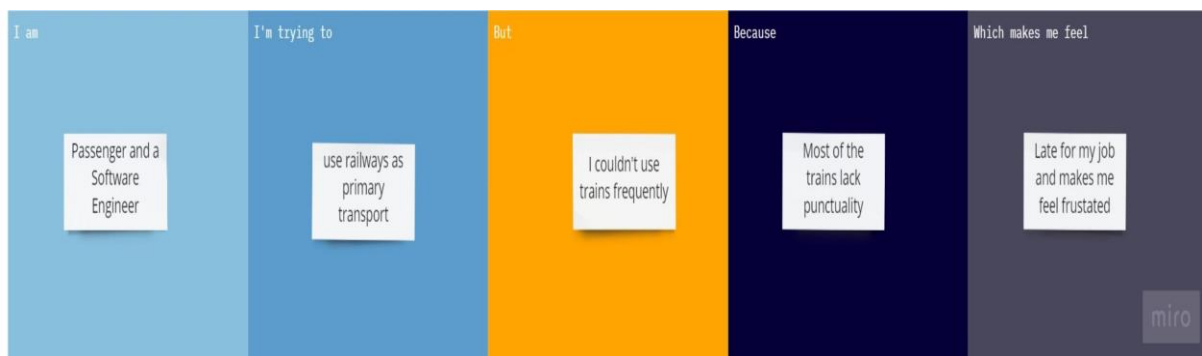
## 2.2 References

- [http://e2e.ti.com/blogs\\_/b/analogwire/archive/2013/12/13/the-promise-of-the-internet-of-things-proliferating-sensor-nodes](http://e2e.ti.com/blogs_/b/analogwire/archive/2013/12/13/the-promise-of-the-internet-of-things-proliferating-sensor-nodes) accessed on 8-3-2015
- <http://iot.ieee.org/> accessed on 8-3-2015
- <http://iot.ieee.org/newsletter/january-2015/towards-a-practical-architecture-for-internet-of-things-an-india-centric-view.html> accessed on 8-3-2015
- <http://www.gartner.com/newsroom/id/2905717> accessed on 11-3-2015
- <http://www.itu.int/en/ITU-T/gsi/iot/Pages/default.aspx> accessed on 11-3-2015
- <http://deity.gov.in/content/internet-things> accessed on 13-3-2015
- <http://www.channelworld.in/features/real-benefits-iot-will-be-realized-2019-ganesh-ramamoorthy-gartner-0#sthash.uJnXLCrQ.dpuf> accessed on 13-3-2015
- [http://planningcommission.nic.in/sectors/NTDPC/voume2\\_p2/potentialv2\\_p2.pdf](http://planningcommission.nic.in/sectors/NTDPC/voume2_p2/potentialv2_p2.pdf) accessed on 1-2-2015
- <http://www.moneycontrol.com/digitizingindia/news/10-interesting-applications-of-the-internet-of-everything-1624181.html> accessed on 5-7-2015

## 2.3 Problem Statement Definition

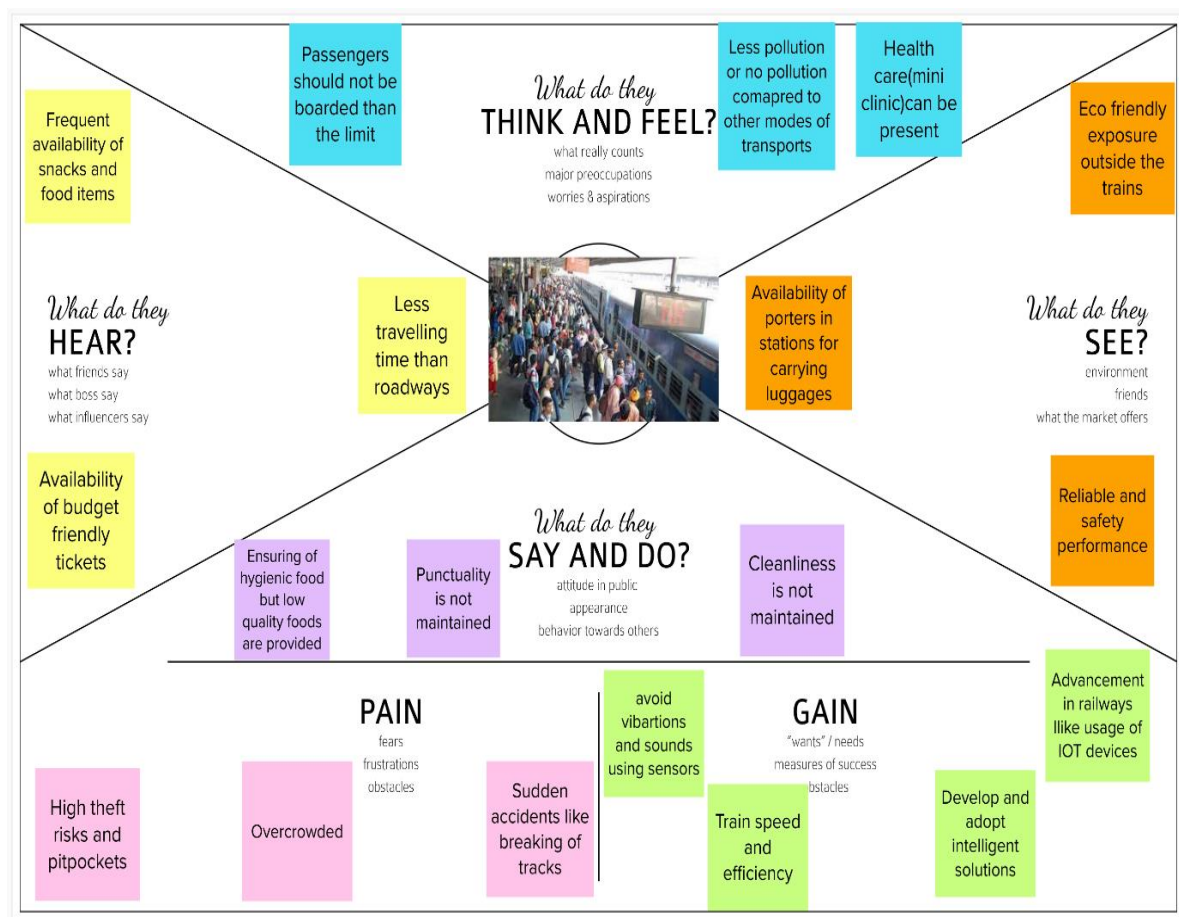
Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.



## 3. IDEATION & PROPOSED SOLUTION

### 3.1 Empathy Map Canvas





## 3.2 Ideation & Brainstorming

### Step-1



#### Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 🕒 10 minutes to prepare
- 🕒 1 hour to collaborate
- 👤 2-8 people recommended



#### Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

🕒 10 minutes



#### A Team gathering

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.



#### B Set the goal

Think about the problem you'll be focusing on solving in the brainstorming session.



#### C Learn how to use the facilitation tools

Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#) →



#### 1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

🕒 5 minutes



#### Key rules of brainstorming

To run a smooth and productive session

- 😊 Stay in topic.
- 💡 Encourage wild ideas.
- 🕒 Defer judgment.
- 👂 Listen to others.
- 🗣️ Go for volume.
- 👁️ If possible, be visual.

### Step-2

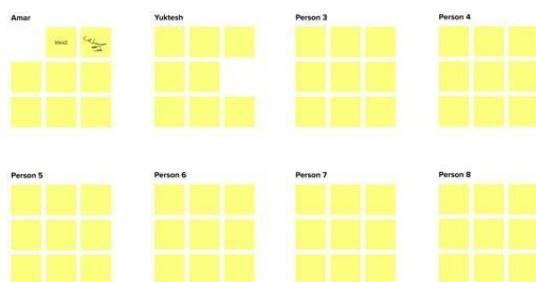


#### 2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

🕒 10 minutes

**TIP**  
You can select a sticky note and hit the pencil (pen) to select/zoom to start drawing!



#### 3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

🕒 20 minutes

Person 4

**TIP**  
Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mind.

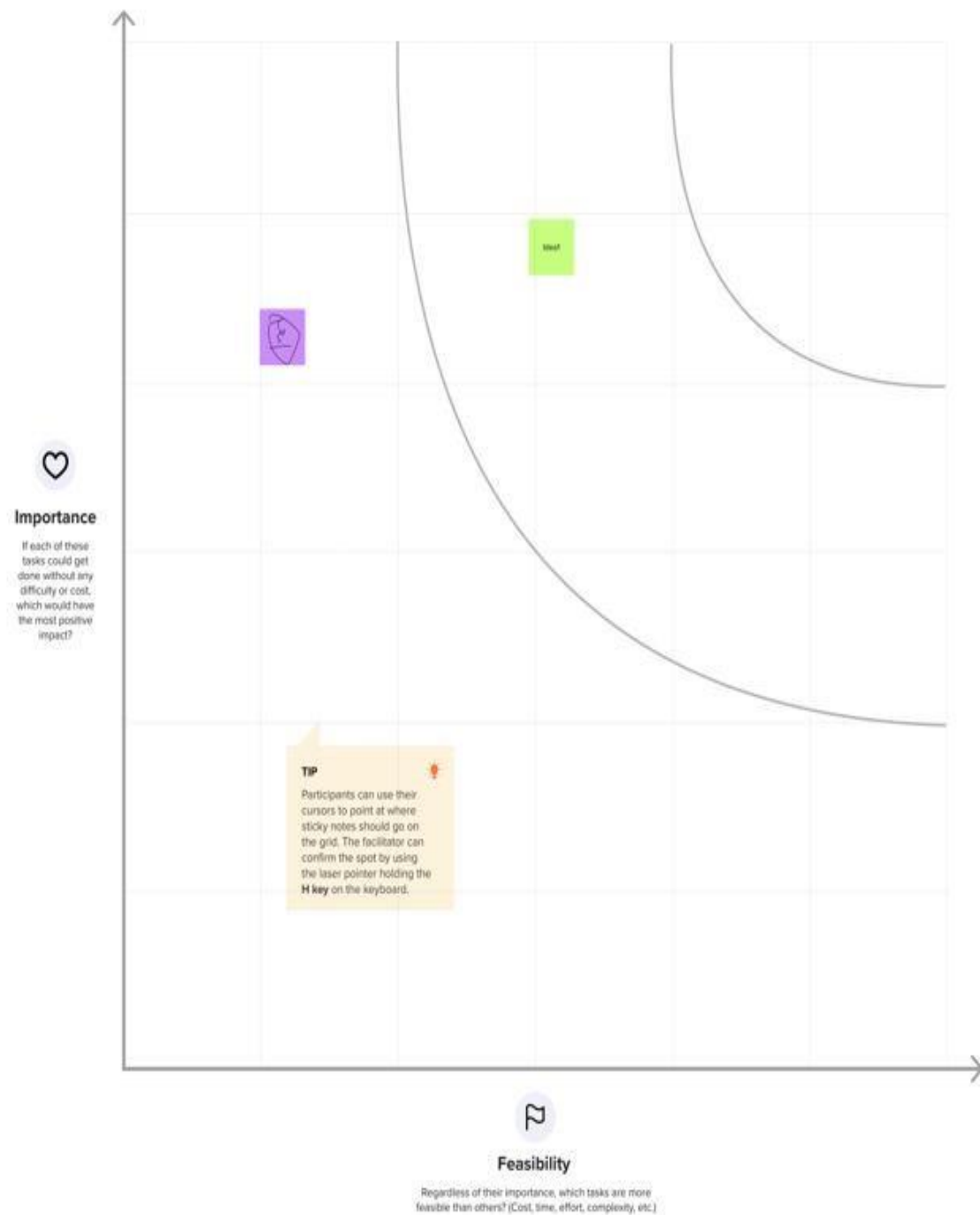
## Step-3

4

### Prioritize

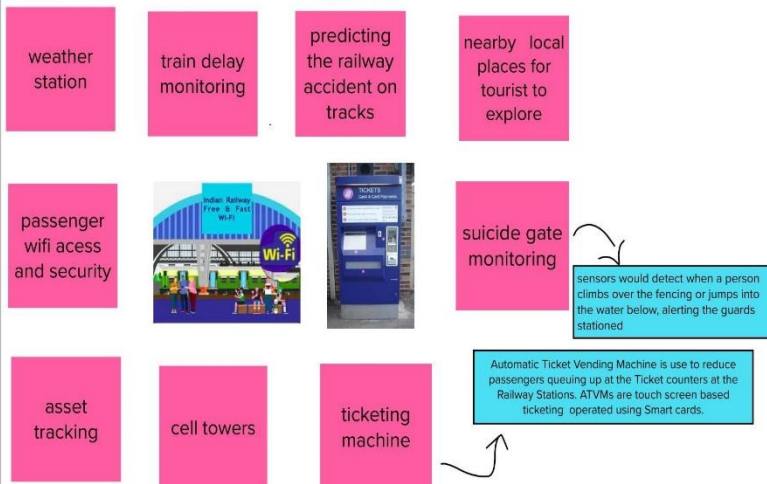
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕒 20 minutes

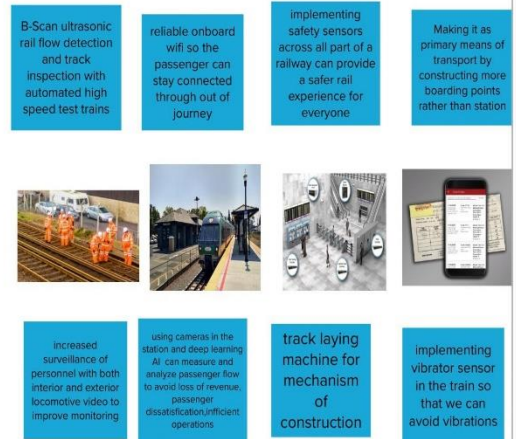


## Step-4

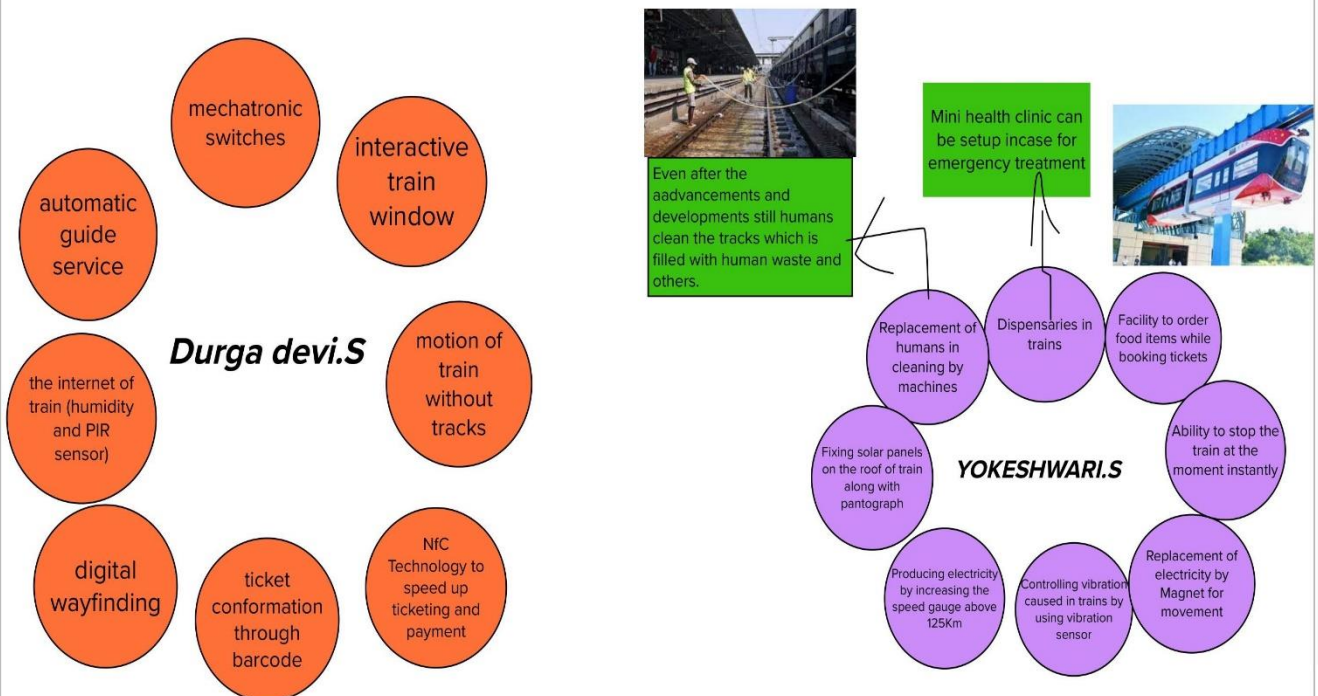
### JAYAVARSHINI K.P.



### kavitha.P



## Prabhatharan.D(mentor)



### 3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	A working person who is dependent on railway mode of transportation cant reach his/her destination place on time due to train delay(train lacks punctuality)
2.	Idea / Solution description	By building a 'layer of intelligence' into the signaling company's real time monitoring system.The solution was able to forecast delays an hour in advance and helped controllers as well as passengers to decide best alternatives to reduce delays.
3.	Novelty / Uniqueness	Enhanced customer experience ,vehicle tracking system.IOT is used along with AI which provides enhanced features in finding out delays.
4.	Social Impact / Customer Satisfaction	By predicting the delays ,it helps the passengers to plan accordingly to their work or trip which avoids the last minute stress
5.	Business Model (Revenue Model)	By using this solution, it makes passengers to avoid delays which increases more number of people to use railway mode of transportation which increases the revenue of railways
6.	Scalability of the Solution	Using IoT in railways, increased the use of trains among people due to its convenient usage. According to <a href="#">Allied Market Research reported</a> that the market was valued at \$135 billion USD in 2016 and was expected to grow to \$328 billion USD by 2023.

## 3.4 Problem Solution fit

<p><b>Define CS, fit into CC</b></p>	<p><b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span></p> <p>Who is your customer? i.e. working parents of 0-5 y.o. kids</p> <div>I'm a Women and a worker (IT professional)</div>	<p><b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span></p> <p>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.</p> <div>Mostly women feel embarrassed to raise voice against the harassment they face while travelling. Proper solution or justice are not provided for the victims.</div>	<p><b>Explore AS, differentiate</b></p>
	<p><b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span></p> <p>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</p> <div>The main problem women face while using railways is that lack of security mainly for Women.</div>	<p><b>9. PROBLEM ROOT CAUSE</b> <span>RC</span></p> <p>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.</p> <div>Lack of security for women. Not well managed system to provide security for women.</div>	
<p><b>Focus on J&amp;P, tap into BE, understand RC</b></p>	<p><b>3. TRIGGERS</b> <span>TR</span></p> <p>What triggers customers to act? i.e. seeing their <del>colleague</del> installing solar panels, reading about a more efficient solution in the news.</p> <div>Frequent occurring of harassment, theft (snatching of handbags and jewels)</div> <p><b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span></p> <p>How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure &gt; confident, in control - use it in your communication strategy &amp; design.</p> <p>Before: Utilizes railways as their primary transport. After: Feels insecure to travel after being harassed, loses confidence in railways.</p>	<p><b>7. BEHAVIOUR</b> <span>BE</span></p> <p>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)</p> <div>Finding a right place to open up their problem so that I can get solution to the problem I faced</div>	<p><b>Focus on J&amp;P, tap into BE, understand RC</b></p>
	<p><b>Identify strong TR &amp; EM</b></p>	<p><b>10. YOUR SOLUTION</b> <span>SL</span></p> <p>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 <del>business</del>.</p> <div>Using capacitive sensor which when pressed for fraction milliseconds to alert, locate and can send emergency message to nearby police station. Using temperature sensor, tilt sensor, camera, GPS, GSM to make a device for women safety.</div>	

## 4. REQUIREMENT ANALYSIS

### 4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Authentication (User Registration)	Registration through Form Registration through gmail Registration through specific apps
FR-2	Authorization level (User Confirmation)	Confirmation via Email Confirmation via OTP
FR-3	External interfaces	External interface are between contracts under the main engineer responsibilities and third parties some external interface are cellphone,terminal,pc's etc
FR-4	Transaction process	Can book tickets using credit card Tickets booking through net banking Tickets booking through online transaction such as gpay,phone pay,applepay and so on
FR-5	Reporting	Reporting data contributes to enhanced the transparency to extent work regarding saftey certification
FR-6	Business rules	Get full refund for short terminated routes

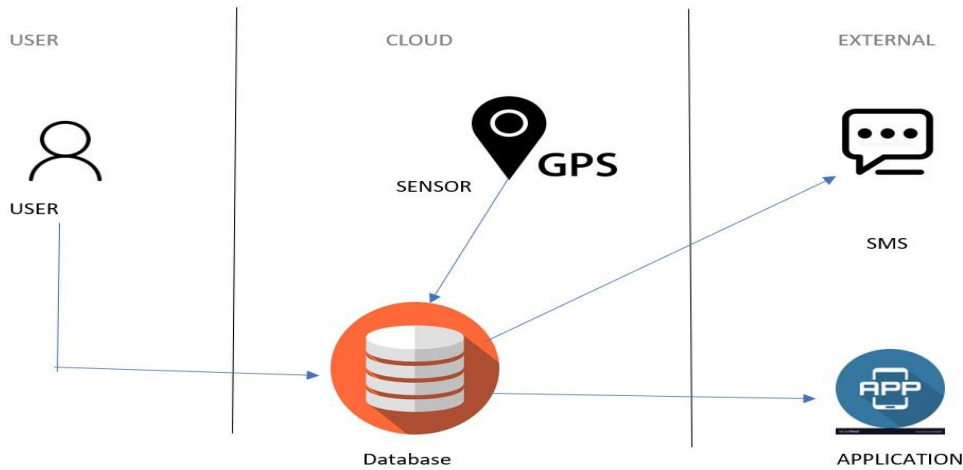
### 4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	Can easily book the train tickets when ever we want Users can easily track the train at any time
NFR-2	<b>Security</b>	Passenger details are encrypted so there low chance of get hacked The personal detail will not leak
NFR-3	<b>Reliability</b>	Features are very simple so that anyone can easily book the tickets
NFR-4	<b>Performance</b>	Can support nearly 10000 users at a time
NFR-5	<b>Availability</b>	Seat availability for the passenger E-Catering are available in side the train WIFI availibility to get connected with the people throughout the travel
NFR-6	<b>Scalability</b>	Reduced renewal and life cycle cost Automatic route finding

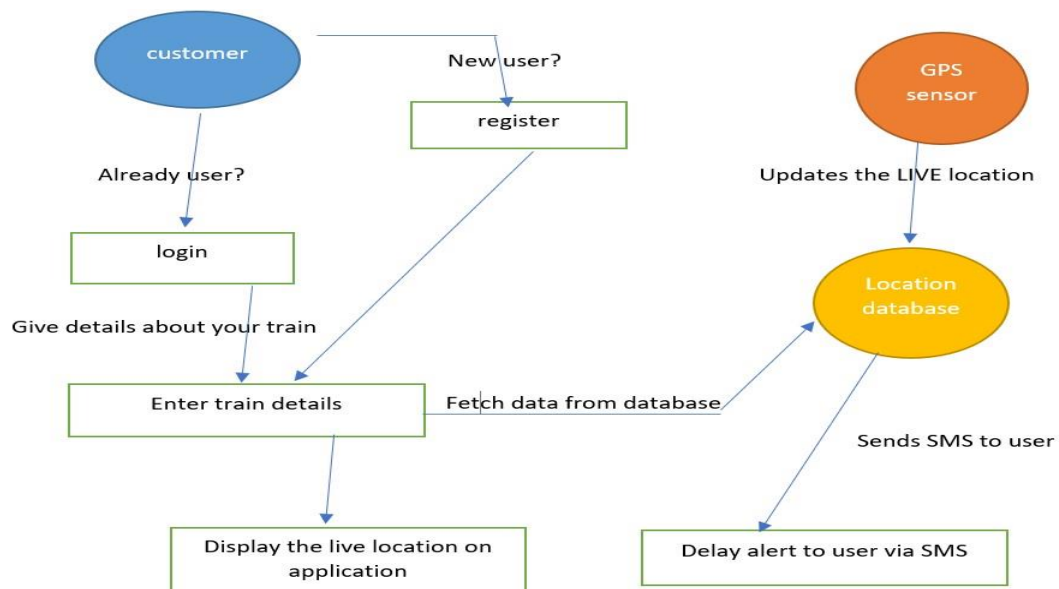
## 5. PROJECT DESIGN:

### 5.1 Data Flow Diagram:

#### Level-0

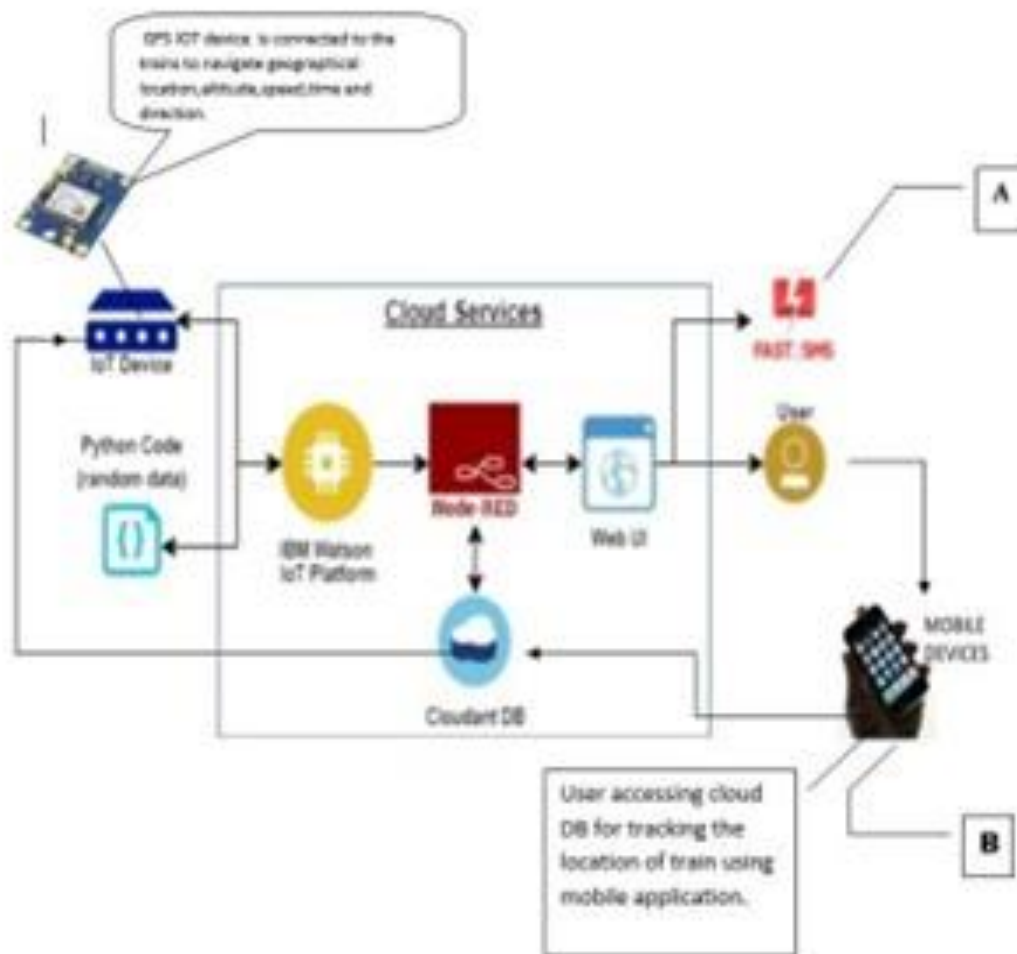


#### Level-1





## 5.2 Solution & Technical Architecture:





## 5.3 User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	User Registration	USER-1	As a passenger I can book tickets through both online and offline mode.	I can access my account using my given ticket ID	High	Sprint-0
Customer (Mobile user)	User confirmation	USER-2	As a Passenger, I will receive confirmation email or OTP once I have registered for the application.	I can receive confirmation email & click confirm	High	Sprint-1
Customer (Mobile user)	Transaction process	USER-3	For transaction, I can use credit cards, net banking and cash.	I can receive the invoice receipt	Low	Sprint-2
Customer (Mobile user)	Business rules	USER-4	As a passenger, I can get an SMS when the train gets delay.	I can receive SMS when train gets delay	High	Sprint-1
Customer (Web user)	User Registration	USER-1	As a passenger I can book tickets through both online modes.	Can easily book train tickets whenever we want	High	Sprint-0
Customer (Web user)	Authentication	USER-2	Passenger details are encrypted so there is low chance to get hacked.	The personal detail will not leak	High	Sprint-1
Customer (Web user)	Accomplishment	USER-3	Features are so simple and effective.	Can support nearly 1000 users at a time	Low	Sprint-2
Customer Care Executive	Reporting	USER-1	Reporting data contribute to enhanced transparency to extent work regarding safety	Dealing with customer, and helping them to clear their queries.	Low	Sprint-0
Customer Care Executive	Problem solving skill	USER-2	Interacting with customers to ensure they have a desirable experience and customer satisfaction.	Handling customer with their complaints	High	Sprint-1
Administrator	Chief executive	USER-1	Create user or organization and provide access to user to login to IOT platform with user management administrator console	Responsible for all damage and maintains the entire system	High	Sprint-0

## 6. PROJECT PLANNING & SCHEDULING

### 6.1 Sprint Planning & Estimation

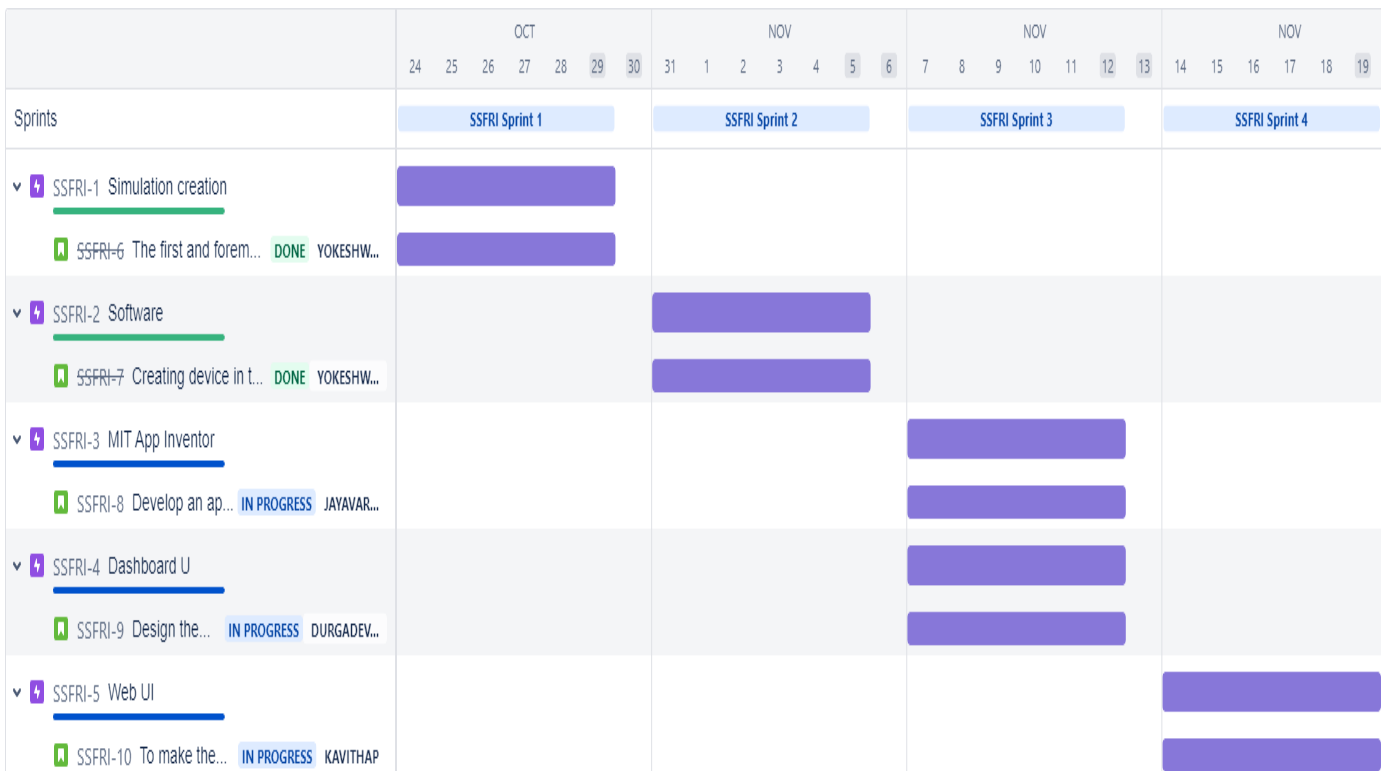
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulation creation	USN-1	The first and foremost task is connecting sensors and Arduino using python code	2	High	Yokeshwari. S Durga devi. S Jayavarshini. K. P Kavitha. P
Sprint-2	Software	USN-2	Creating device in the IBM Watson IOT platform, workflow for IOT scenarios using Node-red in connection with IBM cloud.	1	High	Yokeshwari. S Durga devi. S Jayavarshini. K. P Kavitha. P
Sprint-3	MIT App Inventor	USN-3	Develop an application for railways using IOT project using MIT App Inventor in the IBM cloud.	2	Low	Yokeshwari. S Durga devi. S Jayavarshini. K. P Kavitha. P
Sprint-3	Dashboard	USN-3	Design the modules and test Apps	2	Medium	Yokeshwari. S Durga devi. S Jayavarshini. K. P Kavitha. P
Sprint-4	Web UI	USN-4	To make the user to interact with software	1	High	Yokeshwari. S Durga devi. S Jayavarshini. K. P Kavitha. P

## 6.2 Sprint Delivery Schedule

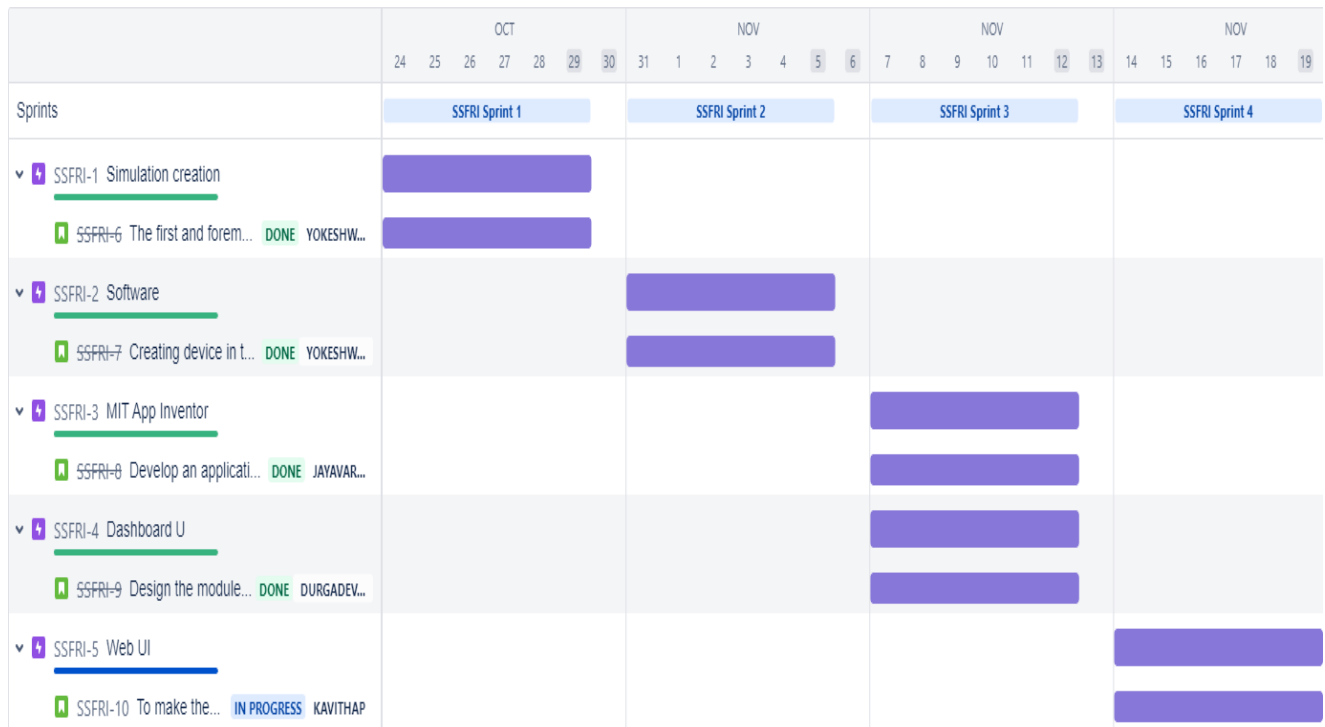
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned EndDate)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022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

## 6.3 Reports from JIRA

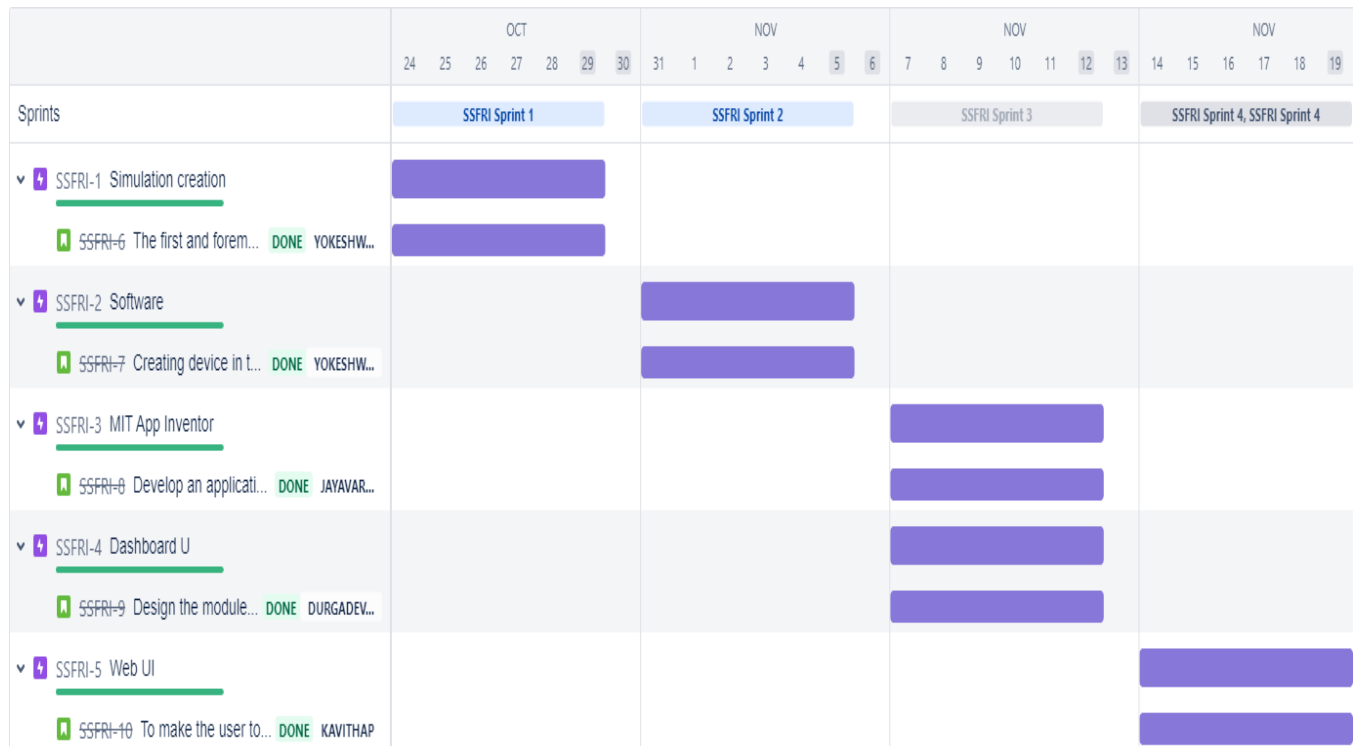
### Roadmap of Sprint-1 and sprint-2



## Roadmap of Sprint-3



## Roadmap of Sprint-4



## **7.CODING & SOLUTIONING (Explain the features added in the project along with code)**

### **7.1 Feature 1**

Our project is user friendly which is easy to access. It also generates tickets through QRcode in a mobilized way which reduces man work , also reduces the usage of paper

### **Code**

#### **Pythonc code:-**

##### **1.GPS code.py**

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
import requests
import json

#Provide your IBM Watson Device Credentials
organization = "vptt54"
deviceType = "GPS"      #Credentials of Watson IoT sensor simulator
deviceId = "1234"
authMethod = "token"
authToken = "12345678"

# Initialize the device client.
L=0
```

```

try:
    deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-
method": authMethod, "auth-token": authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
    #.....

except Exception as e:
    print("Caught exception connecting device: %s" % str(e))
    sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event
of type "greeting" 10 times
deviceCli.connect()

while True:
    overpass_url = "http://overpass-api.de/api/interpreter"
    overpass_query = """
[out:json];area[name="India"];(node[place="village"](area));out;
"""

    response = requests.get(
        overpass_url,
        params={'data': overpass_query}
    )

    coords = []
    if response.status_code == 200:
        data = response.json()
        places = data.get('elements', [])
        for place in places:
            coords.append((place['lat'], place['lon']))

```

```

    print ("Got %s village coordinates!" % len(coords))
    print (coords[0])
else:
    print("Error")

i = random.randint(1,100)
L = coords[i]
#Send random gprs data to node-red to IBM Watson
data = {"d":{ 'Latitude' : L[0], 'Longitude' : L[1]}}
#print data
def myOnPublishCallback():
    print("Published gprs location = ", L, "to IBM Watson")

success      =      deviceCli.publishEvent("Data",      "json",      data,      qos=0,
on_publish=myOnPublishCallback)
time.sleep(12)
if not success:
    print("Not connected to IoT")
time.sleep(1)
deviceCli.disconnect()

```

## 8. TESTING

### 8.1 Test Cases

Simulation process
Client Application
Security
Exception Reporting
Final Report Output

## 8.2 User Acceptance Testing

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1					Date	11 Nov 22									
2					Team ID	PNT2022TMD39421									
3					Project Name	smart solutions for railways									
4					Maximum Marks	4 marks									
5	Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By	
6	1	Functional	Registration	Registration through the form by Filling in my details		1.Click on register 2.Fill the registration form 3.click Register		Registration form to be filled is to be displayed	Working as expected	Pass				Yokeshwari. S	
7	2	UI	Generating OTP	Generating the otp for further process		1.Generating of OTP number		user can register through phone numbers, Gmail, Facebook or other social sites and to get oto number	Working as expected	pass				Yokeshwari. S	
8	3	Functional	OTP verification	Verify user otp using mail		1.Enter gmail id and enter password 2.click submit	Username: abc@gmail.com password: Testing123	OTP verified is to be displayed	Working as expected	pass				Jayavarshini. K.P	
9	4	Functional	Login page	Verify user is able to log into application with Invalid credentials		1.Enter into log in page 2.Click on My Account dropdown button 3.Enter Invalid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: abc@gmail.com password: Testing123	Application should show "Incorrect email or password" validation message.	Working as expected	pass				s	
10	5	Functional	Display Train details	The user can view about the available train details		1.As a user, I can enter the start and destination to get the list of trains available connecting the above	Username: abc@gmail.com password: Testing123678686786876	A user can view about the available trains to enter start and destination details	Working as expected	fail				Yokeshwari. S	
11															
12															

### Defect Analysis

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
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## Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Simulation process	7	0	0	7
Client Application	51	0	3	48
Security	2	0	0	2
Exception Reporting	3	0	0	3
Final Report Output	4	0	0	4

## 9.RESULTS

### 9.1 Performance Metrics



## **10. ADVANTAGES & DISADVANTAGES**

### **Advantages:**

- you always have it with you
- you can have live maps with traffic
- you can constantly update any downloaded maps
- screen resolution
- search built in
- battery life
- size (small)
- specialist maps for marine and wilderness
- . Free and Independent Operation
- Global Accessibility
- Commercial and Scientific Applications
- Civilian and Personal Applications

### **Disadvantages:**

- robustness
- accuracy
- sensitivity ( ability to detect the satellites)
- Battery life
- Dependency on one device in safety situations ( eg hiking)
- size ( big)
- specialist maps for marine and wilderness

## **11. CONCLUSION:**

In today's competitive world everyone runs in a race and its most important to reach ones destination on time. There occurs many misfortunes and delays during the train travel. Our project helps the customer or the end user to detect the live location of train using the GPS. This helps us to prevent any further delays in reaching their correct destination at a correct time.

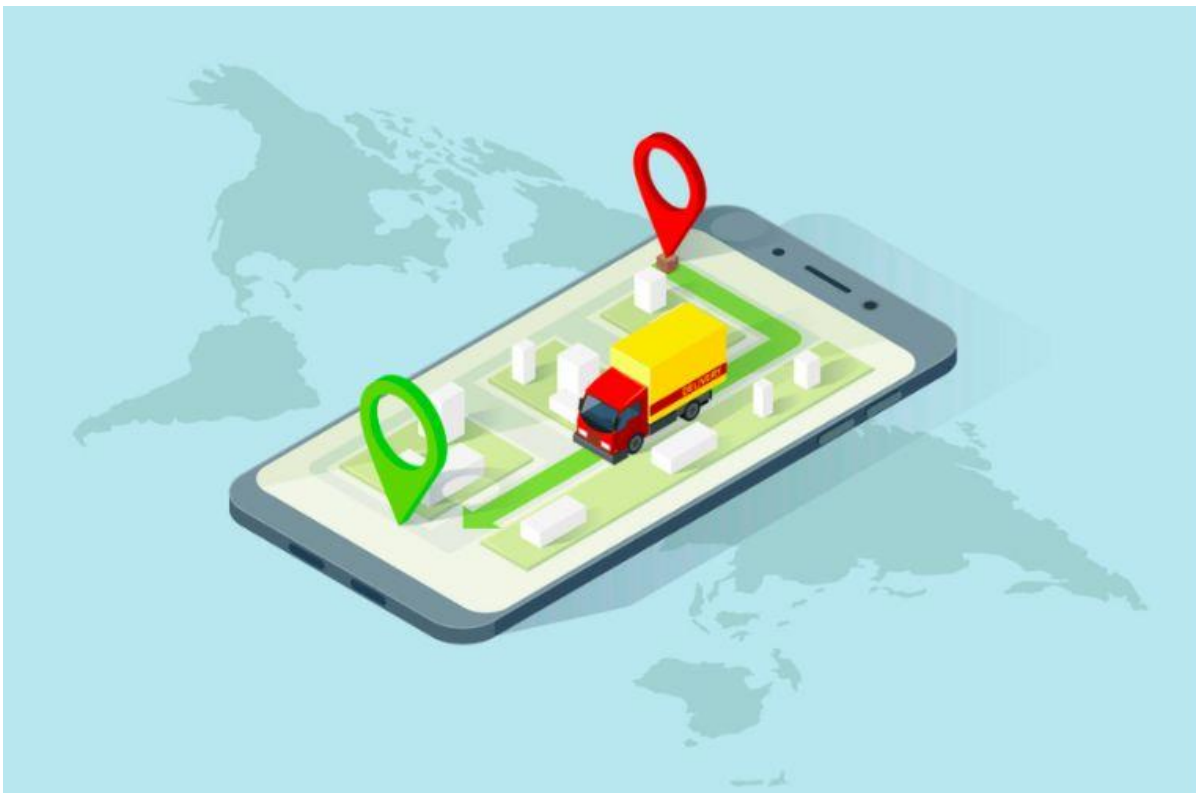
Also our project aims at saving the over usage of resources like paper. We have developed a train ticket confirmation through QRcode generation which is sent to the passengers mobile phone directly. By this method we can save over utilization of papers. It also reduces man power and helps the ticket checker to easy confirm the passengers identity.

## 12. FUTURE SCOPE:

Global Positioning System (GPS) is much more than just the means of finding a way while commuting. It fulfills a much higher purpose than finding the fastest route. They help you to monitor crucial parameters like speed, trip distance, geo-fencing, real-time tracking among others.

GPS trackers have paved the way for both automobiles like cars, trucks, buses as well as personal safety devices like GPS tracking smartwatches. They are easily trackable via smartphone or laptop keeping you tension-free.

Trackers are small with technological advancement, tend to grow and improve. The future of GPS tracking looks extremely promising and we can expect some interesting advancement in this area. Let's look at what the future holds for GPS monitoring systems.



**Compact Size and Longer Life Span**– Compact GPS devices are smaller than a cell phone but the experts predict that continuous development may shrink the sizes of these devices further.

The size of the tracker depends on the battery, while a thumbnail-sized receiver can be improved, it needs to be big enough to accommodate the battery. As the battery technology unfolds, in the future, we may be able to see GPS trackers getting smaller in size.

These days, the best trackers can go up to 30 days without a recharge but to go longer, extended battery packs may be needed which provide up to 6 months of uninterrupted usage.

**Affordability**– [GPS trackers](#) are no longer a luxury reserved for big organizations and government agencies. The low price points have brought it within the reach of small companies and even individuals. GPS vehicle tracking is a must for every business and the raised productivity and efficiency make it a value for money.

They are immensely useful for both the professional and personal front. As per their requirements, different sections of people can be catered through the affordable price range. The devices are getting compact yet powerful. Hence, this is the best time to invest in GPS tracking solutions.

**Extensive Usage**– Past few years have seen a considerable rise in businesses turning to GPS technology, as an effective way to manage their transports, employees, and assets. [GPS fleet management systems](#) allow enterprises to access driver's performance, vehicle maintenance to providing other necessary inputs like live vehicle tracking.

As the crime rate increases with each passing day, GPS trackers give a sigh of relief for parents. Trackers ensure the safety of your loved ones- be it children or elderly family members. Parents rely on these trackers to keep a watch and control their inexperienced young teenagers' reckless driving.

## 13. APPENDIX

### Source Code

#### 1. Python code for GPS tracking

```
import time

import sys

import ibmiotf.application

import ibmiotf.device

import random

import requests

import json

#Provide your IBM Watson Device Credentials
```

```

organization = "vptt54"

deviceType = "GPS"

#Credentials of Watson IoT sensor simulator

deviceId = "1234"

authMethod = "token"

authToken = "12345678"

# Initialize the device client.

L=0

try:

deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-
method": authMethod, "auth-token": authToken}

deviceCli = ibmiotf.device.Client(deviceOptions)

#.....

except Exception as e:

print("Caught exception connecting device: %s" % str(e))

sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event
of type "greeting" 10 times

deviceCli.connect()

while True:

    overpass_url = "http://overpass-api.de/api/interpreter"

    overpass_query = """
[out:json];area[name="India"];(node[place="village"](area));out;
"""

    response = requests.get( overpass_url,
        params={'data': overpass_query}
    )

```

```
coords = []

if response.status_code == 200:

    data = response.json()

    places = data.get('elements', [])

    for place in places:

        coords.append((place['lat'], place['lon']))

    print ("Got %s village coordinates!" % len(coords))

    print (coords[0])

else:

    print("Error")

i = random.randint(1,100)
L = coords[i]

#Send random gprs data to node-red to IBM Watson

data = {"d":{ 'Latitude' : L[0], 'Longitude' : L[1]}}

#print data

def myOnPublishCallback():

    print("Published gprs location = ", L, "to IBM Watson")

    success = deviceCli.publishEvent("Data", "json", data, qos=0,
    on_publish=myOnPublishCallback)

    time.sleep(12)

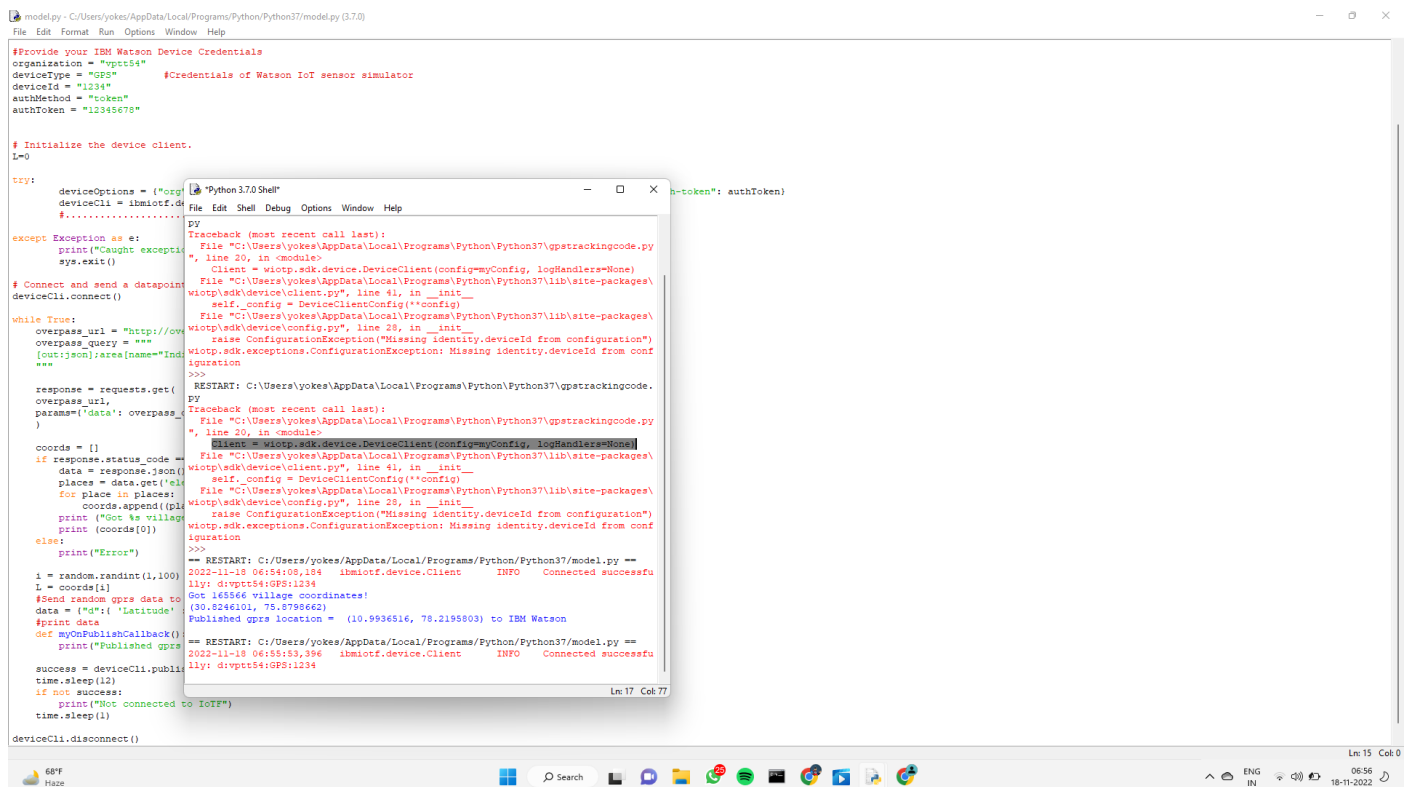
    if not success:

        print("Not connected to IoT")

        time.sleep(1)

    deviceCli.disconnect()
```

# Output:-



```
#Provide your IBM Watson Device Credentials
organization = "diptt54"
deviceType = "GPS"
deviceId = "1234"
authMethod = "token"
authToken = "12345678"

# Initialize the device client.
l=0

try:
    deviceOptions = {"org":
deviceCli = ibmiotf.device.DeviceClient(config=myConfig, logHandlers=None)
except Exception as e:
    print("Caught exception")
    sys.exit()

# Connect and send a datapoint
deviceCli.connect()

while True:
    overpass_url = "http://ov
    overpass_query = ""
    [out:json];area[name="Ind
    """
    response = requests.get(
    overpass_url,
    params={"data": overpass_
    )
    coords = []
    if response.status_code ==
    data = response.json()
    places = data.get('el
    for place in places:
        coords.append([pl
        print ("Got %s village
        print (coords[0])
    else:
        print("Error")
    i = random.randint(1,100)
    l = coords[i]
    #Send random gpsr data to
    data = {'id':1, 'Latitude'
    #Print data
    def myOnPublishCallback()
    print("Published gpsr
    success = deviceCli.publish
    time.sleep(12)
    if not success:
        print("Not connected to IoTF")
        time.sleep(1)

deviceCli.disconnect()
```

```
Traceback (most recent call last):
  File "C:\Users\yokes\AppData\Local\Programs\Python\Python37\gpstrackingcode.py", line 20, in <module>
    Client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
  File "C:\Users\yokes\AppData\Local\Programs\Python\Python37\lib\site-packages\wiotp\edk\device\client.py", line 41, in __init__
    self.config = DeviceClientConfig(**config)
  File "C:\Users\yokes\AppData\Local\Programs\Python\Python37\lib\site-packages\wiotp\edk\device\config.py", line 28, in __init__
    raise ConfigurationException("Missing identity.deviceId from configuration")
wiotp.edk.exceptions.ConfigurationException: Missing identity.deviceId from conf
figuration
>>>
RESTART: C:\Users\yokes\AppData\Local\Programs\Python\Python37\gpstrackingcode.
py
Traceback (most recent call last):
  File "C:\Users\yokes\AppData\Local\Programs\Python\Python37\gpstrackingcode.py", line 20, in <module>
    Client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
  File "C:\Users\yokes\AppData\Local\Programs\Python\Python37\lib\site-packages\wiotp\edk\device\client.py", line 41, in __init__
    self.config = DeviceClientConfig(**config)
  File "C:\Users\yokes\AppData\Local\Programs\Python\Python37\lib\site-packages\wiotp\edk\device\config.py", line 28, in __init__
    raise ConfigurationException("Missing identity.deviceId from configuration")
wiotp.edk.exceptions.ConfigurationException: Missing identity.deviceId from conf
figuration
>>>
RESTART: C:\Users\yokes\AppData\Local\Programs\Python\Python37\model.py ==
2022-11-15 06:54:08,184 ibmiotf.device.Client INFO Connected successfu
lly: diptt54:GPS:1234
Got 145564 village coordinates!
(30.4244101, 75.3788662)
Published gpsr location = (10.9936516, 78.2195803) to IBM Watson
RESTART: C:\Users\yokes\AppData\Local\Programs\Python\Python37\model.py ==
2022-11-15 06:55:53,396 ibmiotf.device.Client INFO Connected successfu
lly: diptt54:GPS:1234
```

## GitHub & Project Demo Link

<https://github.com/IBM-EPBL/IBM-Project-3674-1658588435>