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# PROJECT OVERVIEW

1. **INTRODUCTION**

The future of the railway industry is expected to rely upon smart transportation systems that leverage technologies over a large rail network infrastructure to reduce its life-cycle cost. New services, such as integrated security, asset management, and predictive maintenance, are expected to improve timely decision-making for issues like safety, scheduling, and system capacity. Smart railways represent a combination of interconnected technological solutions and components, as well as modern transportation infrastructure like automatic ticketing systems, digital displays, and smart meters. Smart sensors and analytics across the train engine, coaches, and tracks allow rail systems to be remotely checked and repaired before a small issue magnifies into huge trouble. Asset health monitoring through IoT insights implies less of maintenance delays and helps in extending the life of rail infrastructure.



# PURPOSE

Internet is basically system of interconnected computers through network. But now its use is changing with changing world and it is not just confined to emails or web browsing.Today’s internet also deals with embedded sensors and has led to development of smart homes, smart rural area, e-health care’s etc. and this introduced the concept of IoT . Internet of Things refers to interconnection or communication between two or more devices without humanto- human and human-to-computer interaction. Connected devices are equipped with sensors or actuators perceive their surroundings. IOT has four major components which include sensing the device, accessing the device, processing the information of the device, and provides application and services. In addition to this it also provides security and privacy of data . More improvements are being introduced in almost all fields to reduce human effort and save time.

Thinking of the same is trying to introduce automation in the field of track testing. Railroad track is an integral part of any company's asset base, since it provides them with the necessary business functionality. Problems that occur due to problems in railroads need to be overcome. The latest method used by the Indian railroad is the tracking of the train track which requires a lot of manpower and is time-consuming **.**

# LITERATURE SURVEY

# 

* 1. **EXISTING SYSTEM**

In the Existing train tracks are manually researched. LED (Light Emitting Diode) and LDR (Light Dependent Resister) sensors cannot be implemented on the block of the tracks ]. The input image processing is a clamorous system with high cost and does not give the exact result. The Automated Visual Test Method is a complicated method as the video color inspection is implemented to examine the cracks in rail track which does not give accurate result in bad weather. This traditional system delays transfer of information. Srivastava et al., (2017) proposed a moving gadget to detect the cracks with the help of an array of IR sensors to identify the actual position of the cracks as well as notify to nearest railway station . Mishra et al., (2019) developed a system to track the cracks with the help of Arduino mega power using solar energy and laser. A GSM along with a GPS module was implemented to get the actual location of the faulty tracks to inform the authorities using SMS via a link to find actual location on Google Maps. Rizvi Aliza Raza presented a prototype in that is capable of capturing photos of the track and compare it with the old database and sends a message to the authorities regarding the crack detected. The detailed analysis of traditional railway track fault detection techniques is explained in table

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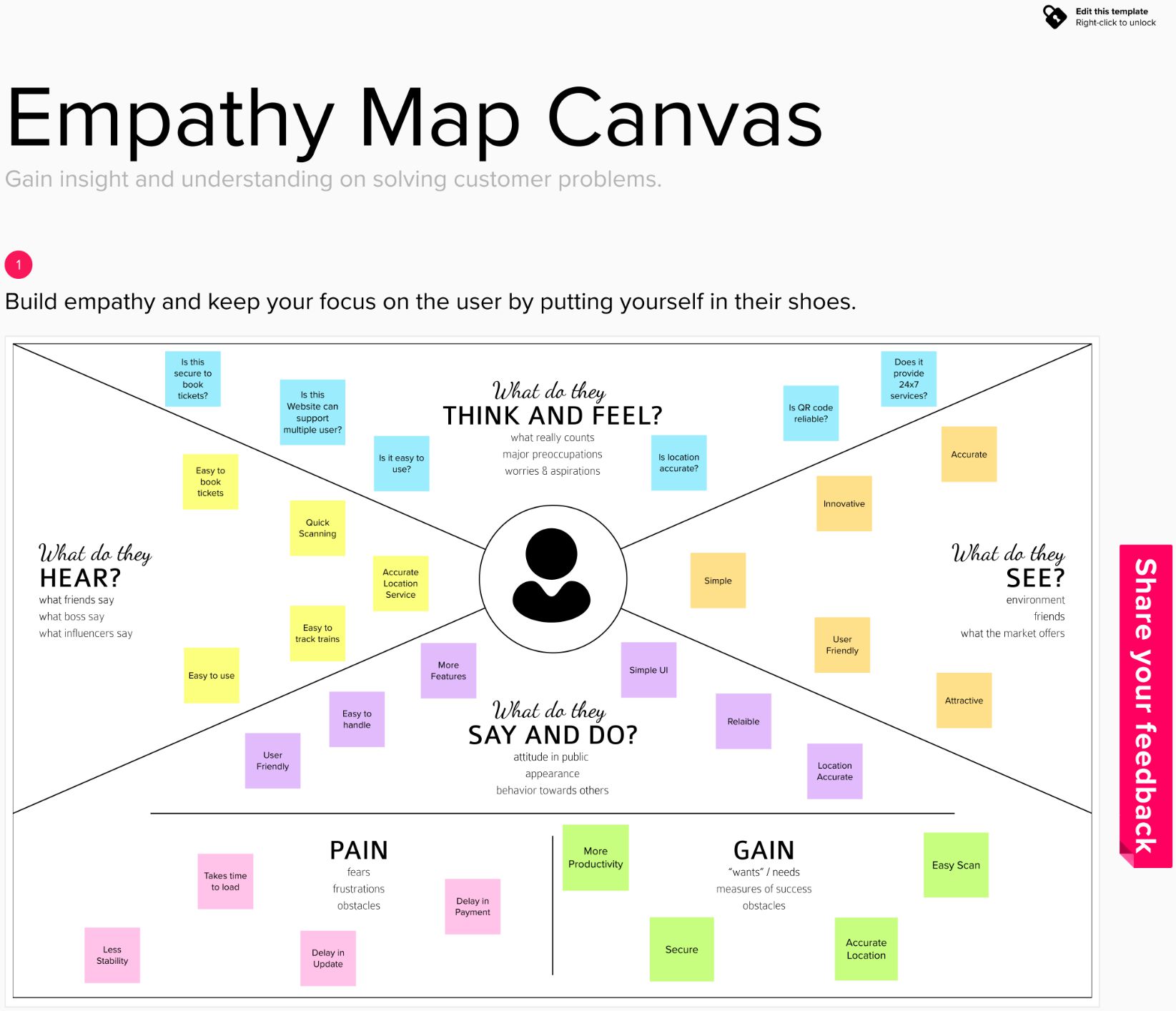
7. H. Aly, A. Basalamah, and M. Youssef, “Accurate and energy-efficient GPS-less outdoor localization,” ACM Trans. Spatial Algorithms Syst., vol. 3, no. 2, pp. 1–31, Jul. 2017.

# PROBLEM STATEMENT DEFINITION

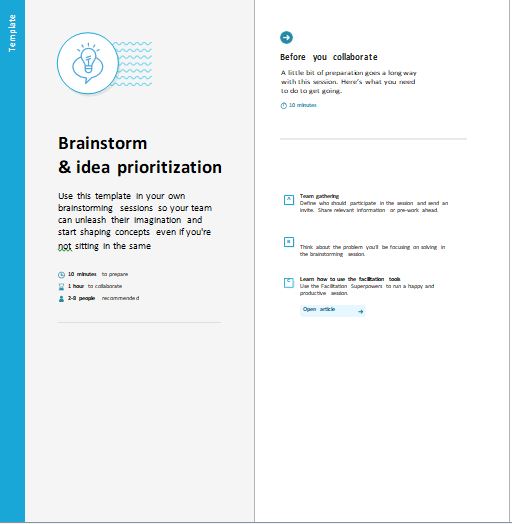
Among the various modes of transport, railways is one of the biggest modes of transport in the world. Though there are competitive threats from airlines, luxury buses, public transports, and personalized transports the problem statement is to answer the question “What are the problems faced by the passengers while travelling by train at station and on board”

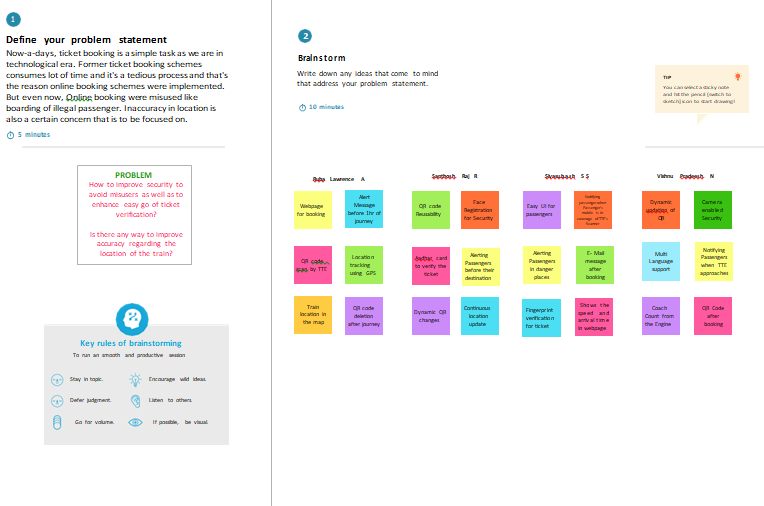
# IDEATION AND PROPOSED SOLUTON

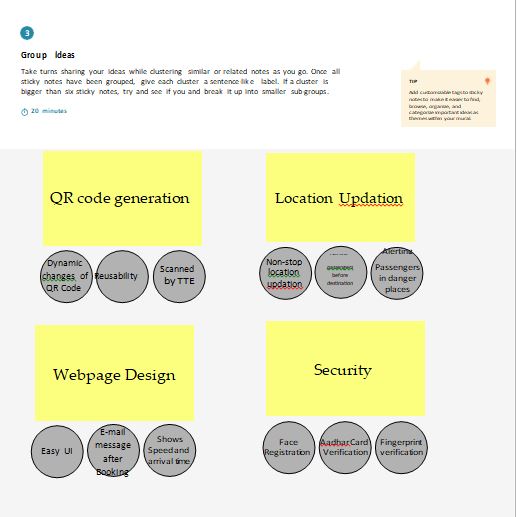
* 1. **EMPATHY MAP CANVAS**

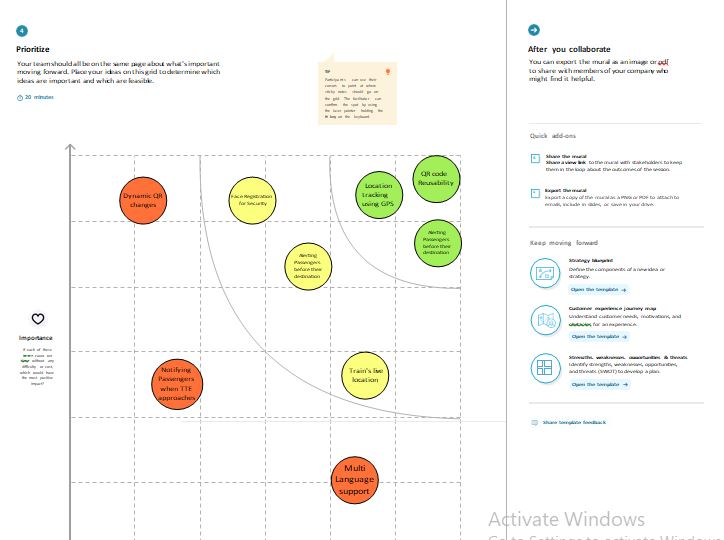
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# IDEATION & BRAINSTORMING









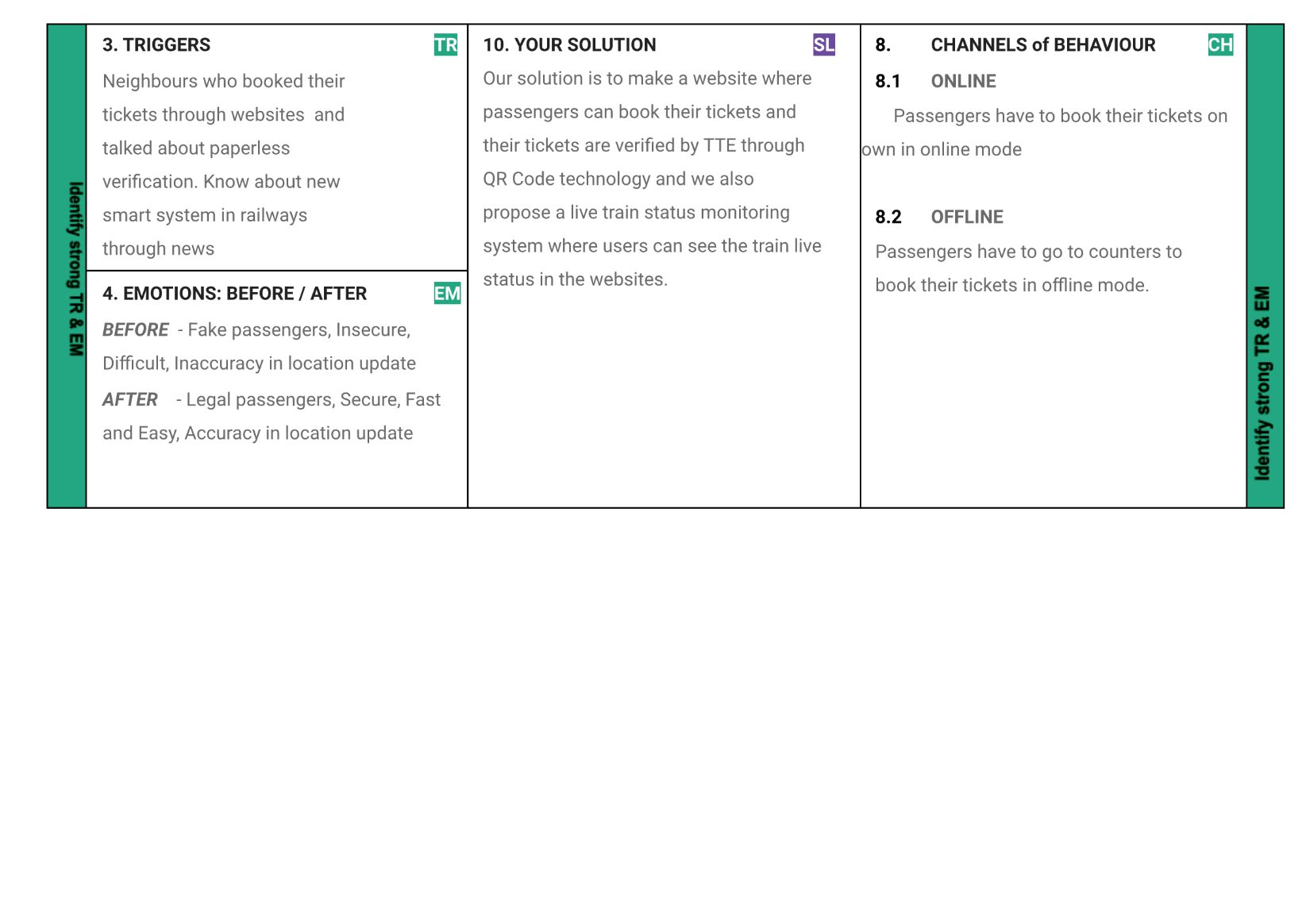
* 1. **PROPOSED SOLUTION**

|  |  |  |
| --- | --- | --- |
| **S.NO** | **PARAMETERS** | **DESCRIPTIONS** |
| 1 | Problem Statement  (Problem to be solved) | In order to satisfy the passengers, the Railways provides various services to its passengers But, the passengers can face some problems. |
| 2 | Idea / Solution description | The idea is to minimize the ticket booking problems among the passengers by providing Online mode of  booking rather than papers. . In queues in front of the ticket counters in railway stations have been drastically increased over the time. |
| 3 | Novelty / Uniqueness | Online mode of booking is most common and so ease of access to everyone that makes more efficient  uniqueness of utilizing the technique. People can book their ticket through online and they get a QR code  through SMS |
| 4 | Social Impact / Customer Satisfaction | Customers for sure they get satisfied as they are in the fast roaming world this technique makes more easier for travelling passengers. A web page is designed in  which the user can book tickets and will be provided with the QR code, which will be shown to the ticket  collector and by scanning the QR code the ticket collector will get the passenger details |

|  |  |  |
| --- | --- | --- |
| 5 | Business Model (Revenue Model) | A web page is designed in which the user can book tickets and will be provided with the QR code, which will be shown to the ticket collector and by scanning  the QR code the ticket collector will get the passenger  details. The booking details of the user will be stored in the database, which can be retrieved any time |
| 6 | Scalability of the Solution | The scalability of this solution is most feasible among the passengers who are willing to travel. No need of  taking printout Counter ticket has to be handled with care, but SMS on mobile is enough. No need to taking  out wallet and showing your ticket to TTR just tell your name to TTR that you are a passenger with valid proof |

# PROBLEM SOLUTION FIT

# C:\Users\Administrator\AppData\Local\Microsoft\Windows\INetCache\Content.Word\(1-2) Problem solution fit.jpg



1. **REQUIREMENT ANALYSIS**

# FUNCTIONAL REQUIREMENTS

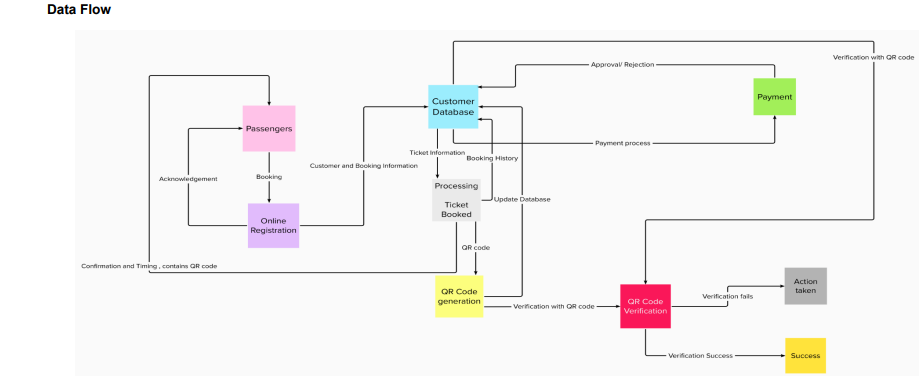
|  |  |  |
| --- | --- | --- |
| **FR No.** | **Functional Requirement (Epic)** | **Sub Requirement (Story / Sub-Task)** |
| FR-1 | User Requirements | Smartphone / Laptop Internet QR code Scanner |
| FR-2 | User Registration | Registration through website  Manual Registration |
| FR-3 | User Confirmation | Confirmation via OTP sent via Email Confirmation via OTP sent via Phone Number  Authentication |
| FR-4 | Payment Options | Net Banking/ UPI Credit/Debit card  Digital Wallet |
| FR-5 | User Feedback | Feedback via website  Contact the authority via mail Direct Complaint |
| FR-6 | Installation | Directly use via website |

* 1. **NON-FUNCTIONAL REQUIREMENTS**

|  |  |  |
| --- | --- | --- |
| **FR No.** | **Non-Functional Requirement** | **Description** |
| NFR-1 | **Usability** | Have an easy to use and understand. Mobile friendly  for better reach. Offline access. |
| NFR-2 | **Security** | Multi-Factor authentication Strong password policy Having strong encryption. Facial Recognition. |
| NFR-3 | **Reliability** | Periodic updates to fix any bugs in the application. Offline mode for important features for better reliability to use in place with no internet  connectivity. |
| NFR-4 | **Performance** | The payment should be quick and reliable. The application should be user friendly and easy to use. |
| NFR-5 | **Availability** | The up-time should be 24\*7 as train journeys take place throughout the day.  Databases should have a history of data. |
| NFR-6 | **Scalability** | The database should be able to handle a large volume of data especially during peak times. It |

# PROJECT DESIGN

* 1. **DATA FLOW DIAGRAMS**

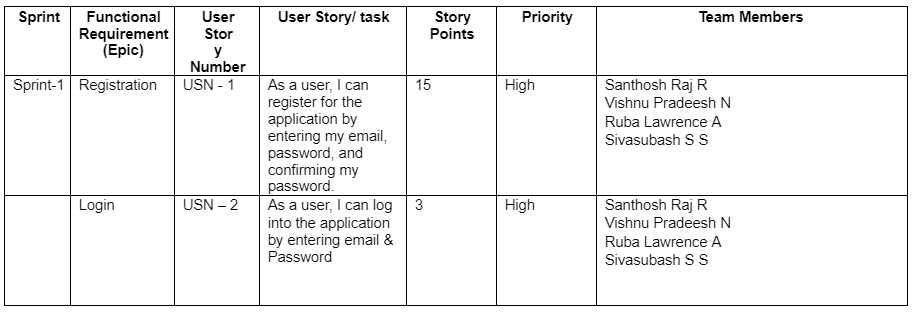


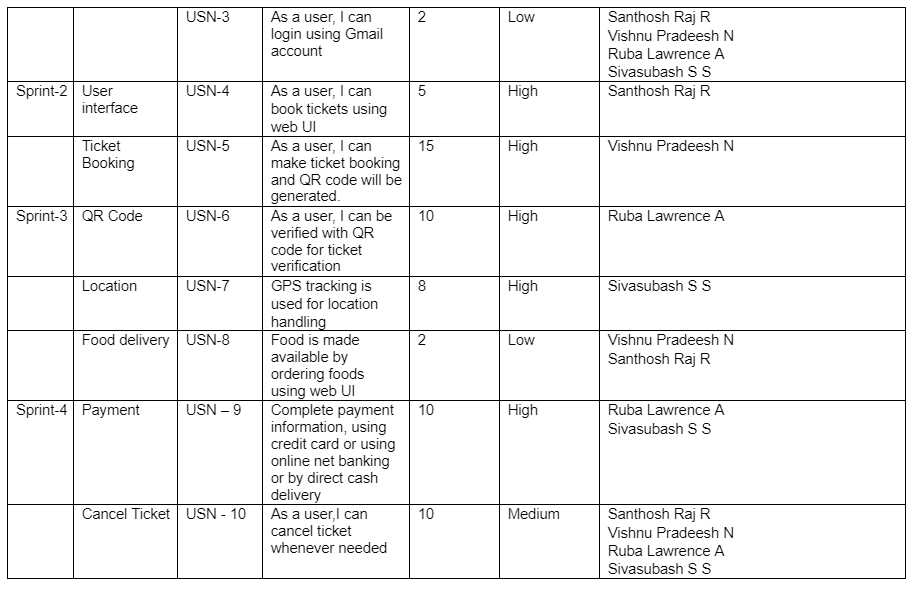
# SOLUTION & TECHNICAL ARCHITECTURE

# C:\Users\Administrator\Downloads\Capture.JPG

# PROJECT PLANNING AND SCHEDULING

* 1. **SPRINT PLANNING& ESTIMATION**

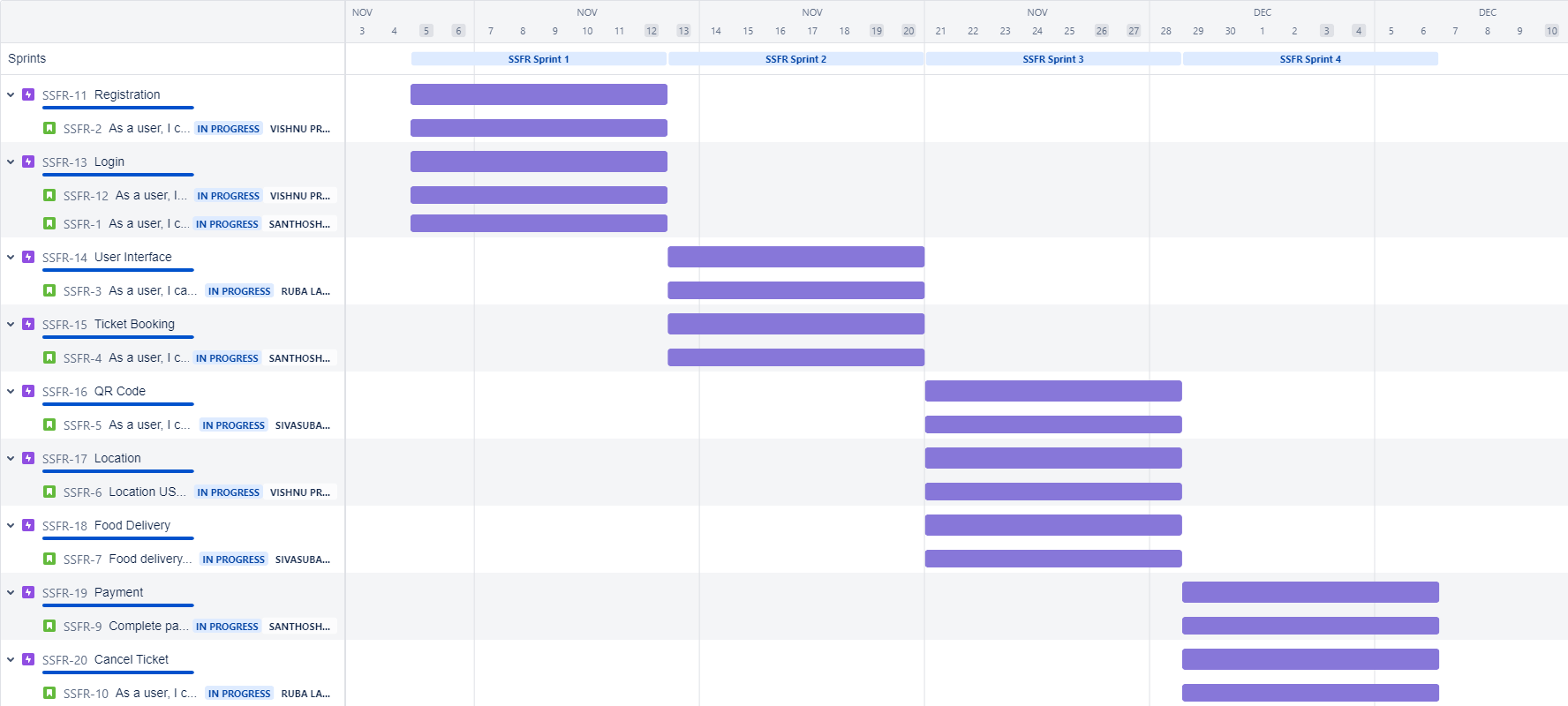




# 6.2.SPRINT DELIVERY SCHEDULE

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sprint** | **Total Story Points** | **Duration** | **Sprint Start Date** | **Sprint End Date (Planned)** | **Story Points Completed (as on Planned**  **End Date)** | **Sprint Release Date (Actual)** |
| Sprint – 1 | 20 | 8 Days | 5 Nov 2022 | 12 Nov 2022 | 19 | 11 Nov 2022 |
| Sprint – 2 | 20 | 8 Days | 13 Nov  2022 | 20 Nov 2022 | 20 | 19 Nov 2022 |
| Sprint – 3 | 20 | 8 Days | 21 Nov  2022 | 28 Nov 2022 | 20 | 27 Nov 2022 |
| Sprint – 4 | 20 | 8 Days | 29 Nov  2022 | 6 Dec 2022 | 20 | 5 Dec 2022 |

**6.3.REPORTS FROM JIRA**



# CODING AND SOLUTIONING

* 1. **FEATURE 1**
* IOT device
* IBM Watson platform
* Node red
* Cloudant DB
* Web UI
* Geofence MIT App
* Python code

# FEATURE 2

* + - Registration
    - Login
    - Verification
    - Ticket Booking
    - Payment
    - Ticket Cancellation
    - Adding Queries

# Sprint1

# 

# 

# 

# 

# 

# 7.4.Sprint2

# 

# 

# 

# 

**Python code:**

import cv2

import numpy as np

import time

import pyzbar.pyzbar as pyzbar

from ibmcloudant.cloudant\_v1 import CloudantV1

from ibmcloudant import CouchDbSessionAuthenticator

from ibm\_cloud\_sdk\_core.authenticators import BasicAuthenticator

authenticator = BasicAuthenticator('apikey-v2-1om1gapjdursna7dhcddso41bl4a3hgnvc1izb2e8rpv','89ea6d526d06babf7ab9adae943d6e51')

service = CloudantV1(authenticator=authenticator)

service.set\_service\_url('https://apikey-v2-1om1gapjdursna7dhcddso41bl4a3hgnvc1izb2e8rpv:89ea6d526d06babf7ab9adae943d6e51@cc3a7875-5c48-4cce-90b0-cc5fc493e5ed-bluemix.cloudantnosqldb.appdomain.cloud')

cap = cv2.VideoCapture(0)

font = cv2.FONT\_HERSHEY\_PLAIN

while True:

\_, frame = cap.read()

decodedObjects = pyzbar.decode(frame)

for obj in decodedObjects:

#print("Data",obj.data)

a = obj.data.decode('UTF-8')

cv2.putText(frame,"Ticket",(50,50),font,2,(255,0,0),3)

#print(a)

try:

response = service.get\_document(

db = 'passengerdetails',

doc\_id = a).get\_result()

print(response)

time.sleep(5)

except Exception as e:

print("Not a Valid Ticket")

time.sleep(5)

cv2.imshow("Frame",frame)

if cv2.waitKey(1) & 0xFF == ord('q'):

break

cap.release()

cv2.destroyAllWindows()

client.disconnect()

# 7.5.Sprint3

# 

Python code:

import time

import sys

import ibmiotf.application

import ibmiotf.device

import random

organization = "9y2uod"

deviceType = "Microcontroller"

deviceId = "1407"

authMethod = "token"

authToken = "9585786415"

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()

deviceCli.connect()

def publish(data):

def myOnPublishCallback():

print("Published data: %s", data)

success = deviceCli.publishEvent("micro\_event","json",data,qos=0,on\_publish=myOnPublishCallback) #uploading data onto the IBM IoT Platform...

if not success:

print("Not connected to IoTF")

while True:

data = {'name' : 'Vaigai EXP', 'lat' : 17.6387448,'long' : 78.4754336}

publish(data)

time.sleep(3)

data = {'name' : 'Vaigai EXP', 'lat' : 17.6341908,'long' : 78.4744722}

publish(data)

time.sleep(3)

data = {'name' : 'Vaigai EXP', 'lat' : 17.6340889,'long' : 78.4745052}

publish(data)

time.sleep(3)

data = {'name' : 'Vaigai EXP', 'lat' : 17.6248626,'long' : 78.4720259}

publish(data)

time.sleep(3)

data = {'name' : 'Vaigai EXP', 'lat' : 17.6188577,'long' : 78.4698726}

publish(data)

time.sleep(3)

data = {'name' : 'Vaigai EXP', 'lat' : 17.6132382,'long' : 78.4707318}

publish(data)

time.sleep(3)

deviceCli.disconnect()

# 

# 

# 

# 7.6.Sprint4

# 

# 

# 

# RESULTS

* 1. **PERFORMANCE METRICS**



# ADVANTAGES &DISADVANTAGES

* 1. **ADVANTAGES**
     + Openness – compatibility between different system modules, potentially from different vendors;
     + Orchestration – ability to manage large numbers of devices, with full visibility over them; o Dynamic scaling – ability to scale the system according to the application needs, through resource virtualization and cloud operation;
     + Automation – ability to automate parts of the system monitoring application, leading to better performance and lower operation costs.

# DISADVANTAGES

* + - * Approaches to flexible, effective, efficient, and low-cost data collection for both railway vehicles and infrastructure monitoring, using regular trains;
      * Data processing, reduction, and analysis in local controllers, and subsequent sending of that data to the cloud, for further processing;
      * Online data processing systems, for real-time monitoring, using emerging communication technologies;
      * Integrated, interoperable, and scalable solutions for railway systems preventive maintenance.

# 10.CONCLUSION

Accidents occurring in Railway transportation system cost a large number of lives. So this system helps us to prevent accidents and giving information about faults or cracks in advance to railway authorities. So that they can fix them and accidents cases becomes less. This project is cost effective. By using more techniques they can be modified and developed according to their applications. By this system many lives can be saved by avoiding accidents. The idea can be implemented in large scale in the long run to facilitate better safety standards for rail tracks and provide effective testing infrastructure for achieving better results in the future.

# 11.FUTURE SCOPE

In future CCTV systems with IP based camera can be used for monitoring the visual videos captured from the track. It will also increase security for both passengers and railways. GPS can also be used to detect exact location of track fault area, IP cameras can also be used to show fault with the help of video.

Locations on Google maps with the help of sensors can be used to detect in which area track is broken

# 12.APPENDIX

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# 13.GIT HUB LINK

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# [GitHub - IBM-EPBL/IBM-Project-3554-1658578452: Smart Solutions For Railways](https://github.com/IBM-EPBL/IBM-Project-3554-1658578452)