SMART SOLUTIONS FOR RAILWAYS

A PROJECT REPORT
Submitted by

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Of

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In

ELECTRONICS AND COMUNICATIONS ENGINEERING

DHAANISH AHMED COLLEGE OF ENGINEERING,
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ANNA UNIVERSITY: CHENNAI 600 025

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1. INTRODUCTION

1.1 Project Overview

- A Web page is designed for the public where they can book tickets by seeing the available seats.
- After booking the train, the person will get a QR code which has to be shown to the Ticket Collector while boarding the train.
- The ticket collectors can scan the QR code to identify the personal details.
- A GPS module is present in the train to track it. The live status of the journey is updated in the Web app continuously
- All the booking details of the customers will be stored in the

  database with a unique ID and they can be retrieved back whenthe

  Ticket Collector scans the QR Code.

1.2 Purpose

The Purpose of our Project is

- To reduce the work load of the user and also the use of paper.
- To enable online Ticket Booking
- To track the live location of train
- To enable Automatic Ticket Verification system
- To reduce the work load of Travelling Ticket Examiner (TTE)

2. LITERATURE SURVEY

2.1 Existing Problem :

➤ Passengers who need to book train tickets have to follow a tedious procedure to get a ticket reserved.

➤ They have to wait in the Ticket booking counter to do the reservation.

➤ Also the TTE has a heavy workload in processing all the paper documents in verifying a user's ticket.

➤ Public users wish to track their train journey to have a sophisticated travel.

2.2 References :

➔ S. Karthick and A. Velmurugan, "Android suburban railway ticketing with GPS as ticket checker,"2012 IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT), pp. 63-66, 2012.

➔ B. Mallikarjuna, A. K. R. Doddi and G. Sailaja, "Enhanced Railway Reservation System using Internet of Things," 2018 IADS International Conference on Computing, Communications & Data Engineering (CCODE), 2018.

➔ G. Shelar, V. Rathod and S. Patil, "Railway Ticket Booking System with Restricted Wi-Fi Zone," International Journal of Trend in Scientific Research and Development (ijtsrd), vol. 2, no. 4, pp. 611-615, 2018.

➔ Swarup, M. Mohan, A. Dwivedi, C. Sonkar, R. Prasad, M. Bag and V. Singh, "A QR code based processing for dynamic and transparent seat allocation in Indian railway," nternational Journal of Computer Science Issues (IJCSI) 9, no. 3 (2012), p. 338, 2012.

➔ R. I. Rajkumar, P. E. Sankaranarayanan and G. Sundari, "GPS and Ethernet based real time train tracking system," 2013 International Conference on Advanced Electronic Systems (ICAES), pp. 282-286, 2013.

➔ C. Ulianov, P. Hyde and R. Shaltout, "Railway Applications for Monitoring and Tracking Systems," Marinov, M. (eds) Sustainable Rail Transport. Lecture Notes in Mobility. Springer, Cham., 20

2.3 Problem Statement definition:

QUESTION	DESCRIPTION
Who does the problem affect?	Passengers, Voyagers.
What are the boundaries of the problem?	Railway ticket booking system that generates a unique QR code for each ticket. Tracking the live location of trains using the GPS.
What is the issue?	Passengers cannot choose the seats they prefer. They have to carry a physical ticket which may get lost. Passengers who got to go quick may not have enough time to wait for the train indefinitely. The live location of the train can help them make the decision to wait or take some other mode of transport.
When does the issue occur?	All the time.
Where is the issue occurring?	Existing Train booking systems, Train and in Railway Stations.
Why is it important that we fix the problem?	Railway is one of the most common modes of transport. Improving the user experience is very important. An efficient way to check the tickets is of top priority.

1. Arun is a trekker and likes long distance travelling. His preferred mode of transport is Railways as it is cost effective. He wants to enjoy his journey along the way. So, he wants the window seat to adore the nature while travelling.

2. Bharath is a very busy guy and goes from one place to another frequently. He needs a way to minimize the time he waits between the travels so that he finishes his work quickly.

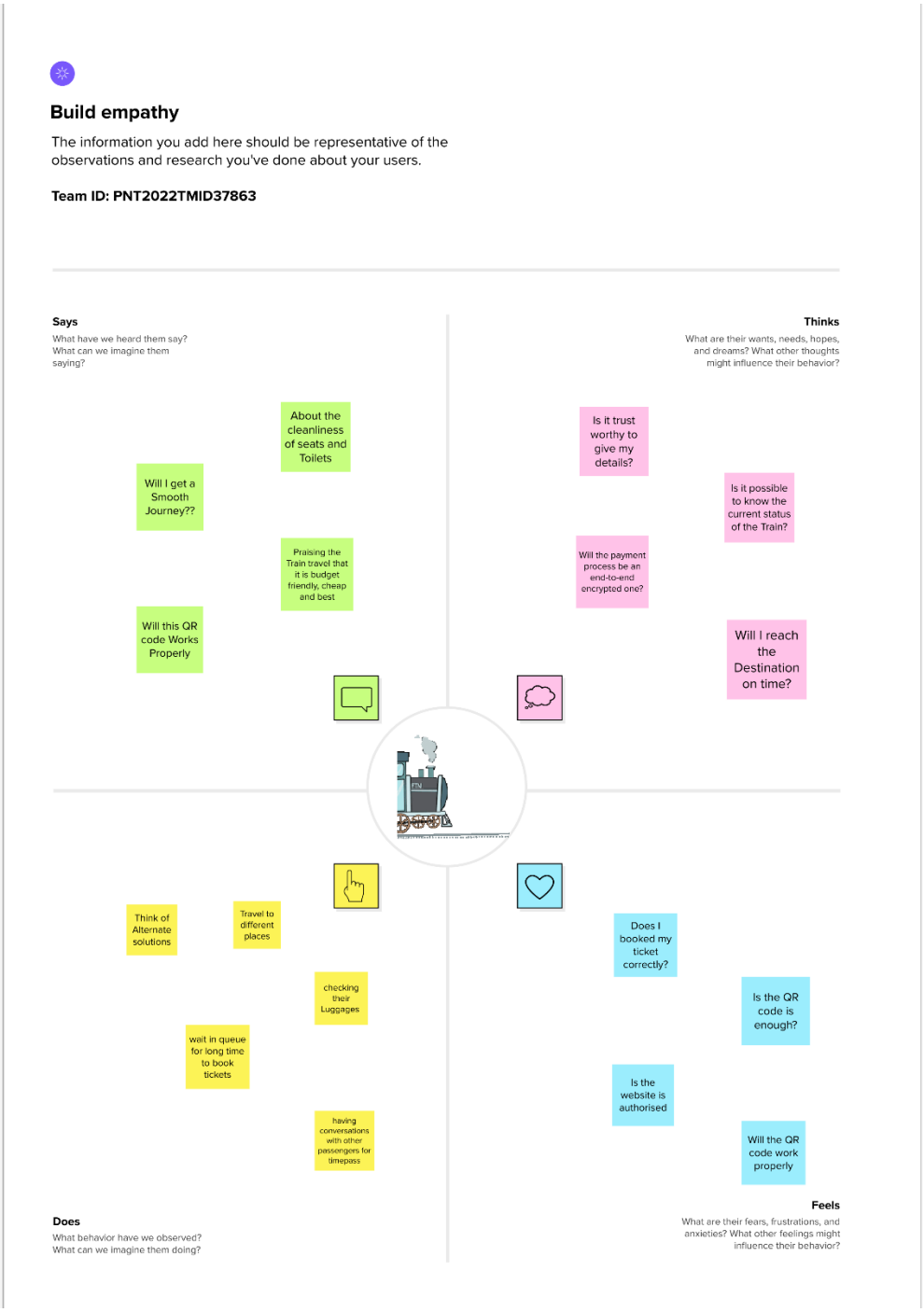
3. KG is a forgetful guy and the only thing he carries all the time is his iPhone. As a result, he likes to have the train ticket in the digital form in his mobile so that he has one less thing to worry about forgetting.

4. HP is a TTE and he wants to verify if the tickets are legitimate reliably and quickly so that he can check a greater number of passengers, reducing the possibilities of travelling without the ticket and escaping the fine.

3. IDEATION & PROPOSED SOLUTION

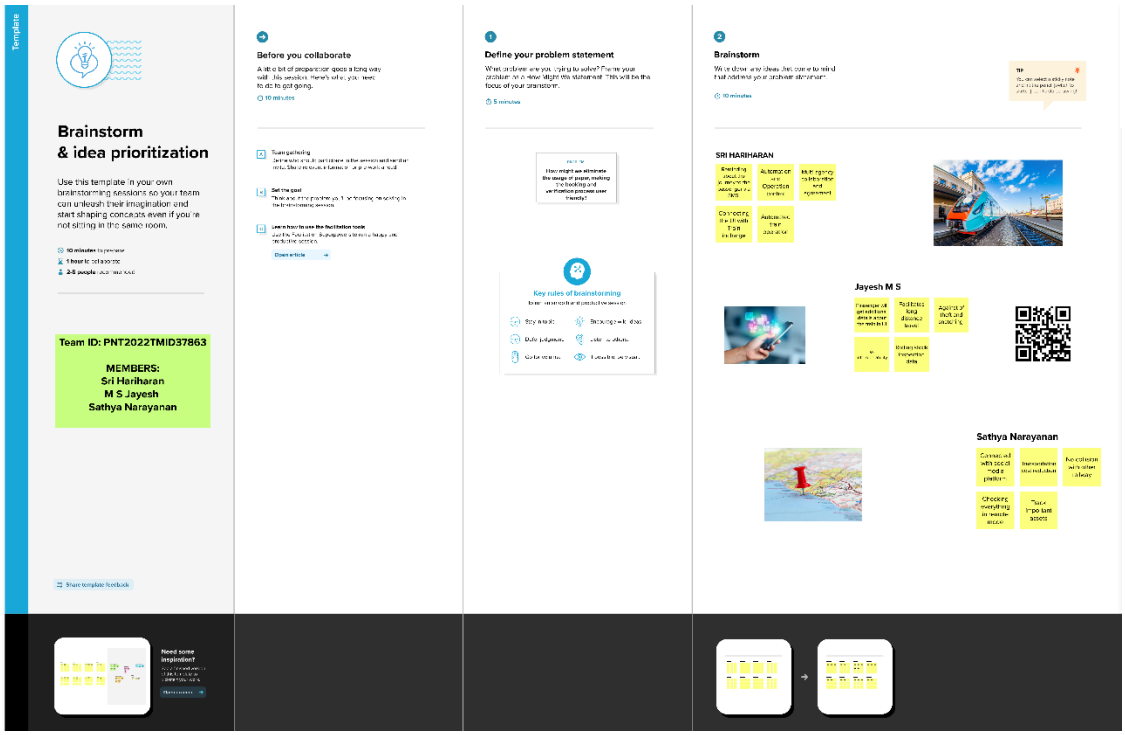
3.1 EMPATHY MAP CANVAS

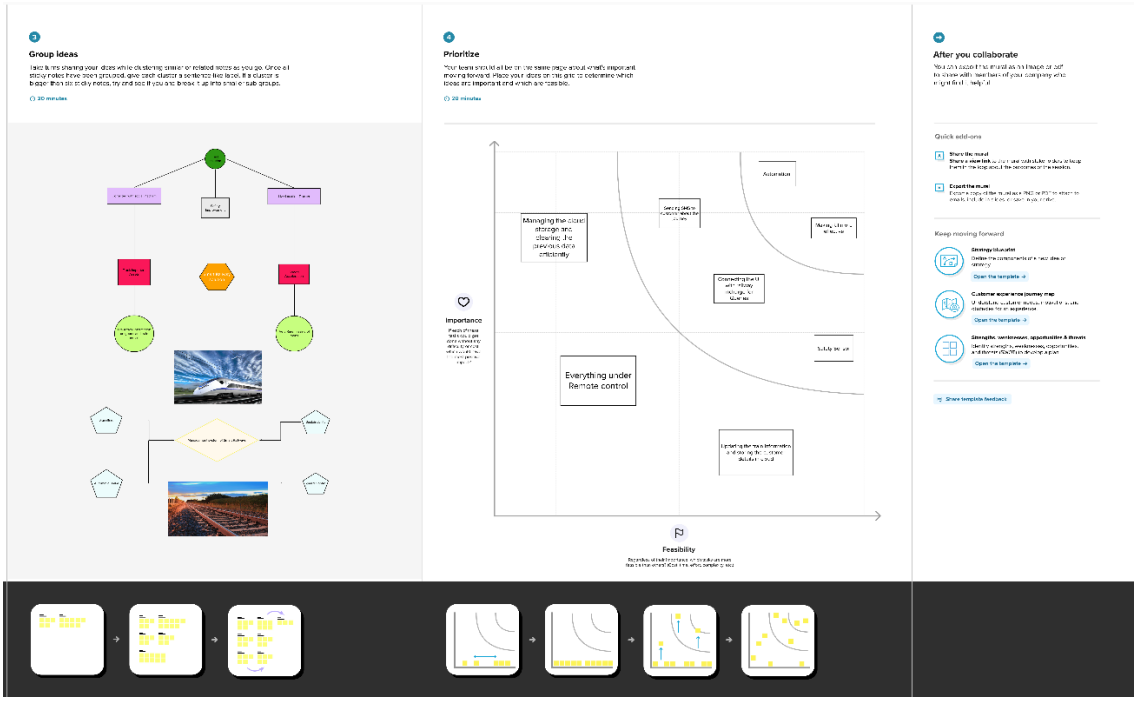
Click this link to view EMPATHY MAP



3.2 Ideation & Brainstorming

Click this link to view BRAINSTORM

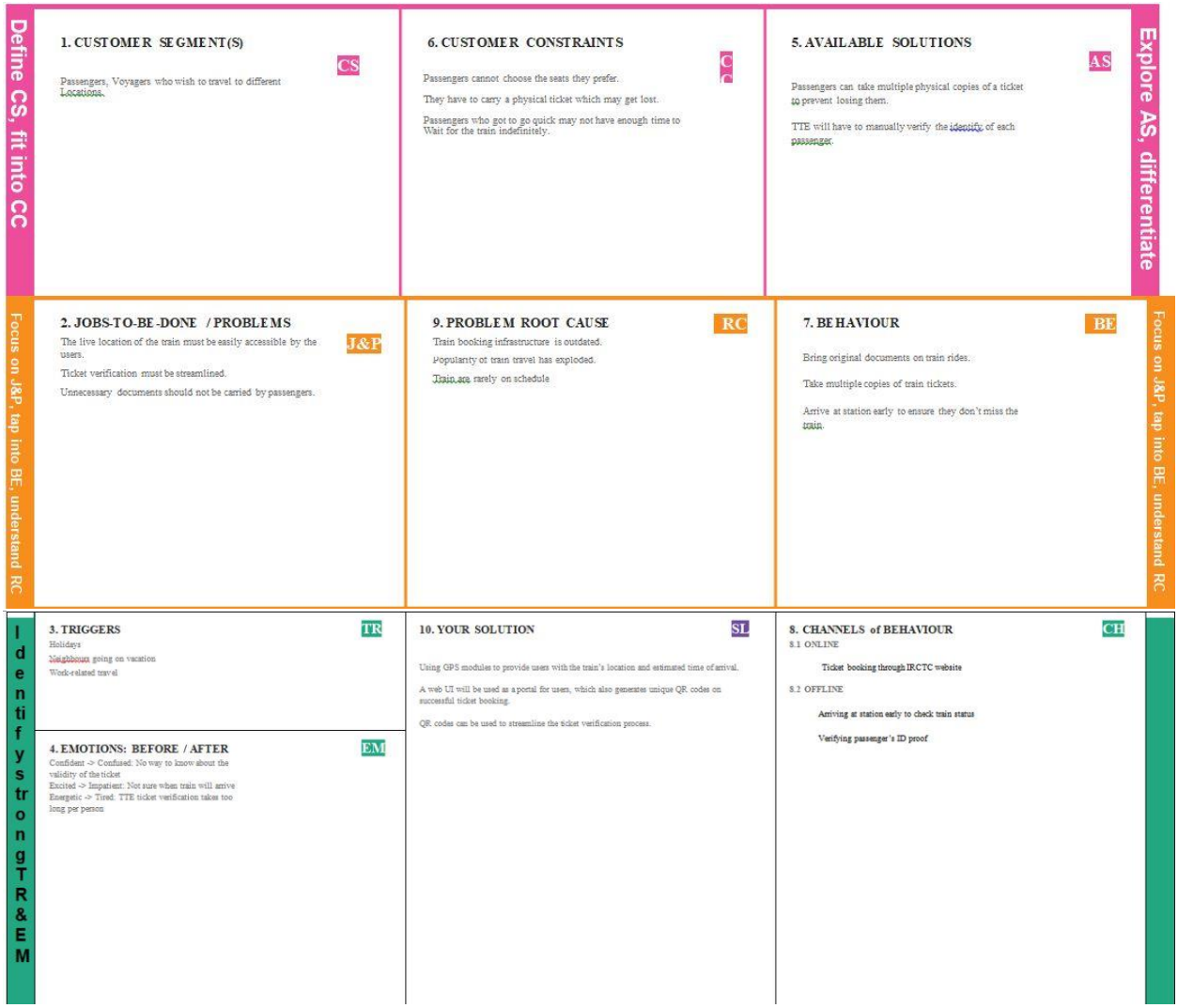




3.3 Proposed Solution

S.No .	Parameter	Description
1	Problem Statement (Problem to be solved)	How might we reduce the workload of the user and the use of paper while booking tickets? How to ease the work of verifying the Tickets which is usually done by TTE thereby reducing the paperwork?
2	Idea / Solution description	A Web UI is designed to enable online ticket booking and a QR code is generated for the user who has booked the ticket to verify it with Travelling Ticket Examiner (TTE) which is done using Cloud Service.
3	Novelty / Uniqueness	• User friendly interface (Web Page) to book the ticket. • Unique QR code for each user to verify their tickets. • GPS Module to track the location of Train and live status is updated in the Web app.
4	Social Impact / Customer Satisfaction	❖ This model reduces the time consuming ticket booking by automating the process. ❖ TTE can easily verify the details of the passenger using the QR code generated while booking the ticket which may reduce the use of paper work. ❖ The location of the train is updated periodically in the web app so customers can easily track the status of the train which may help the customer to arrive on time.
5	Business Model (Revenue Model)	→ This solution gives a feasibility to reduce the conventional ticket booking mechanism at counters which is tedious and time consuming, also the verification of the tickets is simplified.Since it also gives an additional train tracking method it will be more welcomed by the users. → This model helps businessmen and travellers to book the tickets easily and it provides flexibility so customers will prefer this model which may increase the revenue of this model. → Selling a Product which enables online booking platform and automatic verification system would fetch more revenues to the Organisation, also the Online Platform has to be maintained continuously and so, the business will sustain and can be improved if required.
6	Scalability of the Solution	★ We propose a solution which works on the SaaS(Software as a Service) cloud model wherein all

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1Functional requirement

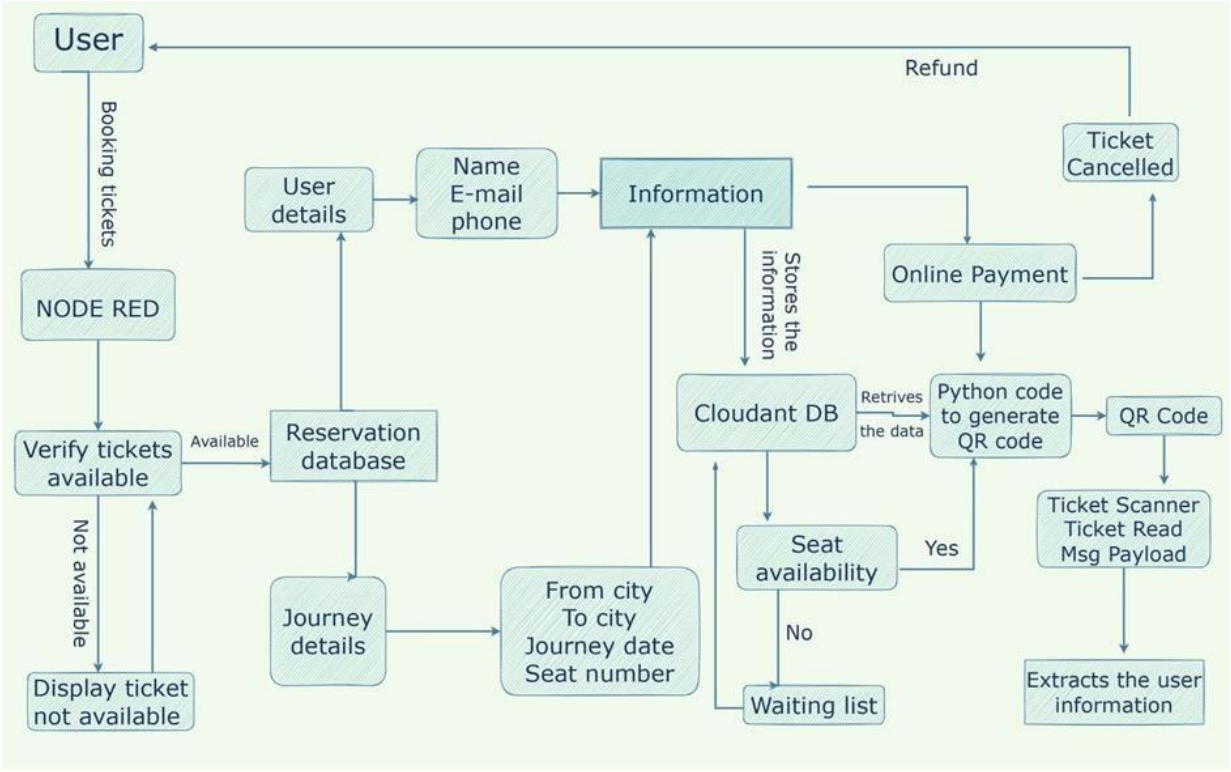
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Official website Registration through Form Registration through App
FR-2	User Confirmation	Confirmation via QR code Confirmation via message
FR-3	Ticket Verification	Ticket collector check the tickets using the QR code which is generated during ticket booking.
FR-4	TTE work load reduction	TTE can simply scan the QR code to identify the personal details and also to reduce the use of paper.
FR-5	Database Storage	All the booking details of the customer is stored in the database with unique ID which can retrieved back when the ticket collector scans the QR code.
FR-6	Train Tracking	The live status of the journey is updated in the web continuously

4.2 Non-Functional requirement

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The user can easily book the tickets at their own pace based on the availability of seats without waiting in the ticket counter.
NFR-2	**Security**	User's personal details are safely stored in the Cloud. QR code reduces the duplicate train tickets.
NFR-3	**Reliability**	As IBM cloud is used to store the information about the customers this product is highly reliable.
NFR-4	**Performance**	The Web UI provides smooth user experience and improves the performance of this solution.
NFR-5	**Availability**	App is readily available on play store for mobile phone users or user can access the website using web browser.
NFR-6	**Scalability**	This solution can be easily scaled up based on the customer demand.

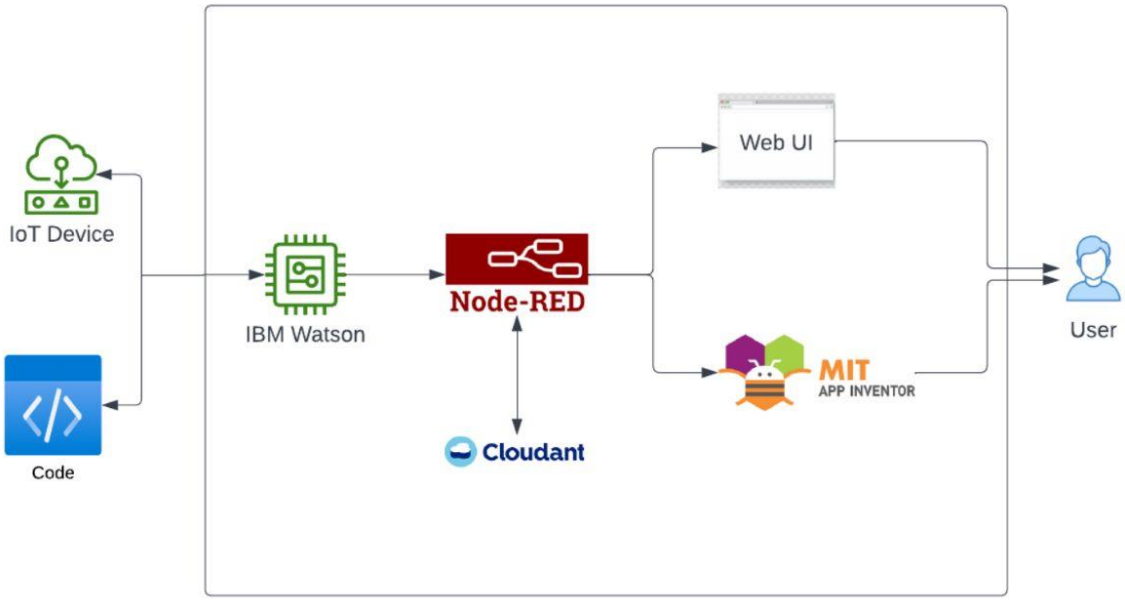
5. PROJECT DESIGN

5.1 Data Flow Diagram

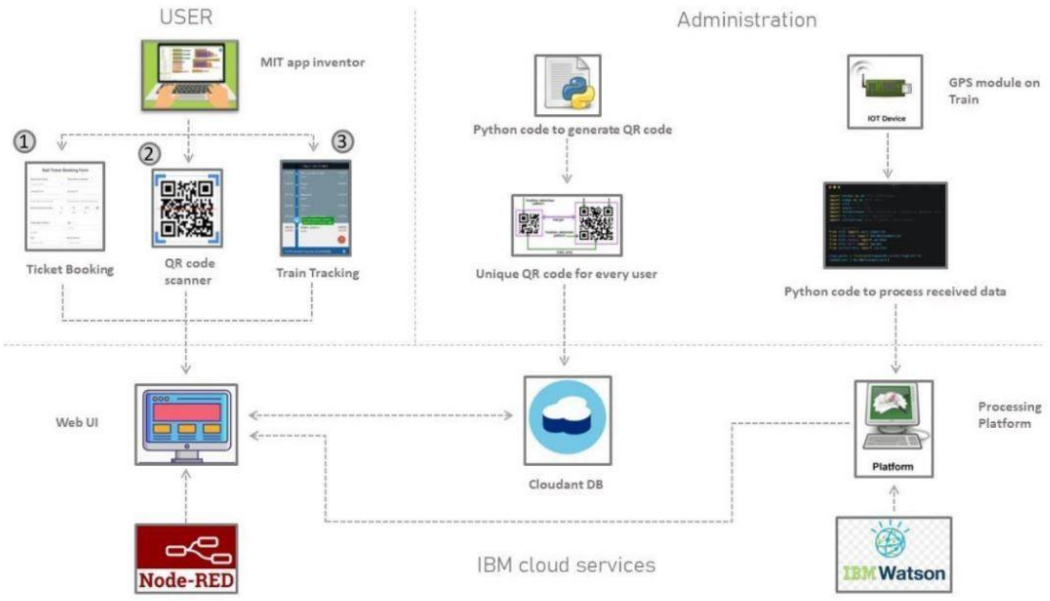


5.2 Solution and Technical Architecture

Solution Architecture:



Technical Architectur



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (web user)	Registration	USN-1	As a user, I can register for the website by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can access my account / dashboard	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can access my account / dashboard	High	Sprint-1
	Dashboard	USN-6	As a user, I can search the trains and seat availability.	I can see the booked tickets	High	Sprint-2
	Booking the Tickets	USN-7	As a user, I can book the train ticket according to my preference.	I can upload my details to fill the form for ticket booking	High	Sprint-2
	Tracking the Train	USN-8	As a user, I can track the location of Train.	I can access the arrival time to my boarding	High	Sprint-3

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application by entering my mobile number and verifying it via OTP.	I can register & access the dashboard.	High	Sprint-1
		USN-5	As a user, I can register for the application through Gmail.	I can access my account / dashboard	Medium	Sprint-1
	Login	USN-6	As a user, I can log into the application by entering email & password.	I can access my account / dashboard	High	Sprint-1
	Dashboard	USN-7	As a user, I can search the trains and seat availability.	I can see the booked tickets	High	Sprint-2
	Booking the Tickets	USN-8	As a user, I can book the train ticket according to my preference.	I can upload my details to fill the form for ticket booking and get the QR code for it.	High	Sprint-2
	Tracking the Trains	USN-9	As a user, I can track the location of Train.	I can access the arrival time to my boarding	High	Sprint-3
Customer Care Executive	Customer service	USN-1	As a Customer Care Executive, I can help the customers by solving their queries via chat.	I can access the Help forum.	Low	Sprint-4
Train Ticket Examiner	Registration	USN-1	As a TTE, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
(TTE- Mobile user)						
		USN-2	As a TTE, I will receive a confirmation email once I have registered for the application.	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a TTE, I can register for the application through Facebook..	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a TTE, I can register for the application by entering my mobile number and verifying it via OTP.	I can register & access the dashboard.	High	Sprint-1
		USN-5	As a TTE, I can register for the application through Gmail.	I can access my account / dashboard	Medium	Sprint-1
	Login	USN-6	As a TTE, I can log into the application by entering email & password.	I can access my account / dashboard	High	Sprint-1
	Dashboard	USN-7	As a TTE, I can access my dashboard showing me verified tickets.	I can see the verified and non-verified tickets.	High	Sprint-2
	Ticket Verification	USN-8	As a TTE, I can verify the tickets by scanning the QR code shown by the passenger.	I can verify the Passenger's ticket.	High	Sprint-2

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

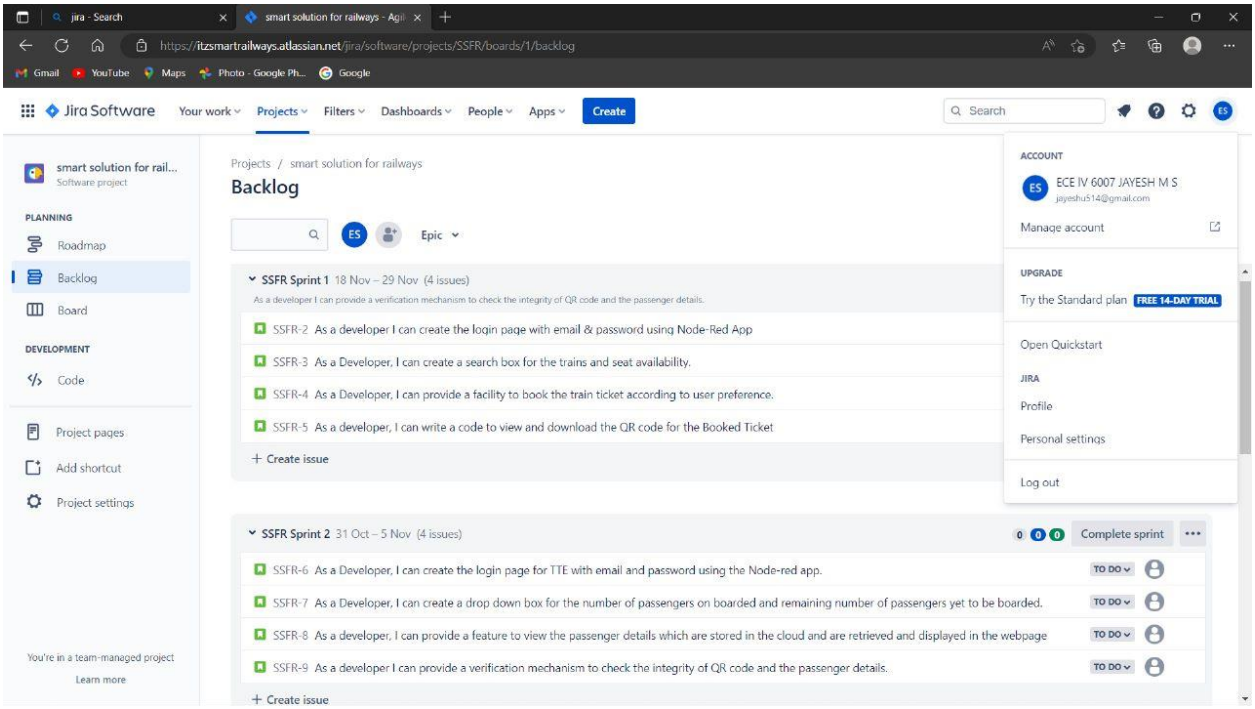
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
			Sprint-1		
Sprint-1	Login	USN-1	As a Developer, I can create the login page with email & password using Node-Red App.	2	Medium
Sprint-1	Dashboard	USN-2	As a Developer, I can create a search box for the trains and seat availability.	6	High
Sprint-1	Booking the Tickets	USN-3	As a Developer, I can provide a facility to book the train ticket according to user preference.	6	High
Sprint-1	QR code Generation	USN-4	As a Developer, I can write a code to view and download the QR code for the Booked Ticket.	6	High
			Sprint-2		
Sprint-2	Login for TTE	USN-1	As a Developer,I can create the login page for TTE with email and password using the Node-red app.	6	High
Sprint-2	Dashboard	USN-2	As a Developer,I can create a drop down box for the number of passengers on boarded and remaining number of passengers yet to be boarded	6	High
Sprint-2	Passenger Details	USN-3	As a developer,I can provide a feature to view the passenger details which are stored in the Cloud and are retrieved and displayed in the webpage.	2	Medium
Sprint-2	Ticket verification	USN-4	As a developer,I can provide a verification mechanism to check the integrity of QR code and the passenger details.	6	High
			Sprint-3		
Sprint-3	Collaboration	USN-1	As a developer, I will provide a smooth way to book the ticket through a website and also to refund if the passenger cancels the ticket.	6	High
Sprint-3	Verifying the passenger details	USN-2	As a developer, I will check whether the passenger is taking his/her journey with a proper confirmed ticket.	6	High

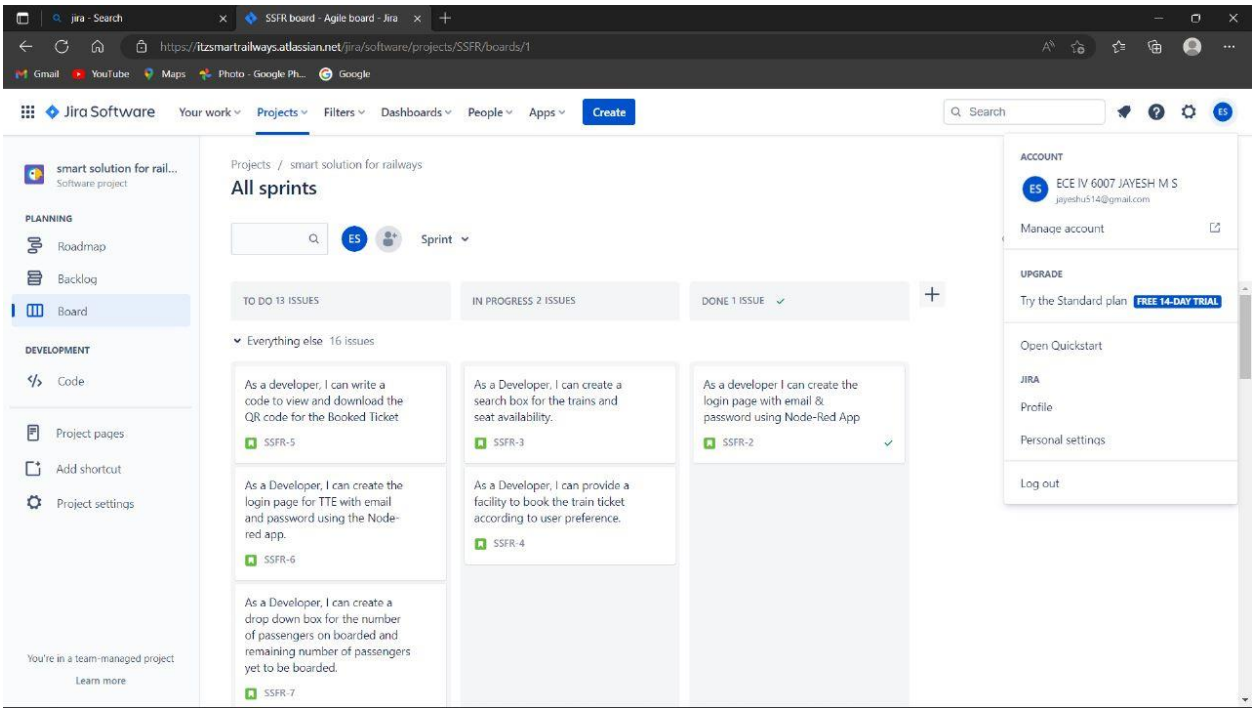
Sprint-3	Identification of the passenger	USN-3	As a developer, I will make sure that the on-boarded passenger is not involved in any travel fraudulently.	2	Medium
Sprint-3	Verifying the tickets	USN-4	As a developer, I will scan the QR code generated by python code to extract and verify the passenger details.	6	High
Sprint-4					
Sprint-4	Tracking webpage	USN-1	As a developer , I can create web page to view train status using Node RED	6	High
Sprint-4	Live location details	USN-2	As a developer I can extract details from IoT device using python code and IBM watson.	6	High
Sprint-4	Retrieving from cloud	USN-3	As a developer, I can upload the details to cloud and display it to user by connecting it with Node RED application.	6	High
Sprint-4	Sending updates	USN-4	As a passenger ,I would like to receive updates over my train status during my journey via fast SMS or App notification.	2	Medium

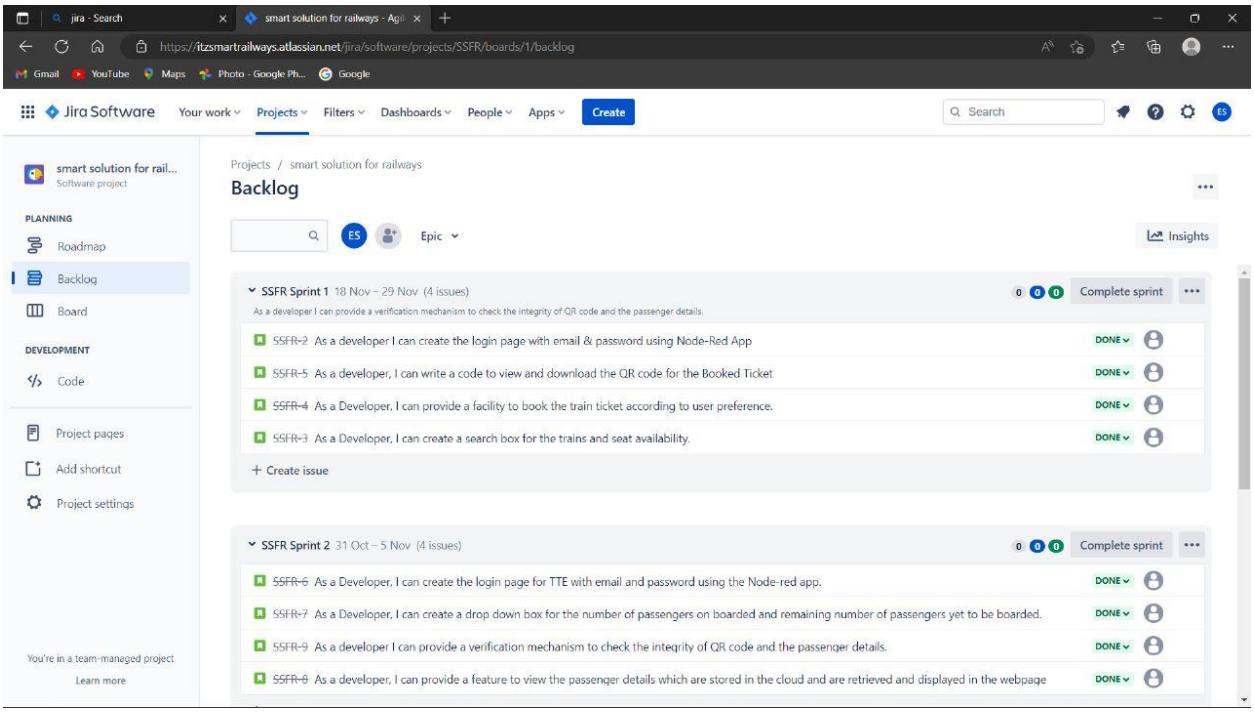
6.2 Sprint Delivery Schedule:

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	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:



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smart solution for rail...
Software project
PLANNING
Roadmap
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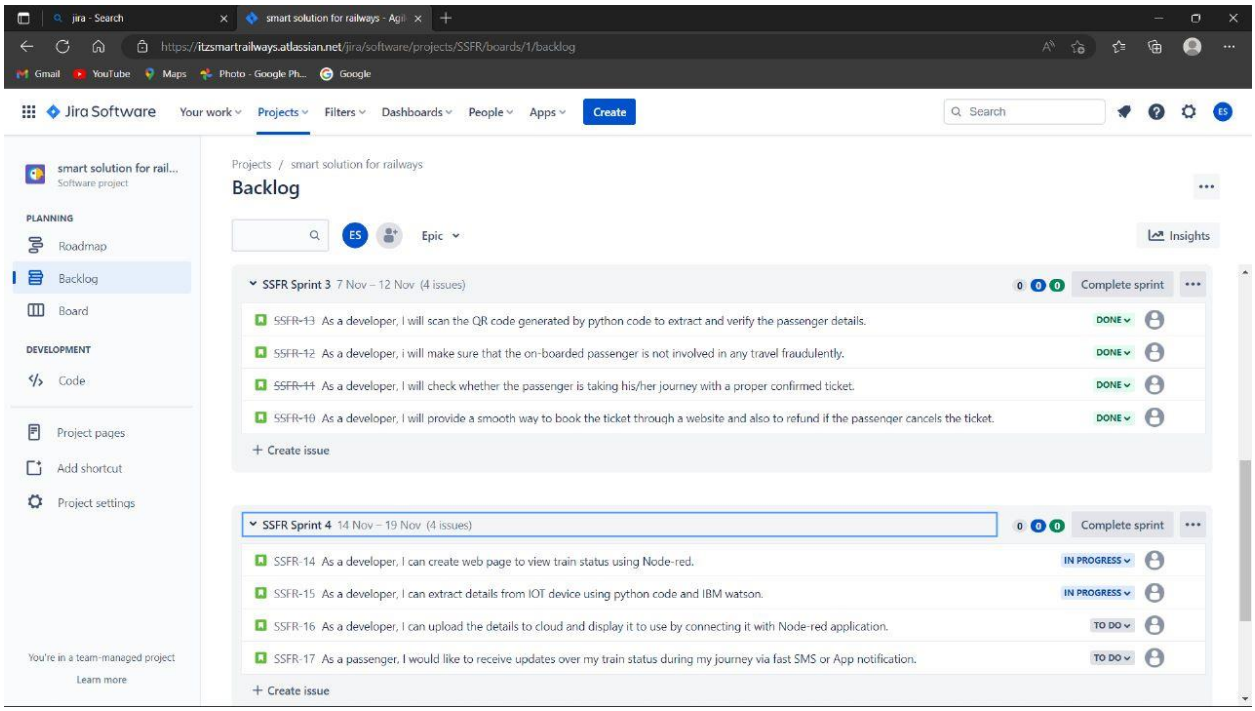
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Projects / smart solution for railways
Backlog
Epic
Insights
SSFR Sprint 1 18 Nov – 29 Nov (4 issues)
0 0 0 Complete sprint
As a developer I can provide a verification mechanism to check the integrity of QR code and the passenger details.
SSFR-2 As a developer I can create the login page with email & password using Node-Red App DONE
SSFR-5 As a developer, I can write a code to view and download the QR code for the Booked Ticket DONE
SSFR-4 As a Developer, I can provide a facility to book the train ticket according to user preference. DONE
SSFR-3 As a Developer, I can create a search box for the trains and seat availability. DONE
+ Create issue
SSFR Sprint 2 31 Oct – 5 Nov (4 issues)
0 0 0 Complete sprint
SSFR-6 As a Developer, I can create the login page for TTE with email and password using the Node-red app. DONE
SSFR-7 As a Developer, I can create a drop down box for the number of passengers on boarded and remaining number of passengers yet to be boarded. DONE
SSFR-9 As a developer I can provide a verification mechanism to check the integrity of QR code and the passenger details. DONE
SSFR-8 As a developer, I can provide a feature to view the passenger details which are stored in the cloud and are retrieved and displayed in the webpage DONE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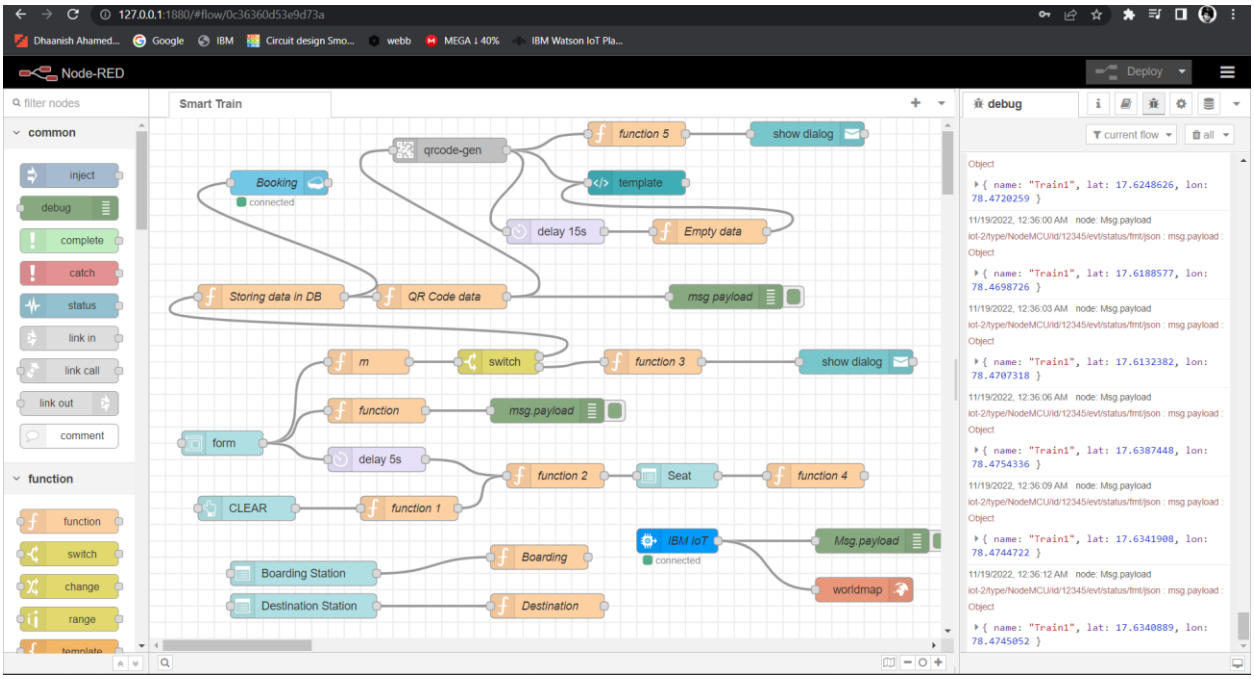
Search
smart solution for rail...
Software project
PLANNING
Roadmap
Backlog
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Projects / smart solution for railways
Backlog
Epic
Insights
SSFR Sprint 3 7 Nov – 12 Nov (4 issues)
0 0 0 Complete sprint
SSFR-13 As a developer, I will scan the QR code generated by python code to extract and verify the passenger details. DONE
SSFR-12 As a developer, i will make sure that the on-boarded passenger is not involved in any travel fraudulently. DONE
SSFR-11 As a developer, I will check whether the passenger is taking his/her journey with a proper confirmed ticket. DONE
SSFR-10 As a developer, I will provide a smooth way to book the ticket through a website and also to refund if the passenger cancels the ticket. DONE
+ Create issue
SSFR Sprint 4 14 Nov – 19 Nov (4 issues)
0 0 0 Complete sprint
SSFR-14 As a developer, I can create web page to view train status using Node-red. IN PROGRESS
SSFR-15 As a developer, I can extract details from IOT device using python code and IBM watson. IN PROGRESS
SSFR-16 As a developer, I can upload the details to cloud and display it to use by connecting it with Node-red application. TO DO
SSFR-17 As a passenger, I would like to receive updates over my train status during my journey via fast SMS or App notification. TO DO
+ Create issue

7 CODING & SOLUTIONING

NODE RED FLOW

As a Developer I have designed a flow in node red to create a user interface and to connect my IOT platform. I have also connected my cloudant database to store the information about the ticket in QR code. So that the ticket collector can verify the ticket.

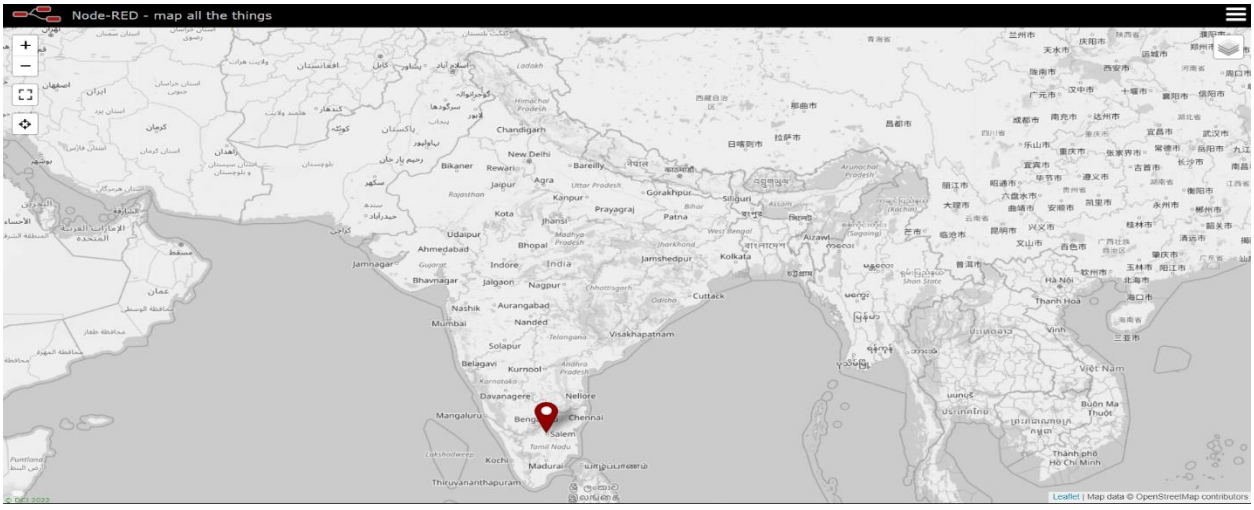


7.1 Python code

Tracking the Live location of train

```
import wiotp.sdk.device
import time
import random
myConfig = {
  "identity": {
     "orgId": "cqfdow",
      "typeId": "NodeMCU",
      "deviceId":"12345"
     },
   "auth": {
      "token": "12345678"
   }}
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()
def pub (data):
   client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
   print ("Published data Successfully: %s", myData)
while True:
    myData={'name': 'Train1', 'lat': 34.209515, 'lon':  77.615112}
    pub (myData)
    time.sleep (3)
    #myData={'name': 'Train2', 'lat': 17.6387448, 'lon': 78.4754336)
```

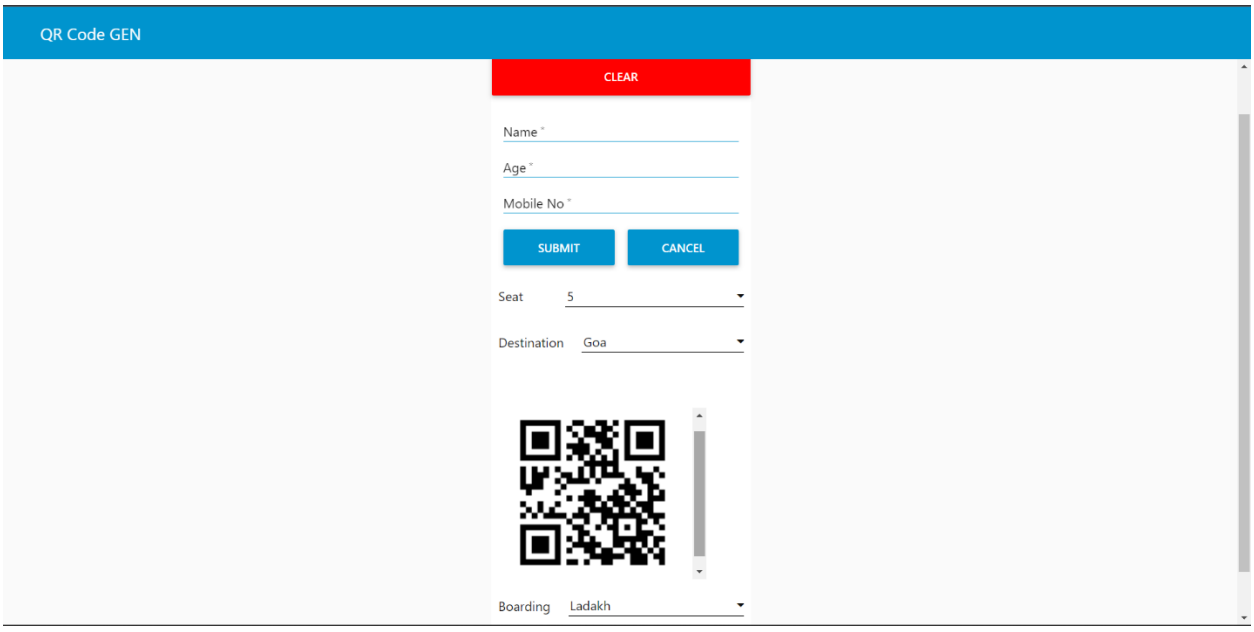
```
#pub (myData)
#time.sleep (3)
myData={'name': 'Train1', 'lat': 34.209000, 'lon': 77.615100}
pub(myData)
time.sleep(3)
myData={'name': 'Train1', 'lat': 13.067439, 'lon': 80.237617}
pub (myData)
time.sleep (3)
myData={'name': 'Train1', 'lat': 13.067800, 'lon': 80.237600}
pub (myData)
time.sleep (3)
myData={'name': 'Train1', 'lat': 11.634725, 'lon': 78.14984}
pub (myData)
time.sleep (3)
myData={'name': 'Train1', 'lat': 15.2993265, 'lon': 74.12399600000003}
pub (myData)
time.sleep (3)
client.commandCallback = myCommandCallback
client.disconnect()
```



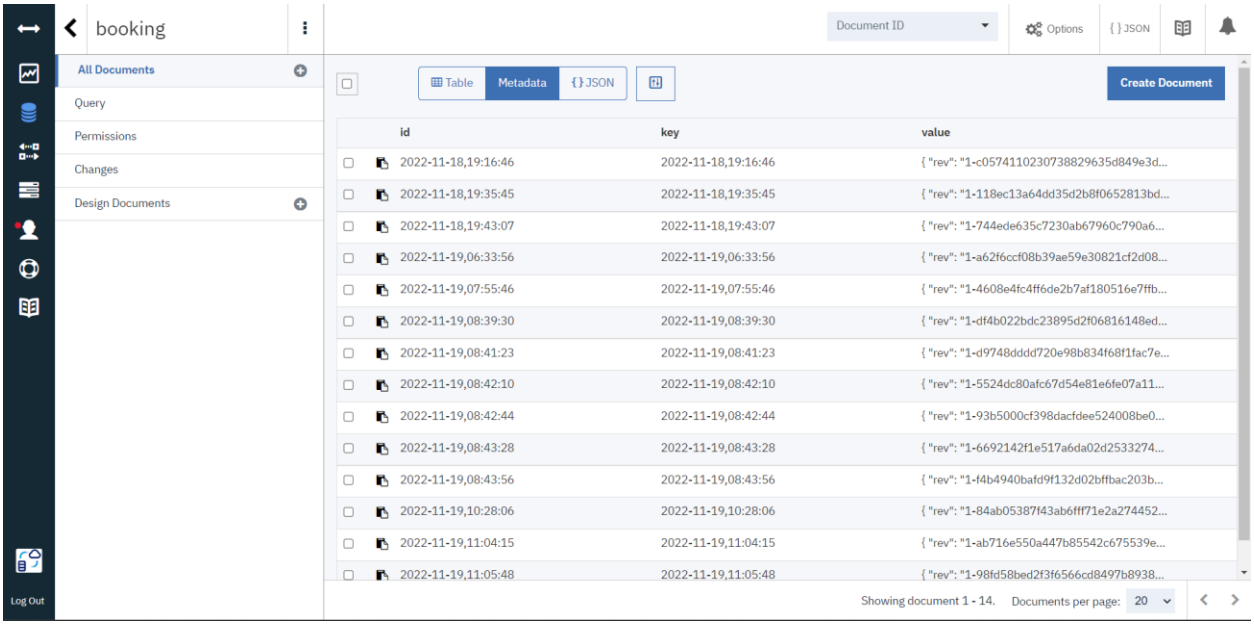
QR Code Generation:

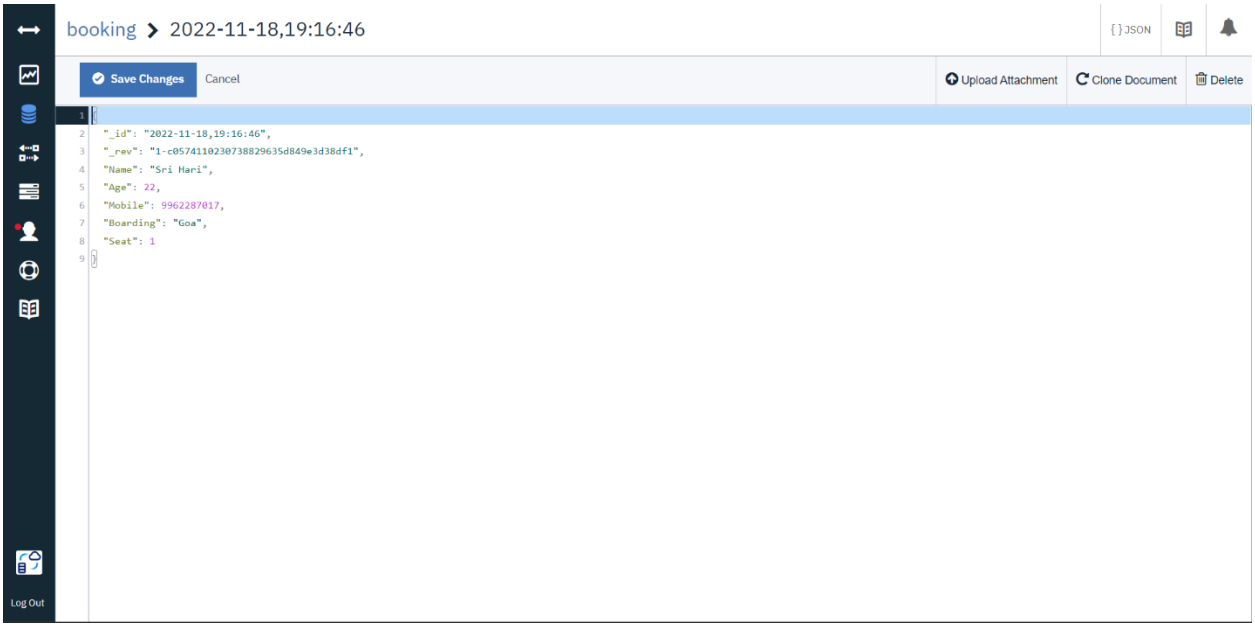
```
import cv2

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-xjj4vtu0o6zki1nv5xufzjrzrndfbkpap58pmn8qai9',
'c38318d6cb4dd64515f50d5822fca43f')

service = CloudantV1(authenticator=authenticator)

service.set_service_url('https://apikey-v2-
xjj4vtu0o6zki1nv5xufzjrzrndfbkpap58pmn8qai9:c38318d6cb4dd64515f50d5822fca43f@d30acc5e-636b-
4561-bfe7-5ffa4397a057-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='booking',

        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()
disconnect()
```



7.3 DATABASE SCHEMA





8. TESTING

8.1 Test Case

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID
HomePage_TC_001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	www.bookonlinetickets/	Login/Signup popup should display	Working as expected	Pass		N	
HomePage_TC_002	UI	Home Page	Verify the UI elements in Login/Signup popup	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery	www.bookonlinetickets/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	Fail	Steps are not clear to follow	Y	BUG-234
HomePage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials	1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box	Username: chalam@gmail.com password: Testing123	User should navigate to user account homepage	Working as expected	Pass		N	
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials	1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter InValid username/email in Email text box 4.Enter valid password in password text box	Username: chalam@gmail password: Testing123	Application should show "Incorrect email or password." validation message.	Working as expected	Pass		N	

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID
Booking_TC_011	Functional	Booking	Verify user is able to see available seats in a train.	1.Enter URL and click go 2. Click on my Account Dropdown button 3. Enter the boarding Station 4. Enter the destination Station 5. Select the seats 6. Click the button	1.From: Mysore 2. To : Goa 3. Train : Chennai Express 4. Time: 12:00 AM 5. Available Seats: 5	Application should show below UI elements: a.From text box b.Destination text box c.Train name: Mysore Express d.Time: 12:00 AM e. Seats: 5	Working as expected	Pass		N	
Booking_TC_012	Functional	Booking	Verify that the user should see realtime train status of availability of seats.	1.Enter URL and click go 2. Click on my Account Dropdown button 3. Enter the boarding Station 4. Enter the destination Station 5. Select the seats 6. Click the button	1.From: Mysore 2. To : Goa 3. Train : Chennai Express 4. Time: 12:00 AM 5. Available Seats: 5	Application should show below UI elements: a.From text box b.Destination text box c.Train name: Mysore Express d.Time: 12:00 AM	Working as expected	pass		N	
Booking_TC_013	UI	Booking	Verify that the user should see realtime train status of availability of seats.	1.Enter URL and click go 2. Click on my Account Dropdown button 3. Enter the boarding Station 4. Enter the destination Station 5. Select the seats 6. Click the button	1.From: Mysore 2. To : Goa 3. Train : Chennai Express 4. Time: 12:00 AM 5. Available Seats: 5	Application should show below UI elements: a.From text box b.Destination text box c.Train name : Mysore Express d.Time: 12:00 AM e. Seat: 7	Working as expected	Fail	Seats were chosen which exceeds the availability	Y	
Booking_TC_014	UI	Booking	Verify if the seat is booked then user should not be able to purchase the ticket for that seat	1.Enter URL and click go 2. Click on my Account Dropdown button 3. Enter the boarding Station 4. Enter the destination Station 5. Select the seats 6. Click the button	1.From: Mysore 2. To : Goa 3. Train : Chennai Express 4. Time: 12:00 AM 5. Available Seats: 5	Application should show below UI elements: a.From text box b.Destination text box c.Train name: Mysore Express d.Time: 12:00 AM Ticket not Booked	Working as expected	Fail	customer chooses seat number 2 but seat number 2 is already booked	Y	

8.2 User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [Smart Solutions for Railways] project at the time of the release to User Acceptance Testing (UAT).

2. 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	5	2	3	1	11
Duplicate	1	1	0	0	2
External	2	1	0	0	3
Fixed	9	4	5	2	20
Not Reproduced	0	0	1	0	1
Skipped	0	1	0	2	3
Won't Fix	1	0	1	0	2
Totals	18	9	10	5	42

The defect analysis was resolved by,

1. Reviewing the code and establishing checkpoints.
2. Debugging window.
3. By working in pairs and conducting team window.
4. By developing action plans to cope with specific issues.
5. Defect resolution process.
6. Prioritize and resolving defect.
7. Validating the corrective action presented.

3. Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Home page	3	0	0	3
Login page	4	0	0	4
Booking	10	0	0	10
Passenger Details	6	0	0	6
TTE	3	0	0	3
Train Tracking	2	0	0	2
Payment	2	0	0	2

9. RESULTS

9.1 Performance Metrics

Software quality is a measurement of something intangible, “how good” a software product really is. Some of the aspects of software quality taken are

a. Scalability

b. Speed

c. Stability

d. Reliability

e. Security

f. Maintainability and code quality

LOAD TEST

Scenario Name	Load Test – Smart solution for railways Project
Scenario Type	Load Test – Duration 1 hour
Scenario objective	To stimulate the peak load and to monitor the performance of the website
Steps	The online load will be maintained at steady state
Entry criteria	All the monitors are in ready state
Exit criteria	Response met the criteria and test completion report is agreed

STRESS TEST

Scenario Name	Stress Test – Smart solution for railways Project
Scenario Type	Stress Test
Scenario objective	Objective is to verify that the application can handle the projected growth and to discover the breaking point
Steps	Ramp up to 150% of peak volume and continuously increase load until breaking point
Entry criteria	All the monitors are in place Test Data is set up Peak load test completed successfully
Exit criteria	Test completion report is agreed upon as per expectation

SOAK TEST

Scenario Name	Soak Test – Smart solution for railways Project
Scenario Type	Soak Test – Duration 8 hour
Scenario objective	To discover memory issues and bottlenecks that might occur under daily usage of the application
Steps	Steady state is maintained for 8 hours with half of the peak load
Entry criteria	All the monitors are in place Test Data is set up Peak load test completed successfully
Exit criteria	Test completion report is agreed upon as per expectation

10. ADVANTAGES :

☆ Work load of the user is greatly reduced.

☆ Passenger's can book tickets from their convenient place and time

☆ TTE can easily verify tickets without the need to carry several documents pertaining to passenger details.

☆ Since cloudant database retrieval is possible only for the TTE (Admin) secure data handling is made possible.

☆ Passenger's can track the location of the train which gives them more flexibility in planning their schedules.

☆ Cost of implementation is less.

DISADVANTAGES:

☆ Since the solution is built on a Web UI which requires internet facility , this may serve to be an issue.

☆ Network errors can cause serious issues while ticket booking and verification.

☆ System compatibility to adapt the user interface may limit booking facility .

☆ Tracking of trains may be an issue at unlocalized terrains.

11. Conclusion

- Smart Solutions for railways is designed to reduce the work load of the user and also the use of paper.
- A Web page is designed for the public where they can book tickets by seeing the available seats.
- After booking the train, the person will get a QR code which has to be shown to the Ticket Collector while boarding the train.
- The ticket collectors can scan the QR code to identify the personal details.
- A GPS module is present in the train to track it. The live status of the journey is updated in the Web app continuously
- All the booking details of the customers will be stored in the database with a unique ID and they can be retrieved back when the Ticket Collector scans the QR Code.

12. Future Scope

- One of the most significant benefits of an online reservation system is that they are always open for business and can accept bookings 24/7, so the customers don't have to wait until the next day to make a reservation or worse.
- By having an online reservation system, we're one step ahead of the game, tipping the scales in the favor when prospects research and compare the capabilities against the competitors.
- We will be able to create mobile smartphone applications in the future.The framework already serves desktop computers and we will be able to make web browsers compliant in the future.
- India is projected to account for 40% of the total global share of rail activity by 2050. This allows great potential for the online ticket booking platform industry.

WEBSITE LINK:

http://127.0.0.1:1880/ui/#!/0?socketid=tjb5ZaaYcs7AitE5AAAA

GITHUB LINK :

https://github.com/IBM-EPBL/IBM-Project-51934-1660986953