SMART SOLUTIONS FOR RAILWAYS

IBM NALAIYA THIRAN

PROJECT REPORT

Submitted By

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TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
1	**INTRODUCTION**	**1**
	1.1 PROJECT OVERVIEW	**1**
	1.2 PURPOSE	**2**
2	**LITERATURE SURVEY**	**3**
	2.1 EXISTING PROBLEM	**3**
	2.2 REFERENCES	**4**
	2.3 PROBLEM STATEMENT DEFINITION	**5**
3	**IDEATION AND PROPOSED SOLUTION**	**6**
	3.1 EMPATHY MAP CANVAS	**6**
	3.2 IDEATION AND BRAINSTORMING	**7**
	3.3 PROPOSED SOLUTION	**10**
	3.4 PROBLEM-SOLUTION FIT	**11**
4	**REQUIREMENT ANALYSIS**	**12**
	4.1 FUNCTIONAL REQUIREMENT	**12**
	4.2 NON- FUNCTIONAL REQUIREMENT	**12**
5	**PROJECT DESIGN**	**14**

	5.1 DATA FLOW DIAGRAM	**14**
	5.2 SOLUTION AND TECHNOLOGY ARCHITECTURE	**15** **16**
	5.3 USER-STORIES	
6	**PROJECT PLANNING AND SCHEDULING**	**17**
	6.1 SPRINT PLANNING AND ESTIMATION	**17**
	6.2 SPRINT DELIVERY SCHEDULE	**21**
	6.3 REPORT FROM JIRA	**22**
7	**CODING AND SOLUTIONS**	**23**
	7.1 FEATURE 1	**23**
	7.2 FEATURE 2	**24**
	7.3 DATABASE SCHEMA	**25**
8	**TESTING**	**26**
	8.1 TEST CASES	**26**
	8.2 USER ACCEPTANCE TESTING	**28**
9	**RESULT**	**29**
	9.1 PERFORMANCE METRICS	**29**
10	**ADVANTAGES**	**30**

11 CONCLUSION 31

12 APPENDIX 32

13.1 SOURCE CODE **33**

13.2 SCREENSHOTS **33**

13 REFERENCE 37

CHAPTER - 1
INTRODUCTION

1.1PROJECT OVERVIEW

Railways have been an essential mode of transportation for people all over the world for centuries. Most people will choose this transportation mainly for low cost and it gives comfort. There has been wide development in the system but there is no standardized process is taken out . In the current system, we can get tickets both over the counter and online, but often we do not get tickets due to black-marketing, and also it generates paper tickets with carbon printing. And in the ticket-checking process, there is a lot of manual work to take place for maintaining passenger records which are tedious to manage. To deal with this problem, we as a team propose the idea of generating a QR code instead of the e-tickets that hold the entire details of the passenger and this method will make the system very simpler for both the ticket collector and the passengers. We are developing a web application where a user can book their ticket online and immediately get their QR code and when the ticket collector needs verification the QR code can be scanned to verify the passenger details. And also they can know their live location on the website itself..

1.2 PURPOSE

Inorder to prevent from the fraudlaunt ticket booking and making the procedure in a easier way we made solution using IOT through the Web application, a user books a ticket based on the availability of the seats by giving the general required information. Once a user clicks on the submit button, a QR code is generated with a Unique ID and the data is stored in the Cloudant DB with that

Unique ID. Users can save the QR code for further process. In python code, a Ticket collector can scan the QR code and extract the information from the QR Code i.e., Unique ID. With that Unique ID, data is fetched from the Cloudant DB, if it is not found, then it displays Not a Valid Ticket. Also, the live location of the train will be published to IBM IoT platform using python code. The train location can be tracked from a Web Application.

CHAPTER - 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

The current railway system involues a simple online ticket booking platform in which users can register and login to their ticket and e-ticket can be downloaded. So apart from this we proposed asolution like instead of an e-ticket an QR code is generated an d by taking a snap of the QR Code is more enough of their verification by the ticket collect during their travel.

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2.3 PROBLEM STATEMENT DEFINITION

Problem Statement is a concise description of an issue to be addressed or a condition to be improved upon. The following are the main problems that are faced in existing railway system. Our aim is to make smart solution for railways to overcome all those problems that are faced by the customers.

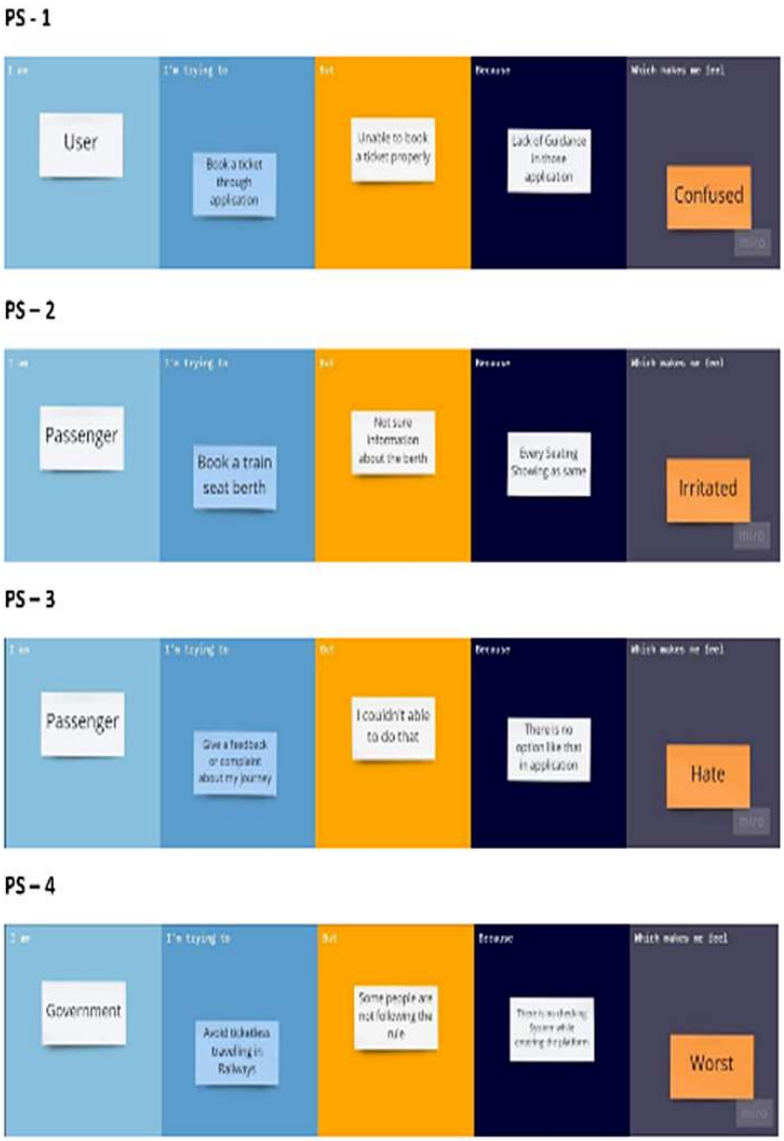


Figure2.3 Problem statement

CHAPTER - 3
IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

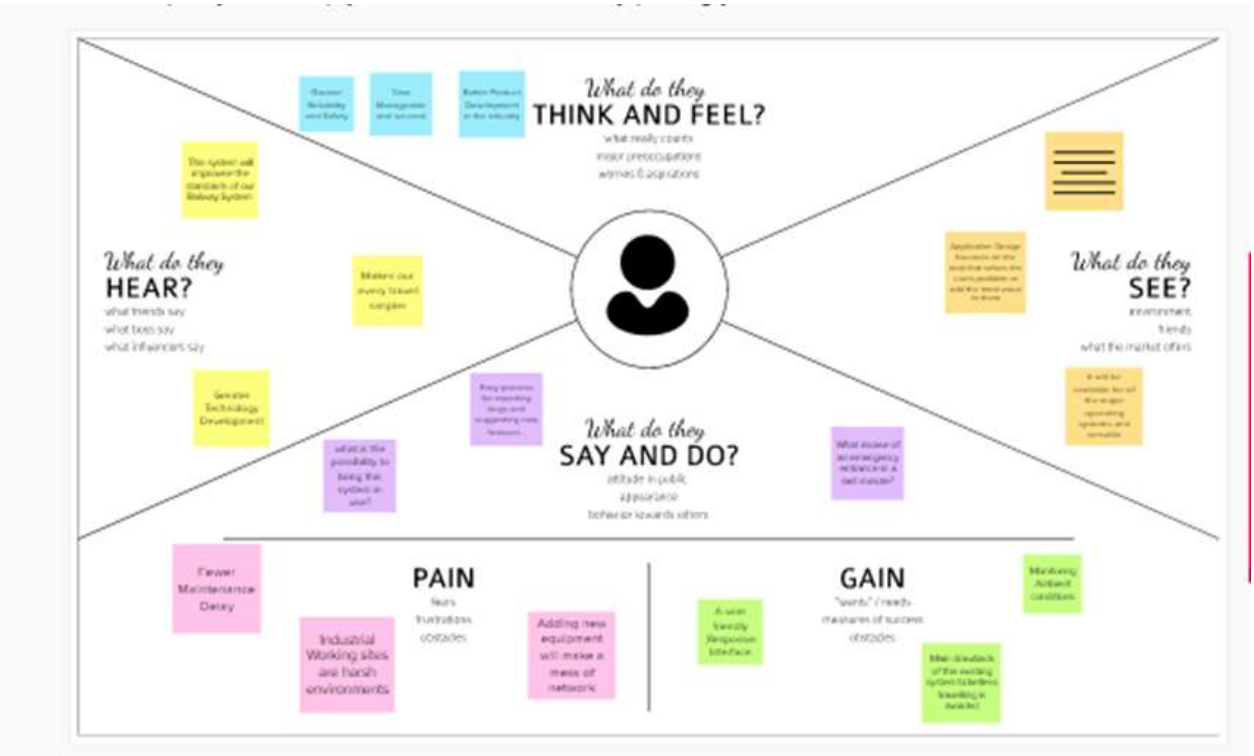


Figure3.1 Empathy Map Canvas

3.2 IDEATION & BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem-solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich number of creative solutions.

3.2 IDEATION & BRAINSTORMING

This step includes the formation of a team, collaborating with the team by collecting the problems of the domain we have taken and consolidating the collected information into a single problem statement

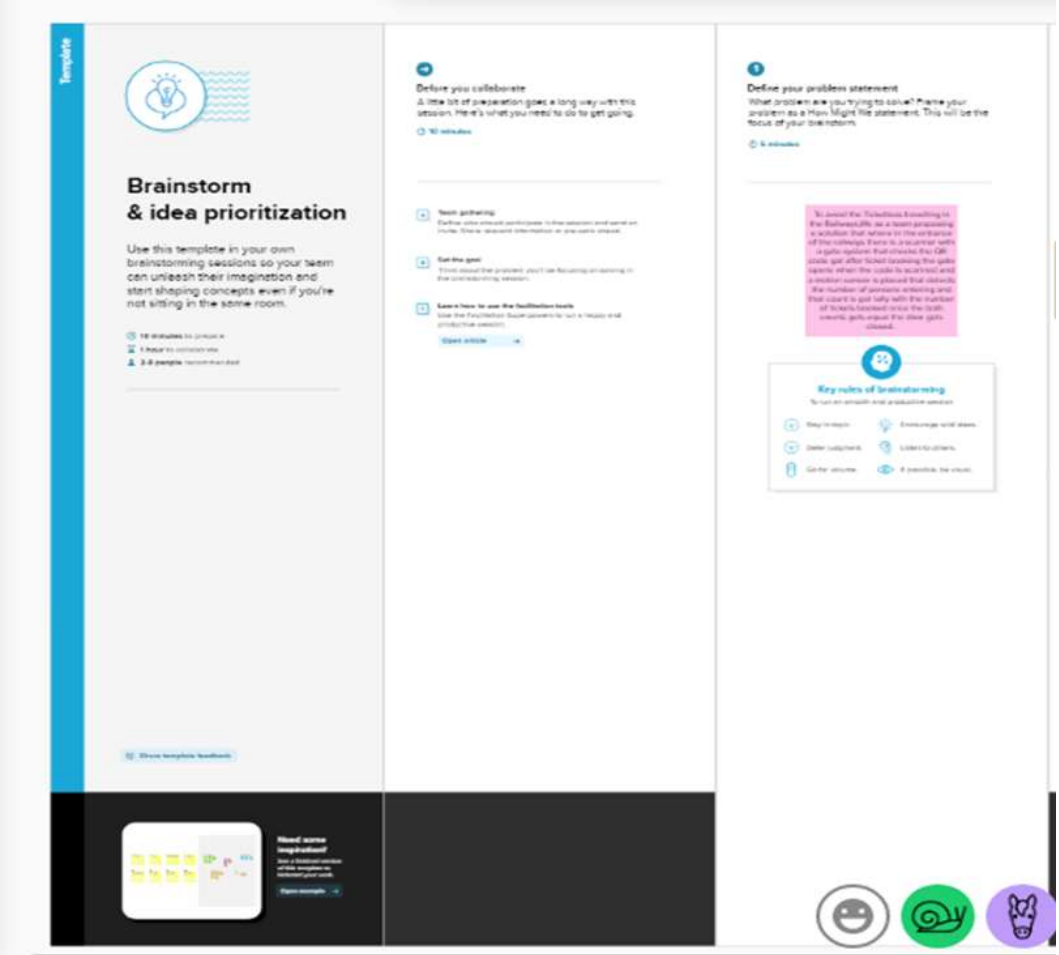


Figure 3.2. Ideation And Brainstorming

STEP 2: BRAINSTORM, IDEA LISTING AND GROUPING

This step of ideation includes the listing of individual ideas by teammates to help with the problem statement framed. All the individual ideas have been valued and made individual clusters.

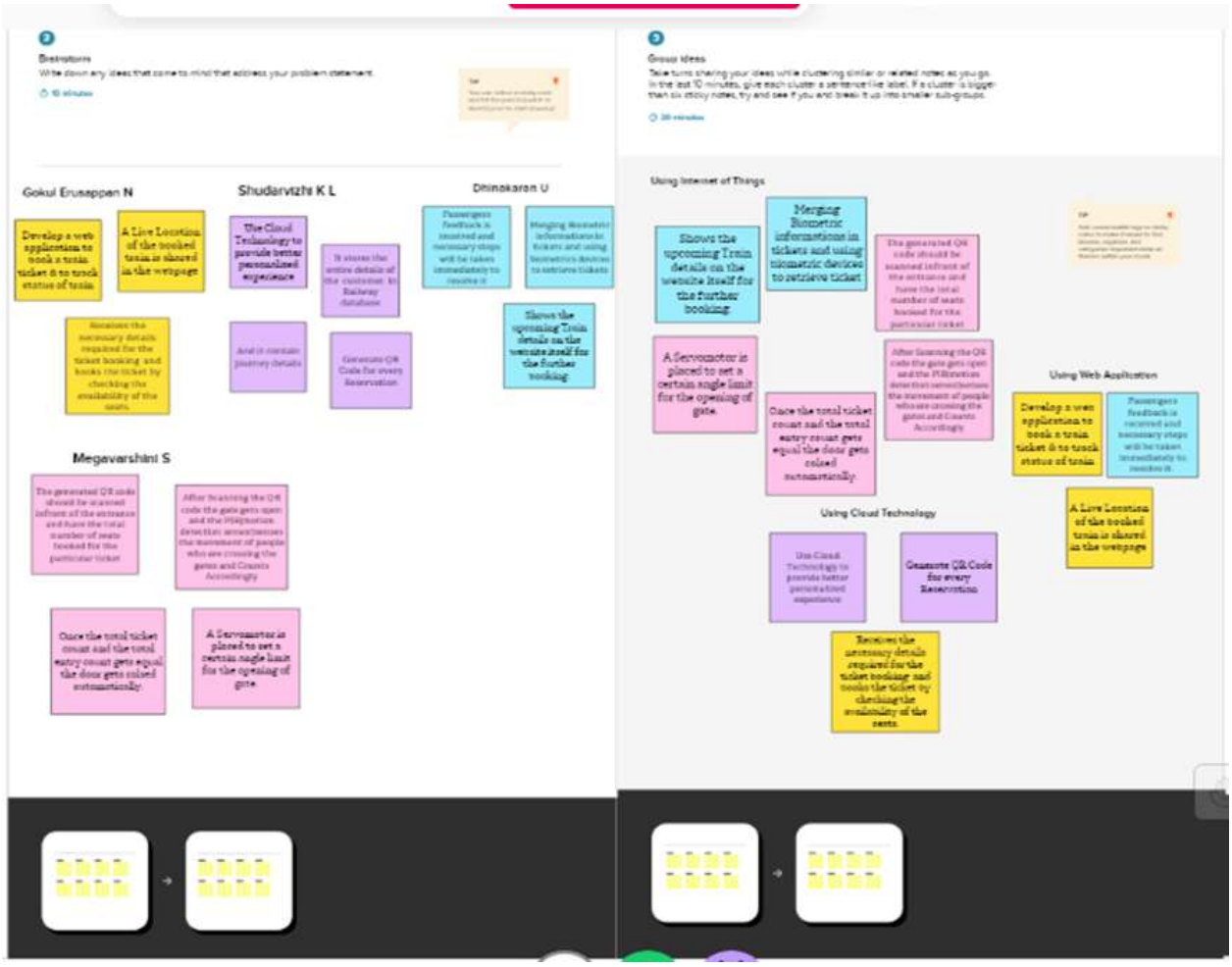


Figure 3.3. Brainstorm, Idea Listing and Grouping

STEP 3: IDEA PRIORITIZATION

This step includes the process of listing necessary components to come up with the working solution and making a hierarchy chart by prioritizing the components based on importance, say from the higher being backend and lower being the user interfacing components.

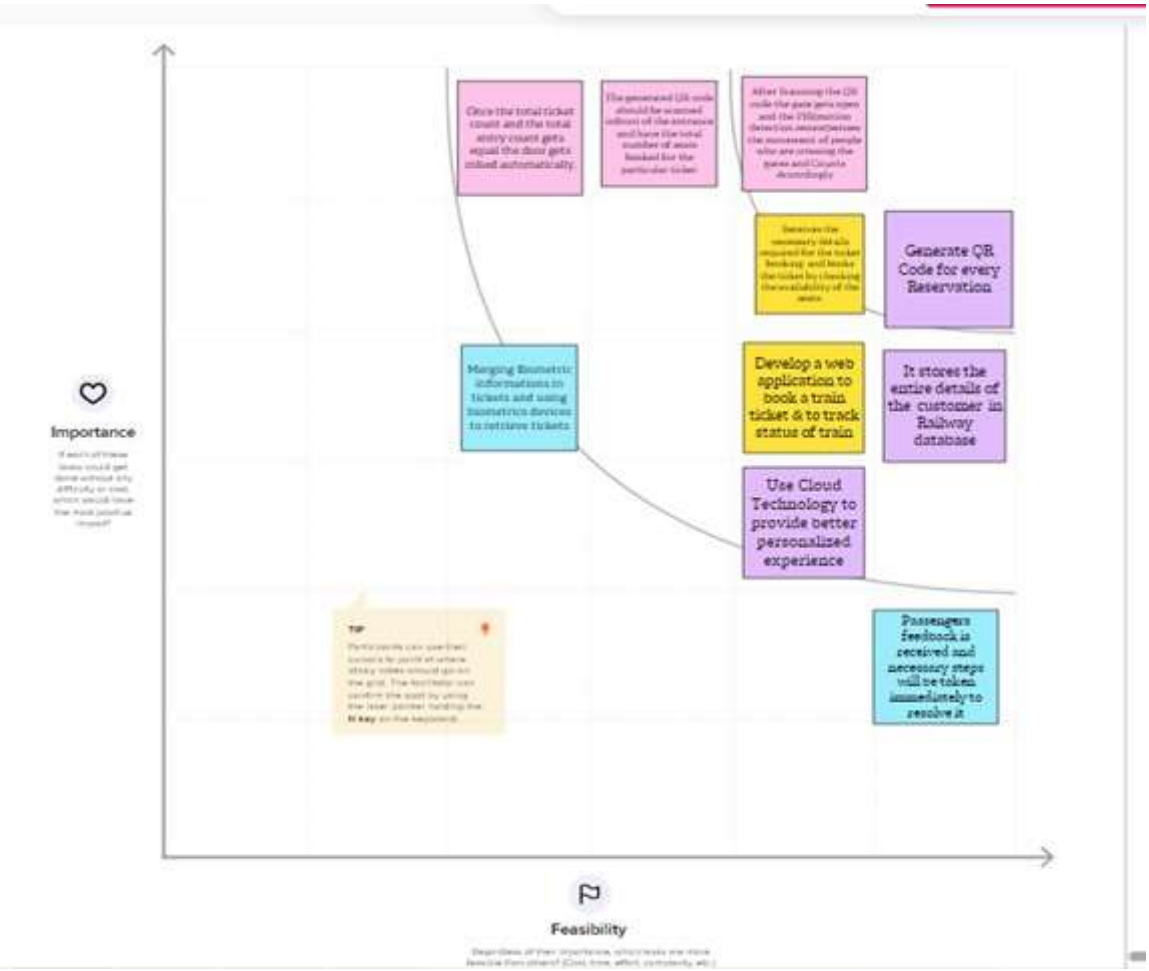


Figure 3.4. Idea Prioritization

3.4 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	A web page designed for the public where they can book tickets by seeing the available seats.
2.	Idea/ Solution description	After booking a train, the person will get a QR code which has to be shown to the ticket collector. The ticket collector can scanthe QR code to identify the personal details. All the booking details of the customers will be stored in the database with a unique ID and theycan be retrieved back when the ticket collector scans the QR code.
3.	Novelty / Uniqueness	QR code generation containing of the passenger details.And live tracking of the train available in the web page
4.	Social Impact / Customer Satisfaction	By using this application passenger can know where exactly they are while travelling. This application will guide every steps for the first users. Passengers can give a feedback or raise a complaint, that willbe resolved within 2 days.
5.	Business Model(Revenue Model)	The main drawback of the railway system, the ticketless traveling is moreover prevented by method.
6.	Scalability of the Solution	It is easy and simple process. This will lead to cost benefits for government. It will save your time. It Supports better services in railway sector

3.4 PROBLEM-SOLUTION FIT

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioural patterns and recognize what would work and why

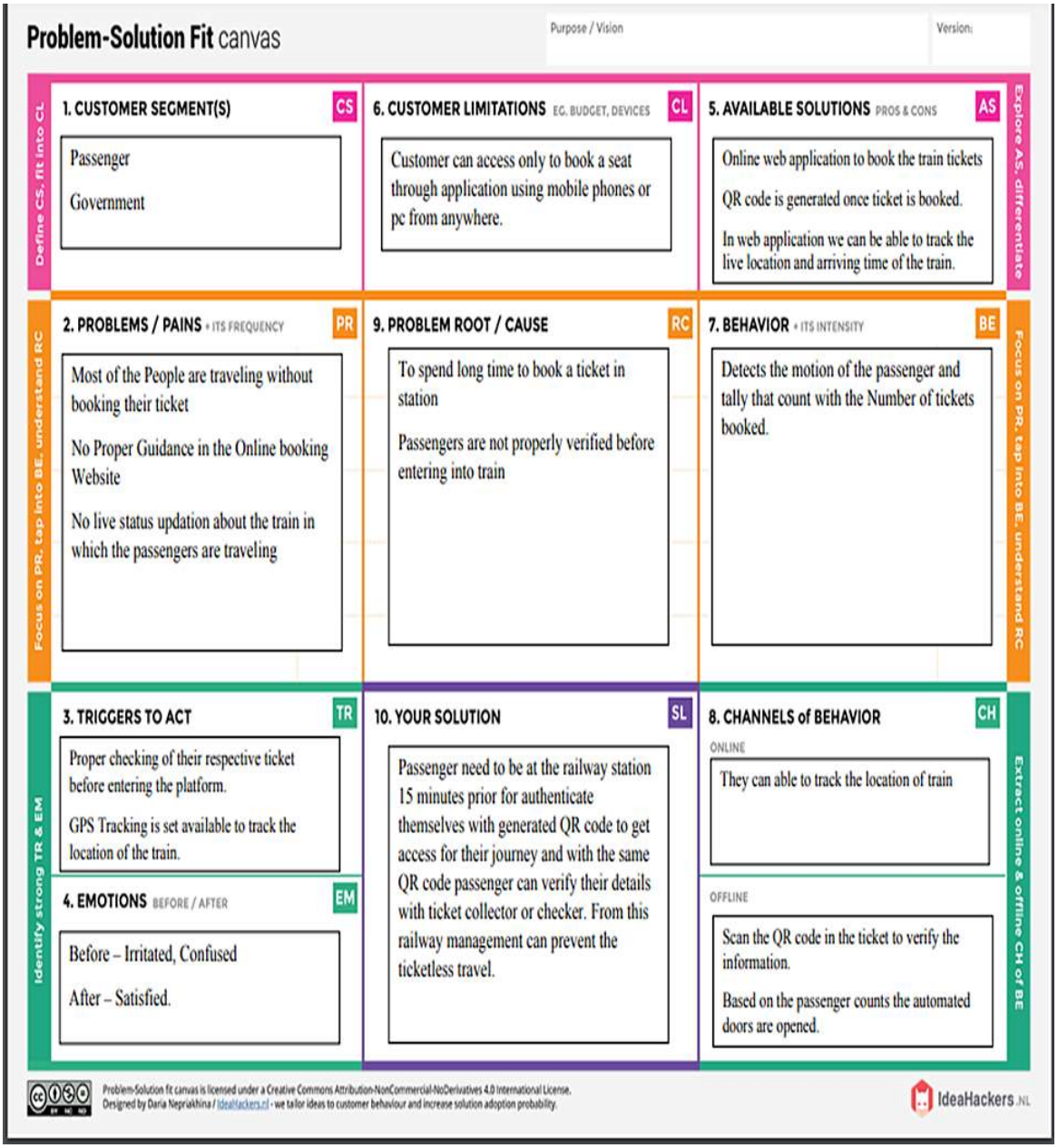


Figure 2,3 Problem statement

CHAPTER - 4
REQUIREMENT ANALYSIS

4.1 Functional Requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP Confirmation via SMS
FR-3	User understanding	Based on the user's entered traveling detail valid ticket is generated with unique QR code.
FR-4	User action	The generated QR code is scanned by the ticket checker there it shows whether the ticket is valid or not. And search for passenger information in cloud service for the verification.
FR-5	User location	Using a GPS the train location is tracked and it is shared in the website.

Table 4.1 Functional Requirements

4.2 Non-Functional Requirements

FR No.	Non-Functional Requirement	Description
NFR-2	**Security**	The data entered during the booking process will be stored in cloud so it is very secure and can be easily retrieved whenever needed.
NFR-3	**Reliability**	It is more reliable where the live location is shared on the spot and is easy to verify the ticket for each passenger and also avoid the fraudulent in ticket booking.
NFR-4	**Performance**	Though the details are get stored in the cloud the system crash will not affect the data. The data can be retrieved from anywhere with a scanner. And the GPS states the exact location of the train.
NFR-5	**Availability**	Any time available system. The ticket can be verified by the ticket collector from anywhere.
NFR-6	**Scalability**	The scanner and the codes written are highly scalable where any implementation can be done anytime needed.

Table 4.2 Functional Requirement

CHAPTER - 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

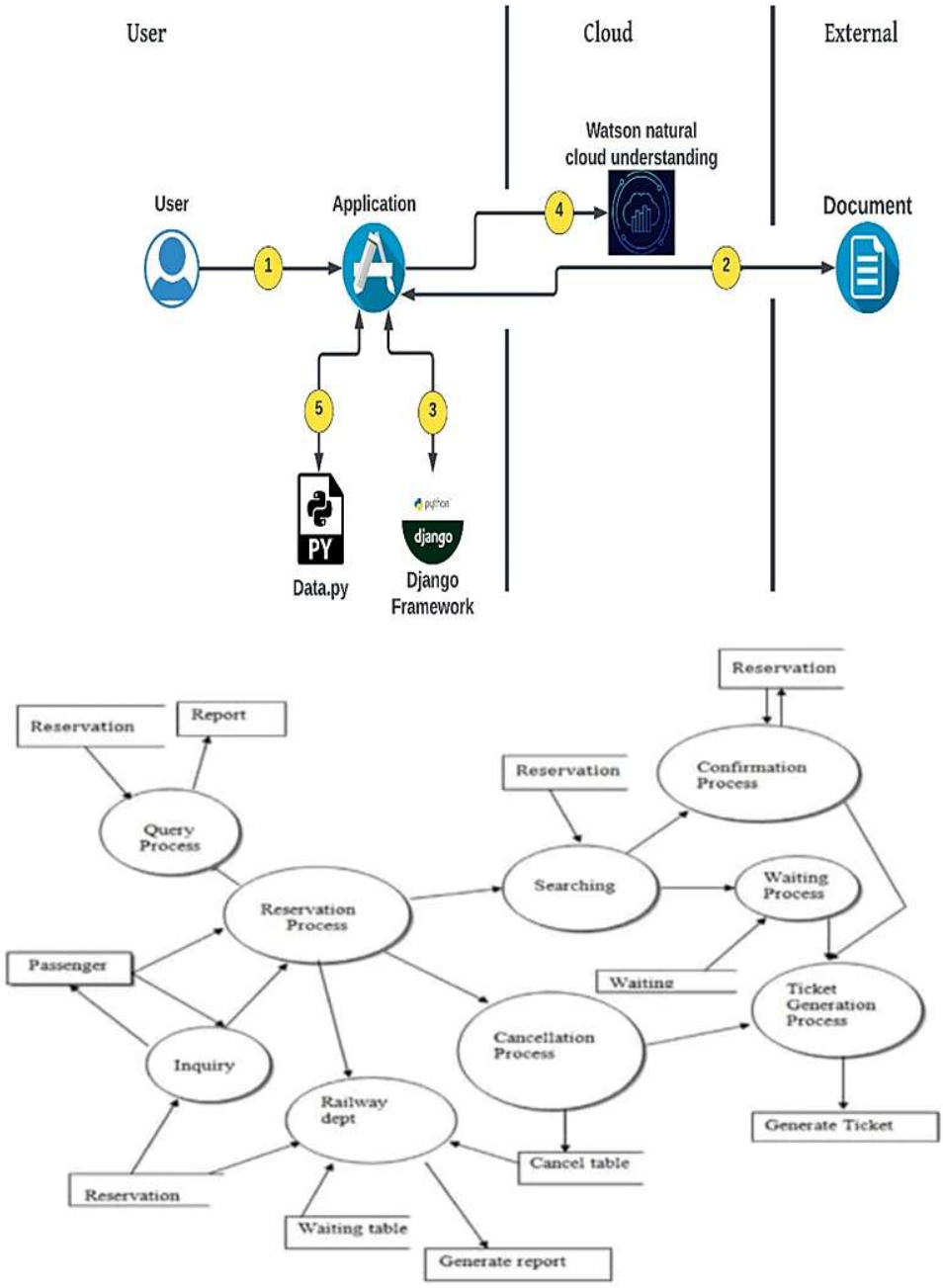


Figure 5.1 Data Flow Diagrams

5.2 SOLUTION AND TECHNICAL ARCHITECTURE

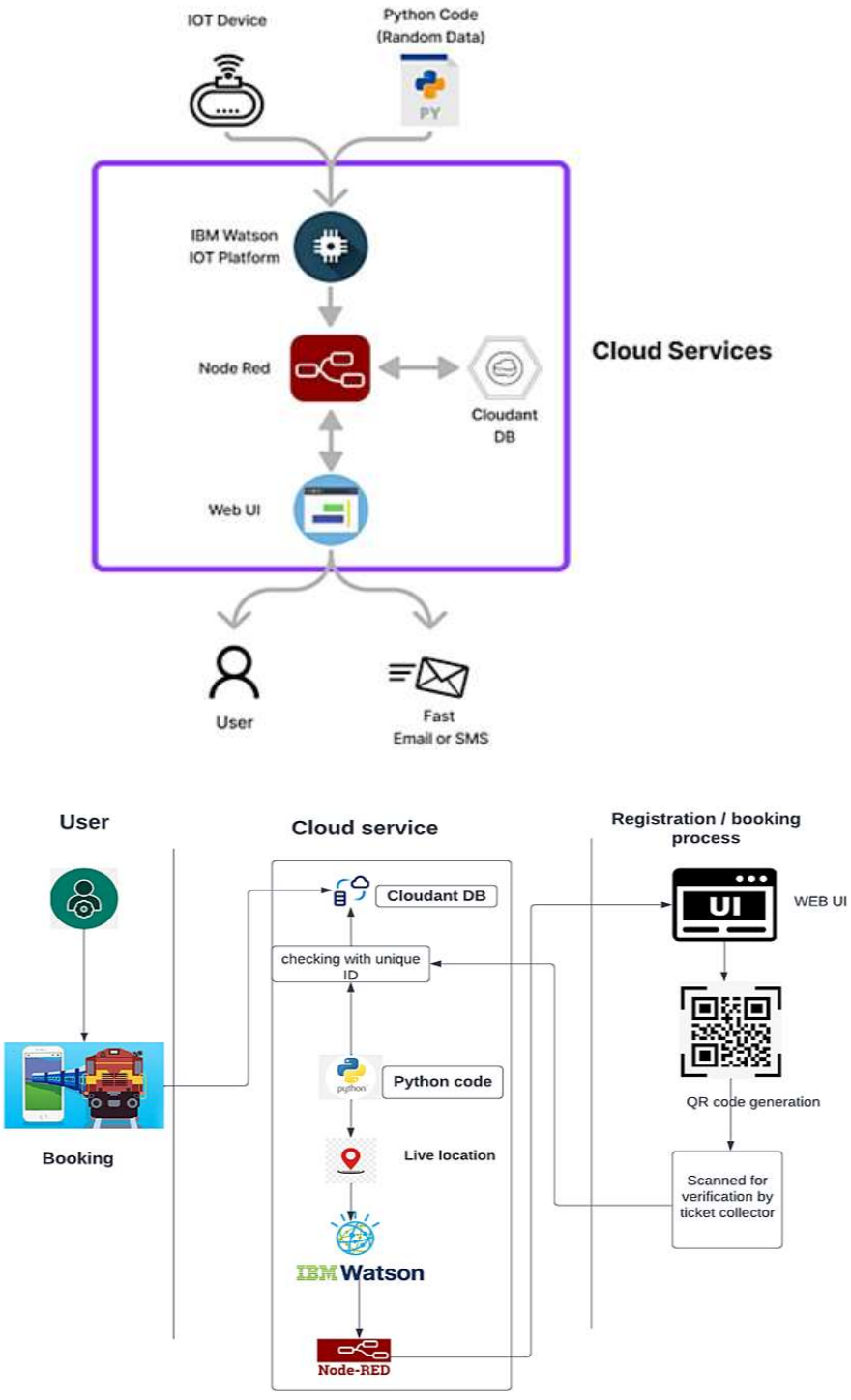


Figure 5.2 Solution And Technical Architecture

5.3 USER STORIES

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, mobile number, and confirming my password.	I can access my profile / dashboard & transactions	High	Sprint-1
Customer (Mobile user)	Registration	USN-2	As a user, I will receive confirmation email or mobile based on my selection. once I have registered for the application	I can receive confirmation email or mobile number & click confirm	High	Sprint-1
Customer (Mobile user)	Registration	USN-3	As a user, I can register for the application through email	I can receive regular updates if wanted and save time to registration and get a QR code for reserved tickets	Medium	Sprint-1

Customer (Mobile user)	Login	USN-4	As a user, I can log into the application by entering email & password	I can access my profile and dashboard	High	Sprint-1
Customer (Mobile User)	Reservation	USN-5	As a user, I can search available train by entering departure and destination location and can choose conventional train to book tickets.	I can access trains available seat or berth reservation	High	Sprint-2
Customer (Mobile user)	Dashboard	USN-6	As a user, I can see my dashboard once logged into application.	I can see recent activities which I have done and access the generated QR code for reserved tickets	High	Sprint--2
Customer (Web user)	Tracking	USN-7	As a passenger, I can know where the train is by using the application with the unique Train ID.	I can instantly know when will reach the destination through GPS tracking	Medium	Sprint-3

Customer Care Executive	Help Customers / Users	USN-8	As a Customer Care Executive, I have to take action for the customer complaints, request and query.	I can navigate the customers to find where the issue is	Medium	Sprint-4
Administrator	Management	USN-9	As a Administrator I can manage the cloud and database.	I can report the problem to customer directly through server	High	Sprint-3

Table 5.3 User Stories

CHAPTER - 6

PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

SPRINT 1

In the Sprint we have designed a sign up page for the user where they can register their new account by entering valid details. After that the user can login with their own credentials to book their tickets. We have used front languages like Html and CSS to design the web page and for the backend purpose we used php and Mysql. We created a user table that stores the details of the user entered while registering their account . And those details will be used to verify their credentials while login. If only when the datas matches the user can successfully login into their account and move on further process.

SPRINT 2

The second sprint brings about the booking of a ticket. In this, we designed a web page that asks for the details of the passenger to book their respective tickets. We designed the web page using Node-red.

Node-RED is a programming tool for wiring together hardware devices, APIs , and online services in new and interesting ways.

It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single click.

So, using Node-Red, we designed our web page to book a ticket for a user. While booking the ticket, the user is asked to enter the credentials such as their boarding station and destination station and their seat preference, and also their booking details such as name, age, and mobile number.

The seat availability is designed in a way that once a seat is booked that is restricted for the next user and when all the seats are booked, it shows a message that no seats are available.

SPRINT 3

In this sprint, we have included another feature to our website so that the passenger can know their live location while they are traveling. For that, we have given random data with python code to point to the random location of the train. This feature is available in the menu option a live location by clicking on that option the passenger can view their respective location.

SPRINT-4

This sprint is all about testing. In this, we check whether a user can book his/her ticket successfully and whether their respective QR code is generated successfully. And also we check whether a ticket collector can scan the QR code and get proper details of the passenger and validation of the ticket.

For scanning the QR code we have written a python code when the code runs the webcam will be accessed for scanning purpose. When the ticket has been scanned the details of the passenger stored in the cloudant DB is retrieved.

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, mobile number, and confirming my password.	4	High	Gokul Erusappan N
Sprint-1		USN-2	As a user, I will receive confirmation email or mobile based on my selection. once I have registered for the application	5	High	Gokul Erusappan N
Sprint-1	Login	USN-3	As a user, I can login by entering email & password through the web application.	1	Medium	Dhinakaran U
Sprint-2	Booking	USN-4	As a user, I can search for the train availability and seats availability	5	High	Megavarshini S
Sprint-2		USN-5	As a user and based on the availability I can	4	High	Megavarshini S

			book my tickets.			

6.3 REPORTS FROM JIRA

Burndown chart

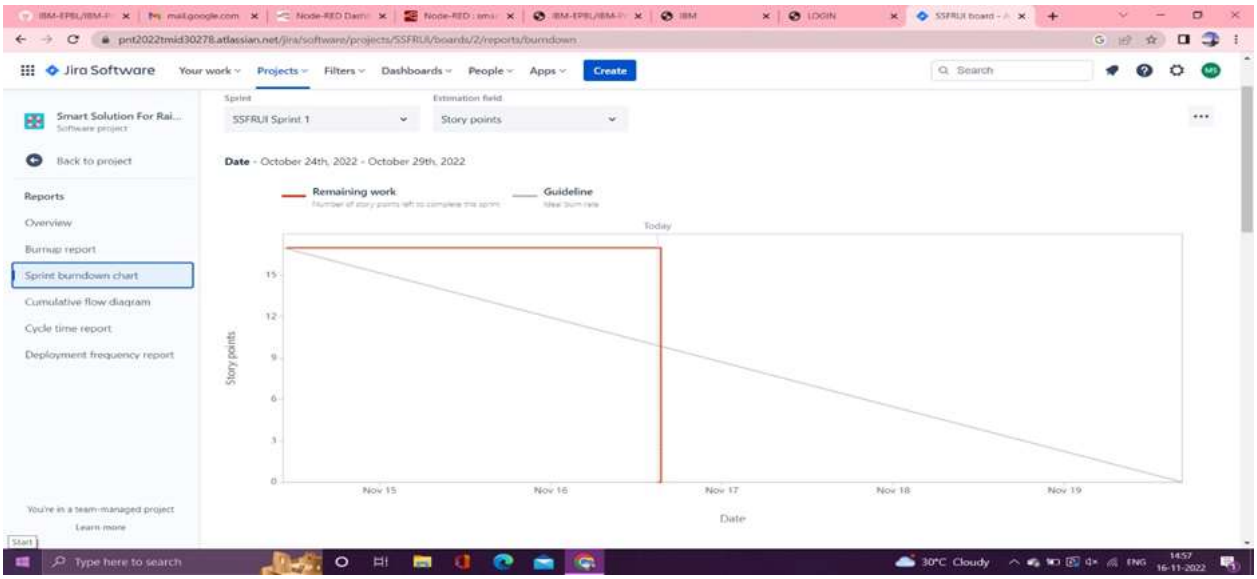


Figure 6.1 Burndown chart

Road map

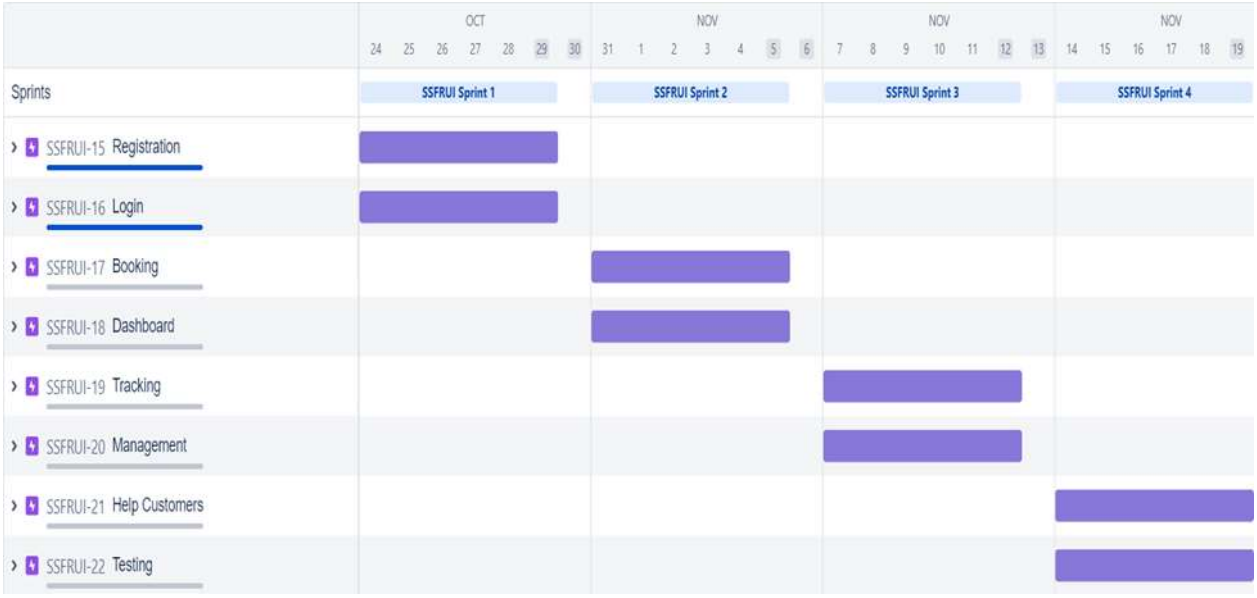


Figure 6.2 Road map

CHAPTER - 7

CODING AND SOLUTIONS

7.1 FEATURE -1

- CloudantDB will store the booking details of the passengers..
- Login details of the user will be stored in Mysql using php.
- GPS live location tracking feature is added to our project..

7.2 FEATURE- 2

- Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.
- Node-RED provides a browser-based flow editor that makes it easy to wire together flows using the wide range of nodes in the palette. Flows can be then deployed to the runtime in a single-click.JavaScript functions can be created within the editor using a rich text edit.
- A built-in library allows you to save useful functions, templates or flows for re-use.

CHAPTER - 8

TESTING

8.1 TEST CASES

A test case might be created as an automated script to verify the functionality per the original acceptance criteria. After doing manual exploratory testing, QA testers might suggest other functionality be added to the application as well as updated test cases be incorporated in the automated test suite.

Test case ID	Feature Type	Component	Test Scenario
Frontend_TC_OO1	Dashboard UI	Home page(Client)	Verify user credentials for their login
Backend_TC_OO2	App Configuration	Node Red Flow Editor	UI should get the details from the user to store in database and to generate QR Code.
QR_Generation_TC_OO3	QR Code Generation	Node Red Tool	Verify QR code generation for the entered information
Datebase_TC_OO4	Cloudant Database	IBM Cloudant DB	Verify the details which we entered while booking to store in the database

Table.8.1 Test Report

Steps To Execute	Test Data	Expected Result	Status	Executed by
1.Register an account for an new user 2.Login in with the respective credentials	localhost/Try/login	User should navigate to user account homepage	Pass	Megavarshini S
1.Web UI configuration 2.Function Configuration 3. Application flow	http://smart-railways.eu-gb.mybluemix.net/ui/..	Process the information which given by the user and store it in database	Pass	Gokul Erusappan N
1. Enter the appropriate information in required fields. 2. Select the available seat 3. Submit	http://smart-railways.eu-gb.mybluemix.net/ui//	The QR Code should be generated which integrated passenger details	Pass	Shudarvizhi K L
1. Click	https://95a9ab	Passenger	Pass	Dhinakaran U

submit once you enter all the required fields. 2. Go to Cloudant dashboard 3. Click the recent updated metadata	19-b04c-498f-82e9-fd70bc26bd54-bluemix.cloudant.com/dashboard.html#database/passengerdetails/_all_docs	details should store in database document		

Table.8.2. Test Report

8.1USER ACCEPTANCE TESTING:

1.Purposeof Document

The purpose of this documentis to briefly explain the test coverageand open issues of the Ticket booking,Node-Red, QR code, GPS location of project at the time of the release to User Acceptance Testing (UAT).

2.Defect Analysis

This reportshows the numberof resolved or closed bugs at each severitylevel, and how they were resolved

Table 8.1. Defect Analysis

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	5	4	2	1	12

Duplicate	0	0	1	1	2
External	3	3	0	1	7
Fixed	8	3	3	14	28
Not Reproduced	0	0	1	0	1
Skipped	0	0	0	1	1
Won't Fix	0	0	0	1	1
Totals	19	14	8	20	52

Table 8.1. Defect Analysis

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

Section	TotalCases	NotTested	Fail	Pass
Login	4	0	0	4
Register	5	0	0	5
Booking Page	10	0	0	10
Database	3	0	0	3
Node-Red	2	0	0	2
GPS	1	0	0	1
QR Code	5	0	0	5

Table 8.2. Test Case Analysis

CHAPTER - 9

RESULTS

9.1 Performance Metrics:

NFT - Detailed Test Plan

S.No	Project Overview	NFT Test approach	Assumptions/Dependencies/Risks	Approvals/Sign Off
1	Booking	Stress	App Crash/ Developer team/ Site Down	Approved
2	Booking	Load	Server Crash/ Developer team/ Server Down	Approved

Table 9.1. NFT - Detailed Test Plan

End Of Test Report

Project Overview	NFT Test approach	NFR - Met	GO/NO-GO decision	Identified Defects	Approvals/Sign Off
Booking	Stress	Performance	GO	Closed	Approved
Booking	Load	Scalability	NO-GO	Closed	Approved

Table 9.2. End Of Test Report

CHAPTER - 10

ADVANTAGES

ADVANTAGES:

- It helps the user to track the location of the train.
- The software is very user-friendly; the need not install any external app.

CHAPTER - 11

CONCLUSION

We have developed a web application where the user can book a ticket to their respective destination based on seat availability. After the successful booking of a seat, a QR code is generated that contains the passenger’s details. A python code is built for the ticket collector to scan the QR code and get the necessary details. And also a separate python code is built for GPS tracking. The website shows the tracked live location of the train.

CHAPTER - 12

APPENDIX

13.1SOURCE CODE:

Signup.php

```
<!DOCTYPEhtml>
<html>
<head>
     <title>SIGN UP</title>
     <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
     <form action="signup-check.php" method="post">
          <h2>SIGN UP</h2>
          <?php if (isset($_GET['error'])) { ?>
               <p class="error"><?phpecho $_GET['error']; ?></p>
          <?php } ?>

          <?php if (isset($_GET['success'])) { ?>
               <p class="success"><?phpecho $_GET['success']; ?></p>
          <?php } ?>

          <label>Name</label>
          <?php if (isset($_GET['name'])) { ?>
               <input type="text"
                      name="name"
                      placeholder="Name"
                      value="<?php echo $_GET['name']; ?>"><br>
          <?php }else{ ?>
               <input type="text"
                      name="name"
                      placeholder="Name"><br>
          <?php }?>
```

```
          <label>User Name</label>
          <?php if (isset($_GET['uname'])) { ?>
               <input type="text"
                      name="uname"
                      placeholder="User Name"
                      value="<?php echo $_GET['uname']; ?>"><br>
          <?php }else{ ?>
               <input type="text"
                      name="uname"
                      placeholder="User Name"><br>
          <?php }?>


          <label>Password</label>
          <input type="password"
                 name="password"
                 placeholder="Password"><br>

          <label>Re Password</label>
          <input type="password"
                 name="re_password"
                 placeholder="Re_Password"><br>

          <button type="submit">Sign Up</button>
          <a href="index.php"class="ca">Already have an account?</a>
     </form>
</body>
</html>
```

—

Signup-check.php

```
<?php
session_start();
include "db_conn.php";

if (isset($_POST['uname']) && isset($_POST['password'])
    && isset($_POST['name']) && isset($_POST['re_password'])) {
```

```php
    function validate($data){
      $data = trim($data);
       $data = stripslashes($data);
       $data = htmlspecialchars($data);
       return $data;
    }

    $uname = validate($_POST['uname']);
    $pass = validate($_POST['password']);

    $re_pass = validate($_POST['re_password']);
    $name = validate($_POST['name']);

    $user_data = '&uname='. $uname. '&name='. $name;


    if (empty($uname)) {
         header("Location: signup.php?error=User Name is
required&$user_data");
         exit();
    }else if(empty($pass)){
       header("Location: signup.php?error=Password is
required&$user_data");
         exit();
    }
    else if(empty($re_pass)){
       header("Location: signup.php?error=Re Password is
required&$user_data");
         exit();
    }

    else if(empty($name)){
       header("Location: signup.php?error=Name is
required&$user_data");
         exit();
    }
```

```
     else if($pass !== $re_pass){
        header("Location: signup.php?error=The confirmation password
does not match&$user_data");
         exit();
     }

     else{

          // hashing the password
        $pass = md5($pass);

         $sql = "SELECT * FROM users WHERE user_name='$uname' ";
          $result = mysqli_query($conn, $sql);

          if (mysqli_num_rows($result) > 0) {
               header("Location: signup.php?error=The username is
taken try another&$user_data");
             exit();
          }else {
           $sql2 = "INSERT INTO users(user_name, password, name)
VALUES('$uname', '$pass', '$name')";
           $result2 = mysqli_query($conn, $sql2);
           if ($result2) {
                header("Location: signup.php?success=Your account has
been created successfully");
              exit();
           }else {
                    header("Location: signup.php?error=unknown error
occurred&$user_data");
                  exit();
           }
          }
     }

}else{
     header("Location: signup.php");
```

```
     exit();
}
```

Login.php

```
<?php
session_start();
include "db_conn.php";

if (isset($_POST['uname']) && isset($_POST['password'])) {

     function validate($data){
       $data = trim($data);
        $data = stripslashes($data);
        $data = htmlspecialchars($data);
        return $data;
     }

     $uname = validate($_POST['uname']);
     $pass = validate($_POST['password']);

     if (empty($uname)) {
          header("Location: index.php?error=User Name is required");
         exit();
     }else if(empty($pass)){
        header("Location: index.php?error=Password is required");
         exit();
     }else{
          // hashing the password
        $pass = md5($pass);


          $sql = "SELECT * FROM users WHERE user_name='$uname' AND
password='$pass'";

          $result = mysqli_query($conn, $sql);
```

```
          if (mysqli_num_rows($result) === 1) {
               $row = mysqli_fetch_assoc($result);
            if ($row['user_name'] === $uname && $row['password'] ===
$pass) {
               $_SESSION['user_name'] = $row['user_name'];
               $_SESSION['name'] = $row['name'];
               $_SESSION['id'] = $row['id'];
               header("Location: home.php");
                  exit();
            }else{
                     header("Location: index.php?error=Incorect User
name or password");
                  exit();
               }
          }else{
               header("Location: index.php?error=Incorect User name or
password");
             exit();
          }
     }

}else{
     header("Location: index.php");
     exit();
}
```

—

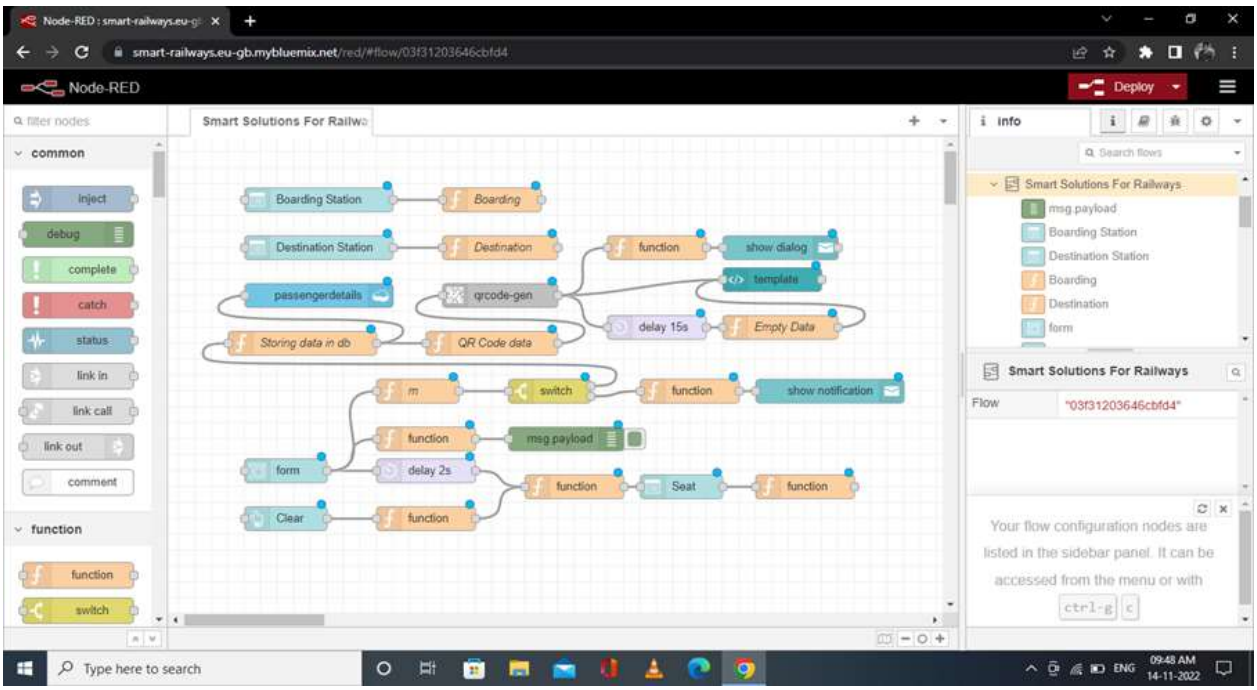
Index.php

```
<!DOCTYPEhtml>
<html>
<head>
     <title>LOGIN</title>
     <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
     <form action="login.php"method="post">
          <h2>LOGIN</h2>
```

```
            <?php if (isset($_GET['error'])) { ?>
                 <p class="error"><?phpecho $_GET['error']; ?></p>
            <?php } ?>
            <label>User Name</label>
            <input type="text" name="uname"placeholder="User Name"><br>

            <label>Password</label>
            <input type="password"name="password"
placeholder="Password"><br>

            <button type="submit"> <a href="https://smart-railways.eu-
gb.mybluemix.net/ui">Login</button>
            <a href="signup.php" class="ca">Create an account</a>
      </form>
</body>
</html>
```



13.2 GITHUB AND PROJECT DEMO LINK:

https://github.com/IBM-EPBL/IBM-Project-42395-1660661440

https://youtu.be/jd2NrQ4Aahw

13.3 SCREENSHOT

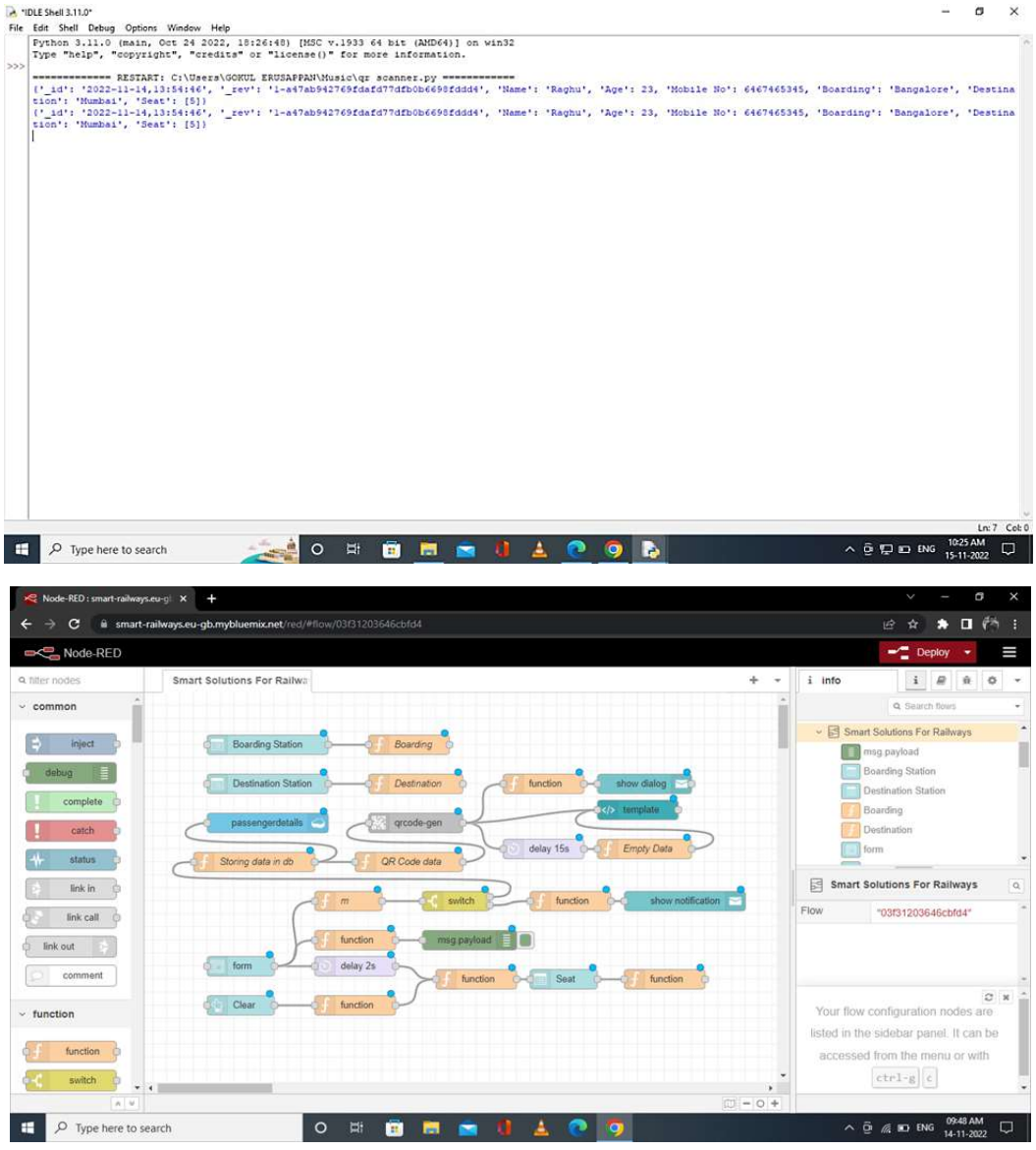


Figure 13.3 Screenshot

CHAPTER - 14

REFERENCES

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4.ArwareDumbare , “Location Based Online Ticket Application.