SMART SOLUTIONS FOR RAILWAYS USING IoT

PROJECT BASED LEARNING

Submitted by

MADHUMITHA M (910619205027)

JEEVAJOTHI J (910619205024)

MONIKA B (910619205028)

MUTHEESWARI M (910619205031)

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ANNA UNIVERSITY : CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **" Smart Solutions For Railways Using IoT"** is the bonafide work of **"MADHUMITHA M (910619205027)" JEEVAJOTHI J (910619205024)" MONIKA B (910619205028)"** and**" MUTHEESWARI M (910619205031)"** who carried out the project under my supervision.

SIGNATURE	**SIGNATURE**
Dr.P.GANESHKUMAR ,M.E.,PH.D.	**Dr.J.S.KANCHANA ,M.E.,PH.D.**
HEAD OF THE DEPARTMENT	**ASSISTANT PROFESSOR**
Information Technology,	**Information Technology,**
K.L.N. College of Engineering,	**K.L.N. College of Engineering,**
Pottapalayam,	**Pottapalayam,**
Sivagangai-630 612.	**Sivagangai-630 612.**

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EVALUATOR	**MENTOR**

ABSTRACT

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 large size it is difficult to monitor the cracks in tracks manually. This paper deals with this problem and detects cracks in tracks with the help of ultrasonic sensor attached to moving assembly with help of stepper motor. Ultrasonic sensor allows the device to moves back and forth across the track and if there is any fault, it gives information to the cloud server through which railway department is informed on time about cracks and many lives can be saved. This is the application of IoT, due to this it is cost effective system. This effective methodology of continuous observation and assessment of rail tracks might facilitate to stop accidents. This methodology endlessly monitors the rail stress, evaluate the results and provide the rail break alerts such as potential buckling conditions, bending of rails and wheel impact load detection to the concerned authorities.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

This project aims at development of a Railway Reservation System that facilitates the Railway customers to manage their reservations and the Railway administrators to modify the backend databases in a User-Friendly manner. This project includes the following functions: 1) Create new database 2) Add new Record 3) Modify 4) Display record 5) Ticket reservation 6) Ticket Modification 7) Ticket Cancellation 8) Ticket printing 9)Train tracking .

Our project introduces railway reservation system to make the reservation system more efficient, easier and fast. This project explores how computer technology can be used to solve the problem of user. The main objectives provided by this software are as follows: We can enquire about availability of trains We can reserve and cancel their seats We can modify the information related to Trains 1 , Timetable , Train Name , Train Number , Ticket Fare. This project is dedicated to model existing railway reservation systems that aim at development of Railway Reservation System that facilitates the railway customer to manage their reservations and the railway administrator to modify the backend database in a user-friendly manner.
In this emerging world of computers, almost all-manual system has switched to automated and computerized system. Therefore, we are developing the software for "Railway Reservation System" to model the present system and to remove the drawbacks of the present system. This project explores how computer technology can be used to solve the problem of user. This being a big step in terms of improvement in the railway system it is widely accepted across the country. Rather than designing manually, we have made use of computer.

1.2 Purpose

The purpose of this software is to describe the Railway Reservation System which provides the rail timing details, reservation, enquiry, billing and cancellation on various types of reservation namely:

1.Confirm reservation for confirm seat

2.Online Payments

3.Train tracking

4.Reservation against cancellation

This project is dedicated to model the existing railway reservation system that aims at development of Railway Reservation System that facilitates the railway customer to manage their reservations and the railway administrator to modify the backend database in a user-friendly manner. The customer and the railway administrator are two parties that interact with the database, who have different ‘view level schemas’ to the database information. The software provides a comprehensive set of features to enhance the operational limits. Now one can easily plan the journey comfortably as the process is efficient and fast with being easy to access. The efficiency of the railway will increase result of computerization.

CHAPTER 2

LITERATURE SURVEY

2.1 Existing problem

The biggest obstacle is poor connectivity in the net. When that is the case, it is advisable to stop trying at all. Because even if somehow you almost book the desired ticket, the payment part can frustrate the whole activity. Then your ticket as well as money is stuck. There are innumerable problems with Tatkal in busy season on busy routes. There is no way to beat the agents because they use every available legal and other way to get you the ticket. You should learn ways to save time, and you should try to plan in advance. That is the real alternative.Sometimes your money will get stuck even when everything is ok .Then the problem is with your bank's server. Here again there is little you can do. Now, it seems to be a challenge to develop an online booking system that offers multiple types of bookings on a single platform. It's always been challenging to manage online booking cancellations. If you provide the booking cancellation option to customers, you will frequently receive tons of booking cancellation requests from the customers that are too complex to manage. On the other hand, if you will not provide the cancel booking option to your customers, you will be flooded with bookings or probably start receiving spams. This may also result in a large number of no-shows if the customers find no option to cancel bookings. It's quite complex to manually set up a different price for each booking slot. In order to have a flexible price for each booking, your online booking system should be capable enough to show a different slot price of the same booking product on different dates. If you are in an eCommerce business, you have to deal with customer complaints. Your customer may have a bad experience with your service but the main challenge is to handle such situations with grace.

2.2 References

1.S.D.T. Kelly N.K. Suryadevara and S.C.Mukhopadhyay "Towards the implementation of IoT for environmental condition monitoring in homes"

In this paper, we have reported an effective implementation for Internet of Things used for monitoring regular domestic conditions by means of low cost ubiquitous sensing system. The description about the integrated network architecture and the interconnecting mechanisms for the reliable measurement of parameters by smart sensors and transmission of data via internet is being presented. The longitudinal learning system was able to provide a self-control mechanism for better operation of the devices in monitoring stage. The framework of the monitoring system is based on a combination of pervasive distributed sensing units, information system for data aggregation, and reasoning and context awareness. Results are encouraging as the reliability of sensing information transmission through the proposed integrated network architecture is 97%. The prototype was tested to generate real-time graphical information rather than a test bed scenario.

2. Y.S.Song J.Kim S.W. Choi and Y.K. Kim "Long term evolution for wireless communications: Testbed deployment and performance evolution

In this article, we show the feasibility of the LTE-R testbed with essentially IP-based network architecture. Specifically, we discuss procedures of deploying LTE-R by describing our construction of a testbed in a commercial railway through cell planning and optimization. Then we demonstrate the performance enabled by the implementation of a testbed for LTE-R. We confirm that not only reliable communications but also multimedia services requiring high data rates are feasible, which gives us some guarantee of the prosperity of various advanced train services. We also discuss a number of valuable technical communication issues related to inherent characteristics of railway communications that are unlike those of commercial wireless communications.

3. J. Kim S.W. Choi Y.S. Song Y.K Yoon and Y.K Kim "Automatic train control LTE: Design and performance evolution"

Due to technical advances in train control and wireless communications, unmanned train operation has gained in popularity of late. On the other hand, any errors involved in managing the QoS of train control traffic will cause negative consequences such as possible loss of life. Operators therefore naturally wish to scrutinize the specifications so that the wireless communications system is capable of guaranteeing the QoS of the train control traffic. In this article, we propose a feasible QoS management scheme for train control traffic based on the methodology used in a conventional LTE system. Based on the proposed scheme, we evaluate the feasibility of the LTE system using a testbed built in a commercial railway region. The key issues to support the train control services by the LTE system are the design of a QoS policy based on analyzing the characteristics of the train control traffic and the appropriate adjustment of the cell parameters during the cell planning and optimization procedures in order to resolve any network issues that may cause problems with data pause.

4. B. Martinez M. Monton I. Vilajosana and J.D. Prades "The power of models: Modeling power consumption for IoT devices"

Low-energy technologies in the Internet of Things (IoTs) era are still unable to provide the reliability needed by the industrial world, particularly in terms of the wireless operation that pervasive deployments demand. While the industrial wireless performance has achieved an acceptable degree in communications, it is no easy task to determine an efficient energy-dimensioning of the device in order to meet the application requirements. This is especially true in the face of the uncertainty inherent in energy harvesting. Thus, it is of utmost importance to model and dimension the energy consumption of the IoT

applications at the pre-deployment or pre-production stages, especially when considering critical factors, such as reduced cost, life-time, and available energy. This paper presents a comprehensive model for the power consumption of wireless sensor nodes. The model takes a system-level perspective to account for all energy expenditures: communications, acquisition and processing. Furthermore, it is based only on parameters that can empirically be quantified once the platform (i.e., technology) and the application (i.e., operating conditions) are defined. This results in a new framework for studying and analyzing the energy life-cycles in applications, and it is suitable for determining in advance the specific weight of application parameters, as well as for understanding the tolerance margins and tradeoffs in the system.

5. J. Kim J. Lee J. Kim and J. Yun "M2M service platforms: Survey issues and enabling technologies"

Machine-to-Machine (M2M) refers to technologies with various applications. In order to provide the vision and goals of M2M, an M2M ecosystem with a service platform must be established by the key players in industrial domains so as to substantially reduce development costs and improve time to market of M2M devices and services. The service platform must be supported by M2M enabling technologies and standardization. In this paper, we present a survey of existing M2M service platforms and explore the various research issues and challenges involved in enabling an M2M service platform. We first classify M2M nodes according to their characteristics and required functions, and we then highlight the features of M2M traffic. With these in mind, we discuss the necessity of M2M platforms. By comparing and analyzing the existing approaches and solutions of M2M platforms, we identify the requirements and functionalities of the ideal M2M service platform. Based on these, we propose an M2M service platform (M2SP) architecture and its functionalities, and present the M2M ecosystem with this platform. Different application scenarios are given to illustrate the interaction between the components of the proposed platform. In addition, we discuss the issues and challenges of enabling technologies and standardization activities, and outline future research directions for the M2M network.

6. A. Gluhak etal , "A survey on facilities for experimental Internet of Things research"

The initial vision of the Internet of Things was of a world in which all physical objects are tagged and uniquely identified by RFID transponders. However, the concept has grown into multiple dimensions, encompassing sensor networks able to provide real-world intelligence and goal-oriented collaboration of distributed smart objects via local networks or global interconnections such as the Internet. Despite significant technological advances, difficulties associated with the evaluation of IoT solutions under realistic conditions in real-world experimental deployments still hamper their maturation and significant rollout. In this article we identify requirements for the next generation of IoT experimental facilities. While providing a taxonomy, we also survey currently available

research testbeds, identify existing gaps, and suggest new directions based on experience from recent efforts in this field.

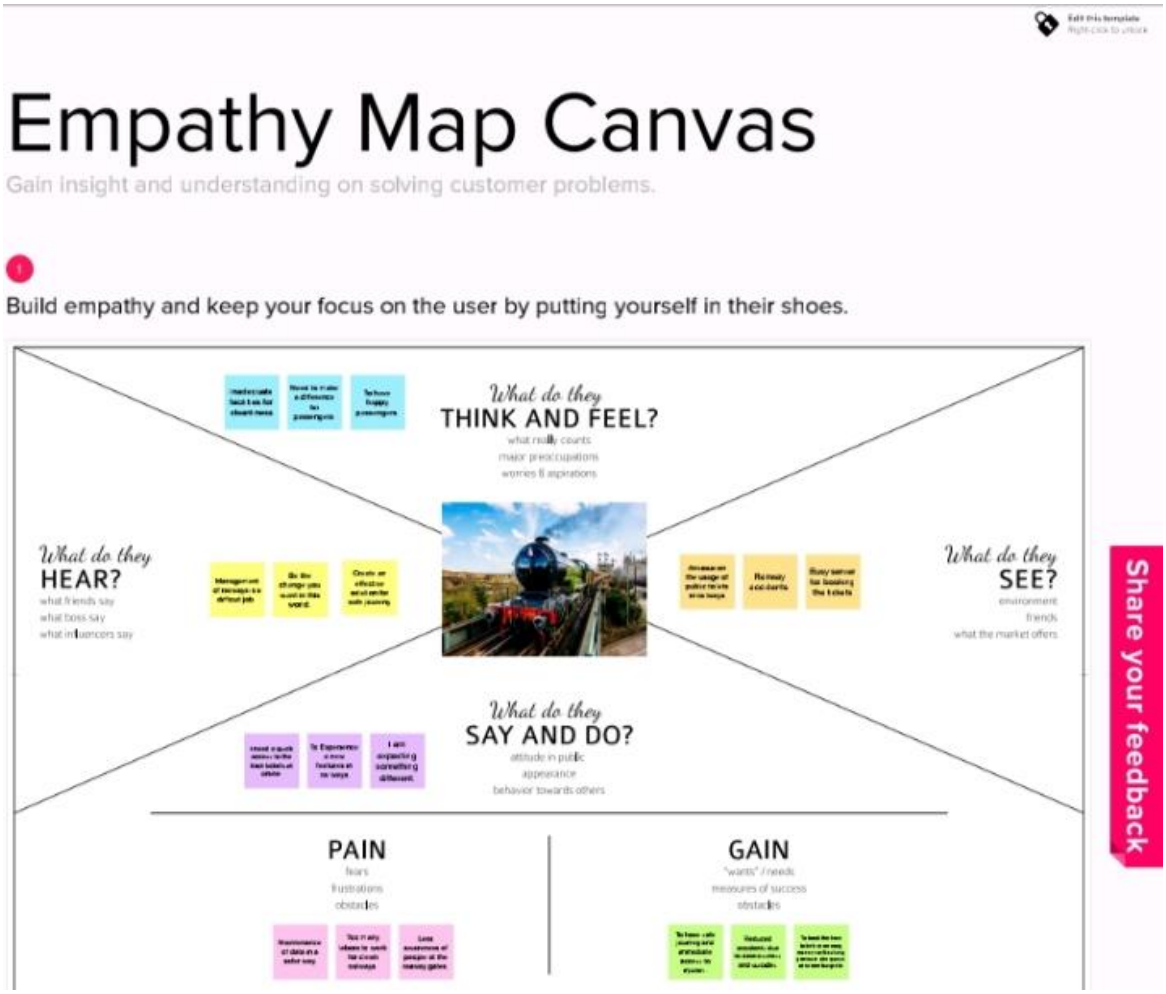
2.3 Problem Statement Definition

Online railway reservation is an efficient way to reserve tickets not by standing in the railway station queue .Now all railways has their own website for online reservation provide better customer service. The manual filling of reservation form cannot be changed once the details had been entered. The goal of online railway reservation is easing the tedious task of railway activity. Initially the customer has to create an ID in the appropriate website, so that the user can log into the system for doing further activities. An online manager will maintain a database. To do login process the customer has to fill a registration form that contains the username, password, first name and last name etc. After submitting the form to the server a customer ID is created with username and password thereby the customer with only the appropriate ID can reserve the tickets. RESERVATION The customer can reserve ticket by filling the reservation form present in the website. The reservation form present contain passenger name, sex, age, address, credit no, bank name, class through which the passenger is to travel etc. The online manager will verify the detail and provide PNR number to the customers who reserve the ticket. CANCELLATION The user can also perform cancellation of the ticket which he she had reserved earlier by entering PNR no. This PNR no will be checked with the PNR no in the database. If it exists then it will be cancelled. After cancellation process the conformation message will be send by the server. TICKET STATUS The customer can also view the ticket status by entering the PNR number on the ticket status icon. To view the train details the user should click the train details icon in the homepage. TRAIN DETAILS It provide information about arrival and departure trains along with information about stations through which it passes search about train passing through stations can be obtained either by means of train no, train name or specifying the source and destination station. While displaying information about train it has to provide following information. Stations through which train passes along with arrival and departure time. Availability of seats in different classes along with waiting list. Before issuing ticket the amount from customer has to be transferred to the railway account. Thus this has simplified the task of reservation, cancellation of tickets in railways.

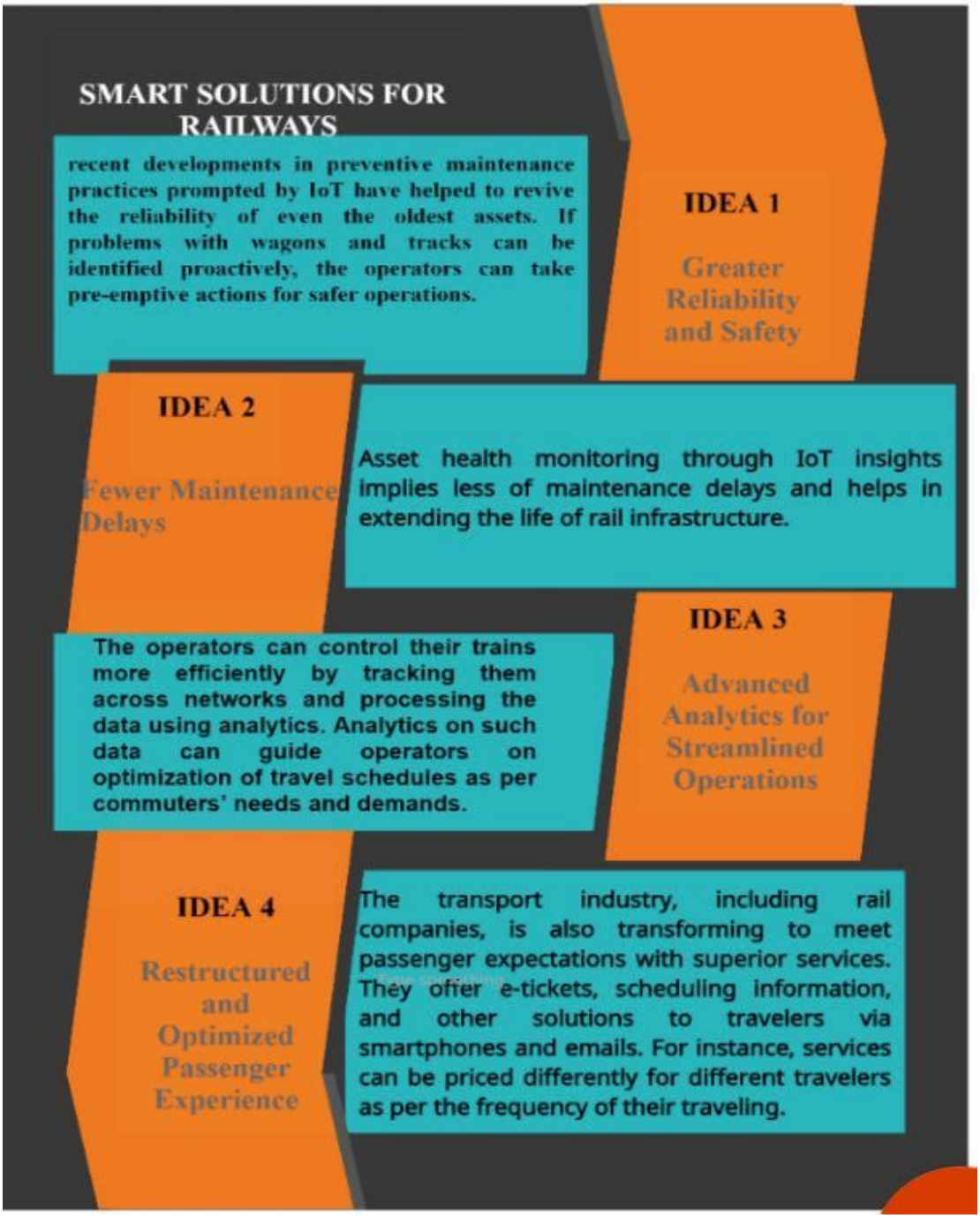
CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Smart Solutions For Railways
2.	Idea / Solution description	Smart railway described the passenger ticket generation, ticket validation, with Unique Identification Authority of India (UIDAI) under the smart train transportation the vision of India 2022 and the experimental result proved that IoT system is effective than well known System. Handling the passenger reservation data has been a key point of consideration in most railway services. The smart railways research report also provides an in-depth analysis of proposed.
3.	Novelty / Uniqueness	• Reduce operation and maintenance costs. • It is fast process. • Data efficiency is more. • Information is accurate.
4.	Social Impact / Customer Satisfaction	Smart railway can have a better understanding of customers' needs. In terms of comfort, availability of seats, comfortable in the units of carriage, temperature, smoothness of ride, and punctuality are the aspects in the dimensions, whereas connection as the second dimension measures adequacy of support services, such as parking facilities, easy accessibility, frequency of trains, and suitable time to board on train, while the last dimension, which is convenience, measures travel information, online counter service, such as ease of buying tickets and convenient office hours at the terminal.
5.	Business Model (Revenue Model)	• Global System Mobile Communications-Railway (GSM-R) • Long Term Evaluation (LTE) • fifth generation (5G)

		• IEEE 802.11 • Wireless Sensor Networks (WSN)
6.	Scalability of the Solution	The Smart railways database maintained by two data bases one is railway data base and another one is UIDAI. The passenger details as input that will match with the UIDAI data base and that information stored in railway reservation database. The Simulation environment is tested with one hundred stored UIDAI passengers information and developed coding smart railway system. We obtained the experimental results on PYTHON programming language and proved the effective result on IoT system. The existing PRS model is a omniscient system it can be modified to IoT system. It IoT system In build UIDAI based verification scheme. The total time is required to book the ticket using IoT system is not take more than 4 mile seconds. The smart reservation system is provides efficient searching and indexing operations are needed for fast query processing.

3.4 Problem Solution Fit

Railways to enhance the passenger experience, help improve safety, enable predictive maintenance, and, ultimately, create a successful future. ❖ IoT technologies help railways successfully manage passenger safety, operational efficiency, and the passenger experience.

✞ Smart sensors can be used to track important assets, manage passenger flow, and enable predictive maintenance.

✞ Innovative ways to safely get back to business post-COVID, meet the changing needs of their citizens, address urban population increases, and reduce their environmental impact. To meet these challenges and position themselves for future success, many forward-thinking governments and railway operators are looking for smart, intelligent IoT technologies to modernize their railways.

✞ There are many types of smart devices that enable IoT in railways, such as vibration and temperature sensors, vehicle and station cameras, digital signage, machine learning libraries, security systems, and more. When these intelligent devices work together in one end-to-end solution, railway operators can:

- **Turn data into actionable insights.** With edge computing, railway operators can process and analyze data closer to where it is collected to allow for nearreal-time decision-making and responsiveness. This low latency computing power helps enable solutions such as railway obstacle detection recognition, dynamic digital signage and interactive kiosk content, and passenger flow monitoring.

- **Maximize the value of existing systems.** Bridging the IT/OT divide and achieving convergence, which is the integration of information technology (IT) with operational technology (OT), helps operators to leverage, aggregate, and analyze data across the whole railway system. This new information can help streamline business processes, generate insights that can drive new innovative solutions and services, and reduce downtime.

- **Position themselves for future success**. Technology differentiators, such as deep learning and AI, can help operators prepare for the future and gain a competitive edge over other modes of transportation. AI can be used to predict rail delays to increase capacity without building new infrastructure, and deep learning can more accurately monitor passenger traffic flow for enhanced analytics in station planning and operational decision-making.

✞ By implementing sensor beacons, edge computing, AI, and cloud-based technologies, operators can eliminate queue lines at ticket machines. Using sensors on station platforms or trains, the system is designed to detect a specific

smartphone app as passengers enter the station or train and automatically charge the correct fair. This not only streamlines the process for both passengers and operators but can also simplify back-end billing and revenue management and collect usage behavior for longterm planning.

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 Functional Requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through App
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Login	Login the app using username and password Search the train details
FR-4	Booking Ticket	Choose the train based on their own journey Give the personal details Book the ticket via online
FR-5	Online payment	After booking you need to pay amount via online Many online payments are available in the app You can easily pay amount via online with securely
FR-6	Ticket Cancelation	If you want to cancel the ticket ,it is very easy in the online reservation. You must cancel ticket before the schedule allotment . Then only you can easily get your refund.

4.2 Non-functional Requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It can be assessed from efficiency of use , intuitive , low perceived work .
NFR-2	**Security**	Security requirements ensure that the software is protected from unauthorized access to the system and its stored data.
NFR-3	**Reliability**	Reliability defines how likely it is for the software to work without failure for a given period of time.
NFR-4	**Performance**	Performance is a quality attribute that describes the responsiveness of the system to various user interactions with it.
NFR-5	**Availability**	Availability is gauged by the period of time that the system's functionality and services are available for use with all operations.
NFR-6	**Scalability**	serving more users, processing more data, and doing more transactions.

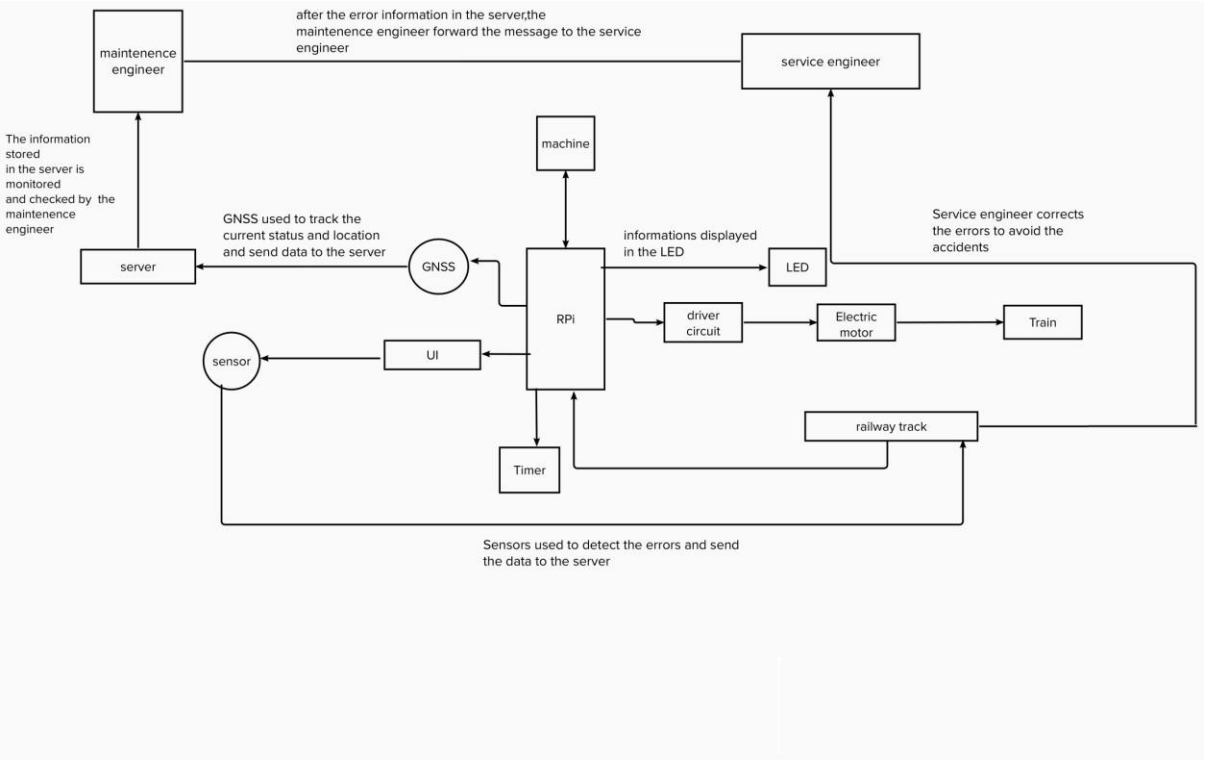
CHAPTER 5

PROJECT DESIGN

5.1 Data Flow Diagram

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Data flow diagram:



5.3 User Stories

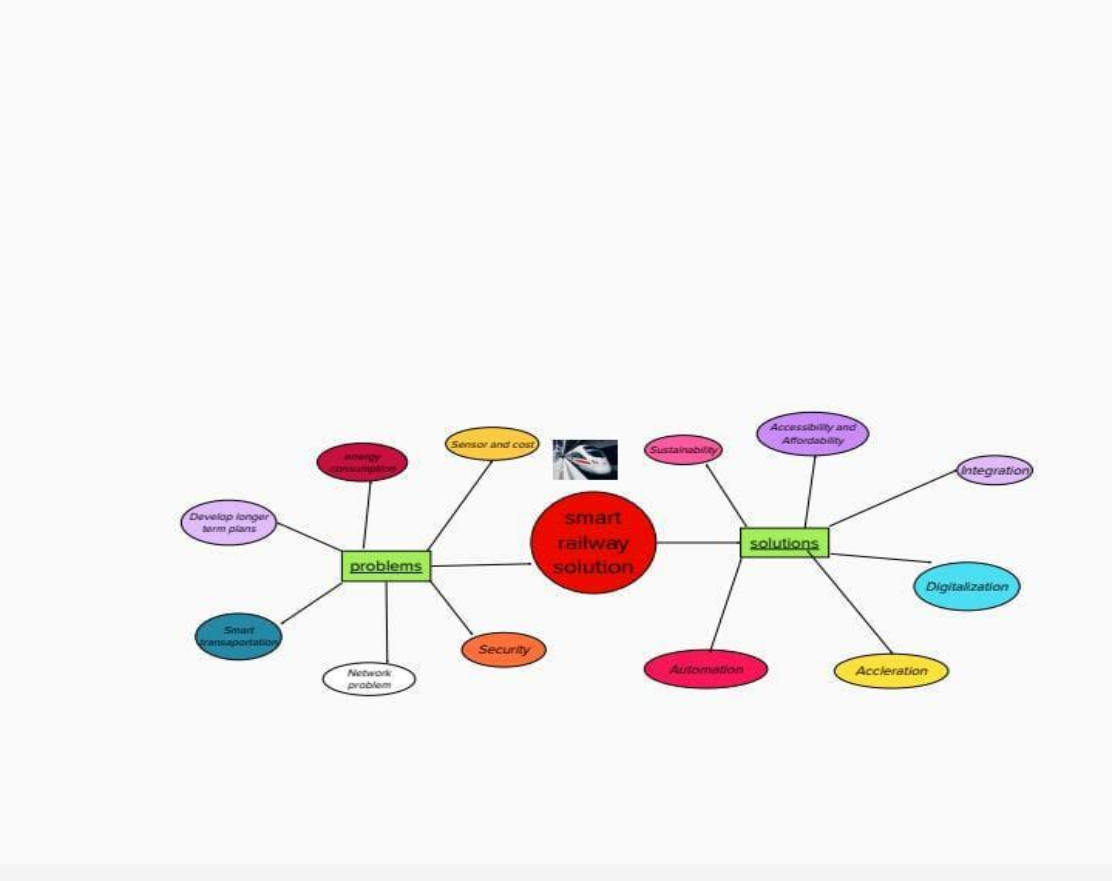
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Passenger (Mobile user)	Registration	USN-1	As a passenger, I can book my ticket through the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a passenger ,I will receive confirmation email once I have booked my ticket.	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a passenger, I can book ticket through link given in the Facebook .	I can register & access the dashboard with Facebook Login	Low	Sprint-2

		USN-4	As a user, I can book ticket QR code in booking station or through Gmail	I can receive message for the confirmation through text messages.	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password.		High	Sprint-1
	Dashboard	USN-6	As a passenger,I can click the link to open the ticket booking page.	To check whether the the ticket is booked or not.	Medium	Sprint-2
Database Administrated	Track the location	USN-7	As an administrator ,used to track the current status and location of the time.		Medium	Sprint-2

Railway Division manager	Digitialized	USN-8	As a division manager, can enhance the railways to be digitilaized with proper network to make passenger comfortable.	Makes the travel easy and in comfortable way.	Low	Sprint-2
Railway Maintenance	Service	USN-9	As a Railway Maintenance		High	Sprint-1

User Type	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Acceptance criteria**	**Priority**	**Release**
engineer			Engineer, want to maintain the tracks.			

5.2 Solution & Technical Architecture



CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 Spirint Planning & Estimation

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, and confirming my password.	2	High	Madhumitha Jeevajothi
Sprint-1	Software	USN-2	As a user, I will login to the app using username and password and search the train details. Then choose the train based on my journey.	1	High	Monika Mutheeswari
Sprint-2	Booking	USN-3	As a user, I can book the ticket by entering the personal details.	2	Low	Madhumitha Monika
Sprint-2	Online Payment	USN-4	After booking, the user should pay the amount through various online payment method. And then the ticket will be booked.	2	Medium	Jeevajothi Mutheeswari
Sprint-3	Tracking	USN-5	As a user, I can track the train by using my unique id through app.	1	High	Madhumitha Jeevajothi Monika

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Cancellation	USN-6	As a user, I will cancel the ticket easily before schedule allotment. And the refund will be return within 2 days.	2	High	Madhumitha Jeevajothi Mutheeswari

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		05 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		12 Oct 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		15 Oct 2022

CHAPTER 7

CODING & SOLUTIONING

7.1 Feature 1

IBM Watson Platform

Node Red

Cloudant DB

Ticket Cancellation

Adding Queries

7.2 Features 2

Registration

Login

Verification

Ticket Booking

Payment

CHAPTER 8

TESTING

8.1 Test cases

Sprint 1:

Date	19-Nov-22
Team ID	PNT2022TMID11580
Project Name	smart solutions for railways
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
1	Functional	Booking	user can provide the basic		1.Enter method of reservation		Tickets booked to be displayed	Working as	Pass				Madhu mitha
2	UI	Booking	User can choose the class,		1, known to which the seats are		known to which the seats are	Working as	pass				Mutheeswari
3	Functional	Payment	user, I can choose to pay		1.user can choose payment		payment for the booked tickets	Working as	pass				Jeeva jothi
4	Functional	Redirectio	user can be redirected to the		1.After payment the usre will		After payment the usre will be	Working as	pass				Monika

Sprint 2:

Date	11-Nov-22
Team ID	PNT2022TMID11580
Project Name	smart solutions for railways
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
1	Functional	Registratio	Registration through the form by		1.Click on register		Registration form to be filled is to	Working as	Pass				Madhu mitha
2	UI	Generating	Generating the otp for further		1.Generating of OTP number		user can register through phone	Working as	pass				Jeeva jothi
3	Functional	OTP	Verify user otp using mail		1.Enter gmail id and enter	Username: abc@gmail.com	OTP verified is to be displayed	Working as	pass				Monika
4	Functional	Login page	Verify user is able to log into		1.Enter into log in page	Username: abc@gmail	Application should show 'Incorrect	Working as	pass				Mutheeswari
5	Functional	Display	The user can view about the						I				

Sprint 3:

Date	
Team ID	PNT2022TMID11580
Project Name	smart solutions for railways
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
1	Functional	Ticket	a user can download the		1.Enter method of reservation		Tickets booked to be displayed	Working as	Pass				Madhu mitha
2	UI	Ticket	a usercan see the status of my		1.known to the status of the		known to the status of the tivkets	Working as	pass				Monika
3	Functional	Remainder			1.user can get reminder		user can get reminder nofication	Working as	pass				Jeevajothi
4	Functional	GPS	user can track the train using		1.tracking train for getting		tracking process through GPS	Working as	pass				Mutheeswari

Sprint 4:

Date	19-Nov-22
Team ID	PNT2022TMID11580
Project Name	smart solutions for railways
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
1	Functional	Ticket	user can cancel my tickets there's		1.tickets to be cancelled		Tickets booked to be cancelled	Working as	Pass				Mahu mitha
2	UI	Raise	user can raise queries through		1.,raise the queries		raise the queries	Working as	pass				monika
3	Functional	Answer the	user will answer the		1.answer the queries		answer the queries	Working as	pass				Mutheeswari
4	Functional	Feed	a user will feed information		1.information feeding on trains		information feeding on trains	Working as	pass				Jeeva jothi

CHAPTER 9

RESULTS

9.1 Performance Metrics

CHAPTER 10

ADVANTAGES & DISADVANTAGES

10.1 ADVANTAGES

● Openness – compatibility between different systemmodules, potentially from different vendors;

● Orchestration – ability to manage large numbers of devices, withfull visibility over them;

● 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 systemmonitoringapplication, leading to better performance and lower operation costs.

10.2 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, andsubsequent sending of that data to the cloud, for further processing; ● Online data processing systems, for real-time monitoring, usingemerging

● communication technologies;

● Integrated, interoperable, and scalable solutions for railway systems preventive maintenance.

CHAPTER 11

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 the 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.

CHAPTER 12

FUTURE SCOPE

If anyone wants to extend this project then he/she can make an additional database of Train Fare. And database for updated availability of seats which is available after the cancellation of ticket on that specific train etc. He/she can also add some more command buttons in the existing software and extend working of the existing software. Implementations of this project idea are in industrial use. Hence, this can be used for suggesting improvements in design, performance and greater usability. Apart from the industrial applications, it is a research-oriented project as well, the task of performance evaluation of different database designs, for efficiency, is in this spirit. He/she also add some online payments method into this project.

CHAPTER 13

APPENDIX

Source code

```
import wiotp.sdk.device
import time
import random
myConfig={
    "identity": {
        "orgId": "kbzwt4",
        "typeId": "NodeMCU",
        "deviceId": "12345"
    },
    "auth": {
        "token": "12345678"
    }
}
def myCommandCallback(cmd):
    print("msg 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':17.6387448,'lon':78.4754336}
```

```
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6341908,'lon':78.4744722}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6340889,'lon':78.4745052}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6248626,'lon':78.4720259}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6188577,'lon':78.4698726}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6132382,'lon':78.4707318}
    pub(myData)
    time.sleep(3)
    client.commandCallback=myCommandCallback
client.disconnect()
```

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Logout

File Edit View Insert Cell Kernel Widgets Help

Trusted | Python 3 (ipykernel)

Run Code

In [ ]:
```
import wiotp.sdk.device
import time
import random
myConfig={
    "identity": {
        "orgId": "kbzwt4",
        "typeId": "NodeMCU",
        "deviceId": "12345"
    },
    "auth": {
        "token": "12345678"
    }
}
def myCommandCallback(cmd):
    print("msg 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':17.6387448,'lon':78.4754336}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6341908,'lon':78.4744722}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6340889,'lon':78.4745052}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6248626,'lon':78.4720259}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6188577,'lon':78.4698726}
    pub(myData)
    time.sleep(3)
    myData={'name':'train1','lat':17.6132382,'lon':78.4707318}
    pub(myData)
    time.sleep(3)
    client.commandCallback=myCommandCallback
client.disconnect()
```

OUTPUT:

```
2022-11-19 14:32:59,141   wiotp.sdk.device.client.DeviceClient  INFO    Connected successfully: d:kbzwt4:NodeMCU:12345

Published data successfully:%s {'name': 'train1', 'lat': 17.6387448, 'lon': 78.4754336}
Published data successfully:%s {'name': 'train1', 'lat': 17.6341908, 'lon': 78.4744722}
Published data successfully:%s {'name': 'train1', 'lat': 17.6340889, 'lon': 78.4745052}
Published data successfully:%s {'name': 'train1', 'lat': 17.6248626, 'lon': 78.4720259}
Published data successfully:%s {'name': 'train1', 'lat': 17.6188577, 'lon': 78.4698726}
Published data successfully:%s {'name': 'train1', 'lat': 17.6132382, 'lon': 78.4707318}
Published data successfully:%s {'name': 'train1', 'lat': 17.6387448, 'lon': 78.4754336}
Published data successfully:%s {'name': 'train1', 'lat': 17.6341908, 'lon': 78.4744722}
Published data successfully:%s {'name': 'train1', 'lat': 17.6340889, 'lon': 78.4745052}
Published data successfully:%s {'name': 'train1', 'lat': 17.6248626, 'lon': 78.4720259}
Published data successfully:%s {'name': 'train1', 'lat': 17.6188577, 'lon': 78.4698726}
```

QR SCANNER CODE

```
from http import client
import cv2
import pyzbar
from pyzbar.pyzbar import decode
import time

from ibmcloudant.cloudant_v1 import CloudantV1
from ibmcloudant import CouchDbSessionAuthenticator
from ibm_cloud_sdk_core.authenticators import BasicAuthenticator

authenticator = BasicAuthenticator('apikey-v2-
rsy830cz1zi58n2c6r65zltdnil5hsvuehtcomsrbbe', '8c8217f7524c8e496de81adc45fd866d')
service = CloudantV1(authenticator=authenticator)

service.set_service_url('https://apikey-v2-
rsy830cz1zi58n2c6r65zltdnil5hsvuehtcomsrbbe:8c8217f7524c8e496de81adc45fd866d@b
a67c7fa-520d-4bdc-9344-0a240f78077b-bluemix.cloudantnosqldb.appdomain.cloud')

cap= cv2.VideoCapture(0)
font = cv2.FONT_HERSHEY_PLAIN

while True:
    _, frame = cap.read()
    decodedObjects = 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='ibm_railways',
                doc_id = a
                ).get_result()
                print (response)
                time.sleep(5)
            except Exception as e:
                print(a)
                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()
```

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Logout

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Not Trusted | Python 3 (ipykernel)

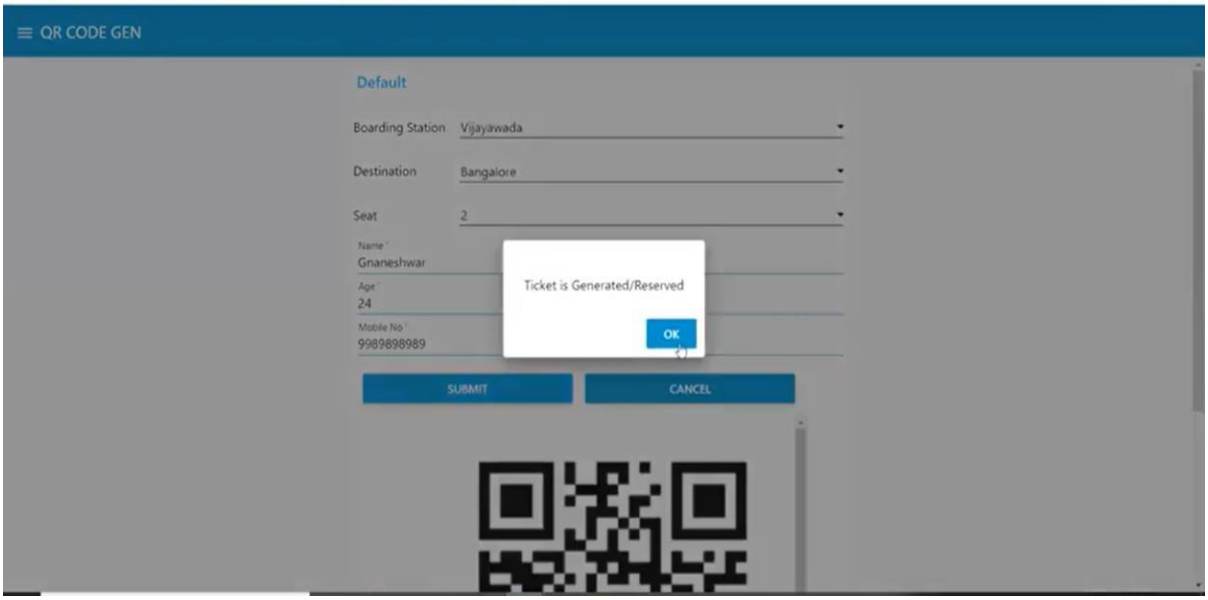
Run Code

In [5]:

```
import cv2
import numpy as np
import time
import pyzbar.pyzbar as pyzbar
from ibmcloudant.cloudant_v1 import Cloudantv1
from ibmcloudant import CouchDbSectionAuthenticator
from ibm_cloud_sdk_core.authenticators import BasicAuthenticator
authenticator=BasicAuthenticator('ApiKey-JzxO3WJWb3g6_v1-1KufcADheRP8jIKFZ8w2GxuIKX-R')
service=Cloudantv1(authenticator=authenticator)
service.set_service_url('https://ApiKey-JzxO3WJWb3g6_v1-1KufcADheRP8jIKFZ8w2GxuIKX-R')
cap=cv2.Videocapture(0)
font=cv2.FONT_HERSHEY_PLAIN
while True:
    _,frame=cap.read()
    decodedObjects=pyzbar.decode(frame)
    for obj in decodedObjects:
        a=obj.data.decode('UTF-8')
        cv2.putText(frame,"Ticket",(50, 50),font,2,(255, 0, 0), 3)
        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()
client.disconnect()
```

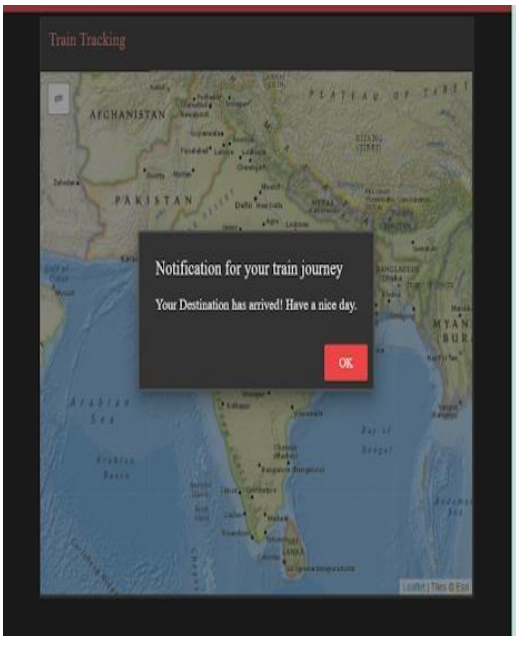
OUTPUT:

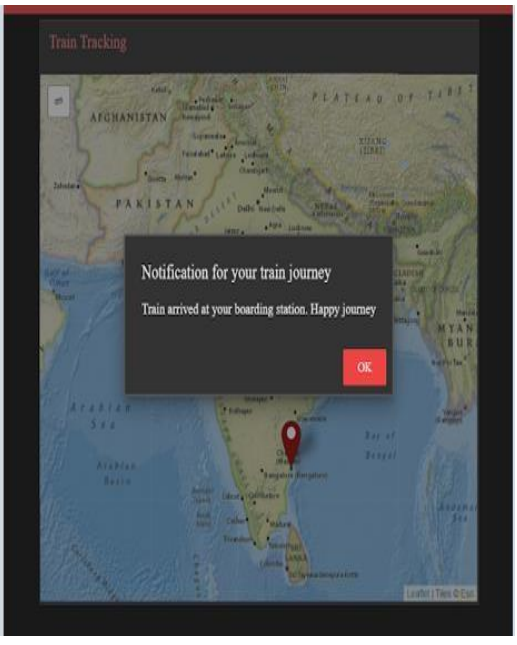

IDLE Shell 3.9.5
File Edit Shell Debug Options Window Help
Python 3.9.5 (tags/v3.9.5:0a7dcbd, May 3 2021, 17:27:52) [MSC v.1928 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=== RESTART: E:\Gnaneshwar\Projects\smart solutions for railways\QRScanner.py ==
{'_id': '2021-07-27,15:41:13', '_rev': '1-7a3dd4e86373d51fbe754f8c5be5f038', 'Name': 'Gnaneshwar', 'Age': 24, 'Mobile': 9989898989, 'Boarding': 'Vijayawada', 'Destination': 'Chennai', 'Seat': 3}
{'_id': '2021-07-27,15:41:48', '_rev': '1-eee068574899b384dcbb74e28ca07d81', 'Name': 'Bandari', 'Age': 26, 'Mobile': 1234567890, 'Boarding': 'Hyderabad', 'Destination': 'Bangalore', 'Seat': 5}
Not a Valid Ticket


QR CODE GEN
Default
Boarding Station
Vijayawada
Destination
Bangalore
Seat
2
Name
Gnaneshwar
Age
24
Mobile No
9989898989
Ticket is Generated/Reserved
OK
SUBMIT
CANCEL


QR CODE GEN
Mobile No
9989898989
SUBMIT
CANCEL
CLEAR

```
*IDLE Shell 3.9.5*
File Edit Shell Debug Options Window Help
Python 3.9.5 (tags/v3.9.5:0a7dcbd, May  3 2021, 17:27:52) [MSC v.1928 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=== RESTART: E:\Gnaneshwar\Projects\smart solutions for railways\QRScanner.py ==
{'_id': '2021-07-27,15:41:13', '_rev': '1-7a3dd4e86373d51fbe754f8c5be5f038', 'Name': 'Gnaneshwar', 'Age': 24, 'Mobile
': 9989898989, 'Boarding': 'Vijayawada', 'Destination': 'Chennai', 'Seat': 3}
{'_id': '2021-07-27,15:41:48', '_rev': '1-eee068574899b384dcbb74e28ca07d81', 'Name': 'Bandari', 'Age': 26, 'Mobile':
1234567890, 'Boarding': 'Hyderabad', 'Destination': 'Bangalore', 'Seat': 5}
Not a Valid Ticket
```





GitHub & Project Demo Link

GitHub Link - https://github.com/IBM-EPBL/IBM-Project-36203-1660293383