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# A Smart Solutions for Railways

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**ABSTRACT:** The project we've taken on, Smart Solutions For Railways, entails designing, building, simulating, and testing a system that carries out the tasks of online user registration, railway ticket booking, live train location tracking, booking and travel status updating and notification, along with a feature for user queries invocation and solution provision. This project follows a methodical process that includes careful planning, design, and incorporation of all available resources through the use of a functional and practical functioning prototype interface. By using Python for the fundamental designing, we do this within the IOT area. The process of creating railroad tickets on Android fundamentally evolved from computer reservation systems to Android-based tickets using QR Codes. Railway Ticket generation using android is basically derived from computer reservation system and upgrade to android based ticket generation using QR Code. Railway The information concerning train timetables, fare rates, passenger reservations, and ticket records is contained in the ticket generation system. All train information with QR Codes is contained in a railroad inventory. The centrally centralised database for the online QR-Based ticket creation system is accessible via an Application Programming Interface (API). The invention of the railroad management system gave both passengers and trains the ability to purchase tickets without having to wait in line. Passengers must wait in line to purchase tickets to travel in an unreserved section. The user of our system can create an unreserved ticket right from their Android phone. By scanning a train's QR code, a passenger can obtain train information and purchase a ticket.

**KEYWORDS:** IoT;IIoT;internet oftrains;railway safety;rail planning and scheduling; Predictive maintenance; WSN; railway enhanced services; freight transportation; cybersecurity.

## I. INTRODUCTION

The purpose of this project is to primarily provide a completely digital mode of railway ticket booking and eventually eliminate the hassle of paperwork and manual labour and effort gone through getting it done. Moreover this project is developed for the purpose of keeping the user completely updated and informed with all aspects regarding the user's booking and travel experience as a whole , making no room for error any sort of inconvenience that might pop up. By providing the solution by means of our project , we aim at fulfilling a purpose of a completely digitalized and hassle free constantly notified and updated regarding almost all aspects with respect to railway travel.

## II. OBJECTIVE

The main goal of this project is to entirely digitise the process of purchasing train tickets, thereby obviating the need for human labour, paperwork, and other administrative hassles. Additionally, this project was created with the intention of keeping the user fully informed about every part of their booking and travel experience as a whole, leaving no space for error or any inconveniences. By offering the answer through our project, we seek to achieve the goal of a fully digitalized and hassle-free train journey that not only requires little in the way of work and time but also sustains the user continuously notified and updated regarding almost all aspects with respect to railway.

## III. RELATED WORK

**1. J. Hempshall, S. Singh, M. Singh, and J. Jaiswal 2015.**Key 5G technology for intelligent railroads. Due to the rapid development of railways, particularly high-speed railways, railway communications have received considerable interest from both academia and industries (HSRs). The rail transportation sector must create cutting-edge communication network architectures and critical technologies if it is to realise the vision of the future of smart train communications. Digital, hybrid multicloud, 5G edge, SD-WAN, and SDN. We have identified essential 5G-based technologies that are important for HSRs, including spatial modulation, quick channel estimation, cell-free massive MIMO, mmWave, effective beamforming, wireless backhaul, ultrareliable low latency communications, and improved

handover techniques.

**2. Sadaf Sheikh, Gayatri Shinde, Et Al., Vol. 4, Issue 1, Pp. 130-132,2014.**

Internet-based layer applications for smart railway systems. Trains go faster, carry more passengers, or have bigger axle loads than ever before on the world's increasingly crowded railway networks. In order to keep up with its progress, the railway sector needs modern information technology (ITs). As a result of the increasing demands for big data, sensors, data mining, and intelligent systems, railway systems already rely on ITs almost as much as they do on physical assets. We present the architecture of a smart railway in this chapter, which will cover the framework for a smart railway based on the Internet of Things and big data, we present the architecture of a smart railway, which is divided into four layers perception and action layer, transfer layer, data engine layer, application layer, and discuss the advanced technologies in each layer.

**IV. OVERVIEW OF PROPOSED SYSTEM**

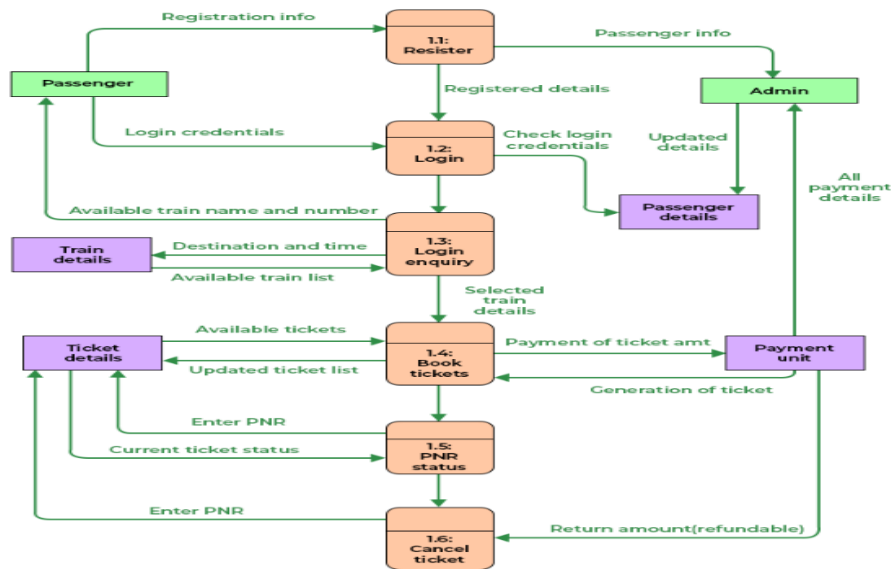


Fig1.Data flowdiagram

**A. Administrator Module**

Enables the administrator to handle all administrative tasks including inventory management. A qualified travel agent or other approved user may be given access permissions, which the administrator may issue or alter for routes, prices, and schedules.



Fig 2.Administrator module

### B. Passenger Module

The passenger should register himself in order to precede the book ticket service. They must enter all the necessary specific information throughout the registration process. The passenger input and length restrictions will be validated by the online service. The traveller will be formally registered to the online service after successfully logging in, at which point he can log in using his username and password.

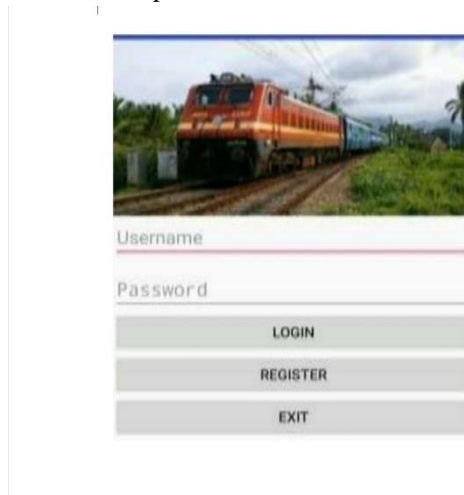


Fig3 passenger module

### C. Train Details Module

The administrator can enter the information about the trains and their routes. Additionally, each train's fare information and QR code are included here. The database has these specifics.

### D. Check Train And Qr Code Scanner

The traveller is allowed to look up available trains using the departure date, origin city, and destination city. Based on the supplied search criteria, the online service will display any matched entries. The passenger will be informed of the availability by the web service. The passenger scans the QR code of the train they want to take if the searching train is available.

### E. Book Ticket & Payment Module

The traveller must log in from the Check Train in order to be prompted by the web service to confirm the Trains. The web service will then prompt the user to decide whether or not to update his profile information. The customer will next be prompted to buy and confirm the ticket for the chosen Train. After a successful transaction is completed, the web service will generate a payment ID. Once confirmed, the web service will issue the traveller with a booking ID and ask them to examine the payment receipt.



Fig4. Book ticket & Payment Module

## V. SYSTEM ARCHITECTURE

The components and architecture of the proposed system consists of two stages.

### A. Using Of Qr Code In The System

The Passengers are becoming accustomed to acquiring information about schedules, bus arrival times, and other things via mobile phones due to the growing use of smart phones and wireless network infrastructures. Denso Wave, a Toyota company, developed the QR code as a two-dimensional information container in 1994. Utilizing QR code generators, data is encoded in an optically readable format for QR codes. Therefore, smartphones are able to read and interpret QR codes. Contrary to standard bar codes, which can only hold 20 digits of information, it can handle up to several hundred times more data. Different information storage capacities may be employed with different versions of the QR code. Numerous applications in numerous fields have been created using QR codes. It was initially created as a substitute for UPC bar codes. Its uses, however, range widely and include general marketing, document management, time monitoring, item identification, and product tracking. With their cost-effective 3D (latitude, longitude, and altitude) smart phone solution, Raj et al. suggested using QR codes to aid in interior navigation. When compared to Bluetooth, AGPS (Assisted Global Positioning System), and RFID, the proposed system's accuracy is great (Radio-frequency identification). In order to determine precise interior user positions, Costa-Montenegro et al. introduce QR-Maps, a quick and effective application that can be utilised in smartphones. This programme uses QR-Codes that are encoded with a brief textual description of the locations that are displayed on a unique Google map. In order to provide bus stop positions, we employ QR codes. Latitude and longitude coordinates for bus stops are included in QR codes. Passengers can examine the expected bus arrival time and the location of the bus by scanning QR codes that have been put at bus stops. Users can also look at the routes of particular buses on a map.

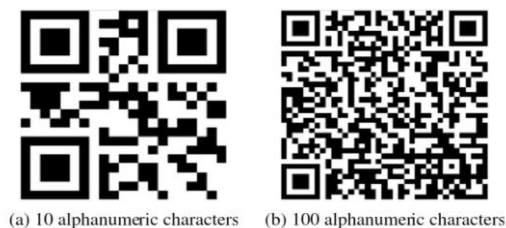


Fig.7.

### B. Google Map Api And Gps

Any bus' location must be determined using latitude and longitude coordinates in order to be found on a map. Each train's GPS device provided these values. Google uses a straightforward REST [Representational State Transfer]-enhanced API to provide its map graphics. The system makes use of the standard libraries and the open source map API in JAVA.

## VI. TECHNOLOGY USED

In this project we are using the following technology:

1. Python IDE
2. IBM cloud
3. Node Red
4. IBM Watson

1. Python IDE: An IDE (or Integrated Development Environment) is a program dedicated to software development. As the name implies, IDEs integrate several tools specifically designed for software development. These tools usually include: An editor designed to handle code (with, for example, syntax highlighting and auto-completion) and Build, execution, and debugging tools.

2. IBM Cloud: This service is the hub of all things IBM IoT, it is where you can set up and manage your connected devices so that your apps can access their live and historical data.

3. 3 Node Red: Node red is used to create a web application. It is a programming tool for wiring together hardware devices API etc. Separate nodes are created for GPS, distance, latitude, longitude and notification. Each property and the message it has to return. The output as the program is executed. Each node is connected to respective function like

ultrasonic sensor node connected to distance node Latitude and longitude connected to GPS node and ultimately GPS node connected to World map

4. IBM Watson: Instances of the Watson IoT Platform can be created in the IBM Cloud dashboard. The Watson IoT Platform can be integrated with other IBM Cloud services and accessed by using the IBM Cloud dashboard, however, Watson IoT Platform does not run on IBM Cloud hardware, which allows for continual data collection by your Watson IoT Platform service.

## VII. RESULTING APPLICATION

The main goal of the project we were able to put into action is to allow users to reserve train tickets based on availability while also providing all relevant information and offering a platform for both new user registration and existing user login. We have also been successful in using GPS to offer a live train tracking system, ensuring that the user may access correct data whenever needed. We've developed a user-friendly booking system with a reliable and fail-safe payment procedure, which they can use with ease and efficiency. They can also use the produced QR code to confirm the booking. The unique ID can be extracted from the QR code by the ticket collector by scanning it. Data is retrieved from the Cloudant DB using that Unique ID; if it cannot be found, Not a Valid Ticket is displayed. Additionally, the user has the option to cancel the reserved ticket, which greatly reduces the amount of difficulty and time spent on the entire ticket reservation and travel process.

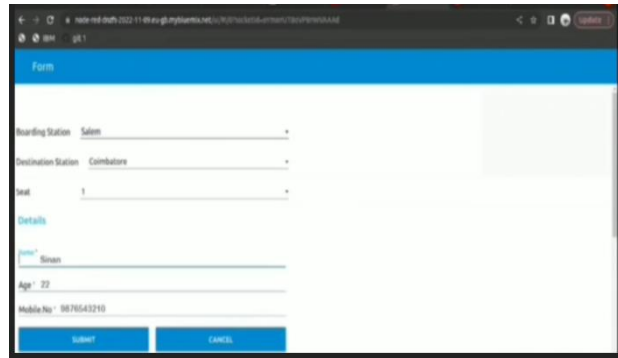
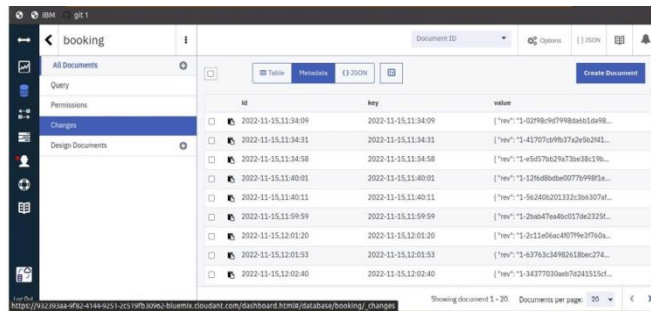


Fig 7.1 Train Ticket Booking And Qr Code Generation Login.



Fig 7.2 Testing Qr Code For Payment Generation.



id	key	value
2022-11-15,11:34:09	2022-11-15,11:34:09	["key": "1-029f6-9d7998a615a98...
2022-11-15,11:34:31	2022-11-15,11:34:31	["key": "1-41797c9f9a7a2e5e2041...
2022-11-15,11:34:58	2022-11-15,11:34:58	["key": "1-e56776a276779a3c196...
2022-11-15,11:40:01	2022-11-15,11:40:01	["key": "1-129648b0e00779f981e...
2022-11-15,11:40:11	2022-11-15,11:40:11	["key": "1-56240a201332c39a307af...
2022-11-15,11:59:59	2022-11-15,11:59:59	["key": "1-29a478a0c0776c2325f...
2022-11-15,12:01:20	2022-11-15,12:01:20	["key": "1-2c11e0eac4079e37f6a...
2022-11-15,12:01:53	2022-11-15,12:01:53	["key": "1-63763c349826180ec274...
2022-11-15,12:02:40	2022-11-15,12:02:40	["key": "1-34377030a57d241515cf...

Fig 7.3 Ticket Booking.

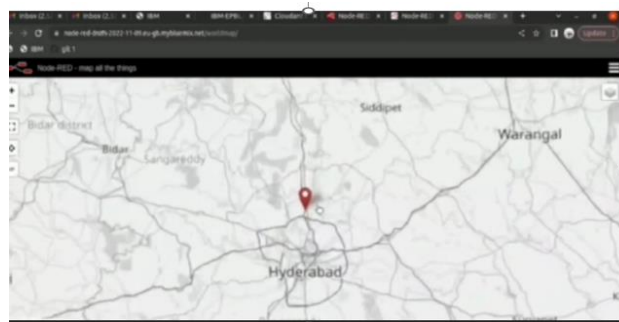


Fig 7.4 GPS Tracking For Live Location Of The Train.

### VIII. CONCLUSION

The primary goal of the project's implementation is to allow users to reserve train seats based on availability while also giving all relevant information and provide a platform for both new user registration and existing user login. We have also been successful in using GPS to offer a live train tracking system, ensuring that the user may access correct data whenever needed. We've developed a user-friendly booking system with a reliable and fail-safe payment procedure, which they can use with ease and efficiency. They can also use the produced QR code to confirm the booking. Additionally, the user will periodically receive notifications about important information including train schedules, coach locations, booking statuses, and delays, if any. The unique ID can be extracted from the QR code by the ticket collector by scanning it. Data is retrieved using that Unique ID; if it cannot be located, Not a Valid Ticket is displayed. The consumer has the option to cancel the reserved ticket, making the entire booking and travel process much less complicated and time-consuming.

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