Android Urban Railway Application with Quick Response Code Ticket

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Abstract— The current ticketing system comprises of many challenges which mainly consists of the formation of "Queues" for buying the tickets especially for metros. In the current age, after there has been a tremendous expansion in the field of technology, we still buy the tickets with oyster & octopus cards for transportation through metros, stand in queues which is a long, cumbersome and inconvenient process as time requirement is more and also losing or theft of cards proves to be uneconomical. This project deals with the development and implementation of a smart-phone application to buy the urban tickets which is simple and easy to use. Our ticket can be bought with the help of a smart phone application, where your urban railway tickets can be carried in your phone in the form of a Quick Response code. The ticketing information of the user is stored in the database. It uses the smart phones facility to validate the ticket and delete it automatically after a specific interval of time once the user has reached the destination. The ticket checker can scan the user's ticket with the help of a scanner in the checker application and check in the database if the ticket is valid. The customer application consists of personal information gathering, buying ticket, pin-code validation, generating QR code and storing it into cloud database. Payment can be done through prepaid services, i.e. if the user agrees to proceed then the equivalent 'amount' of the ticket will be deducted from the balance of the mobile no. Other payment gateway will be using credit cards to pay for the ticket. After payment, QR code is generated on server side, saved in the database and also sent back to the user mobile and saved in the application's memory which serves as a ticket for the user. The checker application is to validate the ticket by scanning the QR code obtained by the user and searching in the railway database to check whether the user has bought the ticket.

Keywords— Android, MySQL, Quick Response Code

I. INTRODUCTION

In the past few years,[1] technology has expanded to a huge extent and also is being utilized in the field of transportation services. Smart phone technology is being used for decision making of the routes, for location based services and for data collection. There have been advances like e-ticketing, m-ticketing, various cards usage for metros but these advances have had their own drawbacks due to which the need for a more enhanced system is necessary.

We propose an android mobile application to buy the urban tickets where you can carry your urban railway tickets in the form of Quick response code which will be saved in the smart phone. For example, if you need to book a ticket from your office to travel from the nearest metro station to your destination then this app comes in handy where you can have access to ticket booking process with just a touch away on your smart phone. This app uses the smart phones to validate the ticket and delete your ticket once the user has reached the destination which is done automatically after certain interval of time. In advancement to this the ticket checker can validate the ticket with a checker application provided to check if the ticket is valid by scanning the QR code and checking in the cloud database if the ticket is valid. The application consists of all the details regarding the schedules of train, the routes taken by the trains with their source and destination places and the cost/expenditure that will be required to reach the destination. The payment can be done directly through the application after booking the ticket and as soon as the payment is done, ticket is generated on the server and sent to the user in the form of QR code. The payment gateways provided will be through credit cards or through prepaid services. The ticket is also stored in the database so that the checker application can cross check from the database if the ticket is valid. The data provided by the user in this app would be saved in the database.

II. BACKGROUND STUDY

[2] In the past few years there were more advancement in the field of technology. Considering department of railway, e-ticket facility was introduced where users browse through a governmental website and book their long journey railway tickets which can be printed out after confirmation to show it to the checker when needed. After few months a new technology called M-ticketing (Mobile Ticketing) was introduced where customers messaged to the web portal through mobile phones after which a complete web page was downloaded to the users mobile phone where users can do the same booking process as it was in the e-ticketing facility. In the foreign countries, the use of Oyster cards & Octopus card has become mandatory during travel. But we face inconvenience and suffer if we forget our travel cards and we stand in the Queue for our local suburban tickets, which is where m-ticketing; e-ticketing was unable lay their foot marks. As a solution to these issues an android mobile application can be made which will comprise of all the functionalities where one can buy the urban tickets and carry your urban railway tickets in your smart phone as a Quick response code. [3]

Mobile devices like smart phones are emerging in the field of transportation services where technology is being used for data collection, location based transportation services and decision making when it comes to travelling. [4]Comparatively study with QR code which gives the idea about how QR code is more efficient than RFID and barcode systems. Which will be compared in parameter such usability cost, executions, requirement, appearance etc. For example, it will decrease the cost of scanner and decoder to verification. QR code is visible on any surface. [5] Feature of QR codes which will contain more information than barcode QR code stores several dozen to hundred times more information. QR code will handle all type of data. It contain up to 7089 character can encode. [6] Survey of how increasing number of people who are using QR codes in many application.27% of peoples are using QR codes who are in 18-34 years. From the survey we got approximately US [19%], UK [15%], Germany [14%], France [12%] which will be surveyed in 2011-2012.[7]How to encoding and decoding the QR code. Steps involved in encoding the QR code 1.input data will be encoded in efficient mode and forms bit stream.2.bit streams divides in code words.3.codewords divided in blocks.

III. **METHODS**

The methodology used in the project comprised of two algorithms for successful implementation where SHA-1 is used for encryption and decryption to provide security to the password assigned by the user during user registration process and further during signing in and the generation of QR code comprises of another algorithm.

A. SHA-1

In cryptography,[14] SHA-1 is a cryptographic hash function designed by the United States National Security Agency and published by the United States NIST as a U.S. Federal Information Processing Standard. SHA stands for "secure hash algorithm". SHA-1 produces a 160-bit message digest based on principles similar to those used by Ronald L. Rivest of MIT in the design of the MD4 and MD5 message digest algorithms, but has a more conservative design.
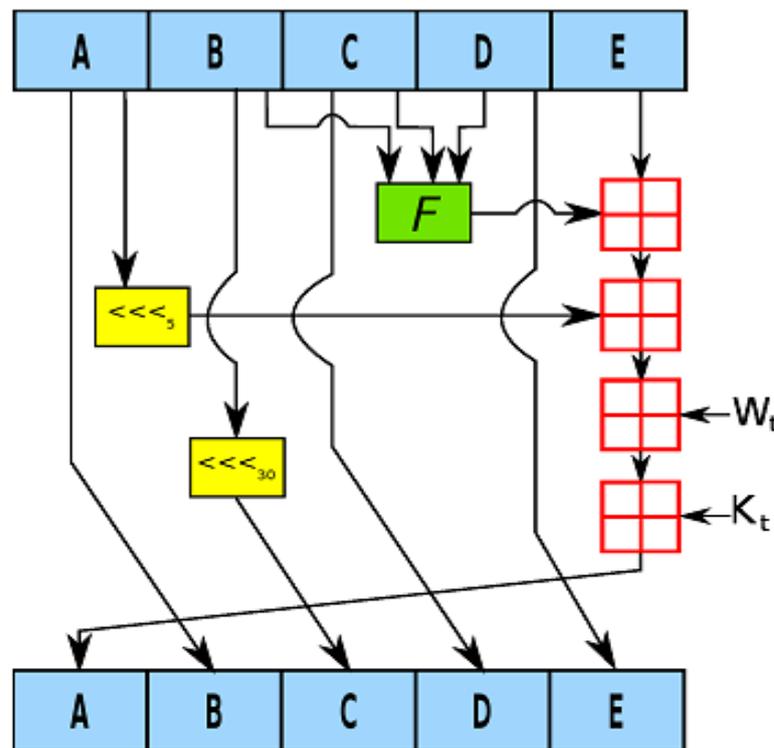
One iteration within the SHA-1 compression function:
A, B, C, D and E are 32-bit words of the state;
F is a nonlinear function that varies;
⋘ₙ denotes a left bit rotation by n places;
n varies for each operation;
W_t is the expanded message word of round t;
K_t is the round constant of round t;
⊞ denotes addition modulo 2^{32}.

Fig. 1 SHA-1 Hash Function

B. Quick Response Code

A QR code is a type of matrix-barcode first designed for the automotive industry but its recent usage has made it popular enough due to its fast readability and the high storage capacity. The image basically consists of black modules arranged in square pattern on white background. The jars files for converting the data into a form of quick response code and vice versa are readily available and have been embedded into the system for its part of working.

C. Routing

The database schema itself is designed in a manner that the routing is embedded in the queries itself for handling the switches among the source and destination but different routes between them and thus calculation of time and fare is done.
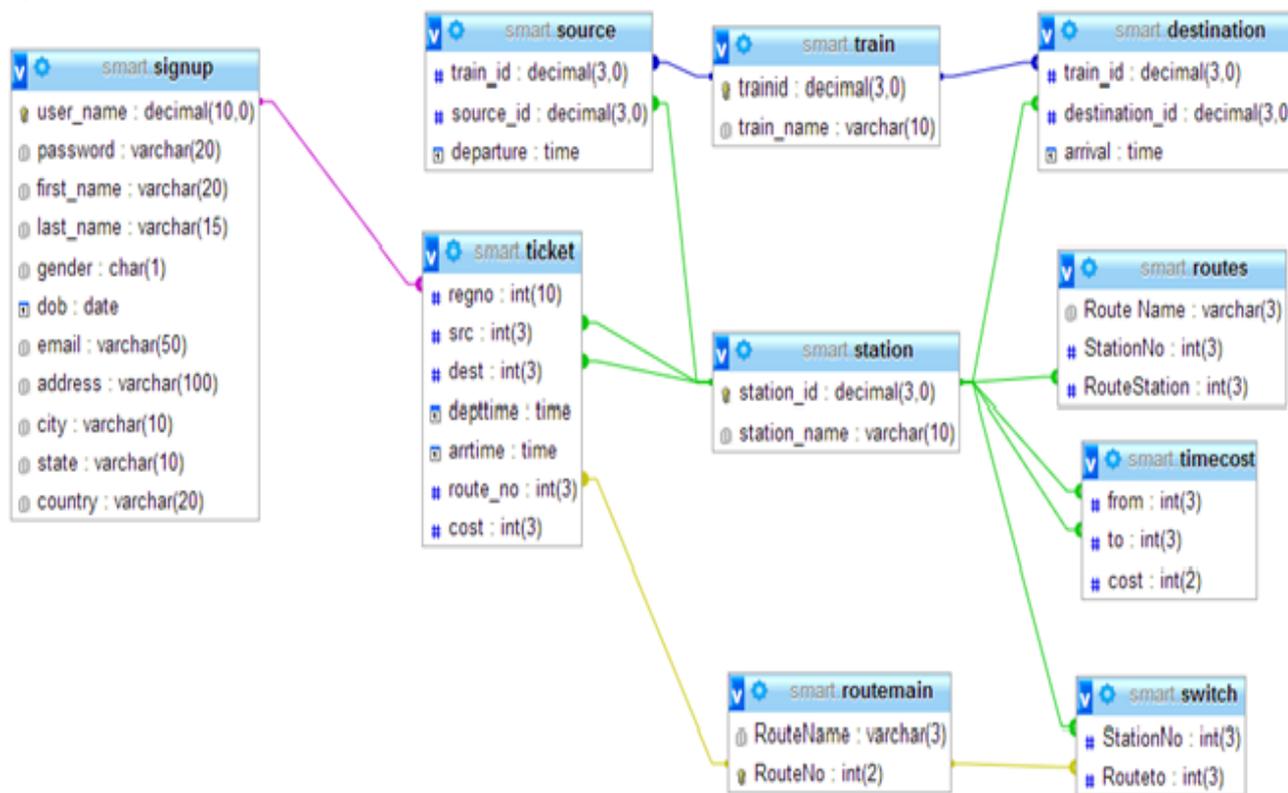

Fig. 2 Schema

IV. IMPLEMENTATION

The project comprises of an android application which is nothing but front end for having access to entire details of train schedules, ticket booking process and validation of ticket. An admin module has also been provided on the server side to add and manage routes, locations, fares and timings which provides as a front end to manage the database and make easy entries. The user has to sign up for the first time and then sign in to have access to the functionalities provided by the application. The modules are as follows:-

A. Book Ticket

This module comprises of booking the ticket by entering the source and destination. If there is more than one number of routes between the stations then the user can choose the route feasible to him by selecting the corresponding route. Once the route is selected the number of tickets can be selected and then accordingly the cost is generated which is to be deducted from the available balance of the user. The generated ticket is then converted in the form of quick response code on the server and sent to the user.

B. View Transaction

This comprises of the history of the tickets booked by the user in the past. For validation by the checker application the user can show the ticket from this module.

C. Credit Management

This module comprises of handling of the credit associated with the particular account. For demo purpose a certain amount is associated with an account whose information is stored onto the server and amount can be added to this account via this module which is deducted on purchase of the ticket. In real time payment gateways can be attached for adding credit or prepaid services can be used by leading mobile carriers.

D. Admin Module

This module is created especially for the administrator who will be handling the railway or metros databases. The admin can add routes, add locations, manage routes and locations and accordingly insert timings and costing for the same. Thus changes can be made quickly and efficiently by non-technical personnel too.

E. Checker

Any QR code scanner app can be used for scanning the ticket and verifying if the ticket is valid.

V. RESULTS

The comparative study of the existing system and our proposed system clearly specifies the advantages of the proposed system.

TABLE I

Parameters	Existing System	Proposed System
Ticket Generation	Paper tickets requiring more consumption of resources like time, money and man power. Time:- Approx 15 to 20 mins	Ticket generated in form of QR code which is feasible economically. Time:- Approx 1min
Information Gathering	Information is obtained via various resources such as websites or boards on railways or info via help centres	Information of schedules available from the application itself.
Payment	Payment has to be done by cash by standing in queues or by credit cards for octopus cards and equivalent	Payment can be done via the application itself with the payment gateways provided
Ticket Verification	Verification is done manually by the checker by tallying it with the info available with him or done by hardware installed at entrance for octopus cards.	Verification is done by scanning the QR ticket with QR scanner available in mobile phones.

VI. CONCLUSION

Our proposed application is feasible for use in the work environment as well as for family and friends. Also it is user friendly and can be used with ease by the novice users as well as professional users. The proposed application can be used for the process of booking a ticket for travel through local trains or metros. It will group together the information regarding the travelling options between various stations along with their timings and fares. This application is innovative in its own aspect as it will minimize the dependency of user on the devices. This app combines a number of functionalities into one, so the user need not download a number of applications for having access to information regarding ticketing process or booking a ticket.

The plus points of the applications are as follows:

1) It eliminates paper! More and more users are listing sustainability as an important component of the app and no printed tickets are required.
2) It has massive sponsorship opportunities – sponsors will appreciate the large exposure.
3) It eliminates the need to visit various websites to access information about train schedules and also eradicates the need to stand in a queue to book a ticket. By integrating the use of mobile applications, you are keeping the event green.
4) Improved customer experience – It's interactive and in real time!

Thus what we are seeing is a significant force that could potentially change the entire transportation industry.

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