Android Railway Ticketing with GPS as Ticket Checker

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ABSTARCT

One of the biggest challenges in the current ticketing facility is "QUEUE" in buying our suburban railway tickets. Our AR ticket can be bought with just a smart phone application, where you can carry your suburban railway tickets in your smart phone as a QR (Quick Response) code. It uses the smart phones "GPS" facility to validate and delete your ticket automatically after a specific interval of time once the user reaches the destination. User's ticket information is stored in a CLOUD database for security purpose which is missing in the present suburban system. Also the ticket checker is provided with a checker application to search for the user's ticket with the ticket number in the cloud database for checking purposes.

Keywords--- *Android, SQLite, Encryption, QR Code, GPS.*

I. INTRODUCTION

In the past few years there were more advancement in the field of technology. Considering railway department, 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 which months before 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 download to the mobile phone where users can do the same booking process as it as in the e-ticketing facility. Also in foreign countries the use of Oyster cards & Octopus card has become mandatory during travel. But we suffer if we forget our travel cards and we stand in the Queue for our local tickets, which is a place where e-ticketing; m-ticketing was unable lay their foot prints. Android Railway (AR) ticketing is mainly to buy the tickets which are the most challenging. Our AR ticket can be bought with just a smart phone application, here you can carry your railway tickets in your smart phone as a QR (Quick Response) code. It uses the smart phones "GPS" facility to validate and delete your ticket automatically after a specific interval of time once the user reaches the destination. User's ticket information is stored in a cloud database for security purpose which is missing in the present system. Also the ticket checker is provided with a checker application to search for the user's ticket with the ticket number in the cloud database for checking purposes.

The system provides an easy interface in cooperation which proves handy. System requires less memory space as well as less time for its boot up process and remotely accessible in turns.

II. PROBLEMS IN CURRENT SYSTEM

There is more space for touts to book tickets illegally and sell them at exaggerated price. Less exposure of technology, for example Travelling Ticket Examiner (TTEs) still use pen and reservation charts to verify the passengers.

A passenger cannot get the reservation after chart is prepared; i.e. chart is prepared four hours earlier of train departure; however train may remain vacant. Lack of optimization in seat allocation, for example whether passenger has boarded or not his seat remains reserved till his destination. A seat can remain vacant if passenger has not arrived and if after departure of train he cancels the ticket then loss of revenue to the Railway.

There is no dynamic seat allocation for waitlisted passenger in place of vacant seats, if passengers with reserved ticket have not arrived.

Our proposed DSA model is an attempt to solve the above problem with the help of QR code. QR code is used to embed the URL in the ticket. It facilitates faster ticket checking process. One of the wireless standards is used for connectivity between HHT and DSA server by which authentication is provided to every ticket.

Very often, every journey starts with the purchase of the tickets at a ticket counter or from the machine such as personal computer. It would be convenient to have electronic systems which make the task of passenger easy and convenient. The expanded use of mobile phones, their computational capabilities and their ability to connect to the internet make them suitable. Several new technologies have been used for this purpose. A very interesting system is touch and travel which is operational in German Railway.

Many problems in Indian Railway still exist after the adoption of latest technologies in electrical, mechanical and commercial department. One of the problems is, with the waiting list passengers, because they are not able to get their confirm seat up to their destination due to rush. The Indian Railway has decided to solve this problem by increasing the number of coaches for waiting list passengers by making their tickets confirm. But still the problem continues because of non-availability of coaches, because near about 10,000 trains run every day all around India.

Through this research paper we are attempting to propose the DSA model which minimizes the problem of waiting list passenger's up-to a certain level. Moreover transparency in the system comes with use of technology. In this model we have enhanced the use of QR code with communication Network of Indian Railway as technology. QR code is a 2 dimensional bar code that can be easily created and decoded with the help of smart phones. Therefore we have suggested the use of mobile phones for secure distributed document processing in the developing world since the smart phone is the pervasive information appliance of choice.

III. THE GROWING IMPORTANCE OF ANDROID MOBILE

Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. It is developed by the Open Handset Alliance led by Android has a large community of developers writing applications ("applications") that extend the functionality of the devices. Developers write primarily in a customized version of Java. applications can be downloaded from third-party sites or through online stores such as Android Market, the app store run by Google. As of October 2011 there were more than 400,000 applications available for Android, and the estimated number of applications downloaded from the Android Market as of December 2011 exceeded lO billion.

➢ *Features*

- *Application framework* enabling reuse and replacement of components.
- *Integrated browser* based on the open source Web Kit engine.
- *Optimized graphics* powered by a custom 2D graphics library; 3D graphics based on the penGL ES 1.0 specification (hardware acceleration optional).

- *SQLite* for structured data storage
- *Media support* for common audio, video, and still image formats (MPEG 4, H.264, MP3, AAC, AMR, JPG, PNG, GIF)

- *GSM Telephony (hardware dependent)*
- *B1uetooth, EDGE, 3G, and Wi-Fi (hardware dependent)*
- Camera, GPS, compass, and accelerometer (hardware dependent)

Rich development environment including a device emulator, tools for debugging, memory and performance profiling, and a plug-in for the Eclipse IDE units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.

A. SQLlTE

SQLite is an CID-compliant embedded Relational Database Management contained in a small C programming library. SQLite implements most of the SQL standard, using a dynamically and weakly typed SQL syntax that does not guarantee the domain integrity. In contrast to other database management systems, SQLite is not a separate process that is accessed from the client application, but an integral part of it. SQLite read operations can be multitasked, though writes can only be performed sequentially.

The source code for SQLite is in the public domain. SQLite is a popular choice for local/client storage on web browsers. It has many bindings to programming languages. It is arguably the most widely deployed database engine, as it is used today by several widespread browsers, operating systems, and embedded systems, among others.

B. QR Code

A QR code (abbreviated from Quick Response code) is a type of matrix-barcode (or two-dimensional code) first designed for the automotive industry. More recently, the system has become popular outside of the industry due to its fast readability and comparatively large storage capacity. The code consists of black modules arranged in a square pattern on white background.

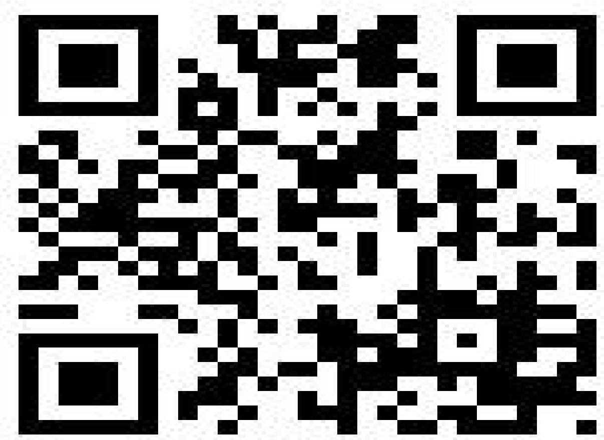

Fig.1: Sample of a QR Code on a Ticket.

IV. SYSTEM DESIGN

1.) PERSONAL INFORMATION GATHERING:

The work here starts during the fIrst time installation of our application . It gathers the basic customer information like first name, last name, date of birth, city, state etc., and it will be stored into user mobile's, SQLite database. So every time when the user buys the ticket this customer information is also sent to the database for security purpose and used also in the QR.

2.) TICKET BUYING:

The user selects source, destination, class, no. of Adult and child tickets, ticket type like return or single etc. then the user browse through the menu option to choose either credit buy option or token buy which simplifies the buy process by remembering the credit card details. Once the user chooses any of these options the application moves on to the pin code validation module.

3.) PIN CODE VALIDATION:

Once the customer hits the buy button a PHP code in the railway server validates the pin number and passwords, if it is successful it saves both the journey details and customer info in the server's MySQL database. After which ticket number and time of buying is generated by the PHP code and the balance credit value is displayed.

4.) GENERATING QR CODE:

Once the php code generates the ticket number and time of buy the details saved in the MySQL database are sent to Google Chart API engine in order to generate the QR code. here all the personal and ticket information are converted into QR codes and sent back to the user mobile as HTTP response and saved in the application.

5.) GPS TICKET VALIDATION:

In this module (fig 2) the GPS plays the role of the checker, where when the user buys the ticket, the source geopoints, destination geopoints, ticket type, expiry time & date are stored in a mobile SQLite database. This service checks the user's current location in accordance with the destination geopoints, after which the ticket type is checked and accordingly the ticket is deleted if two is single or updated if type is return.

6.) CHECKING QR CODE WITH QR READER:

In this module the checker will have QR Code reader and scan the QR code with the application in order to validate QR code and verify the journey details, especially the time and date of the ticket.

7.) CHECKING WITH DATABASE:

If suppose the user's display is being damaged and not able to scan the QR code due to other reasons like battery failure, we have Another failsafe option to check the ticket by searching the ticket database with the user's ticket number for validation purpose

➢ Architecture Description

The structure of system divided into two components :

- The customer application which resides personal information gathering, buying ticket, pin code validation, generating QR code, GPS ticket validation and stored into cloud database.
- The checker application is to validate the ticket by entering the ticket number of the user and searching in the cloud database to check whether the user has bought the ticket.

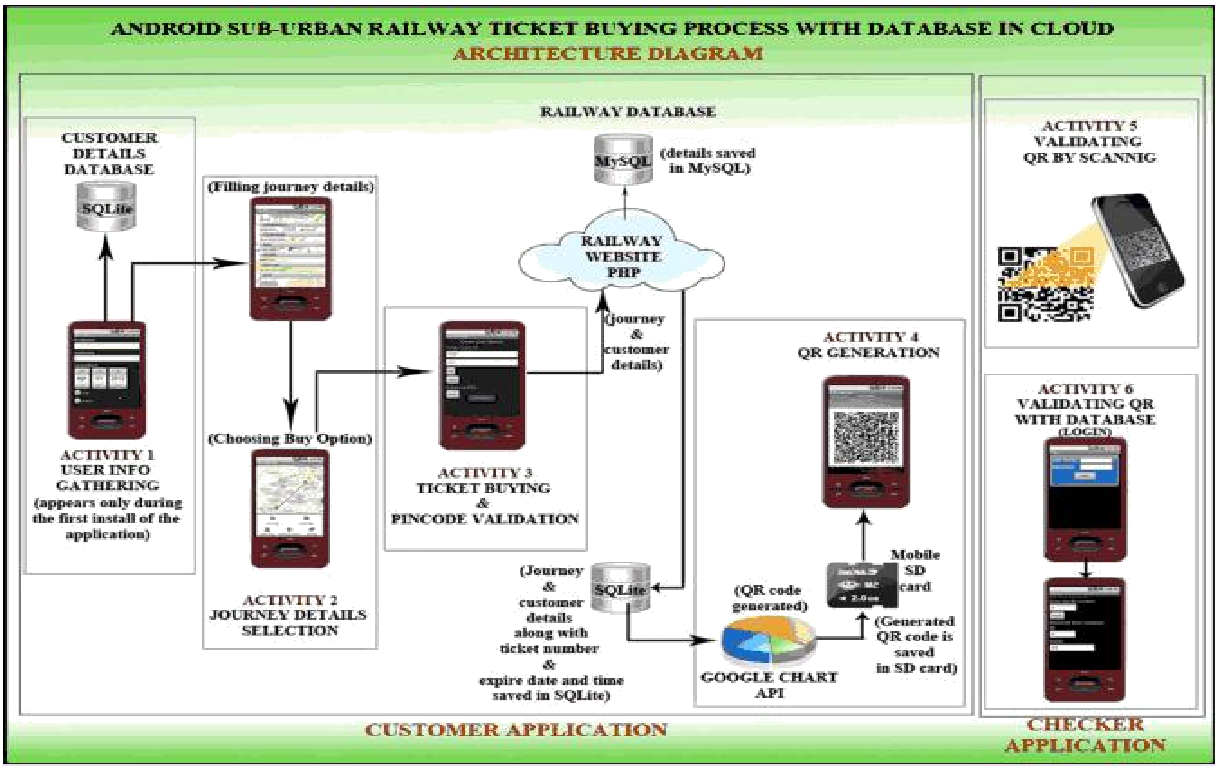
ANDROID SUB-URBAN RAILWAY TICKET BUYING PROCESS WITH DATABASE IN CLOUD
ARCHITECTURE DIAGRAM
RAILWAY DATABASE
CUSTOMER DETAILS DATABASE
SQLite
MySQL
(details saved in MySQL)
(Filling journey details)
RAILWAY WEBSITE PHP
(journey & customer details)
ACTIVITY 1 USER INFO GATHERING (appears only during the first install of the application)
(Choosing Buy Option)
ACTIVITY 2 JOURNEY DETAILS SELECTION
ACTIVITY 3 TICKET BUYING & PINCODE VALIDATION
ACTIVITY 4 QR GENERATION
(Journey & customer details along with ticket number & expire date and time saved in SQLite)
SQLite
(QR code generated)
GOOGLE CHART API
Mobile SD card
(Generated QR code is saved in SD card)
ACTIVITY 5 VALIDATING QR BY SCANNIG
ACTIVITY 6 VALIDATING QR WITH DATABASE (LOGIN)
CUSTOMER APPLICATION
CHECKER APPLICATION

Fig 2 : Architecture Diagram.

V. AES FOR SECURING THE DATA

The Advanced Encryption Standard (AES) is a National Institute of Standards and Technology specification for the encryption of electronic data. It is expected to become the accepted means of encrypting digital information, including financial, telecommunications, and government data.The AES will be used to secure our data like username, password, patient info etc. which is stored in MYSQL.

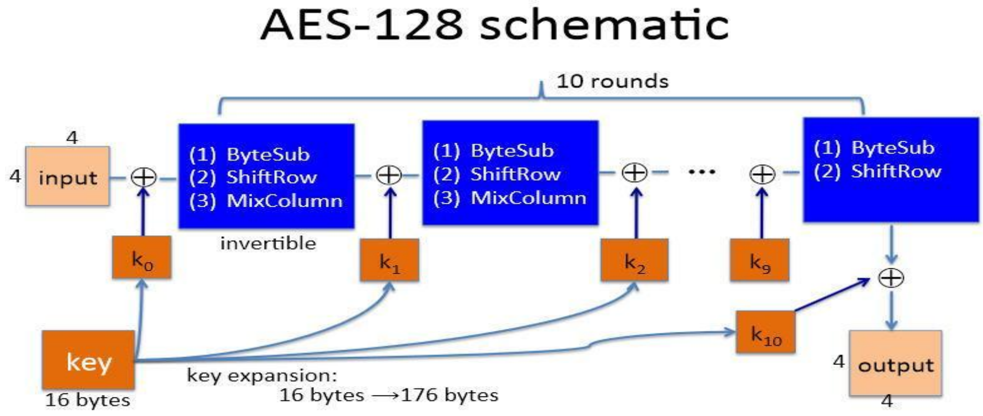

Fig 3: AES algorithm steps

The encryption process uses a set of specially derived keys called **round keys**. These are applied, along with other operations, on an array of data that holds exactly one block of data, the data to be encrypted. This array we call the state array.

You take the following steps to encrypt a 128-bit block:

1. Derive the set of round keys from the cipher key.

2. Initialize the state array with the block data (plaintext).
3. Add the initial round key to the starting state array.
4. Perform nine rounds of state manipulation.
5. Perform the tenth and final round of state manipulation.
6. Copy the final state array out as the encrypted data (cipher text).

The reason that the rounds have been listed as "nine followed by a final tenth round" is because the tenth round involves a slightly different manipulation from the others.

The block to be encrypted is just a sequence of 128 bits. AES works with byte quantities so we first convert the 128 bits into 16 bytes. We say "convert," but, in reality, it is almost certainly stored this way already. Operations in RSN/AES are performed on a two-dimensional byte array of four rows and four columns. At the start of the encryption, the 16 bytes of data, numbered D_0 ? D_{15}, are loaded into the array.

Each round of the encryption process requires a series of steps to alter the state array. These steps involve four types of operations called:

- Sub Bytes
- Shift Rows
- Mix Columns
- Xor Round Key

The details of these operations are described shortly, but first we need to look in more detail at the generation of the Round Keys, so called because there is a different one for each round in the process.

VI. BENEFITS

- This technology will replace the complex reservation chart that is often carried by the TTEs.
- Induction of this technology will facilitate travelling ticket examiners to allot vacant seats to short distance passengers.
- It will enable TTEs to update the status of passengers who are turning up for the journey.
- After this updating, reservation server will come to know about the seats of absent passengers and will allot those seats to RAC/WL passengers informing them by sending an SMS.
- After allotting the seats to all the RAC/WL passengers, if some seats still remain vacant then it will be reflected as available seats across railway network and it could be booked by any passenger which is willing to travel from the upcoming station.
- Revenue of railway is increased.
- Procurement of tickets by touts is eliminated.
- It attempts to reserve each and every seat even vacant for one station to next station.
- It maintains the transparency in berth allocation and makes the ticket checking process fast.

VII. CONCLUSION

In this paper we have presented a mobile ticket application developed for Android 1.5 using Java, SQLite, MySQL, and PHP on the server side which can change the way people buy their tickets in future. This kind of ticketing application can be applied to any kind of transport system. Our android application is one of its kinds and finds huge application to buy sub-urban railway tickets through android mobile. Also our application saves a huge work for our ticket checkers by GPS validation of tickets and also moving from manual ticket checking process to digital ticket checking process by just scanning with his own android mobile to validate the ticket. station level security we can have Hardware devices to validate the QR codes before the user enters or leaves the station, where the user can have access towards platform after being validated by the hardware device. time trains will be available will also ease the user to allot his time accordingly to reach the station, so in our project we will be using GPS here to find the location of the user and nearby train station to display the train Hence a huge problem of issuing local train tickets has been solved with our new application. Knowing at what arrival timings. Still more advance modification can be a Dynamic display of Train locations by fitting GPS devices in trains to show its location in the Google map display which is available in our application.

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