

UTS 2.0: Online/Offline, Authenticate, Paperless Local Railway Unreserved Ticket Booking System for Smart Phones and Feature Phones

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Abstract— Everyday around thousands of commuters use local railways to travel in Mumbai and Chennai. But the common issue faced by them is a long queue they have to stand in to get a railway ticket. Due to which many commuters in emergency travel without a ticket also commuters who buy the ticket spend or waste around 10 minutes in the queue. Keeping this inconvenience in mind the Centre for Railway Information Systems (CRIS) came up with a Smart app for Smart phones where users can buy the ticket online and it eliminates the time spent or wasted by standing in a queue. Also it claims to be paperless which is eco-friendly. But it would be more convenient and add more options for users if they are provided same service offline i.e. without the use of internet that way user with can buy ticket in case they do not have internet access or worse, no network coverage. That way not only users with Smart phone but also users with feature phone can get the benefit of this service.

Key words: offline, railway, ticket, booking, SMS, feature phones

I. INTRODUCTION

Mumbai or Chennai where thousands of commuters are using local railways as a mean of transportation have to waste on an average of 5-10 minutes standing in a ticket queue. Since the fine charged by the railway TC is not affordable to the common man they bear the inconvenience of standing in the queue and buy a ticket. But some commuters do take the risk and do not buy the ticket and travel without one.

Keeping this in mind Railway System came up with following alternative options:

- Coupons: Where user will have to go to the CVM (Coupon Validation Machine) and get them punched to get the date and station name on it.
- Smart Card: Where user will use the card as an ATM debit or credit card and get a print of the ticket by himself by entering all the credentials.

Many commuters welcomed these means of buying ticket but one common and old issue i.e. standing in the queue never got resolved as commuters had to stand in front of CVM's and Smart Card machines.

To resolve this issue CRIS has come up with a smart phone app that can be used by commuters to buy tickets and further travel with ease.

II. CURRENT SYSTEM

The application that has been introduced by CRIS is called UTS. User has to follow some steps in order to book a railway ticket:

A. Create a profile:

- Enter the phone number, select desired city (Mumbai or Chennai), select an ID type for authentication, and enter number of selected ID.
- Enter default train type. Only one option is provided i.e. ordinary.
- Enter default payment option. Only one option is provided i.e. R-Wallet.
- Enter default class. Two options are provided, first class or second class.
- Enter default ticket type i.e. one way or return.
- Enter default number of adults and children.
- Enter default source station and destination station.
- IMEI authentication is done i.e. it is checked whether the same IMEI is been used for another registration or not.

B. Make a recharge to R-Wallet: It is the virtual wallet that has been provided by the app. Where use can keep his money and use it for performing the transaction to buy ticket. There are two ways using which user can make recharge of the R-Wallet:

- From the website utsonmobile.indianrail.gov.in
- From R-Wallet counter on any railway station.

C. Book A Ticket:

- User can opt for quick booking option where all his default values which he entered while creating a profile i.e. default number of adults, children, train type, class, source station and destination station will be considered.
- Else he can opt for second option which is normal booking where he will have to enter all credentials such as source station, destination station, and number of children, adults and type of ticket and train.

D. After making the payment he will get a virtual ticket where all the details of the journey will be shown and user can directly show it to TC (Ticket Checker).

Features that are provided with the current system are as follows:

- (1) User can cancel the booking. The ticket fare will be topped up to user's R-Wallet.
- (2) User can check booking history.
- (3) User can edit his profile i.e. change default city, default route, default train type, number of default adults and children.
- (4) User can check his R-Wallet balance.
- (5) User can surrender his R-Wallet. After the R-Wallet is surrendered he cannot perform any transaction after that.

- (6) User can change his ID card type and its number.
- (7) User can check his recharge history.
- (8) User can show virtual tickets to the TC (ticket checker).

III. DISADVANTAGES OF CURRENT SYSTEM

According to the reviews^[1] by commuters following are the common issues faced by the users:

- (1) User has to use GPS so that he can book ticket only when he is 15 meters away from the station as to make sure he will not misuse the ticket. But many of the users have complains about weak GPS signals which is causing high inconvenience while booking the ticket.
- (2) User has only one option of making payment i.e. R-Wallet.
- (3) Some users are facing problem when clicked on show ticket (virtual ticket) option. Because when clicked it is asking user to print the ticket however the latest update says it is a paperless ticket booking now.
- (4) Users have complains that they are not able to book ticket from all source stations.

IV. PROPOSED SYSTEM

From the issues faced by the users who use UTS to book ticket, it can be concluded that:

- (1) User needs internet access as well as strong GPS signal to use the app i.e. only online transaction is possible.
- (2) Users only with smart phones can make use of this system.

Therefore if there a system that can also provide option of offline ticket booking i.e. by using the SMS (short message system) service, it can be more convenient and less time consuming. This can also beneficial for feature phone users.

This system can eliminate issues of GPS requirement and internet connection requirement.

A. Various scenarios in which offline ticket booking system can be used

1) For smart phone Users:

- (1) Phone is in network coverage area: When the phone will be in the coverage area properly, user can make use of SMS service to book unreserved railway ticket.
 - (2) Phone is not in a network coverage area: In case of SIM card issues or any other issues that prevents user from sending a SMS and user does not have a network access for some temporary period (like a flight mode) then he can use F-Wallet to make the payment for the ticket.
- F-Wallet is a virtual wallet same as the R-Wallet but the wallet will reside in the app.
 - It can be recharged same way as R-Wallet and as soon as user recharges the wallet, his database will be updated.
 - The only drawback is all the transactions made using F-Wallet cannot be synced with user's

information in the database unless his device gets into coverage area or it goes online.

- As soon as device gets connected to internet or gets into coverage area automatically SMS will be sent to the system and his information will be updated, such as F-Wallet balance, transaction history and details of all the tickets booked using F-Wallet.

2) For feature phone users:

Now-a-days many users are upgrading to smart phones yet number of feature phone users is not negligible. Therefore they can make use of offline ticket booking service by using SMS system. But the service can be made available only in two scenarios:

- (1) User should be in the coverage area i.e. to send an SMS to the system server, user's phone should have enough network coverage to send and receive SMS.
- (2) User's R-Wallet should have sufficient balance to make a transaction.

They cannot make use of F-Wallet facility since it is only available on the app for smart phone users.

B. Working of the proposed system in various scenarios:

1) Working for Smart Phone:

User first will have to create his profile on the phone in the app to make the authenticity of the ticket more improved. User will have the facility to save up to 5 offline profiles into his app database in case of offline booking. That way not only the user i.e. owner of the phone but other users who have account for the app can also use the app offline in case of emergency.

Steps of creating profile and recharging R-Wallet and F-Wallet:

a) Fill the details as:

- Name, Last Name
- Profile Picture
- Age
- Phone Number (User Id while logging in)
- Password

b) Further user will have to recharge his R-Wallet in order to make payment while booking the ticket. Three options can be made available for recharge:

- It can be recharged using the option provided in the app i.e. payment can be done via app.
- Else he can recharge using a PC via website. (this option will be more useful for feature phone users.)
- Else he can use coupons to recharge issued by government exclusively. (same as the coupons used to recharge prepaid account.)

c) For offline mode, user will need to recharge his F-Wallet by transferring some amount from his R-Wallet to F-wallet through the app.

Ticket booking process:

Next, user will proceed to ticket booking process. The process will be same for both, 'in a coverage area' scenario and 'not in a coverage area' scenario i.e. it will use SMS system. The only difference will be the use of R-Wallet and F-Wallet according to the scenario.

- a) User will be asked to select a profile since he is working offline.
- b) Further user will be asked to select details such as:
 - Source station.
 - Destination station.
 - He will select a via station (in case of Mumbai suburban where central, harbor and western lines are on different route.)
 - User will select number of adults.
 - User will select number of children.
 - User will select journey type i.e. single or return.
 - User will select class of the ticket i.e. first class or second class if needed.
- c) If enough balance is present in the R-Wallet then transaction will be made successfully.
 - If it is 'in a coverage area', the amount will be deducted from his R-Wallet. This will be updated in his app's R-Wallet and also in system's database through the SMS sent by the app to the system.

The SMS generated via app will have total 9 parameters to it:

- User's phone number (compulsory parameter).
- Source station code (compulsory parameter).
- Destination station code (compulsory parameter).
- Via station code (optional / default value: N/A).
- Number of adults (compulsory parameter).
- Number of children (optional / default value: N/A).
- Journey type code (compulsory parameter).
- Journey class code (compulsory parameter).
- Wallet code (compulsory parameter).

This system generated SMS will be sent only if user has sufficient balance in his R-Wallet. Here app's R-Wallet's amount will be checked.

The amount of ticket will be deducted from the R-Wallet of the app as well as from the user's database. Database will make use of the SMS that has been sent to the system.

Upon going online i.e. when phone will be connected to the internet, data of the app will be synced to the database's data.

This type of transaction will go under user's offline transaction tab. Also it will be updated in the database of the user.

- If user does not have network coverage, the app will use F-Wallet and make sure it has sufficient balance to make the payment. Amount will be deducted from the F-Wallet.

As soon as user gets network access the app will automatically send a SMS to the system separately of all transactions that has been made using F-Wallet and user's database will be updated with all the information including the balance of F-Wallet.

The SMS will be of same format only the 9th parameter will be different as the transition will be made using F-Wallet.

Ticket Generation Process:

- As soon as, in all given scenarios, transaction of the payment for the ticket is complete, an acknowledgement will be sent to the app and ticket will be generated by the app.
- This acknowledgement will not be any message or SMS. It will be like a delivery report of SMS.
- This ticket will contain all the details of the user who has booked it.
- Also the ticket will have a timer of its own on the top of the ticket.
- Using this timer validation of the ticket will be decided. Also there will be a time at which ticket was generated.
- This timer will help users as well as TC to track the remaining time of the validity of the ticket.
- As soon as the ticket is expired according to the timer, it will be shown under expired ticket tab and that way misuse of ticket will be avoided.

The format of the virtual ticket will be as shown in the figure.

The figure shows a virtual ticket interface with the following elements:

- Timer for ticket expiration** (top left)
- Time at which ticket was generated** (top right)
- User's Photo** (left side)
- Name :**, **Age :**, **Gender :** (middle left)
- From (Source Station) :**, **To (Destination Station):**, **Return : (YES/NO)** (middle left)
- Adults :**, **Children:**, **Class :** (middle left)
- Via :** (middle right)
- DETAILS** button (bottom right)

Fig. 1: Format of the virtual ticket

- As shown in the above figure ticket will have a button called details where the details of other commuters will be shown i.e. their photograph, age, gender and name.
- To make the authentication of the ticket more improved, it will be made compulsory to have a photograph on the ticket of all the commuters using it.

Demonstration of details of the co-commuters virtual ticket is shown in Fig 2.

Photograph of the commuters will be made a compulsory factor. That way user will not have to carry any ID proof. All he will have to do is just show his virtual ticket on the phone and details of other co-commuters if any.

User will have the facility of adding as many sub profiles of his co-commuters as he wants for the future reference. So that he can add co-commuters easily, that is by just one click.

The diagram illustrates the format of a virtual ticket for other commuters. It is organized into two main sections: 'Details of adults' and 'Details of children'.
 Under 'Details of adults', there are two identical boxes. Each box contains a placeholder for 'User's Photo' on the left, and three fields for 'Name', 'Age', and 'Gender' on the right.
 Under 'Details of children', there are two identical boxes. Each box contains a placeholder for 'User's Photo' on the left, and three fields for 'Name', 'Age', and 'Gender' on the right.

Fig. 2: Format of the virtual ticket - Details of other commuters

Transaction cancellation process:

User can cancel the transaction within a certain period of time only.

The amount will be refunded to his R-Wallet or F-Wallet according to the mean of payment.

a) Time Issue of the ticket:

Even though the journey of the commuter will not be more than 1 or 2 hours there is a chance that user might cheat by using the same ticket. That will be avoided by using the global clock if the user is online i.e. connected to internet. Else an internal clock in the app will be used by the app to authenticate the time of the ticket. Ticket of the single journey will get automatically expired as the allotted time is passed and it will be shown under tab Expired Tickets.

Ticket of return journey will be expired on the next day automatically.

Thus it takes care of the issue of GPS requirement which earlier was used instead, where user had to be 15 meters away from the railway station while booking the ticket.

b) Working for feature phone:

Since feature phone have many limitations, users of feature phone will be kept deprived of F-Wallet system.

They will have to be compulsorily in the network coverage area to make the transaction using SMS system.

Following steps will be followed by the users:

(1) Profile creation and recharge

- Users will register their mobile number to avail the benefit of the service. It will compulsory require

going on to the website and providing the credential but only once.

- Further they will need to recharge their R-Wallet same way i.e. using coupons or online recharge. App recharge option will not be available for these users.

(2) Ticket booking process and payment

- Feature phone users will have to dial a special number to get the entire steps and information to make the transaction and send it to the server.
- This procedure will be same as when users dial a special number to check their recharge balance or to get information about the special offers of their network provider.
- Same as the smart phone users, they will have to select source station, destination station, via station if needed, number of adults and children, class and type of the train.
- If user has enough amount in his R-Wallet SMS will be processed further and database will be updated.
- Acknowledgement of successful transaction and a virtual ticket will be sent to the user within few seconds.
- Since it is a feature phone user will not have photo of him in the virtual ticket.

(3) Ticket Cancellation:

- User will be able to cancel the transaction of payment by dialing specified number and further sending an SMS but only within certain period of time.
- Since feature phone will not have any facility to track the time, the system's clock will be used to check the time span between transaction of ticket generation and transaction cancellation request.
- If it is done within specified time, user's transaction will be cancelled and refund will be made to his R-Wallet. Else transaction will not be cancelled.

(4) Time Issue of the ticket:

Since there will not be any timer, as there will be in the app, some issues regarding ticket validation will arise.

This issue can be resolved just by looking at the time at which SMS was sent by the server of generating the ticket.

TC will have to check the time at which SMS was received by the user and will have to calculate the approximate journey time and decide the validity of the ticket.

(5) Authentication issues:

Since there will not be a photo on the virtual for the feature phone, user will be asked to carry ID proof of himself as well as other commuters travelling with him will have to carry the ID proof.

V. ADVANTAGES OF THE PROPOSED SYSTEM

- System is for smart phones as well as for feature phones.

- Recharge for R-Wallet and F-Wallet can be done via coupons or website or using the app i.e. two more options are introduced.
- It can be used also as offline i.e. without the help of internet for smart phones.
- It can work properly even if it is out of coverage area (only for smart phones) to complete the transactions with the help of F-Wallet.
- Even if user runs out of battery or mobile gets stolen while travelling, all the transactions will be updated on the server in user's database (except F-Wallet transactions unless got network coverage area or internet access during the journey) therefore TC can check commuter's virtual ticket on his own phone using the app. User will just have to provide his ID and password.

VI. CONCLUSIONS

Thus using these system commuters can easily buy tickets online i.e. with the help of internet, which is present in the current system or offline or even under no coverage area (for only smart phone users) using not only smart phones but also feature phones where time wasted standing in the queue is saved. The issue of GPS requirement, which was mandatory for avoiding misuse of the ticket, is resolved. Further it is totally eco friendly, as ticket printing cost is eliminated and authenticity of the ticket holder is maintained due to new ticket format introduced.

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