E-Pocket Based Public Transport System

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Abstract: The intent of the project is to develop a system that would handle financial transactions in public transports using smart-cards and to completely eliminate the hard cash transactions. When the user wants to get in the bus he will have to swipe the card at the door, his card will be verified, and then only he can get inside the bus. While getting down he would again swipe the card, the amount will be calculated and automatically deducted from his account. The system will generate an e-receipt that would be e-mailed to the commuter's email id. In case the commuter doesn't have an email id, the receipt would remain stored in the database which he can get whenever in need. The smart card can be recharged at several bus stations using simple mobile recharging mechanism. All the concerned vehicles will be continuously tracked and remain connected to the central server station using the internet. All the transactions and related data would be stored at the central server station itself. The maintained database would lead to tracking of commuters as well which would certainly help to improve the vigilance system.

Keywords: e-transactions, Smart Card, Card Reader/Writer, Contactless, Validation/Verification, Commuter tracking, Administrator.

1. Introduction

The intent of the project is to develop a system that would handle financial transaction in public transport using smart-card and completely eliminate the hard cash transaction. This would require each user to carry a personal smart card that will contain the information of the owner, a unique key and the recharged amount of e-money. When the user wants to get in the bus he will have to swipe the card at the door, his card will be verified, and then only he can get inside the bus. While getting down he would again swipe the card, the amount will be calculated and automatically deducted from his account.

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2. Problem Definition

Development of a system using concepts of e-pocket & smart-cards and implement it on the current public transport system to make it fully automated. As the system would be handling financial transactions, hence security and reliability has to be of high concern.
A separate database has to be maintained at the central station to keep track of the overall functioning of the system.

3. Motivation

In today's system, especially in India, manual ticketing system for public transports is implemented. It includes travelers buying tickets by paying hard cash to the bus/taxi service. The idea is to develop a system that can improve the current state of the public transport system by completely virtualization of the money transactions & convince the people to follow public transports rather than their private transportation.

4. Objectives

- To convert hard cash flow into virtual money transactions so as to minimize corruption and digitalize the system.
- To connect each and every vehicle with the central server station using the internet so that proper communication and tracking can be done.
- As critical information of each traveler is maintained, hence database security has to be really high.
- The system would be always connected to internet hence intrusions are expected. Proper network security is also a must.

5. Existing System

1) United States (EASY Card)

The EASY Card is the new way to pay for your transit fare when using Metrobus or Metrorail systems. With the EASY Card, you don't need to look for cash every time you board a bus or train. Load up to $150 in monetary value or a 1-Day, 7-Day or 1-Month pass on your EASY Card. Create an account and buy your EASY Card here. Or purchase an EASY Card by going to a ticket vending machine at a Metrorail station, the Miami International Airport, and at the Golden Glades Park & Ride lot.
Visiting an EASY Card sales outlet

2) Europe (Euro Card)

It consists of a microcontroller based card reader and thermal printing equipment. When the user inserts his card inside the slot, he will be asked the Password. If the Password is correct then he will be asked for the destination code. The passenger can enter the code (Destination code is listed aside) ,number of passengers and date at which he want to travel. Ticket confirmation will be asked for the passenger. On confirmation the ticket will be printed out from the machine and the amount will be deducted from the user's smart card.

3) Mumbai (ETM)

- Every Bus Conductor is carrying an ETIM for issuing tickets on-board.
- These ETIMs are also capable of Validating, and Renewing the RF-ID based pre-paid Smart Cards.
- RF-ID card based pre-paid Smart Cards are issued to the commuters through 64 web based Points of Sales equipped with 90 Counters.

6. Software Requirement Specification

6.1. Project Scope

The system is intended to automate the public transport ticketing and payment system.
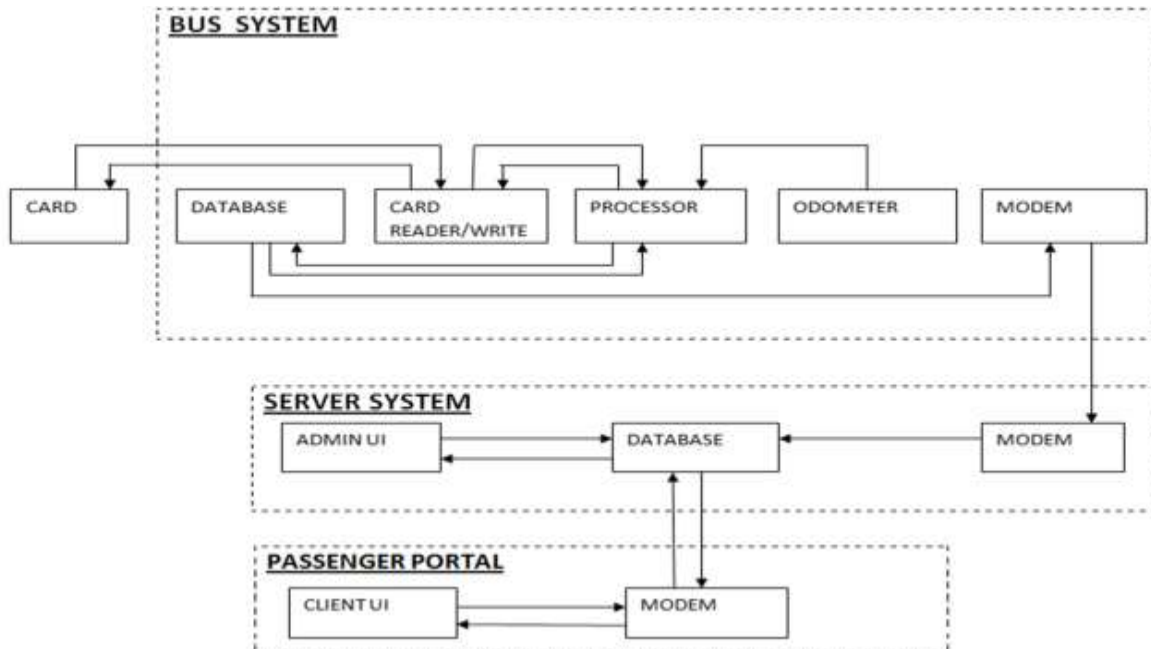
It is a vast system to develop but for this project its scope has been limited by concentrating on:

a.   Its development for local bus service within a city
b.   Smart card based payment & transactions
c.   E-Receipt generation and dispatching to commuter
d.   Commuter tracking for vigilance purpose
e.   Card blocking in case of card loss / theft
f.   Passenger portal to keep track of their travels & expenses
g.   Implementing different types of smart cards viz. General Card, Monthly Pass, Visitor Card etc
h.   A separate online passenger portal has to be developed for the commuters for the following purpose:

- For registration of new commuters
- To keep track of their travels & expenses
- Getting information about the system.

6.2 Design and Implementation Constraints

There are certain design and implement constraints applied to the system which are as follows. There should be three databases:

- Bus database for temporary storage
- Central server database
- Smart Card Database

➢   The system requires network connection.
➢   Each user must carry the smart card in order to avail the bus service.
➢   The balance on the card should be more than or equal to a certain minimum amount to enter the bus.
➢   Smart card readers and writers should be fast and reliable.
➢   Information store in database is in encrypted form.

7. Non Functional Requirements

7.1. Performance Requirements

For the system to give good performance it is required that:

- The card readers and writers should be fast and reliable.
- Data base should have good capacity.
- Network connection should be available.

7.2. Safety Requirements

For safety purpose:

- Back up of database should be maintained.
- The maintenance of bus system should done frequently.

7.3. Security Requirements

As the database is storing critical information such as passenger information it should be provided with proper security. Network security is also of high concern as the system deals with continuous money transaction.

7.4. Software Quality Attributes

Quality attributes are the overall factors that are affecting the system's run-time behavior, system design, and user experience. These are as follows:

- Availability: The system is readily available to the users.

- Performance: The system is making transaction very fast and secure.

- Manageability: It is very easy to handle the system. An admin control is given for vigilance.

- Security: The system is providing database security through encryption algorithms.

8. Technical Specifications

8.1 Advantages

a. Easy-2-pay process
b. Vehicle tracking
c. Commuters tracking
d. Easy to pass critical messages from the vehicle to the central station
e. No need to carry hard cash
f. Control over rush in buses
g. Minimization of on-road traffic
h. Minimization of corruption due to automation

8.2 Disadvantages

a. Bus frequency has to be adequate

b. Maintenance & Hardware cost

8.3 Applications

a. The system can be used to automate the public transport system particularly the Bus.
b. The system can be used by the vigilance bodies for security purposes.
c. The system can be used to reduce corruption by eliminating the free travelers.
d. By maintaining the count of the number of people in the bus ,it can also be used to control rush in the buses.
e. The system can also be used to pass critical messages from the vehicle to the central station.
f. The system can be used to track the vehicle.

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