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Secure Bus-Ticketing System using NFC

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ABSTRACT
For making the day to day life more convenient for the passengers travelling in bus some technologies can be used like Near Field Communication (NFC), Radio Frequency Identification (RFID). The proposed system is based on ticketing and identification of passengers in public transport. The system suggest a user friendly automated ticketing system which will automatically deduct the passengers fare according to the distance travelled as well as detect the passengers detail information. The system also helps to calculate the total revenue of a single bus in a day. Another important aspect is reusability, which helps use ticket multiple times as it is rechargeable.

Keywords - E-ticket, Near Field Communication (NFC), NFC Card, NFC Reader, radio frequency.

I. INTRODUCTION

In India, the number of people using public transports is increasing day by day especially via bus. The current bus ticketing system transactions are performed manually which makes the entire process very slow and tedious. We have to carry change for fare amount since there is always a problem of change between the passenger and service provider. Paper based ticketing system affects the environment since there is a lot of wastage of paper. The current bus ticketing system has 'Pass' system where in the passenger pays a lump sum amount of money which also includes the number of days the passenger did not travel by bus which is a disadvantage for the passenger.

To overcome the following disadvantages this system will help make a user friendly bus-ticketing system where the entire bus ticketing process will be automated. It will be implemented using the upcoming technology NFC that allows data to be transferred between two NFC enabled electronic devices. Here NFC is used to generate E-ticket. An E-ticket is basically a paperless electronic document which is used by the passenger as a ticket travelling by bus. NFC permits the secure transaction i.e. passengers and the service provider cannot accuse each other of forgery by ensuring that either both party receive their desire data from other or neither does. NFC ticket helps collect passenger's information which will be maintained in the database which in turn will minimize fraudulent activity. Another important aspect is Reusability which helps use tickets multiple times.

The system can radically change existing system of interoperable fare management system. This technology will be implemented as one of the way to substitute current bus ticketing system.

II. PREVIOUS WORK

Surya Michrandi Nasution1, Emir Mauludi Husni, Aciek Ida Wuryandari [1] proposed that, train is one of commonly used transport by people every day, train station establish huge number of transactions. Another problem from the passenger's side is the self-hold ticket. By simplifying the ticketing process and transforming ticket from physical form to virtual form, the NFC technology development will not be limited only for payment transaction. This particular technology can also be implemented as one of the way to substitute current ticketing. Passengers can purchase ticket only by providing train ticket scanning. From that card the type of train which will be used by passenger can be known. In the manifestation, supporting application can be made for destroying train ticket which will be done by conductor. The passenger will directly make payment transaction using voucher just like phone credit.

Arnau vives-guasch, Magdalena payeras-capell, Maci`a mut-puigserver, Jordi castell `a-roca, and Josep llu´is ferrer-gomila [2] proposed that, the main focus area of the present paper is the development of a secure e-ticketing scheme for mobile devices. Our protocol presents a fair-trading mechanism during the ticket verification in such a way that user pays in exchange of the right to use the agreed service.one of the property is excludability i.e. users and the service provider cannot falsely accuse each other of misbehaviour. The system ensures that either both parties receive their desired data from other or neither does. Furthermore, this scheme takes special care of the computational requirements of the user side by side by using light-weight cryptography. An electronic ticket is a contract, in digital format, between the user and service provider. The main focus area of the present paper is the development of

the protocol that has been enhanced with the property of reusability. The authenticity, integrity, non-repudiation are the security requirements. Reusability e-tickets can be used exactly the same number of times agreed in the moment of issue. When the user wants to use the survive, she must verify the ticket in advance, for simplicity we present the ticket verification with only one provider.

M.R.Waghe, P.A.Pawar, Prof S.N. Bhadane [3] introduced that, NFC is integrated within sender's mobile device as well as in receiver's mobile device. This will allow both the device to communicate. Communication occurs within two NFC enabled devices when these two devices within the range of twenty centimeters of each other. As NFC can be placed in many consumer devices such as mobile phones, readers, smart posters, PDAs, PCs, readers, the focus of this paper is firstly on use of NFC. Although NFC is also used for security, the main focus of use of NFC is on electronic transactions. In this, by overcoming the drawbacks of existing system NFC ticketing provides the following features: 1) Ticket on go 2) Online payment 3) Paperless ticketing. It can radically change the interoperable fare management. The passenger does the scanning process using NFC. When the passenger scans the tag filled with data, the payment is directly made and if the account balance is less than the fare amount then credit is again loaded. The electronic ticket can also be shown to the waiting rooms gate guards. When the ticket checker receives ticket data, then the ticketing process will end.

III. WHAT IS NFC?

NFC technology was developed in 2004. This technology is a wireless, short-range connectivity which enables simple two-way interaction that is transaction of data between two NFC enabled gadgets (commonly mobile devices). With a single touch NFC enable devices can be connected to each other and can perform wireless transaction. The main reason to apply this technology is to implement it within ticketing application, payment application and public transportation application. It is easy to setup NFC technology then compared to some long range wireless technologies like Bluetooth and Wi-Fi. NFC works using the radio frequency of 13.56 MHz. This technology works within 10-20 cm circumference of area. Data to be transmitted is only less than 1 Mbit. Basically NFC has two different communications which work on different speed, consist of:

1. Active NFC Mode, in this mode, inisiator and target use self- establised radio frequency to communicate.
2. Passive NFC Mode, in passive mode, target answer command made by inisiator to call modulation scheme. Inisiator do the radio frequency creation.

figure1: modes of NFC

Many other wireless technologies which are used in mobile phones such as wireless USB, Wi-Fi, Zig Bee, Bluetooth, 3G are constantly compared with NFC with respect to speed and range. The usage of NFC can be done through 3 major ways: card emulation, reader mode, peer to peer (P2P) mode. The function of NFC introduced by Google into Android 2.3 (API level 9) device. In Android 2.3, the ability of device is limited in only reading the tag. In Android 2.3 data writing and trading ability through Peer to Peer (P2P) began to be implemented within android devices. The .nfc android package provides access to NFC function, allows application to read NDEF message (NFC Data Exchange Format) which located at NFC tag. On android.nfc, located several classes which can be used to running NFC function.

IV. WORKING OF NFC

Both, sender and receiver mobile devices will have NFC integrated within the device. This will allow the communication between two devices. Communication can only occur between two devices with NFC integrated in the device and kept within the range of ten to twenty cms. NFC provides a secure electronic transaction. NFC is a fast and reliable way to transfer information. Any mobile device which consists of NFC technology can use the above features.

V. SYSTEM WORKING

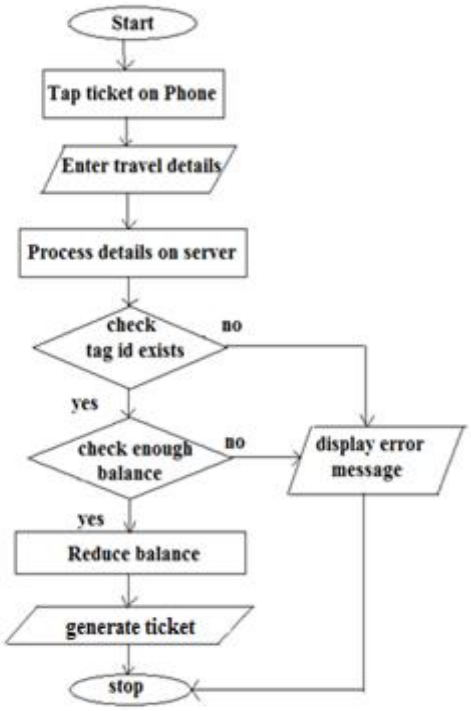

figure2: flowchart design of the system

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As soon as the bus arrives at the bus stop, the passenger would board the bus and show the card (NFC ticket) to the Conductor. The Conductor in the bus will read the NFC card using android based NFC reader. NFC based card will have a unique ID number on it. These cards are rechargeable from certain electronic booths placed at certain locations of the city. The reader will scan the card and retrieve information from the card of the passenger's details. According to the route distance between departure & destination the cost would be deducted from the NFC card. The cost can be deducted according to the distance travelled by the passenger in public transport. The reader will accept the card if the card has required credit to travel that distance. At the end of the day, the individual bus conductors will know how much credit has been transferred to the corresponding account and also the information can be found in the main database. This system will help in cross checking of all those information and will allow better monitoring, reducing corruption, and transparency.

The proposed system is very reliable, reusable, secure, feasible and mobile.

VI. CONCLUSION

We aim to implement a Bus Ticketing System using NFC Technology. The system is implemented to generate NFC tickets, thus reducing human effort and making the process completely automated. NFC tickets helps in identifying people travelling in the bus providing security. The Passengers only need to carry their NFC tags and recharge their account when the balance is below the required fare price. The cards being reusable, they are much more convenient compared to the current ticketing system as it eliminates wastage of papers. This system even helps to keep the record of the entire expense of the bus and provides Bus routes, schedule and fare. Any unwanted events can be avoided as all the person carrying NFC tickets are monitored every time they travel as their details are recorded at the server side database.

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