University of Mumbai

Project report on

"NFC Based Mobile Ticketing System"

By

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(2017-2018)

"NFC Based Mobile Ticketing System"

Submitted in partial fulfillment of the requirements

For the degree of

Bachelor of Engineering

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CERTIFICATE

This is to certify that the project entitled "**NFC Based Mobile Ticketing System** " is the bonofide work of **"Sagar Mitna(16), Pradeep Kamble(09), Shahnawaz Jaliyawala(06)"** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **"Bachelor of Computer Engineering".**

Prof. Manjusha Gaikwad   Prof. Rajat Singh

(Project Guide and Coordinator)   **(Project Coordinator & Incharge)**

Prof. Prashant Rathod   Dr. N. K Rana

(Head Of Department)   **(Principal)**

Project Report Approval For B.E

The project report entitled "**NFC Based Mobile Ticketing System**" by **Mr. Sagar Mitna(16), Mr. Pradeep Kamble(09), Mr. Shahnawaz Jaliyawala(06)** is approved for the degree of **Bachelor of Engineering in Computer Engineering.**

Examiners

1._____

2._____

Date:

Place:

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Acknowledgement

It is indeed a matter of great pleasure and proud privilege to present the seminar and writing this report. First of all, we would like to thank **Prof. Manjusha Gaikwad** our Project Guide, and the anonymous reviewers for their work and valuable comments that have significantly improved the quality of our initial manuscript.

We are grateful and deeply indebted to **Prof. Rajat Singh**, Project Co-ordinator and **Prof. Prashant Rathod,** HOD of Computer Engineering Department. Our Department supported us with the scientific guidance, advice, and encouragement that were always helpful and enthusiastic.

We take the privilege to express our sincere thanks to our Principal **Dr. N.K.Rana** for providing the encouragement and support throughout our work. Last but not least, we also like to show our gratitude to our family for their support.

Mr. Sagar Mitna

Mr. Pradeep Kamble

Mr. Shahnawaz Jaliyawala

Abstract

Near Field Communication (NFC) is a promising new communication technology that, among other things, allows mobile phones to emulate smart cards such as the travel cards used in public transportation. Bringing the travel card into mobile phone creates numerous benefits for both end users and service providers, which is why mobile ticketing with NFC technology has been considered a promising service. However, despite optimistic predictions, NFC technology and mobile ticketing services based on it, has yet to take off. While technical problems have played a part in this delay early on, the most significant reasons can be found in the challenging business models needed to realize NFC services. In this study, we aim to analyze the NFC mobile ticketing business model holistically and to identify critical issues that affect the commercial success of such a service.

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), 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. This project is based on ticketing and identification of the passenger in the public transport. This project suggest a user friendly automated ticketing system which will automatically deduct the passenger's fare according to the distance travelled as well as detect the passenger's identification.This project basically deals with the identification and ticketing of the passengers sitting in the bus.

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Chapter 1

Introduction

The project is implemented using NFC technology. This project suggests building a NFC system that can identify passengers in public transport as well as does all accounting purpose related to travelling expenses. Automated accounting of public transport can be used to provide useful estimates of the cost of travelling from one bus stop to another as well as the crowd density can be measured inside the public transport. But in case of India measuring crowd density is of no use. Near field Communication (NFC) tags has been proposed to be used in this project.

Public would carry NFC card with them. As soon as they enter into the bus they have to show the NFC card to the Conductor. The conductor will read the NFC tag by using his NFC Based Android cell phone. the cost would be automatically deducted according to the distance travelled.

1.1 Near Field Communication

Near Field Communication is a wireless close-range connectivity technology which allows data trade between two gadgets. NFC commonly integrated within mobile devices. This will allow the device to establish communication with sim card or other reader devices. NFC works using 13.56 MHz radio frequency. This technology optimize works under the space of 20 cm. Transmittable data is only less than 1Mbit. This technology developed in 2004. NFC Concept Never the less, the main reason to apply this technology is to be implemented within ticketing application, payment application and publictransportation application. When a cell phone

equipped with NFC deviced, that particular cellphone can be used as ticket of conference or theme park and also a "mini wallet" which can be used in certain time. Moreover, the cell phone can also be used as payment tool and an automatic machine, toll payment, and some other transactions. NFC application is alsocan be used on a public transportation as a substitute of wallet and as a tool to ticket data writting.

Near Field Communication (NFC) as a promising short range wireless communication technology facilitates mobile phone usage of billions of people throughout the world that offers diverse services ranging from payment and loyalty applications to access keys for offices and houses. Eventually NFC technology integrates all such services into one single mobile phone. NFC technology has emerged lately, and consequently not much academic source is available yet. On the contrary, due to its promising business case options, there will be an increasing amount of work to be studied in the very close future. This paper presents the concept of NFC technology in a holistic approach with different perspectives, including communication essentials with standards, ecosystem and business issues, applications, and security issues. Open research areas and further recommended studies in terms of academic and business point of view are also explored and discussed at the end of each major subject's subsection. This comprehensive survey will be a valuable guide for researchers and academicians as well as for business world interested in NFC technology.

Basically NFC has 2 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.

1.2 Near Field Communication Technology

NFC technology was jointly developed by Philips and Sony in late 2002 for contactless communications. It is a short-range half duplex communication protocol, which provides easy and secure communication between various devices. In accordance withPhilips and Sony, NFC is distinct from far field RF communication that is used in 3 personal area and longer-range wireless networks. NFC relies on inductive coupling between transmitting and receiving devices. The communication occurs between two compatible devices within few centimeters with 13.56 MHz operating frequency.

1.3 Existing System

- In current system conductor manually cut the ticket of a passenger.
- When passenger enter into the bus he pays a ticket amount and specify the source and destination, then conductor cut the ticket and return back to passenger.
- This system contains manual and paper work.
- Some time change issue also get create. Passenger and conductor both don't have change for ticket amount which creates issue.
- To solve those problems we are developing a new system which is fully automated and paperless.

1.4 Proposed System

- As soon as the bus arrives at the bus stop, the passenger would board the bus and show the tag to the Conductor.
- The Conductor in the bus will read the NFC tag using android based NFC reader.
- NFC based card that will have a unique ID number. The card is rechargeable from certain electronic booths placed at certain locations of the city.
- The reader will detect the tag and require certain information from the passenger.
- According to the route distance between departure & destination the cost would be deducted from the NFC tag.
- The cost can be deducted according to the distance travelled by the public transport vehicle.
- The reader will accept the card if the card has required credit to travel that distance.
- After the whole day, the individual bus reader will know how much credit has been transferred to the corresponding account and also the information can be found in the main database.

1.5 Android Based NFC Reader

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

mode 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.

1.6 Operation Of The Proposed System

As soon as the bus arrives at the bus stop, the passenger would board the bus and show the tag to the Conductor. The Conductor in the bus will read the NFC tag using android based NFC reader. NFC based card that will have a unique ID number. The card is rechargeable from certain electronic booths placed at certain locations of the city.

The reader will detect the tag and require certain information from the passenger. According to the route distance between departure & destination the cost would be deducted from the NFC tag. The cost can be deducted according to the distance travelled by the public transport vehicle. The reader will accept the card if the card has required credit to travel that distance. After the whole day, the individual bus reader will know how much credit has been transferred to the corresponding account and also the information can be found in the main database. Cross checking of all those information will allow better monitoring, transparency and thus reducing corruption.

1.7 Working of NFC

As introduced, NFC is a technology for contactless short-range communication. NFC-enabled communicates via magnetic field induction, where two loop antennas are located within each other's near field, effectively forming an air-core transformer. A signal supplier coupled to the antenna circuit to supply a drive signal to cause the antenna circuit to generate an RF signal. Most of the RF energy is concentrated in the allowed 14 kHz bandwidth range, but the full spectral envelope may be as wide as 1.8 MHz when using the ASK modulation. The frequency band 13.56 MHz used is to first modulate a subcarrier and then use the subcarrier to modulate the main carrier. This result in a modulation product, generating two sidebands symmetrically at the frequencies between subcarrier and the main carrier, create a counteracting magnetic field according to Lenz's law. This implies that eddy currents cause a significant difference in the magnetic component. Practically, the reader will induce a current in the transponder antenna coil, generates a magnetic field. On the other hand, it is designed to offer a more power efficient and affordable alternative to Bluetooth for very short-range and low-bandwidth applications. It is also touted as providing a

more robust, bandwidth-rich alternative to RFID and other "contactless" technologies. There are two modes of operation covered by the NFC protocol: Active and passive. In active mode, both devices generate their own radio field to transmit data. In passive mode, only one device generates a radio field, while the other use load modulation to transfer data. The NFC protocol specified that theinitiatingdevice is responsible for generating the radio field in this case. The passive mode of communication is very important for battery-powered devices like mobile

phones and PDAs that need to prioritize energy use. The NFC protocol enables such devices to be used in power-saving mode, so that energy can be conservedfor other operations. Inaddition, the active and passive NFC modes can be used to describe the conditions needed to prevent collisions during initialization.

The number of short-range applications for NFC technology is growing continuously, appearing in all areas of life. Especially the use in conjunction with

mobile phones offers great opportunities.

- **Working of Mobile Ticketing**

A. From The Conductor/Ticket Checker(TC) End**:**

- Conductor/TC must have downloaded an apk file and installing that .apk file in his/ her NFC supported android based device

- Icon will be created, after clicking on the icon; Bus Ticketing application will be started.

- Conductor/TC can get the access to system by providing his/her username and password, then conductor can perform tasks like scan NFC card, select source, destination & create ticket log. Ticket checker scans NFC card and view ticket log. Each NFC card has unique passenger identifier.

B. From The Admin End:

- Administrator has to launch the website on the server & also providing link of the apk file.

- Administrator accesses the website and login the website for these functions/management described below.

- Passenger Management: In this module admin will insert the passengers information on the site also can edit or delete that passenger's entry from the database.

- Conductor/TC Management: In this module admin will insert the conductor/TC's information on the site, can also edit or delete their records from the database.

- Ticket log Management: The admin can delete the ticket logs created by conductor & can also change the format of the ticket being generated.
- Bus stop Management: In this module admin can manage the different bus stops and add or delete the entry for different bus stops.

1.8 Technology Used

Near Field Communication :-

- Near Field Communication is a wireless close-range connectivity technology which allows data trade between two gadgets.
- NFC commonly integrated within mobile devices.
- This will allow the device to establish communication with simcard or other reader devices.

1.9 Mobile Ticketing

Mobile ticketing (m-ticketing) can be broadly defined as ordering, purchasing, delivery and usage of a product or service using mobile technology such as Wireless Application Protocol (WAP) (Skarica, Belani, &Illes, 2009). The mobile ticketing industry is a relatively recent and up-and-coming portion of the fast-growing e-commerce industry. According to some estimates, approximately 400 million mobile subscribers global networking system will use their mobile phones for ticketing by 2013, with total gross mobile ticketing transactions reaching $92 billion by 2013 (Eicher et al., 2012). The mobile ticketing predictions are being the research domain for several years.

M-ticketing permits a customer to purchase a valid and legitimate ticket through mobile phone application. The value added services provided by the application allows users of the mobile ticket to store digital tickets on the phone. By doing so, the consumer is less likely to lose his ticket, eco-friendly, durable, cost effective and paperless. Generally, the mobile ticketing process can be defined in the following steps (Ceipidor et al., 2013):

Registration: Online ticketing requires a company to register with all the business and services information.

Provisioning: Allow mobile phone application to interact with customers, allowing the purchase to take place.

Validation: Validating and legitimate the ticket via electronic validation system between the company and the customer.

Ticket check: Controller to verify and accept the sales and display of the mobile ticket as a valid ticket for the passenger, according to the terms displayed on the ticket

Indeed, mobile bus ticketing system (MBTS) is the most noteworthy prospects in India to reduce expenditures and increase traveler's accessibility. This project will reduce ticket processing flow, reduce usage of paper and allows greater convinces and flexibility to the traveler in Iraq cities and allow travel agent to make alterations to the journey. There are other important issues from the use of this technique such as the mobile ticket cannot be lost or stolen on the contrary of sending the ticket by mail also there is a probably of sending it to the wrong address. MBTS will make customers' lives easier, and can get the service by himself in anytime, anywhere and any devices.

Table 1.9

Type of ticket	Advantage	Disadvantage
Paper tickets	Cheap to produce. Easy to use.	Weak protection. Risk of falsification. Not multifunctional.
Paper daily, weekly, monthly, quarterly, tourist passes	Simple, easy to make	Falsification
Paper / plastics cards/tokens with magnetic strip single use and passes	Better protected than those made of paper, more durable. Very thick and light.	Need for contact. Risk of dis functioning or failure on readers, magnetic strip becomes vulnerable to stronger crease or other contact.
Smart Cards	Very convenient validating. Gives data of passenger Useful for optimization of routes according data received. Very multifunctional application of smart cards.	Expensive to introduce. Risks of fake smart cards-ticket still exist. Transaction time of contact smart cards is longer than those of contactless data.
Electronic Ticket (E-ticket): e.g. SMS ticket, WAP page ticket.	No cash payment. Safe payment. Convenient use.	System should be well organized and maintained. Expensive to introduce. Lots of specific technical requirements both for passenger and transport operators.

1.10 Scope

There is always an opportunity for improvement no matter how good the software might be and the same thing goes for our software too. Since we have used asp.net there is a lot of scope for future enhancement 1. Easy Recharge: The user can recharge his account through net banking, pay pal, or from his mobile account without visiting any bus depot. 2. Providing Bus Route and Cost: An interface can also be added in android app that user can see the bus route and cost for a journey from source to destination. 3. Authorization: The photo of the passenger can also be attached to the NFC card so only the authorized person can travel not anyone else. 4. Providing eTicketing approach: All features reflected by the "automation and accuracy" potential of eTicketing for the passenger and ticketing method.

1.11 Objective

It is designed to help in public transport system and passengers to deploy mobile NFC solutions to enhance the efficiency and effectiveness of public transport. It aims to provide better solution to get the potential benefits and to avoid obstacles and considers the deployment of transportrelated mobile NFC services. Mobile NFC ensures to put passengers in control, reducing stress and making travelling by public transport a more pleasurable experience. This user friendly technology, combined with mobile connectivity, makes it easy for passengers to modify their travel plans on the move. Near Field Communication is a radio technology that can transmit data between two devices. Now a days mobile phones are increasingly being integrated with NFC capabilities, enabling new digital services that can greatly increase the passenger experience of public transport. The combination of NFC, an easy-to-use OS and versatile technology, with mobile connectivity could provide many services in the transport sector. Improve the value and functionality of existing contactless infrastructure

- Better passenger convenience: easy to buy NFC tickets via a mobile connection and not to stand in a queue.
- Cost Effective: Lower sales and distribution costs, combined with possible recycling and environmental benefits
- Feasible: Fast, accurate and transparent ticket validation

- More flexible and interoperable ticket systems: NFC handsets can support multiple ticketing standards, creating a greater experience for passengers
- Interaction: Personalized communication with passengers and promotion of public transport
- M-commerce: It provides a good platform for different mobile commerce services like advertising and marketing on android app.
- Efficient and Good Quality: Because of eTicketing it improves the efficiency and effectiveness of the old ticketing process and increases the quality of service.

1.12 Challenges and Factors Influencing Design of NFC Based Systems

Several costs may affect the design and development of NFC based systems directly or indirectly. In many academic studies, NFC technology seems to have a cost cutting affect, however financial and economic side of NFC application and system development are not considered in a clear way for practitioners and system developers. Relating with, some important factors influencing the design of NFC based systems and applications have been explored as follows:

- Cost of the NFC tag, tag placement and management,
- Cost of the NFC readers and reader placement,
- Cost of training and reorganization,
- Cost of developing NFC applications,
- SE Programming and management,
- System integration costs,
- Cost of OTA processes,
- Testing costs of the NFC systems and applications,
- Maintenance costs of overall systems.

1.13 System Description

The project is basically divided into two main parts:-

1. Server
- Administration management
- Employee management
- Passenger management

- Account renewal
2. Android Application
- Conductor Login
- TT Login
- Ticket booking
- NFC Reading
3. NFC tags
4. NFC Read

Chapter 2

Literature Survey

2.1 Surya Michrandi Nasution1, Emir MauludiHusni, Aciek Ida Wuryandari 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.[1] 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.

2.2 Arnauvives-guasch, Magdalena payeras-capell, Maci`amut-puigserver, Jordi castell `a-roca, and Josepllu´isferrer-gomila 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.[2] 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, nonrepudiation 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.

2.3 M.R.Waghe, P.A.Pawar, Prof S.N. Bhadane 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.[3] 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.

Table No. 2.0

Sr. No	TOPIC NAME	INVENTORS	PROPOSED WORK
1.	Analyzing the problem of Passenger's self-hold ticket and physical form of ticket.	Surya Michrandi Nasution1, Emir MauludiHusni, Aciek Ida Wuryandari	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. 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.
2.	Design and development of a secure e-ticketing scheme for mobile devices.	Arnauvives-guasch, Magdalena payeras-capell, Maci`amut-puigserver, Jordi castell `a-roca, and Josepllu´isferrer-gomila.	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,nonrepudiationis the security requirements.
3.	Introduction of NFC is integrated within sender's mobile device as well as in receiver's mobile device for communication.	M.R.Waghe, P.A.Pawar, Prof S.N. Bhadane	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. NFC ticketing provides the following features: 1) Ticket on go 2) Online payment 3) Paperless ticketing.

Chapter 3

System Architecture

3.1 Proposed System

As soon as the bus arrives at the bus stop, the passenger would board the bus and show the tag to the Conductor. The Conductor in the bus will read the NFC tag using android based NFC reader. NFC based card that will have a unique ID number. The card is rechargeable from certain electronic booths placed at certain locations of the city.The reader will detect the tag and require certain information from the passenger. According to the route distance between departure & destination the cost would be deducted from the NFC tag.The cost can be deducted according to the distance travelled by the public transport vehicle. The reader will accept the card if the card has required credit to travel that distance. After the whole day, the individual bus reader will know how much credit has been transferred to the corresponding account and also the information can be found in the main database.

3.2 System Architecture

NFC technology integrated (NFC enabled) mobile devices are typically composed of various integrated circuits, such as a secure element (SE) and an NFC communication interface as depicted. NFC interface is composed of a contactless, analogue/digital front-end called as NFC Contactless Front-end (NFC CLF), an integrated circuit called as NFC controller to enable NFC transactions,

and an NFC antenna. The study of describes the antenna design methods in combination with transponder system properties to show how to efficiently combine established chip platforms with smaller antenna form factors. Similarly, in literature, other novel proposals and experimental approaches can be found on optimizing the design of NFC antenna for readers and transponders, and also on the design of NFC transceiver chipset for improving the communication quality, RF interface and security. An NFC enabled mobile phone consists of secure element(s) for performing secure transactions using NFC devices as well as storing sensitive data in a secure environment. In accordance with, secure element provides a dynamic and secure environment for both programs and data. It enables storage of valuable, sensitive, and private data such as credit card information of the user, and secure storage and execution of NFC enabled services such as contactless payments, which is valid in card emulation operating mode. The mobile device may contain additional SEs based on the requirements. NFC controller is connected to SEs through either Single Wire Protocol (SWP) or NFC Wired Interface (NFC-WI). However NFC literature does not include any comparison analysis of both physical layers in terms of security, performance or other parameters yet. The SE can be accessed and controlled from host controller (internally) as well as from RF field (externally). The host controller, or baseband controller in other words, is the heart of the NFC mobile. Host Controller Interface (HCI) creates a bridge between the NFC controller and the host controller. The host controller sets the operating modes of the NFC controller through HCI, processes data that is sent and received, and establishes the connection between the NFC controller and the secure element.
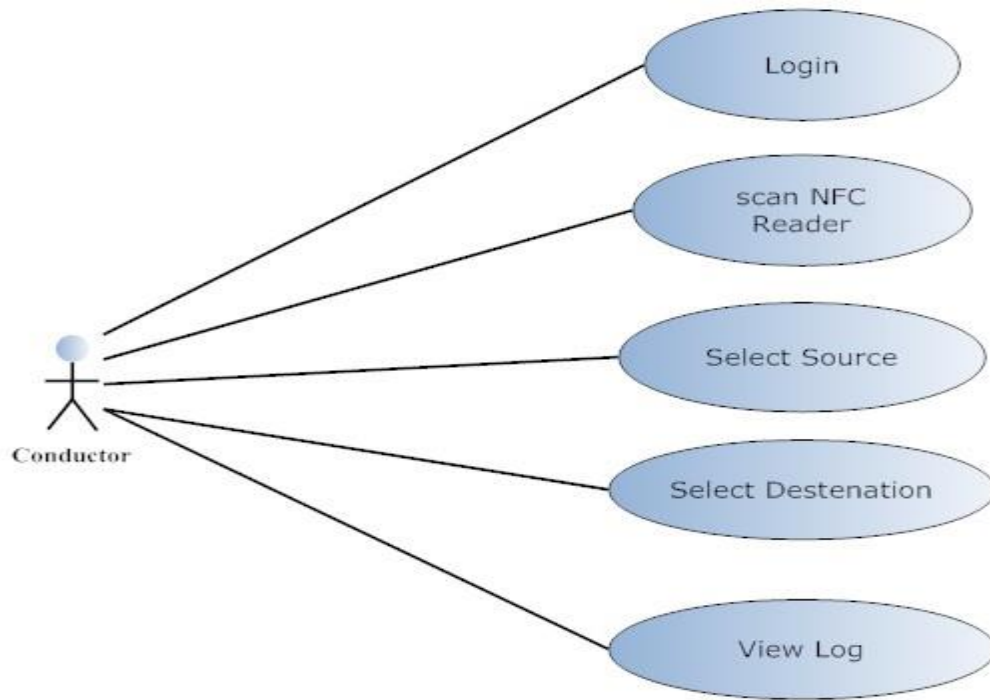
Block Diagram
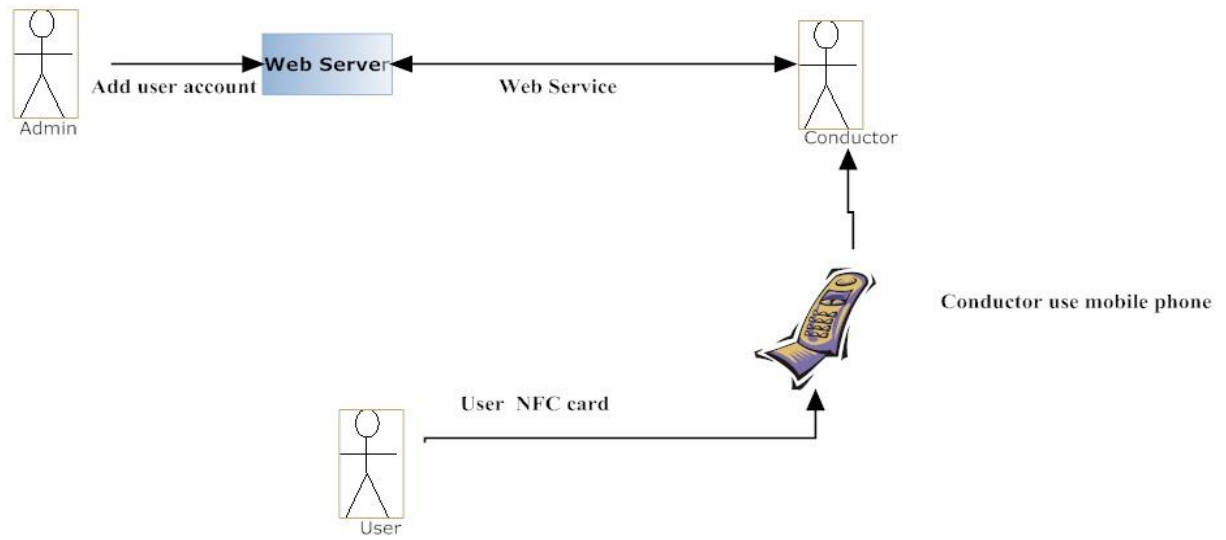
Fig No. 3.1 : Block Diagram Of Nfc Based Mobile Ticketing Process
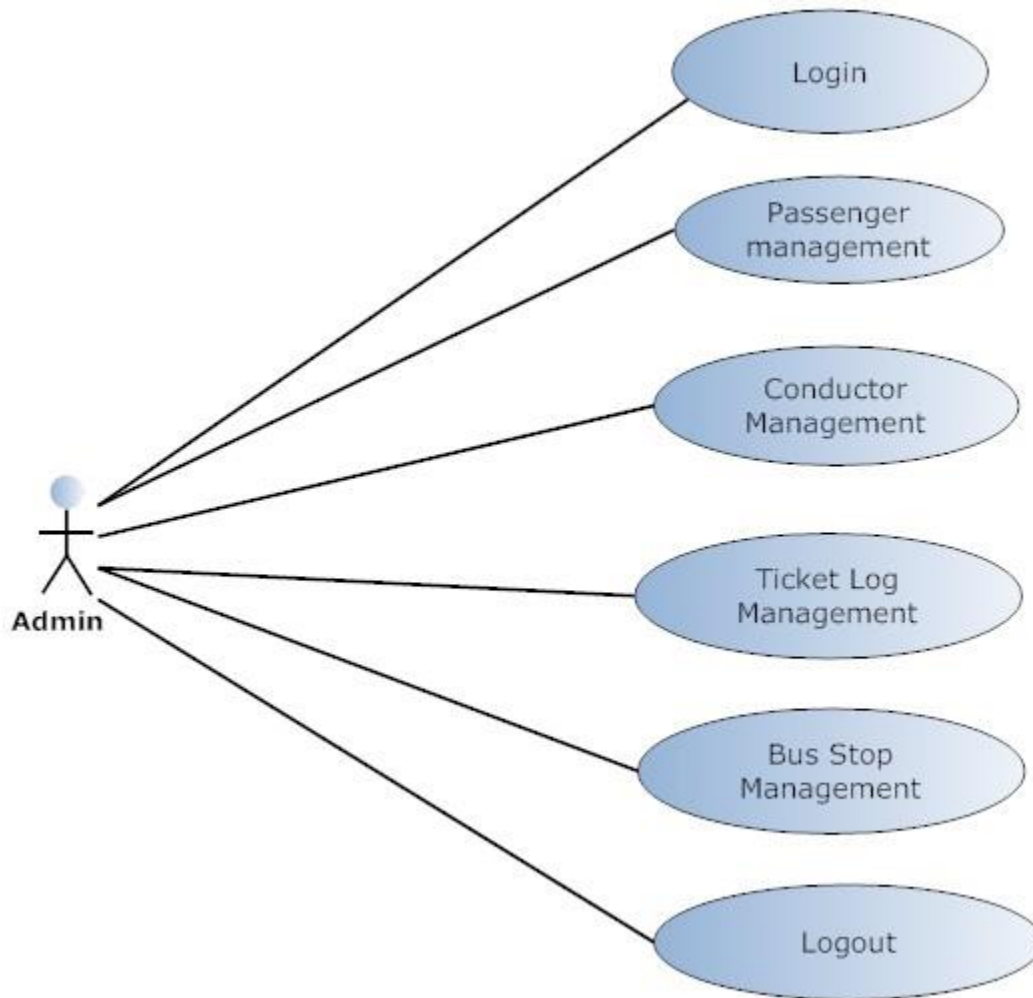
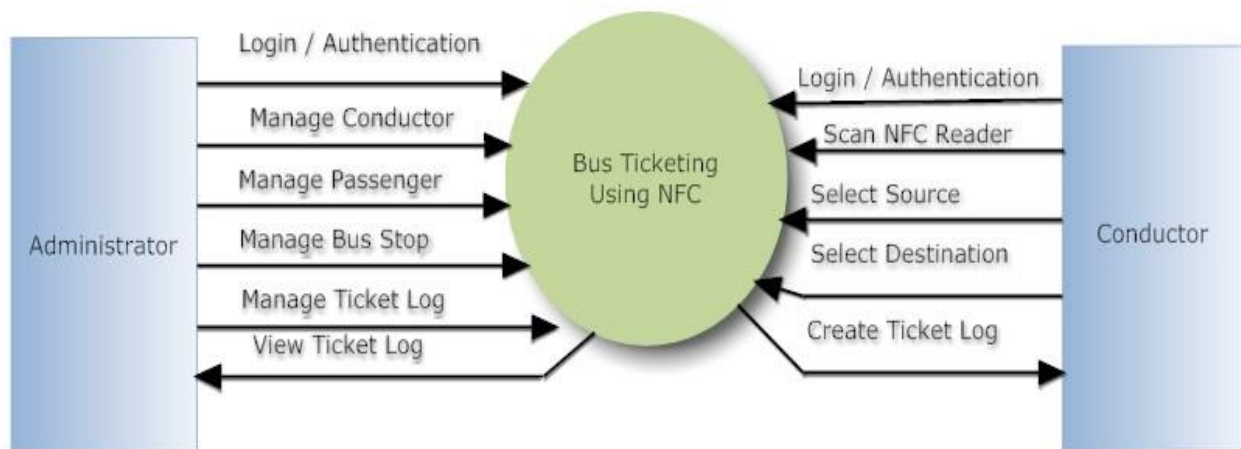**Fig No. 3.2 : Working Of Admin**
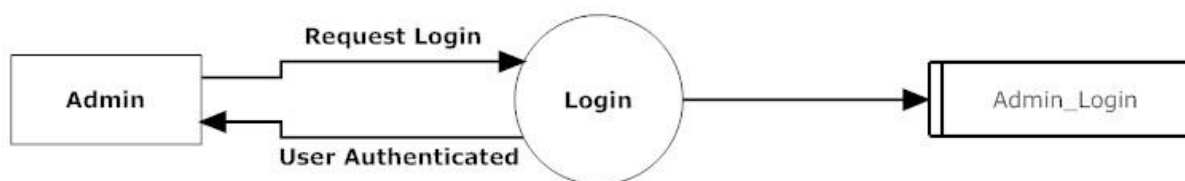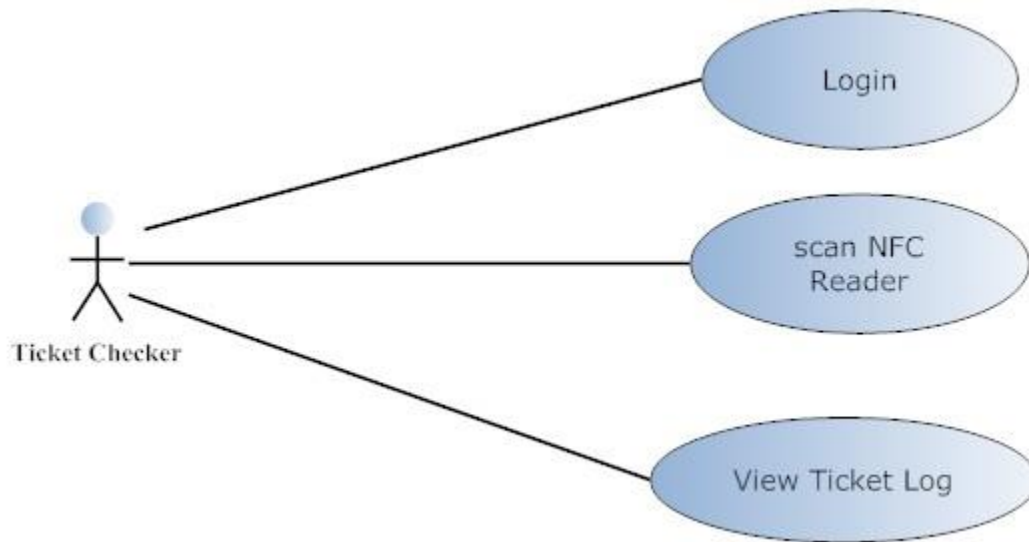

Fig No. 3.3 : Data Flow Diagram Of Admin

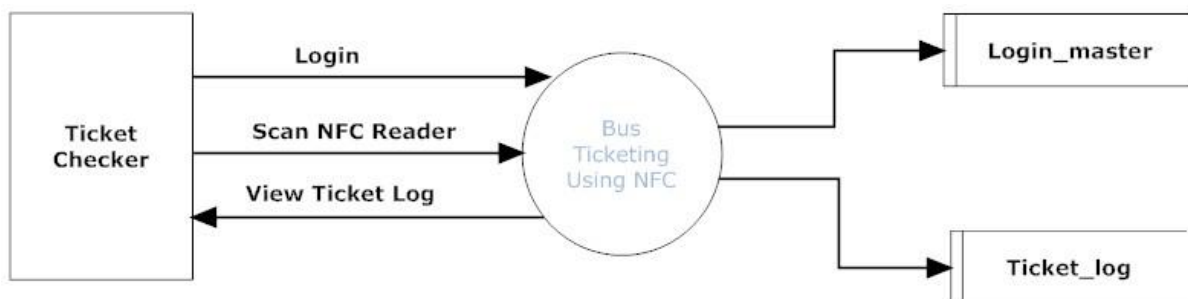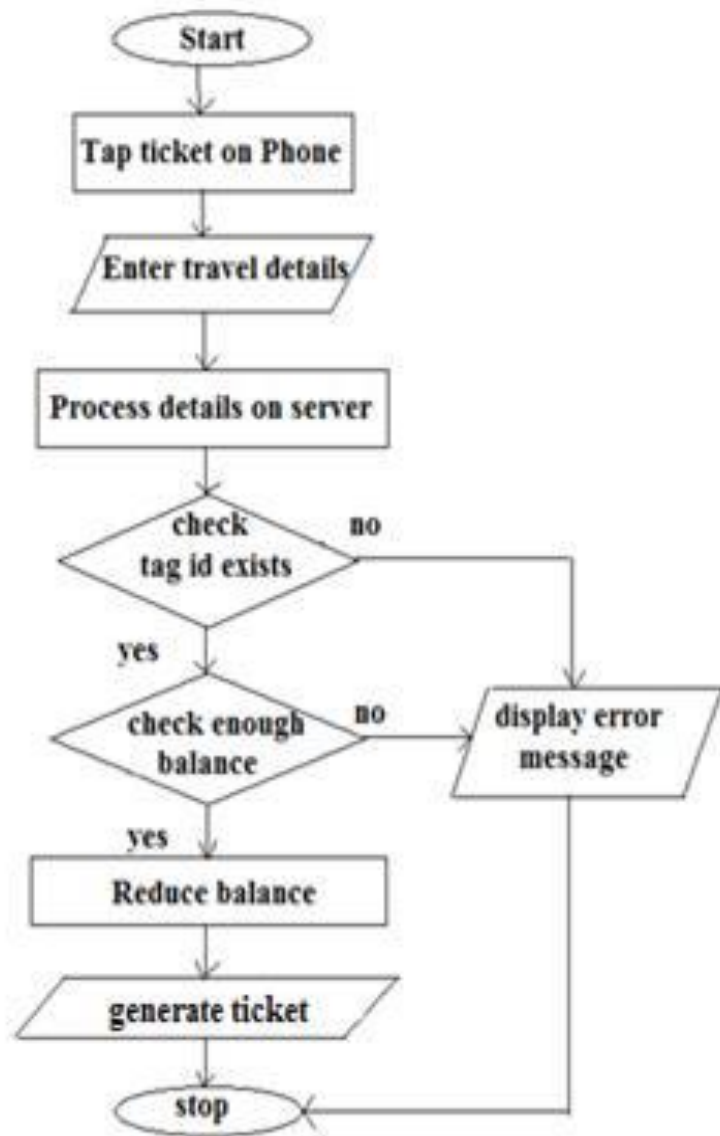**Fig No. 3.4 : Working Of Conductor**

Context Level DFD

Fig No. 3.5 : Data Flow Diagram Between Admin And Conductor

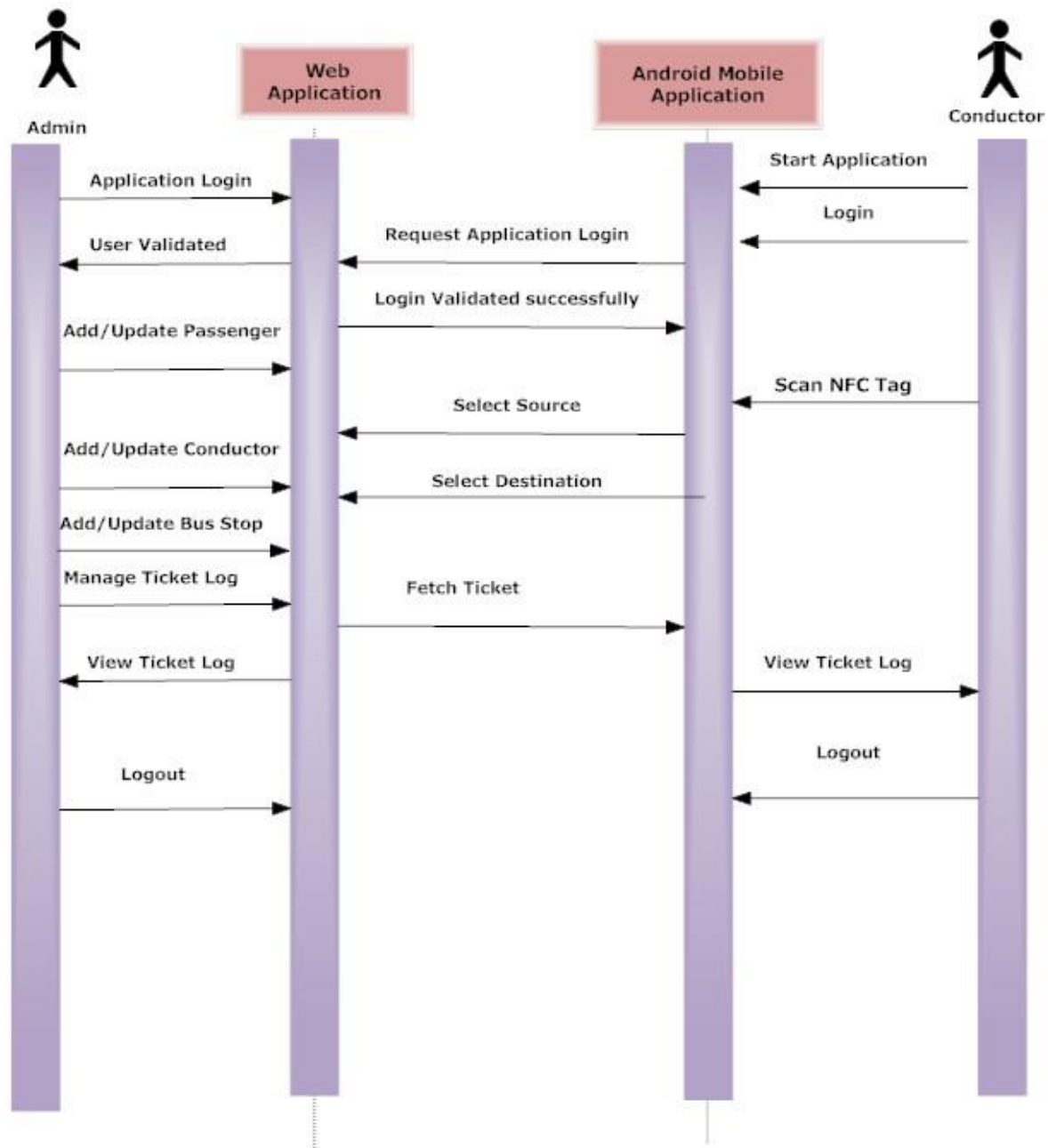**Fig No. 3.6 : Working Of Ticket Checker**

Fig No. 3.7 : Data Flow Diagram Of Ticket Checker

FigNo.3.8 : Flowchart of Actual Working

FigNo. 3.9 : Sequence Diagram

Chapter 4

Hardware And Software Specification

These are the Hardware and Software required for implementing this project.

4.1 Software Requirement

4.1.1 Operating System

An operating system (OS) is system software that manages computer hardware and software resources and provides common services for computer programs.

Full Supported List:

- Windows XP
- Windows Vista
- Windows 7 / 8 / 8.1 / 10

Minimum:

- Windows XP

4.1.2 Web Browsers

A web browser (commonly referred to as a browser) is a software application for retrieving, presenting, and traversing information resources on the World Wide Web. Itsupports the following Web Browsers:

Full Supported List
- Chrome
- Microsoft Edge
- Firefox
- Internet Explorer

4.1.3 Technology

- **Java:** Java is a general-purpose computer programming language that is concurrent, class-based, object-oriented and specifically designed to have as few implementation dependencies as possible. Java has strong support for web development. It is frequently used at the server side. Java is a set of computer software and specifications developed by Sun Microsystems, which was later acquired by the Oracle Corporation that provides a system for developing application software and deploying it in a cross-platform computing environment.

  - **SQL:** Structured Query Language (SQL) is a special-purpose programming language designed for managing data held in a relational database management system (RDBMS). SQL is a structured query language used for querying database. The scope of SQL includes data insert, query, update and delete, schema creation and modification, and data access control.

  - **HTML:** Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. It is used for giving eye catching look to the website. And also providing easy to use GUI.

  - **CSS:** Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language. It is used to give designer look to HTML using the external file.

  - **JavaScript:** JavaScript is a high-level, dynamic, un-typed, and interpreted programming language. It has been standardized in the ECMAScript language specification. Alongside

HTML and CSS, it is one of the three core technologies of World Wide Web content production; the majority of websites employ it and it is supported by all modern Web browsers without plug-ins. JavaScript is prototype-based with first-class functions, making it a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles. Java script is used for client side scripting which can help in using validation on the website and many more other functions.

- **Visual Studio:**Visual Studio is a complete set of development tools for building ASP.NET Web applications, XML Web Services, desktop applications, and mobile applications. Visual Basic, Visual C#, and Visual C++ all use the same integrated development environment (IDE), which enables tool sharing and eases the creation of mixed-language solutions. In addition, these languages use the functionality of the .NET Framework, which provides access to key technologies that simplify the development of ASP Web applications and XML Web Services.

- **SDK for Android:**Android provides a rich application framework that allows you to build innovative apps and games for mobile devices in a Java language environment. The documents listed in the left navigation provide details about how to build apps using Android's various APIs.The Android software development kit (SDK) includes a comprehensive set of development tools.[4] These include a debugger, libraries, a handset emulator based on QEMU, documentation, sample code, and tutorials. Currently supported development platforms include computers running Linux (any modern desktop Linux distribution), Mac OS X 10.5.8 or later, and Windows 7 or later.

- **Eclipse:**Eclipseis an integrated development environment (IDE) used in computer programming, and is the most widely used Java IDE. It contains a base workspace and an extensible plug-in system for customizing the environment. Eclipse is written mostly in Java and its primary use is for developing Java applications, but it may also be used to develop applications in other programming languages via plug-ins, including Ada, ABAP, C, C++, C#, COBOL, D, Fortran, Haskell, JavaScript, Julia,Lasso, Lua,NATURAL, Perl, PHP, Prolog, Python, R, Ruby (including RubyonRails framework), Rust, Scala, Clojure, Groovy, Scheme, and Erlang.

4.2Hardware Requirement

- NFC tags
- NFC based Android Mobile

- Intel processor IV and above

- 1 GB RAM

- 160 GB hard disk

Chapter 5
Testing

Testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. Software testing can also provide an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation. Test techniques include the process of executing a program or application with the intent of finding software bugs, and verifying that the software product is fit for use.

5.1 White Box Testing

White box testing (also known as clear box testing, glass box testing, transparent box testing and structural testing) is a method of testing software that test internal structures or workings of an application, as opposed to its functionality (i.e. black box testing). In white box testing, an internal perspective of the system, as well as programming skills, is used to design test cases. The tester chooses inputs to exercise paths through the code and determine the appropriate outputs. This is analogous to testing nodes in a circuit e.g. - circuit testing (ICT). White box testing can be applied at the unit, integration and system levels of the software testing process. Although traditional testers tended to think of white box testing as being done at the unit level, it is used for integration and system testing more frequently today. It can test paths within a unit, paths between

units during integration, and between subsystems during a system-level test. Though this method of test design can uncover many errors or problems, it has the potential to miss unimplemented parts of the specification or missing requirements.

White box test design techniques include the following code coverage criteria:

- Control flow testing
- Data flow testing
- Branch testing
- Statement coverage
- Decision coverage
- Path testing

5.2 Black Box Testing

Black box testing is the method of software testing that examines the functionality of an application without peering into tis internal structures of workings. This method of test can be applied virtually to every level of software testing: unit, integration, system and acceptance. It typically comprises most if not all higher level testing, but can also embody unit testing. In penetration testing, back box testing refers to a methodology where an ethical hacker has no knowledge of the system being attacked. The goal of a black box penetration test is to simulate an external hacking or cyber warfare attack.

Typically black box test design techniques include:

- Decision table testing
- All pairs testing
- Equivalence partitioning
- Boundary value analysis
- Error guessing
- State transition testing

The following table shows the difference between the expected and actual time taken by Nfc bus ticketing app to boot up.

Table 5.1 Nfc app boot up Testing

Parameter	Expected outcome	Actual outcome	Status
Nfc App Boot up	4-6 sec	5.80 sec	Ok

The following table shows the time taken between the Nfc card and the android application.

Table 5.2 Nfc card detection

Parameter	Expected outcome	Actual outcome	Status
Nfc Card Detection	5-10 sec	8 sec	working

This is the screenshot of the first activity where the android application pops up and we have to enter the Authenticated user name and password.
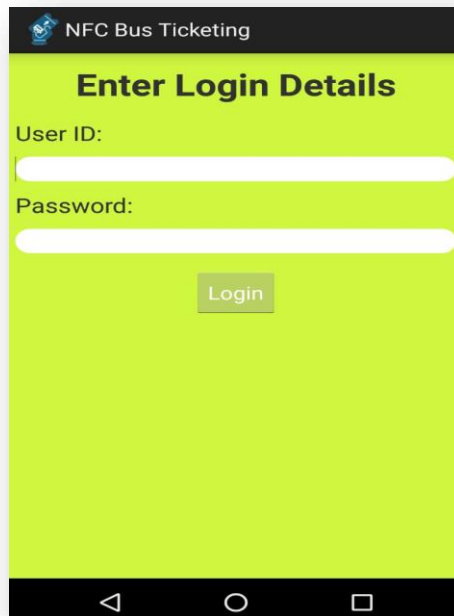
Figure 5.1 Login Page

This is the screenshot of the second activity where the android application pops up the message of authentication failed when the user does not match the authenticated details stored in the smartphone. Every time the user enter the details for authentication, the application checks the database of the smartphone where it can compare and match the details with the already stored information.
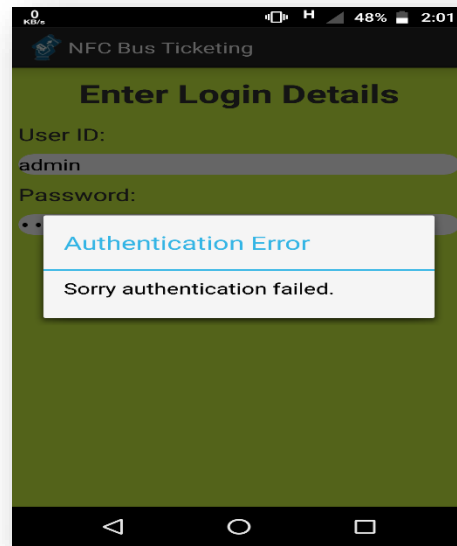
Figure 5.2 Authentication failed

This is the screenshot of the third activity. As discussed in the above screenshot that the android application checks for already stored information in the database of the smartphone for authentication. To avoid the problem of authentication failed the user should enter the correct details.
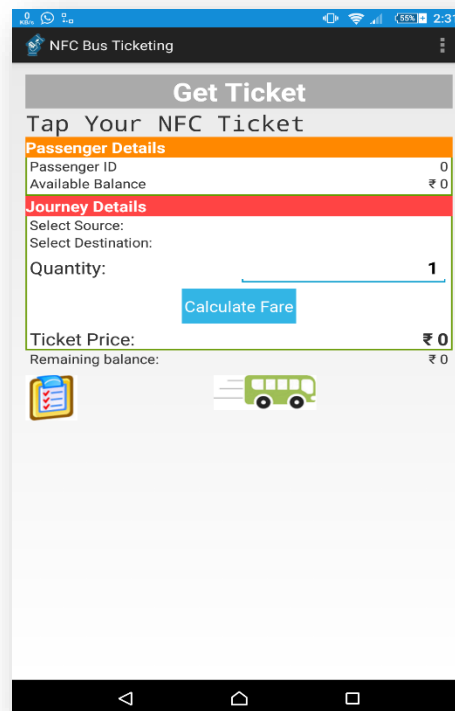
Figure 5.3 Authentication successful

This is the screenshot of fourth activity.here we have tested that when the ticket is booked the Amount deduction has been done from the available Amount. This Deduction is shown in the Android App and the Administrator Database.
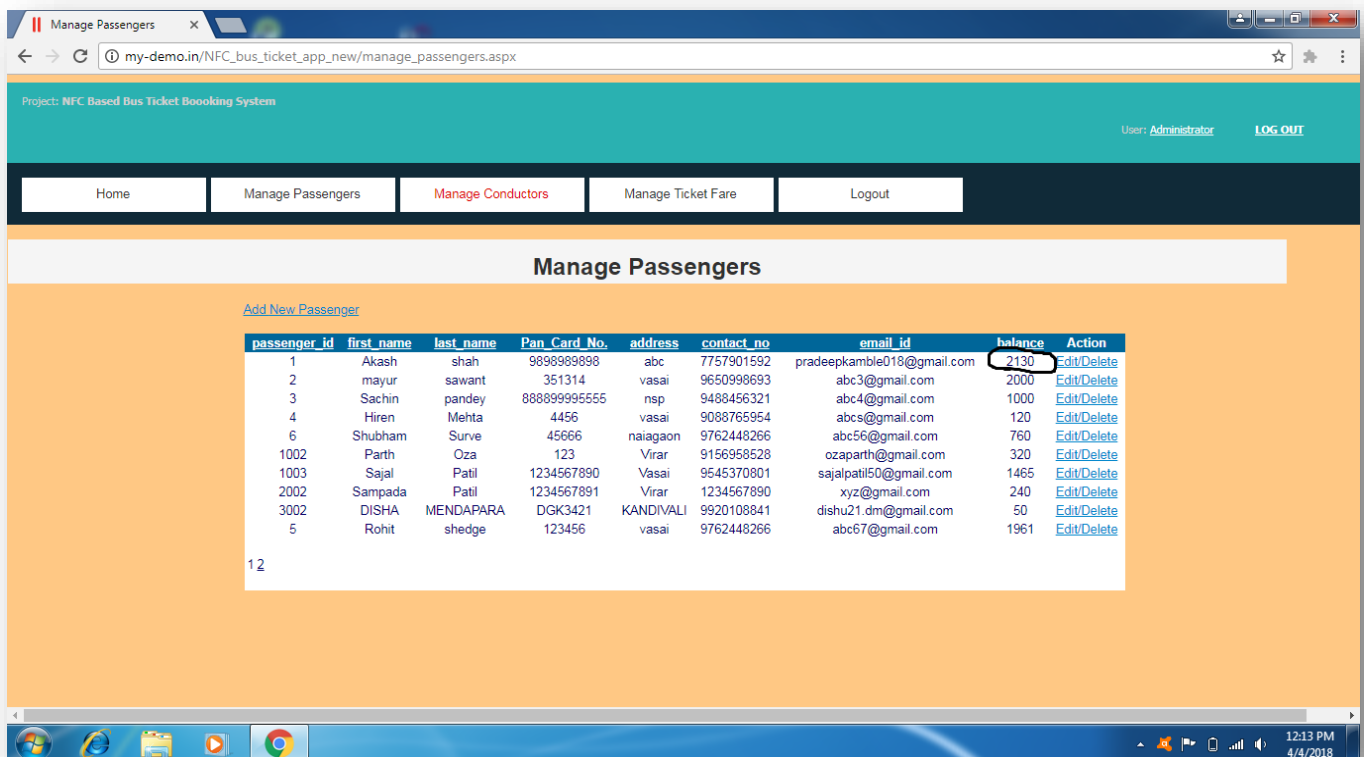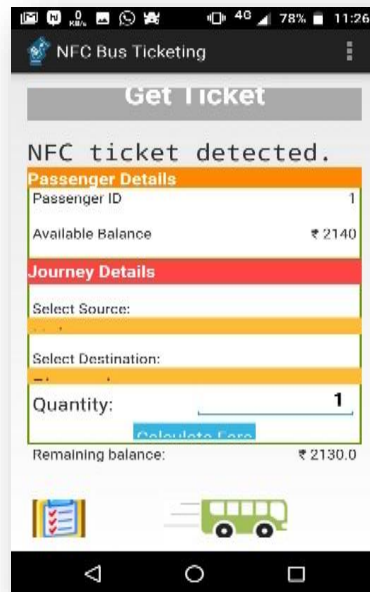
All the above test cases were performed and the results obtained were ok and as per the expectations. The above test cases was conducted under the supervision of Prof. Manjusha Gaikwad.

Chapter 6

Result Analysis and Discussion

This project shows the communication between the android application and Nfc Card for Bus Ticketing System. The Passenger will be authenticated by the android application through Nfc Card. Once the Conductor places the Card for authentication, the android application verifies whether the provided Card matches the stored Information or not. Once the Nfc Card authentication is successfully done, it is paired with Application.The second activity enables the user to perform the function of Booking the Ticket by Conductor. As per the Passenger selection, the Ticket are been confirmed.

6.1 Working

This is the first activity where the Conductor enter the details for authentication. Based on the details already stored in the smartphone, it will check if the provided information matches the details already stored in the smartphone. If matched it will go to the next activity. Thus the first activity simply shows the login procedure of the Conductor.
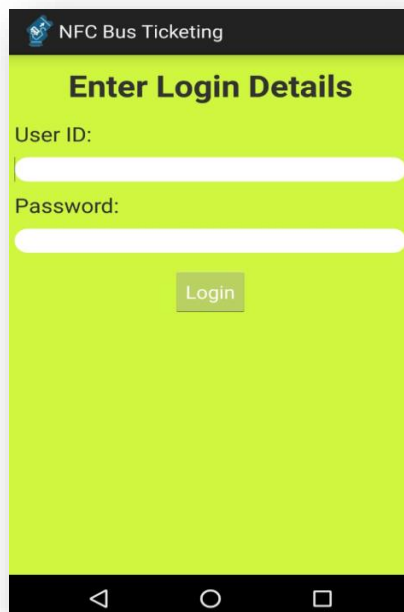
Figure 6.1 First Activity-Login Page

This is the Second activity where the Conductor enter the Wrong details for login , then Authentication error is occurred.
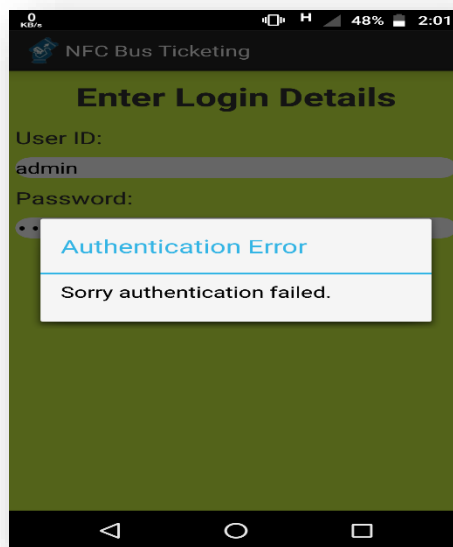
Figure 6.2 Authentication Failed

This is the Third activity where the Conductor get the Starting the page of the Application. This page show the Conductor Authentication has been done succes
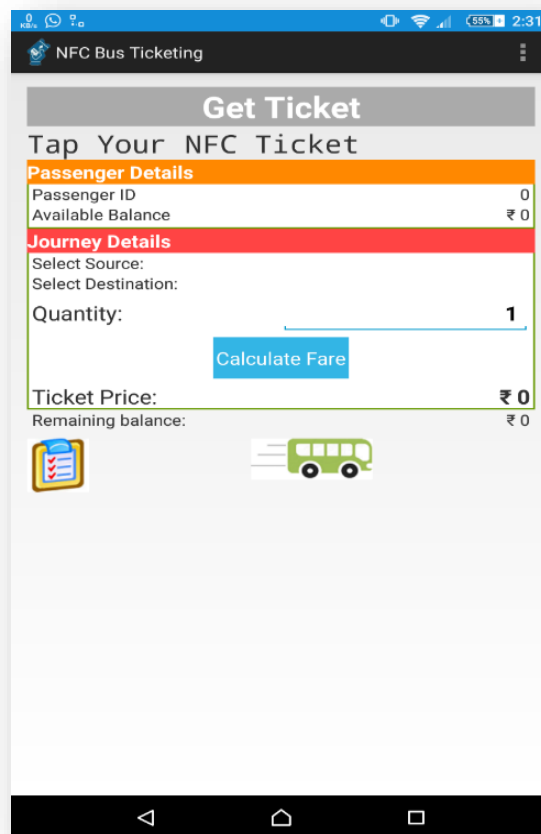
Figure 6.3 Authentication successful

This is the Fourth activity where the Conductor Tap the Nfc Card of the Passenger for the Ticketing purpose. Nfc Card Detected And Conductor get all the details of the Passenger.
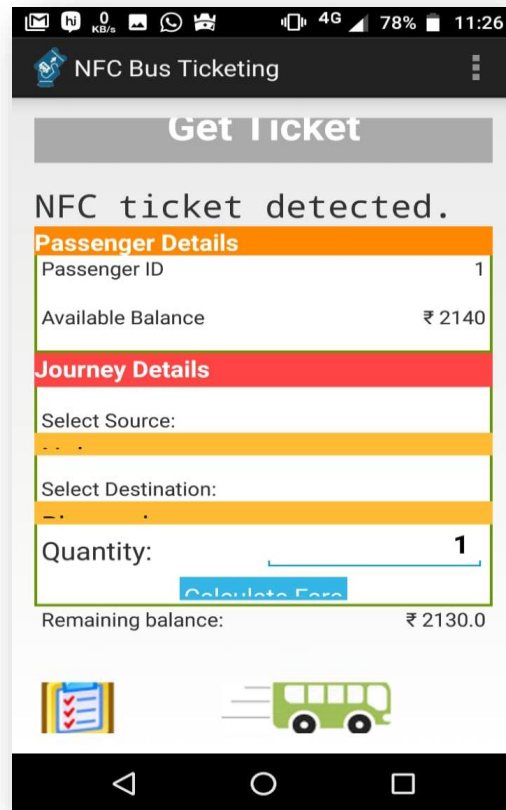
Figure 6.4 NFC card detection

This is the Fifth activity where the Conductor book the ticket by clicking the Book Button and the Tracsaction is done Successfully once the ticket is booked.
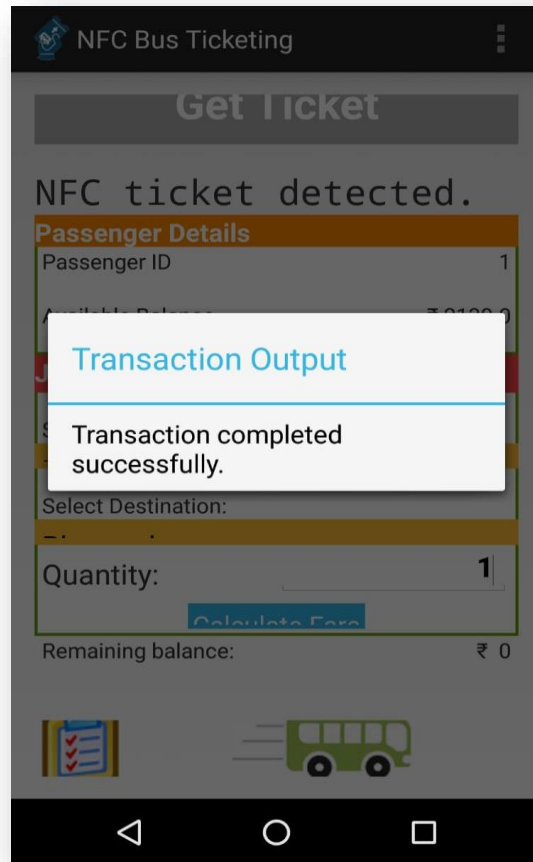

Figure 6.5 Transaction Successful

This is the Sixth activity where the Admin has to log in with the details of self to update the details in the database. This is the Admin Log-in Page. If the details of the Admin is Wrong then Authentication will fail.
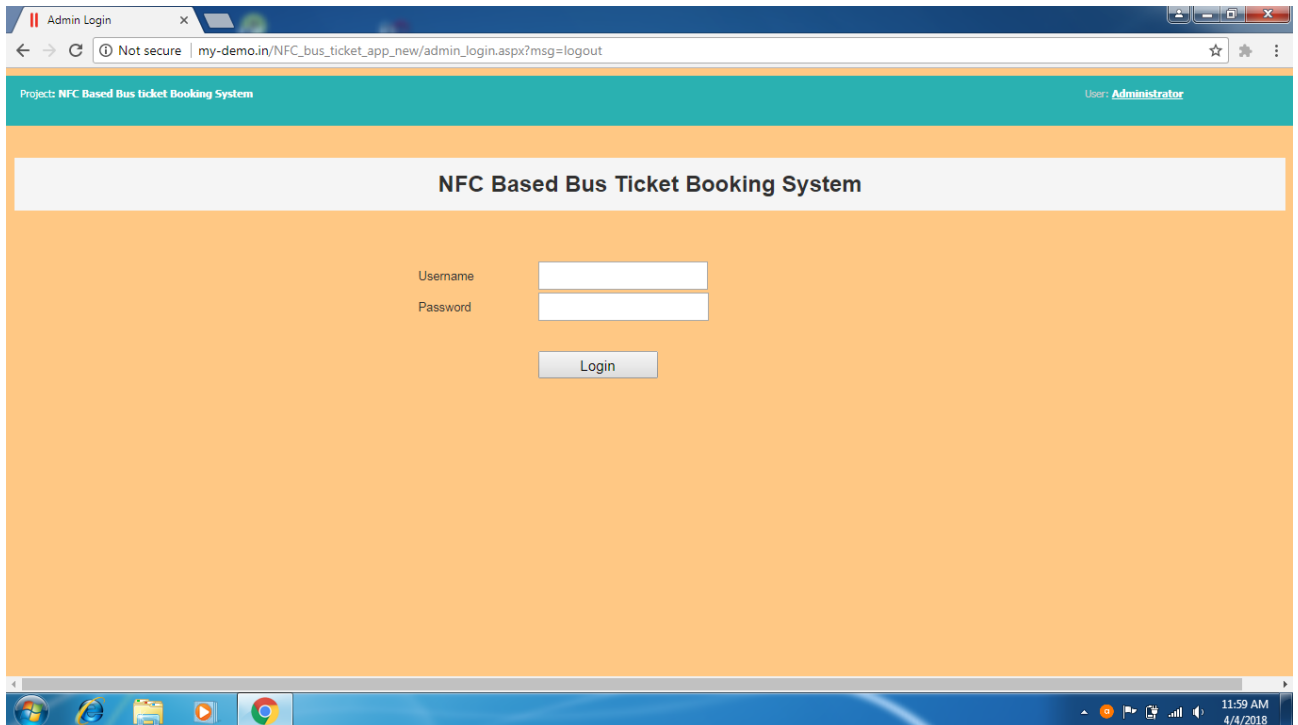
Figure 6.6 Admin Login

This is the Seventh activity where the Admin log–in into the system,once the Authentication is successful the Admin can Manage Conductors , Manage Passengers, Manage Ticket Fares.
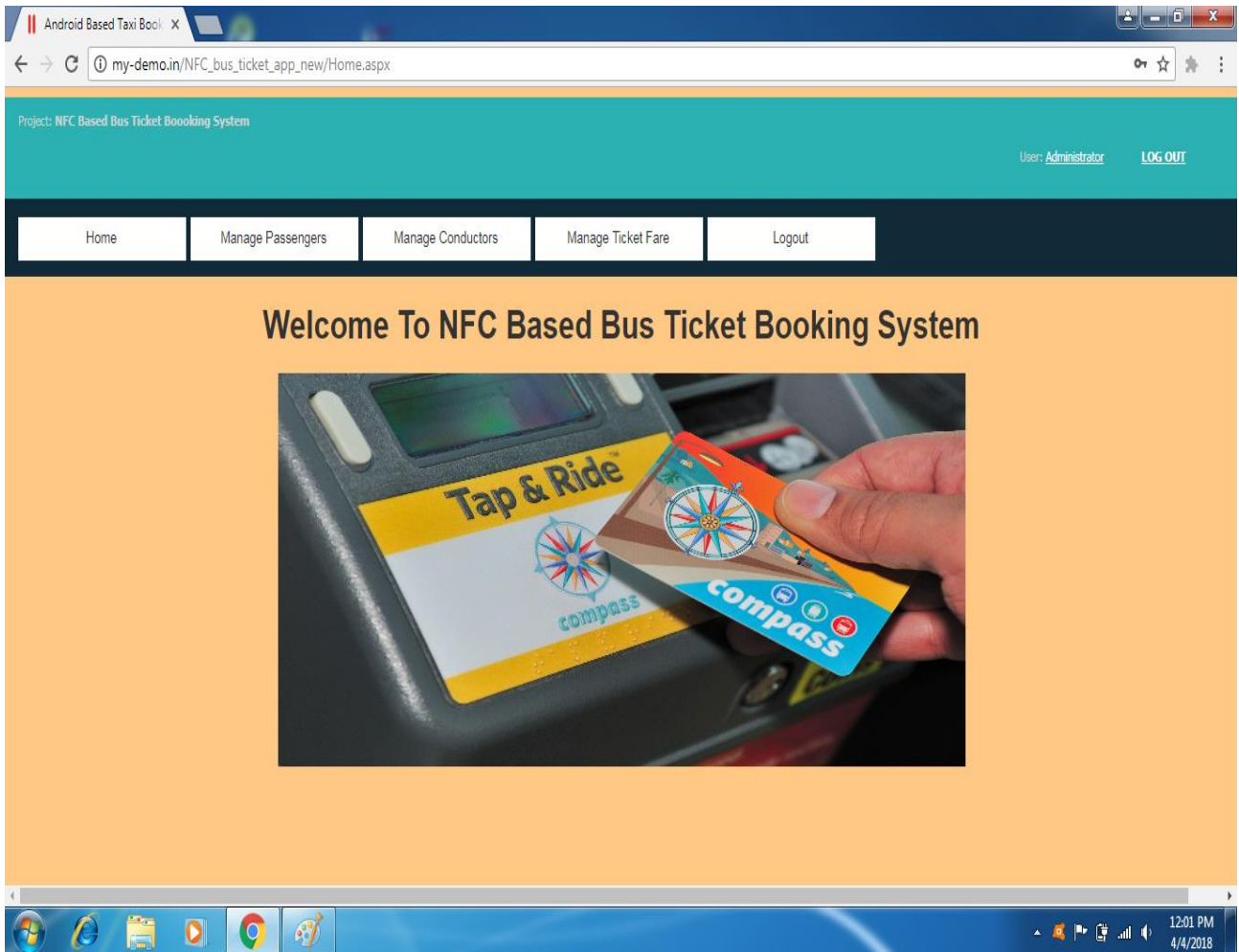
Figure 6.7 Admin Home Page

This is the Eighth activity where the Admin update the details of the passengers. The Admin Add the new Passengers in the list. The Admin can update the details of the Passengers and also Delete the unwanted and outdated Passengersin the list.

Figure 6.8 Manage Passenger

This is the Nineth activity where the Admin can Add the new Tickets Fare. Admincan update the Ticket Fares and Also delete the Unwanted and Outdated Ticket Fares.

Figure 6.9 Manage Ticket Fare

This is the Tenth activity where the Admin Stores the details of the Last Transactions of the Customers with the Date and Time.With the details of the last Transactions the Ticket Checkers can check the Ticket details of the Passengers.
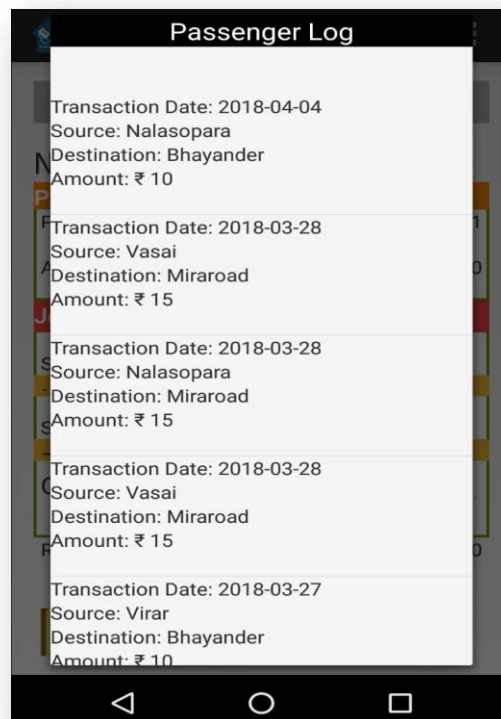
Figure 6.10 Passenger Log

6.2 Advantages

- **Wireless connection**

 Similar to the connection of other technologies such as WiFi or Bluetooth but with a shorter range, generally between 10 and 20 centimetres. Its short range allows for avoiding possible security problems such as the reading of our transmission.

- **Connection speed**

Almost immediate connection with a transfer rate that can reach 424 Kbit/s.

- **Autonomy**

 The chips included in NFC technology do not need to be connected to a main battery.

Practical Application

- **Identification**

only by approaching our transportation bonus or car keys to a compatible scanner with NFC technology.

- **Data collection/exchange**

As complementary technology or alternative to QR we can download in our mobile phone the information on a specific product by approaching the phone to the product. Also, thanks to the NFC technology, we can share archives with other people. In the following video we can see a tutorial on how to use Android Beam, the NFC application developed by the known operative system for mobile phones.

- **Commercial transactions**

Bonuses can already be acquired by using NFC as a payment method. its main advantages are its ease of use and that the charge can be associated to our bill or bank account. Nowadays, tickets for concerts or public transportation.

6.3 Applications

Since NFC technology is started to be promoted, various real-life applications have been evolved. An NFC literature review study in revealed that, about 40% of the NFC literature concentrated on developing new NFC applications. Indeed, design artifacts, which propose composed applications or services operating in two or more modes can be seen in NFC literature.

Review on NFC Applications and Service Domains :

- **Healthcare Applications:** In the last decades, one of the fields where IT is playing fundamental role is healthcare. Providing effective and appropriate healthcare services is one of the most important objectives of information and communication technologies. It is seen from the literature that NFC plays significant role in health service domain due to its easy use with lower consumption property. NFC provides user-friendly remote health monitoring, controlling, and tracking systems, and electronic data capturing services. There are also some services that aim to improve the care dependent people's quality of life such as NFC enabled prescription system, storage of encrypted medical data on tags, adverse drugs reaction and allergy detection systems in pharmaceutical and medical care.

- **Smart Environment Applications:** In technological perspective, smart environment is defined in as "a physical world that is richly and invisibly interwoven with sensors, actuators, displays, and computational elements and also embedded seamlessly in the everyday objects of our lives, and

connected through a continuous network". NFC technology can be also buried in applications that address diverse and heterogeneous needs and capabilities of users in the real world, and make users' life easier. Most of the smart environments are enabled by NFC tags that are distributed around. In accordance with, "tags can provide support in user's everyday life activities by establishing a bridge between the physical and digital worlds when they are ubiquitous in the everyday environments of users" and "the tags become an integral part of physical space, altering the way humans perceive and behave in it". It is possible to see innovative examples of smart environment in the NFC literature, which makes use of NFC tags to simplify utilization of existing functions of a system, to control a system and perform services remotely and also to provide information channel. N-CASH is another example for NFC enabled smart environmentthat clearly describes the creation of a smart space, which can be activated by NFC mobile to control devices such as home appliances. The appliances are controlled and driven by the request from NFC mobile that uses predefined ontology and rule based reasoning. So, NFC mobile acts as the key to enter the space as well as provide personalized control of a variety of appliances in that space.

- **Data Exchange & Sharing Applications:** The exchange of data, image, or similar content between two NFC mobile is also another important application domain provided by NFC technology. Especially today, between potential business partners, exchanging contact data is really important for continuity of the relationship in business world. The proposed system, named VisiExchange prototype, enables mobile devices to share data by peer-to-peer operating mode and eliminates the risk of unwanted data transfer with third parties.

- **Mobile Payment, Ticketing & Loyalty Applications:** With the market and technological developments, successful mobile payment solutions have already been launched over the world. Actually some countries are much more advanced in terms of deployed technology and implemented business cases since governments and influential mobile network operators (MNOs) in those countries have 22 powerful impact on enhancing the development of mobile payment services. Various technologies contributed for the development of mobile payment systems such as RFID technology, contactless smart cards, Short Message Service (SMS), USSD (Unstructured Supplementary Service Data (USSD), WAP (Wireless Application Protocol) IVR (Interactive Voice Response) and so on. Currently, integration of NFC technology with mobile payment systems brought new and innovative business solutions. Payment, ticketing and loyalty applications are possibly the most well-known and promising everyday applications of NFC technology and have the most complexity in ecosystem aspect as well. Thus it can be seen that most of the trials and projects (e.g., Payez Mobile Project, Pay-Buy-Mobile Project, SIESTA Project) are implemented in this application

domain. Some of these projects still continue with growing participating entities. From the academic point of view, some valuable studies have been performed as well as some fruitful usability and user experience analyses in payment and payment related application domains.

Some examples are:

- An automated reservation and ticketing service for tourists, and a system for car parking access and payment system for ticketing,

- Virtual ticketing system and secure mCoupon protocol,

- Secure payment service by Smart Touch Project,

- NFC Ticketing system with a simple architecture, including usability testing,

- NFC Loyal system including a secure data exchange model to promote, payment and loyalty applications on secure elements,

- Offline Tapango system for electronic ticketing process including comparison, with traditional paper ticketing process,

- Offline NFC payment service with electronic vouchers,

- Secure payment system built on a Service Oriented Architecture (SOA), including payment authorization process.

- **Entertainment Applications:** Although NFC technology has high potential for applications like payment and ticketing, applying NFC technology in entertainment and social media applications is receiving more and more attention on user side. Some examples from the literature are Pass the Bomb and Exquisite Touch games which are implemented with a multiplayer purpose; Whack-a-Mole game which combines dynamic NFC displays to explore mobile interaction with tagged, physical objects can leverage mobile gaming; PhonePhone as an NFC enabled musical instrument.

- **Social Network Applications:** Currently, Internet based social network applications are booming with popular services like Facebook, LinkedIn, MySpace and Twitter etc. NFC technology is also an enabler for social networking tools and can be integrated with the existing social network applications. Generally, these applications enable users to interact with tagged physical objects and publish information with the virtual world. Some trials are also using peer-to-peer mode to allow users to share and access their personal information, to create friendships in a more tangible and user friendly way. Another good way of promoting social network services is to provide also advertising and location based services such as TaggyNet.

- **Educational Service Applications:** Currently, universities and schools became a valuable research area for development and testing NFC technology. Various implementations of NFC services

and prototypes in universities can be seen to create smart environments for the students as well as to perform efficient work force management and easier administration services for the staff. Up to now, diverse innovative NFC services in university settings are tested and implemented such as identification, payment services in university cafes and restaurants, photocopy services, reservation and payment of sports facilities, and also resources control and management services, teaching services, dissemination of information and accessing to services. Also NFC technology can be used in interactive learning process of students. For example, the proposed Moodle system in enables use of games in teaching and learning process. It brings together the characteristics of a common strategy game with an evaluation system; and enables to motivate and reward students by using NFC mobiles. Other valuable examples related with the efficient work force management in school settings are NFC enabled attendance supervision system, and examination systems supported by NFC technology in universities.

- **Location Based Applications:** Location based services (LBSs) are used for enabling an information service by using the geographical position of the user's mobile device. With the integration of LBSs with NFC technology, users' behavior can be tracked and user experiences can be improved. Depending on the position of the user, most common examples are displaying friends nearby, broadcasting advertisement of stores nearby through SMS/MMS, and discovering nearest post office depending on our geographical position. Hence these services provide location based, customized messages or information to users. Such services can also be integrated with NFC enabled the indoor navigation systems to provide more value added services to the users, especially in shopping centers.

- **Work Force and Retail Management Applications:** Furthermore NFC technology contributes in solving the problems within the business world and work force management. For example, in retail industry, retailers face various problems in sales data management such as high cost, low security, and poor performance of real-time documentation. Nowadays, it is possible to see the advantages of NFC technology in improving the existing business processes within companies.

Chapter 7

Conclusion

The system is completely automated so it reduces the human effort. The cards being reusable, they are much more convenient compared to the project based ticketing system. Even the bill printer helps to keep the record of the entire expense of the bus. Any unwanted events can be avoided as all the person carrying NFC tickets are monitored every time they travel.

Chapter 8

References

8.1 Journal :

[1] http://ieeexplore.ieee.org/document/5494785/ --- for litreature survey

[2] http://www.mdpi.com/1424-8220/15/6/13348/html --- for litreature survey

[3] http://www.centrenational-rfid.com/introduction-to-nfc-article-132-gb-ruid-202.html --- for litreature survey

[4] https://www.androidauthority.com/what-is-nfc-270730/ ---for working

[5] http://nearfieldcommunication.org/how-it-works.html --- for working

[6] https://www.online-sciences.com/technology/nfc-near-field-communication-uses-advantages-and-disadvantages/ --- for advantage

[7] http://www.nearfieldcommunicationnfc.net/benefits.html --- for advantage

[8] http://support.intuilab.com/kb/faq/minimum-software-and-hardware-requirements --- for hardware and softwarerequirements

[9] https://nfc-forum.org/our-work/compliance/certification-program/device-requirements/ --- forhardware and softwarerequirements

[10] https://nfclab.com/papers/Author_copy-A_Survey_on_NFC_Technology.pdf --- for A Survey on Near Field Communication (NFC) Technology

8.2 Proceeding Paper :

[12] Pradeep Kamble, Sagar Mitna, Shahnawaz Jaliyawala, Prof. Manjusha Gaikwad, "NFC Based Mobile Ticketing System ", *IJSRD*, *Vol*. 6, Issue. 01, March 2018

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