

Bus Ticketing on Android Devices using Near Field Communication (NFC) Technology

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Abstract— This project is based on ticketing and identification of the passenger in the public transport. In the metropolitan city like Mumbai, Kolkata we have a severe malfunction of public transport and various security problems. Firstly, there is a lot of confusion between the passengers regarding fares which lead to corruption, Secondly due to mismanagement of public transport the passengers faces the problem of traffic jam, thirdly nowadays we have severe security problems in public transport due anti- social elements. 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 could be only possible by use of NFC tickets. This project basically deals with the identification and ticketing of the passengers sitting in the bus. Near Field Communication is a wireless technology which allows transmitting data between two devices. Automated and accurate accounting of bus transport can be used to provide useful estimates of the fare of travelling from one bus stop to another as well as the crowd density can be measured inside the bus, but in case of India measuring crowd density is of no use.

Key words: NFC, Bus Ticketing, NFC Tags, Android Application

I. INTRODUCTION

The project is developed using NFC technology. This project provides a NFC system that can identify passengers in public transport as well as it does all accounting purpose based on travelling fares. Automated and accurate accounting of bus transport can be used to provide useful estimates of the fare of travelling from one bus stop to another as well as the crowd density can be measured inside the bus, but in case of India measuring crowd density is of no use. Near field Communication (NFC) tags is going to be used in this project. Passenger would carry NFC card with them, when they enter into the bus they have to show the NFC card to the Conductor. The conductor will use NFC based android cell phone to read the NFC tag. Based on the distance travelled the cost would be automatically deducted.

Near Field Communication is a wireless technology which allows transmitting data between two devices. NFC commonly integrated within mobile devices. This will allow the device to establish communication with another device sim card. So it can be used as a substitute of wallet in public transportation. Basically NFC has 2 different modes of data transmission with regards to placement.

- 1) Active NFC Mode: in this mode, source and destination use their self-generated radio frequency to communicate.
- 2) Passive NFC Mode: in passive mode, destination answer request made by source to call modulation scheme. Source does the radio frequency generation.

The project is basically divided into two modules:

A. Server

- 1) To manage administration
- 2) To manage Conductor/Ticket Checker(TC)
- 3) To manage Passenger
- 4) Renewal of account

B. Android Application

- 1) Conductor Login
- 2) TC Login
- 3) Ticket booking
- 4) NFC Reading, search and apply for jobs.

II. NEED

- The traditional ticketing method of using papers for ticketing can be overcome by paperless ticketing method by using Near Fields Communication (NFC) smart cards.
- The cashless ticketing is very necessary now as it creates chaos and wastes time in asking for change in cash denominations.
- An android mobile handset is much portable to use than the traditional system devices.

The basic concept in the project is that there are five main components which constitute the architecture of the entire system. Starting with the android application; it is installed on the android device through the .apk file. This application will be installed on the conductor's android device and also with the Ticket Checker. The application is extremely user friendly and less complicated. There are two logins to the application, one will be the conductor's login whereas other is the TC's login. Once the conductor has logged in into the application he will be asking the passenger for his Smart card. The next component being the Smart card; it will be a Smart card that will be using the Near Field Communication (NFC) technology.

III. LITERATURE SURVEY

A. Android Application

Now a day's many mobile devices such as smart phones and a tablet computer uses an operating system which is known as android. It is developed by Google. The Android Open Source Project (AOSP) does the maintenance and further development of Android. It has good Linux kernel, middleware layer, includes libraries and application programming interface written in C and application software running on an application framework which is virtual machine with just-in-time compilation to run compiled java code. There are many Android developers who develop an efficient application that extend the functionality of the existing android application. Generally developers write code in a new version of java. Android apps can be downloaded from different third-party websites or through online stores such as Android Market, the Google app store. The android system uses the Dalvik Virtual Machine to run java based applications. You cannot directly run java class files on android they need to get converted in the Dalvik byte code format.

IV. NEAR FIELD COMMUNICATION TECHNOLOGY

An NFC enabled phone functions much like standard contactless smart cards that are used worldwide in credit cards and in tickets for public transit systems. NFC phones also offers enhance security, enabling the user to protect the secure applications through the phones user interface features. It is discussed with the help of diagram shown in figure 2 given below.



Fig. 2: Concept of NFC phone

Also, two working modes of NFC Communications are discussed, they are Active Communication mode and Passive Communication mode. Passive Communication Mode[1] shown in fig. 3 below includes the initiator device provides a carrier field and target device answers by modulating the existing field. In this mode, the Target device may draw its operating power from the initiator provided electromagnetic field, thus making the target device a transponder. Also, in Active Communication Mode[1] shown in figure 4 below includes Both initiator and target device communicate by alternatively generating their own fields. A device deactivates its RF field while it is waiting for data. In this mode, both devices typically have power supplies.

V. PROPOSED SYSTEM

In the proposed system, conductor or the ticket checker should have the .apk file in his/her NFC supported android based device. Conductor or the ticket checker can get access to the application by providing his/her username and password. Conductor can perform tasks like scanning the NFC card, booking the ticket, viewing the ticket log whereas the Ticket Checker can perform tasks like scanning the NFC card and viewing the ticket log.

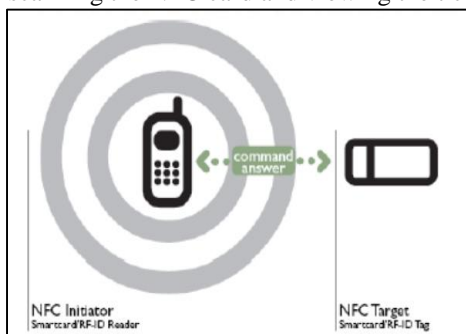


Fig. 3: Passive Communication mode

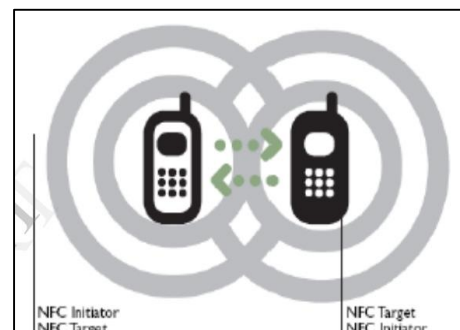


Fig. 4: Active Communication mode

A. Motivation for the Proposed System

Electronic ticketing is spreading as ticketing companies replace their analogue systems. The old tickets are replaced by smart cards communicating either through a contact or contactless interface.

The introduction of NFC in cellular handsets opens for the possibility of the mobile phone acting as a contactless ticket in these systems.

There are several reasons why this can be an interesting combination:

- 1) The mobile phone network can be used as a new distribution and sales channel for electronic tickets.
- 2) The mobile phone can store different types of tickets.
- 3) As the mobile phone can hold numerous tickets, there will be fewer items for the user to carry.

B. Operations on the Proposed System

As soon as the bus arrives at the bus stop, the passenger would board the bus and show his smart card or the tag to the Conductor. Using the android based NFC reader conductor will read the NFC tag.

NFC card will have a unique ID number of the passenger. The card is rechargeable from certain bus depots placed at certain locations of the city. The reader will accept the card if the card has required credit to travel that distance specified by the user. The reader will read the tag and acquire certain information from the passenger. According to the source & destination the fare would be deducted from the NFC tag.

After the whole day, the individual bus reader will know how much amount has been transferred to the corresponding account and also the information of passengers can be found in the main database. Thus better monitoring and transparency can be achieved by cross checking of all these information.

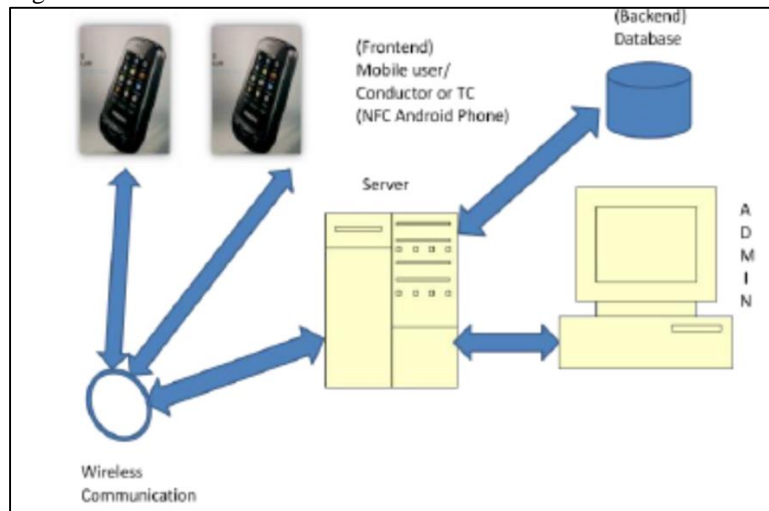


Fig. 5: Architecture diagram of the proposed system

VI. DESIGN DETAILS

A. Context Level Diagram

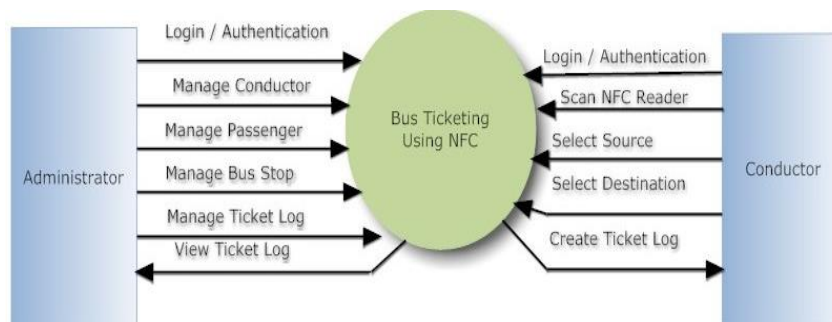


Fig. 6: Context level Diagram

B. DFD for Admin Login

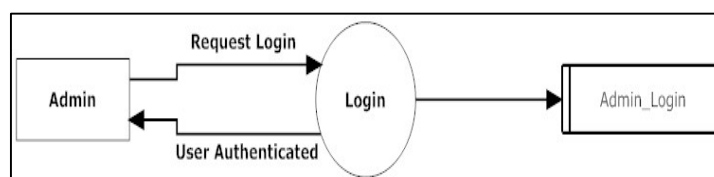


Fig. 7: DFD for admin login

C. DFD for TC login

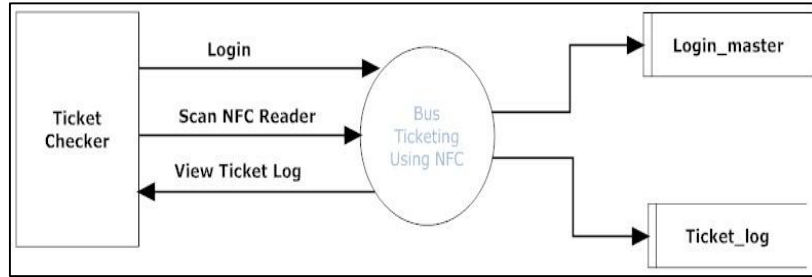


Fig. 8: DFD for TC login

D. Sequence Diagram

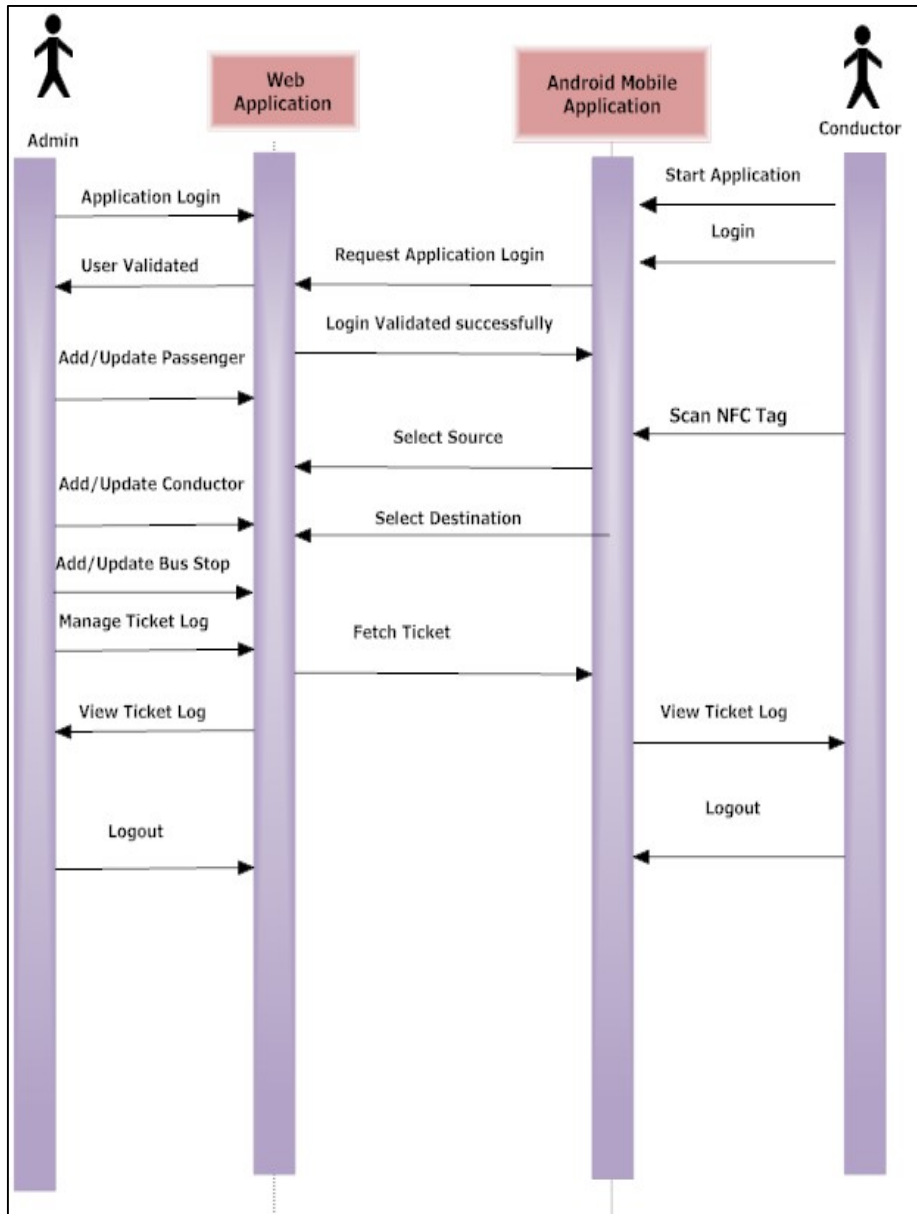


Fig. 9: Sequence Diagram

VII. METHODOLOGY

This section describes the overall methodology adopted in the project. The goal of our project is to use an android application and a NFC smart card for faster and efficient ticketing. We focus on the concept of using a strong and secured database also so that a lot of important information regarding the Conductor IDs, Passenger IDs, the sources and destinations and the fares are saved and the accounting and ticketing logs are secured.

Figure 5 System Overview of Bus ticketing system gives an overview of the automated bus ticketing methodology.

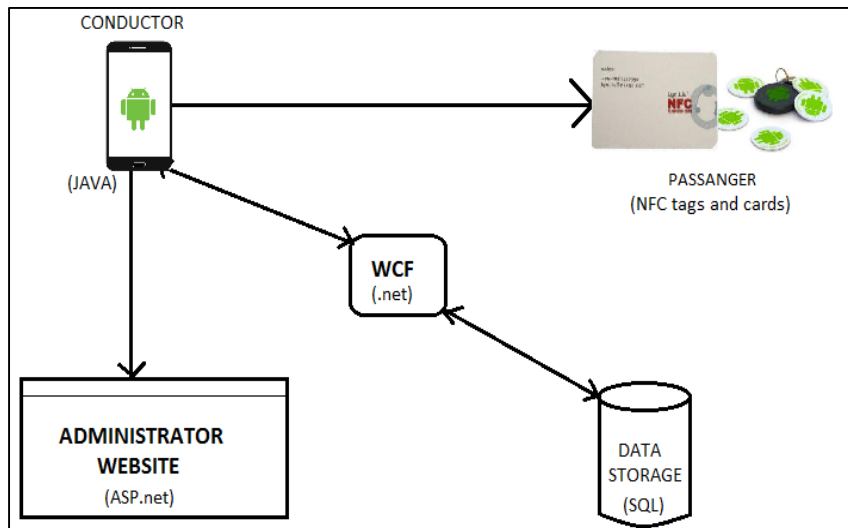


Fig. 6: System overview of the Bus ticketing system

A. Visual Studio

The Microsoft Visual Studio development system is a suite of development tools designed to aid software developers—whether they are novices or seasoned professionals—face complex challenges and create innovative solutions. Every day, software developers break through tough problems to create software that makes a difference in the lives of others. Visual Studio's role is to improve the process of development to make the work of achieving those breakthroughs easier and more satisfying. The Microsoft Application Platform is a portfolio of technology capabilities, core products, and best practice guidance focused on helping IT and development department's partner with the business to maximize opportunity. As one of the core products of the Microsoft Application Platform, Visual Studio can help you drive the right business efficiencies, customer connections, and value-added services by providing a single, fully integrated development environment for all types of development, including Microsoft Windows, Microsoft Office, Web, and mobile applications. Use Visual Studio development solutions to give your development team powerful ways to:

- Increase productivity and quality through integrated and familiar tools.
- Deploy, secure, and support your critical Web applications and infrastructure.
- Reduce costs through better visibility of your development process.
- Provide better predictability and planning through integrated process and methodology support.

B. SQL Server

Microsoft SQL Server 2005 is comprehensive, integrated data management and analysis software that enables organizations to reliably manage mission-critical information and confidently run today's increasingly complex business applications. SQL Server 2005 allows companies to gain greater insight from their business information and achieve faster results for a competitive advantage. Following are the benefits of SQL Server

- High Availability
- Performance and Scalability
- Security
- Manageability

C. ASP.NET

ASP.NET is more than the next version of Active Server Pages (ASP); it is a unified Web development platform that provides the services necessary for developers to build enterprise-class Web applications. While ASP.NET is largely syntax-compatible with ASP, it also provides a new programming model and infrastructure that enables a powerful new class of applications. You can migrate your existing ASP applications by incrementally adding ASP.NET functionality to them.

ASP.NET is a compiled .NET Framework -based environment. You can author applications in any .NET Framework compatible language, including Visual Basic and Visual C#. Additionally, the entire .NET Framework platform is available to any ASP.NET application. Developers can easily access the benefits of the .NET Framework, which include a fully managed, protected, and feature-rich application execution environment, simplified development and deployment, and seamless integration with a wide variety of languages.

D. VB.Net for Administrator Server

Visual Basic is a programming language that is designed especially for windows programming. It will explain most of the tools available for implementing GUI based programs. After introducing the basic facilities and tools provided by Visual Basic, we apply our knowledge to implementing a small VB program. Our program will implement a visual interface for a commonly know "stack" abstract data type.

VB.NET is still the only language in VS.NET that includes background compilation, which means that it can flag errors immediately, while you type. VB.NET is the only .NET language that supports late binding. In the VS.NET IDE, VB.NET provides a dropdown list at the top of the code window with all the objects and events; the IDE does not provide this functionality for any other language. VB.NET is also unique for providing default values for optional parameters, and for having a collection of the controls available to the developer.

VIII. CONCLUSION

In existing system there was a pass type ticketing which was fixed for same source and destination and It was of two type monthly and quarterly. The passenger has to visit the bus depot to renew his/her account and NFC tag was used and data was entered to that card and it was scanned in each travel from source to destination and it expires at the end of month or quarter as per account type, but proposed system is quite flexible that is it has to renew as per user's need and source and destination is also flexible, as per the journey cost the amount is deducted from passengers account so it is easy , fast and less cash handling process. So the existing system is not user friendly. In that either customer can board the bus and then take the ticket or he can use pass for monthly and quarterly for fixed source and destination. Sometime change issue also gets created. Passenger and conductor both don't have change for ticket amount which creates issue.

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REFERENCES

- [1] Near Field Communication: ECMA International Standardizing Information and Communication Systems.
- [2] R. Das, "NFC-enabled phones and contactless smart cards 2008 2018," *Card Technology Today*, vol. 20, Jul./Aug. 2008, pp. 11-13.
- [3] NFC in Public Transport -January 2011 <http://www.nfc-forum.org> Transport Infrastructure| Fourth International Workshop with Focus on Near Field Communication 978-0-7695-4678-0/12 \$26.00 © 2012 IEEE DOI 10.1109/NFC.2012.1413 2012 4th International Workshop on NFC
- [4] RFID-based ticketing for public transport system: Perspective megacity Dhaka
- [5] <http://developer.android.com/index.html>
- [6] N. F. Inc, —Nfc in public transport. January 2011, last visited on January 19th 2012. [Online]. Available: [http://www.nfc-forum.org/resources/white_papers/NFC in Public ransport.pdf](http://www.nfc-forum.org/resources/white_papers/NFC_in_Public_ransport.pdf)