International Journal of Technical Research and Applications e-ISSN: 2320-8163,
www.ijtra.com Special Issue 39 (KCCEMSR) (March 2016), PP. 94-98

INNOVATIVE RAILWAY TICKETING USING NEAR FIELD COMMUNICATION (NFC) TECHNOLOGY

[1]Anam A. Qureshi, [2]Bhagyashree A. Chaudhari, [3]Pooja M. Shet, [4]Rahul Sharma
[1,2,3,4] B.E. Students
Department of Electronics & Telecommunication Engineering,
K.C. College of Engineering & Management Studies & Research,
Kopri,Thane(E)-400 603, India.
anamqureshi93@gmail.com; bhagyashree.extc@gmail.com; poojashet24@gmail.com ;
rhlfb999@gmail.com

Abstract—In today's area of information technology everyone tries to find convenient way to make their jobs as easier as possible without any workload. Everyone knows about the condition of Indian Railway system, travelling via railway is one of the most tedious thing. So we try to develop such a system which will reduce workload of Ticket checker as well as passenger. 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.

Keywords—NFC; Applications; Transactions (ATM, Shopping, Ticketing); Business; Security; Application Development; Survey

I. INTRODUCTION

NFC (Near Field Communication) is a standards-based, short-range wireless connectivity technology that enables simple and intuitive two-way interactions between electronic devices. With NFC technology, consumers can perform contactless transactions, access digital content and connect NFC-enabled devices with a single touch. NFC simplifies setup of some longer-range wireless technologies, such as Bluetooth and Wi-Fi. It is also compatible with the global contactless standards (ISO 14443 and/or ISO 18092), which means transport agencies that have already deployed contactless programs enjoy a built-in advantage, as their equipment may readily interact with NFC enabled mobile devices and provide richer services.

The following chart shows how NFC compares in range and speed with other wireless technologies that can be used in a mobile phone. Communication occurs when two NFC-compatible devices are brought within about four centimeters of each other. By design, NFC requires close proximity and it offers instant connectivity, which provides an intuitive consumer experience that can be readily applied to the transit environment.

Nowadays, technology has been invisibly embedded into daily objects and they are becoming more and more ubiquitous. The increasing mobility of computing devices provided by mobile communications becomes an important step in the development of ubiquitous computing. Currently a new way of interaction approach by NFC technology, which is 'touching paradigm', has been in question. This interaction can be identified as "the deliberate bringing together of two devices, for the purpose of obtaining services". NFC as one of the enablers for ubiquitous computing is a "combination of contactless identification and interconnection technologies" which requires bringing two NFC compatible devices close to each other, essentially touching them. In accordance with, user first interacts with a smart object (either an NFC tag, NFC reader, or another NFC enabled mobile phone) using her NFC enabled mobile phone (in short: NFC mobile). After touching occurs, NFC mobile may further make use of received data, or may alternatively use provided mobile services such as opening a web page, making a web service connection etc.

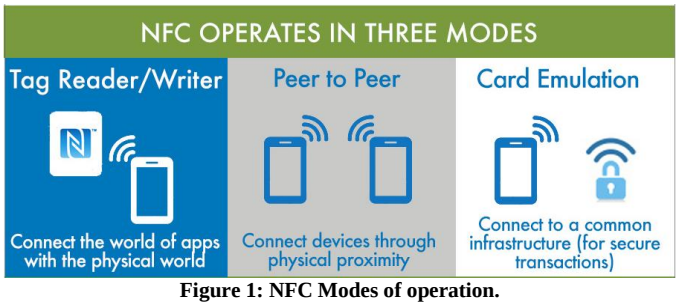

Figure 1: NFC Modes of operation.

II. APPLICATION SCENARIO FOR NFC

There are several short range communication technologies such as RFID, Bluetooth, Bluetooth ULP (Ultra low power, known also as a Wibree, Zigbee and IrDA which provide flexible communication for several applications depending on which kind of communication is required. From these technologies, RFID is one of the promising technologies to be used with a human operator.

	WiFi	ZigBee (802.15.4)	Bluetooth	NFC
Network topology	Star	Mesh	Point-to-point	Point-to-point
Range	30-100 m	10-20 m	10 m	< 0.1 m
Discovery	Broadcast	Broadcast	Broadcast	Response to field
Power	High	Low	Classic: Mid LE/Smart: Low	Tag: Zero Reader: Very low
Privacy	Low	Mid	Mid	High

Figure 2: Comparison of NFC Technology with other technologies.

The benefits of NFC technology for industrial applications can be listed as follows:

- NFC enables intuitive, easy-to-use touch-based communication and interaction between two devices.
- Communication set-up latency with NFC is typically some hundreds of milliseconds, whereas with Bluetooth it is typically several seconds.
- In wireless sensor applications, NFC enables longer lifetime of the sensor battery, or even battery less implementation of the sensor.

NFC Ticketing

III. NFC TECHNOLOGY:

NFC is Near Field Communication technology. NFC is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into proximity, usually no more than a few centimeters. Operating frequency of NFC is 13.56 MHz and it is able to transfer 106 kbits/sec to 424 kbits/sec. With this technology we developed a NFC Application.

IV. PROPOSED SYSTEM

The proposed architecture helps in understanding how NFC technology is used for enhancement in the Railway ticketing system.

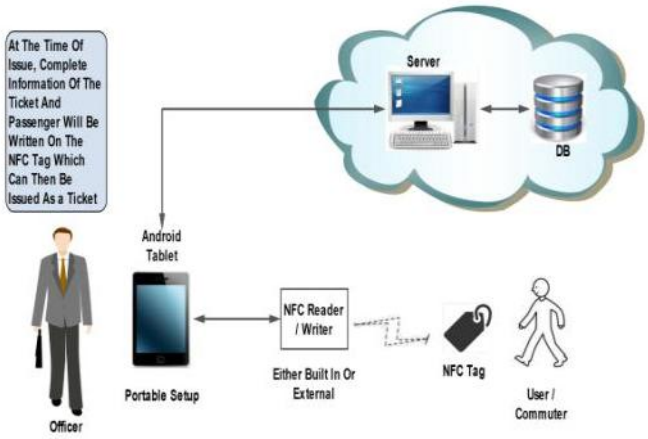

Figure 3: Proposed NFC architecture.

The component of the following architecture are: NFC Tag, NFC Reader, ATMEGA328, TTL to USB Converter, PC/Laptop.

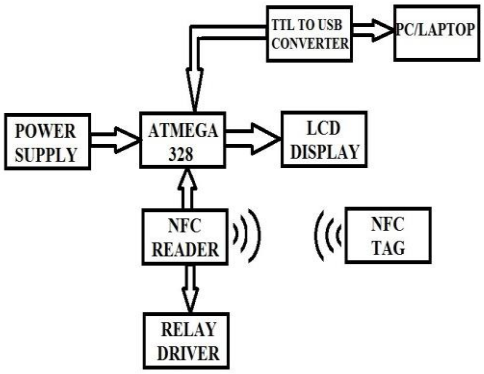

Figure 4: NFC Block Diagram.

NFC Reader:

Figure 5: NFC Reader.

NFC reader is a PC-linked contactless smartcard reader/writer developed based on the 13.56 MHz contactless RFID technology. It supports only MIFARE & ISO14443 A & B cards.
With an access speed of up to 424 Kbps & full USB speed of up to 12 Mbps this can also read and write more quickly & efficiently. The proximity operating distance of the reader is up to 5 cm, depending upon the type of NFC Tag used.

NFC Tag:

Figure 6: NFC Tag.

NFC Tags are passive data stores which can be read, and under some circumstances returned to, by an NFC device. They typically contain data (as of between 96 & 8192 bytes) & are read only in normal use, but maybe rewritable. Applications include secure personal data storage. (Eg. Debit or Credit card information, Personal Identity Numbers (PIN)). NFC tags can be custom encoded by their manufacturers or use the industry specifications.
There are various types of NFC Tags available. Here we are using MIFARE Classic 1K type of NFC Tag.

V. RESULT

The proposed system comprises of the following:

1) NFC Tags for passengers: This NFC Tag consists of a unique ID number. The NFC tag is also allocated with a station number which is fixed, but it can be altered as required.

2) NFC Readers for Stations/ Ticket checker.

Figure 7: NFC Transmitter/Receiver Module.

- The NFC reader will read the NFC tag, which will contain details like the balance in his/her account, station number allocated to it. After getting the desired details, the details will be displayed on the LCD Display. It can be seen as follows:

Fig 8: Initial message on LCD Display.

- If the passenger has balance, in this case the balance should be above □ 50, there will be a display message as "Happy Journey" on the LCD display, along with the balance in his/her account.

Fig 9: LCD display with "Happy Journey"

- There will be a buzzer for 2 seconds indicating the passenger's entry into the station and also there will be a buzzer for the opening of the gates.
- Now the passenger has entered from station number "0", which can be seen in the LCD display above. Now we will change the station number using the switches provided to us. Here we will set the exiting station as number "7".
- Now while exiting the station, there will be the following message displayed on the LCD:

Fig 10: Station exiting message.

- Here we can see that the station number has changed from "0" to "7".
- Now since the difference between the station number "0" & station number "7" is □ 7, there will be a reduction of □ 7 from the user's balance account.

Along with the reduction in balance, there will be a message displayed as "Thanks, Goodbye". This can be seen as follows:

Fig 11: LCD display with "Thanks, Goodbye".

- The other scenario is that if the passenger does not have balance above □ 50, there would be a message indicating "Balance is less". This can be seen as follows:

Fig 12: Balance less than □ 50.

- In this case, the passenger would have to refill his/her card with sufficient amount. In this case we have set the recharge value as □ 100.
- The recharge can be done by authorized personal only, because it requires a key for activation of recharge option.
- After successfully recharging the account, there will be a message on the LCD display showing "Recharge Mode Successful". This can be seen in the figure below:

Fig 13: Recharge successful message.

- The user/ passenger will now have his/her account refilled with □ 100, so the balance becomes □ 148. This can be seen as shown as follows:

Fig 14: Balance refilled.

- Other than the LCD display, there will be another database stored in the Laptop/PC using TTL to USB converter.
- The database on Laptop/PC consists of the current station number, the unique ID of the NFC tag, the station number of the NFC tag, balance and new balance, along with the image of the passenger/user. This can be seen as follows:

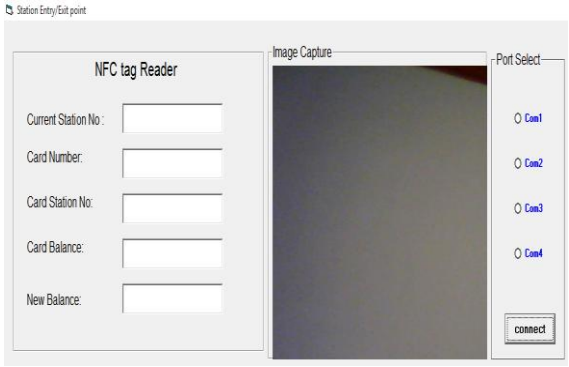

Fig 15: The database as seen on PC/Laptop.

VI. CONCLUSION

Near Field Communication is an emerging technology and it is useful in various real life applications in Banking and Telecommunications industry. Thus, in proposed system we do the comparative study with the existing system. We try to eliminate all the drawbacks of the previous system. With this system all the workload of ticket checker as well as passenger gets reduced. It replaces all paper work with NFC enable smart phone and NFC TAG as ticket. So we try to develop proposed system to improve the condition of railway system and hope this system has bright future.

NFC E-Ticketing is not extensively used in India, but used in countries such as Australia, America etc. will be the most popularly used in the future as they are much more user friendly hope this technology will soon be used in India as well. System is as simple as possible so the layman have to benefit from it .The system is successfully used in developed countries. With more functionality system can be made, throughout the development of the project we learned abundance of new skills (like as a commercial product).

- Mobile phone based ticketing is here to stay.
- NFC enabled mobiles based will make it possible to develop new innovative ticketing solutions.
- It will still take some time until NFC becomes widely adopted.

NFC is one major emerging technology of the last decade. Even though it remains a comparatively newborn technology,

NFC has become an attractive research area for many researchers and practitioners due to its exponential growth and its promising applications and related services. In this survey, we have covered all aspects of NFC and put special stress on the academic and innovative issues.
We have understood the various challenges associated with NFC technology.

VII. REFERENCES

[1] NFC Forum-http://nfc-forum.org/
[2] "Android Suburban Railway Ticketing with GPS as Ticket Checker "2012 IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT).
[3] Ortiz, C. Enrique "An Introduction to Near-Field Communication and the Contactless Communication API", 2008-10-24.
[4] Aziza, H., (2010). NFC Technology in Mobile Phone Next-Generation Services. In Proceedings of the 2nd International Workshop on Near Field Communication, Monaco, pp. 21-26.
[5] Trupti A. Bhosale and B.G.Hogade ,"Near Field Communication Technology", International Journal of Infinite Innovations in Technology, pp.3-6, vol. 1, issue 4 , ISSN:2278-9057.
[6] "Android Suburban Railway Ticketing with GPS as Ticket Checker "2012 IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT).
[7] Ortiz, C. Enrique "An Introduction to Near-Field Communication and the Contactless Communication API", 2008-10-24.
[8] Aziza, H., (2010). NFC Technology in Mobile Phone Next-Generation Services. In Proceedings of the 2nd International Workshop on Near Field Communication, Monaco, pp. 21-26.
[9] Trupti A. Bhosale and B.G.Hogade ,"Near Field Communication Technology", International Journal of Infinite Innovations in Technology, pp.3-6, vol. 1, issue 4 , ISSN:2278-9057.
[10] ―Inside NFC: Usages and Working Principles‖ http://developer.nokia.com/Community/Wiki/Inside_NFC:_Usages_and_Working_Principles.
[7]"The Life-lines of Mumbai" http://www.irfca.org/articles/mumbai-locals.html.
[8] 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 Transport.pdf.
[9] ―Touch & Travel, Deutsche Bahn, retrieved on Oct. 20th, 2011.[Online]. Available: http://www.touchandtravel.de/site/touchandtravel/de/die idee/funktionsweise/funktionsweise.html