

Smart Automated Transport System Using RFID

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Abstract : *This system proposes to establish a real time transportation system with the use of Radio-frequency identification(RFID) by deploying system at junctions of Petrol pump, Toll Booth and for every Traffic policeman. The system is capable of registering each vehicle and each user or owner of vehicle with unique identification number RTO and provides a smartcard to each one of them. The data acquired can be used for the purpose of:*

1. Automated e-challan system
2. To reduce fuel wastage & control air pollution
3. Prevents traffic problems
4. Stop bribery
5. To prevent criminal activities
6. Calculate daily fuel consumption of petrol pumps.
7. Maintain data records of every transaction

Keywords: RFID technology, E-challan system, Tag, Reader, Smart Card, AES

1.INTRODUCTION

India is one of fastest developing nation in the world currently transportation has become Key to this development. The number of vehicles is increasing rapidly due to increase in population. According to survey report only 10809 vehicles was registered in 1985 and 364890 vehicles has been registered in 2015 (government data).[5]

Transport system in India is hence facing many problems like traffic congestion at toll system, due to manually operated environment, vehicle theft, due to no unique identification, air pollution and wastage of fuel, due to waiting of vehicles at petrol pump or toll booth or bribery by the police man and so many. There is need to overcome this entire problem as well as improve the transportation system. Our proposed system hence uses radio frequency identification RFID technology which not only overcome above mentioned problem but

also provide various other applications. The system will be established by providing RFID reader at toll booth petrol pump and traffic policeman and also the RFID tag smart card will be provided to the person who drive the car or owns the car and is of above 18 + years age. Every existing toll, petrol pumps and traffic policeman will be registered and verified at the RTO and also each smart card owner has to register himself at the RTO with all the valid documents required at every toll booth the vehicle driver has to get his Smart Card read using the Reader at toll system, once card is been read the

amount and toll will be deducted from account of the person whose card has been read and the challan will be generated electronically and the message will be sent to the vehicle owner driver and the toll system. This helps to reduce the time fuel wastage and air pollution. The petrol pump will be automated so the petrol pump will read the card of the vehicle driver and will generate bill and deduct required amount from vehicle driver account thereby sending him a text message. It will help to calculate daily fuel consumption in form of charts. The traffic policeman also reads the smart card if the vehicle driver breaks any rule or does any crime, automatically receipt will be generated and the amount deducted will be sent to that particular account.

The aim of this paper is to develop a system with high security and trustful authentication scheme which can protect against most of well-known RFID system attacks. Thus a mutual authentication based on AES primitives and challenge – response method is proposed. The symmetric block cipher AES-128 is utilized in this proposal because it has been standardized and proved to be secure[11].

2.EXISTING SYSTEM

1. Some researchers presents an encoding and decoding of Picode and innovative e-challan application for traffic violators using mobile

payment system based on Picode for mobile users to improve mobile user experience in for e-challan application. strain gauge load cell to determine the vehicles weight and accordingly defining the vehicles type. The load cell has been interfaced with Arduino Mega 2560 which will determine the toll tax of vehicles. The smart card reader ACR122U NFC reader has also been interfaced with Arduino Mega 2560 to debit the appropriate toll tax for specific vehicle type.[1]

2. Developed a concept for implementing the use of strain gauge load cell to determine the vehicles weight and accordingly defining the vehicles type. The load cell has been interfaced with Arduino Mega 2560 which will determine the toll tax of vehicles. The smart card reader ACR122U NFC reader has also been interfaced with Arduino Mega 2560 to debit the appropriate toll tax for specific vehicle type.[5]

3. MOTIVATION

The main motivation is to overcome the problem related to transportation like reduction in traffic jams, reduce fuel wastage & hence control air pollution, reduce health diseases caused due to fuel emission, vehicle theft control, etc. It also aims at implementing e-challan system & RFID for unique identification of authorized user (+18 age).

4. REVIEW OF LITERATURE

1.The author represents e-challan application, design and implementation of proposed mobile and Picode based security solution. Reading Picode requires scanner. It also represents method that can read Picode using the mobile phones can be used in future.[3]

2. The author represents an approach to establish a real-time traffic management system with use of Radio-

frequency identification by deploying suitable hardware at every possible junction throughout Delhi. The hardware can track each registered vehicle in Delhi crossing the junctions, which contain RFID tag.[2]

3. The author proposes an intelligent traffic management system using image processing along with the smart traffic control algorithm. Traffic recognition was achieved using cascade classifier for vehicle recognition utilizing Open CV and Visual Studio C/C++.[7]

4. The paper outlines the novel approach illustrating an electronic toll collection(ETC) system while will accomplish the goal of contactless toll payment and cutting edge surveillance system making this system more reliable. RFID based smart card has been used for self-payment service.[5]

5. SYSTEM OVERVIEW

The proposed transportation system is used as a technology for fast & efficient collection of charges at toll booths, traffic police & petrol pumps thereby identifying each user as the unique registered user. It comprises of three main components i.e. RFID, Contactless smart card and ACR122U NFC reader. [Figure 1]

1. Radio Frequency Identification (RFID)

RFID is an automatic identification method that transmits radiofrequencies between the RFID reader and tags. The RFID system consists of an antenna, transceiver and a transponder. The antenna transmits radio frequency waves to trigger the transponder or tag and the transponder transmits the retrieved data back to the antenna. In recent years RFID has been in the top fields of research works both in the transportation technology [Ministry of Electronics & Information Technology, India] and health care industry [UWRFID Lab]. Due to its nature of accurate identification it is widely used in vehicle tracking, the system and also for users identification purpose. Barcode systems of object identification are now replaced by RFID because it usually has scanning problem, easy damaging of level and cost of equipment. RFID tag does not require direct contact and can work from a longer distance accurately. Basically there are two types of RFID firstly the active RFID tag and secondly the passive RFID tag. Active RFID tag [8] has its own transmitter and battery installed in it. The main feature of an active RFID tag is it has longer worker range and last for usually5-7 years of time. It usually works in ultra-high frequency (UHF)

radio bands. It can work in low signal strength. Its cost is about 50-100\$ [Alibaba.com]. The high price of the active RFID tags and the cost of maintenance has lessened its popularity in the automobile world. Passive RFID tag [9] does not have its own battery rather it derives its power from radio frequency waves. This makes it very cost effective. It usually works in low frequency (LF), high frequency (HF), ultra high frequency (UHF) radio bands. Passive RFID has a life of about 10 years or more. Its cost is about 1-5\$ [Alibaba.com].

2. Contactless Smart card

Contactless Smart card comprises of an internal memory, passive RFID tag and an antenna that transmits the data to the reader by contactless radio frequency interface. With the use of passive RFID tag [9] based smart card data can easily be read by the appropriate RF reader from a short distance and enhancing secure, faster and contactless transaction. When this tag comes in the range of the reader it is powered by the reader's magnetic

field and transmits its data to the reader. Prepaid smart card is used in this system. When the driver of the vehicle crossing the toll plaza slows the car and waves it in front of the RF reader from the distance

of approximately 9 cm it automatically charges the user with the appropriate toll tax. The use of smart card benefits the user with digital cash [9] facility and eliminating the process of carrying cash.

3. ACR122U NFC reader

ACR122U NFC reader [10] is a contactless smart card reader which is based on RFID technology. Its high speed potentiality of up to 12Mbps and high secured encrypted protocols makes this reader one of the best choices in the transportation industry. Its uses are very popular in e-ticketing, payment and toll collection in toll plaza. The card reader has been fixed beside the toll gate where the car crossing the toll plaza stops and access smart card reader with their smart card for debit transaction of the toll tax.

SYSTEM ARCHITECTURE

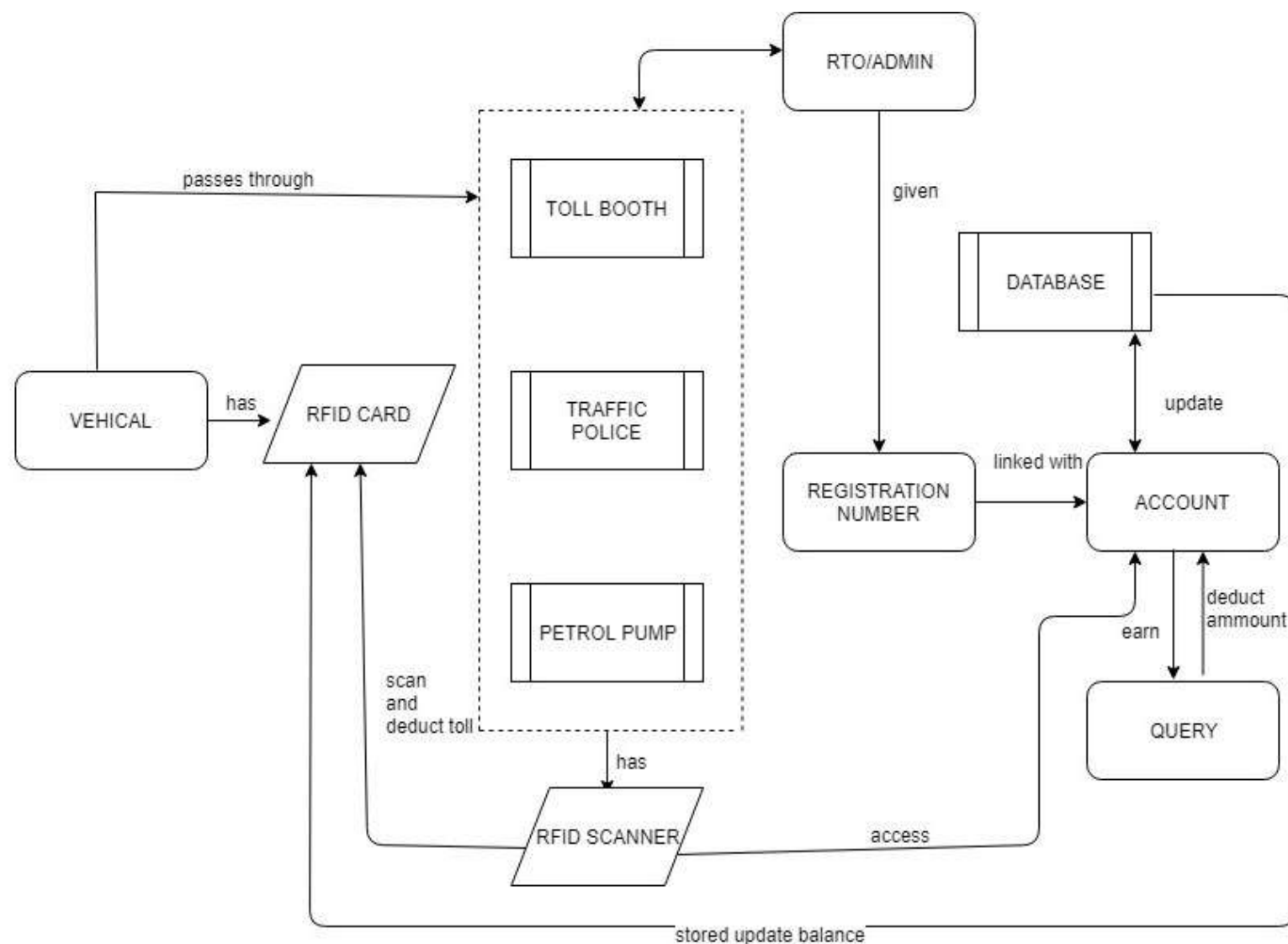


Figure 1: System Architecture

6. THE PROPOSED PROTOCOL

A. Assumptions

- A tag has the AES-128 encrypting block on-board proposed in [26].
- A reader and database server can perform AES-128 encryption and decryption.
- The channel between the reader and tag, the reader and backend database are vulnerable.

B. Initialisation phase

C. Authentication phase

The authentication phase is illustrated in Figure 2.

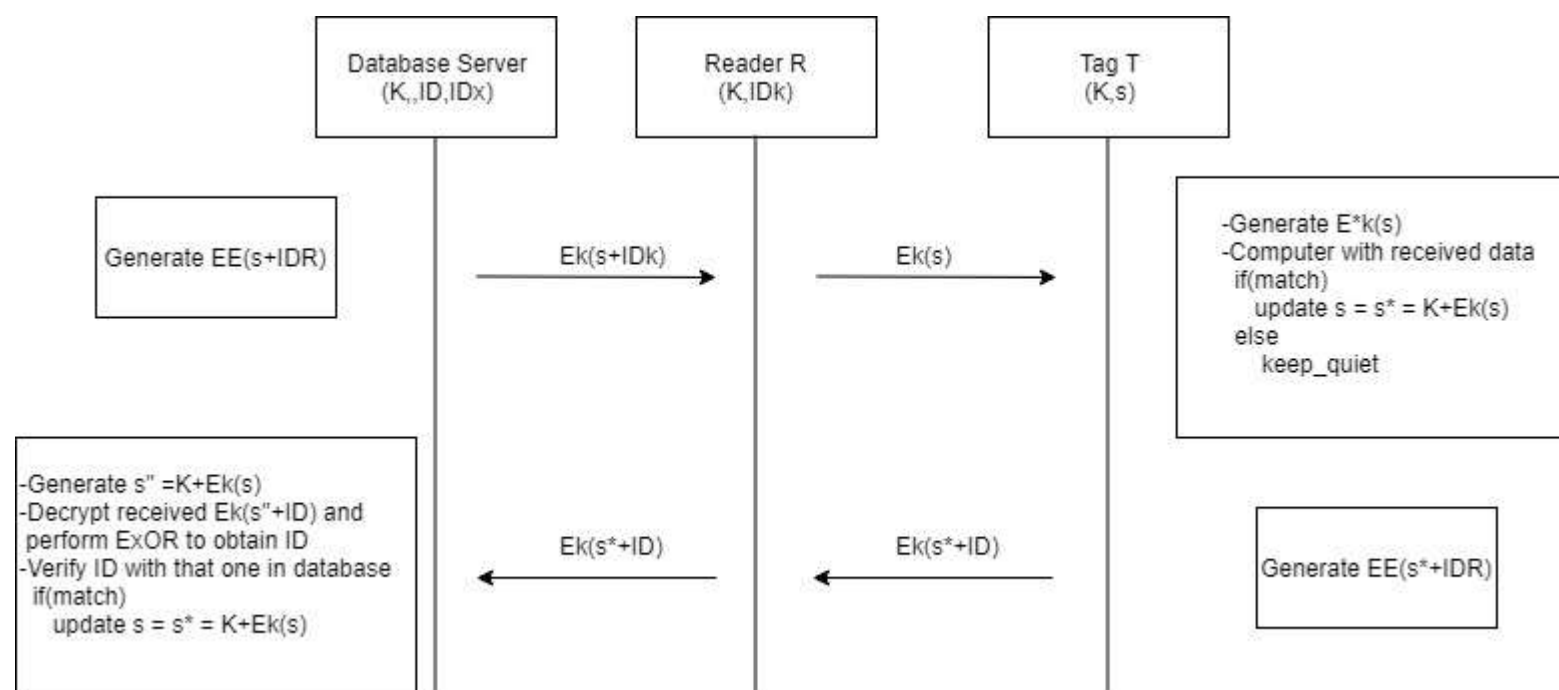


Figure 2: The proposed protocol

Step 1: Query

Initially, the server generates $EK(s+IDR)$ and sends to the reader. The reader will decrypt this value to obtain the seed s by performing $s=IDR(IDRs)$. Afterward, reader encrypts the seed s and 1: Query Initially, the server generates $EK(s+IDR)$ and sends to the reader. The reader will decrypt this value to obtain the seed s by performing $s=IDR(IDRs)$. Afterward, reader encrypts the seed s and forward to the queried tag.

Step2: Reader-to-Tag authentication

On receiving $EK(s)$, the tag employs the on-board AES encrypting block to produce its own

$E*K(s)$ and then check whether $E*K(s)=EK(s)$ holds. If not, the tag keeps quiet. On the contrary, tag updates the seed s by $s*=K+EK(s)$ and again performs AES encrypting block to compute $EK(s*ID)$ in order to convey to the reader.

Step 3: Tag-to-Reader authentication

Upon obtaining $EK(s*ID)$, the reader will pass it to the backend database to decrypt it. The decrypted value $s*ID$ is used to extract the tag's ID by carrying out the simple operation $ID = K EK(s (s* ID))$. Then this ID is verified by comparing with the ID existing in database to check whether this tag is legally acceptable or not. If the mismatch occurs, the server discards any data it has received and declines the authentication of the tag. Oppositely, the server updates the seed value of reader by $s*=K EK(s)$ to guarantee the synchronization of the system.

7.CONCLUSION

Presents a Automated System for transportation using RFID for identification. It consists of RFID, Contactless Smart Card and ACR122U NFC Reader. Also the proposed protocol in this paper is a mutual authentication protocol which utilizes AES-128 as primitive to encrypt the credentials transmitted . With the Cipher block, the protocol can protect against many types of attacks such as information leakage, tag tracking, etc. In addition, the secure keys stored in tag and server are always updated in each authentication session , it is impossible for attackers to play the replay attack or trace back the previous data.

8.REFERENCES

- [1] Rohini S. Dubey and Prof. K.V. Warker “An effective approach for e-challan for Traffic Violator using Picode”, ICICCS 2017
- [2] Antriksh Saini, Shivam Chandok and Pankaj Deshwal “ Advancement of traffic Management System using RFID” , ICICCS 2017
- [3] Changshen CheN, Member, IEEE, Wenjian Huang, Baojian Zhou, Student Member, IEEE, Chenchen Liu, And Wai Ho Mow, Senior Member, IEEE “Picode : A New Picture-embedding 2D Barcode, IEEE transactions on image processing, vol.25, no.8, August 2016
- [4] A. Selamat, “Location-Based System for Mobile Devices Using RFID”:In Modelling & Simulation Second Asia International Conference in AICMS 08, (2008)
- [5] Shubhankar Chatteraj, Karan Vishwakarma, Saptarshi Bhowmik and Parami Roy “ Design and Implementation of Low Cost Toll Collection System In India”, [978-1-5090-3239-6/17/\\$31.00@2017IEEE](https://doi.org/10.1109/IC3EAT.2017.7978171)
- [6] Sahana S. Rao , PG Student , V. Siddeshwara Prasad “ Centralized Automation of Petrol Bunk Management and Safety using RFID and GSM Technology”, 2017
- [7] Ithisham Ali, Arsalan Malik & Waqas Ahmed and Sheraz Ali Kan “ Real-time Vehicle Recognition and Improved Traffic Congestion Resolution” 2105 13th International Conference on Frontiers of Information Technology
- [8]Raed Abdulla , “ A Conceptual Study of Long Range Active RFID System for Reliable Communication” Frontiers Of Communications, Networks and Applications , (ICFCNA 2014-Malaysia)
- [9] Kashif Ali, Hossam Hassanein “ Passive RFID for Intelligent Transportation Systems” : 2009 6th IEEE Consumer Communications and Networking Conference
- [10] [ONLINE] <http://www.acs.com,hk/en/products/3/acr122u-usb-nfc-reader/>
- [11] [ONLINE] <http://cscr.nist.gov/publications/fips/fips197/fips-197.pdf>