



Centralized Web Application Supporting Vehicle Toll Payment System

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ABSTRACT

The requirements for new web applications supporting different types of devices and purposes are continuously growing. The main advantages of web application development as well as popular development features covering integration with different technologies are considered initially in this paper. Integration and possibilities of web applications in real scenarios with different embedded Internet of Things (IoT) devices are considered and described in this paper. The design and implementation of web application supporting vehicle toll payment system using IoT device is presented and described. The development framework as well as featured and popular technologies used to realize a vehicle toll payment by IoT device are described. The concept of vehicle toll payment over an online payment system is also described. Processing, monitoring and control in the web application of such payments using IoT devices are described and presented.

Keywords : *NFC (Near Field Communication), RFID (Radio frequency Identifier), ETC (Electronic Toll Collection).*

I. INTRODUCTION

The use of WEB applications in the business environment has become the standard. Main reasons are ease of maintenance as well as version release as it's made only on the central server without the need for access to a user's computer. In addition, WEB oriented applications are available over the Internet for use in any location and on any kind of small or resource constrained device. Such web applications

can be integrated with different other applications, control and management services, and other applications as well, to realize management, monitoring reporting, etc. Usage of WEB based applications is operation system independent which means that usage of this system has the advantage of hosting a specific web application. From the web application and IoT world perspective, all web applications development and hosting, depending on the security requirements of the web application and the IoT application domain. In case of a web application, security is on a high level because of the access to a single central server, rather than using large amounts of workstations. Moving web applications and corresponding services to the web server gives more reliability and scalability to the whole system, while simultaneously allowing management and administration from one location.

Electronic toll collection (ETC), otherwise called electronic instalment and estimating framework, is one of the significant exploration subjects in wise transportation framework. And so on is an execution of a street estimating idea with a specific end goal to make advantages, for example, decreasing toll paying time, upgrading the comfort and security of explorers, and minimizing air contamination and fuel utilization? As we know normal toll collection takes a lot of time and there is also traffic jams and won't get the transparency in toll amount collection. For this firstly the introduction to RFID was done. RFID is abbreviation of Radio Frequency Identifier which plays vital role in electronic toll collection. RFID is also used for tracing of the vehicles. The drawback of

RFID is that it doesn't work properly in the cloudy and unconditional climate. So, to overcome from this drawback we introduced NFC i.e. Near Field Communication. NFC's full-form itself tells that it is a communication protocol that works within 10cm area (near field) for data transfer

A system is an orderly group of interdependent components linked together according to a plan to achieve a specific objective. Its main characteristics are organization, interaction, interdependence, integration and a central objective. System analysis and design are the application of the system approach to problem solving generally using computers. To reconstruct a system the analyst must consider its elements output and inputs, processors, controls feedback and environment.

Analysis is a detailed study of the various operations performed by a system and their relationships within and outside of the system. One aspect of analysis is defining the boundaries of the system and determining whether or not a candidate system should consider other related systems. During analysis data are collected on the available files decision points and transactions handled by the present system. This involves gathering information and using structured tools for analysis.

The main objective of the system is to present an efficient, secure & cost effective Toll Payment system using NFC Technique with Centralized web server application.

II. Existing System

In the existing system, According to the manual toll collection methodology, a driver has to stop at a charging booth and pay the required fee directly to a collector. The amount to be paid by each vehicle is determined by its characteristics or classification. In the manual toll payment system time consuming and many mischievous things may happen by manpower Fastag is yet another system used in tollgate which operated as an electronic toll collection system in India, operated by the National Highway Authority of India (NHAI). It employs Radio Frequency Identification (RFID) technology for making toll payments directly from the prepaid or savings account linked to it.

Disadvantages of Existing System

- i. The cost of collecting cash from hundreds of fare collection locations around a city is huge.

- ii. It requires security to take care of whole system.
- iii. lot of manpower is expended counting coins and reconciling trips with the amount collected.

III. PROPOSED SYSTEM

We propose a concept, design and implementation of a web application used for vehicle toll payment. The design and implementation model implies usage of an IoT device which initiates vehicle toll payments request calling web application's web service functions. Further, the web application realizes the user (driver) desired toll payment over an electronic payment system. The web application itself is developed to be hosted on a server directly or on a virtual machine using virtualization technology on the physical server.

This project deals with the simplification of procedure followed by passengers to pay toll at toll collection booths, like making it automated, vehicle theft detection etc. All these activities are carried out using single smart card (NFC tag), thus saving the efforts of carrying money and records manually .

Electronic Toll Collection: The NFC Readers mounted at toll booth will read the prepaid NFC tags fixed on users vehicles' windshield and it read the nfc card through nfc reader or smart phones and amount will be deducted automatically respective amount for particular vehicle, user can recharge their card when insufficient balance is found in the card.

ADVANTAGE OF THE PROPOSED SYSTEM

- i. Reduction in fare-collection costs this is the big reason that transit authorities worldwide are introducing NFC payment systems.
- ii. The cost of collecting cash from hundreds of fare-collection locations around a city is huge.
- iii. This system doesn't requires security person to guard the toll gate.
- iv. This system doesn't need lot of manpower is expended counting coins and reconciling trips with the amount collected. The cost of this in many cities is, in fact, greater than the amount of money collected from fares. NFC eliminates virtually all of this expense.

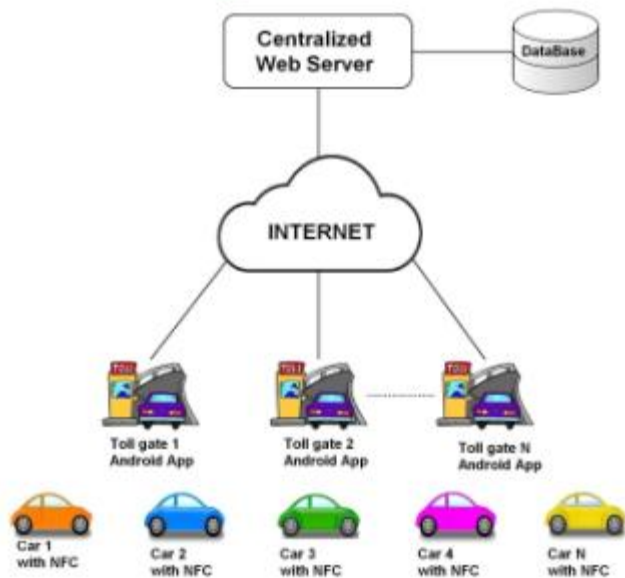
Advantages of proposed system over fast tag using RFID

- i. Fewer or shorter queues of vehicles at toll plazas by increasing toll plaza service turn around rates.
- ii. Fast tag doesn't work properly in cloudy & unconditional climate.
- iii. RFID System consumes more power when compared to NFC
- iv. RFID is one way communication where NFC is two way communication (peer to peer)
- v. Data transmission speed is comparatively less than NFC ie, 424kbps in NFC where in RFID has 212kbps.
- vi. Privacy concern arises in RFID.

successfully. Tollgate person can able to see the tollgate collection details.

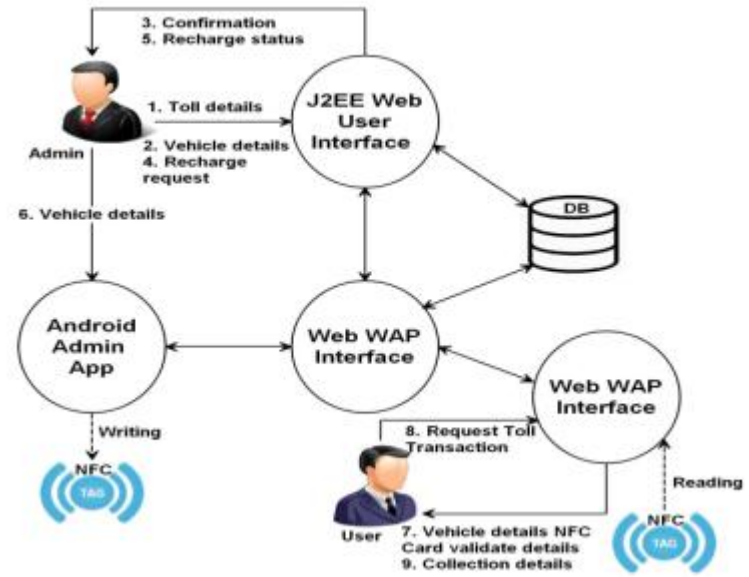
IV. SYSTEM ARCHITECTURE

System Architecture



The Web Server application is running on web server where the centralized database is stored. Through another server application android user going to get all the information about vehicle and tollgate information. In Web Admin application admin going to add all the tollgate details and vehicle details ,admin going to recharge balance for vehicle cards. In Android application user has to login with particular tollgate user_id and password ,if user_id and password is valid ,user has tap the nfc card, after tapping card android application going to communicate with web server application to validate card id and balance details, if card is valid and balance is sufficient ,toll payment will be done

Context Analysis Diagram



V. DESIGN METHODLOGY

1. Web server module

In this web server application all the toll details and vehicle details will be maintained. Vehicle details will be maintained.

2. Writing data into Card (Tag)

NFC builds upon Radio-frequency identification (RFID) systems by allowing two-way communication between endpoints, where earlier systems such as contactless smart cards were one-way only .Since unpowered NFC tags can also be read by NFC devices, it is also capable of replacing earlier one-way applications. In this module the User details like NFC Card no., Vehicle No, Date of Registration, Vehicle Type, Vehicle Model and Card Expiry Date will be encrypted using Encryption key and dumped into the nfc tag, before dumping into the card first data is Declare an Intent Filter to announce to the system that it's enabled to work on NFC. Have a method that Android will call when NFC is detected. Create a method to build a NDEF message. Create a method to write the NDEF (NFC Data Exchange Format) message.

3. Reading data from Tag

When the vehicle owner taps the card to android toll application, first encrypted data is converted into original data with key and reading NDEF data from an NFC tag with language convention English.

4. Toll management System with Recharge Module

When the vehicle owner taps the card to android toll application, first encrypted data is converted into original data with key .All card details will be displayed. card number, vehicle detail and tollgate details will be send to web server, Web Server Receives the Card No and fetch the Vehicle Record and its Balance , if Card no is miss match then stop Fetch the Fare details from Toll Gate table Based on Vehicle type fetch the amount from toll fare details If insufficient balance and stop the process to be continued. After successful payment update in vehicle record. Send Transaction Success Message to Android App.

VI. OUTCOME OF PROPOSED SYSTEM

Whenever the matter of Integration of systems comes to mind, we think of a system having the following important features viz.

Accuracy: All the functionally bonded logical dependencies must be integrated.

Efficiency: The whole system should work under all circumstances and on a long run it should work efficiently irrespective of their proprietary format.

Cost Effectiveness: As our software do not require any special software for implementation hence is less costly as compared to other existing system.

Any Prerequisite for the use: As the existing systems are not altered, and integration is done at the background hence there is no need for any training.

CONCLUSION AND FUTURE SCOPE

The Integration and possibilities of application of Centralized web applications in real scenarios of vehicle toll payment system with embedded Internet of Things (IOT) devices can be achieved. Hand to hand payment can be dropped by designing the online payment system in Vehicle toll payment system. Maintenance and processing the Vehicle Toll Payment application is very user-friendly and cost will be efficient.

Application:

The Vehicle Toll Payment System can be used in existing vehicle toll payment system.

In Future It may applicable in field of Vehicle parking payment, Garage payment or any transaction involving some of IoT devices that can communicate with the aforementioned Web centric central system.

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