

# M-Toll using Wi-Fi Technology - A Survey

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**Abstract**—The existing toll collection system all over India is operated manually. A toll system where toll is paid for passage of a vehicle from the toll plaza. In the existing toll tax system, we observe disadvantages like mismanagement of time, long queue for the payment. The aim of the project is to implement toll collection system using Wi-Fi technology to overcome demerits of existing toll system. A mobile wallet promises a future where users do not need to carry hard cash while travelling. Wi-Fi toll collection stations allow the traffic to flow continuously, and stopping and starting vehicle again. It reduces fuel consumption and has positive effect on environment. By using M-toll payment system it leads to automatic and easy toll payment. The Android phone need to be included in each vehicle and details of vehicle owner must be stored in the database of toll tax system. Wi-Fi technology will develop the existing payment system used in toll collection.

**Key words:** Android Application, Wi-Fi Technology, M-Toll, ETC

## I. INTRODUCTION

In India toll collection is done manually. In order to avoid the limitations of the existing system we have proposed an idea of making the toll collection with the use of Wi-Fi and Android technology.

M-Toll using Wi-fi is a technology enabling the electronic collection of toll payments. It has been studied by researchers and applied at various toll booths. This system is capable of determining whether the vehicle is registered or not, and then informing the authorities for any toll payment violations, debits, and participating accounts. The most important advantage of this technology is to avoid long queues at tollbooths, which causes traffic. It is also a method by which we can provide a solution for complaints from motorists regarding the inconveniences involved in the existing toll collection system. Other than this advantage, M-Toll could also benefit the toll operators.

In the paper [1] the concept and technologies for the Wild Card, a programmable universal payment card is proposed. In the paper [2] toll tax system is briefly explained and the base of highway projects i.e. PPP (Public Private Partnership) is studied. In the paper [3] the application of ETC system on toll gates and how to use GUI for collection of toll, the real time management and monitoring is studied. In the paper [4] implementation of Bluetooth technology in the application of toll tax system is studied. In the paper [5] the study on various types of ETC systems applied in some countries and passive RFID technology is done. The paper [6] is based on the Electronic Toll Collection and Radio Frequency Identification Technology (RFIT).

The remainder of the paper is organized as follows. In section 2, we have discussed about the working of various systems. Different Technologies are described in Section 3 and in section 4 we have concluded the topic.

## II. WORKING

### A. Working of Wild Card

The Wild Card interacts with a mobile phone to receive both data and energy through NFC. To make the Wild Card programmable, a magnetic stripe emulator is designed that can be driven by a microcontroller to produce the magnetic field that is expected by card readers. A security framework is designed so that the card information is safe and the Wild Card cannot be used to steal other credit card contents. The backward compatibility and security of Wild Card makes it distinct from other mobile payment systems. The evaluation of the Wild Card shows that the card can be swiped up to 100 times with just one charge from the phone. From this paper we got an idea about mobile wallet and their issues. Although NFC has experienced faster growth in recent years, the adoption is still slow compared to the massive payment infrastructure built around conventional magnetic stripe based credit or debit cards [1].

### B. Working of RFID

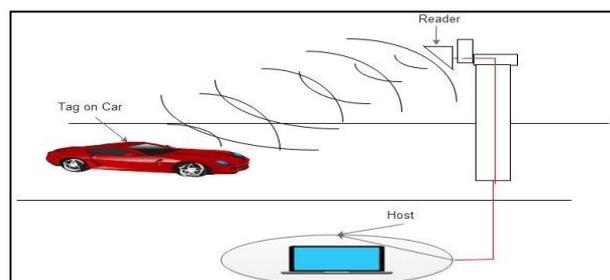


Fig. 1: General Block Diagram

This system focuses and investigates on the use of GUI for collection of toll, the real time management and monitoring is done. It has expanded capacity for vehicle without building big infrastructures. It has improved efficiency and reliability of toll plazas and traffic abilities of Highways. The block diagram below gives an idea about how the structure of toll plaza should look like.

The system produced is microcontroller based system with embedded C coding, and the hardware is interfaced with java base coding. The software's used are netbeans and jdk for hardware, mysql for database and micro C for interfacing microcontroller. The basic advantage of the system is travelling time is decreased, congestion free network, less emissions in toll area and no infrastructure cost is required. This gives a win condition for both toll authorities and toll customers [2].

### C. Working of Bluetooth Approach

Bluetooth toll collection station allows the traffic to flow continuously and vehicle having avoided stopping and starting again. This combination with reduced fuel consumptions has positive effect on environment i.e pollution created will be minimum. Smart cards should be integrated with this technology as these are secured electronic devices that are used for keeping data and other information in a way that only "authorized" users are permitted to see or write the data. Implementing a Bluetooth technology is also not much costly as its price is only \$5 .Man power and cash risks are also reduced to minimum. But the Bluetooth technology is only operated in a very short range area [4].

### D. Working of E-Z Pass System

In this system tags have been used in vehicles to automate the toll process on toll roads, bridges, and tunnels. These tags are mounted to the windshield or externally surrounding the license plate on a vehicle and read as the vehicle proceeds without stopping through special lanes at the toll plaza. As you slowly pass through the E-Z Pass facility, your E-Z Pass tag is read. In an instant, the tag information is read by an over head antenna in the E-Z Pass facility and the proper charge is deducted from your E-Z Pass account. At some facilities, there are gates that will be opened when a valid tag is read. A video enforcement system is in place to identify charge evaders. Each of the participating E-Z Pass toll authorities maintain their own service centers that issue the transponders and maintain the accounts for their local patrons. The centers receive and correlate all of the transactions from the toll plazas it services and adjusts the accounts of the patron, then sending the transaction result back to the plaza within milliseconds. These centers interact when patrons from one center use the toll services of another center [6].

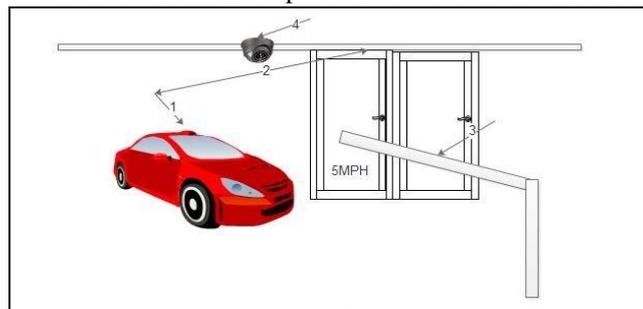


Fig.2: E-Z Pass System

## III. TECHNOLOGY USED

### A. RFID Technology

RFID is a generic term used to identify technologies utilizing radio waves to automatically identify people or objects. The RFID system uses RFID tag and RFID reader which collects information of vehicle passing through the toll plaza and automatically debits the toll amount from prepaid account of vehicle owner, which in return reduces the traffic congestion and human errors. The vehicle owner has to register his vehicle with provided RFID tag, creating a rechargeable account. When the vehicle will pass through toll gate the amount of toll will be reduced automatically from its account. The system produced is microcontroller based system with embedded c coding, and the hardware is interfaced with java coding. The softwares used are netbeans and jdk for hardware, Mysql for database and micro c for interfacing microcontroller. The basic advantage of the system is travelling time is decreased, congestion free network, less emissions in toll area and no infrastructure cost is required. This gives a win condition for both toll authorities and toll customers [2].

### B. Bluetooth Technology

Bluetooth technology operates at a short-range radio frequency (RF) and is capable of transmitting voice and data. The Bluetooth technology encompasses a simple low cost, low-power, global radio system for integration into mobile devices, which can form a quick ad-hoc secure "piconet" and communicate among the connected devices. The bluetooth specifications use frequency-hopping spread-spectrum technology, which entails the transmitter's jumping from one frequency to the next at a specific hopping rate in accordance with a pseudo-random spreading code sequence. Frequency hopping makes the transmission more secure and resistant to noise and fade. In spread spectrum technique used by Bluetooth , the signal is taken apart or "spread" so that it sounds more like noise to the casual listener. Using the same spreading code as the transmitter, the receiver correlates and collapses to the spread signal back down to its original form. Bluetooth requires that a low-cost transceiver chip be included in each device [4].

### C. Wild Card Technology

In this technology the Wild Card interacts with a mobile phone to receive both data and energy through NFC. To make the Wild Card programmable, he designed a magnetic stripe emulator that can be driven by a microcontroller to produce the magnetic field that is expected by card readers. This technology includes a security framework so the card information is safe and the Wild Card cannot be used to steal other credit card contents. The backward compatibility and security of Wild Card makes it distinct from other mobile payment systems [1].

Parameters	Cost	Efficiency	Speed
Technologies			
Wild Card	Less Expensive	Less	Very Fast
RFID	Expensive	More	Moderate
Bluetooth	Cheap	Less	Fast

Table 1: Comparison Technologies used

### IV. CONCLUSION

Wi-Fi toll collection system allows the traffic to flow continuously. This helps in reducing fuel consumption has a positive effect on environment i.e. there will be minimum pollution. Implementing the Wi-Fi technology is also not so costly. The use of man power is reduced to minimum. Also, the cash risks involved in the existing system is minimized. Only a minimum of traffic disruption is caused during installation. The system also increases safety and long queues are avoided. Societies and business communities are also benefited from this system as it provides faster transportation. The system is cost-efficient, time saving and easy to install which benefits the operator as well as user.

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