Advanced Tracking System with Automated Toll

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Abstract:

This paper presents a novel approach to integrate RFID (Radio Frequency IDentification) in WSN (Wireless sensor network). The WSN is used to support RFID identification process by extending the reading range of an RFID system. Besides, with the WSN the environment of an object and optimize RFID reader's performance and energy can be monitored. Subsequently, methodology to integrate RFID technology, with wireless sensor network that form an intelligent vehicle tracking application is implemented. The proposed system can monitor vehicle from monitoring stations as well as toll booth stations, and can inform police whether the vehicle is arriving on particular rout with directed map also the system provides a precise way to repetitively track vehicles using SMS service. The acquired information is displayed via SMS as well as detailed report is generated of tollbooth collection and submitted to its owner via e-mail service displays inside and outside the toll booth and toll will be deducted as per type of vehicle.

Keywords: *RFID, WSN, Integration, Tracking, Toll plaza, Tollbooth, Automated ,Lost.*

I. INTRODUCTION:

Now a days, toll plaza and real time vehicle tracking are major component of Advanced Tracking System (ATS) with Automated Toll The automatic vehicle tracking facility delivers the flexibility, scalability, and responsiveness that today's organizations need. It provides accurate, up-to-minute information, high- speed communication, and powerful analysis features required to make better decisions faster. The major potential comes from the much acclaimed no line of sight and simultaneous reading properties of RFID.It is now widely recognized that real – time vehicle information will revolutionize the control and logistical organization with significant vehicle fleets. In a global marketplace where productivity is crucial to success, vehicle fleet operators use vehicle management systems as a formidable tool to drive down costs and increase the value of their service including the toll plaza collection as well as the hectic job of finding lost vehicles as well as real time tracking. Moreover, transport departments have no visibility over utilization of its fleet on real-time, which results in underutilization of resources. So, all these naturally results in avoidable stress, costly errors and sub cost optimal fleet utilization and finally dissatisfaction and inconvenience to millions of customers. The provision of timely and accurate transactions is so important. New technology can help the administrator to monitor the vehicles routes while increasing the satisfaction of users by reducing cost through efficient operations asset utilization at toll plaza carring fully automated functions. At the end of work hours every day, large number of vehicles throng the local vehicle-stop, forced to wait indefinitely. There are certain vehicles that ply at very low frequencies, and inevitably results in lengthy waiting times for many. When the vehicle arrives, there is an unprecedented rush. In a nutshell, returning from one's workplace/college by public vehicles is a hassled activity.

Dealing with this problem on a daily basis, we have designed and prototyped an RFID-based system that monitors vehicle activities at the monitoring hot spots as well as the toll collection booths which will help in acquiring the accurate location of the vehicles location providing an efficient way for the police department in tracking the vehicles as well as carrying out automated transactions for the related departments including toll fee collection, traffic rules following and a major factor for the RTO department for maintain a safe and efficient database on cloud. An RFID tag is mounted on each vehicle. Each of these tags holds a unique 24-bit ASCII code. For simulation purpose the low range passive tags – 125 kHz operational frequency, 5cm range is utilized. In the full-scale prototype, Gen-2 RFID tags (active) operating at 900 MHz is used.

II. SYSTEM DESIGN:

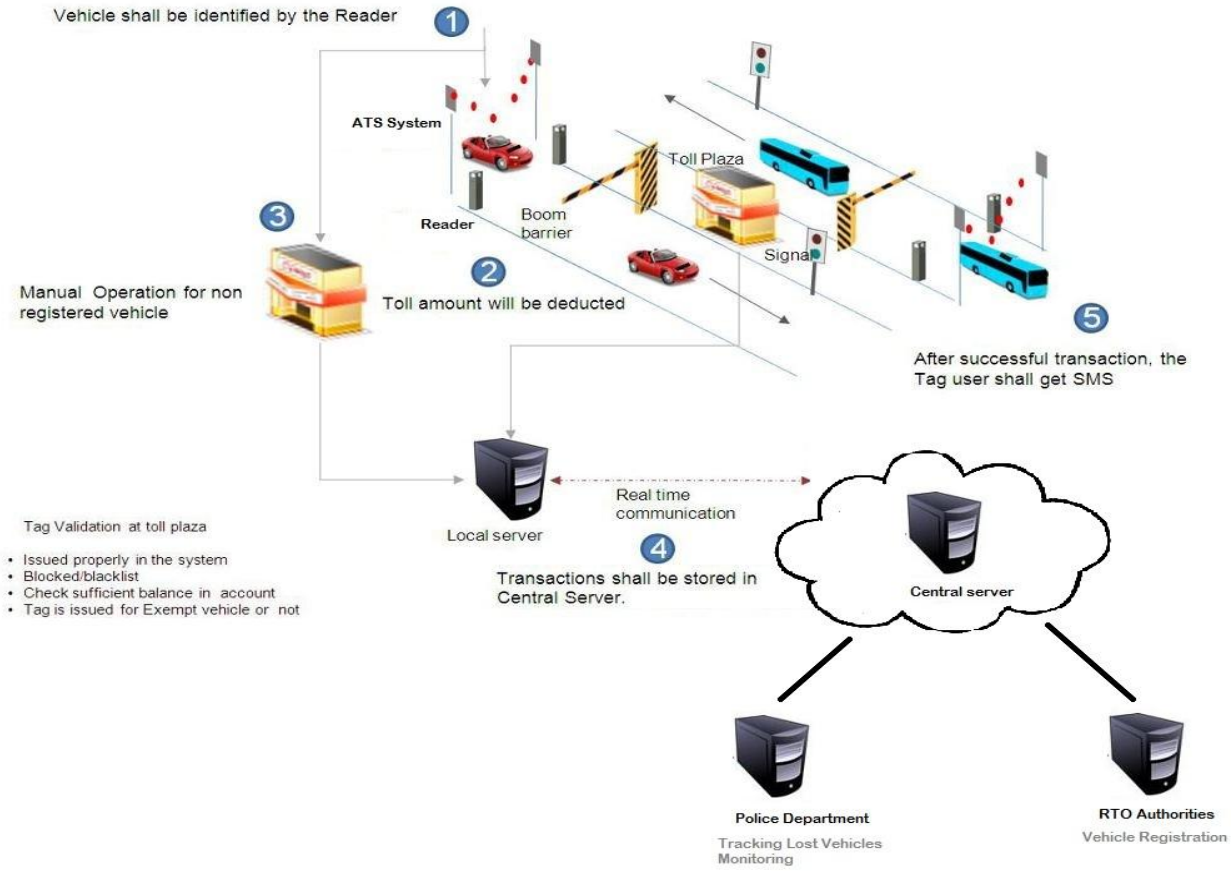

Fig 1: System Design for proposed system

2.1 Client-Server Architecture:

Every toll station shall be equipped with client machine with an RFID reader that can read the tag information once the vehicle comes in proximity. The client machines present at all toll stations shall immediately report to the central server where the database can be updated. The tracker (police) can now fetch vehicle information either using SMS service or a web based application. RFID system is extended with wireless facility to RFID readers. Each RFID tag is equipped with a wireless module which can transmit data to and from the reader. RFID reader acts as sensor node: it reads the identification of an object and performs required processing on it as designed. This provides real-time update as well as automated toll collection of every vehicle at toll station. Hence the hectic and tedious job of manual toll collection and vehicle tracking is now simplified.

2.2 Server Database:

When vehicle comes at toll station RFID Reader, reads the Tag number and processes the information such as Tag ID,vehicle ID, name of owner ,etc. into the database.

The main task of server database is to fetch the information associated with the RFID tag when the vehicle arrives in proximity and update the information. This information is now synced on the database on cloud. The main server database will calculate all the credentials for toll deduction of the vehicle at its location. The calculation of credentials of the vehicle is calculated as per stored data. In case, the connection between main server and local client fails, the connection will resume whenever the connection gets re-established.

2.3 RFID Reader:

The RFID reader is to read the tag attached to the Vehicle and process that information on the server database. It sends electromagnetic waves which carries a signal to detect an RFID tag. Then, receives the information returned back to the reader. The Database is to stores and processes information collected by the reader.

2.4 Working of System:

Toll stations are equipped with an RFID reader. Each vehicle has a UHF tag, which is applied inside the windshield or integrated with any of the specified vehicle part such as the number plate. With this system, the vehicle traffic in real-time and without human intervention is monitored on toll station and monitoring hot spots. Each time, a vehicle enters or exits the toll station; the RFID reader sends its identification to the server database. Hence, the supervisor no longer needs barrier on toll station to allow entry to the vehicle.Besides, this system provides a dynamic display inside the toll station. System allows travelers to continue journey without stopping for toll collection. Each vehicle has to have sufficient balance for automatic toll deduction. System also allows authorized persons to track vehicle in case of stolen vehicle. A software application on the toll station keeps track of the entrance and the exit of vehicles and updates the database related to those vehicles with helpful information such as insurance status etc.

Displays are used to provide customer with real-time information about vehicle. Traced Maps of vehicle must be provided on each query in the case of tracking vehicle. UHF is better suited for reading tag attached to vehicles. It uses backscatter technique to communicate with the tag and provides higher read range compared to HF and LF technology. Alien circular antenna to read RFID tags regardless of orientation is utilized in this design. Also, two antennas are used in each gate, to communicate with tags. One ensures the emission of energy to the tag and the other receives energy back from the tag.

III. CONCLUSION:

RFID reader integrated with WSN will benefit from communications and sensing capabilities. The integration of the RFID and WSN will facilitate the extension of an RFID network eliminating the need of wired installation while reducing cost and saving time. The combination of these two promoting technologies has been explored in this article to provide a smart solution for managing the automatic toll deduction on toll stations & also track vehicle by authorized persons. It is believed that by the implementation of this system, problems such as high labour cost, underutilization of petrol/diesel and long waiting time at the toll station will be reduced. So, both passenger and vehicle station administrators such as police will benefit from the system as real time information are provided. It is expected that integration of RFID and WSN will provide new opportunities for applications related to the identification of object over a large area.

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