

# RFID, GPS and Android based Smart Ticketing System for BMTC

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**Abstract**— This paper presents an automated system for ticketing in the public transport which is based on RFID and GPS. The Frequency Identification (RFID) card and GPS are used to make the identification of passenger and deduct the passenger's fare according to the distance travelled. GPS tracks the bus location. The RFID cards provided to the passengers are reusable, rechargeable and user friendly.

**Index Terms**— RFID, GPS, GSM

## I. INTRODUCTION

The project is implemented using RFID technology, Microcontroller, GSM and GPS system. RFID has been an emerging technology in recent years. It can be effectively employed in number of applications as it is very economical and a widely used tool for tracking the transit transports. RFID cards with unique id are provided to the public, this unique id along with personal data is stored in database for each user in internet. By accessing this database, it identifies the traveler, check his account and deduct the fare from traveler's account. GPS system is used to keep track of the distance travelled. The propose system is very helpful for government as well as public. It gives the entire solutions for all these issues:

- Ticketless travelling
- Stop jumping
- Conductor cheating
- Problem related with change (coins).
- Bus tracking etc.

## II. HARDWARE DESCRIPTION

The convergence of the sensors like smart objects, RFID based sensor networks and Internet gives rise to the Internet of Things. Smart devices are now connected to Internet using their communication protocol and continuously collecting and processing the data. The very need for digitalizing the fares to be error free and easy access to the public transport system, is achieved using RF ID for access into the public transport, where the user has to top up the card for using it similar to a SIM and when entering the transport system it would check for the availability of funds in the card, if available it would provide access to the service, if

not it would denied and if the user has to leave the public transport at desired station, the user has to tap the card at the exit, in this manner it would detect the exact fare for his/her journey. Passengers availing the RFID based electronic tickets can access any bus service of the city by entering current and destination location. This data will directly be transferred to the server main database and the equivalent credit will be stored in the corresponding bus account. Also the screen at every bus stop will notify the passengers, the departure time of the last bus of any route.

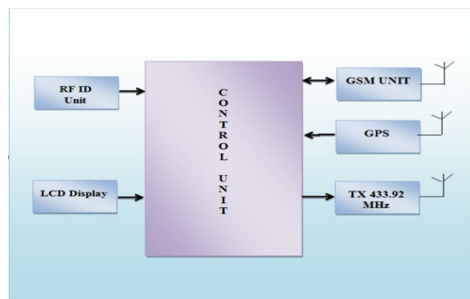


Fig1: Block diagram Public Transport Unit

#### A. Radio Frequency Identification (RFID):

Radio-frequency identification (RFID) is a technology that uses communication via radio waves to exchange data between a reader and an electronic tag attached to an object, for the purpose of identification and tracking. Some tags can read the information which is beyond the line of sight or several meters away from it. There are two parts in RFID tags: i) an integrated circuit for storing and processing the information as well as modulating and demodulating RF signals. ii) an antenna for receiving and transmitting the signal.

A basic RFID system has three components:

- An antenna or coil
- A transceiver (with decoder)
- A transponder (RF tag) electronically programmed with unique information

**Antenna:** The antenna emits radio signals to activate the tag and read and write data to it. Antennas are the conduits between the tag and the transceiver, which controls the system's data acquisition and communication. Antennas are available in a variety of shapes and sizes; they can be built into a door frame to receive tag data from persons or things passing through the door, or mounted on an interstate tollbooth to monitor traffic passing by on a freeway. The electromagnetic field produced by an antenna can be constantly present when multiple tags are expected continually. If constant interrogation is not required, a sensor device can activate the field.

**TAGS (Transponders):** An RFID tag is comprised of a microchip containing identifying information and an antenna that transmits this data wirelessly to a reader. At its most basic, the chip will contain a serialized identifier, or license plate number, that uniquely identifies that item, Similar to the way many bar codes are used today. A key difference, however is that RFID tags have a higher data capacity than their bar code counterparts.

**Data capacity:** The amount of data storage on a tag can vary, ranging from 16 bits on the low end to as much as several thousand bits on the high end. of course, the greater the storage capacity, the higher the price per tag.

**Frequencies:** low-frequency tags are cheaper than ultra-high-frequency (UHF) tags, use less power and are better able to penetrate non-metallic substances.

**EPC Tags:** EPC refers to "electronic product code," an emerging specification for RFID tags, readers and business applications first developed at the Auto-ID Center at the Massachusetts Institute of Technology. This organization has provided significant intellectual leadership toward the use and application of RFID technology. EPC represents a specific approach to item identification, including an emerging standard for the tags themselves, including both the data content of the tag and open wireless communication protocols.

**RF Transceiver:** The RF transceiver is the source of the RF energy used to activate and power the passive RFID tags. it controls and modulates the radio frequencies that the antenna transmits and receives. The transceiver filters and amplifies the backscatter signal from a passive RFID tag. **Transmitter & Receiver:** The

transmitter itself generates a radio frequency alternating current, which is applied to the antenna. When excited by this alternating current, the antenna radiates radio waves. A radio receiver is an electronic circuit that receives its input from an antenna, uses electronic filters to separate a wanted radio signal from all other signals picked up by this antenna, amplifies it to a level suitable for further processing, and finally converts through demodulation and decoding the signal into a form usable for the consumer.

**B. GPS**

We can track the location of the bus even if it is present in the remote area by using the APP in the smart phone called “GUARDIAN”. The Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth when and where there is an unobstructed line of sight to four or more GPS satellites. A GPS receiver calculates its position by measuring the distance between itself and three or more GPS satellites. Measuring the time delay between transmission and reception of each GPS radio signal gives the distance to each satellite, since the signal travels at a known speed. The signals also carry information about the satellites' location.

**C. GSM**

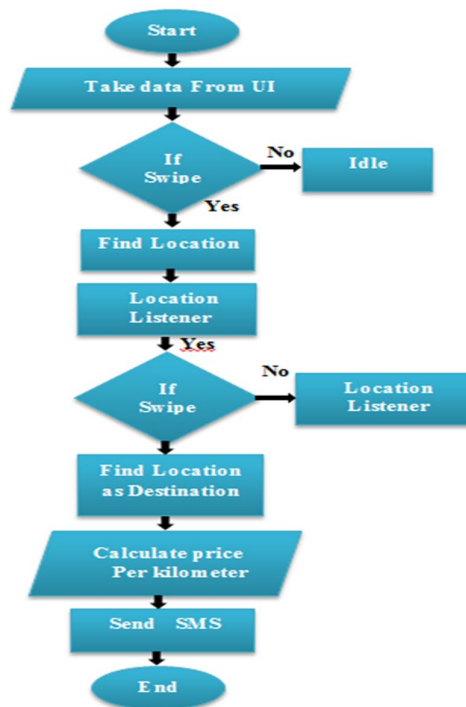
This paper also includes accident zone and accident detection and gives the information to the nearest police station and ambulance and dynamically by using the App in the smart phone called “EMERGENCY”.

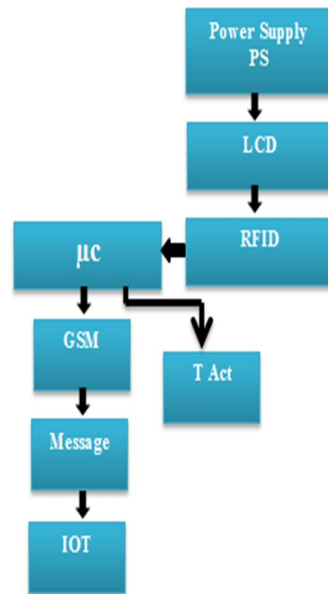
**D. Microcontroller**

Here 8051 based Philips P89V51RD2 microcontroller is used for implementation. The P89V51RD2 are 80C51 microcontrollers with 64kB flash and 128 B of data RAM.

**III. SOFTWARE REQUIRED**

Keil software provides the ease of writing the code in either C or ASSEMBLY. U-VISION 2, the new IDE from keil software combines project management, Source code editing and program debugging in one powerful environment; it acts as a CROSS-COMPILER





## V. CONCLUSIONS

This paper has presented an automated, reliable, transparent and convenient system for ticketing in Public Transport System. RFID cards can be reusable and more convenient compared to paper based ticketing system. GPS helps in distance measurement and fare calculation. With this methodology the travelers can able to make their transaction easier, tracking of the bus will be possible. Additionally number of passengers accessing the bus can also be monitored and that information utilized to improve their service. This is more economical, reliable and user friendly system for public.

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