

ISSUES AND THE PROPOSED SOLUTIONS WITH THE AUTOMATIC MONITORING OF SCHOOL BUSES USING RFID

NIHARIKA GARG

Department of Computer Science ITM University, Gurgaon, Haryana, India

ABSTARCT

The ability to locate and track children is a vital issue to both parents and school staff. Identification and tracking can be achieved, with today technologies in different ways.

The conventional modus operandi of personnel tracking and management has been known to be ineffective with respect to the secure transport and tracking of the personnel in question. This has prompted to deliver a foolproof solution, which will enable the parents to constantly monitor their child and providing an online view of the busses while en route. RFID technology now makes the job easier and can give school bus operators, school officials and parents the peace of mind that comes from knowing where their children are while making their trip to and from school.

KEYWORDS: RFID Tags, Active Tags, Passive Tags, RFID Reader, GPS, GPRS

INTRODUCTION

Security has become the need of the hour. A safety protection and visibility plan should be flexible to adapt to the social and security requirements of the local communities. In Indian cities like Mumbai, where the weather and the traffic are always unpredictable, parents are often worried about their children. The RFID Personnel Tracking solution aims to provide a comprehensive and integrated application system [1].

Radio Frequency Identification Technology provides for automation of data capture and identification processes that enable a superior management of the personnel. The objective of this solution is to offer a semi-automated system for Personnel Tracking Management with automated processes offering a cover for manual tracking and intimation, in real time.

But the adoption of this solution leads to several privacy and security issues, which are discussed in the following sections.

SOLUTION

RFID Cards of 13.56 MHz (High Frequency) [2, 3] allow the RFID readers to record students entering or leaving school buses [5, 6].

- Every student is assigned a Unique Tag ID
- Student Boards Bus
- Student's tag is read by Hand-held Reader
- GPS Technology used to get updates on student's real time location.
- Student information sent to Remote Server using GPRS technology

- Student Alights and RFID tag is read again
- Remote Server automatically sends SMS with updated information to parents

As the student passes the card reader upon entering or exiting the bus, the time, date and location are logged and transmitted to a secure database. The system ensures that every driver performs a daily safety inspection. This one-of-a-kind system captures data in four dimensions including latitude, longitude, time and speed at every data collection point, giving administrators a clear view of the bus' path, each stop and start, and even a time, date and location at which the door is opened. This creates certainty for school officials and parents, as well as accountability for the drivers [4]. The system identifies when and where a student enters or exits the school bus to enhance their safety and security.

ARCHITECTURE

The architecture represents a model for the implementation of RFID in school buses. This shows how the data is collected from a RFID reader and is transferred to the server with the help of Handheld Scanners. The scanner then by collecting the data from GPS and RFID sends the information of the students to their parents.

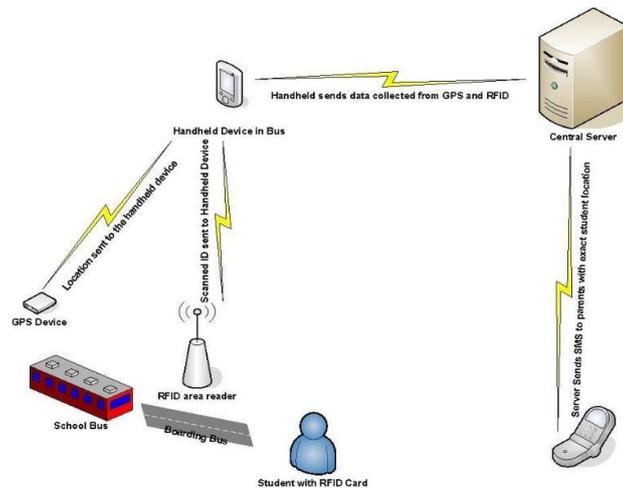


Figure 1: Architecture of the RFID System in School Bus

BENEFITS

For School

Equipping buses with the RFID solution will differentiate the School in the minds of potential parents seeking admission of their children

- Customized reports to help increase efficiency of the fleet by-
 - Reducing unauthorized stops along a pre-determined route
 - Reducing over-speeding
 - Reducing detours
- Broadcast information on common interests to parents
- 2-way communication with the driver
- Very useful in case of public unrest, sudden 'bandhs', or bad weather.

For Parents

- Secure Passive RFID smart cards for students.
- Smart card for Drivers/Attendants for proper authentication.
- Email alerts and online real time status.
- SMS message for registered Parents/Guardians mobile with information on entering or leaving school bus by the child, or any emergencies.
- Reduce anxiety and tension among Parents/Guardians about the safety of their wards during transportation to school.

For Student**Ease of Use**

The unique RFID cards are not to be carried and swiped by the child. Even if the RFID card is placed in the backpack, our readers can read them. As the student passes the card reader upon entering or exiting the bus, the time, date and location are logged and transmitted to our secure database

SECURITY/PRIVACY ISSUES WITH SUGGESTED SOLUTIONS

The adoption of RFID by the education markets comes with privacy concerns.

Issue: Broad Casting Personal Information of the Students

Some parents object to electronically tracking their children's whereabouts, suggesting that it might compromise their privacy. A primary RFID security concern is the illicit tracking of RFID tags. Tags, which are world-readable, pose a risk to personal location privacy

Solution

RFID tags come in two varieties: passive and active. Passive tags carry very little information about the person or thing being tracked. Lacking an independent power source, they're unable to transmit signals over long distances. They work only when they come very close in the coverage of the radio. So passive tags should be used with stored & encrypted student School ID and role number. This will avoid any risk of sharing personal information.

Issue: Place of Installing the Tags

Many schools have yet to figure out what sort of tag would be easiest for students to keep with them at all times. Wallet cards are one option; sewing the tag into a backpack is another. Schools also fret over replacement costs when tags inevitably are broken or lost.

Solution

Busses should be mandated to come pre-equipped with the RFID devices with standard frequencies/tags and complete tracking system as cloud. In this case schools will have not to worry about the type of tags to be used. All schools will follow same standard.

Issue: Learning RFID

RFID comes with a learning curve. School district personnel must learn to operate and manage the system, which until recently has been unnecessarily complicated in terms of assembling, installing and configuring all the

components. These systems have multiple components that must be assembled and made to work together. Historically, no one vendor has been able to offer all of those components as well as the necessary engineering and installation capabilities.

Solution

If buses will come pre-equipped then schools really not need to learn the complete RFID process. They will just issue the tags to students attached with their Identity Cards.

Issue: Increased Fees

Conveyance fees charged by schools will go through the roof if these technologies are installed.

Solution

Pre-equipped devices and common tracking system will not add much cost to existing system, as massive production of same units will cost lesser than the individual system setup. Also the maintenance costs will be centralized.

Issue: Data Flooding

Not every successful reading of a tag represents data useful for the purposes of the business. A large amount of data may be generated that is not useful. Event filtering is required to reduce this data inflow to a meaningful depiction [7].

Solution

System should be developed to avoid duplicate reads. Using of passive tags will avoid data flooding.

Issue: Global Standardization

The frequencies used for RFID in the USA are currently incompatible with those of Europe or Japan. Furthermore, no emerging standard has yet become as universal as the barcode. To address international trade concerns, it is necessary to use a tag that is operational within all of the international frequency domains [7].

Solution

Pre-equipped devices and common tracking system will make sure the use of the devices and tags with standard frequency. Devices will be registered with schools and tags will not work on any other school bus.

Issue: Temperature Exposure

Currently, RFID tags are created by gluing an integrated circuit (IC) to an inlay. This poses a problem as vibration and high temperatures will loosen the connection. If the IC loses connection with the inlay, the RFID tag will no longer transmit [7].

Solution

Passive tags will avoid any damage due to temperature and vibrations. They are rugged enough to use in this type of environments.

DATA MINING IN RFID

When the child walks toward the school gates - either from inside the school or from outside, powerful long-range RFID readers can detect the presence of the RFID tag either on the child or in somewhere in the bag. This

information is instantly sent to cloud-based servers, which do the following:

- Correlate the entry/exit of the child with the child's presence on the bus,
- Check for multiple, contiguous entries & exits,
- Ensure that the number of entries match the number of exits,
- Match the times of entry/exit with school authorized times

CONCLUSIONS

The potential benefits of this technology are so great that a lot of school districts will eventually embrace it. The challenges, like training schools how to use them and creating RFID tags that kids won't lose or destroy, can be solved, and once they are, adoption rates should take off. Using RFID technology simply helps schools do more efficiently and effectively what they're already doing manually.

- The same short-range signal of 10-20 ft read distance also provides nodal visibility of students in school grounds when they enter or exit the school.
- The same drivers, teachers and staff RFID-enabled badges may be programmed to provide real-time visibility at all time to ensure accountability of all operations involved with students.
- In case of emergency, the RFID-enabled badge can be activated "on-demand" by students or by the system administration to provide full real-time location of the students within the school grounds.

REFERENCES

1. Li Ye, Wang Jingbo, Dong Libo, IOT in the Application of intelligent transportation [1], Mobile Communication, 2010(15): pp.30-34 (references)
2. Liu Yunqing, Design and implement of automatic vehicle identification system (AVI) based on RFID [D]. Jilin: Jinlin University, 2009.1-4
3. Wang Shaofei, Guan Ke, Wu Qingwen, The research of RFID applied in automatic public transport system (APTS) [J]. Technical forum, 2008, (3): 140-142
4. Lai Wuwen, Wang Hexing, Tian Wanjun.etc, Intelligent public transport system based on RFID [AJ, 2010 4th International Conference on Intelligent Information Technology Application, 2010
5. http://www.gps-gsm-system.com/school_bus_tracking.htm
6. <http://www.rfidjournal.com/article/view/2808>
7. Challenges in RFID Deployment – A Case Study in Public Transportation
<http://www.it.iitb.ac.in/~kamlesh/Page/Reports/iceg06.pdf>

