

DESIGN OF STUDENT SECURITY SYSTEM USING RFID MECHANISM

Priya.N¹, Divya Josephin.V², Prabhakaran.S³, Vaira Sundari.N⁴

¹Assistant Professor, Department of Information Technology, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India.

^{2,3,4}Student, Department of Information Technology, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India.

Abstract - The abduction of school children has increased by 47% in the last year, for various reasons such as child labor, ransom, organ trade, and begging. Due to this reason, parents are cautious about sending their children to school. They purely depend upon the school to ensure that their child is safe while entering and exiting the school premises. To ensure the safety of the child we are proposing a system that implements Radio frequency. Student information such as in time and out time from the campus will be recorded on mobile application and thus the SMS gateway will automatically send information about their child using SMS that the student arrived safely at the school.

Key Words: Radio Frequency Identification (RFID), RFID Tag, RFID Reader, Short Message Service (SMS), SMS Gateway.

1. INTRODUCTION

In this system, the concept of IoT is applied to store and maintain the information about the students. The Internet of Things (IoT) is basically "A network of Internet-connected objects able to collect and exchange records." It is usually abbreviated as IoT. In a simple manner to put it, you have "things" that sense and collect facts and send it to the internet. These records can be on hand with the aid of other "things" too. The Internet of Things (IoT), also sometimes alluded to as the Internet of Everything (IoE), comprises all the web-enabled devices that gather, transmit and follow up onto information they obtain from their surrounding environments utilizing embedded sensors, processors and communication hardware.

A portable system is designed which has the capability of recognizing the student via their RFID tags and then sending the details of the student to the server, whose tag is identified. First of all the system requires an internet connection, which can be achieved through Wi-Fi. So a system is needed which has the capability of Wi-Fi connectivity. Now when the system is powered ON, it first scans all the available Wi-Fi networks and can be connected to any network by entering the password. Once the connection is established, it scans for the RFID tag via an RFID reader and recognizes the student, whoever is recognized their tag, particulars are sent to the server (PC). When the server receives the tag ID it marks the attendance of the student. The server is a PC which maintains all the

records of the attendance and sends the information to the parents.

This attendance can be checked on the website or android application, where a student or their parents can view the corresponding attendance in real time. By upgrading mobile phones with the Near Field Communication (NFC) technology, they either can be recognized or can peruse RFIDNFC labels. IoT supports the correspondence between devices, also broadly known as Machine-to-Machine (M2M) correspondence. In this system IoT is also used for monitoring the attendance of students.

The existing attendance system requires a person to take attendance by roll calling, which has many drawbacks, such as proxy attendance and even there is a chance for manual errors. In order to overcome this problem, we are proposing a RF based School Security system. In this project dual RF (Radio Frequency) ID has been used. The RFID reader has 320 hz frequency to capable frequent input data. RFID 1 will be placed in the IN gate and RFID 2 will be placed in the OUT gate. Now 1 is for IN students and 2 is for OUT students. Each student will be provided with a RFID card. The RFID card will be placed inside the shoe's sole. It cannot be removed.

Once the student entered the school means, they need to cross the RFID 1, now the RFID reader will automatically identify the student's details with the RFID card. The student details will be synchronized with the card, while the card provided to the student. After the identification a mail with entry details will be sent to the parents with time, attendance will be calculated automatically. This process will be reverse in the OUT gate. Once the student steps out, a mail will be sent to the parents. While getting IN grace will be provided for late comers. All the information will be centralized in a web server for generating reports and further clarifications.

2. RELATED WORKS

The related work that is based on the issue intended by this project is presented in this segment. Saranya.J, Selvakumar.J [9], the authors proposed a framework that traces the location of students using a child module that transmits the whereabouts of the students to a database and a cell phone. The drawback of this framework is that the module may not be suitable for students and wide-scale organization is expensive. A paper [10], by Mori, suggests a system that implements Blue-tooth technology to form

clusters and communicate among them through android terminals. The major drawback of this method is costly.

In paper [11], the author Shu, C. proposed that the categories of tracking units can be integrated with a mobile phone application that informs the parents if their kid went outside the school radius. If the child is outside this range, the unit will send an alert to the parents. Besides, the application sends the location of the kid by deploying a map. One of the drawbacks of this application is that they work with restricted areas.

The author Akshay Shetty et al. [12], presents a framework utilizing biometric features for example. The school children track biometric systems while entering into the bus students scan their palms across a palm reader. To replicate the palm's specific pattern, palm reader uses IR light. For cross-verification, the results of scanned palms are sent against original patterns stored in a secure database. The inconvenience is that it is manual and small kids feel difficult to place their palms correctly on the scanner.

Sanjay Ram M, Vijayaraj [13] proposed a design, TCP provides a cloud computing system with some important security features, such as authentication, communication security, and data protection. The TCP provides cloud computing a secure base to achieve trusted computing. Proposed a method to build a trusted computing environment for the cloud computing system by integrating the trusted computing platform into a cloud computing system and pay attention to the security requirements in the cloud computing environment. Some major security services, including authentication, confidentiality, and integrity, are provided in a cloud computing system.

At present, maintaining the attendance details of the students are maintained manually by staff. And the attendance is taken only after the first hour starts, by this staffs might not know if the students bunk the classes. The process of marking attendance manually will waste a lot of time, and information identification is relatively slow. Students usually need to get the attendance information by name. If there are more students in the class, the attendance takes up a lot of class times between teachers and students. Contact smart card cannot timely obtain the distribution of students on campus, and also does not mark the student's attendance manually.

Drawbacks of Existing System

- Attendance of students are marked only when the class hour starts.
- The parents are not intimated with the student's presence and absence.
- Attendance marked by the staffs manually.

- The parents are not provided with children's attendance.
- There is a possibility that sensitive data could be leaked to untrusted environment

3. IMPLEMENTATION

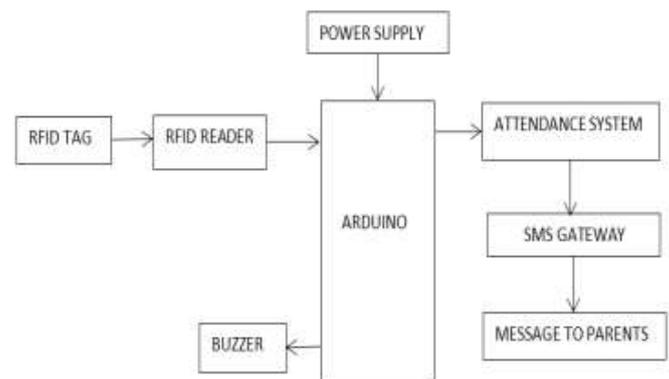


Fig. 1. Security System

3.1 RFID Tag

RFID (radio frequency identification) is a form of remote (wireless) communication that uniquely recognizes an object, animal or person. RFID tags are affixed to objects so that they can be traced using an RFID reader and antenna. RFID tags transmit information about the object through radio waves to the receiving antenna/reader combination. Radio Frequency Identification (RFID) is the utilization of radio waves to read and capture data saved on a tag connected to an object. A tag can be read from a distance of up to several feet and need not be within the reader's direct line of sight to be monitored. Advantage of the use of passive RFID tags, they ought to last for 20 years, as long as the tags are not bent or broken. An RFID tag comprises of a small radio transponder, a radio recipient and transmitter. These radio waves transmit information from the tag to as per user, which at that point transmits the data to an RFID computer program.

3.2 RFID Reader

Radio Frequency Identification (RFID) is a technology intended to permit objects, animals and even human beings to be recognized, spotted, and traced using radio frequency signals. An RFID Reader is a device that uses radio-frequency waves to remotely transfer information between itself and an RFID tag/label to identify, categorize and monitor properties. Technically, All RFID readers are only allowed to examine one tag at a time. When two tags send signals simultaneously to a scanner, then there is no way for the user to differentiate between them. RFID tags forward information about an object to the antenna/reader combination through radio waves. The vitality initiates the

chip, which modulates the energy with the specified information, and afterward transmits a signal back in the direction of the antenna/reader.

3.3 Arduino

The Arduino Integrated Development Environment (IDE) is a cross-platform application. All the standard system libraries are written in C/C++ and the IDE uses the GCC g++ compiler. Arduino is modest and is employed to compose and upload programs. The Arduino Integrated Development Environment or Arduino Software (IDE) incorporates a textual content editor for writing code, a message region, a text console, a toolbar with catches for common features and a series of menus. It is easily accessible for an operating system like MAC, Windows, Linux, and runs on the Java Platform that accompanies inbuilt methods and instructions that play a vital role in compiling, editing, and debugging within the environment. Arduino is a great tool for interactive object creation, utilizing inputs from a variety of switches or sensors, and controlling different types of lights, motors, and other outputs. Arduino projects can be stand-alone or they can be associated with a computer using USB.

3.4 SMS Gateway

An SMS gateway allows a computer to send and receive SMS textual content message to and from an SMS capable device over the worldwide telecommunication network (normally to a cellular phone). The SMS Gateway converts the message sent and makes it compatible for conveyance over the network to be able to attain the recipient. An SMS gateway is an interface that enables sending SMS without utilizing a cellular device. SMS is translated into an email or HTTP-solicitation and the other way around, and this often convenient both for the sender and the recipient.

As the name suggests, an SMS Gateway is a channel that allows a device to send/receive SMS to or from the telecom network. Ultimately routed cellular phones. It transfers the message which is in user friendly application's language to the cellular mobile carrier compatible languages for the conveyance over broadcasting networks to be able to attain the recipients. This entire process happens during a matter of seconds and the message is sent to an out-sized number of recipients simultaneously.

SMS Gateway has made it an extremely simple and quick job to send SMS to a massive variety of recipients (mass recipients) spread over the world. There are three types of gateway for Bulk SMS Campaigns. There are three types of gateway for Bulk SMS Campaigns. That are Web2SMS, SMS2Email, SMS2Skype. In this system, we are using Web2SMS that sends a message through the internet web. The benefits of employing SMS Gateway is cost-effective, faster system, easier processing, secure, and less downtime.

3.5 Attendance System

Attendance of the student is done where the card is being validated by the RFID reader to mark the attendance of the authorized student when they enter the campus. This reduces the work of staff and demands the student to be physically present to avoid fraud activities of students.

3.6 Buzzer

The buzzer is an electrical component that produces a buzzing noise and is employed for signaling. Typical uses of buzzers and beepers incorporate alarm devices, timers, and user input confirmation such as a mouse click or keystroke. The buzzer composed of an external case with two pins to connect it to power and ground. Buzzer and LED are active low signals. For Buzzer and LED current limiting Resistor has to be mounted. The maximum current is 20mA. LED's Anode and Buzzer's positive marked pin to be connected to Vcc.

3.7 Message to Parents

SMS with entry details will be sent to the parents with the time, attendance will be calculated automatically. This process will be reversed in the OUT gate. Once the student steps out, SMS will be sent to the parents. While getting IN grace will be provided for latecomers. All the information will be centralized in a web server using IoT that allows the parents to view their children's attendance.

4. PROPOSED WORK

4.1 RFID Hardware Integration

This is the project initial module. This module contains various hardware integrations, like RFID Reader, Microcontroller board, Power Supply Unit, and RS232 data logger. Initially, the RFID reader will be integrated with the controller board for data transfer. The RFID reader will collect the information from the RFID card.

4.2 RFID Data Processing

After the integration part, the hardware unit will be connected with the PC. For connecting the Hardware with the PC the hardware output will be given as PC input using COMM port. The RS232 data logger has been used as a data transferring tool. Before providing the RFID card, the student and parent's details will be synchronized. So each impression will be taken into the process. The system /PC receive the gathering data from the hardware.

4.3 Attendance and SMS Processing

This module is the most important in this project. This module is totally in the PC side. The data from the hardware will be received from the PC, now the data will be searched for the information in the database. While a corresponding student entering the school means, the hardware sent information to the PC via COMM port. Now the synchronized

data will be enabled to trigger out all the processes like SMS and Attendance. The SMS is sent to parents using SMS Gateway. The message consists of details such as IN time and OUT time. In added with, using the date and time, attendance of the student will be calculated automatically. All information will be updated in the centralized server.

4.4 Report Process

This is the final project module. All the web server updating and data processing will be done in this module. In this module, all attendance reports can be generated. Along with all IN and OUT reports of the students. In addition to this, their homework will be updated towards the parents. Since we are using IoT it will always be available on the internet so parents can easily access it through a mobile application. There is communication amongst the teacher and parent in case of an emergency where the parent is unable to pick up their phone. This module can also be used for homework purposes in general for the parents to be informed about their student's progress during the class hours.

5. RESULT AND DISCUSSION

5.1 Hardware Component

The hardware components of the project consist of the RFID tag, RFID reader, adaptor, communication port the components are all integrated with the system. Once the card is read, the reader checks whether the card details are matched with the database detail of the student. And the attendance is stored in a database for the school and the message of the in and out time is sent towards the parents. The parents can also check the attendance via a mobile application that is provided to the parents. The account creation consists of the student's details that are required by the school to identify the student. Once the account is created the RFID card is linked to the student's details. When we read the card number is first student detail is displayed and the attendance is marked for the specific student.

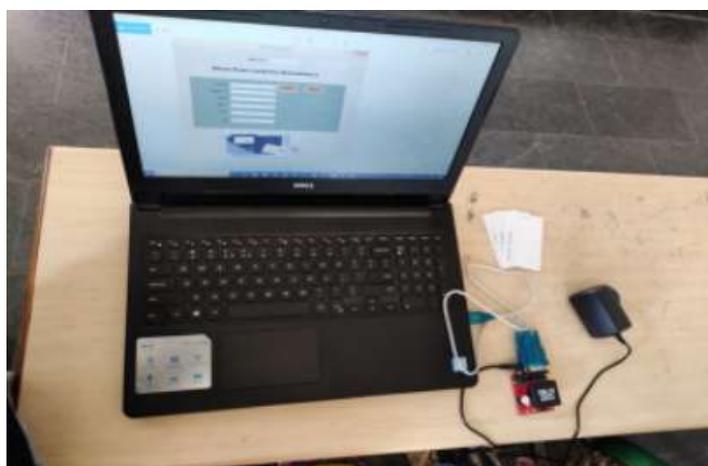


Fig. 2. Hardware Components

5.2 Account Creation

The account creation consists of the student's details that are required by the school to identify the student. Once the account is created the RFID card is linked to the student's details. When we read the card number is first student detail is displayed and the attendance is marked for the specific student.



Fig. 3. Account Creation

5.3 Attendance

Once the card is read, the reader checks whether the card details are matched with the database detail of the student. And the attendance is stored in a database for the school and the message of the in and out time is sent towards the parents. The parents can also check the attendance via a mobile application that is provided to the parents.



Fig. 4. Attendance

5.4 Transaction

The transaction process involves marking the attendance for the specific student the in and out time will be stored. These details will be sent towards the specific parent. It helps both the parents and teacher know the student's regular attendance.



Id	Cardno	Regno	Hailer/Name	Mobile	Class	Adate	Status
56	26082C13F188	01	John	0248738172	10	02-05-2020	Present
57	26082C548C30	01	Jack	9787412138	10	02-05-2020	Present
58	26082C580939	03	ill	9778933393	10	02-05-2020	Present

Fig. 4 Transaction

6. CONCLUSION AND FUTURE ENHANCEMENT

The development of IoT based attendance system involves the process of verifying the students are entering the school premises by RFID mechanism. The system will automatically update the attendance onto the server and simultaneously send a message towards the parent to notify them about the arrival of their children also the assignments for the students can be updated by the teachers to the parents. The further enhancement for student security can be implemented by adding additional proprieties to the system such as learning management systems and learning record storing which help both the students and parents in further interaction in learning the children's education. The tracking system can be implemented to track students anywhere on the school premises. The use of the RFID reader can also be implemented in the library and canteen in which the parents can monthly pay for the student.

7. REFERENCES

- X. Liu et al., "Fast Identification of Blocked RFID Tags," in IEEE Transactions on Mobile Computing, vol. 17, no. 9, pp. 2041-2054, 1 Sept. 2018.
- B. R. Ray, M. U. Chowdhury and J. H. Abawajy, "Secure Object Tracking Protocol for the Internet of Things," in IEEE Internet of Things Journal, vol. 3, no. 4, pp. 544-553, Aug. 2016.
- J. Han et al., "Twins: Device-Free Object Tracking Using Passive Tags," in IEEE/ACM Transactions on Networking, vol. 24, no. 3, pp. 1605-1617, June 2016.
- W. Gong, I. Stojmenovic, A. Nayak, K. Liu and H. Liu, "Fast and Scalable Counterfeits Estimation for Large-Scale RFID Systems," in IEEE/ACM Transactions on Networking, vol. 24, no. 2, pp. 1052-1064, April 2016.
- S. Sundaresan, R. Doss, S. Piramuthu and W. Zhou, "Secure Tag Search in RFID Systems Using Mobile Readers," in IEEE Transactions on Dependable and Secure Computing, vol. 12, no. 2, pp. 230-242, March-April 2015.
- X. Liu, K. Li, G. Min, Y. Shen, A. X. Liu and W. Qu, "A Multiple Hashing Approach to Complete Identification of Missing RFID Tags," in IEEE Transactions on Communications, vol. 62, no. 3, pp. 1046-1057, March 2014.
- Q. Xiao, S. Chen, M. Chen, Y. Zhou, Z. Cai and J. Luo, "Adaptive Joint Estimation Protocol for Arbitrary Pair of Tag Sets in a Distributed RFID System," in IEEE/ACM Transactions on Networking, vol. 25, no. 5, pp. 2670-2685, Oct. 2017.
- Deenadayalan, C., Murali, M. and Baanupriya, L.R., 2012, July. Implementing prototype model for School Security System (SSS) using RFID. In 2012 Third International Conference on Computing, Communication and Networking Technologies (ICCCNT'12)(pp. 1-6). IEEE
- Saranya, J., Selvakumar, J., "Implementation of children tracking system on android mobile terminals," Communications and Signal Processing International Conference, Vol., no., pp.961, 965, 3-5 April 2013
- Mori, Y.; Kojima, H.; Kohno, E.; Inoue, S.; Ohta, T.; Kakuda, Y.; Ito, A, "A Self-Configurable New Generation Children Tracking System Based on Mobile Ad Hoc Networks Consisting of Android Mobile Terminals," Autonomous Decentralized Systems (ISADS), 2011, 10 th
- Shu, C., "Guardian Uses Bluetooth Low Energy Tech To Keep Your Child Safe " Available at: <http://techcrunch.com/2013/10/09/guardian-uses-bluetooth-low-energy-tech-to-keep-your-child-safe/>
- Akshay Shetty, Harshad Shinde, Ashwath Kumar, Ankit Verma, Popat Borse, " Proposed BLE(Bluetooth Low Energy) Based Safety System for School Bus Network, " International Journal of Technical Research and Applications, Vol. 3, Issue 5, 5th (September- October 2015), pp.272-274.
- Sanjay Ram M, Vijayaraj A, "Analysis of the characteristics and trusted security of cloud computing", International Journal on Cloud Computing: Services and Architecture (IJCCSA), Vol.1, No.3, Pp:61-69, November 2011
- J. H. Khor, W. Ismail, M. I. Younis, M. K. Sulaiman, and M. G. Rahman, "Security Problems in an RFID System," Wireless Personal Communications, vol. 59, pp. 17-26, Jul 2011.
- F. Guo, Y. Mu, W. Susilo, and V. Varadharajan, "Privacy-Preserving Mutual Authentication in RFID with Designated Readers," Wireless Personal Communications, vol. 96, pp. 4819-4845, October 01 2017.

16. Shahid et al., "Chipless RFID Tag for Touch Event Sensing and Localization," in IEEE Access, vol. 8, pp. 502-513, 2020.
17. L.Zhu et al., "EPC-Based Efficient Tag Selection in RFID Systems," in IEEE Access, vol. 8, pp.20546-20556, 2020.
18. X. Liu et al., "Fast and Accurate Detection of Unknown Tags for RFID Systems Hash Collisions are Desirable," in IEEE/ACM Transactions on Networking, vol. 28, no. 1, pp. 126-139, Feb. 2020.
19. W. T. Chen, "A Feasible and easy-to-implement Anticollision Algorithm for the EPCglobal UHF Class-1 Generation-2 RFID Protocol,"IEEE Transaction on Automation Science and Engineering, vol. 11, pp. 485-491, 2014.
20. U. Mujahid, M. Najam-ul-Islam, and M.Khalid, "Efficient Hardware Implementation of KMAP+: An Ultralightweight Mutual Authentication Protocol", Journal of Circuits, Systems and Computers, vol. 27, p. 1850033,2017.