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# Monitoring of School Kids Using Android Devices and Near Field Communication(NFC)

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**ABSTRACT:** This paper proposes a Near Field Communication (NFC) based school kids monitoring system. Near Field Communication (NFC) is one of the latest technologies in radio communications and being a subset of RFID technology, it is growing at an enormous pace. NFC technology provides the fastest way to communicate between two devices and it happens within a fraction of a second. It has several applications in Mobile Communications and transactions. An NFC-supported school kids monitoring system is discussed as one potential use of this technology. There are many applications that are available for tracking the vehicle as the kids go to school and come back from school. The existing system gives the tracking observation of vehicle and its exact location. Even some applications give vehicle position update information to the parents. This existing system helps the parents only with the information of the vehicle but they don't tell whether their kid is in the bus or not. To rectify these problem, we have desire to put the NFC tag into service. Each tag has a unique ID. These NFC tag are given to kids, and when students step into the school bus and touch these tag on instructor's mobile phone, NFC readers program on instructor's mobile phone will read these tags, identify the students from their respective NFC tag and sends a email/ message to the parents saying "Your kid is inside the bus". Mobile phone, in turn, sends all the data it has collected to the server. The main advantage is it also displays the kid image when the card is tapped on to the phone which confirms the identity of the kid. This paper discusses NFC as a technology that is more secure and convenient than the prevalent technology of RFID.

**KEYWORDS :** NFC; NFC enabled android devices; Global Positioning System; NFC cards.

### I. INTRODUCTION

The main aim of this paper is to implement a new authorized system for monitoring School kids using Near Field Communication (NFC). It is important for the parents to track their kids who travel to school via school transport vehicle. Assume that the kid has participated in some cultural program. They are not able to take the vehicle allotted to them or suppose the kid has missed the bus to reach his/her house. In that case parents are not able to monitor the kid after school time. This was the problem of existing system.

In proposed system we are planning to send email / SMS confirmation to the parent when the kid enters into the vehicle using Android Mobile phones through Near Field Communication (NFC) features. To provide additional security it also displays the kid image when the card is tapped on to the phone which confirms the identity of the kid.

### II. NEAR FIELD COMMUNICATIONS

NFC [1][2], or near-field communication, is an easy and intuitive technology that allows user to use user's mobile phone for special purposes. An NFC tag [3] can share and link to information such as web pages, social media and all other sorts of other information generally. Other areas where NFC is starting to evolve into are making payments, opening doors secured with contactless locks, logging on to computers and many more. All of these actions have something in common, that is they invoke an action based on user placing user's phone (or any other NFC device) near (the N in NFC) the thing user want to read or interact with. NFC is bridging the gap between both the physical and

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virtual world. By bringing two devices near each other, there is a virtual reaction. Bluetooth and Wi-Fi do not have this ease in set up. So the key feature of NFC is automatic and there is no need to launch an application. In more technological terms, NFC defines the way two products communicate with each other. NFC is short range wireless RFID technology [4] (1-4cm. realistically, 10cm. theoretically) which uses low speeds (106-414 kbps) and a low friction setup (no discovery and no pairing), which then allows two devices to automatically start communicating when they are close to one another. NFC uses passive targets with no batteries and random devices that are not powered, so called tags or stickers, sometimes transponders or labels. NFC Tags are essentially “targets” that “want” to be touched by NFC devices like mobile. These Tags can contain information, applications or services [5]. NFC is coming to many phones and handset manufacturers like HTC, Nexus, Samsung, Sony and Blackberry have been pushing the deployment of the technology. [6]. NFC technologies is well the main usage for payment [7]. Contactless banking cards are becoming more and more common and a NFC phone can act like a contactless bankcard. This means that when user are in a shop and ready to pay, rather than getting user’s standard plastic card out user can put user’s phone near a payment reader and complete the payment.



Figure 1: Sample of application using NFC technology

### III. RELATED WORK

A literature review has showed there are many studies made use of Radio Frequency identification (RFID) as a system that transmits the identity of an object using radio waves by Kumar [1]. This identity is transmitted in a form of serial number that distinguishes each object from others. The RFID system consists of an RFID reader and an RFID tag. The tag consists of the microchip that is connected to an antenna; microchip can store a maximum of 2 KB of data, which may include data and information about the product, manufacturing date, and destination.

Further, the author also observed that the ability of the reader field decreases quickly with increasing distance, which defines the area of reading to 4-5 meter distance using VHF 860-930 MHz. Another research Ben&Abdullah [2] introduced a system that monitors children inside the bus in a safe manner. It uses a combination of RFID, GPS (Global Positioning System), and GPRS (General Packet Radio Service) technologies. Each student carries a unique RFID card. The card is embedded in each of the student’s school bags. Whenever a student enters or exits from the bus, the reader records the time, date, and location and then transfer the data into a secure database and this does not require any action from the drivers and students.

The system enables parents to receive instant SMS alerts within 10 minutes of the designated pick up and drop off points, reducing the time the child spends on the street. The system will also notify the parents via SMS when the

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student boards from the bus or when entering and leaving the school, this will make the parents take the appropriate action because they have precise answers to boarding status and times. If the child is still inside the bus for a predetermined period after running the bus engine, and bus's doors are closed, a message will be sent to school management, and the system will display the location of the bus.

In addition, the system includes a web-based reporting that makes it fast and easy access to get accurate information, such as student report that provides a data and time for all the activities of loading and unloading by students, and bus report that provides all student ridership data by bus. Another study carried out by Shafaat [3] for the Emirates Transport in Dubai applied new technologies in order to upgrade transport services and raise the level of traffic safety during the transfer the school students and as well as, to allow families of the students to trace the route of their children while they are in school buses. This system consists of three techniques, such as smart card, tracking device and the golden rule. The student scans the card when he/she come up to the bus via a device fixed in the bus and he should do the same thing when he got off from the bus. Based on that parent receives a text message during the student scan of the card when entering and exiting. The tracking device technique also will enable parents to determine the route of the bus to follow its path on a map that can be found via a mobile phone, once the student entered the bus, and scanned the card. On the other hand, the golden rule, which is a golden box down on the area of parking buses inside a red box that is bigger than it is to warn students from bypassed. In order to alert them to not cross the road when there is a vehicle and it avoid deadly stampedes or presenting in front of the bus moving, for their own safety to avoid exposure to any harm. Since implementation, it was observed that the use of this system has led to many positive results, as it has reduced the number of incidents of school transport by 63%; reduced the number of student users of private cars to get to school by 9%; increased the number of students that use the school buses by 5.5%.

Anon [4], presented a system which is called, Smart School Bus Architecture. The student swipes the card at the RFID reader while boarding the bus, when the RFID reader transmits the student identification to mobile DVR, which will transmit student identification to the CMS server using 2G/3G/WIFI network. The CMS server will send SMS to assigned parents mobile, then the parents will receive the message and then the bus will depart. During the bus is moving, the mobile DVR will record (video/audio) the various school bus spots that will be shown in the CMS server through 2G/3G/WIFI network as well as there is a GPS used for tracking and monitoring the smart bus location at the central monitoring site. School management permits and allows parents to access the monitoring system that enables them to monitor their children via the internet using browse/CMS client. In case of incidents, urgent communication or alarm trigger on the CMS server by the driver and then the CMS administrator will communicate directly with the driver using a mobile DVR system through 2G/3G network.

Zonar [5], has designed the Zpass specifically for school buses for monitoring and tracking the students in a safe manner. Zpass provides accurate and immediate answers. This system uses RFID with a small card carried by the student containing passive RFID technology that records each student's entry or exit automatically when the student passes from the scanner device that located in the school bus. Through that, parents can receive information from the student through the mobile phone or computer browser with Zpass+, which gives parents a new level of comfort and confidence, using the information that is collected from Zpass, simple notifications send directly whenever the child gets on or gets off from the school bus through SMS to the parent's mobile phone.

### IV. PROJECT OVERVIEW

#### A. Existing Approach:

The current system gives the tracking report of vehicle and its exact location, driver of the vehicle as message in their smart phones. After finishing the school, parent will get the updated message from the vehicles until kid reaches home. This system helps the parents to pick up the children on time

Disadvantages of Existing System:

- This system gives the track report about only the school vehicle location but it won't tell that kid is inside the bus or not.
- Vehicle report - parents can receive only as message in their mobile.

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## B. Proposed System:

To overcome the existing system we are planning to send out an email or message or both. Main benefit of proposed system is, parent can know if their kid is coming in the school vehicle or not. The Android SDK supports Near Field Communication API that can be used to develop NFC applications that conduct Protection and monitoring of school kids.

Advantages:

- This system gives the track report about kid if he/she is coming in school vehicle or not.
- Parent can get SMS or mail.
- Protection of children is good while comparing the existing approaches.
- The system is Centralized which means the messages are sent to the parents as soon as kid taps their NFC card.
- To provide security and confidentiality the kids information in the NFC id card is encrypted.
- The main advantage is it also displays the kid image when the card is tapped on to the phone which confirms the identity of the kid.

## V. DESIGN APPROACH

This system has following 2 Main applications as shown in Figure 2, in turn each applications has many functionalities.

- A Web Server Application.
- B Android Application.

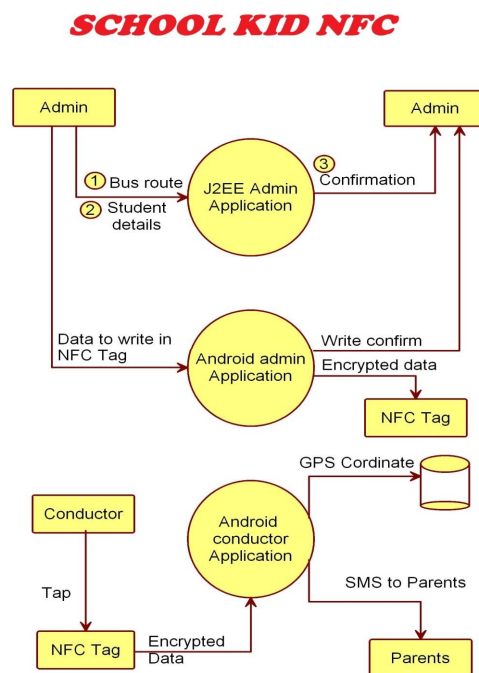


Figure 2: Context Analysis Diagram

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### A. Web Server Applications

This application is running on web server where the centralized database is stored. There is separate Admin session available as shown in the Figure 3. Through which admin can be able to maintain the Bus Details, Route Details, kid Details. Admin can able to monitor the bus positions in this system.

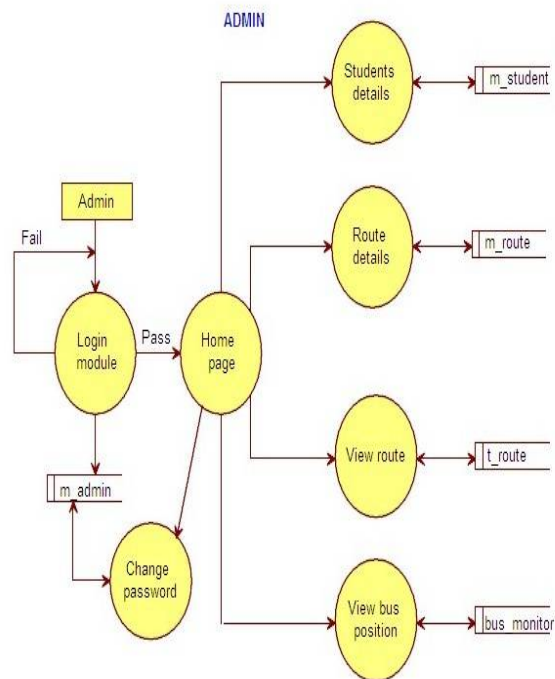


Figure 3: Web Server Application.

### B. Android Application

This Android application has three sub programs

- NFC Writing App

This app is available for authorized users only that means Admin user only able to use this system. Using this App, Admin has to fill the student details, bus details, parent cell details etc, then he has to press the write button, once writing process initiated the data are encrypted and encrypted data is written on the NFC Tag as shown in Figure 4. NFC Tag is pasted in student ID Card. Understand each NFC Tag contains different tag data in encrypted form.

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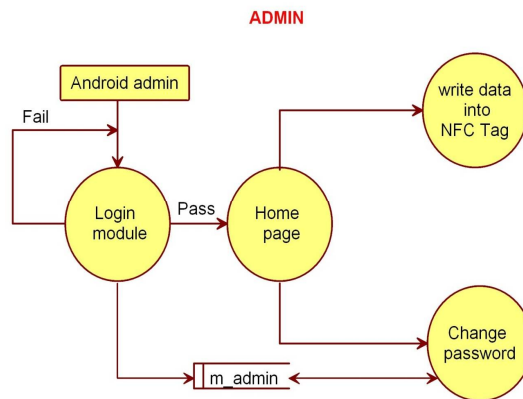


Figure 4: NFC writing App

- NFC Reading App & Data Processing APP**

One NFC Smarts phones have placed in each bus and which is going to handle by the conductor. In this mobile this application and Data Processing App have to install. Once student step in conductor has to tap the student ID with NFC mobile, which will read the encrypted data and decrypt it. Decrypted Data is validated, like the kid belongs to this bus or not, if something wrong it will show error message. Also to confirm the identity of the kid it also displays the kid image when the card is tapped on to the phone. If the data are correct it will send a SMS to concern Parent mentioning your kid is inside the bus and reaches your home in next xx minutes. Also the data are send to web server application and updated in database as shown in Figure 5.

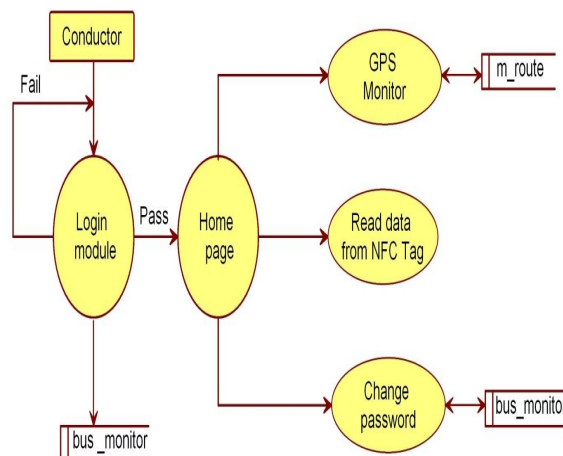


Figure 5: NFC Reading App

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## VI. RESULTS AND DISCUSSION

To verify our design, we implemented this application in Java programming language on Android operating system version 6.0, using SQLite for store data on the phone, using MySQL for records data on the server, and test our application on Google Nexus 6. The results as described below.

Using NFC write Application, admin has to login with his/her User name and Password as shown in Figure 6(a). After logging in the User Interface of the kid details is displayed. To write on to the card, the admin has to place the NFC card on to the back of the NFC enabled phone. After the card is detected the admin can write the kid details such as Bus number, Kid name, Parent phone number and a URL path to load a kid image as shown in Figure 6(b).

After entering the above details, the admin has to press the write button so that the details are encrypted and written on to the card.

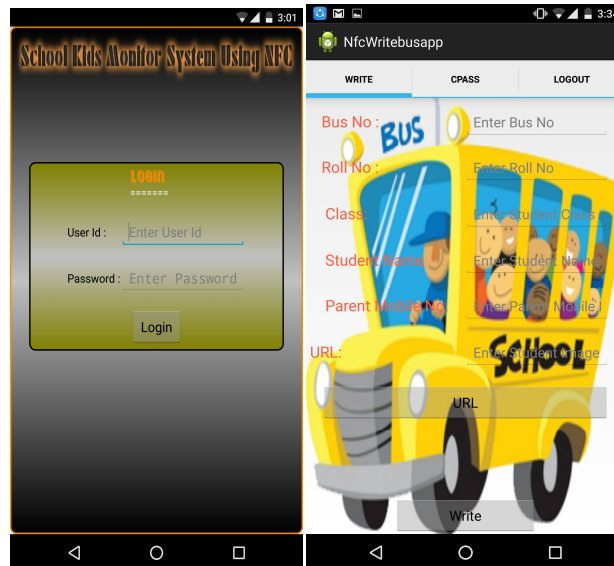


Figure (a)

Figure (b)

Figure 6: Login module of the admin and User Interface of writing part.

When the kid enters the bus and touch their NFC tag near driver mobile phone as shown in Figure 7, the NFC reader on mobile phone automatically reads their NFC tag and validates if the kid belongs to this bus or not. If not error message is displayed. If true the kid image stored in the database is fetched and is displayed in the phone. After confirming the kid the message is sent to the parents saying “your kid is inside the bus and will reach your home in XX minutes”.

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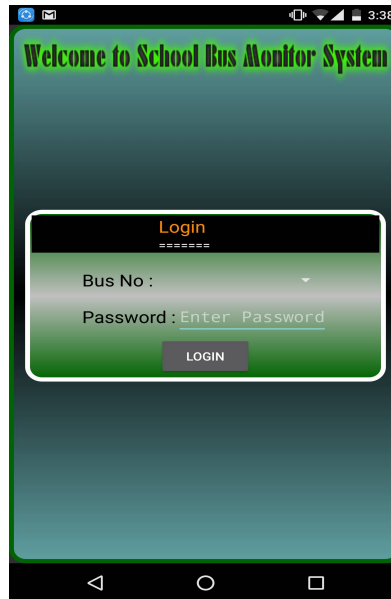


Figure 7: The application is waiting for kids NFC tag.

After the kid reaches the destination, again kid has to tap his/her NFC card and the message will be sent to the parents phone number saying that “Your kid has reached the destination”.

To maintain the confidentiality of the data, the kid information is encrypted and written to the NFC tag. The method used for encryption is Exclusive-OR (XOR). The XOR encryption is a simple symmetric algorithm. This means that the encryption key can be used as a decryption key. The Exclusive-OR (XOR) is a function of Boolean algebra in which two bits are compared and if two bits are identical, the result is a binary 0. If two bits are not the same, the result is a binary 1.

First Bit	Second Bit	Result
0	0	0
0	1	1
1	0	1
1	1	0

Table 1: XOR truth table



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## VII. CONCLUSION

This research has shown how a system relying on NFC technology may be developed. This system is flexible, which means that it may be extended by adding more modules. The tags that have been employed for this specific system are NFC tag, and the algorithm used has shown stable and reliable results; moreover, this algorithm has secured important data that we have stored on these tags. Monitoring and protection of school kids has become more reliable and secured. Additional functions can always be incorporated into the system and greater security provided to the tags. NFC technology continues to develop, and the time has come for us to avail ourselves of its promise and convenience. The main aim of this research has been to demonstrate potential uses of NFC technology and build a system reliant on it.

## VIII. ACKNOWLEDGMENT

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## REFERENCES

1. Kumar, "RFID based embedded system for vehicle tracking and prevention of road accident". International Journal of Engineering Research-, Vol.1, No. 6, pp3-5, 2012.
2. H.BEN, & ABDULLAH, K., "SMART TRACKING SYSTEM FOR SCHOOL BUSES USING PASSIVE RFID TECHNOLOGY TO ENHANCE CHILD SAFETY". *TRAFFIC AND LOGISTICS ENGINEERING*-. Vol.1,No.2,pp. 191-196, 2013
3. S. Shafaat, UAE launches smart school buses to improve students safety system to offer parents direct access to bus status". 1 (2). Available Online: [http://www.emaratalyoum.com/local\\_section/education/2013-04-22-1.568158](http://www.emaratalyoum.com/local_section/education/2013-04-22-1.568158)
4. Anon., 2011. Smart school bus monitoring and tracking system. IEEE Trans. Single processing, 55 (9), 200-205. Available Online: <http://www.hammruki.com/html/products/monitoring.html.P>
5. Zonar, 2013. Zpass: Student Ridership Tracking. International research.4 (1), 20-25. Available Online: <http://www.zonarsystems.com/products/zpass-student-tracking/>.
6. Anon., 2012. School Bus Tracking – Student Tracker. Single processing. 3(1), 34-45. Available Online] :  
[http://www.sifa.com/school\\_bus.php](http://www.sifa.com/school_bus.php).