NFC Enabled Location Tracking System

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Abstract— **Child Security has become a major issue. Near Field Communication (NFC) being one of the latest technologies in radio communication is growing at an illuminating pace.NFC though being a subset of Radio Frequency Identification (RFID) is more human centric and is highly secured compared to the later technology. Location Tracking System for school going kids with enabled RFID technology is only restricted to give information about the vehicle but fails to update the parents regarding child's presence inside the bus. Proposed system uses NFC-supported tag which will not only mark the presence of child in the bus, but also monitor the location of the child and send timely updates to the parents.**

Keywords— Near Field Communication, Security, Cost

I. INTRODUCTION

Road safety of children while travelling to and fro from their premises to school is a most common and important topic that has been added to various fields such education and social awareness. For serving the purpose the very basic form of technology known to all is child lock in Cars. Apart from that Angel Child Monitoring is a GPS- and GSM-card enabled device, APPS such as TALKATIVE PARENTS, comprehensive app called ITS MY CHILD and many more. Near Field Communication (NFC) is a human centric, fast and secured device. The proposed idea talks about implementation of a newly authorized system for monitoring School kids location using Near Field Communication (NFC). It is vital 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 which used RFID. In proposed system SMS is sent as a confirmation to the parent when the kid enters into the vehicle using Android Mobile phones through Near Field Communication (NFC) features.

II. LITERATURE RIVIEW

OVERVIEW

Near Field Communication (NFC) has short range, high frequency, low bandwidth and wireless communication technology that has got a hype in past decade. NFC is derived from RFID (Radio Frequency Identification) technology. Two NFC devices can be made to interact/communicate by touching them together, bringing them into closer proximity of each other and also possible between an NFC device and an unpowered NFC chip which is known as a "tag". While in other technologies such as GPS enabled smart phone that integrates a GSM device logger in order to acquire the routes and activities. [1]

13.56 MHz high frequency which was originally used by RFID is used for Communication.[2]

TECHNOLOGY

There are 2 types of infrared system configurations:
• Point-to-point communication: transmitter and receiver are placed in line-of-sight of one another;
• Directed LoS systems, diffuse communication: transmitter and receiver are placed in the vicinity, but not necessary in a straight line.[3]

NFC MODES OF OPERATION

NFC has three operating modes;
1. Reader/Writer mode: Reader/Writer is the mode which enables NFC devices to read/write data from/to NFC tags(compatible).
2. Card Emulation mode: NFC enabled device behaves as an emulated card .Also external NFC readers read the data that is available in NFC enabled device.
3. Peer-to-Peer mode: In this mode, two devices can interchange or exchange data at link-level. Peer-to-Peer mode

is standardized on the ISO/IEC 18092 standard, and allows data speed as high as 424 Kbit/sec.

To standardize and spread the knowledge pertaining to NFC, NFC Forum was formed. I define these operating modes as the way of communication varies in each NFC mode and these variations impact on the field of operation and utility areas accordingly.[4]

STANDARDS

NFC standards are based on currently existing radio-frequency identification (RFID) standards which includes ISO/IEC 14443 and FeliCa. The standards also include ISO/IEC 18092 and those defined by the NFC Forum, hunted in 2004 by Nokia, Philips and Sony, now with more than 160 members.[5]

RFID (Radio Frequency Identification)

There are many studies making use of Radio Frequency identification (RFID) as a system for transmitting the identity of an object using radio waves. The identity is transmitted in a form of serial number that differentiates each object from others. The RFID system comprises of an RFID reader and a 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 in context of the product, manufacturing date, and destination. Further, it was observed that the ability of the reader field decrements quickly with increasing distance, which defines the area of reading to 4-5 meter distance using VHF 860-930 MHz Research, has introduced a system that monitors children inside the bus in a safe manner. It uses an RFID technology.[6]

Comparison (NFC V/S RFID)

	NFC	RFID
Set-up time	<0.1ms	<0.1ms
Range	Up to 10 cm	Up to 3m
Usability	Human centric Easy, intuitive, fast	Item centric Easy
Selectivity	High, given, security	Partly given
Use Cases	Pay, get access, share,	Item tracking

	initiate service, easy set up	
Consumer Experience	Touch, wave, simply connect	Get Information

[7]
Delhi Private School, Sharjah has outsourced its school transport using same technique.

All buses are provided with RFID system which helps the parent to trace the location of child but the limitation where the parents have no confirmation whether the child is in the bus or not. [8][9]

Limitation

1.   Cost:-As we have compared the cost of RFID is very high and with less specification comparing NFC is cheaper and have more options within it.[10]

2.   Collision:- Attempting to read multiple tags at a time results in signal collision and ultimately into data loss. For prevention of same, anti-collision algorithms (most of them are patented or patent pending) can be applied but at an extra cost.[11]

3.   Security and privacy Issues:- Depending on the application field—while in some cases, as prescribed by law—it may become a necessity to prevent unauthorized users from reading or writing data stored on tags or transmitted from tags. Encryption must be ensured at all the interfaces where data can be intercepted or transmitted (on the medium itself, as well as tag–reader and reader–host communication).It can perform malicious operations on the database contents as well as prompt the system to copy the infected data to further tags.[12]

4.   Possible virus attacks:- SQL systems (like the Slammer virus) false end-of-row characters, intentionally effected buffer overflow and camouflaged comments can lead to un-verified data interpretation as SQL commands which can perform malicious operations on the database contents or prompt the system to copy the infected data to further upcoming tags.[13]

Faulty manufacture rate is high:- Unfortunately, manufacturing of tags is not yet 100% failure-free even today

about 20–30% of tags used in early RFID pilots have been defective. [14]

III. PROPOSED SYSTEM

To overcome the drawbacks in the existing system RFID will be replaced by the use of NFC. We are planning to send out an ping or message for the confirmation of child's presence in college and this is a colossal benefit of newly proposed system where in, parents can know if their kid is coming in the school vehicle or not. Android SDK supports NFC (Near Field Communication) API that can be used for developing NFC applications that conduct Protection, complies safety, security and monitoring of school kids. The implementation of the developed idea is converted and presented in form of a website as shown in the methodology below:-

(For final implementation and testing the proposed model was introduced in form of an android application.)

IV. METHODOLOGY

1 Login Page

Login Page For Location Tracking System
1. Login into the APPLICATION can be made by:
a. Admin
b. Conductor(of specific bus)
c. Parents(of registered child)

Only an authenticated user can login. Login is only successful if user enters username and password that matches with the stored values of database priorly made.

New entries into the Location Tracking database require permission and access from the admin.

2 Admin Page

ADMIN PAGE
2. Admin page delivers three alternatives:
a. Conductor option
b. Parents option
c. Logout option

i. The Admin can make necessary modification into both options(Conductor & Parents) such as adding or deleting as per the requirement. If no changes to be made he can logout from the system.

ii. Clicking on the logout option will redirect Admin user to the LOGIN page of LOCATION TRACKING system.

3 Conductor Page

CONDUCTOR PAGE
3. Adding or Deleting Conductor record:

a. Bus No. (Specific) and User ID of the Conductor must be entered into respective textboxes.

b. And only by the access as an ADMIN a conductor record can be added or deleted to/from the database.

c. Clicking the link Back will redirect to the ADMIN page.

4 Parents Page

PARENTS PAGE

4. Adding or Deleting Parents record:

a. Source, destination of child (specific) and User ID of the Parents must be entered into respective textboxes.

b. And only by the access as an ADMIN, Parents record can be added or deleted to/from the database.

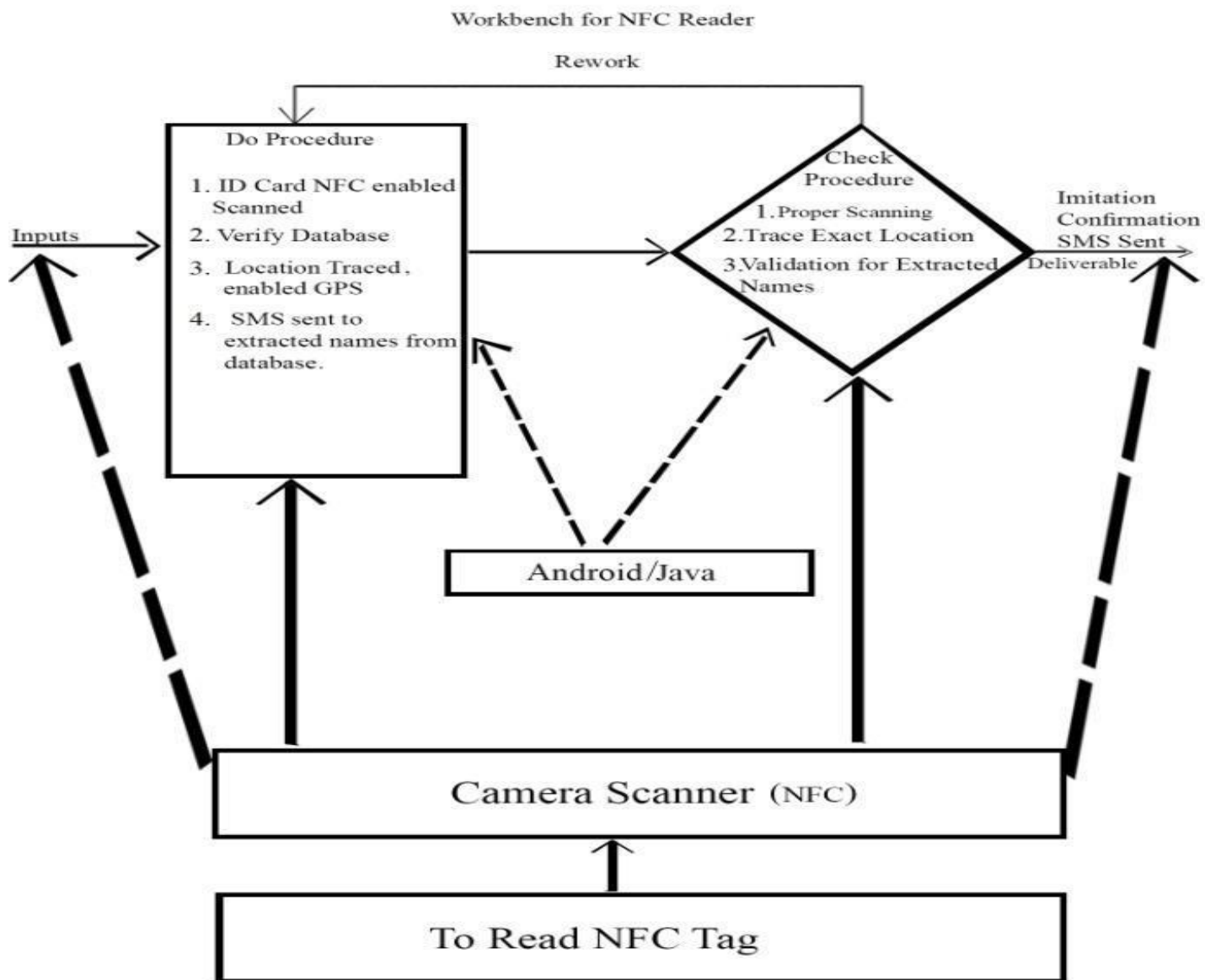c. Clicking the link Back will redirect to the ADMIN

page.

5 Conductor Verification Page

CONDUCTOR VERIFICATION PAGE 5.

a. On the login page verification and validation will be done for all the three types of user. For records synced with LOCATION TARCKING database.
b. Hence, For the field of username and password if the entered values match to those already stored in database, CONDUCTOR VERIFICATION page opens.
c. Automatically the Bus No. field will be filled because of influence of values already present in database. User can modify if any change in value for any of the fields.
d. As soon as a child enters the bus premises the conductor needs to strike/move the Identity card (containing NFC tag) near NFC reader present on the page of application.
e. All information generated/decoded from the NFC tag will be displayed on PARENTS VERIFICATION page.
f. Clicking on the logout option will redirect conductor to the LOGIN page of LOCATION TRACKING system.
g.

6 Parents Verification Page

PARENTS VERIFICATION PAGE 6.

a. On the login page verification and validation will be done for all the three types of user .For records synced with LOCATION TARCKING database.
b. Hence, For the field of username and password the if the entered values match to those already stored in database, CONDUCTOR VERIFICATION page opens.
c. Automatically the Bus No., SOURCE and DESTINATION fields will be filled because of influence of values already present in database User can modify if any change in value for any of the fields. Eg parents can change location for where theirs child is to be picked or dropped after attending school.
d. As soon as a child enters the bus premises the conductor needs to strike/move the Identity card (containing NFC tag) near NFC reader present on the page of application.
e. All information generated/decoded from the NFC tag will be displayed on this page.
f. As a result of which parents sitting back at home and the admin present in school premises can monitor the location of children, displayed with the help of GPS (Global Positioning System) installed in the Location Tracking System.
g. Clicking on the logout option will redirect conductor to the LOGIN page of LOCATION TRACKING system.

V. WORKBENCH FOR NFC READER

Workbench for NFC Reader

Rework

Do Procedure

1. ID Card NFC enabled
   Scanned
2. Verify Database
3. Location Traced,
   enabled GPS
4. SMS sent to
   extracted names from
   database.

Check
Procedure

1.Proper Scanning
2.Trace Exact Location
3.Validation for Extracted
Names

Imitation
Confirmation
SMS Sent

Deliverable

Inputs

Android/Java

Camera Scanner (NFC)

To Read NFC Tag

VI. TABLE FOR NFC TAG

TAGS	Definition
ACTION_NDEF_DISCOVERED	The task of the system is to inspect the initial Ndef Record in the first NdefMessage and looks in for a URI, SmartPoster, or MIME record. If an URI or SmartPoster record is found after search the intent will contain the URI in the data field. If a MIME record is found then the intent will contain the MIME type in type field. This allows activities to register IntentFilters wich target specific content on tags. Activities should register the most specific intent filters possibly to avoid the activity chooser dialog, which can disrupt the interaction with the tag while the user interacts with the screen.
ACTION_TECH_DISCOVERED	A tag only matches if any of the tech-list sets is as a subset of Tag.getTechList(). Each of the tech-lists is considered individually and the activity is considered a match is any single tech-list matches the tag that was discovered. This involves AND and OR semantics to filter desired techs.
ACTION_TAG_DISCOVERED	This intent will not be started until a tag is discovered and any activities respond to ACTION_NDEF_DISCOVERED or ACTION_TECH_DISCOVERED for the current tag.

VII. CONCLUSION

This research on project shows how a system supported by NFC technology can be developed. This system should be made in way that it is flexible, which means that it may be extended by integrating more modules. The tags that have been employed for the specific system are NFC tag. Additional functions can always be incorporated into the system and greater security provided to the tags. NFC technology continues to develop, evolve and illuminate hence 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.[15]

VIII. FUTURE SCOPE

In near future, NFC technology has potential to become staple of our daily lives. NFC technology is compatible to a wide range of devices, with unlimited future growth. NFC technology is already beginning to be compatible with different smart phone manufacturers, allowing users to make payments or unlock their hotel room doors with just a smart phone. Its a belief that NFC technology will have continuous growth and become pervasive throughout our society. One place where NFC technology is most useful is within our homes. The notion of a smart home using NFC is very intriguing . Actually, a smart home would incorporate NFC technology entirely around someone's house. This application has the capacity of making its way into many residences worldwide.[16] Future NFC Uses at Home At present, NFC technology has the capability of opening the front door of a home just by using the mobile phone/device of the homeowner. If anyone is walking to their front door with their full hands, they could simply use their cell phone for scanning the front door lock in order to open the door. NFC door technology will soon be produced for the mass consumer market. In September , this year, Yale has developed the first front door lock (for consumer utilization) that can be opened with a smart phone using NFC technology. Once the owner gets home, NFC technology has the capacity of activating/turning on the heat/ air conditioning of the house. A device with an NFC chip needs to be swiped near the thermostat of the home, tuning to the desired temperature. NFC also has multi potential utility in the kitchen , to start with the smart fridge.A refrigerator having NFC technology can keep track of food and drink inventories much more feasible easier for the user. A smart fridge keeps a track over every item in the fridge, intimating the user about, when things are out of stock or when food expires. LG and Samsung have already developed smart refrigerators with Wi-Fi capabilities and an HD screen.[17] NFC technology can be made compatible to many such systems in the future. This idea can only work if the food/drink items present in the smart fridge have a NFC tag attached that could be read by the NFC chip in the refrigerator itself. Future NFC Uses in Healthcare is hunting its way in to almost every industry, healthcare industry seems to be equally competitive with colossal prospects for growing technology.[18] NFC enabled mobile device can help the visually impaired in finding objects and navigate through sthe areas conveniently. Reports have marked that around 1% of deaths occur because of adverse drug events. If NFC can be used to maintain a database about drug compositions . Doctors can access that database along with the patients historic data (past medications and allergies) such accidents can be avoided.[19]

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