Nokia and the rfid student attendance monitoring system

Technology, Computer

Abstract:

RFID student attendance monitoring system is a system that will take students attendance by using RFIDtechnology. This system mainly comprises of Nokia 6212 NFC mobile which is used as RFID reader, RFID tags which are embedded to the students ID cards and Server machine which is likely computer. This system records student’s attendance to an attendance database server. The system is included with other additional system module for students and lecturers. The information in the attendance database is used by the university administration to better manage the class room statistics, warning for unattended students via letters or e-mails, reminder for students, report for parents and students can also track their performance. RFID student attendance monitoring system is developed using java programming language. The database support for this software is oracle 10g. In order to have complete system functionality, the software application is needed to be integrated with the RFID technology. The software application on the computer is needed with the attendance details which would come from the RFID reader in to order to take attendance and persist in the database. The software application on the computer is deployed in Apache Tomcat 6. 0 server and can be viewed by the user by using any internet browsers such as Mozilla Firefox orGoogleChrome.

Introduction:

The research is proposed to investigate the requirements of automatic students’ attendance monitoring system. The requirements which has been identified and modelled are represented in the form of structure for students’

attendance system. In order to obtain requirements, some of the methods have been applied such asobservationand literature research related to current RFID monitoring systems.

We have an existing system like taking attendance manually. For example professors take attendance of their students by taking signatures on an attendance sheet. The main problem with this system is that students will sign occasionally for their friends who are not present to the class. The purpose of this project is to automate tracking of the presence of students in the class room, with the intention of bringing transparency and reducing number of errors that usually happen in such tasks. The another problem is counting each student attendance for the total semester will be difficult if the professor got 100 or more students which leads to time consuming and error prone.

In order to make taking attendance simpler I got a thought to make this application automatic with the existing identification technologies like automated finger print identification system, barcode system and radio frequency identification system. In my project I am using radio frequency identification (RFID) technology for security and attendance purposes. Identification means the ability to find, retrieve, report, change or delete specific data without having any doubt.

These problems can be eliminated by using RFID technology. The main advantage of RFID based student attendance monitoring system is,

1. It saves time for taking attendance during the class.

2. More authentic attendance system

3. Reduces paper based system

4. It provides interaction between student, course leaders and lecturers.

Student attendance monitoring system is an exclusive software solution. It can be integrated with RFID technology. In order to implement this project we require RFID reader, RFID tags and web interface. The card reader should positively identify student’s ID cards and provide consistent class attendance logs for the benefit of students, lecturers and university. The attendance logs must be stored in the central database in order to generate reports. The device must capable to communicate with the central database server.

Professors should be able to view attendance and be capable to add information to the system.

1. This application tracks each student’s classroom attendance for any number of students.

2. It provides a software set up to monitor information about scanned cards against a database and provides detailed statistics to the lecturer’s about the students. The software set up must include adequate administration capabilities.

3. Provide a wireless interface between the reader and database server.

4. It also provides facility to the course leaders, professors to monitor student attendance at regular intervals.

5. It monitors the attendance of students for each course.

Radio frequency identification (RFID) consists of a transmitter chip/IC and a receiving antenna. Each chip has a unique identification number generally referred to as a RFID Tag, which is attached to the object that we want to discover. Now the RFID tags are detected and identified using an antenna or a scanning device known as transceiver, which with the help of radio signals identifies the tag, the object. In this project, the RFID tags will be associated, to the students (by attaching the RFIDs to student's university cards) and the transceivers will be placed on the entry points of the classrooms. Software at the back end will keep and manage the records, relating to the student's entry to the classroom. All the use-cases will be accomplished using software having application and databases layers. Concepts of Object orientation will be followed in the design of the system.

Aim:

This research is aimed to develop a student attendance monitoring system using RFID technology.

Objectives:

The main objective of the project is to automate the student attendance recording system using RFID technology.

To study on data transfer between RFID system and Graphical user interface (GUI).

The application should be able to display the student attendance percentage in each of the modules and the overall semester attendance.

The application should be capable to generate attendance reports for the authorized party which we would be helpful for university administration to have better database record.

To test the application using testing techniques.

Deliverables:

1. A review of RFID readers and methods for programming them including a demonstration application running on the Nokia 6212 that can read the unique information from an RFID label.

2. A Nokia 6212 application for tutors to take to classes to capture students' id data from RFID labels.

3. A review of techniques for communicating between mobile phones and PCs accompanied by a demonstration application for transferring id card data from a Nokia 6212 to a PC.

4. A PC application for downloading and collating register data from a Nokia 6212 and storing it in a central database.

5. An application for generating reports for personal tutors and admin staff.

Research question(s):

How RFID Technology used for monitoring student attendance

What are the best techniques for storing and processing the data

What are the techniques and technologies for getting data from the phone to PC

Problem Statement

According toWang. (2005), Automatic student attendance using RFID technology comprises of multiple devices work together. The devices include RFID reader, RFID tag, system interfaces and databases. This system needs a good system design to make sure that the devices can capture accurate data and can interact with the information system accurately and efficiently. In order to obtain good system design, developers should have clear idea, knowledge and able to understand the requirements and convert them in to useful information. It is very important to represent the necessary information in to a meaningful data model suitable for application level interactions, including monitoring, tracking and application integration. Therefore a structure is needed to present plans for developing automatic student attendance monitoring system using RFID Technology.

Why Automation?

To save on time spent for daily roll calls.

To avoid manual errors.

To obtain accurate attendance means exact IN time.

To avoid record search time, when we want to see any student’s attendance performance.

To avoid reporting time used for preparing the attendance percentage reports at the end of the year.

Finally to have professional and global look of the organization.

Scope:

The scope of this project is mainly based on the following things.

I selected university of Wolverhampton as acase studyto acquire requirements.

Web-based technology is used to develop the application.

Unified modelling language is used as a requirement modelling technique.

Significance:

The structure of the student attendance monitoring system is planned to provide strategy for developing automatic student attendance system using RFID technology.

Need to know the project requirements for developing the application.

Technical knowledge is required on RFID technology and software tools to develop the application.

System functionality:

Components used for the system

RFID reader

RFID tags

Bluetooth connection

Power supply

Software on the computer

Description:

The students old ID cards will be replaced with RFID ID cards which means the RFID tags are embedded on the ID cards. The card looks similar to their old cards havingphoto, name and other details.

The sufficient number of RFID readers will be installed at the entrance of each and every class room.

All the RFID readers are networked to the computer via Bluetooth connection.

The students enter the class room by showing their ID cards to the RFID reader from the maximum of 3cm.

The RFID reader reads the card data that is RFID tag reference number and sends the data to the computer via Bluetooth connection.

As soon as the card is read by the reader, the tag reference numbers will be streamed in the newly created excel sheet in the computer and waits for other card get scanned.

The RFID reader reads a card within less than a second.

The software application in the computer uses the data in the excel sheet for taking students attendance and maintains the data for generating reports.

Summary:

The RFID technology has been used by many sectors for automated tracking of objects like chain management, retailing, security andhealthcare applications. The RFID student attendance monitoring system utilizes the existing RFID based applications technology which gives advantages to the users in the term of feasibility while recording their attendance. This application combines multiple devices which work together as a complete

system. This system consists of readers, tags, user interfaces and databases to keep and manage user’s data. Designing multiple devices system is a great challenge. The developer needs to have a clear understanding of the system from different perspectives to ensure the successful of the system. Therefore this research investigates the requirements of the system and suggests a structure for it.

Resources required:

The following resources are required to develop the application.

Processor1 GHz processor is recommended

RAM256 MB RAM is recommended

Operating SystemWindows XP Service Pack 2, Windows Vista or Windows 7 is recommended

IDEEclipse Pulsar 1. 3. 2

DatabaseOracle 10g

Java ToolsJDK and JRE 1. 6 is needed to run java files

Web ServerJakarta tomcat 6. 0 is necessary to host the application on the web and to test the application.

HardwareNokia 6212 NFC Mobile is used as a RFID reader and RFID tags and Server machine

MS – Office 2007MS-Excel 2007 is recommended.

Literature Review:

Automatic Identification and Data Capture Technology:

This chapter mainly describes the introduction to automatic capture of data for the purpose of user identification.

Definition of User Identification Devices (UIDS):

User Identification devices are used to describe a physical object or a process that discovers the attributes of the consumer or producer and attempts to exclusively organize that entity. The main objective of the UIDs is to maintainaccountabilityand access control. Currently the UIDs are supported by the business people because it making them more convenient, continuing efforts to make them smaller, easier to transport and maintain, and more efficient withrespectto data throughput. Many of the UIDs are currently in usage they are plastic cards or badges with a picture on it, barcodes, magnetic strips, embedded microchips also known as smart cards, biometrics and passwords. The latest identification technology which is being advanced is the use of radio frequency. The radio frequency identification is a noncontact transmission method. The main objective method is to automatically capture the data for accurate identification. Firstly these UIDs need to improve the security and integrity of UIDs.

Automatic Identification and Data Capture (AIDC):

The Automatic Identification and Data Capture (AIDC) can be referred as a worldwide industry term. AIDC explains the identification and direct collection of information into a computer system, programmable logic controller (PLC) or other microprocessor-controlled device without using keyboard. The ability of recognizing and accessing the information in

secured places within the business world and without the use of keyboards has directed to the use of contact and non contact badges and cards.

Smart Card Technology:

In the early 1950's the concept of plastic cards was first appeared in the USA. They introduced plastic credit cards and it was first being issued by Diners club in 1950s. Later integrated technology was developed which made it possible to integrate data memory and processing logic on to a single silicon chip. The desire for the ease of a smaller transaction tool caused the two to merge in to what is known as the " smart card".

RFID technology background:

According toChing-Hsien Hsu. et al.(2009), RFID technology is one of the most commonly used technologies for identification nowadays. It is an automatic technology which helps the machines or computers to identify, record, or control the individual target through radio waves. Typically an RFID system consists of two components namely RFID reader and RFID tag. Generally RFID reader electronics uses outside power resource to generate a signal to drive the reader's antenna and turn into radio wave. The radio wave will be accepted by the RFID tag and reflects the energy in the way signalling its identification and other related information. In order to access the reflection from the RFID tag, the RFID reader works as a receiver on sensing and decoding the signal from the RFID tag. In simple RFID system, RFID tag is passive and powered by the energy of the reader's signals. In some systems, the RFID reader radio frequencies instruct the memory to be read or write from the associated RFID tag.

RFID Reader

According toJohansson (2004), The RFID readers continuously send the interrogating radio signals in search for the responding tags. These radio signals are sent at fixed frequency bands. The tag discovers this radio energy signals and sends the tag’s serial number and any other information to the reader. In addition to reading the data from the tag, some readers can write data to the tag. The distance from which a reader can set up a contact with a tag is called read range and the read rate can be defined as the maximum rate at which the data can be read from the tag (bits or bytes per second). The high frequency signal and the stronger powered examination signal forcommunicationincreases the range of communication.

According toSimson(2005), Historical RFID readers were designed to read only a particular type of tag but multimode readers can read different type of tags and are becoming popular. Similar to tags, RFID readers come in many sizes. The largest reader consists of a desktop computer with a special card and multiple antennas connected to the card through shielded cable. These type readers in general hold a network connection, so that it could report tags that it reads to other computers. The smallest readers are of postage stamp size and are designed to embed in mobile telephones.

RFID tags:

According toMark (2010), An RFID tag is sometimes referred as a transponder. It contains the identifying data of the object where it is sited on and it generates a signal containing that relevant information. There are four different types of tags available based on the power sources.

They are:

Passive tags

Semi Passive tags

Active tags

Semi Active tags

Passive tags: These tags usually get their power to transmit the signal from the magnetic field created by the RFID reader. These tags can transmit up to a range of 10 meters. These tags are smaller and cheaper because they don’t have batteries.

Semi Passive tags: This tag consists of onboard battery which is used to power the onboard circuitry but it doesn’t produce any signal but it still uses magnetic field produced by the reader to produce a signal. These tags have a maximum transmission range of 100 meters.

Active tags: This tag consists of an onboard battery which is used to communicate and send signals to the reader and power the onboard circuitry. The onboard battery allows it to transmit up to a maximum range of 1000 meters.

Semi Active tags: These tags are very much similar to active tags with a small difference of they remain in sleep mode until they receive a signal from the reader. Which means the tag activates when it receives a signal from the reader.

The communication between the reader and tag is possible through the radio frequencies.

Tag detection:

According toBogdon (2008), Signals from the RFID readers activates the tags which are likely within their examination zone. The examination zone can be referred as the area around the reader where the tags can receive the readers signal, process it and sends back the response that can be decoded by the reader. The information that is decoded by the reader is passed to the host computing systems for processing according to the application. RFID reader-writers have the capability to send back the data to the read/write-capable tags in order to append or replace data. The RFID reader usually locates, activates, and receives transmissions from RFID tags. Readers can be fixed or portable. Fixed readers are typically attached to antenna to notice the tag within particular area. These readers usually collect the data from the products that are travelling through conveyor belt, gates and doorways etc. Portable readers can be moved to detect remote tags. In today’s market readers with wireless communication capabilities exists such as SkyeTech’s SkyeRead reader is attuned with Mica Motes and IDBlue is a handheld Bluetooth 13. 56MHz reader with High Frequency is compatible with devices ranging from PDAs to PCs. Now a day’s major mobile phone manufacturers providing phones with embedded RFID readers e. g. Nokia 6131 and Nokia 6212 NFC.

RFID Frequencies:

According toAli (2008), Different RFID systems drive at a variety of radio frequencies. Each range of frequencies offers its own power requirements, operating range and performance. Each of the ranges may have different restrictions that limit based on the applications they can be used for. The detection range may vary from few centimetres to 100 meters. RFID systems are currently operating in the Low frequency (LF), High Frequency (HF), Ultrahigh Frequency (UHF) and Super High Frequency bands.

RFID operation frequency ranges and related applications shown in the below table:

Frequency RangeDescriptionTypical Applications
< 135 KHzLow Frequency, Inductive CouplingAccess Control & OEM applications13. 56 MHzHigh Frequency, Inductive CouplingAccess Control and Library Books868 – 870 MHz902 – 928 MHzUltra High Frequencies (UHF), Backscatter couplingSupply chain tracking2. 40 t – 2. 483 GHzSHF, Backscatter couplingAsset tracking Highway toll tags Vehicle tracking

Elements of an RFID System:

Basically RFID system consists of four elements:

RFID Readers

RFID tags

Antennas and radio characteristics

Computer network (if any) which is used to connect the readers

Antennas and Radio:

The physical layer of the RFID system comprises of antennas and radios used to connect the reader to the tag which allows the devices to share the information. The RFID tag antenna is the conductive element that allows the tag to send and receive data. In order to form a magnetic field, the passive, low (135 KHz) and high frequency (13. 56 MHz) tags consists of a coiled antenna that couples with the coiled antenna of the reader. UHF antennas come in different shapes. Readers consist of antennas which releases radio waves. The Radio Frequency energy from the reader antenna is harvested by the antenna and this energy is used to power up the microchip, which leads to change the electrical load on the antenna to reflect back its own signal.

http://www. rfidjournal. com/glossary/antenna

Near Field Communication:

According toRaine (2009), Near Field Communication (NFC) and Radio Frequency Identification (RFID) terms are often confusing as the RFID acronym holds multiple standards. NFC and RFID are used inaccurately as transferable terms. This means that the RFID readers might be able read the RFID tags which are implemented with the same standard. Near Field Communication (NFC) technology is used for remote identification and data transfer at reading ranges up to a few centimetres. It means it reads the tags which are close in range. NFC can be considered as a division of more common RFID technology. NFC operates in different communication modes when compared to traditional RFID reader/RFID tag combination. It is more likely for the two NFC devices communicate each other and NFC devices are

also capable to imitating definite RFID smart cards. The emulation mode enables the NFC devices to use the existing reader infrastructure. NFC is complaint with some smart card ISO (International Organization for Standardization) standards: ISO 14443A, 14443B, and 15693 along with Sony's FeliCa Standards and MiFare. NFC was initiated from a joint project of Philips and Sony for developing a short range communication technology in 2002 and it resulted as a Ecma Standard (ECMA 340) and later it was a accepted as ISO Standard 18092 in 2003. Nokia, Philips and Sony founded the NFC forums and been promoting the NFC technology.

According toRaine (2009), Basically NFC operates in three different modes. The first operational mode is read/write mode. In this mode, the NFC device reads/writes data to or from an NFC complaint tag and in read/write mode the NFC device acts as an initiator and the tag acts as a target. In this mode it transfers the data at a maximum rate of 106 kilo bits per second. The second operation mode is peer to peer mode. In this mode it allows the two NFC devices to interact to each other and the maximum data transfer rate is 424 kilo bits per second. The third operational mode is emulation mode which allows the NFC device to emulate as a smart card. In this mode the built-in smart card chip is integrated in the NFC device and connected to the NFC antenna.

Technical capabilities of Mobile interaction with NFC:

According toKhoovirajsingh (2009), in these days mobile phones are increasingly used for storing pictures, videos, documents and Personal Information Management (PIM) data. In addition to this there is often need to

copy these files from mobile phone to a computer or vice versa. In this process the user first need to find file, then need to select the method for transferring file (e. g. Bluetooth), after wards the user need to perform the device discovery process, then select the target device. After having the file on the other device, the user has to decide what to do with it. This will be an awkward process to the user. In order to avoid this process. Some of the basic interaction techniques are available to make things simple.

According toGregor (2011), Dynamic NFC-displays can be used for a wide range of applications at private e. g. home, semi-public e. g. pubs and public places like stations and shopping malls etc., including information retrieval, interactive advertisements, maps or games. NFC enabled mobile phones provide interaction with the diverse content of dynamic NFC-displays, including pictures, texts, links, maps and custom widgets. The design, implementation and performance of interaction techniques for dynamic NFC-displays rely on the technical capabilities of reading devices, tags and physical UIs. Basically NFC displays depends on the size of the tags, target items and mobile devices. Some of the NFC enabled mobile phones are available in the market e. g. the Nokia 6212 NFC classic. This mobile can read only tag a time and cannot identify multiple tags as they block during the interaction with one or several items. NFC enabled devices need a considerable amount of time to read a tag say about 0. 5 seconds and tag should be placed very nearer to the device. These types of issues are seen in the currently available devices like Nokia 6212 mobile.

Basic interaction techniques:

These types of techniques can be used for simple interactions like the selection of items, triggering actions or activating links.

Touch-select: This is the most basic interaction technique. In this technique the users touch a tag with a mobile phone and take out from it after the tag has been recognized. This tiny interaction can be varied through the combination with input from keyboard, joysticks or sensors.

Click-select: This technical can also be referred as touch-select method. This method is pursued by pressing the pressing dedicated key on the mobile device to confirm the selection of the tag.

Touch and Hold: This technique needs users to touch a tag for a certain amount of time which is longer than the normal touch-select e. g. 2 seconds.

Double-touch: In this technique users have to touch the tag twice in a row.

Contactless Cards (tags) Mifare 1k or 4k:

According toNXP, (2007), The read/write mode of NFC needs two devices to communicate, one is NFC reader/writer and the other one is NFC tag. The NFC technology permits to access standard ISO 14443A card products as the Mifarefamily. In the NFC forum, the specification to store data for any kind of service or application is currently specified and it is known as NFC Data Exchange Format (NDEF). In order to store NDEF formatted data which is also called as NDEF data or NFC forum data inside a contactless tag product a mapping model is required. The Mifare 1k/4k tag product is a contactless card presently available in market with 1k byte and 4k byte of EEPROM

memory. The Mifare standard 1k/4k supports mutual three pass authentication, file data transfer up to 106 kbit/s, data encryption of RF-channel with replay attack protection and CRYPTO1 stream cipher for secure data exchange.

Mifare 1k tag:

A Mifare 1k tag is able to store up to 1024 bytes of information. These 1024 bytes are organized as 16 different sectors numbered as Sector 00, Sector 01….. Sector 0E and Sector 0F. Each sector comprises 16 bytes of data blocks named as blocks and numbered as Block 0, Block 1, Block 2 and Block 3. Block 0 of the Sector 00 contains IC manufacturer’s data. In every sector Block 3 is called as trailer and is used for sector authentication serving the security purposes. The first six bits of the authentication block are known as Code A, the next four bits are known as access bits and finally the last six bits are known as Code B. Code A and Code B are typically password keys which can be programmed for reading and writing protection.

Fig: Mifare 1k

Mifare 4k:

The memory area of Mifare 4k is organized in numbered sectors from 0 to 39. It can store 4096 bytes of information. The organization of the first 32 sectors follows the similar structure of blocks and sectors of Mifare 1k. The last eight sectors are quadrupled in capacity. Depending on the settings of

the access bits the reader device has to carry out an authentication with key A or key B to read or write the sector.

Nokia 6212 NFC Classic Mobile in focus:

According toNokia Corporation (2008), The device which i focussed of this paper is Nokia 6212 NFC classic. This device comes with an RFID module which functions as RFID tag and reader operating at 13. 56 MHz. It also supports features like read write, card emulation and peer to peer communication. According to product specification, the Nokia 6212 NFC device is capable of

Tag reading and writing as native NFC functionality.
Contactless communication API (JSR-257) with extensions for java applications on the phone.
It gives support for all NFC Forum defined tags.
This phone is compatible with non-battery powered tags (passive tags) which are:

a) MIFARE (Standard, Standard 4K, Ultralight and DESFire)

b) Sony FeliCa (non-secure)

c) Innovision (Jewel read only and Topaz)

d) ISO 14443-4 complaint tags or cards.

Compatible with ISO/Global platform smart card for service providers to install application specific data e. g. payment and ticketing applications.

Compatible with existing contactless reader infrastructure (payment and ticketing).

The main features of Nokia 6212 NFC include different connectivity options like Bluetooth, GPRS, USB and NFC with read, write and sharing capabilities. Graphic display with 2” QVGA 240 x 320 display supporting up to 16 million colours and contains user storage of 22 MB and microSD format for removable flash cards.

Fig: Nokia 6212 NFC Mobile

Nokia 6212 provides some settings to configure NFC functionality.

NFC detection:

To switch NFC on or off we need to select Menu > NFC > NFC settings. To use NFC switch on the mobile and activate the NFC setting, if disabled. With the phone touch the service tag or other NFC device with in the discovery area. Typically the reading range is 0-3 centimetres. When a tag or device is discovered the corresponding information is displayed on the mobile.

Share to device:

Select Menu > NFC > Share to device and select the required option.

When the sharing is enabled you can send a bookmark, business card, call request, alarm alert calendar note, gallery item, profile, radio station, note, or to-do note.

Service tags:

A service tag may hold a shortcut such as URL of an internet based service, business card, SMS based service and phone number of a telephone service.

Share or read service tags:

Select Menu > NFC > Share to tag. Scroll to select desired option. Select share and touch a service tag. In order to read a service tag, need to touch a tag with the phone. Touch a service tag with your device to allow video streaming or Bluetooth connection or receive a business card, SMS message, call request, bookmark, calendar note etc. NFC received items or card applications can be accessed by selecting Menu > NFC > Inbox or Cards. The device memory restricts the amount of tag data that can be stored. In order to free up memory space delete the received files from the NFC Inbox. We can share the same information repeatedly to different service tags.

Bluetooth:

According toCynthia et. al. (2007), Bluetooth is a Personal Area Networking standard based on short range radio. Devices like phones, printers, modems and headsets use Bluetooth technology to communicate between themselves. Bluetooth technology is mainly useful for communication when two or more devices are in close proximity and need reserved bandwidth. A Bluetooth device either acts as a “ master” or “ slave”. At most a master can communicate with seven slave devices, and a Bluetooth consisting of one master and it slaves is called a piconet. The master acts as a controller to control all the timings of all Bluetooth connections on piconet. Bluetooth pairing can be defined as a process of adding new slave device to the

Bluetooth piconet. Bluetooth simple paring is a set of security improvements to the Bluetooth pairing mechanism. The target of the Bluetooth simple pairing is to set up authentication credentials between the Bluetooth master and the slave devices. Bluetooth simple pairing encourages four different pairing models. Those are:

Numeric comparison

Just Works

Out of Band and

Passkey Entry

Numeric Comparison Method:

The Numeric Comparison model is proposed when both the devices are able to display a six digit number and both provide “ Yes” and “ No” buttons.

Numeric Comparison

For example, A PDA can use the pairing scheme with a PC. During the process of pairing, each of the devices displays a six digit number matched from the pairing protocol. The user of each device is believed to compare the two numbers and select “ Yes” if they match and “ No” if they mismatch. The numeric comparison is executed over Bluetooth, which is in the in-band channel in the standard model for authentication.

Just Works Method:

The Just Works model is proposed when at least one of the devices has no display or “ Yes/No” buttons. This model is commonly used when pairing a Bluetooth headset with a cell phone. This method is similar to numeric

comparison model but it does not display the six digits for comparison it uses numeric comparison internally. Even if one of the device displays numbers it won’t be compared on the putatively paired device because the Just Works model lacks any out-of-band channel required by the standard model. This model does not provide security against active attack.

Out of Band Method:

The “ Out-of-Band” method is used when an alternate communication medium exits on both the devices, such as Near Field Communication (NFC). The alternate communication medium transfers a key between the proposed devices and functions as the Out-of-Band channel in the standard model.

Passkey Entry Method:

The Passkey Entry method is proposed when one of the devices has a display and the other device should have a key pad. The device which has got display randomly generates a six-digit number and the user enters this number on the other device using keypad. Like the numeric comparison an attacker can negotiate the six digit pass key with a probability of at least 2-20. The protocol which divides the passkey in to 20 bits and unveils one bit over 20 rounds of exchange. Each bit of the passkey can be computed by an eavesdropper after it has been sent. A passkey can be used securely only once.

Pass key Entry

Why attendance should be taken?

According toMelchiorre, et. al. (2003), To verify the accuracy of attendance records, the research team visited Southwest Community Center three times on different days of the week at different times. During their visits the research team conducted random head checks, looked at the attendance and registration records. They discovered the flow of passage throughout the Southwest Community Center. During the head checks, the number accounted on the attendance sheet was compared with the number of members present. While these attendance sheets do not contain time in and time out and the head checks could not show whether the attendance recorded correctly or not. This results inaccurate attendance. Finally we could not know how many persons were present during the entire hours of operation. Problems with the attendance can be recognized as unclear understandings of job responsibilities.

According toMary. (2005), A small California startup called InCom has developed a radio frequency identification (RFID) system called Inclass which is used automate student attendance in elementary and secondary schools. This system uses ultra-high frequency (UHF) readers which are mounted at the entrance of the class rooms and passive RFID tags are embedded to student ID cards. This InClass system was tested at Brittan Elementary School in Sutter, but the use of RFID in schools was protested by the parents of Brittan students. The Brittan school administrators were interested in the product in part because California bases school assist upon attendance numbers.

The InClass product working scenario: Each of the students ID card comprises of unique 15 digit ID number written to each tag and associated with name of the student. When the student pass through the reader interrogation area at the class room entrance, the reader immediately sends the tags unique ID numbers to a central server. Software program was developed by the InCom and it is installed on the server where it collects the tag data and uploads a list of present, absent and tardy (based on when they enter the classroom) students to the PDA which is issued to the teachers. The upload can be done wirelessly over an 802. 11b Wi-Fi protocol. Now theteacherwould perform a visual check on the InClass generated attendance list by examining the class quickly to compatible what the list says with class room present number. Once the attendance was confirmed, the list is sent to the school administrators via PDA. School administrators need to file attendance records to the board ofeducation. Later school administration tested the InClass product to see whether it could decrease the amount of time taken by the teachers to take attendance manually.

Contactless communication API:

According toEnrique (2008), the contactless communication API java specification specifies a set of proximity, contactless-based communication. These specifications are defined under the java community process as JSR-257 and led by Nokia.

JSR 257 Packages:

Out of all these packages mainly we use javax. microedition. contactless API. The contactless communication API permits us to Discover and Exchange

data with contactless targets such as NDEF tags, RFID tags, and external smart cards. This API also provides support for visual tags. The following diagram demonstrates the relationships between the different API classes and interfaces.

Fig: Contactless Communication API Relationships

Source: http://java. sun. com/developer/technicalArticles/javame/nfc/

Applications using Contactless Communication API usually follow the flow demonstrated below.

Fig: Typical flow of a Contactless Communication Application

Each of the steps are explained below.

The first step is basically for the application to query the implementation to discover the supported targets by the device.
Here the application registers a target listener to receive activity notifications for each of the supported targets. On the other hand the application registers with the PushRegistry for the activation due to target activity. The supported target activities are NDEF and secure element in card emulation method activities.
When the targets come in to proximity they are discovered by the implementation, which notifies the application by invoking the right activity listeners. On the other hand PushRegistry activates the MIDlet.
The application can learn the target properties for each of the discovered target.

The application can be connected to read, write, exchange data with the discovered agent.

When the job is done the application releases the resources.

Design

This phase will produce outline of the system architecture and the prototype of the application that will satisfy all requirement analysis. In this stage all the necessary input, user interface and process will be identified. This phase also determines the application architecture which will show how to transform the logical design in to basic system coding to generate the first prototype of the system. The result of this phase is application interface and system design specification.

This research proposed an outline for student’s attendance monitoring system using RFID technology. Implementing this kind of system will maximize lecture time and provide convenience to them.

This application uses Nokia 6212 NFC mobile as a RFID reader and are placed at the entrance of the classroom. The MIFare RFID tags are attached to the student ID cards. A unique ID number is written to the tag. When the student scans the ID card through the reader range at the classroom, the reader sends the tags unique ID numbers to the computer via Bluetooth.

Description:

A framework includes the hardware of the system, and describes how it works. However, the reader must be placed at the entrance of the classroom to read the student ID cards (Tags) of every student who attends classes.

This proposed research mainly contains four components which are discussed below.

The reader: RFID reader is responsible for communicating with the tag and it uses radio waves to retrieve data from the tag.

The tag: RFID tag is an integrated circuit which is embedded on the student ID cards. This research proposes to use passive tag, which does not need any battery. This type of tags gets it power from the reader.

Software Development process:

This software application uses Contactless Communication API (JSR-257) which comes with Software Development Kit for Nokia 6212 NFC mobile phones. Nokia 6212 NFC SDK allows the users to develop Java applications (MIDlets) for Nokia 6212 NFC mobile phones. The contactless communication API mainly gives access to many contactless cards and communicates with them. Some of the use cases of Contactless Communication are calling a taxi by touching tag given by the taxi company and linking to a web page by touching a smart poster. In order to discover and communicate contactless targets, the applications should use classes and interfaces of this API. The contactless cards which pass through in the radius of NFC device can be recognized by any instance of DiscoveryManger class to receive notification. Then the device can set up a target particular connection defined in the subpackages with the detected target. The link required to open connection to the target device is given in the TargetProperties parameter. For example, for an external smart card it can be ISO14443Connection. Access and

modification of data is provided by the methods of this connection. The data exchange format (NDEF) allows communication between an NFC device and another NFC device or with a tag which is defined in the NFC forum. Any device that supports NDEF data formatting is capable to communicate by using APDU (Application Protocol Data Unit) commands given by the Contactless Communication API. Record Type Definitions (RTD) which is supported by the NDEF defines the rules and formats for creating standard record types to be used by NFC Forum application definitions and offers users to create fully compatible applications. The four specific RTDs defined by NFC Forum are:

NFC Text RTD: In this method by using NDEF format and RTD mechanism which allows storing text strings in multiple languages. An example of using this specification is integrated in the Smart Poster RTD.

NFC URI RTD: Like the above method this technique also uses NDEF format and RTD mechanism to Uniform Resource Identifiers (URI). An example of using this specification is included in the Smart Poster RTD.

NFC Smart Poster RTD: This method allows SMSs, URLs, phone numbers on an NFC tag, or to transport them between the devices. The Smart Poster RTD establishes on the RTD mechanism and NDEF format and uses the URI RTD and Text RTD as building blocks.

NFC Generic Control RTD: This method offers a simple way to request a specification to an NFC device (destination device) from another NFC device, tag or card (source device) trough NFC communication.

The class diagram that shows the relationships of Contactless Communication API.

Application Development:

Programming Languages and Software Tools:

DevelopmentEnvironment:

Microsoft Windows XP (SP2)

Eclipse pulsar 1. 3. 2

JDK 1. 6

Nokia 6212 NFC mobile phone

Mifare 1k or 4k tags

Nokia connectivity frame work 1. 2

Nokia 6212 NFC SDK 1. 0

Apache Tomcat Server 6. 0

Developing Application Tools:

Java:

According toGosling, et. al. (2005), Java is a high-level object-oriented language produced by Sun Microsystems. Java is operating system independent since it uses Java Virtual Machine to interpret and execute the previously compiled code in different environments producing the same output.

I have chosen Java technology as programming language to carry out this project. I have chosen Java technology as programming language to carry out this project. During this project i have used Java Standard Edition Development Kit 6 (JDK 1. 6), the Java Standard Edition Runtime Environment (JRE 1. 6) and Java Micro Edition with the Software Development Kit 3. 6 (Java ME SDK 3. 6) which also includes Java Wireless Toolkit 2. 5. 2.

J2ME:

According toShenbagaraj, (2011), J2ME is called as Java to Micro Edition. It is an advance technology in java, developed with the help of Java Community Process Program. J2ME is specifically designed to operate within the limited resources available in the embedded computers and microcomputers and it is a low version of Java API and Java Virtual Machine. The J2ME mainly targeted the developers of small computing devices and intelligent wireless devices who want to incorporate cross-platform functionality in their products. The main advantage of using J2ME is compatible with all java enabled devices. The java enabled devices are Nokia, Motorola and Panasonic. J2ME application acts as a balanced application between local and server-side processing.

MIDlet:

According toShenbagaraj, (2011), A MIDlet is a J2ME application which operates on an MIDP. A MIDlet can be defined with at least a single class that is derived fromjavax. microedition. midlet. MIDlet abstract class. A MIDlet

can be called as a event-based application. All the routines that are executed in the MIDlet are initiated in response to an event reported to the MIDlet by the application manger. The application manger invokes startApp() method when the MIDlet is started. The startApp() method in a MIDlet contains a statement holds a statement that displays a screen of information and informs the user to enter a selection from the list of the list of options provided. A Command object is used to inform the user with a selection of options to opt from when the screen is displayed. Each screen should have a CommandListener. A CommandListener follows the user events with a screen and makes the right code to execute on the current event.

Java Libraries:

According toSun. (2006), A java library can be referred as a set of resources required by a project. Typically a library contains one or more JAR files containing compiled classes, the source file required to debug the classes, and java documentation for the classes. A project can reference one or more libraries for the purpose of compiling java files or additional JAR files in the deployed application. In IDE the Library Manager allows you edit and create libraries.

I have used few libraries which are downloaded from internet and added to the code to fulfil the requirements of the application. These libraries or APIs that communicate with some of the specific elements or implementations that have been used during the project development. They are

BlueCove (JSR-82):

According toBlueCove, (2008), BlueCove is a Java library for Bluetooth (JSR-82 implementation). This library currently interfaces with the WIDCOMM, BlueSoleil and Microsoft Bluetooth stack found in Windows XP SP2 or Windows Vista and WIDCOMM and Microsoft Bluetooth stack on Windows Mobile. BlueCove offers JSR-82 java interface for the following profiles:

SDAP – Service Discovery Application Profile
RFCOMM – Serial Cable Emulation Protocol
L2CAP – Logical Link Control and Adaptation Protocol
OBEX – Generic Object Exchange Profile (GOEP) profile on top of RFCOMM and TCP

UploadBean:

This API simply reads and stores the uploaded files sent the browser. It is a technical component that can be integrated in any Java/JSP/Servlets application.

Servlet:

According toStephanie. (2002), A servlet is a java programming class which is used to extend the facilities of servers that hosts applications accessed through request-response programming tool. The servlets give response to any type of request and these are normally used to extend the applications hosted by the web servers. Java servlet technology usually defines HTTP specific servlet classes.

JSP:

According toStephanie. (2002), Java Server Pages (JSP) technology is used to create web content that has both static and dynamic components. JSP technology provides a normal approach to create static content. JSP presents all the dynamic capabilities of Java Servlet. The main advantages of JSP technology are:

A language for developing JSP pages, which are text based documents that illustrate how to process a request and construct a response.
Techniques for defining extensions to the JSP language.
Constructs for accessing server side objects.

Developing platform:

Eclipse:

According toBob, (2008). Eclipse is a software development platform developed in java and mainly used to develop java applications. It provides an IDE and a complete set of plug-ins. In eclipse except the eclipse kernel, everything is treated as a plug-in. This plug-ins expand the application features and permits the developers to program in different languages like C, C++, and COBOL etc. This also includes management of databases, extending network capabilities, creating web services etc by using eclipse’s interface. In total the Eclipse Plug-in central has gathered more than 1200 different plug-ins for eclipse, some of them are developed by third parties and released to the community.

In this project, I have used EclipseME plug-in which helped in developing J2ME Midlets and Suite projects, supports J2ME emulators and offers JAD editor as well as connecting to the already installed wireless toolkits.

Apache Tomcat Server:

Apache Tomcat Server is free open-source software from Apache Software Foundation (ASF). It can be defined as a container where java Servlets and Java Server Pages (JSP) files are placed and afterwards invoked. In this project i have used Tomcat 6. 0 version and made use of configurations.

Management Console:

The management console offers a web interface where the parameters of the developed application can be configured. It consists of JavaServer pages, which are hosted in the Tomcat server. The web interface comprises of four different tabs through which the user can be capable to establish the parameters' values.

Nokia PC Suite:

Nokia PC Suite is a group of applications that permit connecting Nokia mobile phones to computers. Basically it is used to transfer pictures, musicor applications. This application is used in the project in order to send the developed Midlets to the NFC-enabled phones through Bluetooth.

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