Automation of Attendance Posting System Using Messaging Services

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Abstract: This research highlights a new model of Attendance Posting System through mobile phones using SMS feature. The proposed system eliminates all kinds of paper work involved in traditional attendance system. This is a one step process, which eliminates redundant data and efforts. The proposed system can also be programmed to send attendance reports in the form of short messages to parents and students regularly. In the proposed system, a user is given an application which, as a prerequisite has to be populated with student's data. The user needs to authenticate him/her self using a username and password. The application has a simple user interface displaying a list of students' names and their register numbers. The user marks the presence of a student using a check box. The marked attendance is converted to a predefined report format and is then sent to a server in the form of a SMS. The SMS is the analysed at the server side and is updated to the respective students' ERP accounts. This system does not require a third party provider like SMS Gateway Hardware or a Commercial SMS application developer. This system can be further extended as an application that can be implemented in any educational institution.

Keyword: Attendance System, Mobile System, Economical, Mobile Phone Application, J2ME Applications, SMS Services.

I. INTRODUCTION

Short Messaging Service (SMS) is being widely used to send messages among mobile users. SMS serves as an effective information providing service in today's scenario and is widely used in variety of applications like E-banking, E-marketing, Weather, news, travel etc., Ease of use and affordability are attributed to increased penetration of mobile phone use in the recent years. SMS has been proven very popular among the users of mobile phones and mobile operators continue to promote it by offering many SMS-oriented services like railway PNR status enquiry, balance enquiries, etc. It is very easy and cost effective to use SMS as there are several network providers like Idea, Airtel, and BSNL etc who provide unlimited SMS services to their subscribers on a minimal monthly rental basis. Keeping this fact in mind the following architecture has been designed by us to simplify the complicated and data redundant attendance posting system using SMS feature in mobile phones. Attendance posting system has been ignored since eras in all educational institutes. Every educational institute requires attendance, based on which it can assess a student's regularity, eligibility in the college for various programmes. But still, almost all institutes fall back when coming to the attendance management system. Almost all institutes fail to update their students' attendance details regularly. Some efforts were made previously to make the entire process simple, but they involved lot of economical hurdles. Keeping all those drawbacks in mind, we designed the architecture targeting cost cuts, removal of redundancy in work and removal of time lag in updating the attendance details to the central database. The general procedure in educational institution is to computerise the attendance processing system where the first step is to mark the attendance in a register booklet and then update the register details to the central database at a later time. This process involved lot of draw backs like redundancy of work, time lag in update process, missing of attendance reports or registers etc...

In our proposed system, it is assumed that every instructor would possess a Java enabled mobile device. Information about the students registered to the course offered by the instructor will be available on the mobile device. Instructors can initiate the application present in the mobile through authenticated username and password. After the user authentication stage the instructors will be provided to choose the week day and hour for which the attendance has to be marked, upon entering the weekday and hour the students name list of registered students for that Instructor will be displayed. Instructors then have to use the navigation keys to browse through the list and mark attendance using the navigation keys. Once the attendance entering process is over, the attendance details will be converted to a predefined format, which will then be compressed, encrypted and finally the message is sent to the a mobile device or a modem connected to a server PC as an SMS. The modem or mobile device connected to the PC is constantly listened over a com port and whenever an SMS is received, it is validated against a general encrypted message format. Upon success that SMS is decrypted, analysed and the results are updated to a central database. This system can be integrated to the existing student attendance processing system through the pre-registration and post-processing modules, which can be fine-tuned based on the existing applications.

II. EXISTING SYSTEMS AND THEIR DRAWBACKS

Most of the Educational institute follow manual process of marking the students attendance, while others have designed and developed an attendance processing system. It is observed that very few attempts have been made to develop an efficient attendance marking system. In the present electronic attendance processing system, in most of the educational institutes, first the course instructor has to mark the attendance register and later post it on the

attendance processing system. Drawbacks in the existing system are that an instructor might lose the attendance register or an instructor may find marking a register cumbersome and misplace the attendance register or may forget to post the entry in the attendance processing system. Certain attendance processing systems enables the students and parents to monitor the attendance through a web, delay in posting the attendance leads to obsolete information to the Students / Parents. Interestingly researchers have demonstrated the use of mobile phone communication through e-mail for effective interaction between the instructor and the student where student and teacher can communicate through email system [3]. [4] have designed an attendance management systems based on image processing technique. Where, the instructor simply takes a picture of the class with the camera in the mobile and sends the picture to a server. The server computer processes the image and identifies the faces of the students and matches them against the faces in its database. The major disadvantages are cost involved in providing every Instructor with a high resolution camera enabled mobile phone; the instructor should be able to capture the picture of the class without photographical errors. In case of an erroneous picture, the clarity may be fine for human eye and not the computer. Hence this system failed. [5] One more system based on RFID technology was proposed where every student identity card is tagged with an RFID chip. This system is also not successful as it requires a lot of initial setup in every classroom. The major drawback with this system is that, even if the student is absent, some other student may bring the absentee identity card and post his attendance. Hence this system failed. [6] One more proposed system used wireless finger print system, where students' finger prints are recorded in a mobile or some other device and the information is sent to a server, where it is analysed and attendance is updated. This system works out well if the attendance is to be marked only once in a day. But this fails if the attendance is to be marked by the instructor for every class that they attend. Because it will be tedious not only to collect the finger prints of students for every class but also it is tedious to process a lot of finger print information every hour. [7] Proposed a design of a cost effective RF based attendance and access control system. The design utilizes a low cost and readily available wireless door bell for wireless transmission of user information. Here a computer based software checks the in and out time of individuals and use that information to process their attendance. But this also has same defect as the above mentioned systems, also this system doesn't suit for students whose classes keep changing from place to place every hour. [8] Proposed a long-distance non-contact IC card and computer video technologies are adopted to design a set of management system for monitoring staff attendance. This system provides a number of advantages, such as non-contact to read, anti-swipe fake card, easy to operate, high reliability and efficiency and so on. But it still could not solve the problem of a student bringing the id card of an absent student. All these proposed systems turned out to be very expensive and complicated. Hence they failed to reach every institute requiring an efficient attendance system. Later on the concentration turned to the point of updating the attendance quickly to the database, by marking the attendance in an electronic gadget like a laptop which is connected to a private network of the institute. [9] The conversion of attendance record system from manual to online is reported in this work. The improvement of the system has been successfully tested in an international college in China. There are two major components contributing to the improvement of the attendance record system, firstly is the reliable and fast network and secondly the smart excel spreadsheet. But the trouble turned out to be a reliable network and its administration for every institute also costly laptops involved in accessing the network. A need for a simple, economical and robust attendance posting system has become a must. While the concentration in most of the trials was to develop a better interface, the point of lag in updating information is ignored. This is the most important issue of the entire attendance system. In an attempt to solve this issue, we propose the "Automation of Students Attendance Posting System Using Messaging Services" architecture. This architecture is developed with utmost priority given to make it economical, user friendly and adoptable by everyone. Where the time lag involved in updating the entire attendance can be reduced to minimum of the delivery of an SMS and a maximum delay of delay in delivery of SMS.

III. FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

A. *Functional Requirements*

[a] The system shall have facility to create login page for the user and it allows only authenticated login.
[b] The system shall able to display the student details with following information like regno, name of the student.
[c] The system shall provide the access to the user to enter their attendance.
[d] The system shall have automatic editing function; So that whenever user wants to do any modification and updating that can be done.
[e] The system shall provide a facility to mark only the absentee's.
[f] The system shall have facility to send their attendance information to secured server.
[g] The system shall have facility to send the messages in secured way.
[h] The system shall have facility to generate the report once user has entered their attendance.

B. *Non Functional Requirements*

[a] The system shall have more security
[b] The system shall have easy access to the user
[c] The system shall have quicker communication
[d] The system shall have user friendly graphical user interface.
[e] The system will be platform independent
[f] The system shall have facility to perform more one than one task simultaneously.

IV. PROPOSED ARCHITECTURE AND ITS DIVISIONS

A. *Construction of database and mobile application*

This phase involves creating a database of all required details and implementing it in a mobile and creating a mobile application for accessing the database. Database consists of tables with attributes like name of student,

subject, corresponding faculty, weekday, hour, username, password etc regarding the mobile application:

[a] The mobile application:

The mobile application is developed using J2ME technology. This application provides a user login page which on successful login forwards the user to a page which intakes the weekday and hour details from the user. Later the database is queried and data corresponding to the query is retrieved. Data retrieved is displayed with checkboxes against students' names. The user interface provides an option to mark the students who are absent using a button click.

[b] Algorithm implemented in application:

The algorithm behind the process of accessing the database is that for every student there exist a corresponding Instructor name and a list of weekday and hours for which he is engaged to the Instructor. This correspondence is matched against the combination of available username and required weekday and hour combination obtained from the user. Doing so a short list of names is obtained which is the required list of students.

[c] Encryption Necessity:

The marked attendance can be converted to a string using programming techniques. This string is the required attendance report. Now this report is sent to the server as an SMS. But as SMS is sent through an external network, security cannot be assured to full extent. To handle this purpose, the report can be encrypted strongly so that even if the report goes into wrong hands, it can't be accessed. Encryption can be achieved using the available encryption algorithms or a new encryption technique can be designed. Once the report is encrypted, it can be sent to a predefined mobile device, which acts as a link between user and server.
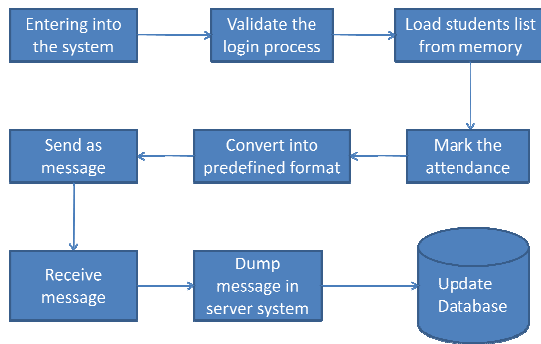

Figure 1. State flow diagram

B. Middleware Mobile / Modem

The SMS from the user is received in a mobile/ modem connected to a PC via a com port. This device keeps receiving SMS's from various authenticated users continuously. This device is continuously listened on a port and whenever an SMS is received, it is read using the AT & T commands and is fed as an input to the backend server (the program in PC to which device is connected).

C. Backend server functionality

The backend server (a program in PC with access to original students' attendance database) consists of an

application developed using J2SE/VB language. This application mainly consists of decrypting algorithm to decrypt the received report. The report is then analysed and the database is accessed to make the necessary updates as indicated in the report.
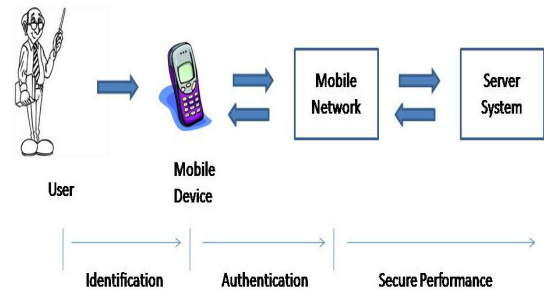

Figure 2. Overall view of proposed system

V. ENCRYPTION TECHNIQUE USED

As we have already discussed the importance of the encryption in this application, now we move forward to discuss the encryption technique chosen by us and the reasons behind choosing the technique. We have chosen the elliptic curve technology to encrypt the message which is being sent over an external network. There are many encryption techniques available, like DES algorithm, RSA algorithm etc….But there are some reasons why elliptic curve cryptography is chosen. First of all we are working on a mobile device, and for mobile devices, the major drawback is the power. They work over a rechargeable battery. Every encryption technique requires a lot of mathematical operations to perform encryption. We cannot simply use major part of the battery energy just for encrypting a message. So while working over a variety of encryption techniques, we came across the fact that, ECC is a public key cryptography technique and it provides the same security as provided by the RSA algorithm using 1000 bits key, just for 160 bits key length. Thus if we use this encryption technique, we can reduce the power consumption. Also this technique is very powerful.

VI. MODULES

A. Pre-registration Module

[a] Used to register the subjects handled by the Instructor in mobile set
    [i] Convert required data from the back server to the mobile device
    [ii] Registration of course, student to the Instructor
    [iii] Assignment of register numbers to the students
    Iv] Setup of Security related parameters

[b] This Setup procedure is carried out once in a semester / trimester.

B. Attendance Posting Module

[a] A GUI Module used to mark attendance of the students
    [i] User authentication
    [ii] Marking of students attendance
    [iii] Encrypting the data using standard encryption techniques
    [iv] Create and send the data as an SMS to a

predefined number

C. *Post-processing Module*

[a] Conversion of data from the mobile device to the required backend server format

    [i] Receive the SMS

    [ii] Read the SMS from the mobile/modem device and transfer into system for post processing

    [iii] Decrypt the message

    [iv] Identify the sender and check the credentials

    [v] Convert the string into appropriate format as per the specification of the existing back end database

    [vi] Update the existing database

[b] This module should be executed continuously by listening on com port to update the existing database. Preferably twice in a working day.

VII.   ONGOING WORK

The proposed mobile application is coded and given to a Instructor. A very satisfactory feedback is received regarding the system. The Instructor found the system to be extremely user friendly. It is also expressed that, as the instructor is from a non-computer background, the burden of operating on the ERP for posting the attendance is relieved. Also it is expressed that double work of marking attendance in the register and then posting it to the ERP has been avoided. The Instructor is now totally unwilling to go back to the previous system. Currently we are working on the security issues of the system. We have successfully implemented a basic ECC technique. Now we are designing a new technique to encrypt and decrypt the message using the Elliptic Curve Cryptography.

SCREENSHOTS OF MOBILE PHONE APPLICATION

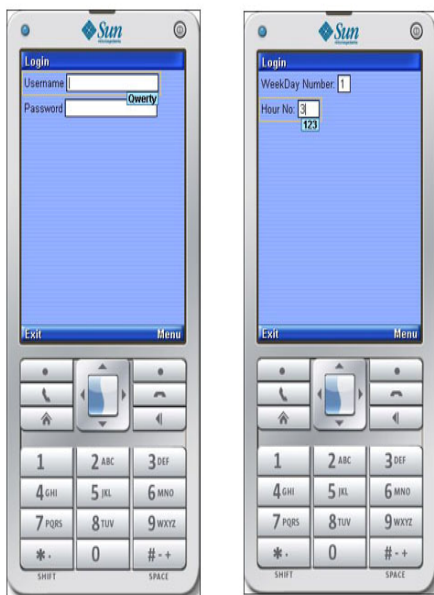Figure 3. User login page and data entry page

Figure 4. Student list page and composed message page

VIII.   ADVANTAGES

A. Time lag in attendance system can be conquered.

B. Unnecessary access to ERP, Internet, and Intranet can be avoided.

C. Unnecessary cost involved in printing registers can be avoided.

D. Data redundancy can be reduced.

E. Economical than other techniques as cost of SMS is user plan dependent. (Free SMS is also very much possible depending on the service provider)

F. Data entry errors don't occur.

G. Obsolete data never occurs.

H. High security is provided for data.

I. System can be embedded into existing systems.

J. More modules as per requirements can be added.

IX.   CONCLUSION

In this paper, a new attendance monitoring system is proposed. The algorithm implemented in the application has been newly deduced. This application makes use of three existing technologies, combines them and reaches its goal. The experimental tests have been carried out and the results show the correctness of the approach. The advantages and slight disadvantages of this application are also discussed in the paper. In an overall view, this turns out to be the most economical attendance processing technique available as of today.

X.   REFERENCES

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