ATTENDANCE SYSTEM USING CLOUD COMPUTING

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Abstract -The aim of this paper is to discuss the implementationand designing an automatic attendance registration system based Mobile Cloud Computing. A prototype for managing and control the registration of student attendance is developed using Phone Gap and jQuery mobile framework. However, the mobile app is designed to help students for checking their presence details, such as the number of missed classes, and the percentage of absence. Automate the process of roistering students' attendance using Bluetooth technology will reduce the falsification of attendance which will make students to attend classes regularly. Moreover, using the Bluetooth address for the student attendance registration based on the cloud will be costless, that is because all students have their smartphones with built-in Bluetooth. Moreover, building and designing a desktop and cross-platform mobile application to control and follow the attendance process and print out the suitable reports. However, the benefits of using cloud computing and mobile technology in education institution will cost less than a traditional data center. The proposed registration system is less the time of recording the student attendance with highaccuracy.

*Key Words***:**Attendance, Cloud computing, jQuery, Framework, journals.

1.INTRODUCTION

Cloud computing is recently appeared as IT industry as a new model for delivering secure, fault-tolerant, reliable, sustainable, and scalable computational services through the Internet. These services include platform as a service, infrastructure as a service, and software as a service. In the last few years, Cloud Computing draws the attention of business owners since it eliminates the requirement of planning for the provision of resources in the future as well as it allows companies to start without thinking about IT infrastructures such as servers, network, and data storages. National Institute of Standards and Technology (NIST) define Cloud computing as "a model for enabling convenient on-demand network access to a shared pool of configurable computing resources, such as networks, servers, storage, applications, and services, that can rapidly be provisioned and released with minimal management effort or service provider interaction"[1]. The structure of Cloud Computing can be divided into four layers: hardware, data centers, infrastructure, and platform and applications layer.

This paper proposes a Mobile Cloud Computing model for automatic academic attendance system. Cloud Computing provides a significant number of computing resources, which can be used to come over these limitations on mobile devices. Combining the mobile devices and Cloud Computing can create a new structure called Mobile Cloud Computing (MCC). In MCC structure, data storage and data processing systematically saved outside mobile devices.

Educational institutions have now adopted the use of Information and Communication Technologies to achieve more efficient and competitive system in delivering both, lectures and administrative processes. Furthermore, if the students want to check their fees, then they can enroll courses online payment, or check their attendance. Therefore, there is a need to automate university's processes and work. Integrated Academic Management Systems is expensive. However, finding alternative ways to meet customers' expectations within constrained budgets is an important matter [I]. The registration of students' attendance is done manually, which considered as a serious issue. It is not a trivial task due to time-consuming, and it is hard work to record by the lecturer in each class even when the classroom is small. Thus, repeating of the recording process for each class will result in an increased level of the possibility of failure to get accurate results. There is a big correlation relation between the attendance and the academic success [3]. Hence, attending lectures on a regular basis helps students to get the correct level ofunderstanding.

The study of possible technologies helps to propose a solution for implementing an automatic model for academic attendance system. This paper aims to automate the process of registering the student's attendance to reduce the time and effort required to complete the registration of students with high

efficiency. Therefore, the study of existing technologies such as Bluetooth [4-8], QR code (by utilizing mobile phones), RFID, IMEI, fingerprint, hand geometry, and the iris is needed to discover suitable ways to implement the proposed system. Indeed, different factors for measuring the efficiency of proposed system needs to be taken in considerations such as cost, time taking per student, performance, acceptance, usability, and the possibility of adopting and implementing the environment of the university. using Cloud Computing will

raise some problems and limitations because the application that use cloud need a a constant Internet connection with high speed [9,10]. Also, this research will include three types of identification technologies,which are Bluetooth, near field communication (NFC), and Radio frequency identification [RFID]11.

The work aims to propose Mobile Cloud Computing model as a solution for students' attendance. Also, it will build and design a desktop and cross-platform mobile application to control the attendance as depicted in Figure 1.

TABLE 1: BLUETOOTH TRANSMITTER POWER CLASSES

Power Class	Maximum Output Power	Operating Range
Class 1	100 mW (I0 dBm)	100 meters
Class I	I.5 mW (4 dBm)	10 meters
Class 3	1 mW (0 dBm)	1 meter

Fig. Overview design of students' attendance management

2.BLUETOOTH TECHNOLOGY RANGES

Bluetooth technology vary is application specific. The Fundamental Specification mandates that one meter is that the minimum vary of Bluetooth. in line with the official web site of Bluetooth organization, there's no limit for the vary of Bluetooth, the makers they will offer the vary required that support their use cases for various solutions. However, the vary of Bluetooth technology depends on the ability category, that is employed within the implementation. There are 3 core radios categories of Bluetooth technology as shown in Table one. category one radios may be found in industrial use cases, that encompasses a most vary up to a hundred meters. category 2 radios largely found in mobile devices, that encompasses a vary of ten meters. Moreover, the vary of sophistication three is one meter.

Bluetooth core power category one can be wont to cowl schoolroom with dimension 50M*50M, as a result of as we all know the vary of sophistication one is a hundred meters, therefore by golf stroke Bluetooth transmitter device with NFC may be a short-range contactless wireless communication technology. It provides a secure and easy method for electronic devices to start out communication between one another. It based mostly of RFID. users UN

agency have NFC-enabled devices such as Smartphone or pill they will get in a straightforward thanks to link their devices to different NFC-enabled components to start out the communication. The communication between NFC-enabled devices is inside few centimeters because it a short-range wireless technology. The advantage of short transmission vary is that it prevents eavesdropping on NFC-enabled transactions.

The processes involved in the bluetooth based attendance system are quite simple as it will not require any complex procedures that should be followed in order to take the attendance. Starting from taking direct Input from user will be a key part in this process then the user will look up bluetooth MAC address and enters into profile via webpage User interface based on the different procedures as per manufacturer of the mobile phones. After that a windows program will display a list of Bluetooth Connections in range and corresponding MAC addresses.

Bluetooth based attendance system will operate in the same range of the spectrum as of the standard Bluetooth technology. Bluetooth will connectthedevicesofstudentsandlecturerwiththehelpoftheandroid application.Theapplicationwillsearchforsuretyofthestudentsdevice which is nearby to the range of android applications possessing device. If the student device which is already registered and is detected will be treated as validated, it proceeds to the database program and after that will essentially
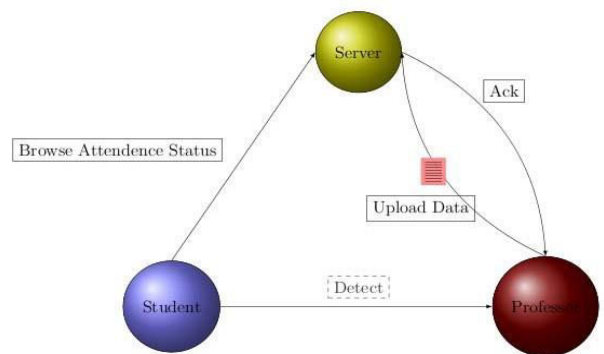

Fig.Proposed model architecture

On the off chance that the understudy gadget which is enrolled and not identified, that one will be considered as the missing for that specific subject taken by the teacher.
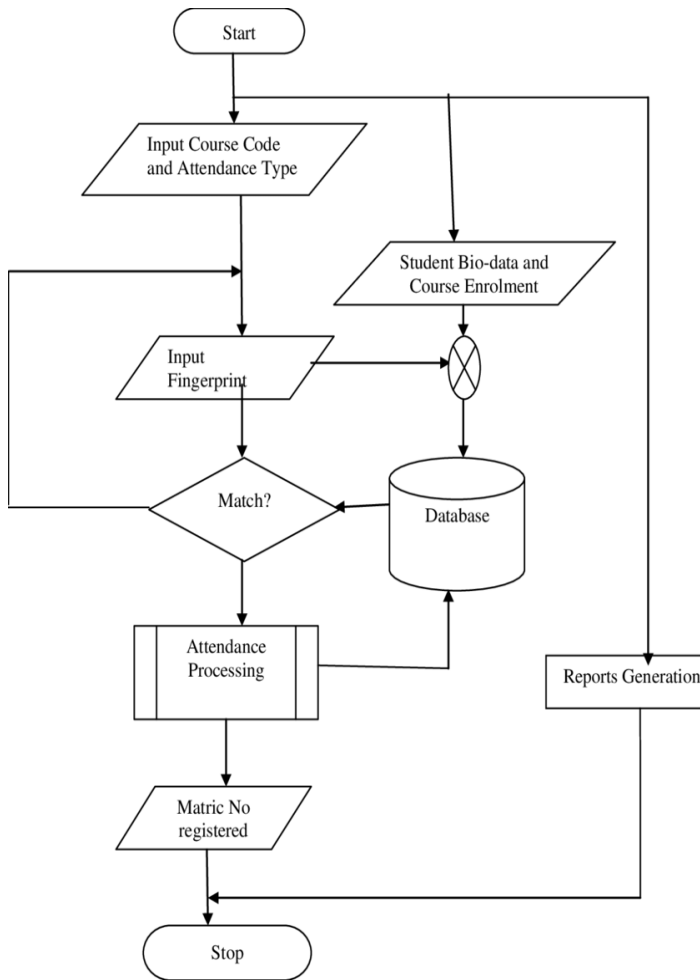
Fig.Flowchart of the student attendance system to process the information.

3.NFC STANDARDS AND COMPATIBILITY

NFC is a short-range contactless wireless communication technology. It provides a safe and straightforward way for electronic devices to start communication between each other. It based of RFID. nsers who have NFC-enabled devices such as Smartphone or tablet they can get in an easy way to link their devices to other NFC-enabled elements to start the communication. The communication between NFC-enabled devices is within few centimeters as it a short-range wireless technology. The advantage of short transmission range is that it prevents eavesdropping on NFC-enabledtransactions.

NFC has sets of specifications like:

•Operates within available and unlicensed radio frequency ISM band of 13.56 MHz. The bandwidth of NFC is almost IMHz.
•Working distance up to I0 cm with standardantennas.
•Supported data rates 106, I1I, or 4I4kbit/s.
•NFC has two modes: Passive Communication Mode and Active CommunicationMode.
There are two coding to transfer data, modified Miller coding, and Manchester coding. NFC-enabled Devices have the abilityto transmit and receive data at the same time. NFC is an openplatform, developed by Sony and Philips. NFC which

described by NFCIP-1 is standardized in ISO 1809I, ETSI TS 10I 190 as well as in ECMA 340. nsing standard to specify capabilities like encoding schemes, the architecture of frame, modulation, transport protocol, and data transfer speeds. In addition, the standardized described the two modes of NFC which are passive and active modes, as well as specify the conditions needed to avoid collisions while initialization. However, NFC device do not use NFCIP-1 only, but there is NFCIP-I which is standardized in ISO 1809I, ETSI TS 10I 190 as well as in ECMA 340. There are three modes that could be selecting. NFCIP-I allows selecting of one of these three modes:

- NFC data transfer(NFCIP-1),
- proximity coupling device (PCD), defined in ISO 14443,and
  - • Vicinity coupling device (VCD), defined in ISO15693.

4. LITTERATURE REVIEW

Marcos et.el developed an attendance control system, as a solution for student's attendance using NFC technology. The students used their mobile devices, enabled with NFC. Students, who have mobile devices without NFC technology, have been asked to use NFC tag which. Also, they developed mobile application using jQuery Mobile [13], the mobile app provided information about the subjects, the student has enrolled-in, and calendar with indication of classes missed or attended. Patel, et. al. [14] proposed an architecture for attendance system using RFID technology. Their proposed architecture consists of RFID tags, RFID reader, database server, application server, and middleware. During class time, RFID reader scans students' tags and then sends the collected information to middleware layer to perform some filtering. In the application server layer, there is software receives row data and then query the database to search for student ID and mark him/her as a present. The Proposed architecture automated the attendance process with using of less costing materials.

Zhao and Gao suggested and implemented dynamic attendance system [15]. The system consists of four main parts include RFID tags, RFID readers, transmission network, and server. The tags can transmit signals to be detected by the RFID reader. The user is responsible for reading the information of the electronic tags. The transmission of data is conducted through the transmission network. Whereas the server is responsible for processing the data as well as updating the database after the attendance is over. To record the attendance in a classroom, the server will invoke the RFID reader. This will be sent through the transmission network. Then the RFID reader read the students' tags in a classroom.Then collected data of students will be sent back to

the server, and finally, the server will query the database to store the data to identify who attend the class. The proposed system by Zhao and Gao had weaknesses such as inaccuracy of the RFID reader while reading students' tags of adjacent classrooms. To come over this problem, they proposed the date comparison algorithm, to eliminate the interference of other RFID tags of the adjacent classroom. Ivanilson et. al., introduced an automatic attendance register system for the Cape Peninsula nniversity of Technology. They concluded that the proposed Academic attendance register system would help lecturers to keep track of students, measure their attention, and determine their performance. However, due to inefficient and inconsistent of the manual attendance system in the Cape Peninsula nniversity of Technology, they studied set of possible technologies as a solution to gather, store, process, and validate student attendance. They evaluated the best solution which can be suitable for the environment of the nniversity. They suggested a set of technologies including Bluetooth, QR code, and RFID. Bluetooth is a wireless technology which used a radio link I.4- GHz. Shoewu et. al., proposed an attendance system through using fingerprint; as a solution for student identification in the classroom. However, their proposed solution for attendance system using biometrics improved the performance over the manual method. It takes 3.79 seconds for 80 candidates while themanualattendancetakes19.83seconds,sothesuccessratefor

the system was 94%. However, in the enrollment stage, information about student name, gender, ID, and the fingerprint are stored in the database. The fingerprint is captured using fingerprint device Lecturers can generate a report for each student that shows the percentage of student attendance. The proposed Software Architecture consists of database and application program. The type of database is Microsoft SQL Server database. It was used to store student's attendance records. The application program developed by c# programming Language using visual studio, to provide the end user interface for Attendance Management System [16]. Nawax, and Pervaiz [17], they proposed automatic attendance system, by using a fingerprint to obtain student's attendance. They decided to use fingerprint in their proposed attendance system because of the simplicity and accuracy provided by fingerprint and it widely used for identification. Regardless of simplicity and accuracy, there are two main critical factors which make it as one of the best solutions; persistence (the features do not change) and individuality (the fingerprint for each one is unique) [11,13]. The fingerprint is one of the most mature biometric technologies. The components of proposed system consist of students, fingerprint device, LCD screen, and database.

5. CONCLUSION

The conclusion for registering the student's attendance consists of three primary levels. These levels are including the following:

- Private Cloud and user level: It has the education institution servers, computers, hardware, and user's devices (smartphones, tablets,Pcs).
- Communication and network level: This level contains all network equipment such as switches, routers, and cables. It allows the users connect to the public cloud and request the information, which is stored in the cloud using their Smartphone or tablets fromanywhere.
- Public Clouds has the Information management, data mining and analysis level: public clouds, information management and analysis clouds. The information of students, lecturers, courses, and classes will be stored and processed in this level.

Illustrates these three levels Private Cloud and user level, Communication and network level, and Public Clouds, Information management and data analysis level of proposed solution. Proposed solution consists of two parts: the first part is students' attendance registering system, and the second part is students' attendance management system as mobile application. The first part of proposed solution is windows form application that is written using C# language of .Net framework. This application is need to be installed on all classroom's PC which is a built-in Bluetooth device. The application will utilize the built-in Bluetooth device in the PC to discover students' devices, if they use smartphone such as iPhone, Galaxy, HTC, or Nokia. Or even a tablet.

The student's devices should have Bluetooth put it in enable mode. However, this application will search and detect the students' devices MAC address and store them in a cloud database corresponding to student identification number. In the lecture session, the application will detect all MAC addresses and store them in the array to match up with Student's list, and registerthem as attending. The traditional method is to register the MAC address for each student one by one in the students' information database. This procedure will consume the time and will need more effort.

The advanced method is to tell all students in the classroom at the first class session changing their device Bluetooth name to be their Student ID. The application will start to discover and search students' Bluetooth Address plus Bluetooth name, then will run a query to update student information record to set the MAC address for each student. The proposed attendance registration system consists of four main components. These components are PC with the built-in Bluetooth device, Desktop application. Figure 4 shows these four maincomponents.
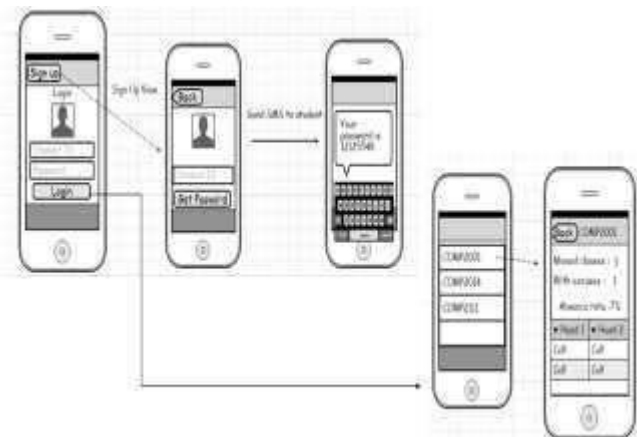
Fig. views of students' attendance management app



Fig. Screens of attendance management app

6. FUTURE ASPECTS

Automate the process of registering students' attendance using Bluetooth technology help to reduce the falsification of attendance, which make students attending classes regularly. However, the benefits of using cloud computing and mobile technology in education institution that because it cost less than a traditional data center [I0]. Registration of student attendance is not easy, especially if the classroom has a big number of students. This process consumes the time and

effort of the lecturer to complete the attendance record and then insert into the official attendance record. In many cases, the recording of attendance is inaccurate because it relies on manual monitoring and manual recording, thus eliminating the benefit of this process.

Therefore, the proposed system helps to complete the process of recording students' attendance through the use of automated methods based on the recognition of the address of phone devices to students through Bluetooth technology. And then register addresses with a database in a cloud site to provide flexibility and speed to update and access data. Also, a smartphone application was designed and implemented to enable students to follow up and learn about the attendance of their courses, to know the percentage of students enrolled in the course and any guidance messages from the lecturer to the student. The proposed program has helped reduce attendance errors and reduced the time and effort required to complete the attendance registration process. Moreover, using the Bluetooth address for the student attendance registration based on the cloud will be costless, that is because all students have their smartphones with built-in Bluetooth. It also relied on smartphone applications for speed, data access, and first-rate absences.

Relying on the Bluetooth address technology in recording the student's address in which some disadvantages such as the limited range of Bluetooth and any student can register attendance from outside the boundaries of the lecture hall if the student within the scope of broadcasting Bluetooth. A student can also use his friends' phones to record MAC address and then registered as attending. Therefore, it is proposed to add a counter to using the Arduino nno board and built counter sensor after connect photoresistor and resistor to the board as shown in Figure 11. Another solution is to apply the techniques of analyzing and identifying the student image by installing a camera at the entrances to the halls [I1-I8], and then analyzing the entry card information for each student using natural language processing [I9-38].
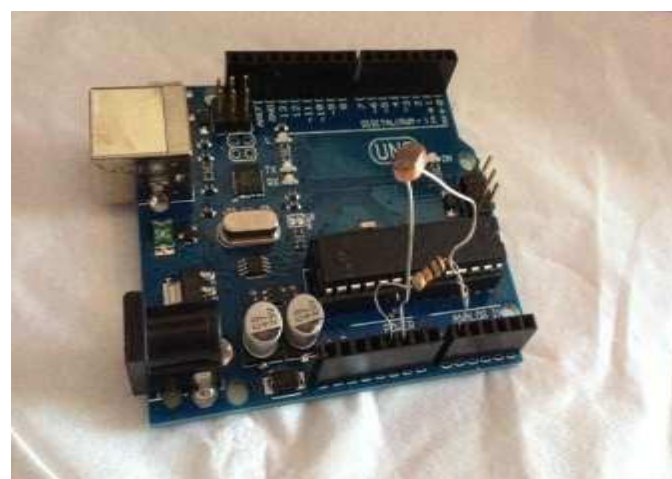
The future directions of this work is to design and implement other authentication methods, so that ensure each student has a unique address.

Fig. Studentcounter sensor based photoresistor and resistor

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