International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A Survey of Cloud-based Attendance Tracker Systems

Harshal Jadhav[1], Shubham Madne[2], Aniket Mane[3], Mrs. S. V. Shinkar[4]

[1,2,3]Student, Department of Electronics and Telecommunications Engineering Pune Institute of Computer Technology Pune, Maharashtra
[1]harshaljadhav343@gmail.com, [2]shubhammadne699@gmail.com, [3]aniketsmd310@gmail.com
[4]Assistant Professor, Department of Electronics and Telecommunications Engineering Pune Institute of Computer Technology Pune, Maharashtra
svshinkar@pict.edu

ABSTRACT—

Attendance management is a very important aspect of institutional or organizational management. When there is a rise in cloud computing techniques day by day, there has been a significant orientation towards cloud-based attendance tracking and management systems. In this survey paper, we review the literature on cloud-based attendance Tracking and management systems using various technologies, including their advantages, features, and limitations. We also discuss the challenges of implementing and using these systems.

Index Terms—Attendance Management, Cloud Computing, Cloud-based Systems

I. INTRODUCTION

Attendance operation is an essential task of institutional management for maintaining the discipline of the institute. With the increasing demand for flexibility and mobility in the workplace, there has been a shift towards cloud-based attendance management systems. In this survey paper, we provide an overview of the literature on cloud-based at- tendance management systems. Successful schools begin by engaging students and making sure that they will come to school regularly, so the attendance rate become very important. An attendance system is a system that is used to track the attendance of a particular person and is applied in industries, schools, universities, or working places. The attendance rate will be calculated based on the average percentage of students attending school in every class of the course. The attendance rate is important because students are more likely to succeed in academics when they attend class consistently. It's difficult for the lecturer and the class to build their skills and progress if a large number of students are frequently absent. Moreover, the students have been given the right to have their own time management at university. This will cause the attendance rate of the class to become a major problem because some students may choose to be absent from the class. Therefore, students from universities in Malaysia are required to attend the class not less than 80% per semester otherwise students will be barred from taking any examinations. The traditional way of taking attendance has a drawback, which is the data on the attendance list hard to reuse. If the lecturer wants to calculate the percentage of the students that attend the class, he/she must calculate manually or input by typing. This also easily leads to human error such as the lecturer may be wrong. The technology-based attendance system will reduce human involvement and decrease human error. There are various types of attendance systems that are applied in different fields. Mostly, their working places are still using the punch card system. But some of them had integrated their system into the bio-metric attendance system. The biometric attendance system is based on fingerprint identification using extraction of minutiae techniques and it is very reliable and convenient to verify the identity of people. Human fingerprints are read by the reader to take attendance as the uniqueness of human fingerprints [1]. Another technology is a Radio Frequency Identification (RFID) based attendance system that consists of an RFID Reader, RFID Tag, LCD displays, and microcontroller unit [2]. RFID can be interfaced with a microcontroller through Universal Synchronous, Asynchronous Receiver Transmitter (USART) [2]. Data is transferred from RFID cards to the reader and from there to the microcontroller. The NFC-based attendance system is another means to tackle conventional attendance system problems. above. Because the installation cost of NFC based attendance system is lower than the other advanced attendance system like the fingerprint attendance system. The main advantages of the NFC are the simple and quick way of using it and the speed of connection establishment is fast [4]. Besides that, other important advantages of NFC technology have also included the transmission range of NFC devices. The transmission range is so short when the user separates the two devices more than the limited range, then communication is broken [5]. The NFC-based attendance system can process the data collected in a quicker way compared to the manual system which needs to enter the data one by one. Besides, all the data will be saved on the server and this can avoid losing any students' attendance. Students can also check their attendance rate using their smartphones through the login system from time to time to avoid any miss entering of attendance. Thus, the main objective of this paper has present a new NFC-based attendance system capable of recording and tracking students' attendance in the classroom. The second objective will look into two different sensor-based attendance system which is RFID and NFC-enabled. The remainder of the paper is organized as follows, section 2, introduces background and related work on the existing attendance system. Section 3 looks into Near Field Communication based attendance, the way near-field communication works, and the units used to develop the (NFC) Attendance Based system project. Sections 4 and 5 discussed NFC-enabled Attendance System and RFID –enabled Attendance Systems. Section 6 presents a discussion followed by a conclusion.

II. BIOMETRIC-BASED ATTENDANCE SYSTEM

Biometric-based attendance system recognize a person identity based on biological characteristics such as fingerprint, hand geometry, voice, retina, iris, and face recognition which reliably distinguishes one person from another or is used to recognize the identity. They have five subsystems: data collection, signal process, matcher, storage, and transmission. However, the biometric system is suitable for highly secured systems, and mostly the biometric system is expensive [9]. Kadry and Smaili [10], implement an attendance system based on iris recognition. The system takes attendance as follows; a) a digital image of one person's eyes to be verified is captured) feature extracting algorithm is carried out; c) minutiae are extracted and stored as a template for verifying later; d) people to be verified place their eye on the iris recognition sensor and

e) a matching algorithm is applied to match minutiae. Talaviya et.al [11], implement a system that takes attendance of students by using a fingerprint sensor module. When the student enrolls his/her finger on the fingerprint sensor module, his/her fingerprint will be matched with the database to mark attendance. Chintalapti and Raghunadh [12], implement an automated attendance management system based on face detection and recognition algorithm. Every time the student enters the class, his / her images will be captured by the camera placed at the entrance. The images will retrieve the identity of the student and take attendance for that student. They use the Viola-Jones algorithm for the face detection part. There are five performance evaluation conditions used by them for the face recognition part, which are PCA + Distance Classifier, LDA

+ Distance Classifier, PCA + SVM, PCA + Bayes, LBPH + Distance Classifier. As a whole biometrics systems are known for their more expensive means of setup and operational costs. In terms of its accuracy, the biometrics attendance system prevents cheating and has a lesser false alarm rate.

III. SENSOR-BASED   ATTENDANCE   SYSTEM

Barcode technology is a method of identification, which is used to retrieve in the shape of a symbol generally in the bar, vertical, space, square, and dots which have different width with each A reader of scanners are required to identify the data that is represented by each barcode by using a light beam and scanning directly to the barcode. During the scanning process, a scanner measured the intensity of reflected light in the black-and-white region. A black region will absorb the light, meanwhile, a white region will reflect it [9]. A smart card is built with a variety of chips with a simple memory consisting of bytes of information that may range from 1K up to 64K of the microcontroller or multi-application memory. The smart card can use as individual identification, building access, and network access are part of a multi-tiered program that is in the final stages of rolling out. The data in the smart card can be read when a physical contact has a reader [9]. Meng and Mahinderjit [9], implement an attendance, which takes attendance by using RFID. Figure 1 shows the system architecture of the RFID attendance system[9]
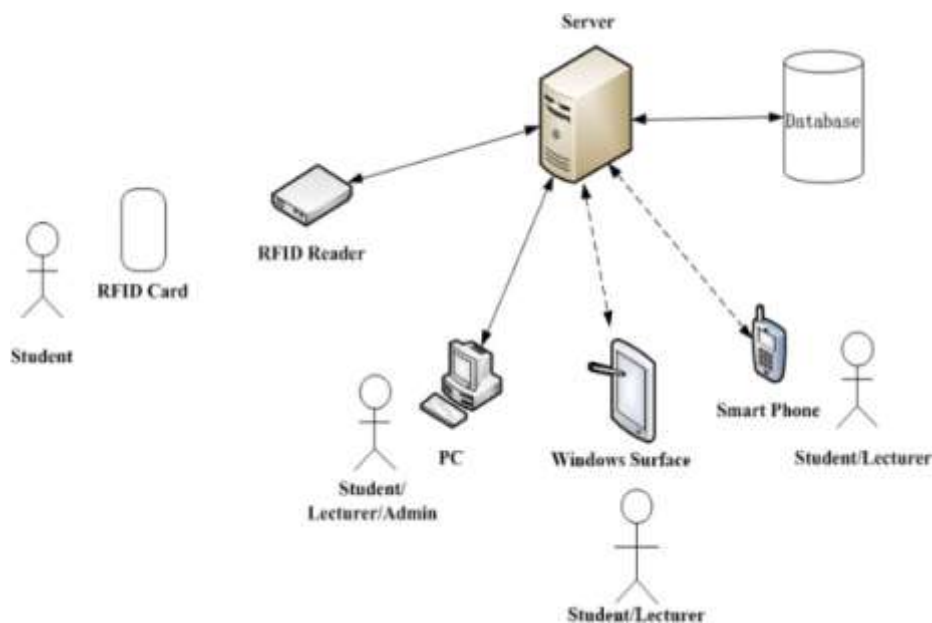

Fig. 1. System Architecture for RFID attendance system[9].

RFID is an automatic identification method, whereby identification data are stored in electronic devices, called RFID tags (Transponders), and RFID readers (interrogators) retrieve these data. Based on the figure, students only need to place their RFID tags which contain a unique id number on the reader and their attendance will be taken immediately. Every time the student enters/leaves the class, they need to scan their RFID tags with an RFID reader. The RFID reader will read the identification code in the RFID tags and transfer the code to the PC, which is connected to USB. A program in PC will retrieve the student's identity from the database using the identification code that was received and take attendance for that student. RFID-based attendance systems are costly and require extra infrastructure for their operation. Ayu and Ahmad [13], implement NFC supported attendance system in a University Environment named as TouchIn. Before the class start, the lecturer will run a mobile application on his/her own NFC-enabled smartphone,

students that want to take attendance will run another mobile application that will fetch the student ID from a file, read the device ID, and beam (send) it to the lecturer's device by simply touching the device.

The attendance of the student will be taken. This system has disadvantages if compared to this project such as the accuracy is low on the identification part. The student can help his/her friend take attendance, although his/her friend is absent. They just need to borrow their smartphone from his/her friend and his/her friend can scan the lecture's device with the smartphone and attendance will be taken.

IV. NEAR FIELD COMMUNICATION ATTENDANCE SYSTEM OVERVIEW

A smartphone is a mobile phone with an operating system. Smartphones typically include the features of a phone with those other popular mobile devices, such as personal digital assistants, media players, and GPS navigation units. Most have a touchscreen interface and can run 3rd-party apps, and are camera phones. Later smartphones add broadband internet web browsing, WI-FI motion sensor, and mobile payment mechanisms. Soomro, 2013[5], shows that almost 2 billion people all around the world will be using Smartphones, Laptops, Tablets, and Desktops by 2014. This rapid growth for smartphones over the years shows the number of users of smartphones is increasing and this means it will be easier to just put in an NFC tag on each of the smartphones for people to use it and it'll be more convenient. Besides that, most Android smartphones have the NFC tag. NFC stands for Near Field Communication which is a wireless communication interface for devices equipped with NFC [3]. The working distance for NFC is just up to 10cm only, but the set-up time is just less than 0.1s [3]. There are 2 kinds of modes which is active mode and passive mode for the NFC devices [3] (as shown in Table 1). The device which generates its own RF field is called an active device, while the device which retrieves the power from another device is called a passive device. Besides that, the device which starts the communication is called an initiator. The initiator is only in active mode and could have many targets either active mode or passive mode. One initiator can only communicate with one target at one time while other relevant targets will be ignored at first [3]. Hence, the broadcasting message is impossible in the NFC.

TABLE I

POSSIBLE COMBINATION OF ACTIVE/PASSIVE WITH INITIATOR/TARGET [3]

Mode	Initiator	Target
Active	Possible	Possible
Passive	Impossible	Possible

NFC works on the principles of sending information over radio waves [3]. The technology used in NFC is based on Radio Frequency Identification (RFID) idea which uses electromagnetic induction to transfer information. The transmission frequency of NFC is 13.56 MHz with a transfer speed of 424 Kbps, which is fast enough for data transfers [3]. NFC is currently supported for peer-to-peer mode, which means 2 devices with NFC-enabled are able to exchange information with each other. NFC has also supported read/write mode. An active device can read information from another device. For example, a smartphone is reading the information from an NFC advert tag. Lastly, the NFC device is able to act as a credit card or a contactless card in order to make payments in card emulation mode.

V. SYSTEM ARCHITECTURE NFC-ENABLED STUDENT ATTENDANCE SYSTEM

The proposed system in this project is a web-based attendance system using NFC technology in Android smartphones. The system has two main components which are the reader unit and the server unit which are hardware and software components respectively. The hardware component of the reader unit is an NFC-enabled Android smartphone and student materials card with an NFC tag while the server unit is the computer that hosts web services and databases. This part of the paper consists of, how two sections that are User Interface which explains the user interface of the project, and the System Interface which also explains the System interface how it works and how is it done. Figure 2 shows examples of the interfaces.

Fig. 2. NFC-enabled Attendance System Interface
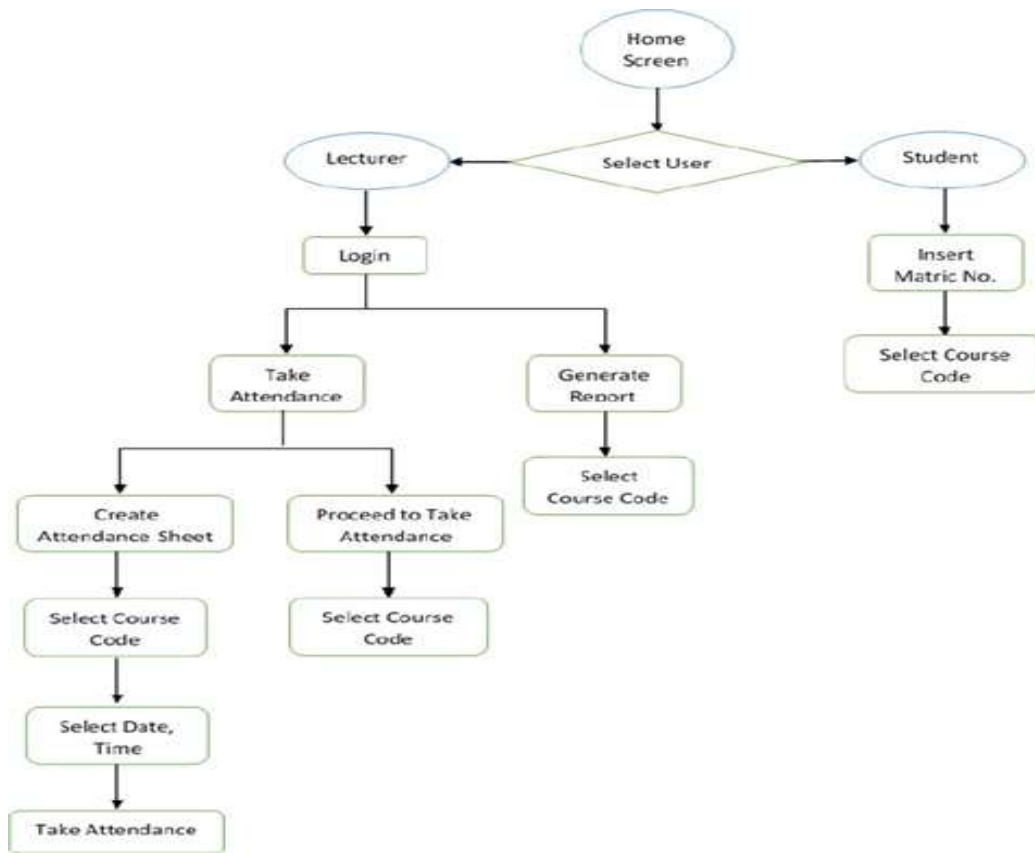
According to the above figure, there are two classes of the user which are the students and the lecturers. Next, we will discuss NFC-based attendance, this is shown in Figure. 3. Firstly, the administrator of the school needs to create an account for the students and lecturers in order for them to log in to the system. The admins are able to update the account and delete the account in case wrong data is entered. Besides that, the admin should generate a list of the students that enrolled in the particular subject for lecturers' reference. On the mobile app, students need to log in to their accounts in order to register for attendance for each class that they attend. They also can view the amount of attendance for respective subjects on their phones. For the lecturers, they need to log in to the system first and select the subject every time they want to record their attendance. The lecturers will be able to calculate the total attendance of the class and generate a report about the attendance rate at the end of the semester.
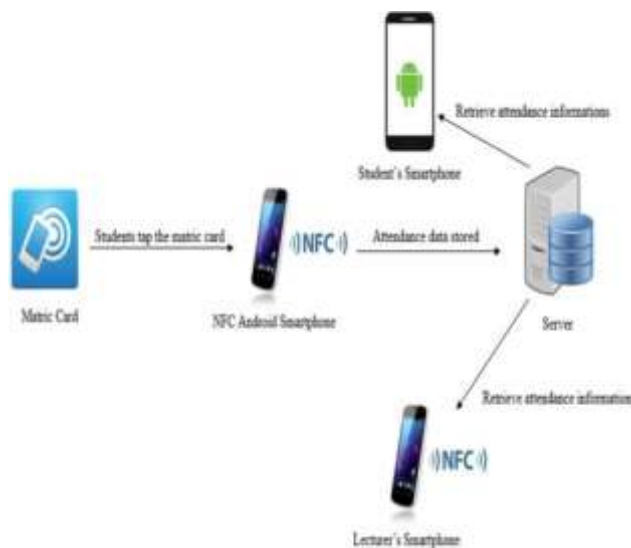

Fig. 3. NFC-enabled System Architecture

The student has to tap the matric card towards the NFC android Smartphone and automatically the attendance will be stored in the server. For the lecturers to check the attendance of the student, the system will retrieve the attendance information from the server to the Lecturer's smartphones. The system also does give the information to students as well to check for them whether the days they attended and did not attend for their own records. In this project, the implementation strategy used is a bottom-up strategy. The implementation starts from the lowest level of software units such as view report, take attendance, generate reports and etc., which are the function within the student module and lecturer module. Then, all the lower units are linked together to form higher-level units such as the NFC module, student module, and lecturer module. Next, the modules were designed and implemented, followed by the subsystems, and finally the complete system.

VI. RFID-ENABLED ATTENDANCE SYSTEM MANAGEMENT

In this section, RFID-enabled Attendance System Manage- ment presented by Meng and Mahinderjit-Singh [9] will be discussed. This project has two parts one is a web page system, and the others are smartphone and tablet applications. After a   student enters or leaves the classroom by scanning an RFID card, the lecturer could view the attendance situation of the class and the movement of the different students through a web page system, smartphone system, and tablet system. Students could view his attendance only and movement only through the web page system, smartphone system, and tablet system. Besides that, the lecturer or student could track the attendance history by both systems. This project is expected to provide a smart attendance system for different users to sign attendance and view the situation of attendance. When the users enter the classroom or lecture hall, they have the option either to swipe their card on the reader or simply let the card be detected by the reader. The card is attached with an RFID tag, which can be detected by the reader as long as a certain range of distance between the tag and the reader is complying. Once the reader detects and obtains the information, it will be then saved to its own database automatically.

TABLE II

COMPARISON OF ATTENDANCE MANAGEMENT SYSTEMS

Research Paper	Technology used	Technical Parameters	Accuracy	Performance
An Efficient Automatic Attendance System using Fingerprint Verification Technique (2010) - C. Saraswat, A. Kumar	Fingerprint verification, Automatic attendance system	Efficiency	High accuracy (over 95%)	Fast processing speed
RFID Based Attendance System (2009) - T.S. Lim, S.C. Sim, M.M. Mansor	RFID technology, Attendance tracking	Industrial Electronics	Accurate identification	Real-time tracking, Efficient Data Management
Experiences from NFC Supported School Attendance Supervision for Children (2009) - M. Ervasti, M. Isomursu, M. Kinnula	NFC technology, School attendance supervision	Mobile Ubiquitous Computing	Reliable attendance data	Seamless user experience
RFID-enabled Smart Attendance Management System (2014) - Z. Meng, M. Mahinderjit-Singh	RFID technology, Smart attendance management	Lecture Notes Electrical Eng. publication	Accurate attendance logs	Scalable for large-scale use

VII. CONCLUSION

In this survey paper, we have provided an overview of the literature on cloud-based attendance management systems. We have discussed their features, advantages, and limitations, as well as the challenges of implementing and using these systems. Finally, we have identified several areas for future research in the field. We have compared some systems and analyzed the working speed, accuracy, and reliability of the systems and aim to add improvements in some areas of our project.

REFERENCES

[1] C.Saraswat, A.Kumar *"An Efficient Automatic Attendance System using Fingerprint Verification Technique "*, ChitreshSaraswat et al. / (IJCSE) International Journal on Computer Science and Engineering Vol. 02, No. 02, 2010, 264-269.

[2] T.S.Lim, S.C. Sim,M.M. Mansor, *"RFID Based Attendance System"*, 2009 IEEE Symposium on Industrial Electronics and Applications (ISIEA 2009), October 4-6, 2009, Kuala Lumpur, Malaysia.

[3] E.Haselsteiner, K. Breitfuß, *"Security in Near Field Communication (NFC)"*, Philips Semiconductors Mikronweg 1, 8101 Gratkorn, Austria.

[4] M.Ervasti, M.Isomursu, M.Kinnula,*"Experiences from NFC Supported School Attendance Supervision for Children"*, 2009 Third International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies

[5] T.R Soomro,*" Impact of Smartphones's on Society"*,College of Engineer- ing Information Technology Al Ain University of Science Technology, Al Ain, United Arab. European Journal of Scientific Research 2013

[6] O.K Kerem, V.COSKUN, N.Mehmet, B. OZDENIZCI, *"Current Benefits and Future Directions of NFC Services"*, 2010 International Conference on Education and Management TechnologyICEMT 2010

[7] S. K. Jain, U. Joshi, B. K. Sharma, *"Attendance Management System"*, Masters Project Report, Rajasthan Technical University,Kota.

[8] M. K. P. Basheer, C. V. Raghu, *"Fingerprint attendance system for class- room needs, "*, in Proc. India Conference (INDICON), 2012 AnnualIEEE, pp. 433-438, 7-9 Dec. 2012.

[9] Z.Meng, M.Mahinderjit-Singh, *"RFID-enabled Smart Attendance Man- agement System"*, 2014, Lect. Notes Electrical Eng., Vol. 329, James J. (Jong Hyuk) Park et al. (Eds): Future Information Technology - II, 978- 94-017-9557-9, 328439-1-En.

[10] S,Kadry; K.Smaili ,*"A Design and Implementation of A Wireless Iris Recognition Attendance Management System"*, ISSN 1392 – 124X Infor- mation Technology and Control, 2007, Vol.36, No.3.

[11] G.Talaviya; R.Ramteke; A.K.Shete, *"Wireless Fingerprint Based Col- lege Attendance System Using Zigbee Technology"*, International Journal of Engineering and Advance Technology (IJEAT), ISSBN: 2249-8958, Volume-2, Issue-3, February 2013.

[12] S.Chintalapati; M.V. Raghunadh,*"Automated attendance management system based on face recognition algorithms"*, Computational Intelligence and Computing Research (ICCIC), 2013 IEEE International Conference on , vol., no., pp.1,5, 26-28 Dec. 2013, doi: 10.1109/ICCIC.2013.6724266

[13] M. Ayu, B. Ahmad, *'TouchIn: An NFC Supported Attendance System in a University Environment'*,, International Journal of Information and Education Technology, vol. 4, no. 5, pp. 448-453, 2014