A Review paper on Smart Campus using NFC technology

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Abstract— The concept of Smart Campus Near Field Communication (NFC) is a current growing process. We know that education is one of the basic need of every individual now-a-days. Running collage with all student and parents as well as faculty with complete communication on one single platform will be a boon for today's security. the main advantage of a Smart Campus NFC technology is that it provides advance technology to make the campus life easier. By using this technology, we can easily enter data while accessing any class room or equipment in the campus. The Smart Campus Near Field Communication (NFC) is mostly used by people education and is time efficient. This is a motivation for the university to act in a smart way, today's society will have the opportunity to lead a collage or students, parents and each other in the faculty of communication. The Smart Campus system is focus on a solution such as security and collage management to address the university with Cutting- Edge Technologies called Internet of Things(IoT) and NFC technologies.

Keywords— Internet of Things (IoT), NFC Technology, Arduino, Cloud Computing.

I.   INTRODUCTION

The concept of Smart Campus Near Field Communication (NFC) is a current growing process. NFC is a technology which is used to implement indirect communication that is without a physical contact for example: without a direct contact to the smartphone we can   create a communication between the NFC chip, on the other hand while connecting two devices together you have to bring or physically touch the device from very close range but NFC can automatically set up, select the   peer to peer network and without the physical contact of devices it can exchange the information/data as well as implement the contactless transaction, etc. Various applications of NFC include the contactless transaction, data transfer and complex communication such as Bluetooth or Wi-Fi. NFC has only a handful of applications, including tickets and payments, search information between devices (device pairing), and supports both communications. [1][2]

Now android Smart phone has a great contribution to NFC and most of the smartphones are having the NFC in their phones , but the problem is: In Indonesia there is still no company who introduce NFC to those people so they still don't have knowledge about the adoption of NFC technology the people who live in this country still use the card and cash for the payment.so to introduce these people about the NFC technology we need to have various strategies such as attendance system for the universities as various people who

live in Indonesia use smart phone they will be get used to the new technologies such as the NFC technology. Clever collage can stimulate the study of students and also stimulate students to make new innovations and build their capacity by using this advance technology [2][4]

Looking for a new way to solve the problem, build a better ecosystem, but now it is not being able to afford those needs and unable to provide variety of integrated information services for real use such as educational modernization and education technology. The smart university network should turn into mono network access services to stereo intelligent network application services. [1]

The university has to adopt advanced technology such as Internet of Things (IoT), cloud computing, face recognition, virtualization technology and networking. The news Standards for changing the lives of students, faculty communicate with each other on a single platform. Possibly NFC security can be as user approval, the user should be allowed to confirm the request (e.g. download file) and NFC is safer technology than RFID and Bluetooth about usage and short distance features, which makes NFC superior to these technologies[1].Though the striking application of NFC to be implemented as an attendance system but there are some are some conditions must be followed for this implementation such as students and faculty should be allowed to use there smartphones in the classes freely, the Wi-Fi and server connectivity should be strong in the campus area to ensure

the speed of the network and they should hold more devices at a time and server data should always be accessible and there should be integration between the subject, schedule, class, lecturer, and students.[2]

Thus, the main objectives of this technology are to provide essential requirement for campus in smart way, web application and android app has been developed to control activities is all done using Internet of Things (IoT) and NFC technology, the storage is done using the cloud computing. [3][4]

II.   RELATED WORK

The Near Field Communication basically started in early 1980s in the form of Radio Frequency Identification (RFID). The use of this technology was that it allowed the user to send radio information to a receiver where it was identified and it was a good technology for tracking purposes. This technology was invented by **Charles Walton**. The NFC technology was inspired by this technology and was invented by millennium, Sony and a company called NXP Semiconductors in 2002. By the year 2004 many companies started to implement this concept of Near Field Communication in their devices, and in 2006 many more companies implement this process to their devices to share photos, videos, documents, etc [34]

Shyam Ambilkar, Shivkumar Hegonde, Rutuja Therade, Surbhi Lingamwar generated an international research journal of engineering and technology in Dec 2018 to demonstrate Smart Campus an Android and Web based application using IoT and NFC Technology.
Author "**Ed**" who is a near field communication enthusiast in year 2017 published a paper on NFC in which he covered reading about NFC and NFC enabled phones along with he described the history and various mobile based transactions.

Shin Kamada, Takumi Ichimura, Tetsuya Shigeyasu & Yasuhiko Takemoto in year 2014 published a paper which demonstrate registration system of cloud campus by android smart phone, which also contain the storage mechanism of the NFC enabled smart phones.

Marisa Karsen, Yohannes Kurniawan, Cadelina Cassandra and Hanny Juwitasary in year June 2018 published a paper for NFC design for attendance system in the university, for the overall view of the NFC technology which is used in the schools and colleges.

III. METHODOLOGY

System Architecture:
This diagram contains matric card, student smartphone, server, teachers' smart phone, in this the student has to tap

the matric card towards the Smartphone which automatically store the attendance in the server. Whenever the lecturer wants to check the attendance of a student, the system will retrieve the attendance from the server to the lecturer's smartphone. It will also provide the students overall information and also check them weather the days they have attended and did not attend for their own record. [3]

In this bottom-up strategy is used, the implementation is started from lowest level of the software unit such as view report, take attendance, generate report, etc. These features are included in the teacher's module and student's module. The next module is designed and implemented by subsystems and finally the complete system, in order for testing, user's login as the administrators that is students and lecturers. [3][7]

Fig: 1 Attendance system using NFC

There are two types of communication modes in the NFC architecture, they are Active and Passive mode respectively. In Active mode the devices have the power supplies and can communicate with each other by alternating signal transmission. In Passive mode the initiator device generate radio signals and target devices are powered by the electromagnetic field, the target devices respond the initiator by modulating the existing electromagnetic field.[3][7]

There are three operating modes for the NFC, they are Read Mode, Write Mode and the Peer-to-Peer mode. In the Read/Write mode the NFC-enabled phones can read and write data to any supported tag types in a standard NFC data format. In the Peer-to-Peer mode the NFC devices can exchange the data. This mode is standardised by ISO/IEC 18092 standard [7]
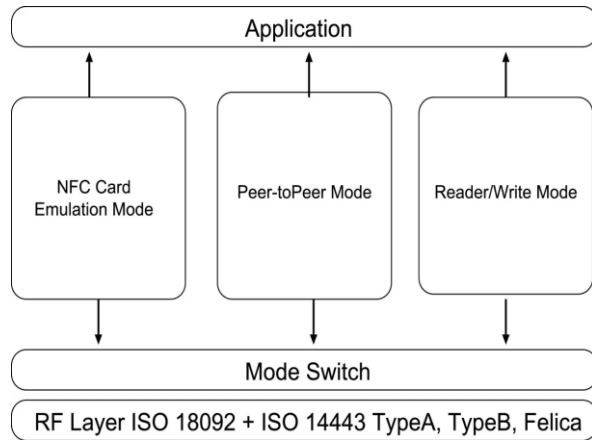
Fig: 2 Communication Modes

Working:

The NFC is having two modes for the communication between the devices enabled with NFC and along with the communication modes there are three operating modes, they are Read/Write and the Peer-to-peer mode. The Read/Write is used for the reading and writing of the data and the Peer-to-Peer mode for the exchanging data between the devices [8]

The Magnetic Induction between the devices is explained as, a small electric current which creates a magnetic field around which is emitted by the reader. Another coil of the customer's device receives it and turns it back into the electrical impulses for the communication of the data. After the activation of the NFC, a signal is sent to the NFC chip in the smart phone. Electricity flows through the circuit of this chip which then generate the magnetic field. At this stage the smart phone uses the power for the generation of the magnetic field. Due to this process of the smart phone this magnetic field is induced in the transponder or a device that does not have its own power supply. This results in the creation of the radio field by the device that interacts with the electromagnetic field generated by the smartphone. [9][10][12]

Advantages:

- It improves the quality of education and it is time efficient.
- NFC devices communicate instantly in less than 100 milliseconds when placed within range.
- NFC devices requires nothing more than a tap so it is effort-free,
- Power consumption is very less as NFC tags and cards do not consume more power than 15 mA.
- NFC tags and cards are inexpensive compare to other wireless devices.[1][2][3]
- Data transfer speed is good but a quarter less than that of Bluetooth.

Limitations:

- **Eavesdropping:** It occurs when two devices using RF waves, communicate actively to each other via NFC.
- **Data corruption/Modification:** An attacker can try to block or modify the data which is transmitted via NFC interface.
- **Data Insertion:** It means attacker can insert messages into the data exchange between the devices.
- **Relay Attack:** In this the attacker intercepts a message sent to a victim and responds to the sender, pretending to be the intended receiver.
- **Spoofing:** When the user reads a tag with NFC-enabled phone, the phone is tricked into performing harmful operations. [3][4]

Applications:

- Smart Cards
- E-wallet (Payment using smart phones)
- Smart Ticketing
- Medicines and Healthcare
- Keyless Access
- Manufacturing
- Logistics and Shipping
- Smart Inventory Mangement
- Theft control

III. CONCLUSION AND FUTURE SCOPE

This paper mainly focused on smart campus based on the NFC technology. This technology encourages us to use the internet and it is gradually turning our country from underdeveloped country to a sound developed country, etc. Students usually have opportunities' such as attendance, face recognition, etc. Traditional system is a time waste process of working, by the use of this technology we can make the work easy and time efficient.

REFERENCES

[1] Smart Campus an Android using IoT and NFC "Shyam Ambilkar1", "ShivkumarHegonde1"," Rutuja Therade"1, "Surbhi Lingamwar1" [last accesed:10-08-19]
[2] NFC technology literature "Ed" [last accessed:11-08-19]
[3] NFC-enabled Attendance System Interface "Mahinderjit Singh" [last accessed:11-08-19]
[4] Registration system of cloud campus " Tetsuya Shigeyasu" [last accessed:12-08-19]
[5] Near-Field Communication Technology and Its Impact in Smart University and Digital Library: Comprehensive Study "Doaa Abdel-Gaber Abdel-Aleem Ali" [last accessed:13-08-19]
[6] Applications and Future of Near Field Communication "Rajiv" [last accessed:14-08-19]
[7] NFC design for attendance system in the university "Marisa Karsen"," Yohannes Kurniawan"," Cadelina Cassandra" and "Hanny Juwitasary" [last accessed:14-08-19].
[8] Smart Wireless Attendance Monitoring Using NFC "Puja Rani1", "Oshin2" [last accessed:15-08-19] Building a smart campus to support ubiquitous learning"Y.Atif",

"SujithSamuelMathew","Abderrahmane Lakas" [last accessed:16-08-2014].

[9] Constructing Smart Campus Based on the Cloud Computing Platform and the Internet of Things Published by "Atlantis Press, Paris, France. the authors 1576" [last accessed:17-08-2019].

[10] Smart campus features, technologies, and applicationsreview "Wardani Muhamad", "Novianto Budi Kurniawan", "Suhardi Suhardi"[Last accessed:18-08-19]

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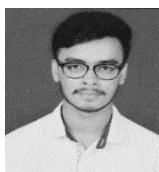
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