

Near Field Application: NFC Smart Notice Board

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Abstract—One of the conventional ways of dispersing information in a university or corporate office is through the Notice Board. Notice boards are an ideal platform that allows one to put up information so that it can be seen by everyone. Whenever there is a new circular to be dispersed among the students or employees, it will be immediately put up on the notice board where everyone has to manually gather at the board and look into the notice. In the busy and fast moving world today, this will lead to wastage of time. Instead, this paper provides a solution to the above problem using NFC application. The idea that has been proposed in this paper is to display the notice board through NFC tags. Each NFC tag is programmed to contain the notice information to display. Whenever it is required for a circular to be displayed just program (Update the Notice) the NFC tag. The students, employees etc., can scan the NFC tag through their NFC enabled smart phones which downloads the notice in the document format online into their handheld devices. This solution is user-friendly as the end-user can read the notices at their own convenient time in turn leads no wastage of time.

Index Terms—NFC tag NTAG203, Notice Boards and NFC enabled smart phones, Notices.

I. INTRODUCTION

The digital world paradigm is shifting towards the alternative communication rather than conventional. Near Field of Communication (NFC) is live example for unconventional way of communication. NFC is born out of Radio Frequency Identification (RFID), but the range is small compared to RFID. It operates at the frequency of 13.56 MHz and proximity of distance to communicate is maximum up to 10cm. The act of communicating is called tap-in. The electrical communication is called inductive coupling. The Standards for NFC are being defined by international standardization bodies ISO/IEC and ECMA international. Even though there exists so many alternate ways of communicating technologies, NFC is much more advantageous because of its nature of connecting to the cloud through app which has made stand out in the heap of alternating communication technologies. NFC has many implementations; one of the example to name in banking system is contact-less card payment systems introduced at ICICI bank in India recently. The future of NFC is very promising if there is increase in the size of storage capacity. NFC technology allows user to make digital transactions, access the digital content from two or more devices without having to connect these devices physically. In NFC, there are three modes of

communications; Peer-to-Peer Mode, Reader/Writer Mode and Card Emulation Mode [1] [2].

II. LITERATURE SURVEY

The paper [3] gives the complete specification about how to use an NFC card for generating smart posters which is a substitute for the conventional posters. Firstly, the various motivations to use NFC are location-based information browsing, its ease of use, convenience and the fun of using it. In order to create an NFC smart poster, it requires various components such as: an object for which NFC based application is being developed, an NFC tag, a touch point indicator that indicates a point to touch an NFC device, NFC reader/writer which is capable of reading from and writing to NFC tags and a content provider. The design aspect of an NFC smart poster is much similar to a standard poster. It requires the NFC smart poster to be flat, clean and a touch point which needs to be clearly indicated. In addition to these, it is necessary to include enough description of all services that can be accessed through the touch of an NFC device. It is possible to have more than one touch point indicator for a single object giving more access to different services of that particular NFC smart poster. The content provided by NFC smart poster can be either static or dynamic. In case of static content, it can be as simple as procuring a website address or a phone number. In case of dynamic content, it gives additional privilege for the end user to interact with the content provider once connection is established.

A. Few real time applications of NFC smart poster are:

To acquire tourist information where in the user can touch the NFC enabled memorial which provides the complete route map to reach to that destination within that tourist place. NFC smart posters can be implemented in museums where the user can touch the object to procure additional information about a particular object on display. It will be widely used in future in the area of shopping where the user can touch the NFC smart poster shopping lists so that an entire catalogue of items are displayed with its value and any offers on sale. Restaurant fast track ordering Similar to shopping lists, it can be used in restaurants for meal ordering during busy lunch hours. The paper [4] presents virtual machine based framework for NFC

applications to provide high level application security in multiple application NFC environment. The paper, illustrates a virtual machine like execution environment - which is also called Scripting host application, on different mobile platforms. The application execution environment, which is the scripting host contains an API having all functions for NFC services. This avoids multiple implementations of similar functionalities in NFC environment. In addition to this, the scripting host is also responsible for providing security services which isolates multiple NFC applications and protect stored sensitive data. The scripting host running on the mobile device consists of two applications - scripting host MidLet running on the phone and a CardLet responsible for providing the security services. Finally by running the host API one can uniquely access all the components belonging to NFC ecosystem. One major benefit of this scripting solution is that only the MidLet depends on the underlying platform. Rest of the script applications, including the Host script are platform independent. The scripting environment presented in the paper is prone to two levels of security threat application-level security and inter-applications level security. In the application level security, the hosting script by itself is not capable of providing any security service. Hence, it requires all the security prone sensitive data handled by the NFC services to be stored on the secure element inside the mobile equipment. However, the scripting host application uses CardLet to manage the content of the secure element. The CardLet is installed on the security element in two different ways: CardLet installation via card reader and Over the air (OTA) installation. The authors in the paper [5] propose a prototype which uses the developed hardware for NFC-supported Bluetooth communication for combined acquisition of Blood pressure and ECG. The proposed prototype uses existing Telemonitoring system into which the concurrent acquisition of blood pressure and ECG with NFC triggered Bluetooth connection has been integrated. ECG recording has been included using the J2ME application running in the phone. Upon touching the ID card, this application will be launched. The credentials used for logging on this ID card will be used to log in at the remote Telemonitoring system. The patients data will be uploaded to the patient record which matches this ID card. The user interface included in the prototype helps the patient by guiding which step he has to take next. Physicians can securely access the data stored in the database using a web browser. As in the paper [6] presents the usage of NFC for mobile healthcare domain. All the activities in a hospital from registration of a patient to uploading patients history and making payment is done by making use of NFC tag. This requires exchanging information back and forth from NFC tag to NFC device and finally updating the database. With all these complex activities there is a major concern for security. Hence, the paper mainly focuses on security and privacy in dealing with such systems using NFC tag. For this purpose, it makes use of QR code along with data hiding techniques. QR codes provide a quick way of accessing a web page. The security algorithm presented in this paper uses QR code encryption and decryption to provide security. The QR

code uses the private key with encryptions and then embedded in NFC. This is done by converting the embedded QR code in NDEF format to store in NFC tag. Every user will be provided with a private key, so that only authentic users can securely access NFC. Now when a user reads the NFC, he decrypts the QR code using his private key. Additional security features like face detection, pin code matching etc., can be added. Finally, if the authentication is successful then it proceeds to the payment system. As in [7] paper provides an optimal solution for saving time when compared to manual methods of data acquisition. The system architecture proposed consists of an NFC-enabled mobile phone that can be used as the local reader device. NFC is realised as a close range communication technology which is used to acquire data from sensor interface and transfer control commands to PLC interface. These interfaces are used to store sensor measurements and these measurements are transferred into an NFC enabled phone when it is brought into the close range of the interface. With the use of NFC technology as local wireless technology, it relieves the burden of target devices with NFC connectivity from having unnecessary hardware to enable wireless connectivity as these hardware are also power-consuming. This gives an advantage in terms of cost by eliminating the need of expensive networking hardware devices and replacing them by having target devices with NFC capability. With this arrangement, it only requires that the employee having an NFC enabled phone goes near the target device and by touching the device with phone it enables transfer of commands. The author of the paper [8] gives the overview about NFC integrating into mobile. He states that the NFC operates on the same principle of RF as proximity cards. Out of the many advantages of integrating NFC into mobile phones, few advantages are listed here. One foremost advantage is centralizing a users daily life. Another advantage is that, through the connection to the cellular network many high-level operations are driven by inputs provided by NFC interactions. The paper also e that in many designs, when the mobile phone is running out of battery power, the NFC circuits can still be field energized. In the peer-to-peer mode there is a specific data exchange format prescribed by the NFC forum while exchanging information between devices from different manufacturers The paper [9] analyses and identifies issues that affect the service based on NFC mobile ticketing business model. In this analysis, a framework called the STOF model is used in evaluating NFC mobile ticketing business model theoretically. This paper utilizes the STOF model service, technology, organization, finance. The STOF Model is used as an analytical tool for identifying issues related to different participants in the business model. The STOF model is being used to analyse the deployment of mobile ticketing services using NFC. In the service domain, it offers great solutions to end-user where user does not need to carry a travel card all the time, instead carrying a mobile phone which is integrated with mobile ticketing service is sufficient enough. Also, with the NFC-based approach, a user can buy tickets prior to acquiring the service and activate them later. In the Technology domain, the paper brings to our notice about the lack of NFC enabled

handsets in market at present. Also, there is no much clarity in the business model behind NFC services which is seen as a reason for slow deployment of NFC. In the Organization domain, it states that NFC-based mobile ticketing service offers many benefits to Public Transport Operators (PTO). In the Finance domain, it discusses issues around revenue of operators due to the high cost involved in installing NFC chips and required technology in the handsets.

III. PROPOSED SYSTEM

As we know that the memory of the NFC tag is limited to size of 99 bytes to 4096 bytes, it is not feasible to include all the necessary information to display. To avoid this catastrophe we have used Wi-Fi or mobile data that is being used in NFC enabled mobile to solve this. In our proposed system when the NFC enabled mobile phone detects the NFC tag, it links to a web page where all the necessary information is stored. The website contains all the notices that are present in the notice board. Each notice is uploaded in the pdf format so that user can access the notice with ease. In a notice board, there will many notices to be displayed due to which we have divided the notice board into number of slots accordingly. Each slot contains a single notice. The following figure 1 depicts the arrangements of the notices in the notice board.

NOTICE BOARD 1

slot 1	slot 2	slot 3	slot 4
slot 5	slot 6	slot 7	slot 8
slot 9	slot 10	slot 11	slot 12

Fig. 1. Slot arrangements in the notice boards.

NOTICE BOARD 2

slot 1	slot 2	slot 3	slot 4
slot 5	slot 6	slot 7	slot 8
slot 9	slot 10	slot 11	slot 12

Fig. 2. Slot arrangements in the notice boards.

The notice board is nothing but a collection of webpages in the website shown in the figure 2. Each webpage contains a

unique slots notice. Once the notice board gets filled, there is a choice of shifting to the second notice board by increasing the web pages or editing the webpages corresponding to the old notices which might be irrelevant to the current date. The notices which are felt as irrelevant are discarded manually(if it is a digital or other type of notice board the corresponding processing for removing is done) by removing the notices and by deleting the respective webpage in the website. Replacing the new notice with old one in the website is done in the following way. Firstly, the notice that has to be deleted is noted down. Then the corresponding webpage is deleted in the website. To replace the new notice, fresh webpage has to be created but the criterion is that the new webpage that is being created should the same URL as that of the previous one. One of the ways to do that is, by keeping same name for the new webpage as that of the deleted one. We followed this method in our system. This is because NFC tag contains only the URL name, which remains same. So here we can avoid reprogramming NFC tag every time a new notice pops up, this eventually saves lot of time. Suppose if a different URL is given to the new notice, then, NFC tag has to be rewritten every time new notice pops up. Whenever a NFC enabled mobile comes in contact with NFC tag, URL stored in the tag is accessed by the mobile and particular webpage is displayed, that is, particular notice. If the new notice has a different URL than the old notices URL then, when NFC enabled mobile comes in the range of the NFC tag, it doesnt redirect to the new notice as the URL in the NFC tag is different from the one stored in the website. The notices are uploaded in the PDF format so that whenever the NFC tag directs the mobile phone to the URL stored in it, the contents of the webpage (i.e. notice) corresponding to the URL will be downloaded to the mobile phone, as pdf documents in the internet are downloaded in the mobile phones whenever opened. This downloading process will not more than few seconds, so it saves time and one view this notice whenever they are free and the clarity of the notice will also be better compared to that of the images of notice captured by mobile phones.

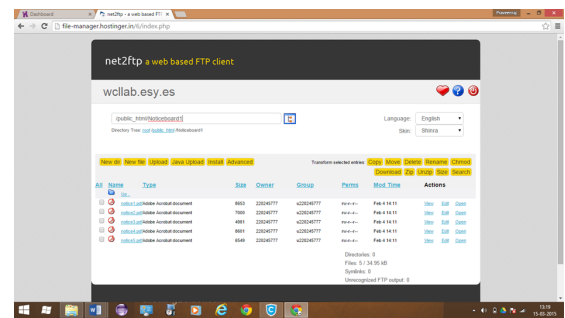


Fig. 3. Snapshot of website storing all the notices in the pdf format.

To protect the NFC tag from reprogramming by unauthorised person we can upload the notices and lock them. Locking procedure used in our proposed model is soft locking. Soft locking is nothing but password protected lock. Once

all the NFC tags are programmed with their respective URLs we can put a soft lock to it. By doing this we are giving protection from unauthorized access to modify the notices which causes adverse effects. The implemented NFC smart notice board in wireless communication laboratory of B.M.S. College of Engineering, the figures 3, 4, 5, and 6 show the implementation. The figure 3 depicts the real implementation in the lab with correct working conditions. The figure 6 shows the snapshots from the NFC enabled mobile while reading the notice from figure 5.

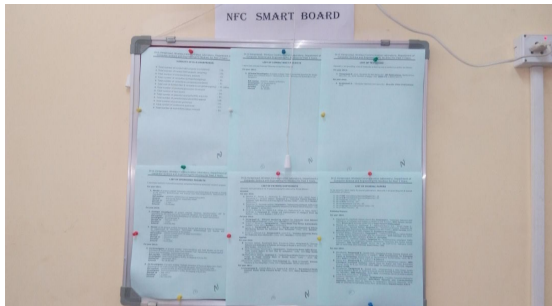


Fig. 4. Implemented NFC smart notice board at wireless communication lab of B.M.S. College of Engineering.

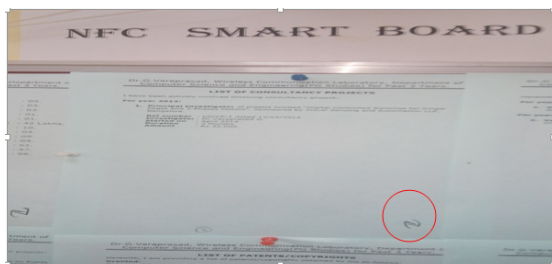


Fig. 5. In NFC smart notice board, right corner indicated with highlighter N as symbol indicates that notice is NFC enabled.

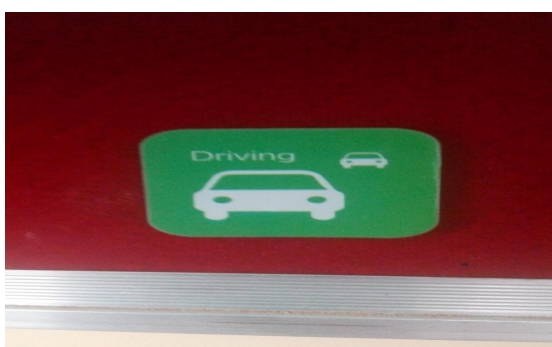


Fig. 6. NFC tag, NTAG203 used in our model.

The implementation of NFC in Mobile is shown in figures 7 and 8. Once we have the access to the location we can get the information required as much necessary.

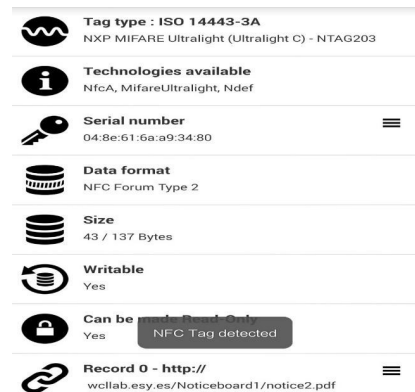


Fig. 7. Snapshots from the mobile about detection of NFC tag.

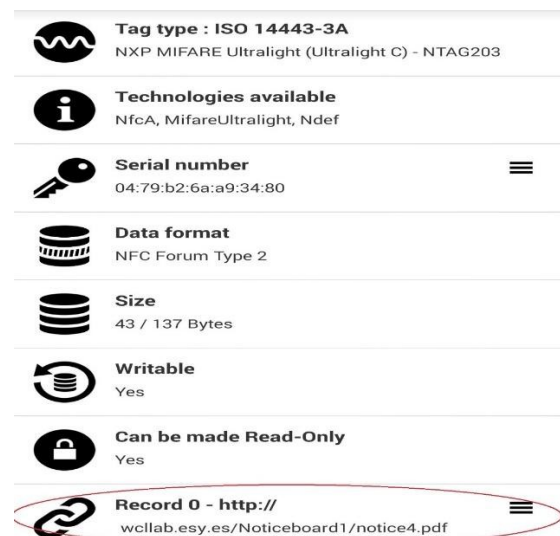


Fig. 8. Snapshots from the mobile about detection of NFC tag, location of notice to access.

IV. CONCLUSION AND ENHANCEMENT

Hence, we can conclude that, the NFC enabled notice boards is efficient in terms of saving time and also easy to implement. Once it is implemented everyone who has the NFC enabled mobile phones can read the notices at their own convenient time. For enhancements we can implement this kind of application for other industries such as Healthcare, Library etc. In Healthcare, we can keep updating the patients information in the website and can be easily accessed through NFC enabled mobile phone about the patients information. The accessed information can be sent to the other doctors for better check-up of the patients. In the Library, we can install an NFC tag for each book and give the overview of the book so that students are not required to go through complete index of the books to see if what they are looking for is present.

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