

NFC+ Android Application by using NFC technology for Hospital Management System

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Abstract-NFC tag can be employed for automation of identification of patient and doctors in hospital using smart phones and tablet computers that use the Android platform NFC can be used to explore new ways of real time hospital workflows and data processing in the medical world. Using NFC technology, physicians can easily view recent ward round results and update information without manually paper works. This application shows how NFC act as unique ID and how mobile devices can be connected to backend services to store and retrieve information. Using this application patient can be assigned another doctor in case of emergency. Remote access to patient data can be achieved from anywhere.

Index Terms- Android platform, NFC, Patient identification, Ward.

1. INTRODUCTION

Today healthcare is using information and communication technologies approach for early detection, prevention of disease and long-term management of healthcare in many developed countries to improve quality of life. Intelligent systems should be developed to reduce the cost of the medical services by achieving high operational efficiency and providing better service at an affordable cost. With the increasing number of health issues across different parts of the world, there is a need of management system with efficient patient and doctor identification, to store and retrieve patient records to ensure a proper context between the patient and the correct medical documentation. In a hospital patient identification is recurring task mainly done at the time of admission, during rounds at bedside, and while doing radiology, physical therapy done several hundred times a day by various doctors and hospital staff. Wrong identification may connect the patient to an different patient documentation. Unique Identification Number must be assigned instead of using just name of patient. Latest technologies like NFC (Near Field Technology) and RFID can be used to facilitate the use of the latest NFC enabled Smartphone for patient identification which general lead to a significantly higher probability of connecting the specific patient ID to his records to efficient treatment. The NFC enabled Smartphone or tablets can be used to ensure better doctor-to-patient, doctor-staff, doctor-doctor collaboration among to increase the health observe ability efficiency and thereby decrease healthcare costs. This paper describes how this programmable monitoring system can be

integrated with a wide variety of networks (such as 3G, Bluetooth, wireless LAN, WCDMA and GSM), and connected to hospital management server using Wi-Fi and mobile technology

2. IDENTIFICATION USING NFC TAGS

We have developed a NFC based Identification and hospital management system using Android platform to identify ,store and query data for patients form a backend server. Patients will equipped with wrist band that has NFC tag placed in, and doctors and other staffs will be provide with batch having NFC tags which will be read by NFC enabled Smartphone. When Smartphone are placed near batch or wristband the tag data will be read mobile and this unique ID will be sent to server to select the appropriate record. This tag can be assigned to patient with a unique ID at the time of registration. Doctors and other staff are also provided with batches with tag installed. The Tags will be assigned to doctors for authorized access and for security reasons. The Application is also monitor and manage the hospital ward round system, to ensure smooth and efficient management. Authorized doctors, users or administrator could easily view the ward round status.

2.1. Existing methods

System using bar code scanners rely on unchangeable information stored in the bar code. In case barcode got scratched, scanner could not read the data, causing failure or erroneous identification. NFC tags data can be read or rewritten without actually seeing the tag, The NFC tags can store up to a few bits to kilobytes.

2.2. Advantage of NFC tag

With NFC there is no need of a pairing of devices, physicians or staff just has to place the NFC reader next to the tag. a secure communication between mobile and tag is ensured because of the short NFC communication distances of about 0-20 centimeters and the fact that NFC readers can only read one tag at a time. Small size of tags (0.5mm²) makes it portable. The fact that the tag can be rewritten, makes is cost effective and best suitable for using for identification. Their won't be a need of paper works any manual writing of reports or carrying reports or files.[1][2][3] Using NFC in health care, doctors can save the time and staff required to produce and maintain the patient records and fast treatment could be done. The other major advantages of using these NFC technology is that the NFC standards cover the data exchange formats and as well as the communication protocols, and are based on the existing Radio Frequency Identification (RFID) ,standards like ISO/ IEC 18092, ISO/IEC14443, FeliCa and other rules defined by the NFC Forum.

3. SYSTEM DESIGN WITH SPECIFICATION

3.1. NFC (Near Field Communication) Tags

Each NFC technology consists mainly of a low power smart tag and a reader. The tag is consists of a small

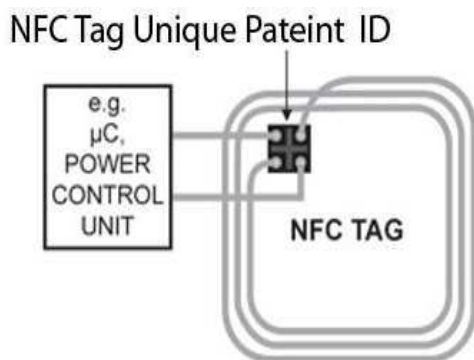


Figure 1.NFC Tag

antenna and a microchip as shown in figure 1. The NFC enabled Smartphone transmits radio-waves of about frequency of 13.56 MHz that are received by antenna in the smart tag and, which allows the reader to identify the information in the smart tag by converting the radio waves reflected by the smart tag in to digital information. This information is stored mainly in the Hospital backend server.[2]

3.2. Multilayer architecture in hospital

The NFC based identification and Hospital management system made up of six layers namely physical, middle, process, data access, application layer and user interface layer. The first layer physical layer consists of the NFC smart tags, antennas and NC enabled mobile, desktop servers, Wi-Fi Modems all hardware components. The Middle layer is the interface between the NFC smart tags and the NFC readers is the major layer and also the hospital database and management system. It also monitors the physical layer and follows the ISO standards. The RDBMS (Relational Data Base Management System) is the Process layer made up of the applications used for creation of the NFC based events. This layer accesses NFC, patient, doctor, staff and hospital data through SQL (Structured Query Language) and PHP code.[4]

The Application layer interfaces with NFC tags for multiple users in the hospital. Finally, the User Interface layer is used to provide a interact and have a uniform interface using an Android Phone.

3.3. Developing a NFC based Identification and hospital management system

NFC based Identification and hospital management system is developed for Android platform using the Android SDK version 4.3 Jelly Bean (API level 18) that will be compatible with all versions and will run in all NFC enabled Android phones.[2]NFC technology will be used for identification wherein once a person is identified ,the ID will be sent to server to retrieve all the data about the patient. When brought near NFC tag , the mobile device extract the ID, and read other Android/NFC related information like parameters for automatic application execution, If ID is matched with the record the application get started otherwise display message of unidentified ID. For successful identification it opens up the patient records and display information coming from the backend server system.

3.4. Server and android mobile device

The NFC Tag ID read by mobile are sent to the server through the internet by using the hospital Wi-Fi. The server system is designed in C# .net, that is used to register patient, doctors and other staff, assigned ID, store, and processes the received data in the server showed in figure 2 Through the wireless internet, the server is able to connect to different types of mobile devices and various development testing can be performed on it. After the record is found, the corresponding data that could be patient is serialized to XML and returned to the calling device. The query processes handle the communication between the server and Android mobile device to display information on a mobile screen in real-time.[5]A lot

of performance is taken by XML parsing libraries, from mobile devices. In the backend server code, we

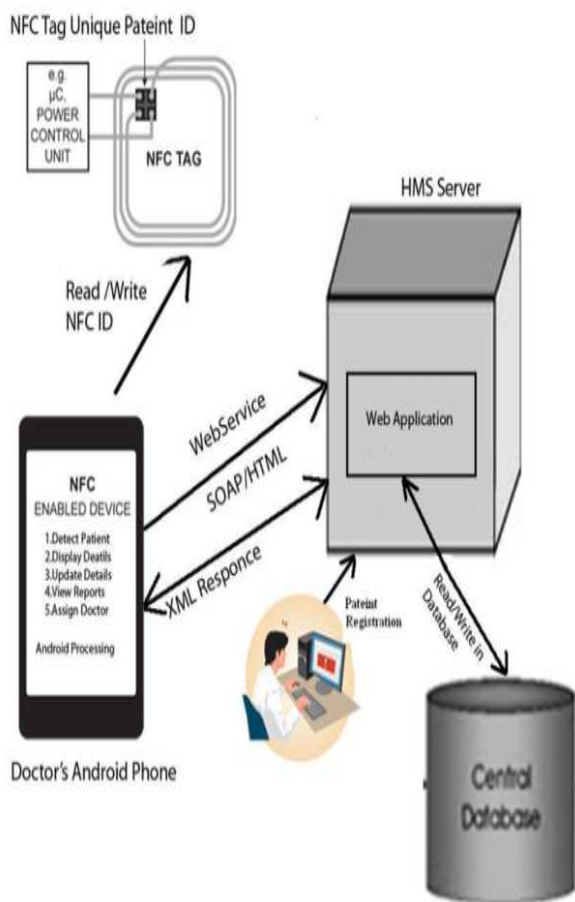


Figure 2. Architecture of proposed system

applied certain optimizations to minimize the amount of data transmitted.

3.5. Patient identification using NFC technology

- (1) Patients once registered are equipped with a NFC wristband which carries a unique ID. Every time a new ID is created for each patient. Doctors and staff are also assigned batches with Unique ID carrying Tag installed.
- (2) During a ward round, a physician or hospital staff first need to present their batch for authorization without with the patient cannot be treated. After the device reads the tag information it starts the NFC application with the read ID as a parameter.
- (3) Once authorized can physician read, update the Patient information by placing the NFC enabled mobile device (Smartphone, tablet, etc.) next to the wristband.

- (4) The application sends requests to hospital server for the given ID
- (5) The backend plug-in searches for the ID records and the corresponding record (or ward round composition) and returns the data to the calling mobile.
- (6) The composition received is extracted from the response and parses it in a format to render the user interface. The doctors then can edit and update the information
- (7) Record saved on the Smartphone forces the device to serialize it and send it back to the server, where record is stored in persistent database.

4. USABILITY ON SMARTPHONES

The NFC based Identification and hospital management Systems is implemented focusing on a clear and structured user interface. The first screen appear when the application starts asking for presenting doctors batch As shown in figure 3

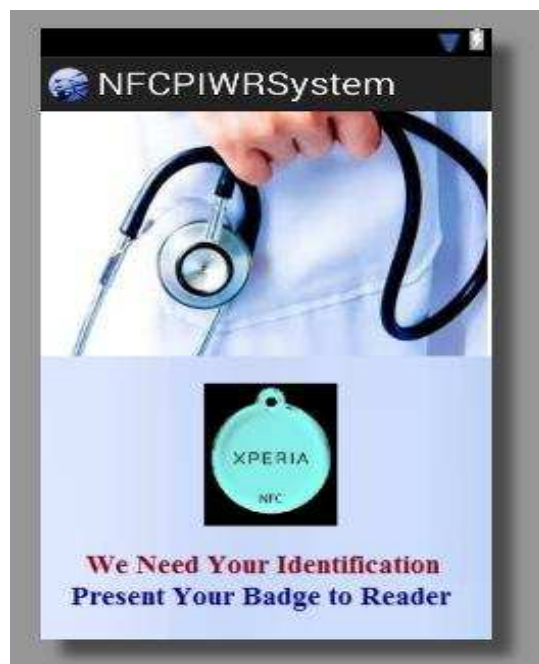


Figure 3. Main Screen for detecting doctors batch.

Next screen displays all the information of doctor like his specialty and name etc. Then doctor can view patient information by reading tag ID. After Tag ID is read, the patient Information is display with the option to modify and update the information after the treatment is carried out. The record saved is sent to server where it is updated and saved. The patient information will appear as Show in Figure

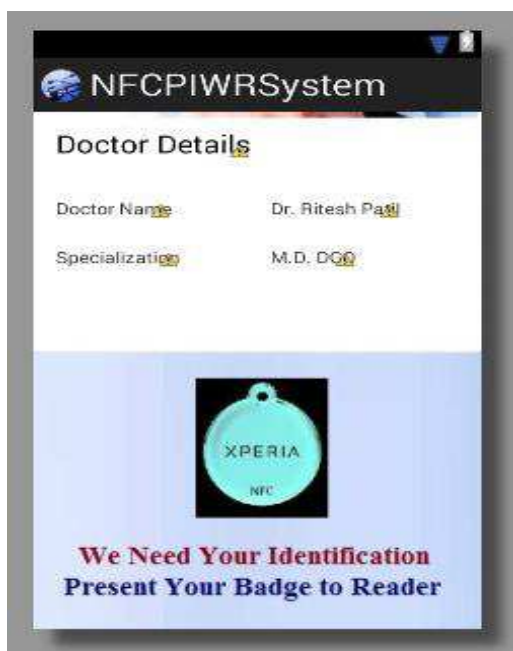


Figure 4. NFC Identification system showing doctor details.

All the information including ECG reports, X-ray can be view in patient information. For discharge there is a icon on the doctor info screen, which only doctor has access to, once clicked it ask for tag ID and for specific ID, that patient will be recorded discharge for specific time and date, message is sent to server and billing is done on the server side. The most important department in any hospital is emergency cases that are solved without disturbing the patient. So in case when doctors are not in hospital they can have a remote access to patient detail in read mode and a alternate doctor could be consulted.

5. EXPERIMENTAL RESULTS

Practical tests have been conducted to evaluate the real time performance of NFC identification and hospital management system. An author wore wristband integrated with NFC tags. When mobile having application installed was placed near author, ID was successfully detected. All packets transmitted through the internet are verified in the server monitoring program. Algorithms that are implemented as mobile application software using Android language to handle all the processes from the server were successfully executed. Data Updated on mobile was successfully saved on to the server using MySQL. The template and archetypes for the backend database or server must be predefined to store or retrieve the required kind of data. Such templates can be defined as flexible and adaptable to local needs as needed by specialists and can be edited and customized for each institution.

6. CONCLUSION

The Android Smartphone's having NFC application used in any Hospital, Clinic, Dispensary or Pathology labs .Here we tried to show how NFC enabled mobile can used for identification and be connected via the any network to exchange information across any device that is incompatible or does not have an NFC reader. Hence we can conclude that NFC technology appear to be credible for providing a efficient solution in many health care organization.

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