

NFC Based Secure Mobile Healthcare System

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Abstract—The health affairs journal states that in India the rate of wrong diagnosis have become more. In Delhi the correct diagnosis was less than 50 percent and same was the case in rural Madhya Pradesh where 42 percent was found to be wrongly diagnosed. Since only few in these areas get correct treatment for the diseases we are putting forward a method for efficient healthcare management. Mobile devices have become a basic need in the present generation. Therefore we are making use of mobile devices in our project to improve the health care by reducing medical errors. We have proposed an application that makes use of NFC tags for storing EHR.

Index Terms— NFC, Health Care, Mobile Devices.

I. INTRODUCTION

Now a days, Mobile devices are in more use compared to any other technologies. Mobile devices have many applications which help people in different ways and healthcare is one of them. There are many technologies in mobile devices using which we can improve quality of clinical service and NFC(near field communication) is one of them.[10][9] Higher quality of life and better operational success can be attained using this technology such as NFC. Taking the benefit of NFC technology we can develop a automated system that prevents medical errors. In this automated system a doctor can automatically update, edit the patients medical records. NFC enabled smartphones can be used for the above purpose i.e. to simplify workflows and to establish a better patient doctor interaction[4]. In the present scenario, we are using computers for selecting the patients from the entire patient list using identification numbers. But this leads to disastrous consequences when the identification number is entered wrong. To overcome his problem, we incorporate machine readable tags to make the process simple and robust. In this proposal, we are interacting with the computer in a new way which integrates NFC for processing the patient data.We are making the process of patient identification simple and automatic via NFC using the mobile devices.Whenever a doctor checks the patient, he/she updates the patients medical status without selecting the patients identification manually[3][9]. Healthcare has become completely advanced. So many technologies have been developed to make the processes in hospitals easier. Applications in the mobile device are used by the user not only to check blood pressure, temperature,etc but also the whole diagnosis can be saved in the cloud and referred whenever required.[9][8] A much secured system is what needed in this industry for the data to be protected from many external threats.[10][3] NFC can be seen as a secured way of processing the data because of its short range[10][9][8].

II. NFC TECHNOLOGY

NFC(near field communication)is one of the wireless technology which is used in the mobile devices, which creates radio communication between the devices by tapping them or bringing them together at a distance of 10cm or less[2][9]. The tag which activates the NFC is RFID (radiofrequency identification) enabled which gets the radio signal and transfers the data. The transfer of data is done with the RF field activation [1][4].NFC is ECMA-340 and ISO/IEC 18092 standardized. These specify the transfer speeds , coding, modulation schemes and the frame format of RF interface. NFC operates in two variants

- (1) *Active mode*: Active NFC device can generate its own RF field for data transfer. Such a device will take the role of the initiator in the communication.
- (2) *Passive mode*: A passive device can not generate RF field. They act as target. NFC data exchange format (NDEF) is used for the data transfer in all the modes. There is a set of rules for the structure of data used in communication. A NDEF message contains one or more NDEF records which encapsulate the user data at the application level.

Three modes of operation of NFC enabled devices are as follows

- (1) *Reader/writer mode*: A NFC enabled device can exist in active reader or writer mode. Due to magnetic induction, there is a energy transfer that takes place between the device and the passive tag when the two are brought near eachother. In this way a wireless communication can be setup. Now the NFC device can read and write data to the tag[3].
- (2) *Peer to Peer mode*: In this mode exchange of information takes place[3].
- (3) *Card emulation mode* :Two devices cannot establish contact with each other[3].

III. COMMUNICATION CONFIGURATION

In a simple scenerio, two devices are used for the communication via NFC.The devices can either be in active mode or passive mode. When the data transfer occurs, the sending devices which is in the active mode generates the RF field whereas the recieving device which is in the passive mode doesnt generate the RF field.To be precise, the device that is in the active mode generates the

RF field, the device which is in the passive mode does not generate the RF field. Amplitude shift keying is used when the data is being sent in the active 2 mode, hence RF signal is modulated with the data by using any coding scheme. A NFC device can either act as an initiator or a target. An initiator device starts the communication and target is the device that is at the receiver's end. A device can either act as an initiator or target in the course of communication. Most importantly, NFC communication is just not limited to two devices. An initiator can communicate with multiple targets.

Security issues

- (1) *Eavesdropping*: Devices that communicate via NFC interface are prone to eavesdropping. RF signals are used for communication, the attacker with the help of antenna can intercept the RF signals and extract the data that is being transmitted.
- (2) *Data corruption*: It's a denial of service attack. Here the attacker wants to disturb the communication/system. The attacker corrupts the data that is being sent so that the receiver can not understand it.
- (3) *Data modification*: In this type of attack the attacker wants the receiver to receive manipulated data. It is not the same as Data corruption.
- (4) *Data insertion*: Unwanted data is inserted within the data that is being sent from one device to another. In case a answering device takes longer time to answer, the attacker can impersonate the answering device and send a message to the sender.
- (5) *Man-in-middle*: It's an attack where two entities (say device A and device B) that want to communicate are tricked by a third entity (device C). Device A and B have a shared key to establish a secure communication, but here device C creates a shared key between itself and A as well as B. Now C can eavesdrop and intercept the messages. Establishing a secure NFC channel is the only way to overcome all these attacks.

Comparison with bluetooth technology

Bluetooth is a short range communication technique that will be present in the mobile devices. Setting up of NFC is easier and faster as compared to Bluetooth. Bluetooth required manual configuration to pair with the devices, whereas in NFC, there is automatic and faster contact established between devices. Data transfer rate of NFC and Bluetooth are 424 kbit/s and 2.1 Mbit/s respectively. NFC has a shorter range (~20 cm) compared to Bluetooth. NFC is RFID compatible [4][9].

IV. PROPOSED WORK

We propose a novel architecture, here each patient will be provided with a NFC tag. The NFC tag contains patient identification and information. Doctors can view the previous medical records by tapping the smartphone that is enabled with a NFC reader over the NFC tag. In the same way doctors can add/edit the information. Basically this architecture eliminates manual (paperpen) work. It makes the system automatic and robust. The following block diagram explains the whole architecture [13]. This architecture makes the system simple. Here the doctor just needs to place the NFC reader over the tag to

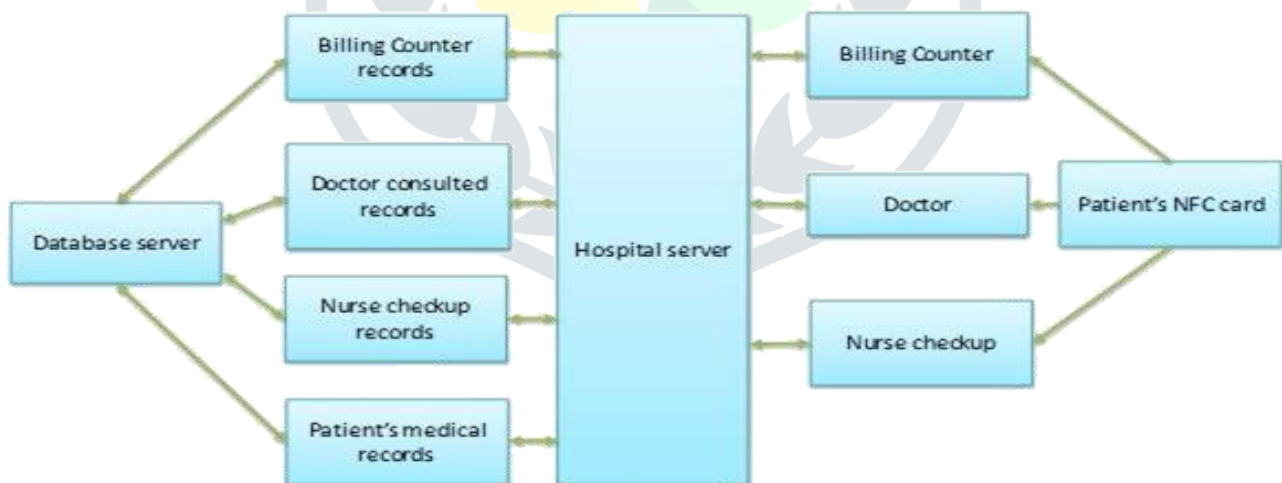


Fig. 1. Block diagram of proposed work

fetch previous information and add can query it. The values extracted by the device is been collected by the microcontroller which monitors the health condition. If any critical condition occurs the microcontroller transmits a message to the Zigbee device that gets connected to this system wirelessly from there we can transmit this to some intended person wirelessly. The system will update conditions of the patient and load it to the Database also provide an authentication to the user who wants to monitor the patient conditions [12][11].

V. APPLICATIONS

NFC has various applications like in banks, hospitals, metro stations, airports etc. [12] Since it has a secure data transferring because of the short range it can be used in many more areas like as follows:

- (1) PAYMENT S THROUGH MOBILE DEVICE: instead of carrying a wallet or a credit card user can make the payments through his mobile phones for the purchased commodities[5].
- (2) REPLACEMENT OF CREDIT CARDS: NFC cards can be used as a substitute in place of multiple credit card[5].
- (3) ADVERTISEMENT: We get all the required information like movies, interviews, coupons, offers, etc just by using NFC tags and NFC enabled smart phones[5].
- (4) TICKETING: In railway stations for example the user can book his/her ticket just by showing the smart phone to the device which reads it and the users booking details is shown or even the ticket is booked with cheapest price debiting from his account[5].

VI. CONCLUSION

A NFC based mobile healthcare device is designed to reduce the complexity and also preventing mistakes in the diagnosis by the doctors[10]. This is done by NFC enabled device which has a very high security. There will be many patients in a hospital or clinic and the people working in the hospital may not have the time to refer the patients properly and there are also chances of patients losing their prescriptions and test results or it can also be misplaced in the hospitals. Hence to avoid these problems, we have proposed NFC enabled mobile devices which can be used to keep the track of patients identification and also about multiple physicians checking them [16].

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VIII. FUTURE WORK

The proposed method can be developed into advanced healthcare system by introducing the concept of artificial intelligence wherein we can predict the right medication and treatment. Each step taken by physicians for the diagnosis is observed and updated in the patients NFC card. If the diagnosis is positive, then the physicians go forward with further treatments. If the patients lose their tag or have broken tags, then the physicians will have an option of entering the patients information in their patient ID manually [7].

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