

# NFC-based Hospital Real-time Patient Management System

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**Abstract -- In a health care milieu, the use of NFC (Near Field Communication) technology can be employed for not only bringing down health care costs but also facilitate automating and streamlining patient identification processes in hospitals and use of mobile devices like PDA, smart phones, for design a health care management systems. In this paper, we outline a NFC model for designing a system in the health care. An application of the architecture is described in the area of NFC-based Real -time Hospital Patient Management System (HPMS).**

## I. INTRODUCTION

From past few years, in almost every country across the world, significant financial resources have been allocated to the health care sector. The two factors that triggered this shift are modern technology developments and also the latest medicine practices. Most of the developed countries are facing currently the problem off middle and older aged marketplace from a largely youth-driven marketplace. Due to this trend there is a great competition among health care providers and also there is a great demand for the health services. Due to this competition there is a huge effort put by the health care providers through different ways. From the management point of view the cost of the medical services in hospitals can be controlled through high operational efficiency and also by providing improved access to public that too at an affordable cost. In order to achieve these goals of lowering costs and improving efficiency the intelligent systems can play a crucial role at this stage.

Compared to other industries the efficiency of the health care sector is poor, this mainly due to lack proper maintenance which is caused due to many reasons. Now-a -days there is a huge increase in the number of health issues being reported across different parts of the world. The hospitals have not

been able to manage this increase due to lack of proper monitoring system.

There are lots of latest technologies like micro chips, sensor technology that provide real time information about vital signs in the human body before they actually appear. This is being tried to extend to rural areas as well. All this facilities can be achieved through the use of the latest mobile technology known as NFC (Near Field Technology). The NFC is a extraordinary technique that provides wide range of solutions to different kinds of needs and also in this advanced technology one can integrate the smart tags (NFC) and data processor into a single system. This paper is structured as follows section 2 outlines NFC model used for developing health care system. Section 3 describes the benefits of using NFC in health care system and Section 4 illustrates the six layers of health care system. Section 5 illustrates the application of health care systems using NFC-based HPM. Section 6 concludes the paper.

## II. MODEL OF NFC FOR HEALTHCARE SYTEM

Generally many hospitals across the world use the paper based flow chart to capture patient information during registration period which is later passed to many other people over different shifts of time. Even though the hospital people try to update the paper work every time beside the patient it is not most accurate as it is hand written.

NFC is one of the most important emerging technologies that provide a better solution to this at it can facilitate automation and also provide an accurate tracking of patient identification. Each NFC tag/ wrist band is identified by a Unique Identification Number (UIN) that can programmed and can also be protected through password.

Each of the NFC smart tag or wrist band can be given to each patient during the time of registration at the hospital. This can be used to identify patient's information during the period of their hospitalization and also can be used to store some important data regarding patients like blood group, allergies, tests to be undertaken, and drugs to be given etc. NFC encoded device can be used to read this information from the patient at any time without causing any inconvenience to them. NFC can be used to transmit and receive the data from patient smart tag to the health providers systems.

Each NFC technology consists mainly of a low power smart tag (smart tag) and a reader. This small tag is made up of a small antenna and a microchip. The reader transmits radio-waves or electromagnetic rays that are picked up by the 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 can be stored in any device and mainly in the Hospital Patient management System. We can even obtain in other hospitals database though the internet. Now a days the NFC smart tags are provided in the name of poken's through which one can interchange data like business cards etc. The poken looks like as



Fig 1: Poken, the latest NFC based devices

The left side one can act as the smart tag of the patient and the other is the reader that reads the data from the smart tag. The interior of the poken consists of a small cell, if it as an active device, and an small microcontroller as shown



Fig 2: Poken Interior

When ever both the reader and the smart tag are brought together then the poken shows some indication that a reader is present and when the data transmit is successful it shows green light and if in case the data transfer is unsuccessful the it indicates red. The patient can use it at any hospital he goes in this way we can even save many trees from being cut down for paper. The Intel's IMEC 2012 event had saved more than 8 trees by using the NFC tags. The patients can similarly save the trees by using these smart tags and exchange data at the hospital patient management system like taking an appointment, doctor availability and other data.



Fig 3: A person obtaining data using his poken (smart tag)

### III. ADVANTAGES OF USING NFC IN HEALTHCARE SYSTEM

There are many benefits of using NFC in healthcare, but the most potential advantages of using the NFC in health care are improve patient's identification by eliminating the paper based documentation work, provide a way to automation, increase efficiency and also decrease manual power. One can use this smart tag even when they go to other hospitals, so instead of carrying many files they need to simply carry this small smart tag that can be read using a reader at the respective hospital. So this even provides benefits to customer. And also during frequent checkups one need not carry heavy files but can simply carry their smart tag and update it every time the health checkup is performed. This is of utmost benefit to old age people across world. Through the use of this NFC in health care, doctors can reduce the time required to go through a patients profile by waiting for someone to bring it and also to go through a lot of papers.

Also one of the advantages of these NFC based smart tags is that they can also have data backup in smart phones or PC's. Due to these many advantages the NFC can implemented in the health care system in order to increase efficiency and also provide accurate and reliable source of data.

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 that was jointly formed by the Nokia, Philips, and Sony, that presently has over 160 members.

### IV. MULTILAYER ARCHITECTURE IN HOSPITALS

The system of the NFC based Hospital management system consists of six layers namely physical layer, middle layer, process layer, data access layer, application layer and user interface layer. The following fig 1 shows the detailed view of the different layers in the Healthcare system

The Physical layer in architecture consists of the NFC smart tags, antennas and readers that is it consists of all hardware components.

The Middleware is the major layer as it is the interface between the NFC smart tags and the NFC readers and also the hospital database and as

well as patient management system. It also monitors the physical layer and follows the ISO standards.

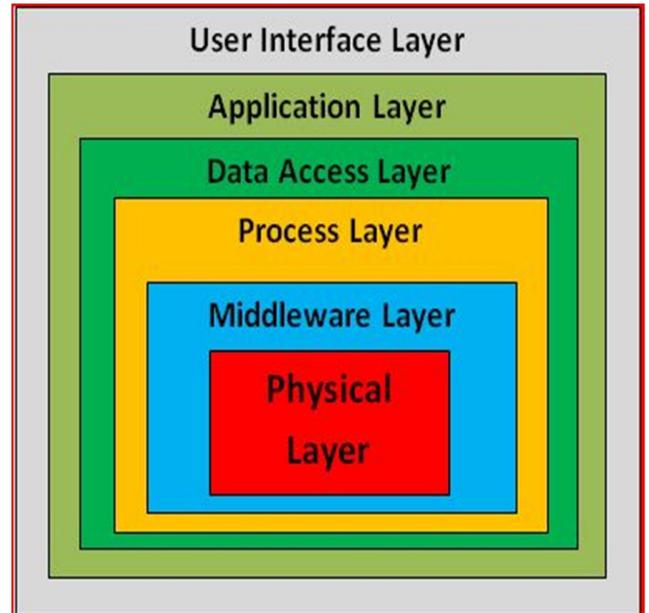


Fig 4: Architecture of Health care systems

The Process layer is nothing but a RDBMS (Relational Data Base Management System) and also consists of the applications used for creation of the NFC based events. This layer accesses large volume of NFC data through SQL (Structured Query Language).

The Application layer is used to interface with multiple user smart tags in the hospital. Finally, the User Interface layer is used to provide a user friendly and uniform interface so that the use can use it in any OS environment easily.

### V. IMPLEMENTATION OF NFC BASED HOSPITAL PATIENT MANAGEMENT SYSTEM

The latest versions of the Hospital Patient Management Systems can be implemented in different departments namely medicine and surgeries etc. The most important department in any hospital is the emergency department that handles emergency cases, so it needs to be first implemented in this department as the time of doing different formalities in a hospitals for such cases is very time consuming and also many require immediate health care, in such environment this can be highly useful in obtaining data later without disturbing the patient. The reader can be placed on the door and should be uplinked to the database so that every time it receives data it should be updated immediately. By achieving this we

can use the NFC for time stamping as well just like the RFID tags that we use now a day's very frequently in our day to day life. The Near Field Communication reader can also be placed on a door as shown in the fig 5, so that we collect data of persons entering the hospital or the doctors cabin.



Fig 5: Poken Reader Placed on the entrance door

If we use the poken in this manner it allows us to make updating of data/ information very easy.

## VI. CONCLUSIONS

In this paper we have described the multi-layer system architecture for the development of the NFC based Real Time Hospital Patient Management System. This architecture can be used in different areas or departments across the multi specialty hospitals and super specialty hospitals as they have several cases that are dealt by different doctors. It can be used in the impatient and ward management department, nursing department, housekeeping department, helpdesk, patient billing, outpatient management, pharmacy department and also the emergency department. Finally we can even try for updating this information remotely using the smart phones that have NFC application via the internet so that they can obtain this data or information across any device that is incompatible or does not have an NFC reader. Currently, it is possible to conclude that NFC promises appear to be credible for providing a better solution to the hospital patient management system in many hospitals.

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