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Digitization of Vaccination System for Public Healthcare Centers

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Abstract: ***India currently ranks amongst the lowest in infant mortality in the sub-continent. The use of ICT in medical and healthcare sector is making major impact last few decades[1]. Unfortunately, this is not the case when it comes to public, government subsidised programs such as Infant Immunization program run by State owned Primary Healthcare centres in India. The current immunization system is pretty complex to work with due to issues such as illegible handwriting, decay of paper records, misplacing the record booklets and many more. In the proposed project we plan to digitize the vaccination records with the use of simple android applications. These applications allow digitization of records, instant access to records with Digital Vaccination Card ID or by searching by Aadhar, name, phone number. The system can be accessed via dedicated android application or a text based API for non-Android Mobile Devices. The system provides functionality to track the schedule of newborn's vaccinations, and remind the parents on timely basis, as well as alert the hospitals and clinicians, at the time of each of the newborn's doctor visits, during its first year of life.***

Keywords: Mobile Cloud Computing, cloud computing, mobile computing, mobile device, REST API, Public health care, RFID, Android, Digital vaccination card

I. INTRODUCTION

The introduction of technology in healthcare offers an opportunity to discard the paper based system and improve the quality of service. It improves process efficiency, safety, data management, placing patient at the centre of the healthcare system. Thus, digitizing and implementing patient health records is the first step in creating an information system that safely manages patient data, improves process efficiency and quality of care[2]. The main motivation of this project is to overcome the issues with physical system by Digitization of vaccination records of all babies. Handling paper records isn't an easy job. Paper records can get misplaced or destroyed and scheduled vaccinations don't go quite as planned. Tracking of schedules and on time vaccination is hard to achieve through paper records. Our system allows digitization of the data and reduces the issue of keeping track of schedule due to automated reminders. As about 50% of Indian population has smartphones and 75% have cellular devices[3], this network is growing rapidly and can be used effectively through proposed system to access the vaccination details of baby.

The existing paper based System in india has a lot of drawbacks, illegible handwriting, decay of paper records, misplacement of the records being among the few of them as seen in fig (1) & fig (2). There are few applications in the market that provide a viable solution for this, but all of them are commercial products and targeted to specific hospitals and Health Maintenance Organizations (HMOs).

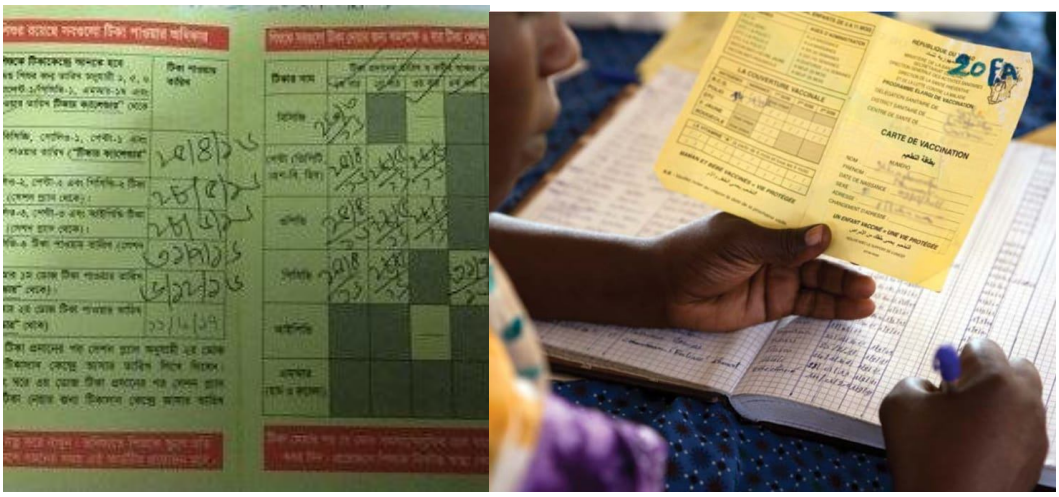

Fig. 1 & 2 Existing paper based Immunization Record System.

Our proposed system, Digital Vaccination Card, is developed to be used in every city, town and village primary healthcare centres across India, implementing the Infant immunization programs subsidised by the government. Objectives of digitizing the immunization program are reduced infant mortality, improved life expectancy, minimizing Healthcare costs, reaching all income groups, tracking immunizations from birth, managing Regional Pandemics.

II. RELATED WORK

Authors in [1] propose an Electronic Health Record (EHR) system based on top of cloud computing stack to serve as a web portal for storing patient's health record history including but not limited to past medical history, immunization status, sugar level and blood pressure records. Authors in [2] propose a cloudlet based approach to the healthcare system. Specifically, cooperative cloudlet MCC model is composed of a set of connected and well-distributed cloudlets within a hospital. Here, a mobile user communicates with the nearest cloudlet instead of a enterprise cloud server. Cloudlets constantly communicate together to serve the requests of the users. This reduces the time delay and power consumptions for mobile users. Authors in [3] propose Mobile Cloud Computing Electronic Healthcare (MCCEH) model can be implemented to ease the emergency process and save the time for user in need of help, and implement searching process for nearest Health care center based on location, make appointment in the medical center. Authors in [4] discuss networked healthcare and how to implement it using Mobile Cloud Computing (MCC). They describe a cloudlet-based MCC infrastructure for dedicated healthcare applications. Authors in [4] propose a mobile healthcare application to manage health records and images. The mobile application is developed using Android. The Amazon's cloud service is used in this mobile application.

III.PROPOSED SYSTEM

The proposed system plans on creating two android applications, one for the parents and one for the public healthcare center. Both the android applications have different purposes and provide different functionalities. The figure 3.1 explains the system architecture of our project.

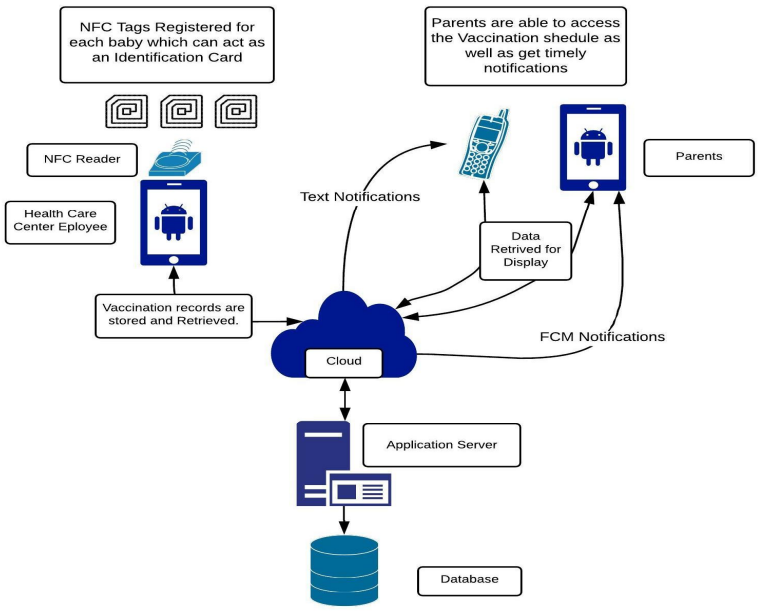

Fig. 3 System Architecture

The clinician uses healthcare app to insert baby records and update existing ones. He/she also administers vaccinations and marks particular vaccines as administered or canceled via the PHC application. The parent application will receive timely notifications based on the schedule. Parents with non-Android phones will receive text message notifications. Near Field Communication (NFC) tags are used for unique identification of a baby. These tags are rewritable and can be used again after the course is complete. Records can be searched using these tags. These tags come in various shapes and storage capacity. The proposed system uses card shaped NFC tags for the operation.

IV. EXPERIMENTAL RESULTS

For testing the developed system, we registered 3 parents with 5 infants among them. We registered 3 different healthcare centers, once a baby is registered, the tentative schedule will be generated automatically. The baby is identified by a NFC tag. The vaccines are administered through an appointment. Appointment is created at a particular Primary HealthCare Center (PHC) and the vaccines are marked as administered (or cancelled and rescheduled). Appointment history shows all the appointments at respective PHCs. The records can be searched using NFC tag, parent's email or Aadhar number. Our system also provides a text-based service for users who don't use an android phone. Fig 4 shows the details of the registered babies, while fig 5 talks about the vaccine schedule of a particular baby. Fig 6 gives more information about the appointment details or visits to the Primary Health care Centres. These figures show the results of implementation of the android applications.

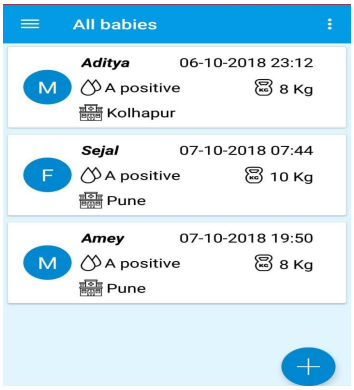

Fig. 4 List of babies registered to immunization program

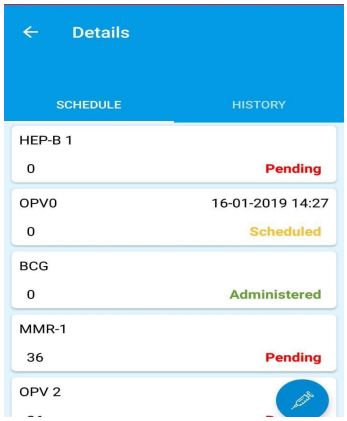

Fig. 5 Auto-generated Tentative Schedule of the baby

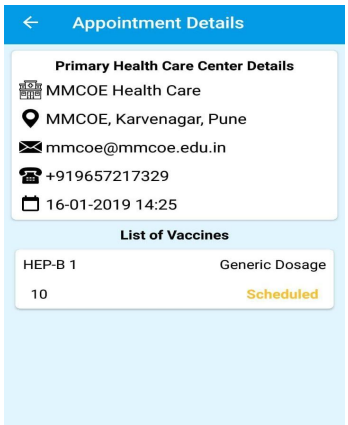

Fig. 6 Information of scheduled appointment of the baby

V. CONCLUSION

Our system provides instant access to records anytime over the Internet or Text API. Digitization of data allows Central Access to Vaccination Records. Baby's Vaccination Reports can be accessed or manipulated globally i.e. parents need not get their babies vaccinated at the same Health Care Clinic. Our system can successfully overcome the limitations of the traditional paper based system which makes the process nearly error free, completely reliable and efficient. The future work for this system would be to practice encryption of records as policy measure a feedback system to analyze the data based on vaccination performance region.

VI. ACKNOWLEDGEMENT

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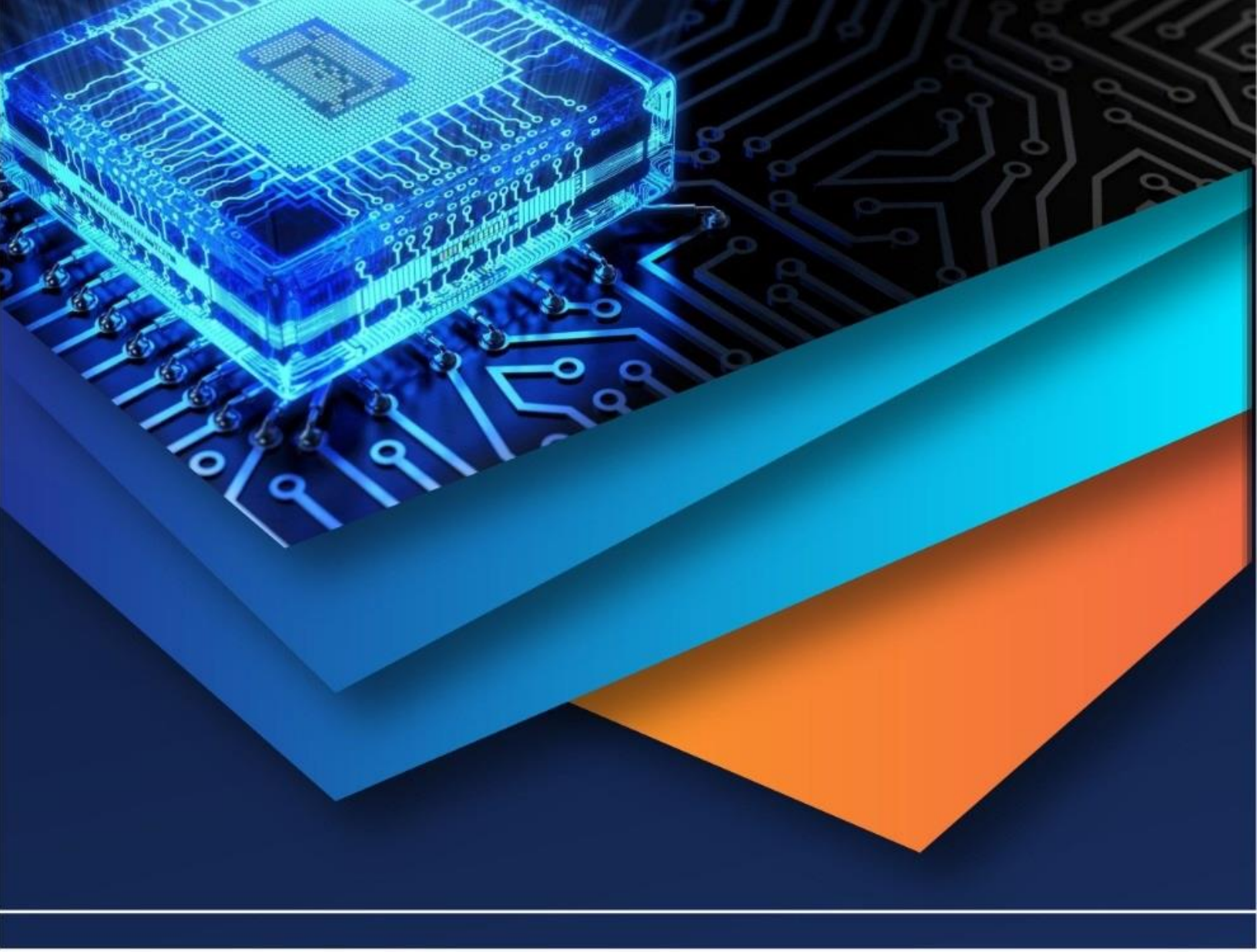

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