NFC Based Secure Mobile Healthcare System

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***Abstract*— With the recent increase in usage of mobile devices especially in developing countries, they can be used for an efficient healthcare management. In this work, we have proposed a novel architecture for improving healthcare system with the help of Android based mobile devices with NFC [1] and Bluetooth interfaces, smartcard technology on tamper resistant secure element (SE) for storing credentials and secure data, and a HealthSecure service on a hybrid cloud for security and health record management. The main contribution of this paper is proposal of applications for i) Secure Medical Tags for reducing medical errors and ii) Secure Healthcard for storing Electronic Health Record (EHR) based on Secure NFC Tags, mobile device using NFC P2P Mode or Card Emulation Mode. We have also briefly mentioned a basic security framework requirement for the applications. Since NFC NDEF format is prone to security attacks [2], we have utilized low level APIs on Android based mobile devices, to securely access NFC tags such as MIFARE Classic tags with NFC-A (ISO 1443-3A) properties. Simple touch of NFC enabled mobile devices can benefit both the patient as well as the medical doctors by providing a robust and secure health flow. It can also provide portability of devices and usability for health management in emergency situation, overpopulated hospitals and remote locations.**

Keywords— mobile based secure healthcare; NFC in healthcare; e-Health card; medical object identifier; RFID; MIFARE Classic; java card; secure element; patient health record

I. INTRODUCTION

Robust healthcare is a requirement for both developed countries, where the cost of healthcare is high and security and privacy are critical issues and developing countries like India, where there is a mass population to handle in hospitals and robust healthcare procedures are required. An efficient, reliable, robust and secure health flow is important to manage patients, their health records smoothly and for the right care to reach to the patient at the right time.

Identification of objects for secure medical procedures is very essential for a secure workflow. For example, secure identifiers on the medicines can help healthcare professional to administer correct medication to a patient to reduce errors.

Along with this issue the Patient Health Record management is important both for patients as well as hospital management. In developing countries like India, there is no centralized management of health records and records are mostly retained by patients in a paper format OPD (Out Patient Department) card, which is both cumbersome to maintain along with the paper based reports and also unreliable. Work is still being done for a secure, electronic patient record management as a Healthcard on a Smartcard in developing countries like India [3] and other nations [4]. Most of the public healthcare services issue a Healthcard on a Smartcard, which retains just the primary information of the patient. All other records are stored on a centralized medical storage server. In developing countries like India, there are challenges like costly infrastructure, connectivity problem for accessing centralized medical records and acceptability of the Healthcard uniformly across different hospitals.

With the recent advancements in mobile devices involving secure credential storage, larger storage capability, wireless communication interfaces and computational power, they can be used in healthcare for not only gathering vital health parameters, as in the Body Area Networks, but also for healthcare management. Privacy and security is a very important aspect of healthcare [5].We propose that the patient should retain all or major patient's EHR electronically, on a Healthcard that is either on a external Smartcard accessible by a mobile device or on the mobile device retained by a patient. A Healthcard retained on a mobile device can retain the entire EHR including reports and tests. Permitted portion can be accessed securely by an authorized medical provider by a simple tap of mobile device. Due to the computational capabilities the records can be summarized and organized for a quicker action to be taken.

Healthcard on a mobile device can be helpful in developed countries also, where healthcare cost is high and privacy and security are critical. The patient can retain all records and can manage the privacy concerns of which portion of the records are to be accessible. The records can occasionally be synced to the central server for backup or storing past history. EHR on Healthcards retained by people can also help in providing the right care in an emergency situation when the patient is unconscious. It can also help determine location of the patient in case of emergency through location service on recent mobile devices. The business logic of using Healthcard on mobile devices can be beneficial to a medical professional since it can securely identify patients using simple portable mobile devices and also get a concise health report. A simple tap of NFC enabled mobile device, will not only improve the workflow of medical professionals but also prove to be beneficial in emergency and chaotic conditions like mass populated