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RESEARCH ARTICLE

CONDITIONAL PRIVACY PRESERVING SECURITY PROTOCOL FOR NFC APPLICATION

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ABSTRACT

The mainstay of this project is to propose a mobile ward round system based on openEHR standards for the use on smart phones and tablet computers using the Android platform which integrates and uses NFC to explore new ways of computer interaction, data processing and workflows in the medical world. Based on the automatic patient identification via NFC using the mobile device, physicians can easily view recent ward round results and edit/add information without manually selecting the patient from a list. Relying on the open EHR standard, physicians are not limited to a certain ward round document anymore but can define their own ward round templates by means of the open EHR templates and archetypes.

Index Terms- NFC, openEHR, data processing.

1.1 INTRODUCTION

Patient identification is the most basic requirement in clinical workflows regardless whether documentation is done using a computer, pen and paper or a combination of both. Currently several computer aided systems exist for the medical documentation and patient identification.

1.2 ANDROID

Android is the name of the Linux based operating system that is backed by Google and the other members of the Open Handset Alliance. Because of Android's open source nature, Android based smart phones should be cheaper to produce than those that use operating systems, such as Microsoft's Windows Mobile, that require a royalty fee be paid for each use. The T-Mobile G1, announced on September 23, 2008, was the first Android OS smartphone to be officially introduced to the market.

1.3 ANDROID FEATURES

- Reuse and replacement of components
- Dalvik virtual machine
- Integrated browser
- Optimized graphics
- SQLite
- Media support
- GSM Telephony
- Bluetooth, EDGE, 3G, and WiFi
- Camera, GPS, compass, and accelerometer
- Rich development environment

1.4 ANDROID TOOL:

The Android Developer Tools (ADT) plugin for Eclipse provides a professional-grade Development environment for building Android apps. It's a full Java IDE with advanced features to help you build, test, debug, and package your Android apps.

1.5 NEAR FIELD COMMUNICATION (NFC):

NFC is a set of standards for portable devices. It allows them to establish peer-to-peer radio communications, passing data from one device to another by touching them or putting them very close together

NFC came out of RFID. RFID, or radio-frequency identification, is the technology used by shipping companies and in superstores to keep track of goods, it uses electromagnetic induction in order to transmit information. NFC is similar technology, but standardized for consumer smart phones. NFC standards are defined by a group called the NFC Forum, which includes Nokia, Sony and Philips.

In essence, if your phone has NFC as a feature it can be used to transfer data to other phones or to NFC readers.

1.6 FUTURE USES OF NFC:

Unfortunately at the minute a lot of this is theory. Google Wallet allows consumers to store credit card and store loyalty card information in a virtual wallet and then use an NFC-enabled device at terminals that also accept MasterCard Pay Pass transactions. But do you use Google Wallet?

Staying in the future other potential uses for NFC include the ability to control devices around your home. Perhaps your house would unlock and the heating and lights go on when your NFC-enabled phone passed a sensor in the driveway. And there are potential social benefits: if everyone had NFC-enabled smart phones swapping contact details would be pretty straightforward. See all our Smartphone buying advice.)

1.7 NFC ARCHITECTURE DIGRAM:

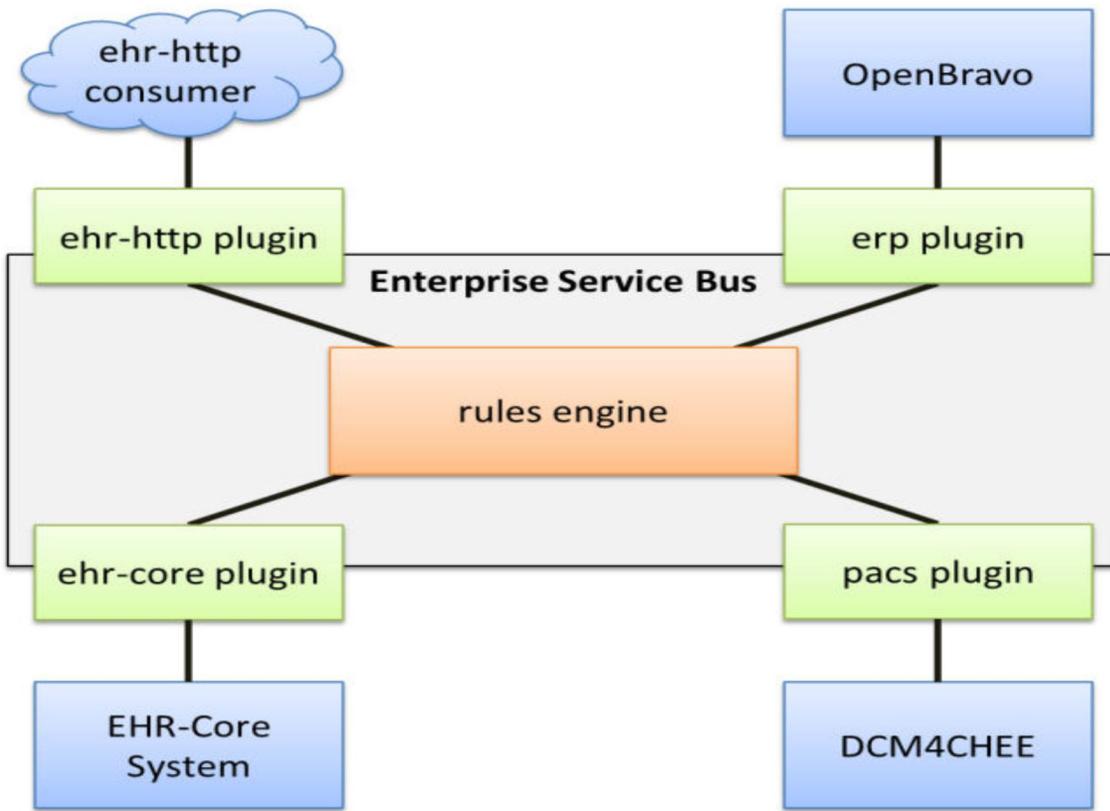


Figure 1. NFC Architecture

1.8 PROJECT SCOPE

Patient identification is the most basic requirement in clinical workflows regardless whether documentation is done using a computer, pen and paper or a combination of both. Currently several computer aided systems exist for the medical documentation and patient identification. These systems are usually based on bar-codes, RFID (Radio Frequency IDentification) or NFC (Near Field Communication) tags.

Patient identification in a hospital is mainly done at:

1. The time of admission.
2. At bedside during rounds
3. At various points of care during a hospital stay (e.g. radiology, physical therapy)
4. In Pharmaceutical transactions.

2. PRODUCT FEATURES

In IT systems, patient selection with implicit patient identification is a recurring task which is done several hundred times a day by various user groups. Even though, this is a basic and simple task, it has disastrous consequences when done wrong. Machine-readable identification tags simplify this process and in general lead to a significantly higher probability of selecting the right patient. In scenarios where mobile devices (smartphones, tablets) are used for clinical documentation, patient identification is an even more delicate process because of the input capabilities. We addressed this problem in our education and research HIS platform based on openEHR using NFC tags and an Android based smartphone platform. We developed a NFC based ward round system using the openEHR platform to store and query data for patients from a remote available openEHR based backend server. The openEHR standard based backend allows the use of different ward round documents per patient based on different openEHR templates and archetypes. Since the currently existing openEHR reference implementations do not support mobile platforms, we ported the existing Java reference implementations onto the Android platform.

3. USER CLASSES AND CHARACTERISTICS

3.1 PATIENT IDENTIFICATION AND NFC GENERATION

The system requires patients to be equipped with a small wearable NFC tag placed in wristband which is identifiable by physicians during their ward rounds using NFC enabled smart phones. The task of selecting the correct patient record using other mobile ward round systems therefore limits to a simple action of placing the Smartphone next to the wristband for a few seconds. Main advantages for NFC tags and the reason why we decided to make use of this technology include the possibility to write data back to the tag without a direct line of sight. This allows the tags to be covered and increases the usage convenience for the patient as well as for the clinical staff.

Since NFC does not require a pairing of devices, physicians do not have to perform additional steps than just placing the NFC reader next to the tag. These advantages make it easy

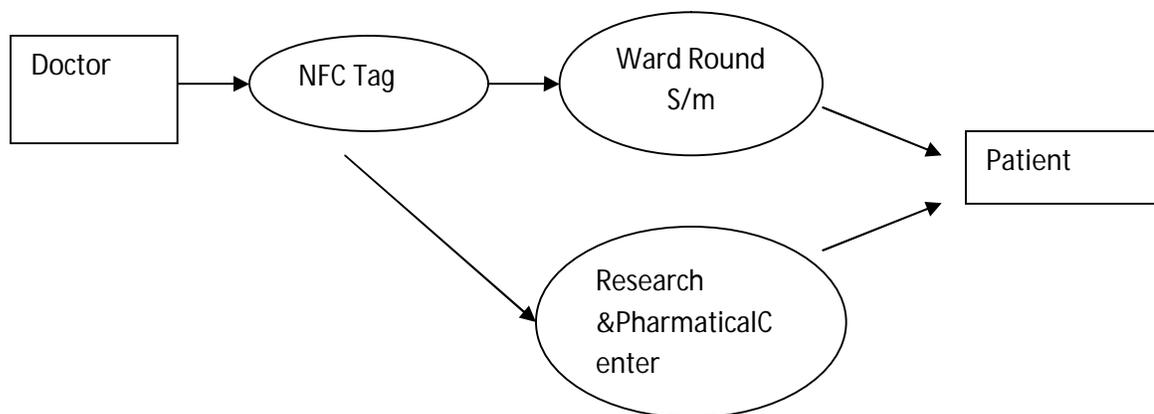
to place NFC tags in small and wearable wristbands, identified with and handed to the patient at the time of admission.

3.2 REPORT ENCRYPTION BASED ON ECC

In this module the patient's reports are fed to the tag via the NFC mobile. Before writing to the tag the data's are encrypted for security purpose. The attackers trying to retrieve the data will not be able to get the original data. The system is secured with ECC for encryption and decryption of data.

3.3 PARSING THE NFC TAG

The proposed system uses Android platform for developing application in the mobile end ensuring upward compatibility and therefore can be executed on all Android based smart phones and tablets where NFC is available. It uses the NFC technology to identify patients and their corresponding EHRs. Placing the mobile device next to a NFC tag, which comprises the EHR ID and other Android/NFC related information (such as the parameters for automatic execution of the application) leads to an automatic startup of the mobile ward round system and opens up the patients HER coming from the backend system.



A hierarchical structuring of relations may result in more classes and a more complicated structure to implement. Therefore it is advisable to transform the hierarchical relation structure to

a simpler structure such as a classical flat one. It is rather straightforward to transform the developed hierarchical model into a bipartite, flat model, consisting of classes on the one hand and flat relations on the other. Flat relations are preferred at the design level for reasons of simplicity and implementation ease. There is no identity or functionality associated with a flat relation.

4. CONCLUSION

Thus the above literature survey defines clearly about the existing system for We developed a proof of concept that shows, that NFC enabled devices can be connected to an existing web service enabled infrastructure using standard technologies. Mobile devices are ubiquitous in our daily life and have a high acceptance rate.

The main problems to tackle are not the technical issues, but the organizational and work flow ones. Further studies and experience will show how and if mobile consumer devices will augment daily medical practice.

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