

Framework for Near-Field-Communication-Based Geo-Localization and Personalization for Android-Based Smartphones—Application in Hospital Environments

Meng P^{1,2}, Fehre K³, Rappelsberger A⁴, Adlassnig KP^{3,4}

1 AKh Linz GmbH, Linz, Austria

2 Philipp Meng, Individual Enterprise, Linz, Austria

3 Medexter Healthcare GmbH, Vienna, Austria

4 Section for Medical Expert and Knowledge-Based-Systems, Center for Medical Statistics, Informatics, and Intelligent Systems, Medical University of Vienna, Vienna, Austria

Section for Medical Expert and Knowledge-Based Systems

Introduction

- Hospitals:
 - Common devices – many users
 - Exact geographical localization important
 - Low budget for extra expenses (tax money)

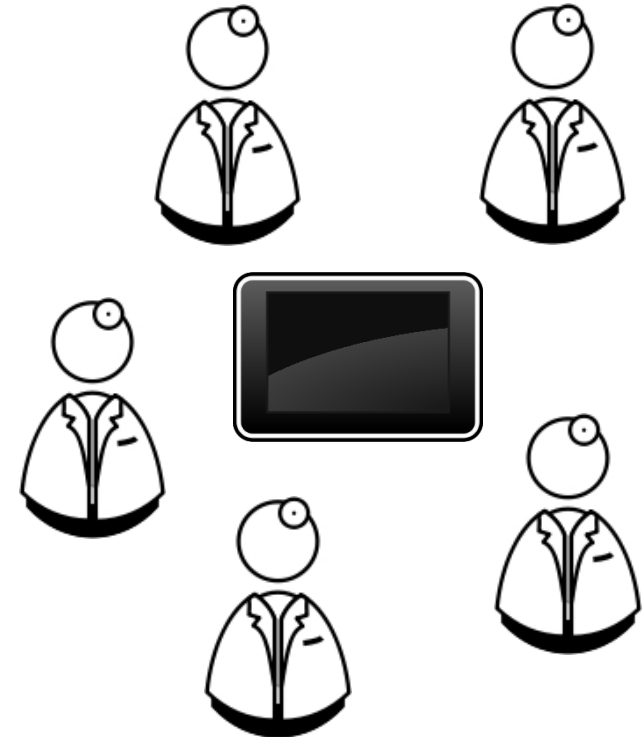
Introduction

Indoor geographic localization

- Currently available technologies:
 - WiFi™ triangulation
 - indoor-GPS
 - Bluetooth triangulation
 - RFID based systems
- Problems:
 - Setup cost
 - Administration
 - Failures in reception

Application personalization

- Technologies for personalization in multi-user environments:
 - user-specific login for the device (restricted profiles)
 - user-specific authentication inside of the application
- Problems:
 - bad usability (username/password has to be entered)
 - low flexibility – high administrative burden
 - restricted profiles limited to a small amount of users (Android: 8 users)
 - no sharing of settings possible



Near Field Communication

- Short-range (maximum approx. 10cm) wireless communication standard
- Introduced in 2002 – various applications in the medical sector today
- Easy to use
- NDEF (NFC Data Exchange Format) for standardized data exchange
 - NDEF messages – each message can contain one or more
 - NDEF records

Overview

Development of two prototypes:

- „nfcgeo“ - offering geographic localization with NFC
- „nfcsettings“ - storing personal preferences on NFC tags

Development Environment:

- Android + NFC-capable Device
- NTAG203 NFC Tags (144 Bytes memory)

Methods

Security setup – two layers

Electronic layer:

- Encryption:
 - TwoFish (symmetrical) – encryption of the data stored in the Android SharedPreferences system
 - RSA (asymmetrical) – encryption of the data transferred between the applications in Intents
- Read-only tags (nfcgeo)

Physical layer – prevent movement

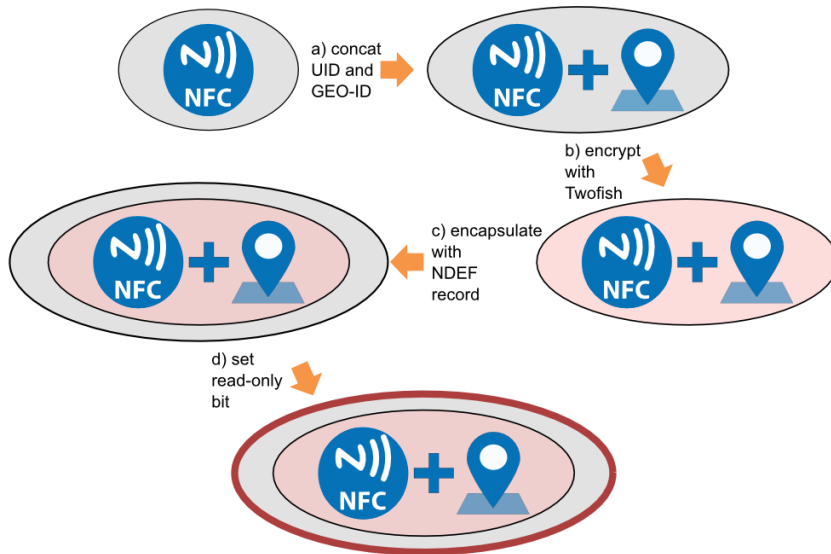
- holographic security seals (nfcgeo)



from: <http://www.htetikett-shop.de/>

Nfcgeo

Tag initialization

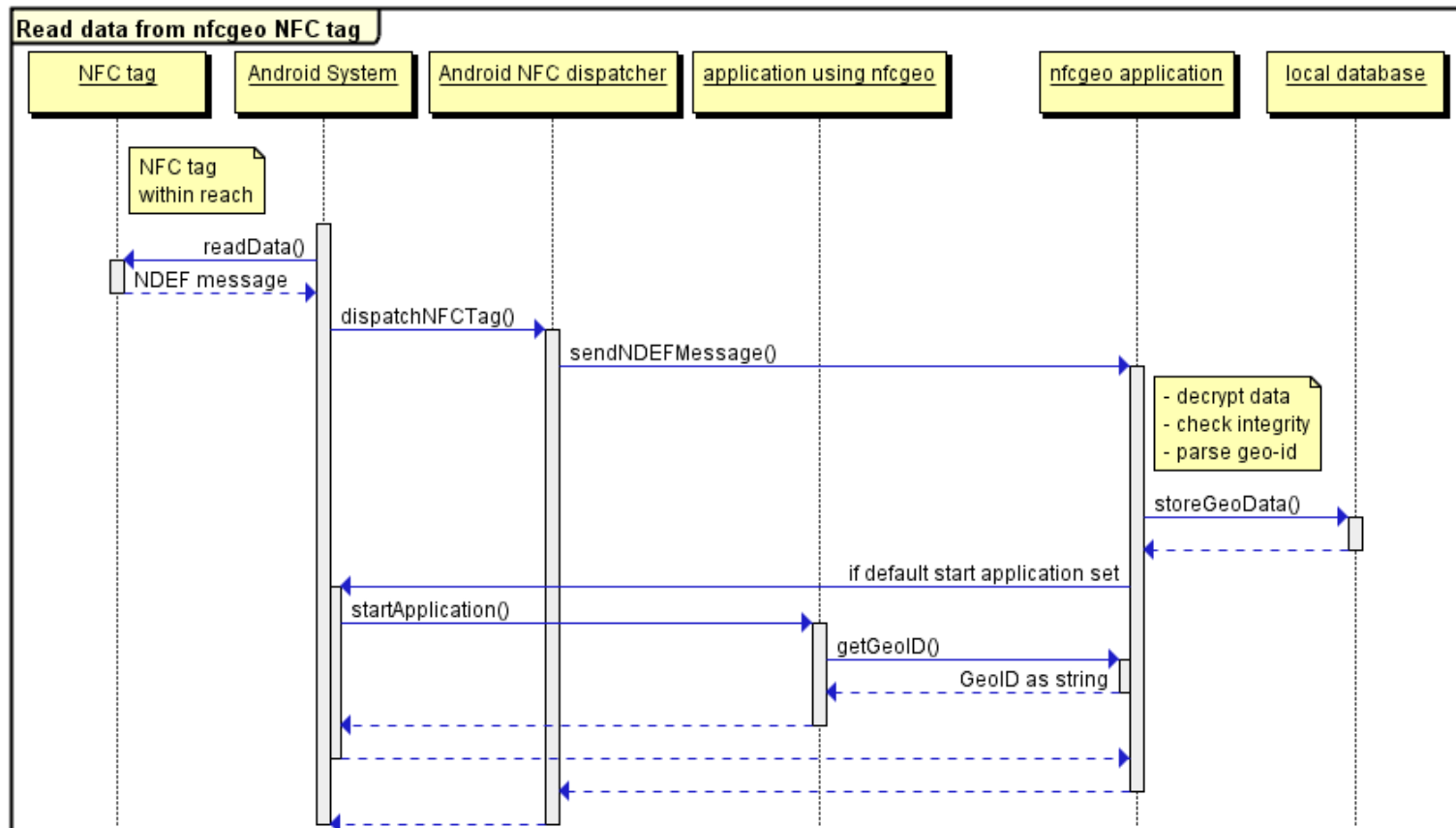


Contained data

- String representing the location
- latitude (optional)
- longitude (optional)

Methods

Nfcgeo



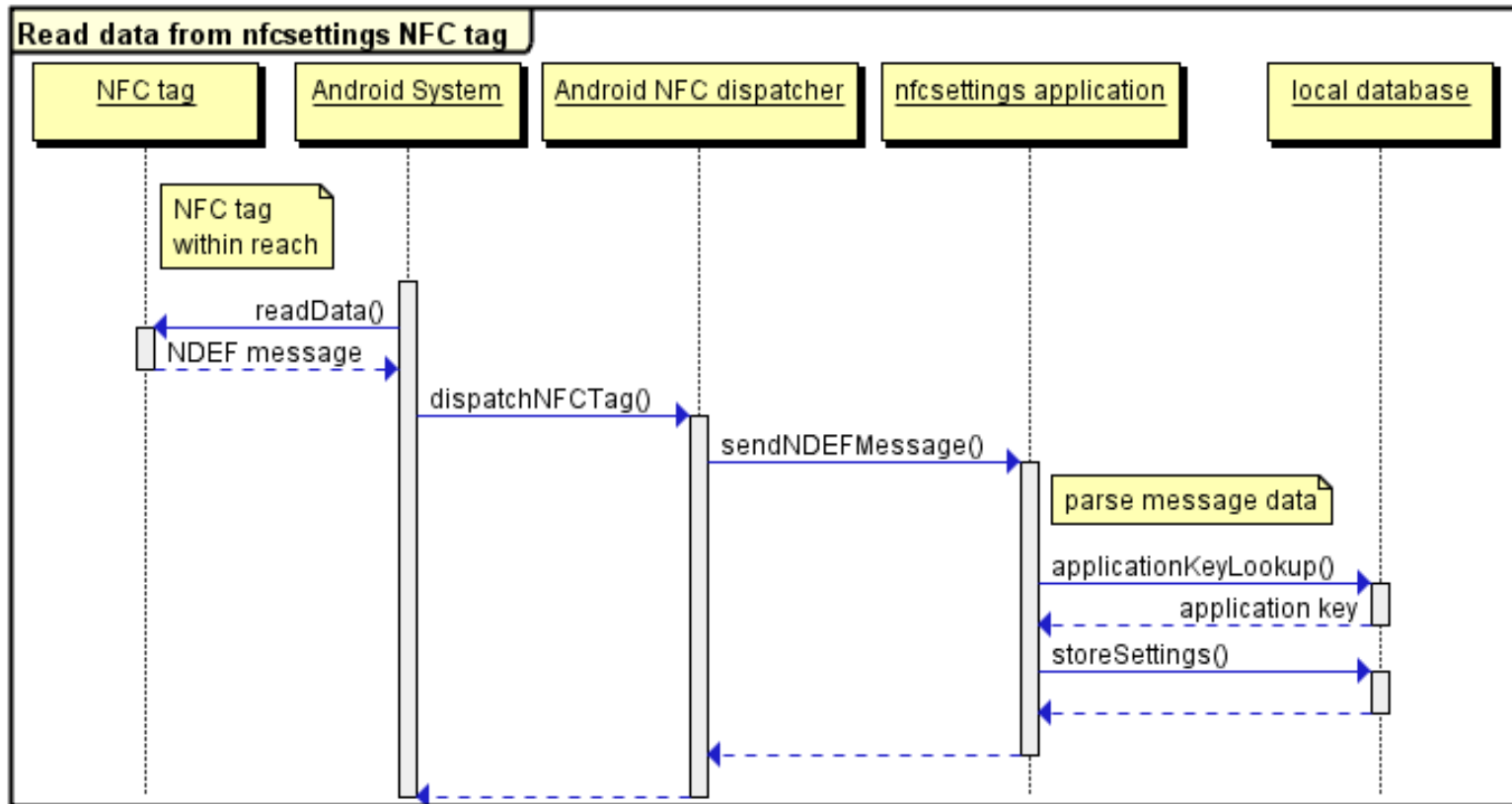
Nfcsettings

Data encoding:

- NDEF message
 - MIME type
 - NDEF record(s)
- each NDEF record
 - Byte 0: Identification byte for nfcsettings
 - Byte 1-4: Identification of the application context
 - Bytes 5-n: Data from the application

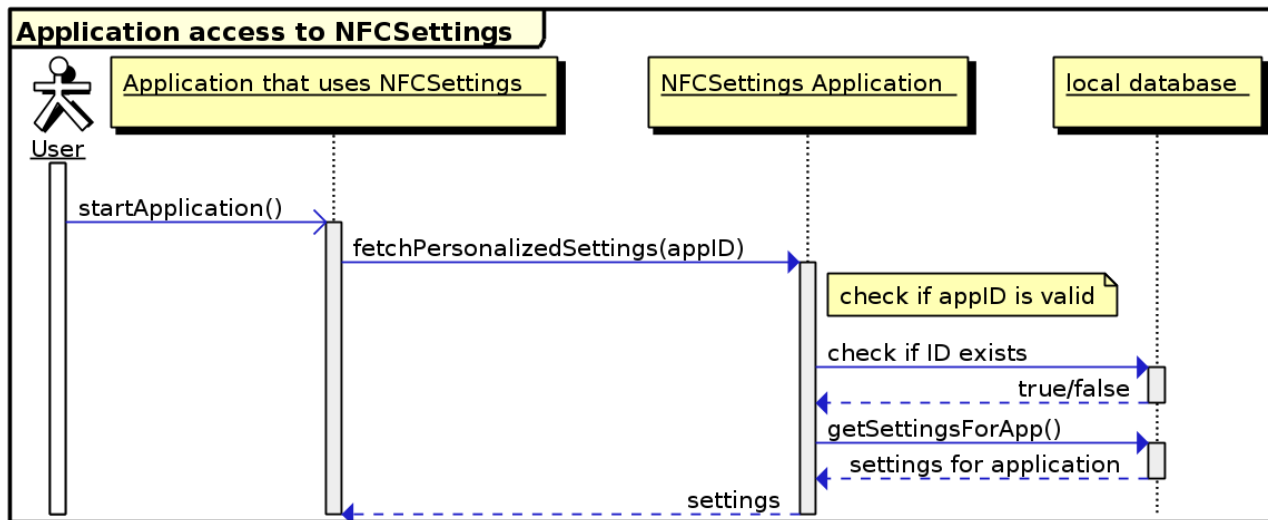
Methods

Nfcsettings



Methods

Nfcsettings



Geographic localisation using NFC

- low-cost (~ 0,5€ / NFC tag)
- accurate
- user-friendly

Multi-user enhanced applications using NFC

- intuitive
- limited storage

Discussion

Nfcgeo

- New framework for exact geographic localization
- No communication with a server needed
- Usability – default application started after scanning of NFC tag
- hospital environment – high security requirements
 - Hard-coded encryption key – problematic?
 - counterfeiting of NFC tags and security seals?

Nfcsettings

- NFC tags for storage of (limited amount of) personal settings of applications → multi-user support
- Low-cost, no specialized hardware necessary
- Limited memory
- Bridging technology
- To evaluate: hybrid smart cards (NFC + integrated circuit card)

Thank you for your attention!

Dr. Philipp Meng

philipp@pmeng.org

Univ.-Prof. Dipl.-Ing. Dr.
Klaus-Peter Adlassnig

klaus-peter.adlassnig@meduniwien.ac.at