NFC LOYAL: A Beneficial Model to Promote Loyalty on Smart Cards of Mobile Devices

Busra OZDENIZCI, Vedat COSKUN, Mehmet N. AYDIN and Kerem OK
Department of Information Technology
ISIK University, Istanbul, Turkey
Outline

• Near Field Communication (NFC)
• Loyalty Services
• Our Motivation
• NFC Loyal and Architecture
• NFC Loyal Model
• Conclusion
Near Field Communication (NFC)

- Short Range Wireless Communication Technology based on Radio Frequency Identification (RFID) technology

- Jointly developed by Sony and Philips in 2002

- Frequency: 13.56 MHz, Max. Bandwidth: 424Kbits/sec

- Three operating modes
  - Reader/Writer Mode, Card Emulation Mode, Peer-to-Peer Mode
Near Field Communication

Smart Poster Applications

Payment Applications

Social Network Applications
Near Field Communication

- NFC technology’s integration with mobile phones increases its usage

- Payment and ticketing applications

- Smart Cards as Secure Element
  - Secure, interoperable, multiapplication platform
  - Secure concurrent execution of applications
  - Secure storage of valuable information
    - Credit cards, debit cards, membership cards, and loyalty cards can be stored into one single device!
Loyalty Services

- Effective marketing tool for companies
Our Motivation

• Using information storage and processing capability of smart cards by loyalty programs

• Integrating information of payment and loyalty programs on the same smart card

• Increasing the availability, mobility and simplicity of using loyalty programs

• Creating a win-win model for all actors
NFC Loyal

- Extends the conventional understanding of loyalty services to a more efficient and secure usage

- Stores loyalty data on the smart card and enables secure data exchange among payment applications and loyalty applications
NFC Loyal Architecture

• Global Platform Card Specifications

• Smart card architecture is comprised of a number of logical and physical components
  ▫ Microprocessors, OPEN and GP Trusted Framework, RTE, Security Domains, Several Application Slots, Application Provider, and Global Services ...

• We further extend existing smart card architecture to satisfy NFC Loyal needs!
NFC Loyal Architecture

- Secure Common Domain acts as centralized secure database storage cluster
  - Managed by SCD Manager (SCDM)

- SCDM acts as the interface between the SCD and the payment and loyalty applications
  - Responsible to store the data that is sent by the payment applications
  - Respond to queries made by the loyalty applications as agreed by the user and configured accordingly
NFC Loyal Model

- Loyalty & Payment App. SPs
- SCDM
- Certificate Authority
- NFC Loyal
- Card Holder
- Card Issuer
Loading SCDM, and Payment and Loyalty Applications

1. Secure Common Domain Manager
2. OTA Transfer of (SCDM Application || C₅)
3. Verification
4. Approval for Installation
5. C₅ = E([KU₅ || ID₅ || Time₁], KRₐ₅)
6. OTA Transfer of (Application || C₆)
7. Certificate Database
8. Card Holder

Certificate Authority

C₆ = E([KU₆ || ID₆ || Time₂], KRₐ₆)
SCDM Configuration

- Payment applications can share *all or partial* information with loyalty applications
  - A setting mechanism is beneficial for Card Holders who want more *user privacy*!
  - The amount of the shared information can be low or high
Interaction with SCD

- Extensible Markup Language (XML) for the interaction between the SCDM and applications

```xml
<!DOCTYPE Transaction [ 
<!ELEMENT Transaction (ID, date, time, price, company, category)> 
  <!ELEMENT ID (#PCDATA)> 
  <!ELEMENT date (#PCDATA)> 
  <!ELEMENT time (#PCDATA)> 
  <!ELEMENT price (#PCDATA)> 
  <!ELEMENT company (#PCDATA)> 
  <!ELEMENT category (#PCDATA)> ]>
```
A Sample for Transaction XML Document

<! — — TRANSACTION.XML document — — >

<?XML VERSION= "ENCODING="ISO-8859- STANDALONE= "no"?>

<Transaction>
  <ID> 1</ID>
  <date> 15 April 2010 </date>
  <time> 14:00 </time>
  <price> 100 </price>
  <company> Gaseous </company>
  <category> Gasoline </category>
</Transaction>
Interaction with SCD

- After each transaction ...

- To achieve a secure channel protocol, public key encryption schemes such as RSA may be used
- A more advanced form of encryption, by creating session keys of secret key cryptography is also possible
Conclusion

- Usage of NFC Loyal creates a win-win business model!

  - **Mobile User**
    - Gain coupons, discounts, free miles or free talks etc. from loyalty applications

  - **Loyalty Card Issuers**
    - Gain increase in purchases
    - Acquire more loyal customers

  - **Payment Card Issuers**
    - Experience increase in usage
    - Act as loyalty firms by offering customers to use that banks’ account
NFC Lab - ISTANBUL is one of the leading NFC focused research labs in Europe.

NFC Lab - ISTANBUL considers Near Field Communication as an emerging technology that transforms innovative ideas into reality for Future Information and Communication Society.

NFC Lab - ISTANBUL strives for research excellence in focused research areas relevant to NFC. The Lab is aimed to be a catalyst in achieving substantial progress with involvement of key players including MNO, Financial Institutes, Government Agencies, other Research Institutes, Trusted Third Party, other Service Providers.

NFC Lab - ISTANBUL embodies a core team and a network of business and academic partners.

We are committed to work on NFC technologies with multidisciplinary network of expertise all around the world. The core team is accountable for creating and maintaining the business and academic partnerships and dynamically generates networks on project basis.