

Near Field Communication for Handset-Based Ticketing in Public Transportation

Thesis work Presentation

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Agenda

- Basics of Near Field Communication
 - What is it?
- NFC enabled mobile phones
 - What devices are available?
 - How can NFC be used?
 - How can it be used in public transportation?
- How does NFC enabled mobiles change the existing public transportation ticketing landscape?
 - Benefits of NFC ticketing
- Over the Air (OTA) Ticket Purchase
 - Would this increase the ticket costs?
- Conclusions

Basics of Near Field Communication

What is it?

- NFC is based on Radio Frequency Identification (RFID)
 - Communication distance is limited to only few centimeters
 - Two way communication
 - New use cases (e.g. contactless smart cards)
- NFC is not a proprietary technology
 - Standardization is done in NFC-Forum which has today more than 100 members including handset manufacturers, semiconductor vendors, operators, CC companies, banks etc.
 - Communication is based on ISO14443
- NFC is not only used with mobiles (but in this Thesis I have concentrated on NFC enabled phones)

NFC enabled mobile phones

What devices are available?

- Nokia is a clear leader, but also other manufacturers are active
 - So far two commercial products that contain also the secure chips has been announced



Nokia 3220 with the Nokia NFC shell for p&t
(used as the reference product in this Thesis)



Nokia 6131NFC, Announced 01/07
(not included in this Thesis)

NFC enabled mobile phones

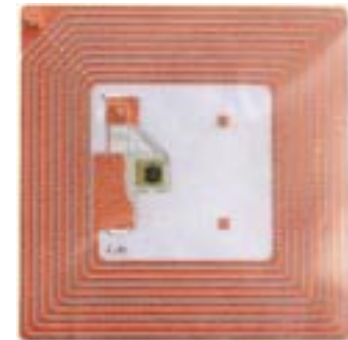
What is a secure chip?

- Mobile phones memory is not safe enough for storing business critical applications like credit and/or traveler cards
- These applications are stored on a separate chip
 - High-security multi-application smart card
 - Encryption handled by the chip itself
- The chip can be located in several places
 - Embed it into the phone (Non transferable)
 - Include it in a SIM card (standardization missing)
 - Include it in a removable flash card (standardization missing)

NFC enabled mobile phones

How can NFC be used?

- Examples of NFC mobile use cases
 - Turn the phone in to a contactless credit card
 - Use the phone as a contactless traveler card
 - Easy access to services by reading shortcuts from RFID tags
 - Share and get information by touching
 - Pair devices (e.g. Bluetooth, Wi-Fi)



NFC enabled mobile phones

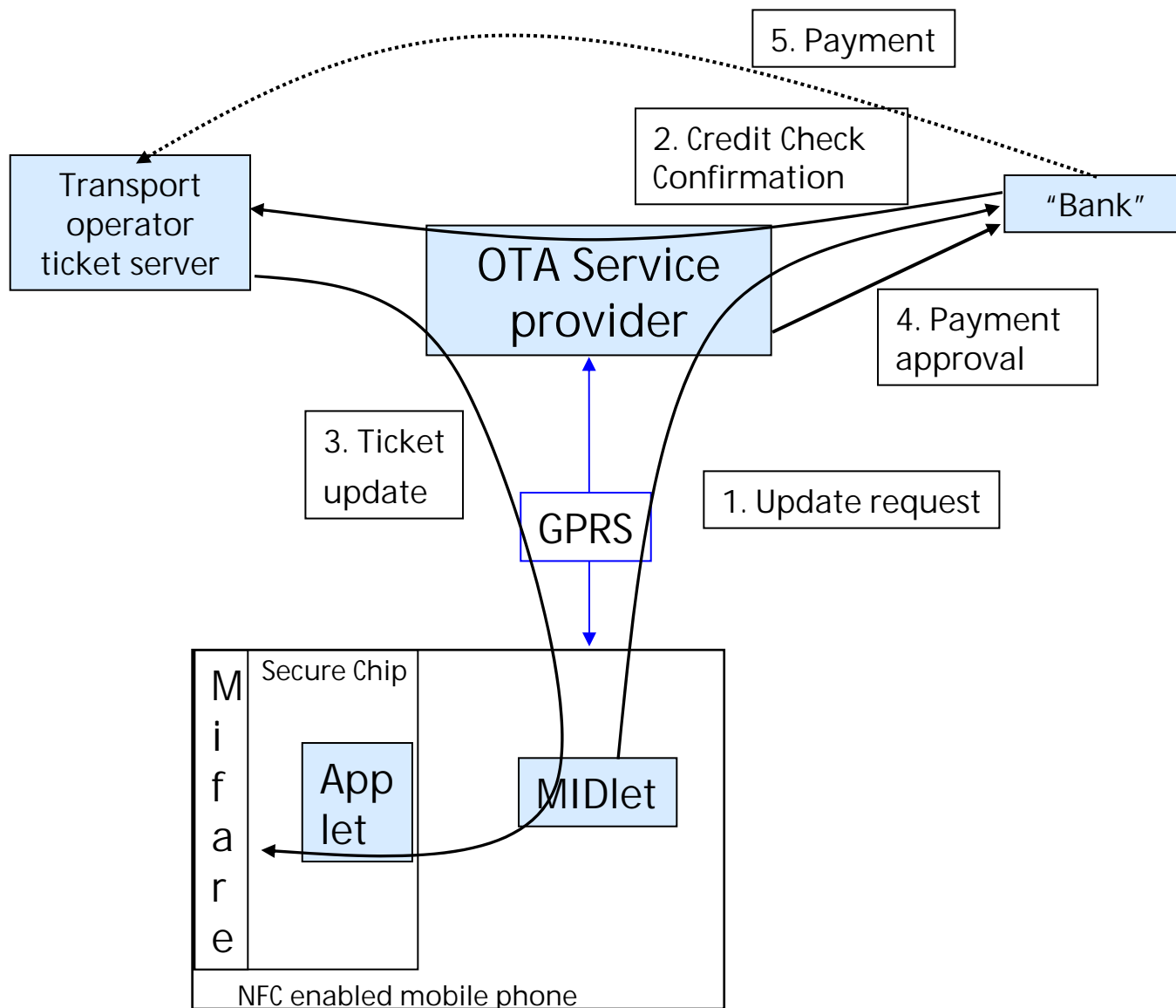
How can NFC be used in public transportation?

- Contactless traveler card systems are built around the world
 - Mifare-based ticketing is the most common card type used
 - NXP proprietary technology, based on ISO14443
 - Currently in use e.g. in London, Moscow, Belfast, Tampere...
- Phones announced so far have a secure chip that can emulate Mifare 1k or 4k cards
 - Phones are interoperable with the existing ticket infrastructures
- Mobile phones screen, key pad & connectivity features can be used to develop new innovative and more user friendly services
 - Check the ticket validity or amount of money left from the phone screen
 - Buy new tickets or top-up new value Over the Air (OTA)

How does NFC enabled mobiles change the existing public transportation ticketing landscape?

- Currently most of the tickets are “charged” at physical locations (kiosks, vending machines, service points) by using “physical currency” (cash, credit / debit cards)
- The OTA ticket delivery needs new stakeholders
 - OTA ticket purchase service providers
 - Public transportation companies rarely develop their own ticketing systems
 - Develop and run a service for enabling OTA ticket purchase
 - Connections to the different payment providers
 - Banks / CC companies to enable real time electronic payments
 - Mobile operators to “host” the secure element
 - Act as the “owner” of the secure element
 - Manage the use of the secure chip
 - Trusted third parties e.g. to enable secure access key handling
 - Offer secure application installation services
 - Additional trust
- Who suffers?
 - Kiosks, plastic traveler card manufacturers

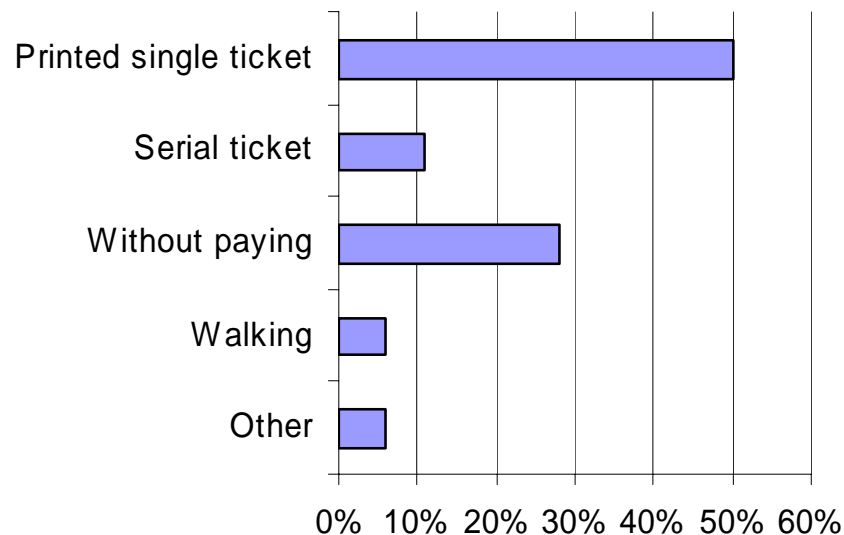
Over the Air (OTA) ticket purchase



How does NFC enabled mobiles change the existing public transportation ticketing landscape?

Benefits of NFC ticketing (1/2)

- Public transportation companies
 - The “first generation mobile tickets” (mainly SMS based) has shown that people like to use the mobile phone as a ticket
 - So far almost 10M SMS tickets have been sold in the Helsinki region
 - Increase ticket sales by offering more user friendly ticketing
 - Decrease the amount of people traveling without a ticket



What would have been the alternative for a SMS ticket?

How does NFC enabled mobiles change the existing public transportation ticketing landscape?

Benefits of NFC ticketing (2/2)

- Mobile operators
 - New business potential
 - Increase the mobile data usage
- Banks & CC Companies
 - Increase the amount of processed payments
- OTA service providers & trusted 3rd parties
 - New business potential
- Users
 - New services
 - Ease of use

Over the Air (OTA) ticket purchase

Will this increase the ticket costs?

- Phone replaces the plastic cards
 - Saved money can be used to pay the operator “hosting fee”
- The amount of kiosk & vending machine sales decreases and the total amount of sold tickets increases
 - Saved service fees & part of the increased money flow can be used to pay the OTA Service provider and payment provider fees

Conclusions

- Mobile phone based ticketing is here to stay
- NFC enabled mobiles based will make it possible to develop new innovative ticketing solutions
- Although the amount of stakeholders increases and the business model is more complex, NFC based ticketing does not increase the overall ticketing costs
- It will still take some time until NFC becomes widely adopted
 - Most likely until the NFC-SIM card standardization has been completed

Thank you!

Questions? Comments?