

Near Field Communication - the future of mobile payments and authentication

Carl Wållberg
carlwa@kth.se

Royal Institute of Technology (KTH)

Fredrik Schmidt
frsc@kth.se

Royal Institute of Technology (KTH)

1. Abstract

In society today there are many different devices or cards used for everyday tasks like paying bus fares or to gain access to buildings.

This is a problem partly because of the inconvenience but also because when everything needs different methods of access, there is a chance to forget or lose one or more of these devices or cards.

The solution for this is to have everything in the same place that is easily carried with you, this can be achieved using a cell phone equipped with NFC (Near field Communication) capabilities.

Our result shows that NFC can be a viable solution to the stated problem.

2. Introduction

Many different cards are used today during an average day. One is used for example when commuting, one is used for payment in the local store while the other is used to access your office. Because of this it is needed to carry a lot of different cards with you all time to be able to access to services you need. The problem arises when you have a lot of cards to keep track of and it might be hard to remember which card which is used for a specific services or what PIN code that card has, or even if you need to bring that card. There might even be a separate device that has to be used with the card, for example some Internet banks require a device together with the credit card to be able to pay over the Internet. Another inconvenience today is how small amounts of money are handled. Credit card companies take out large fees for small payments making it unprofitable for the merchant.

A solution to this problem is to use Bluetooth that has the capability to communicate between different devices using peer2peer. Using this method allows

two different devices to exchange data which will enable them to perform operations like authentications and money transfer. But a disadvantage with using Bluetooth for this kind of use is that Bluetooth requires to set up a connection between two devices and it takes around 6 seconds [3]. Another disadvantage is that it requires the device to be discoverable and that it has a range up to 10 meter [1] (Bluetooth class 2 which is the class used in most cell phones). Another option is to use RFID (Radio-frequency identification). The main argument against it is that the range is much higher, it can be up to 1 meter using the 13.56 MHz frequency [4], making it easier to read by someone that shouldn't access that information.

The contribution of this paper is to show that by using NFC technology with the cell phone, you will get a universal device that can be used with almost every task that you would encounter on a normal day. Because by using the NFC you will have a quick, easy and secure way to handle bus tickets or maybe keycards, and by using the cell phone then it will be easy to have an interface to control all different information that might be stored on the phone and be able to use a code to keep the data secure from others.

3. Design

NFC is a wireless technology which is used to exchange data over a very short distance (up to 10 cm). This is achieved using radio technology operating at 13.56 MHz [6]. NFC can, in contrast to RFID, act as a sender as well as a receiver. This allows two devices equipped with NFC to communicate without the need of a dedicated reader device.

Because of its short range it makes it hard for an unauthorized person to get the information stored in

the NFC, but like normal credit cards it can suffer security issues from modified readers in for example a grocery store. As the device that is using NFC, in most cases, also have hardware like processors it's possible to implement security features such as encryption on a software level. The device is, like every other wireless technology, vulnerable to jamming of the signal by using a device that generates a more powerful field, this can unfortunately not be prevented, but as this only affects availability, and not the integrity, it can in many cases be tolerated.

An application could be developed by the developer of the operating system to provide functionality for centralized authentication and settings for the NFC. When you have a centralized authentication it will be up to the app developer to implements functionality for theirs NFC tags, and if needed use the centralized authentication. This makes it easier for the users to authenticate themselves by removing the need for a lot of different codes or passwords.

4. Evaluation

Today when you need access to a building you often use a key card and the code associated with it. Instead if you have an NFC enabled phone you can just access the application written by the company responsible for the security hardware and enter the global code. This application communicates with the application written by the operating system developers for authentication and thereby granting or denying access to the building.

When using your phone for paying, instead of needing to use your card and PIN, for smaller amounts you can just use your phone. The phone is associated with an account, similar to pay pal, which has been topped up prior to use with a regular credit card or from a bank account. When used for paying, the amount will be charged to that account instead of a credit card, which is both more convenient for the customer and more profitable for the merchant since the credit card fees can be avoided.

Everyone that is regularly commuting knows that there usually is a lot of different tickets and most that travels regularly by train or bus uses a electronic

ticket card like the SL Access card or London Oyster card. The advantage of cards like these is that you can keep them inside the wallet when authenticating that you have a valid ticket. By using NFC technology inside your cell phone it makes it possible to keep the electronic ticket on the phone. This makes it possible to use the same card when visiting different cities by load a ticket that can be used in the system used in that city.

On Nice Côte d'Azur Airport with Air France they have run some test with using NFC enabled cell phones as a boarding pass. The test has been a huge success for the reason that travelers doesn't have to print out the tickets and NFC makes it possible to check in and collect frequent flyer points in one transaction in just a few milliseconds.[5]

5. Conclusions

Our conclusion is that NFC can be used to solve the stated problem, and because it's is capable of reading RFID tags, NFC can be used in many places since RFID technology is frequently used today. Since it's a new technique, there is not that many devises that are using the technology, however many major phone manufacturers have announced that they are planning to use, or have already started to produce cell phones with NFC.

6. References

- [1] <http://www.bluetooth.com/Pages/Basics.aspx> (2011-03-02)
- [2] http://java.sun.com/developer/technicalArticles/java/me/nfc_bluetooth/index.html (2011-03-02)
- [3] <http://pcforall.idg.se/2.1054/1.200178/sa-funkar-tekniken-som-gor-din-mobil-till-planbok> (2011-03-02)
- [4] <http://www.theiet.org/factfiles/it/rfid.cfm> (2011-03-02)
- [5] <http://www.check-in.aero/2010/08/nfc-enabled-mobile-phones-the-future-of-the-check-in-process/> (2011-03-02)
- [6] <http://www.ecma-international.org/publications/standards/Ecma-352.htm> (2011-03-10)