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Feasibility Study for a Smartphone App to Make EMV-Compatible Payments via NFC

A New Approach to the Card Emulation Mode Dilemma

Paying by smartphone at a POS terminal

Use case for which contactless payment was originally intended: paying by proximity card

Introduction: Contactless payment concepts have been around for some years, but they have failed to take off on a large scale in Europe as yet. Although significant efforts have been made, there are still several issues which need to be addressed in order to establish a successful business model. The contactless payment model was developed for proximity cards (e.g. contactless credit cards) only and did not consider smartphones. Therefore, smartphones have to use a card emulation mode, where they behave just like proximity cards. The use of the card emulation mode requires the control of a so-called secure element, which provides the protected storage of cryptographic keys and other sensitive data. This secure element is either under the control of the mobile device manufacturer (chip soldered onto the circuit board) or the mobile network provider (SIM card). This causes either the mobile device manufacturer or the mobile network operator to become another stakeholder within the value chain of the payment process. Of course, this situation is undesirable for the current stakeholders, in particular the card issuers (in Switzerland, typically a bank). The aim of this thesis is to give a possible solution for the card emulation mode dilemma.

Approach / Technologies: A market survey has been conducted in order to outline the roles of the players in the Swiss market and the linkage between them. Several possible solutions for the issue have been considered. Each has its drawbacks (financial, logistical or regulatory) and seems, at the current time, unlikely to succeed. Additionally, the linkage between the participants involved in the payment process has been found to be unique in Switzerland, which needs to be considered. Therefore, a completely new approach has been developed. In order to test the technical feasibility of the proposed solution, a prototype has been implemented. Furthermore, an assessment of the designed solution regarding processes, costs, time scheduling and compliance to regulations has been conducted.

Result: We propose the use of the NFC peer-to-peer mode in order to overcome problems caused by the card emulation mode. This approach also enables the smartphone and the POS to exchange further data (e.g. for loyalty), making the system more flexible and expandable. As the EMV-protocol communication is tunnelled, it is completely transparent to the existing parts of the terminal. Even though the solution fits the Swiss market situation, it is not limited to Switzerland and can technically be deployed anywhere.