KATEDRA INFORMATIKY A VÝPOČETNÍ TECHNIKY

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Master's thesis

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Acceptance of Payment Cards on Android OS Devices

Abstract

The main goal of this master's thesis is to find out whether non-specialized devices, such as mobile phones, could be used to accept payment cards. Therefore, it covers the SPoC and CPoC standards and the way payment transactions utilizing the EMV technology are processed. Additionally, the differences between the Google Pay and Apple Pay mobile payment applications are described there. The commercial application Dotypay is extended in such a way that it can be used on mobile phones and Nexgo devices running the Android OS to accept cards. Finally, using the industry-standard UL Brand Test Tool product it is verified that the extended application is able to correctly process payment transactions.

Introduction

Every day, millions of card transactions are performed to make the checkout process in stores and services easier and more convenient. This thesis aims to explore the complex technologies that stand behind card transaction processing to find out whether non-specialized devices, such as Android mobile phones or tablets, could be used by merchants to accept cards. This would reduce the initial cost of getting a card terminal as most people already own a mobile device. As a result of that, the number of places where one can pay with cards could increase.

Card Transaction Processing

Today, the PCI Security Standards Council (PCI SSC) oversees technologies and policies behind cashless payments that include transactions made with cards. All card terminals and environments that process card transactions and cardholder data must comply with PCI SSC standards.

Because payment cards are often targeted by attackers to steal cardholder data or perform fraudulent transactions, EMV technology is used today to improve security against fraud. The EMV standards consist of several books and cover the way terminals and cards exchange data between each other to securely authorize card transactions.

Usage of Mobile Devices in the Card Industry

In 2018, PCI SSC unveils the Software PIN on Commercial off the Shelf (SPoC) standard that describes how non-specialized devices can be used as PIN pads to allow cardholders to enter their PIN. One year later, the Contactless Payments on Commercial off the Shelf (CPoC) standard is released by PCI SCC, which provides guidelines and requirements for accepting card payments on commercially available devices. However, mobile devices are not commonly used today to accept card payments.

On the other hand, by using card tokenization, mobile devices are frequently used instead of cards to pay for services or goods. Examples of products that facilitate mobile payments include Apple Pay and Google Pay.

Extending the Dotypay Product

Dotypay is a commercial product developed by Dotypay s.r.o. that allows merchants to accept card payments via a Landi A8 terminal running the Dotypay application.

In the implementation part of this thesis, it was required to design and implement a new architecture of the Dotypay application so that it could be run on other devices than it was originally designed for.

Once the new architecture was implemented, the application was extended with support for NFC-capable mobile devices running the Android OS. Additionally, the support for card terminals from the Nexgo manufacturer was added.

Image of Android devices being used to process a card transaction.

Testing the Updated Application

To test whether the updated application is compliant with requirements imposed by EMV standards, the UL Brand Test Tool product was used. During testing, transaction authorization requests were forwarded to the testing environments of Visa and Mastercard payment networks and almost all of the selected tests passed successfully on the Nexgo N86 device. Even though it was verified by the test tool that card transactions are correctly processed on common Android devices, they could not be authorized by payment networks. This was caused by the absence of cryptographic keys that must be exchanged with the transaction authorization center.

Conclusion

The most important card industry standards were covered and then used to extend the Dotypay application to implement a new architecture that was designed within the scope of this thesis. Using an industry-standard test tool, the application's ability to correctly process card transactions was verified.

By successfully processing transactions on common Android devices, it was confirmed that these devices could be used by merchants to accept cards. Due to the characteristics of these devices, it is recommended that they are used in environments with lower transaction counts.

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