Internship at NXP Semiconductors

Java Card bytecode verification

Mobile devices, such as smart phones and tablets, are increasingly being equipped with Near-Field Communication (NFC) technology. Part of NXP's NFC solution for mobile devices is the incorporation of a so-called embedded Secure Element (SE). This SE is essentially a smart card chip running a Java Card virtual machine. Ideally, third party developers should be able to install their applets on it, but this is usually not allowed for security reasons. For the security of the information stored in the SE it is important to check and verify any Java bytecode that is uploaded to the SE for potentially exploitable or malicious code.

With this internship, NXP Research seeks to investigate the current state of the art in Java Card bytecode verification. The end-result of this internship is a software tool to analyze bytecode for the presence of potentially exploitable or malicious code. The outcome of the accompanying literature study is to be collected into a written report at the end of the internship.

This project will include the following tasks:
- Literature study and report, detailing state of the art, known threats and possible attacks, determining detectability of exploitable or malicious code
- Create a classification of exploitable and malicious code patterns
- Make a reference implementation for an off-card bytecode checker (as extension to existing .cap file verifier)
- If possible, also investigate how vulnerable a "trusted" bytecode binary can be to fault injection attacks

Your profile:
- Computer science student
- Knowledge of security
- Good programming skills

The project will take six months, including the writing of a final thesis report. It will be carried out on-site at the High Tech Campus in Eindhoven, The Netherlands, due to the required high-intensity knowledge transfer and supervision, as well as the availability of specific hardware and software tools. Working in this project at NXP Semiconductors in Eindhoven implies working in a stimulating, multidisciplinary environment at the forefront of technology, with knowledgeable colleagues, and an excellent infrastructure.

Contact information:

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