Over-the-Internet

User-Centric Content Management for Secure Elements in Mobile Devices

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Outline

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Smartphones

What makes them smart?

Nokia N900

iPhone 1

The *iPhone* Effect

Description

Users can easily personalize their devices with third-party applications, and service providers can easily make their applications available to end users.

Smartness

smartness is not measured by features, it is about application management.

Outline

Secure Element

Definition

A secure element (SE) is a tamper-resistant smart card chip capable of running applications (called applets or cardlets) with a high level of security.

There are 3 form-factors of SE:

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- SD card;
- SIM/UICC.

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The NFC Ecosystem

The management of NFC applications

The unsolved problem

NFC services consist of two applications:

1. Applet: installed on the SE;
2. UI app: installed on the smartphone.

Management Problems

- The content management of SE is controlled by the SE owner;
- Current platforms in charge of content management are not adapted to install NFC applets;
- The life-cycles of applet and UI app are independent.

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Design requirements

1. Deployable: deployability depends on the induced cost and compatibility with industry standards;
2. Remote and efficient: appropriate wireless technology;
3. Secure: only authenticated contents are allowed;
4. Tied life-cycle: applet and UI app are managed together.

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Workflow of installation

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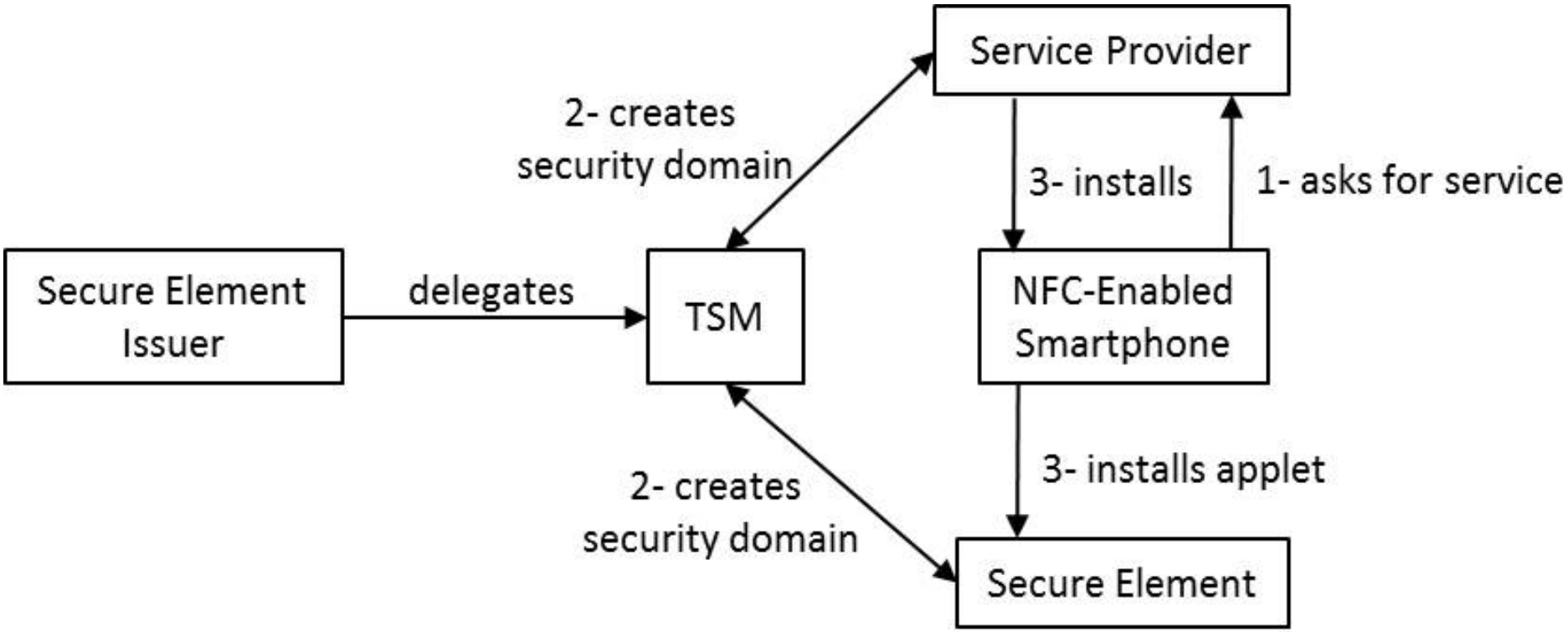
5. The applet is sent and installed on the SE.

Overview of the OTI architecture



Some technical details

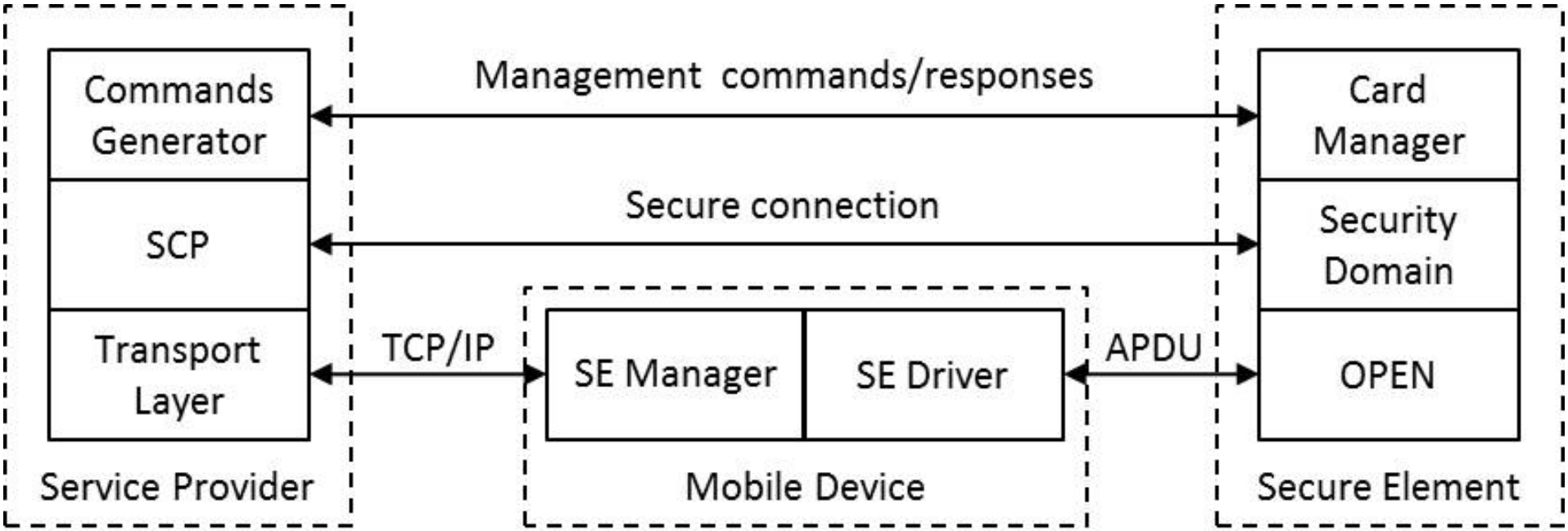
Private Space in SE

- We leverage the concept of Security Domain defined by GlobalPlatform.
- A Security Domain (SD) is created using the radio interface.
- Once created, the service providers get the secret keys that allow them to set up a secure connection with the corresponding SD.

Wireless technology

- We leverage Internet connection to communicate with SE.
- SEs are not directly connected to the Internet.
- A bridge application is required to send the APDUs encapsulated into IP packets to the SE.

Secure Channel Protocol



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4. At the end, the SE sends a cryptographic ACK to the service provider in order to update its database.

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- SE API implemented in JavaScript (Ajase);
- GlobalPlatform card specification 2.2.1 implemented in Java 7;
- Orange OTA platform.

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Evaluation

Content Management Platform	Average of Download Time
OTW (Over-the-Wire)	18.2 seconds
OTI (Over-the-Internet)	25.7 seconds
OTA (Over-the-Air)	5.42 minutes

Comparison of download time of 9-kilobyte-JavaCard applet

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- Integrating users' permission in the process of creating security domains.

Summary

- The most difficult problem in the NFC ecosystem is not security, but applications management;
- OTI is an efficient management system for secure element based NFC applications in mobile devices;
- OTI does not trade off deployability and security;
- OTI is faster and more reliable than SMS-based OTA platforms.

Thank you for your attention!