Chapter 5
Secure Element

ABSTRACT

NFC enabled mobile phones are equipped with SE combined with NFC infrastructure like readers and POS terminals. The actors in the NFC infrastructure are the pre requisites but not sufficient for the use of NFC payments. There has to be a secure way to download, install, personalize, upgrade and delete an application in SE without the need to go to the service provider or mobile operator stores. TSM solution provide means of managing the NFC service life cycle OTA by using built upon and emphasizes the role an importance in NFC ecosystem. Mobile device needs to have a trusted Execution environment a place where sensitive data can be stored in secure fashion. It is a piece of hardware called as SE.

INTRODUCTION

A Secure Element a chip that offers a dynamic environment to store data, process and perform communication with external entities securely. It is tamper resistant component used in the device to provide security and confidentiality in addition of multiple application environment required to support various business models. Secure element hosts applications along with their confidential and cryptographic data for financial NFC transactions. Secure element is not required in all NFC transactions or applications. Where ever and whenever a transaction or application involves monetary value, it requires high level security for protection. The Secure Element resides in highly secure cryptographic chips. It also provides delimited memory for
Secure Element

each application stored in it and other functions that can encrypt decrypt and sign the data packet. In Smart phones secure element can be found as a separate smart card chip embedded directly into the phone’s hardware, or in a SIM/UICC card provided by your network operator or in an SD card that can be inserted into the mobile phone. The secure element implementation approach is selected by the mobile operator or by the service provider for SD card implementations.

While using a NFC enabled mobile device to Tap & Pay the NFC controller goes into card-emulation mode. The NFC controller itself does not deal with the data or processing associated with the payment transaction. It is just an interface that allows communication using standard protocols.

It is the Secure Element that actually emulates the contactless cards. It performs handshake with the terminal, sends the right responses to the right queries, generates dynamic cryptograms and authenticates the stored card. To be more accurate, it is not the Secure Element that emulates the card. It is the software that is stored inside the secure element in the form of payment applications or applets. The Secure Element provides secure storage and execution environment for the payment applications to do its job.

TYPES OF SECURE ELEMENT

Secure Element is a combination of hardware, software, interface protocols embedded in a mobile handset that enables secure storage and processing. Secure elements can be mainly categorized into two categories depending upon where it resides.

- **Removable:** Smart Card (especially UICC), smart microSD card.
- **Non-Removable:** Broadband Processor Embedded Secure Element (ESE)
- Cloud based Secure Element.

**UICC**

The Universal Integrated Circuit Card (UICC) is a physical smart card that ensures integrity and security of all kinds of data. It contains the application authenticating the user in mobile network. It contains several applications
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