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Technical Specification

## Smart Cards; Embedded UICC; Requirements Specification (Release 12)

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## Foreword

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## Introduction

Work on Machine-to-Machine (M2M) applications has given rise to the possibility of having a UICC that is embedded in a communication device in such a way that the UICC is not easily accessible or replaceable. The ability to change network subscriptions on such devices becomes problematic, thus necessitating new methods for securely and remotely provisioning access credentials on these Embedded UICCs (eUICC) and managing subscription changes from one MNO to another.

In its current state, the present document is to be considered as a "work in progress". It contains a restricted set of requirements related to the provisioning of profiles in an eUICC as well as general requirements on the architecture of the eUICC. As a consequence, some of the elements required to specify a complete technical solution are missing, among which are requirements for:

- management of profiles;
- management of credentials;
- the policy control function;

which will be defined in further versions of the present document.

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# 1 Scope

The present document defines the use cases and requirements for an embedded UICC.

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## 2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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### 2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ETSI TS 102 221: "Smart Cards; UICC-Terminal interface; Physical and logical characteristics".
- [2] ETSI TS 102 671: "Smart Cards; Machine to Machine UICC; Physical and logical characteristics".

### 2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Recommendation ITU-T E.212: "The international identification plan for public networks and subscriptions".
- [i.2] ETSI TR 102 216: "Smart cards; Vocabulary for Smart Card Platform specifications".

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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 102 216 [i.2] and the following apply:

**Embedded UICC:** UICC which is not easily accessible or replaceable, is not intended to be removed or replaced in the terminal, and enables the secure changing of subscriptions

**Enabled Profile:** profile, the files and/or applications (e.g. NAA) of which are selectable over the UICC-Terminal interface

**eUICC Management Credentials:** credentials used to verify the authorization for the establishment of Profile Management Credentials and Profile Installer Credentials

**eUICC Supplier:** supplier of the eUICC modules and resident software (such as firmware and operating system)

**Mobile Network Operator (MNO):** entity providing communication services to its customers through mobile networks

**Network Access Application (NAA):** application residing on an eUICC that provides authorization to access a network

EXAMPLE: A USIM application.

NOTE: Copied from TR 102 216 [i.2], to be deleted when the current document is finalised.

**Network Access Credentials (NAC):** data required to authenticate to an ITU E.212 [i.1] Network

NOTE: Network Access Credentials may include data such as Ki/K, and IMSI stored within a NAA.

**Operational Profile:** profile containing one or more network access applications and associated network access credentials

**Operational Subscription:** subscription that enables a device to access an ITU E.212 [i.1] network for the purpose of accessing telecommunication and related services

**Policy:** principles reflected in a set of rules that govern the behaviour of an eUICC and/or entities involved in the remote management of the eUICC

**Policy Control Function:** function that defines, updates or removes policy rules to implement a policy

**Policy Enforcement Function:** function that executes policy rules to implement a policy

**Policy Rule:** defines the actions required to implement a policy and the conditions under which they are executed

**Profile:** combination of a file structure, data and applications to be provisioned onto, or present on, an eUICC

**Profile Access Credentials:** data required to exist within a profile so that secured communication can be set up between an external entity and the eUICC in order to manage that profile's structure and its data (e.g. operator OTA keys)

**Profile Container:** logical container for a profile on an eUICC providing security services, enabling separation of profiles and providing secure communication

**Profile Container Initialisation:** process of preparing a Profile Container so that it is ready for Profile Installation

**Profile Loading:** transfer of a profile into the eUICC

**Profile Installation:** process of allocating resources and registering parameters for a profile to bring it to a state where it can be enabled

**Profile Installer Credentials:** data required to exist within an eUICC so that a profile downloaded from an external entity can be decrypted and installed on the eUICC

**Profile Management Credentials:** data required to exist within an eUICC so that a secured communication can be set up between an external entity and the eUICC in order to manage the profiles on the eUICC

**Provisioning:** container creation and initialisation, loading, and installation of a profile into an eUICC

**Provisioning Profile:** profile containing one or more network access applications, and associated network access credentials which, when installed on an eUICC, enables access to communication network(s), to provide transport capability for eUICC management and profile management between the eUICC and an SM-SR

**Provisioning Subscription:** subscription, with its associated provisioning profile, that enables a device to access a mobile network for the purpose of management of operational profiles on the eUICC

**Subscriber:** entity that has a subscription with a telecommunications service provider

**Subscription:** commercial relationship for the supply of services between the Subscriber and Telecommunications Service Provider

**Subscription Manager:** combination of the functions of the SM-SR and the SM-DP

**Subscription Manager - Data Preparation (SM-DP):** role that prepares operational and provisioning profiles to be securely provisioned on the eUICC e.g. encryption of profile

NOTE: "securely" is felt to relate to requirements captured in an appropriate section of the present document. The term "securely" may be removed from this definition once those requirements are specified.

**Subscription Manager - Secure Routing (SM-SR):** role that securely performs functions which directly manage the operational and provisioning profiles on the eUICC

NOTE: "securely" is felt to relate to requirements captured in an appropriate section of the present document. The term "securely" may be removed from this definition once those requirements are specified.

**Telecommunications Service Provider:** MNO, or party trusted by the MNO acting on behalf of the MNO, which provides services to the subscriber

### 3.1a Definitions for further study

Definitions are required for the following terms:

- **Initialised State:**

NOTE: This definition is required. Best proposal so far: "refers to the state the eUICC is in when an operational profile is either not active or not present, and the eUICC is only accessible for the purpose of management of operational profiles".

### 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATR	Answer To Reset
CAT	Card Application Toolkit
eUICC	embedded UICC
FFS	For Further Study
IMSI	International Mobile Subscriber Identity
M2M	Machine to Machine (communication)
MNO	Mobile Network Operator
NAA	Network Access Application
NAC	Network Access Credentials.
OEM	Original Equipment Manufacturer
OTA	Over -The-Air
PCF	Policy Control Function
SM	Subscription Manager
SM-DP	Subscription Manager - Data Preparation
SM-SR	Subscription Manager - Secure Routing
SP	Service Provider

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## 4 Abstract (informative)

The present document enables remote management of an embedded UICC (eUICC) for purposes of changing an MNO subscription without requiring a physical removal and replacement of the UICC in the end Device.

The present document develops use cases and requirements for the "enhanced, remote management" of a UICC, which is embedded in a communication device, i.e. where the UICC is not intended to be removed. This type of embedded UICC (eUICC) is compatible with Machine-to-Machine (M2M) applications. The eUICC may be embedded at the manufacturing site in advance, depending on the country and network operator, and is compatible for use in a variety of end-user equipment. In these scenarios there may be a requirement to remotely change a subscription easily, similar to what is currently achieved by physically changing the UICC.



The purpose for defining these requirements is to provide ease of use and deployment benefits for end users/consumers and thereby stimulate the M2M sector. A further intent is to enable the creation of common standards and processes for remote management of profiles on an eUICC, such that interoperability is ensured.

It is noted that new business models and usage scenarios, primarily driven by M2M, struggle when supported by the traditional UICC/SIM card. For example:

- By installing a physical UICC, the user is connected to a specific network, as the card only provides access to one network. Should the user wish to (or need to) use another network, then they or the M2M Service Provider has to fit another card in the user's device.
- Changing a UICC maybe problematic since that M2M equipment may be remotely located and/or hermetically sealed. It should be noted that where the UICC is not intended to be sealed and inaccessible, the portability of traditional form factor UICC cards is perceived to be a user benefit.
- Non-standard provisioning and re-provisioning methods are being defined and used. These present security implications and a risk of fragmentation within the industry.

New remote provisioning/re-provisioning mechanisms are required to support the new business models and usage scenarios.

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## 5 Background (informative)

### 5.1 Overview of the use cases

A range of use cases is identified in this clause to derive requirements for the development of a trusted framework for the management of an embedded UICC (eUICC). This is not intended to be an exhaustive list of use cases and applications, but a set of examples to ensure requirements will be flexible enough to securely support current and future use cases.

Use cases are provided as a means to understand and add context to the overall requirements.

### 5.2 Use Case: 1 - Provisioning of multiple eUICCs for M2M

A Machine-to-Machine Service Provider (M2M SP) sets-up subscriptions for a number of connected M2M devices to start telecommunication services with a first MNO. While it is expected that there will be a very great range of M2M applications, and many of these will have different parties and business models, it is likely that the key technical requirements will become clear through examining a few examples of this use case; the following examples are considered further in this clause:

- a) Provisioning for a first subscription, and optional later change of subscription, for communication services for automated reading of utility (electricity, water, gas) meters; a M2M Service Provider will contract these subscriptions.
- b) Provisioning for a first subscription and optional later change of subscription for a security camera.
- c) Provisioning for a first subscription, and optional later change of subscription for communication services to vehicles (e.g. telematics); the vehicle vendor will provide the automotive services.

#### 5.2.1 Use case 1 - example a) - Utility Meters

The Meter Reading M2M SP has a commercial contract to both supply meters and - once they have been installed - to provide regular meter readings of these meters to the utility company. The M2M SP selects the preferred MNO to provide a number of subscriptions after completing a tender process for the communication services as part of a defined service level agreement.

Once the MNO is selected, the M2M SP arranges for the utility meters to be installed and as part of the installation process for the communication services to start. While the physical installation is a manual process, the subscription management required for the communication services will be automated.



These contracts for communication services are negotiated to last for a given period of time e.g. several years; if a change of contract is negotiated, the change is likely to apply to multiple subscriptions. The changeover is expected to be managed in an automatic fashion at an agreed date over a relatively short period.

### 5.2.2 Use case 1 - example b) - Security Camera

A consumer purchases a security camera for monitoring his house. The security camera is supplied with a communication service so that recorded data is uploaded and stored as part of the service from a security (M2M) SP. The consumer (or M2M SP) installs the camera and sets up access to the security services online.

The M2M SP selects the MNO for the video camera service; the subscription management will be automated for the contracted number of subscriptions between the M2M SP and the MNO.

These contracts for communication services are negotiated to last for a given period of time e.g. several years; if a change of contract is negotiated, the change is likely to apply to multiple subscriptions. The changeover is expected to be managed in an automatic fashion at an agreed date over a relatively short period. Noting that the level of MNO coverage within individual properties can be different, an automated check of coverage for the target MNO may form part of any change of an operational profile.

### 5.2.3 Use case 1 - example c) - Telematics

A consumer purchases a new vehicle and this includes a number of vehicle manufacturer provided services delivered over wide area wireless communications to the vehicle and its occupants. The services will be delivered whether the vehicle is mobile or stationary, and whether or not the vehicle is in the country in which it was purchased. The vehicle manufacturer himself or a subcontractor acts as M2M SP, providing both vehicle related services (such as engine monitoring) and being a broker for services supplied by other SPs (such as infotainment).

The subscription starts at vehicle purchase to be operational as the customer drives the vehicle away; the subscription management will be automated for the contracted number of subscriptions between the M2M SP and the MNO. The M2M SP agrees to the commercial contract with MNO(s) in either the same or different countries for subscriptions for the communication services; the vehicle customer may not know which MNO is providing communication services.

These contracts for communication services are negotiated to last for a given period of time e.g. several years; if a change of contract is negotiated by the M2M SP, the change is likely to apply to multiple subscriptions. The changeover is expected to be managed in an automatic fashion at an agreed date over a relatively short period.

## 5.3 Use case 2 - Provisioning of an eUICC for a first subscription with a new connected device

An end user purchases a new type of communications or connected device from an OEM together with a subscription to provide first services to this device. While it is expected that there will be a range of consumer purchased devices for communication, media and Internet applications and more, and many of these will have different parties and business models, it is likely that the key technical requirements will become clear through examining a few examples; the following examples are considered further in this clause:

- a) Provisioning an eUICC in a new device; the consumer will select the MNO to provide communication services.
- b) Provisioning an eUICC in multiple connected new device for an enterprise workforce; the enterprise will select the MNO to provide the subscriptions.

### 5.3.1 Use case 2 - example a) - Provisioning of a new device

A consumer purchases a new device with an eUICC and then selects an MNO for communication services. The MNO might be selected at the same or another retailer, at an MNO shop or online and will be activated within a short period. First use of the new device will be with the first subscription already set-up, or if no subscription is set-up, the customer will select an MNO and, if required, after appropriate authorization a subscription will be set-up. The subscription management will be automated for this single consumer subscription between the consumer and the MNO. The consumer agrees to the contract with the MNO for the subscription for the communication services.

### 5.3.2 Use case 2 - example b) - Provisioning of multiple new devices for an enterprise

An enterprise (Purchasing Manager) purchases new devices for a set of employees. Contracts for multiple subscriptions will be negotiated for communication services, which enable a range of telecommunication and enterprise applications. The subscriptions will be activated as new employees start, at the latest on their first use of the device. The subscription activation may be followed by device management to configure enterprise specific applications and directories.

The subscription management will be automated for the contracted number of subscriptions between the enterprise and the MNO. The enterprise agrees to the commercial contract with MNO(s) for subscriptions for the communication services; the enterprise employees will be aware of which MNO is providing communication services.

## 5.4 Use case 3 - Change of subscription for a device

A subscriber changes the contract and thus subscription for the device to stop services with the current MNO and start services with a new MNO.

- a) Change of a subscription for a device by the consumer.
- b) Change of the subscriptions of multiple connected new devices for an enterprise workforce to a new MNO; the enterprise will select the MNO to provide the subscriptions.

### 5.4.1 Use case 3 - example a) - Change of subscription by consumer

A contract for communication services of a device is expected to last for a period of one or more years; if a change of contract is decided upon by the consumer, the change is likely to apply to a single subscription, or possibly a few subscriptions the consumer has for connected devices. The changeover is expected to be managed seamlessly in an automatic fashion at an agreed date. The changeover will be undertaken in accordance with relevant Policy Control Functions.

### 5.4.2 Use case 3 - example b) - Change of subscriptions for devices for enterprise workforce

Contracts for communication services for the workforce are expected to be negotiated to last for a period of one or more years. If a change of contract is negotiated by the enterprise, the change is likely to apply to multiple subscriptions, and the changeover is expected to be managed in an automatic fashion at an agreed date over a relatively short period. The changeover will be undertaken in accordance with relevant Policy Control Functions.

## 5.5 Use Case 4 - Change of SM-SR

The M2M device manufacturer orders eUICCs from an eUICC Manufacturer. The eUICCs contain Profile Management Credentials which are associated with an SM-SR Y.

MNO A has to provide telecommunication services to a M2M service provider that has M2M devices equipped with eUICCs. The SM-SR Z is used by MNO A.

However, as MNO A usually manages their profiles with SM-SR Z, the management of the eUICCs will be handed over from SM-SR Y to SM-SR Z.

SM-SR Z will request the necessary data to manage the eUICCs (e.g. the appropriate access credentials, characteristics of the eUICCs, previous SM-SRs) in the M2M devices from SM-SR Y.

However, SM-SR Z doesn't want the SM-SR Y to have knowledge of the eUICC Profile Management Credentials it will have.

Therefore SM-SR Y and SM-SR Z perform a change of eUICC management responsibilities involving the eUICCs in the process.

As a consequence SM-SR Z becomes the entity managing the eUICCs on behalf of the MNO A.