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Smart Cards;
Security mechanisms for UICC based Applications
Functional requirements
(Release 17)

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Secure Element Technologies (SET).

It is based on work originally done in the 3GPP in TSG-terminals WG3 and ETSI SMG.

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1 Scope

The present document provides standardized security mechanisms in conjunction with the Card Application Toolkit for the interface between a Network Entity and a UICC.

The security mechanisms which are specified are independent of applications.

The present document describes the functional requirements of the security mechanisms with the implementation detail of these mechanisms being described in ETSI TS 102 225 [1].

Within the scope of the present document, the UICC refers here to an ICC which support at least one application in order to access a cellular network.

The ICC is considered as a platform, which is based on ETSI TS 102 221 [4].

2 References

2.1 Normative 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 referenced document (including any amendments) applies.

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Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

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

[1] ETSI TS 102 225: "Smart Cards; Secured packet structure for UICC based applications".

[2] ETSI TS 131 111: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; Universal Subscriber Identity Module (USIM) Application Toolkit (USAT) (3GPP TS 31.111)".

[3] Void.

[4] ETSI TS 102 221: "Smart Cards; UICC-Terminal interface; Physical and logical characteristics".

[5] ETSI TS 102 223: "Smart Cards; Card Application Toolkit (CAT)".

[6] ETSI TS 102 127: "Smart Cards; Transport protocol for CAT applications; Stage 2".

[7] ETSI TS 102 483: "Smart cards; UICC-Terminal interface; Internet Protocol connectivity between UICC and terminal".

[8] ETSI TS 102 412: "Smart Cards; Smart Card Platform Requirements Stage 1".

2.2 Informative 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 referenced document (including any amendments) applies.

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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] ETSI ETR 330: "Security Techniques Advisory Group (STAG); A guide to legislative and regulatory environment".

[i.2] ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Vocabulary for 3GPP Specifications (3GPP TR 21.905)".

[i.3] ETSI TR 102 216: "Smart Cards; Vocabulary for Smart Card Platform specifications".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI TR 102 216 [i.3] and the following apply:

NOTE: A term defined in the present document takes precedence over the definition of the same term, if any, in ETSI TR 102 216 [i.3].

application layer: layer above the transport layer on which the application messages are exchanged between the sending and receiving applications

application message: package of commands or data sent from the sending application to the receiving application, or vice versa, independently of the transport mechanism

NOTE: An application message is transformed with respect to a chosen transport layer and chosen level of security into one or more secured packets.

counter: mechanism or data field used for keeping track of a message sequence

NOTE: This could be realized as a sequence oriented or time stamp derived value maintaining a level of synchronization.

cryptographic checksum: string of bits derived from some secret information, (e.g. a secret key), part or all of the application message, and possible further information (e.g. part of the security header)

NOTE: The secret key is known to the sending entity and to the receiving entity. The Cryptographic checksum is often referred to as Message Authentication Code (MAC).

digital signature: string of bits derived from some secret information (e.g. a secret key) the complete application message, and possible further information (e.g. part of the security header)

NOTE: The secret information is known only to the sending entity. Although the authenticity of the digital signature can be proved by the receiving entity, the receiving entity is not able to reproduce the digital signature without knowledge of the secret information owned by the sending entity.

receiving application: entity to which the application message is destined

receiving entity: entity where the secured packet is received (e.g. SMS-SC, UICC, USSD entry point, or dedicated toolkit server) and where the security mechanisms are utilized

NOTE: The receiving entity processes the secured packets.

redundancy check: string of bits derived from the application message and possible further information for the purpose of detecting accidental changes to the message, without the use of any secret information

secured packet: information flow on top of which the level of required security has been applied

NOTE: An application message is transformed with respect to a chosen Transport Layer and chosen level of security into one or more secured packets.

security header: that part of the secured packet which consists of all security information

EXAMPLE: Counter, key identification, indication of security level, checksum or digital signature.

sender identification: simple verification of the identity of the sending entity by the receiving entity comparing the sender identity with an a priori stored identity of the sender at the receiving entity

sending application: entity generating an application message to be sent

sending entity: entity from which the secured packet originates (e.g. SMS-SC, UICC, USSD entry point, or dedicated toolkit server) and where the security mechanisms are invoked

NOTE: The sending entity generates the secured packets to be sent.

status code: indication that a message has been received (correctly or incorrectly, indicating reason for failure)

transport layer: layer responsible for transporting secured packets through the network

NOTE: The transport layer implements one or more transport mechanisms (e.g. SMS or USSD).

unsecured acknowledgement: status code included in a response message

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TR 121 905 [i.2] and the following apply:

CAT	Card Application Toolkit
CAT_TP	Card Application Toolkit Transport Protocol

4 Introduction

The Card Application Toolkit (CAT) as described in ETSI TS 102 223 [5] is a set of applications and related procedures that may be used during a card session. It allows operators to create specific applications resident on the UICC. There exists a need to secure Card Application Toolkit (CAT) related communication over the network, (e.g. SMS, USSD, and future transport mechanisms) with the level of security chosen by the network operator or the application provider.

It is assumed in the present document that the sending and receiving entities are in a secure environment.

The appropriate security mechanisms are described in the present document.

The security mechanisms cover the following security requirements:

- unilateral authentication from network to UICC;
- unilateral authentication from UICC to network;

- message integrity;
- replay detection;
- proof of receipt;
- message confidentiality.

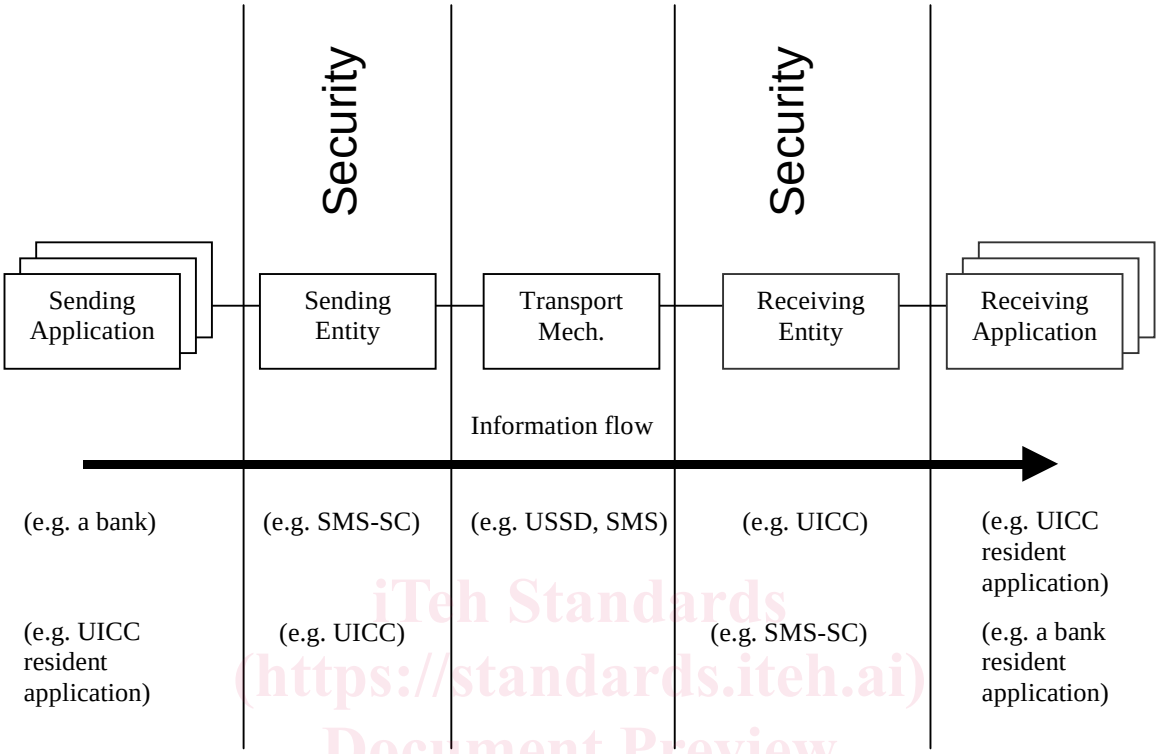

Figure 1: System overview

5 Security requirements

5.1 Introduction

The application message is transferred from the sending application to the receiving application in one or more secured packets via a sending entity and a receiving entity, or group of receiving entities. The receiving entity is then responsible for reconstructing the application message from the received secured packets for presentation to the target receiving application. It is possible that there are several receiving entities and applications.

The sending application shall indicate to the sending entity the security mechanisms to be applied to the application message. This shall be indicated in the secured packet. The receiving entity shall indicate to the receiving application the security mechanisms applied to the secured packet, in a secure manner. The interface between the sending application and the sending entity, and the interface between the receiving entity and receiving application are not defined.

The security requirements to satisfy when transferring application messages from the sending entity to the receiving entity that have been considered are:

- authentication;
- message integrity;
- replay detection and sequence integrity;
- proof of receipt and proof of execution;