
**Information technology —
Telecommunications and information
exchange between systems — NFC
Security —**

Part 1:

**NFC-SEC NFCIP-1 security services and
protocol**

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Technologies de l'information — Téléinformatique — Sécurité NFC —

Partie 1 Services de sécurité et protocole NFC-SEC NFCIP-1

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 13157-1 was prepared by Ecma International (as ECMA-385) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

ISO/IEC 13157 consists of the following parts, under the general title *Information technology — Telecommunications and information exchange between systems — NFC Security*:

- *Part 1: NFC-SEC NFCIP-1 security services and protocol*
- *Part 2: NFC-SEC cryptography standard using ECDH and AES*

Introduction

This International Standard specifies common NFC Security services and a protocol. This International Standard is a part of the NFC Security series of standards. The NFC-SEC cryptography standards of the series complement and use the services and protocol specified in this International Standard.

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Information technology — Telecommunications and information exchange between systems — NFC Security —

Part 1: NFC-SEC NFCIP-1 security services and protocol

1 Scope

This International Standard specifies the NFC-SEC secure channel and shared secret services for NFCIP-1 and the PDUs and protocol for those services.

NOTE 1 NFC-SEC is exclusively designed for the data exchange protocol of ISO/IEC 18092.

NOTE 2 This International Standard does not address application specific security mechanisms (as typically needed for smart card related use cases and standardized in the ISO/IEC 7816 series). NFC-SEC may complement application specific security mechanisms of ISO/IEC 7816.

2 Conformance

Conformant implementations employ the security mechanisms in the NFC-SEC cryptography part that defines the selected PID using one or more of the services specified in this International Standard.

Conformant implementations that use the NFCIP-1 protocol shall also conform to the requirements in Annex B.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7498-1:1994, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*

ISO 7498-2:1989, *Information processing systems — Open Systems Interconnection — Basic Reference Model — Part 2: Security Architecture*

ISO/IEC 10731:1994, *Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services*

ISO/IEC 11770-1:1996, *Information technology — Security techniques — Key management — Part 1: Framework*

ISO/IEC 13157-2:2010, *Information technology — Telecommunications and information exchange between systems — NFC Security — Part 2: NFC-SEC cryptography standard using ECDH and AES (also published by Ecma as Standard ECMA-386)*

ISO/IEC 18092:2004, *Information technology — Telecommunications and information exchange between systems — Near Field Communication — Interface and Protocol (NFCIP-1)* (also published by Ecma as Standard ECMA-340)

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 18092, ISO/IEC 7498-1, ISO 7498-2, ISO/IEC 10731, ISO/IEC 11770-1 and the following apply.

4.1

connection

(N)-connection as specified in ISO/IEC 7498-1

4.2

entity

(N)-entity as specified in ISO/IEC 7498-1

4.3

link key

secret key securing communications across a secure channel

4.4

NFC-SEC User

entity using the NFC-SEC service

4.5

protocol

(N)-protocol as specified in ISO/IEC 7498-1

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4.6

Recipient

NFC-SEC entity that receives ACT_REQ

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4.7

secure channel

secure NFC-SEC connection

4.8

Sender

NFC-SEC entity that sends ACT_REQ

4.9

service

(N)-service as specified in ISO/IEC 7498-1

4.10

shared secret

secret shared by two peer NFC-SEC Users

5 Conventions and notations

The following conventions and notations apply in this document unless otherwise stated.

5.1 Representation of numbers

The following conventions and notations apply in this document unless otherwise stated.

- Letters and digits in parentheses represent numbers in hexadecimal notation.

- The setting of bits is denoted by ZERO or ONE.
- Numbers in binary notation and bit patterns are represented by sequences of 0 and 1 bits shown with the most significant bit to the left. Within such strings, X may be used to indicate that the setting of a bit is not specified within the string.
- In octets the lsb is bit number 1, the msb bit number 8.

5.2 Names

The names of basic elements, e.g. specific fields, are written with a capital initial letter.

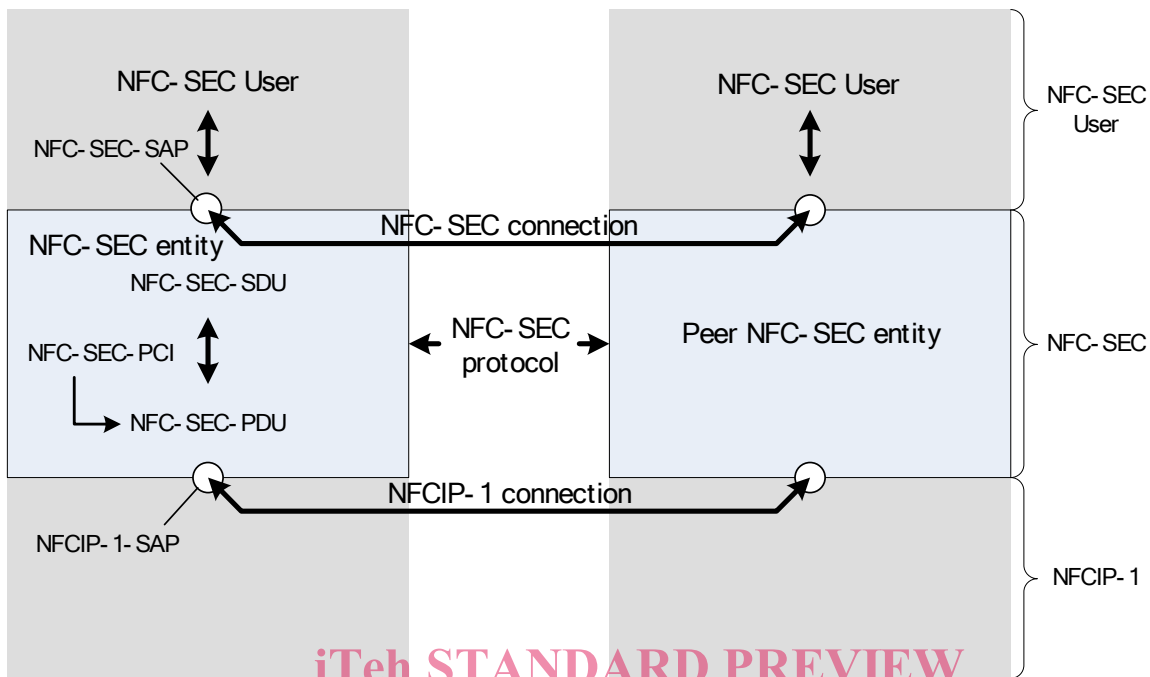
6 Acronyms

For the purposes of this document, the acronyms given in ISO/IEC 18092 and the following apply.

ACT_REQ	Activation Request PDU
ACT_RES	Activation Response PDU
ENC	Encrypted Packet PDU
ERROR	Error PDU
lsb	least significant bit
LSB	Least Significant Byte
msb	most significant bit
MSB	Most Significant Byte
MSG	MesSaGe code
PCI	Protocol Control Information (see ISO/IEC 7498-1)
PDU	Protocol Data Unit (see ISO/IEC 7498-1)
PID	Protocol Identifier
RFU	Reserved for Future Use
SCH	Secure Channel service
SDL	Specification and Description Language (as specified in ITU-T Z.100)
SDU	Service Data Unit (see ISO/IEC 7498-1)
SEP	Security Exchange protocol Parameter
SN	Sequence Number
SNV	SN variable
SSE	Shared Secret Service
SVC	SerVicE code
TMN	Terminate PDU
VFY_REQ	Verification Request PDU
VFY_RES	Verification Response PDU

7 General

NFC-SEC as illustrated in Figure 1 uses the OSI reference model specified in ISO/IEC 7498-1.



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Figure 1 – NFC-SEC architecture

NFC-SEC Users invoke and access the NFC-SEC services through NFC-SEC Service Access Points (NFC-SEC-SAP). NFC-SEC entities obtain NFC-SEC-SDUs (requests) from NFC-SEC Users and return NFC-SEC-SDUs (confirmations) to them.

This International Standard specifies the Secure Channel Service (SCH) and the Shared Secret Service (SSE).

To provide the NFC-SEC services, Peer NFC-SEC entities exchange NFC-SEC-PDUs by conforming to the NFC-SEC protocol over NFC-SEC connections.

Peer NFC-SEC entities communicate with each other accessing the NFCIP-1 data service through NFCIP-1 Service Access Points (NFCIP-1-SAP), sending and receiving NFC-SEC-PDUs. A NFC-SEC-PDU consists of NFC-SEC Protocol Control Information (NFC-SEC-PCI) and a single NFC-SEC-SDU.

8 Services

This Clause specifies two services, SSE and SCH, that NFC-SEC provides to the NFC-SEC User. When invoked, these services enable the cryptographic protected transmission of NFC-SEC User messages between the peer entities by means of a protocol described in Clause 9.

Shared secrets established with the services specified below shall be cryptographically uncorrelated from any shared secrets established beforehand or afterwards.

8.1 Shared Secret Service (SSE)

The SSE establishes a shared secret between two peer NFC-SEC Users, which they can use at their discretion.

Invocation of the SSE shall establish a shared secret by the key agreement and key confirmation mechanisms, according to the NFC-SEC cryptography part that defines the PID.

8.2 Secure Channel Service (SCH)

The SCH provides a secure channel.

Invocation of the SCH shall establish a link key, by derivation from a shared secret established by the key agreement and key confirmation mechanisms, and shall subsequently protect all communications in either direction across the channel, according to the NFC-SEC cryptography part that defines the PID.

9 Protocol Mechanisms

The NFC-SEC protocol comprises the following mechanisms. Figure 2 specifies the sequence of the protocol mechanisms.

9.1 Key agreement

The peer NFC-SEC entities shall establish a shared secret using ACT_REQ and ACT_RES, according to the NFC-SEC cryptography part that defines the PID.

9.2 Key confirmation

The peer NFC-SEC entities shall verify their agreed shared secret using VFY_REQ and VFY_RES, according to the NFC-SEC cryptography part that defines the PID.

9.3 PDU security

PDU security is a mechanism of SCH service only.

The peer NFC-SEC entities shall protect data exchange using ENC, according to the NFC-SEC cryptography part that defines the PID.

This mechanism shall comprise one or more of the following, as specified in the respective NFC-SEC cryptography standard:

- Sequence Integrity, conforming to the requirements of 12.3;
- Confidentiality;
- Data integrity;
- Origin authentication.

9.4 Termination

The peer NFC-SEC entities shall terminate SSE and SCH using TMN. After Release or Deselect of NFCIP-1, or when the NFCIP-1 device is powered off, SSE and SCH instances shall be terminated. Upon transition to the IDLE state the associated shared secret and the link key shall be destroyed.