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IT Security techniques — Key management —

Part 2: Mechanisms using symmetric techniques

Techniques de sécurité IT — Gestion de clés —

Partie 2: Mécanismes utilisant des techniques symétriques

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Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Symbols and abbreviated terms ... **3**
5 Requirements ... **4**
6 Point-to-point key establishment ... **6**
6.1 General ... 6
6.2 Key establishment mechanism 1 ... 6
6.3 Key establishment mechanism 2 ... 7
6.4 Key establishment mechanism 3 ... 7
6.5 Key establishment mechanism 4 ... 8
6.6 Key establishment mechanism 5 ... 8
6.7 Key establishment mechanism 6 ... 10
7 Mechanisms using a Key Distribution Centre ... **11**
7.1 General ... 11
7.2 Key establishment mechanism 7 ... 11
7.3 Key establishment mechanism 8 ... 12
7.4 Key establishment mechanism 9 ... 14
7.5 Key establishment mechanism 10 ... 15
8 Mechanisms using a Key Translation Centre ... **17**
8.1 General ... 17
8.2 Key establishment mechanism 11 ... 17
8.3 Key establishment mechanism 12 ... 18
8.4 Key establishment mechanism 13 ... 20
Annex A (normative) **Object identifiers** ... **22**
Annex B (informative) **Properties of key establishment mechanisms** ... **24**
Annex C (informative) **Auxiliary techniques** ... **26**
Bibliography ... **28**

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 27, *Security techniques*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This third edition cancels and replaces the second edition (ISO/IEC 11770-2:2008), which has been technically revised. It also incorporates ISO/IEC 11770-2:2008/Cor 1:2009.

The main changes compared to the previous edition are as follows:

— the list of requirements in Clause 5 has been updated;

— an optional message and mechanism identifier to the encrypted strings sent within each of the mechanisms has been added;

— the set of inputs for calculation of the key in Mechanism 5 has been expanded;

— minor changes have been made to the fourth message in Mechanism 8 and the second message in Mechanism 10.

A list of all parts in the ISO/IEC 11770 series can be found on the ISO website.

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Introduction

The purpose of key management is to provide procedures for handling cryptographic keying material to be used in symmetric or asymmetric cryptographic algorithms according to the security policy in force.

Key establishment mechanisms using symmetric cryptographic techniques can be derived from the entity authentication mechanisms of ISO/IEC 9798-2 and ISO/IEC 9798-4 by specifying the use of text fields available in those mechanisms. Other key establishment mechanisms exist for specific environments. Besides key establishment, the goals of such a mechanism can include unilateral or mutual authentication of the communicating entities. Further goals can be the verification of the integrity of the established key, or key confirmation.

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IT Security techniques — Key management —

Part 2:
Mechanisms using symmetric techniques

1 Scope

This document defines key establishment mechanisms using symmetric cryptographic techniques.

This document addresses three environments for the establishment of keys: Point-to-Point, Key Distribution Centre (KDC), and Key Translation Centre (KTC). It describes the required content of messages which carry keying material or are necessary to set up the conditions under which the keying material can be established.

This document does not indicate other information which can be contained in the messages or specify other messages such as error messages. The explicit format of messages is not within the scope of this document.

This document does not specify the means to be used to establish initial secret keys; that is, all the mechanisms specified in this document require an entity to share a secret key with at least one other entity (e.g. a TTP). For general guidance on the key lifecycle, see ISO/IEC 11770-1. This document does not explicitly address the issue of inter-domain key management. This document also does not define the implementation of key management mechanisms; products complying with this document are not necessarily compatible.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 11770-1, *Information technology — Security techniques — Key management — Part 1: Framework*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
distinguishing identifier
information which unambiguously distinguishes an entity

3.2
entity authentication
corroboration that an entity is the one claimed

[SOURCE: ISO/IEC 9798-1:2010]

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3.3
explicit key authentication from *A* to *B*
assurance for entity *B* that entity *A* (and possibly additional identified trusted parties) is the only other entity that is in possession of the correct key

Note 1 to entry: Implicit key authentication from *A* to *B* is assurance for entity *B* that entity *A* (and possibly additional identified trusted parties) is the only other entity that can possibly be in possession of the correct key.

Note 2 to entry: Implicit key authentication from *A* to *B* and key confirmation from *A* to *B* together imply explicit key authentication from *A* to *B*.

Note 3 to entry: Where a mechanism is claimed to provide explicit key authentication, this assumes that the mechanism has completed successfully, i.e. both parties send and receive all messages correctly and succeed in processing them correctly. In any protocol, it is not possible from within the protocol itself for the sender of the final message to know whether this message has been received correctly by the intended recipient. If assurance is required that this has occurred, then this can typically be obtained from the context of use of the mechanism, e.g. if a message is received from the recipient making use of an established key.

[SOURCE: ISO/IEC 11770-3:2015]

3.4
key confirmation
key confirmation from *A* to *B*
assurance for entity *B* that entity *A* is in possession of the correct key

Note 1 to entry: Where a mechanism is claimed to provide key confirmation, this assumes that the mechanism has completed successfully, i.e. both parties send and receive all messages correctly and succeed in processing them correctly. In any protocol, it is not possible from within the protocol itself for the sender of the final message to know whether this message has been received correctly by the intended recipient. If assurance is required that this has occurred, then this can typically be obtained from the context of use of the mechanism, e.g. if a message is received from the recipient making use of an established key.

[SOURCE: ISO/IEC 11770-3:2015]

3.5
key control
ability to choose the key, or the parameters used in the key computation

3.6
key derivation function
KDF
function which takes as input a number of parameters, at least one of which is secret, and which gives as output keys appropriate for the intended algorithm(s) and applications

Note 1 to entry: In ISO/IEC 11770-2:2008, such a function was referred to as a key generating function.

[SOURCE: ISO/IEC 11770-6:2016, 3.3 — modified, Note 1 to entry has been changed and Note 2 to entry has been removed.]

3.7
point-to-point key establishment
direct establishment of keys between entities, without involving a third party

3.8
random number
time variant parameter (3.11) whose value is unpredictable

3.9
redundancy
information that is known and can be checked

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3.10
sequence number
time variant parameter (3.11) whose value is taken from a specified sequence which is non-repeating within a certain time period

3.11
time variant parameter
data item used to verify that a message is not a replay, such as a *random number* (3.8), *sequence number* (3.10), or a time stamp

3.12
unknown key share attack
attack in which all the entities involved in the mechanism complete the mechanism successfully to establish a shared secret key K, but do not agree on the identity of the entity with which they share the key.

4 Symbols and abbreviated terms

A, B	entities between which a key is established
$e_K(Z)$	result of encrypting data Z with a symmetric encryption algorithm using the secret key K
f	key derivation function
F	keying material
F_X	keying material originated by entity X
I_X	the distinguishing identifier of entity X
K	secret key that is established between entities A and B as a result of the use of one of the mechanisms specified in this document; K can be part of F or computed from F using a key derivation function NOTE K is not to be confused with K_{AB}, the long-term secret key shared by A and B.
KDC	Key Distribution Centre
KTC	Key Translation Centre
K_{XY}	secret key associated with entities X and Y
MAC	Message Authentication Code
$\mathrm{MAC}_K(Z)$	result of applying a MAC function to data Z using the secret key K
P	Key Distribution Centre or Key Translation Centre
R	random number
R_X	random number issued by entity X
SID^i_m	constant uniquely identifying the mechanism (m) and the instance of encryption (i) within the mechanism
T/N	time stamp or sequence number

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