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Information technology — Security techniques — Key management —

Part 3: Mechanisms using asymmetric techniques

Technologies de l'information — Techniques de sécurité — Gestion de clés —

Partie 3: Mécanismes utilisant des techniques asymétriques

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/IEC JTC 1, *Information technology, SC 27, Security techniques*.

This third edition cancels and replaces the second edition (ISO/IEC 11770-3:2008 with ISO/IEC 11770-3/Cor1:2009), which has been technically revised.

ISO/IEC 11770 consists of the following parts, under the general title *Information technology — Security techniques — Key management*:

- *Part 1: Framework*
- *Part 2: Mechanisms using symmetric techniques*
- *Part 3: Mechanisms using asymmetric techniques*
- *Part 4: Mechanisms based on weak secrets*
- *Part 5: Group key management*
- *Part 6: Key derivation*

Further parts may follow.

Introduction

This part of ISO/IEC 11770 describes schemes that can be used for key agreement and schemes that can be used for key transport.

Public key cryptosystems were first proposed in the seminal paper by Diffie and Hellman in 1976. The security of many such cryptosystems is based on the presumed intractability of solving the discrete logarithm problem over certain finite fields. Other public key cryptosystems such as RSA are based on the difficulty of the integer factorization problem.

A third class of public key cryptosystems is based on elliptic curves. The security of such a public key system depends on the difficulty of determining discrete logarithms in the group of points of an elliptic curve. When based on a carefully chosen elliptic curve, this problem is, with current knowledge, much harder than the factorization of integers or the computation of discrete logarithms in a finite field of comparable size. All known general purpose algorithms for determining elliptic curve discrete logarithms take exponential time. Thus, it is possible for elliptic curve based public key systems to use much shorter parameters than the RSA system or the classical discrete logarithm based systems that make use of the multiplicative group of some finite field. This yields significantly shorter digital signatures, as well as system parameters, and allows for computations using smaller integers.

This part of ISO/IEC 11770 includes mechanisms based on the following:

- finite fields;
- elliptic curves;
- bilinear pairings.

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Information technology — Security techniques — Key management —

Part 3: Mechanisms using asymmetric techniques

1 Scope

This part of ISO/IEC 11770 defines key management mechanisms based on asymmetric cryptographic techniques. It specifically addresses the use of asymmetric techniques to achieve the following goals.

- a) Establish a shared secret key for use in a symmetric cryptographic technique between two entities *A* and *B* by key agreement. In a secret key agreement mechanism, the secret key is computed as the result of a data exchange between the two entities *A* and *B*. Neither of them should be able to predetermine the value of the shared secret key.
- b) Establish a shared secret key for use in a symmetric cryptographic technique between two entities *A* and *B* via key transport. In a secret key transport mechanism, the secret key is chosen by one entity *A* and is transferred to another entity *B*, suitably protected by asymmetric techniques.
- c) Make an entity's public key available to other entities via key transport. In a public key transport mechanism, the public key of entity *A* shall be transferred to other entities in an authenticated way, but not requiring secrecy.

Some of the mechanisms of this part of ISO/IEC 11770 are based on the corresponding authentication mechanisms in ISO/IEC 9798-3.^[6]

This part of ISO/IEC 11770 does not cover certain aspects of key management, such as

- key lifecycle management,
- mechanisms to generate or validate asymmetric key pairs, and
- mechanisms to store, archive, delete, destroy, etc. keys.

While this part of ISO/IEC 11770 does not explicitly cover the distribution of an entity's private key (of an asymmetric key pair) from a trusted third party to a requesting entity, the key transport mechanisms described can be used to achieve this. A private key can in all cases be distributed with these mechanisms where an existing, non-compromised key already exists. However, in practice the distribution of private keys is usually a manual process that relies on technological means such as smart cards, etc.

This part of ISO/IEC 11770 does not specify the transformations used in the key management mechanisms.

NOTE To provide origin authentication for key management messages, it is possible to make provisions for authenticity within the key establishment protocol or to use a public key signature system to sign the key exchange messages.

2 Normative references

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

ISO/IEC 10118 (all parts), *Information technology — Security techniques — Hash-functions*

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

ISO/IEC 15946-1, *Information technology — Security techniques — Cryptographic techniques based on elliptic curves — Part 1: General*

ISO/IEC 18031, *Information technology — Security techniques — Random bit generation*