INTERNATIONAL STANDARD

ISO/IEC 20009-3

First edition
2022-02

Information security — Anonymous entity authentication —

Part 3: Mechanisms based on blind signatures

Sécurité de l'information — Authentification d'entité anonyme —

Partie 3: Mécanismes fondés sur des signatures aveugles

Reference number
ISO/IEC 20009-3:2022(E)

© ISO/IEC 2022



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO/IEC 2022 – All rights reserved

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 General model and requirements ... **4**
6 Unilateral anonymous authentication ... **5**
6.1 General ... 5
6.2 Mechanism 1 — Two-pass unilateral anonymous authentication ... 5
6.2.1 General ... 5
6.2.2 Requirements ... 5
6.2.3 Domain parameters generation process ... 6
6.2.4 Key generation process ... 6
6.2.5 Credential issuance process ... 7
6.2.6 Authentication process ... 8
Annex A (normative) **Object identifiers** ... **10**
Annex B (informative) **Conversion functions** ... **11**
Annex C (informative) **Group description** ... **12**
Annex D (informative) **Special hash-functions** ... **13**
Annex E (informative) **Security considerations** ... **15**
Bibliography ... **16**

© ISO/IEC 2022 – All rights reserved

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.

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 or www.iec.ch/members_experts/refdocs).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see https://patents.iec.ch).

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

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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 27, *Information security, cybersecurity and privacy protection*.

A list of all parts in the ISO/IEC 20009 series can be found on the ISO and IEC websites.

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 and www.iec.ch/national-committees.

© ISO/IEC 2022 – All rights reserved

Introduction

In an anonymous entity authentication mechanism, the entity to be authenticated (the claimant) provides evidence to a verifier that it has knowledge of a secret without revealing its identifier to any unauthorized entity. That is, given complete knowledge of the messages exchanged between the parties, an unauthorized entity cannot discover the identifier of the entity being authenticated. Moreover, it is possible that even an authorized verifier is not authorized to learn the identifier of the entity being authenticated.

The anonymous entity authentication mechanisms specified in this document are based on blind signatures, specified in the ISO/IEC 18370 series.

© ISO/IEC 2022 – All rights reserved

Information security — Anonymous entity authentication —

Part 3: Mechanisms based on blind signatures

1 Scope

This document provides general descriptions and specifications of anonymous entity authentication mechanisms based on blind digital signatures.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
anonymous entity authentication
corroboration that an entity possesses certain *attributes* (3.2), without distinguishing this entity from other entities with the same attributes

[SOURCE: ISO/IEC 20009-1:2013, 2.2]

3.2
attribute
application-specific data element

[SOURCE: ISO/IEC 18370-1:2016, 3.1]

3.3
claimant
entity which is or represents a principal for the purposes of authentication

Note 1 to entry: A claimant includes the functions and the private data necessary for engaging in authentication exchanges on behalf of a principal.

[SOURCE: ISO/IEC 9798-1:2010, 3.6]

3.4
claimant information field
special *credential* (3.6) *attribute* (3.2) encoded within a credential that is not seen by the *issuer* (3.13) during credential issuance, and that is always disclosed to a *verifier* (3.15)

© ISO/IEC 2022 – All rights reserved

3.5
collision-resistant hash-function
hash-function (3.12) satisfying the following property: it is computationally infeasible to find any two distinct inputs which map to the same output

[SOURCE: ISO/IEC 10118-1:2016, 3.1, modified — Note 1 to entry has been deleted.]

3.6
credential
data held by a *claimant* (3.3) that provides evidence that the claimant is the rightful holder of encoded *attributes* (3.2) and/or a public key, corresponding to a private key

Note 1 to entry: In the context of this definition, attributes can include information regarding the qualification, competence or clearance of the claimant.

3.7
credential information field
special *attribute* (3.2) encoded within a *credential* (3.6) that contains metadata about the credential, such as its expiry date, that is always disclosed to *verifiers* (3.15)

3.8
credential private key
data item specific to a *claimant's* (3.3) *credential* (3.6) that should only be used by this claimant

3.9
credential public key
data item mathematically related to a *credential* (3.6) that is disclosed to the *verifier* (3.15) upon authentication

3.10
domain
set of entities operating under a single security policy

[SOURCE: ISO/IEC 18370-1:2016, 3.11]

3.11
domain parameter
data element which is common to and known by or accessible to all entities within the *domain* (3.10)

[SOURCE: ISO/IEC 14888-1:2008, 3.5]

3.12
hash-function
function which maps strings of bits of variable (but usually upper bounded) length to fixed-length strings of bits, satisfying the following two properties:

— for a given output, it is computationally infeasible to find an input which maps to this output;

— for a given input, it is computationally infeasible to find a second input which maps to the same output

[SOURCE: ISO/IEC 10118-1:2016, 3.4, modified — Note 1 to entry has been deleted.]

3.13
issuer
entity responsible for provisioning of a *credential* (3.6) to a *claimant* (3.3)

© ISO/IEC 2022 – All rights reserved

3.14
unilateral anonymous authentication
anonymous entity authentication (3.1) that provides one entity with assurance of the legitimacy of the other entity, but not vice versa

[SOURCE: ISO/IEC 20009-1:2013, 2.20]

3.15
verifier
entity which requires assurance of the legitimacy of another entity (the *claimant* (3.3))

[SOURCE: ISO/IEC 20009-1:2013, 2.22]

4 Symbols and abbreviated terms

$\emptyset$	The null value, a zero-length octet string.
`0x`	Prefix of a hexadecimal value. For example, `0x37c5` represents the two octet values `37` and `c5` in sequence.
$a \in A$	Indicates that element is in set A.
$a\|\|b$	Concatenation of data items a and b in the order specified. In cases where the result of concatenating two or more data items is input to a cryptographic algorithm as part of one of the mechanisms specified in this document, this result shall be composed so that it can be uniquely resolved into its constituent data strings, i.e. so that there is no possibility of ambiguity in interpretation. This latter property can be achieved in a variety of different ways, depending on the application. For example, it can be guaranteed by: a) fixing the length of each of the substrings throughout the domain of use of the mechanism; or b) encoding the sequence of concatenated strings using a method that guarantees unique decoding, e.g. using the distinguished encoding rules defined in ISO/IEC 8825-1.
$A \subseteq B$	Indicates that set A is a subset of or equal to set B.
A \ B	When A and B are sets, represents the set of elements present in A but not in B.
CI	An extra claimant information field.
$cred$	The claimant's credential.
$\|D\|$	Bit length of D if D is a bit string, or bit size of D if D is a non-negative number (i.e. 0 if $D = 0$, or the unique integer i such that $2^{i-1} \leq D < 2^i$ if $D > 0$).
$desc(G_q)$	Specifies a group G_q of prime order q in which it is infeasible to compute discrete logarithms.
E	Elliptic curve over the finite field F_p for a prime $p > 3$.
$E(F_p)$	Set of all points (x, y), $x \in F_p$, $y \in F_p$, which satisfy the defining equation of the curve E, together with the point at infinity O_E.
$\#E(F_p)$	Order (or cardinality) of $E(F_p)$.
F_p	Finite field containing exactly p elements.
g, g_i	Generators of G_q.
$\gcd(N_1, N_2)$	Greatest common divisor of integers N_1 and N_2.

© ISO/IEC 2022 – All rights reserved