
**Information technology — Security
techniques — Digital signatures with
appendix —**

Part 3:

Discrete logarithm based mechanisms

AMENDMENT 2: Optimizing hash inputs

*Technologies de l'information — Techniques de sécurité — Signatures
numériques avec appendice —*

Partie 3: Mécanismes basés sur un logarithme discret

*AMENDEMENT 2: Optimisation des entrées pour la fonction de
hachage*



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Foreword

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Amendment 2 to ISO/IEC 14888-3:2006 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 27, *IT Security techniques*.

It introduces an optimization for the Schnorr Elliptic Curve Digital Signature Algorithms specified in ISO/IEC 14888-3:2006/Amd.1:2010. Whereas this optimization is described in an informative (only) note of ISO/IEC 14888-3:2006/Amd.1:2010, Amendment 2 makes the optimization a normative option. It also corrects various errata in Annexes E and F and updates the date of a reference in the Bibliography.

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Information technology — Security techniques — Digital signatures with appendix —

Part 3: Discrete logarithm based mechanisms

AMENDMENT 2: Optimizing hash inputs

Subclause 6.9.1, Introduction to EC-SDSA

Replace the text in 6.9.1 with the following:

EC-SDSA (Elliptic Curve Schnorr Digital Signature Algorithm) is a signature mechanism with verification key $Y = [X]G$; that is, the parameter D is equal to 1. The message is prepared such that M_2 is empty and $M_1 = M$ the message to be signed. The witness R is computed as a hash-code of the message M and a random pre-signature $\Pi = [K]G$, by one of two methods, either

normal $R = h(\text{FE2BS}(\Pi_x) \parallel \text{FE2BS}(\Pi_y) \parallel M)$

or

optimized $R = h(\text{FE2BS}(\Pi_x) \parallel M)$.

The first method generates the witness by hashing the concatenation of the x-coordinate of Π , the y-coordinate of Π and the message M . The second method omits the y-coordinate from the hash calculation and thereby improves performance.

The second method is an optimized variant of EC-SDSA (see [40]).

Subclause 6.9.4.4, Computing the witness

Replace the text in 6.9.4.4 with the following:

The signing entity computes $R = h(\text{FE2BS}(\Pi_x) \parallel \text{FE2BS}(\Pi_y) \parallel M)$.

For the optimized variant of EC-SDSA, the signing entity instead computes $R = h(\text{FE2BS}(\Pi_x) \parallel M)$.

Annex A, ASN.1 Module

Add the following entries at the appropriate places in the OID assignments section.

```
id-dswa-dl-EC-SDSA-opt  OID ::= { id-dswa-dl  ec-sdsa-opt (13) }
```

```
    dswa-dl  EC-SDSA-opt
```

```
dswa-dl-EC-SDSA-opt  ALGORITHM ::= {
    OID id-dswa-dl-EC-SDSA-opt  PARMS HashFunctions
}
```

F.11.2.3, Per message data

Append the following text to F.11.2.3:

For the optimized variant of EC-SDSA,

$$R = h(FE2BS(IT_x) \parallel M) =$$

D7FB8135	D8EA45E8	FB3C9059	F146E263	0EF4BD51	C4006A92
EDB4C8B0	849963FB				

F.11.2.4, Signature

Append the following text to F.11.2.4:

For the optimized variant of EC-SDSA,

$$R =$$

D7FB8135	D8EA45E8	FB3C9059	F146E263	0EF4BD51	C4006A92
EDB4C8B0	849963FB				

$$S =$$

B46D1525	379E02E2	32D97928	265B7254	EA2ED978	13454388
C1A08F62	DCCD70B3				

F.11.2.5, Verification

Append the following text to F.11.2.5:

For the optimized variant of EC-SDSA,

$$R' = h(FE2BS(IT'_x) \parallel M) =$$

D7FB8135	D8EA45E8	FB3C9059	F146E263	0EF4BD51	C4006A92
EDB4C8B0	849963FB				

F.11.3.3, Per message data

Append the following text to clause F.11.3.3:

For the optimized variant of EC-SDSA,

$$R = h(FE2BS(IT_x) \parallel M) =$$

27D2F5B9	62A3ACF6	390A4718	EA540DA7	9612A60E	AA15BEBB
00B9E166	5783F7C7	91CCAC42	2CEE815A	9C5DA367	8AC8D1F0

F.11.3.4, Signature

Append the following text to F.11.3.4:

For the optimized variant of EC-SDSA,

$$R =$$

27D2F5B9	62A3ACF6	390A4718	EA540DA7	9612A60E	AA15BEBB
00B9E166	5783F7C7	91CCAC42	2CEE815A	9C5DA367	8AC8D1F0

$$S =$$

22CC89CE	B9E6BE84	15CC14B3	99BC66E6	F3A21E5B	A38E09A6
DE8DE670	A145C0E4	74D5CC88	BE8878F0	123CC662	25A1BA12

F.11.3.5, Verification

Append the following text to F.11.3.5:

For the optimized variant of EC-SDSA,

$$R' = h(\text{FE2BS}(\text{IT}'_X) \parallel M) =$$

27D2F5B9	62A3ACF6	390A4718	EA540DA7	9612A60E	AA15BEBB
00B9E166	5783F7C7	91CCAC42	2CEE815A	9C5DA367	8AC8D1F0

Annex E

To provide a description of the reduced Tate pairing, which is used in examples of Annex F, insert the following clause at the end of Annex E:

E.4 The reduced Tate pairing

Let $l > 2$ be prime, and let P and Q be points on E with $[l]P = O$, the pairing $\langle P, Q \rangle$ can be computed in the following steps:

- choose some random point T on E , then
- compute $\langle P, Q \rangle = (d(P, Q - T) / d(P, -T))^{(p^k - 1)/l}$.

If during the computation of the pairing, a division by zero is attempted, then the computation should be restarted with a new point T .

NOTE 1 – More detailed information of pairing implementation can be found in [2, 14].

NOTE 2 – The reduced Tate pairing is used in numerical examples of clauses F.7 and F.8.

F.2.2, Signature key and verification key

To correct a one-digit error in the value of Y , in the last line of the formula for Y change “48CDF8DE” to “48CBF8DE”.

F.3, Pointcheval-Vaudenay mechanism

To identify which hash-function is used in the example of F.3, insert the following at the beginning of F.3:

This example uses the Secure Hash Algorithm (SHA-1) as the hash-function h . The hash-code is simply the value of SHA-1.

F.5.2.1, Parameters

To correct a one-digit error in the value of G_Y , in the formula of G_Y change “631011EC” to “631011ED”.

F.5.3, Example 2: Field F_{p^m} , 32-bit P and $m = 5$

To correct a minor typographical error in the title of F.5.3, change “Example 2” to “Example 3”.

F.7.2.1, Parameters

To correct the polynomial cited in F.7.2.1, change " $Y^2 = X^3 + 1$ " to " $Y^2 = X^3 + X$ ".

F.8.1.1, Parameters

To correct a multiple-digit error in the value of q in F.8.1.1, in the formula of q change

80000000 00000000 00FFFFFF FFFFFFFF FFFFFFFF

to

80000000 000FFFFFF FFFFFFFF FFFFFFFF FFFFFFFF.

Bibliography

Update reference [3] (ISO/IEC 11770-3) by changing "1999" to "2008".

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