Cryptographic Message Syntax (CMS) algorithms for

<draft-ietf-smime-gost-00.txt>

Status of this Memo

This document is an Internet-Draft and is subject to all provisions of Section 10 of RFC2026.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or made obsolete by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at http://www.ietf.org/id-abstracts.html

The list of Internet-Draft Shadow Directories can be accessed at http://www.ietf.org/shadow.html

Abstract

This document describes the conventions for using cryptographic algorithms GOST 28147-89, GOST R 34.10-94, GOST R 34.10-2001, GOST R 34.11-94, along with Cryptographic Message Syntax (CMS). The CMS is used for digital signature, digest, authentication and encryption of arbitrary message contents.

Table of Contents

1 Introduction .............................................. 2
1.2 Terminology............................................. 3
2 Message Digest Algorithms............................... 3
1 Introduction

The Cryptographic Message Syntax [CMS] is used for digital signature, digest, authentication and encryption arbitrary message contents. This companion specification describes the usage of cryptographic algorithms GOST 28147-89, GOST R 34.10-94, GOST R 34.10-2001 and hash algorithm GOST R 34.11-94 in CMS, proposed by CRYPTO-PRO Company for "Russian Cryptographic Software Compatibility Agreement" community. This document does not describe those cryptographic algorithms; they are defined in corresponding national standards.

The CMS values are generated using ASN.1 [X.208-88], using BER-encoding [X.209-88]. Algorithm identifiers (which include ASN.1 object identifiers) identify cryptographic algorithms, and some algorithms require additional parameters. When needed, parameters are specified with an ASN.1 structure. The algorithm identifier for each algorithm is specified, and when needed, the parameter structure is specified. The fields in the CMS employed by each algorithm are
1.2 Terminology

In this document, the key words MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, RECOMMENDED, and MAY are to be interpreted as described in [RFC 2119].

2 Message Digest Algorithms

This section specifies the conventions for using digest algorithm GOST R 34.11-94 employed by CMS.

Digest values are located in the DigestedData digest field and the Message Digest authenticated attribute. In addition, digest values are input to signature algorithms.

2.1 Message Digest Algorithm GOST R 34.11-94

Hash function GOST R 34.11-94 has been developed by "GUBS of Federal Agency Government Communication and Information" and "All-Russian Scientific and Research Institute of Standardization". The algorithm GOST R 34.11-94 produces a 256-bit hash value of the arbitrary finite bit length input. This document does not contain GOST R 34.11-94 full specification, which could be found in [GOSTR3411] in Russian, [Schneier95] ch. 18.11, p. 454. contain the brief technical description in English.

The initial value (IV) and S-box are optional for algorithm parameters (Algorithm Parameters part in [GOST28147] in Russian, description in English see in [Schneier95] ch. 14.1, p. 331). The Standard [GOST3411] does not define hash function algorithm parameters, which ought to be set by object identifiers (OID) in software code.

id-CryptoPro OBJECT IDENTIFIER ::= 
  { iso(1) member-body(2) ru(643) rans(2) cryptopro(2) }

id-CryptoPro-algorithms OBJECT IDENTIFIER ::= 
  { id-CryptoPro }

The hash algorithm GOST R 34.11-94 has the following identifier:

id-GostR3411-94 OBJECT IDENTIFIER ::= 
  { id-CryptoPro-algorithms gostr3411(9) }

The following structure contains digest in little-endian.
representation:

GostR3411-94-Digest ::= OCTET STRING (SIZE (32))

3 Signature Algorithms

This section specifies the CMS procedures for GOST R 34.10-94 and GOST R 34.10-2001 signature algorithms.

Signature algorithm identifiers are located in the SignerInfo signatureAlgorithm field of SignedData. Also, signature algorithm identifiers are located in the SignerInfo signatureAlgorithm field of countersignature attributes.

Signature values are located in the SignerInfo signature field of SignedData. Also, signature values are located in the SignerInfo signature field of countersignature attributes.

3.1 Signature Algorithm GOST R 34.10-94

GOST R 34.10-94 has been developed by "GUBS of Federal Agency Government Communication and Information" and "All-Russian Scientific and Research Institute of Standardization". This signature algorithm MUST be used conjointly with GOST R 34.11-94. This document does not contain GOST R 34.10-94 standard description, which is fully described in [GOSTR341094] in Russian, and brief description in English could be found in [Schneier95] ch. 20.3, p. 495.

For a signature algorithm identifier, GOST R 34.10-94 public key algorithm OID [CPPK] is used:

id-GostR3410-94-signature OBJECT IDENTIFIER ::= id-GostR3410-94

Signature algorithm GOST R 34.10-94 generates digital signature in the form of a binary 512-bit vector (<<256||s256). signatureValue contains its little endian representation.

GostR3410-94-Signature ::= OCTET STRING

3.2 Signature Algorithm GOST R 34.10-2001

GOST R 34.10-2001 has been developed by "GUBS of Federal Agency Government Communication and Information" and "All-Russian Scientific and Research Institute of Standardization". This signature algorithm MUST be used conjointly with GOST R 34.11-94. This document does not contain GOST R 34.10-2001 standard description, which is fully described in [GOSTR34102001].
For a signature algorithm identifier, GOST R 34.10-2001 public key algorithm OID [CPPK] is used:

\[
\text{id-GostR3410-2001-signatute OBJECT IDENTIFIER ::= id-GostR3410-2001}
\]

Signature algorithm GOST R 34.10-2001 generates digital signature in the form of a binary 512-bit vector \(<r'>256|<s>256\). signatureValue contains its little endian representation.

\[
\text{GostR3410-2001-Signature ::= OCTET STRING}
\]

4 Key Management Algorithms

This chapter describes the key agreement and key transport algorithms, always supposing that key enciphering usage is GOST 28147-89 algorithm only.

4.1 Key Agreement Algorithms

This part describes the key agreement algorithms based on both GOST R 34.10-94 and GOST R 34.10-2001 public keys.

Key agreement algorithm identifiers are located in the EnvelopedData RecipientInfos KeyAgreeRecipientInfo keyEncryptionAlgorithm and AuthenticatedData RecipientInfos KeyAgreeRecipientInfo keyEncryptionAlgorithm fields.

Key wrap algorithm identifiers are located in the KeyWrapAlgorithm parameters within the EnvelopedData RecipientInfos KeyAgreeRecipientInfo keyEncryptionAlgorithm and AuthenticatedData RecipientInfos KeyAgreeRecipientInfo keyEncryptionAlgorithm fields.

Wrapped content-encryption keys are located in the EnvelopedData RecipientInfos KeyAgreeRecipientInfo RecipientEncryptedKeys encryptedKey field. Wrapped message-authentication keys are located in the AuthenticatedData RecipientInfos KeyAgreeRecipientInfo RecipientEncryptedKeys encryptedKey field.

4.1.1 Key Agreement Algorithm Based on GOST R 34.10-94/2001 Public Keys

Key agreement algorithms based on GOST R 34.10-94 and GOST R 34.10-2001 public keys are described in [CPALGS]. When using those algorithms, the EnvelopedData RecipientInfos KeyAgreeRecipientInfo field is used as follows:

- version MUST be 3.
- originator MUST be the originatorKey alternative. The
originatorKey algorithm field MUST contain the object identifier
id-GostR3410-94 or id-GostR3410-2001 with necessary parameters
(see [CPALGS]). The originatorKey publicKey field MUST contain
the sender’s public key.

keyEncryptionAlgorithm algorithm MUST be the same, as
originatorKey algorithm algorithm. keyEncryptionAlgorithm
parameters MUST encapsulate GostR3410-TransportParameters,
containing encryptionParamSet (GOST 28147-89 algorithm parameters
used for key encryption), and UKM. ephemeralPublicKey MUST NOT be
present.

GostR3410-TransportParameters ::= SEQUENCE {
  encryptionParamSet   OBJECT IDENTIFIER,
  ephemeralPublicKey   [0] IMPLICIT SubjectPublicKeyInfo OPTIONAL,
  ukm                  OCTET STRING
}

KeyAgreeRecipientInfo ukm MUST be absent,
GostR3410-TransportParameters ukm is used instead and is not
optional.

encryptedKey MUST encapsulate Gost28147-89-EncryptedKey, which
contains encrypted session key and it’s MAC.

Gost28147-89-EncryptedKey ::= SEQUENCE {
  encryptedKey         Gost28147-89-Key,
  macKey               Gost28147-89-MAC
}

4.2 Key Transport Algorithms

This part describes the key transport algorithms based on both GOST R
34.10-94 and GOST R 34.10-2001 public keys.

Key transport algorithm identifiers are located in the EnvelopedData
RecipientInfos KeyTransRecipientInfo keyEncryptionAlgorithm field.

Key transport encrypted content-encryption keys are located in the
EnvelopedData RecipientInfos KeyTransRecipientInfo encryptedKey
field.

4.2.1 Key Transport Algorithm Based on GOST R 34.10-94/2001 Public Keys

Key transport algorithms based on GOST R 34.10-94 and GOST R
34.10-2001 public keys are described in [CPALGS]. When using those
algorithms, the EnvelopedData RecipientInfos KeyTransRecipientInfo
field is used as follows:
version MUST be 0 or 3.

keyEncryptionAlgorithm MUST be identical to the recipient public key algorithm identifier.

encryptedKey encapsulates GostR3410-KeyTransportEncryptedKeyOctetString, which contains encrypted session key, it’s MAC, GOST 28147-89 algorithm parameters used for key encryption, sender’s ephemeral public key, and UKM (UserKeyingMaterial, see [CMS], 10.2.6).

transportParameters MUST be present.

ephemeralPublicKey MUST be present, and its parameters, if present, MUST be equal to the recipient public key parameters;

GostR3410-KeyTransportEncryptedKeyOctetString ::= SEQUENCE {
    sessionEncryptedKey   Gost28147-89-EncryptedKey,
    transportParameters    [0] IMPLICIT GostR3410-TransportParameters OPTIONAL
}

GostR3410-TransportParameters ::= SEQUENCE {
    encryptionParamSet   OBJECT IDENTIFIER,
    ephemeralPublicKey   [0] IMPLICIT SubjectPublicKeyInfo OPTIONAL,
    ukm                  OCTET STRING
}

5 Content Encryption Algorithms

This section specifies the conventions employed by CMS implementations that support content encryption using GOST 28147-89.

Content encryption algorithm identifiers are located in the EnvelopedData EncryptedContentInfo contentEncryptionAlgorithm and the EncryptedData EncryptedContentInfo contentEncryptionAlgorithm fields.

Content encryption algorithms are used to encipher the content located in the EnvelopedData EncryptedContentInfo encryptedContent field and the EncryptedData EncryptedContentInfo encryptedContent field.

5.1 Content Encryption Algorithm GOST 28147-89

This section specifies the use of GOST 28147-89 algorithm for data encipherment.

GOST 28147-89 is fully described in [GOST28147] (in Russian).
This document specifies the following OID for this algorithm:

\[
\text{id-Gost28147-89 OBJECT IDENTIFIER ::= }
\{ \text{id-CryptoPro-algorithms gost28147-89(21) } \}
\]

Algorithm parameters MUST be present and have the following structure:

\[
\text{Gost28147-89-Parameters ::= SEQUENCE { }
\]
\[
\text{encryptionParamSet }
\]
\[
\text{OBJECT IDENTIFIER { }
\]
\[
\text{id-Gost28147-89-TestParamSet } \text{| } -- \text{Only for tests use }
\]
\[
\text{id-Gost28147-89-CryptoPro-A-ParamSet }
\]
\[
\text{id-Gost28147-89-CryptoPro-B-ParamSet }
\]
\[
\text{id-Gost28147-89-CryptoPro-C-ParamSet }
\]
\[
\text{id-Gost28147-89-CryptoPro-D-ParamSet }
\]
\[
\text{id-Gost28147-89-CryptoPro-Simple-A-ParamSet }
\]
\[
\text{id-Gost28147-89-CryptoPro-Simple-B-ParamSet }
\]
\[
\text{id-Gost28147-89-CryptoPro-Simple-C-ParamSet }
\]
\[
\text{id-Gost28147-89-CryptoPro-Simple-D-ParamSet }
\}
\]
\[
\text{iv } \text{Gost28147-89-IV }
\]
\}
\]

\text{encryptionParamSet specify the set of corresponding }
\text{Gost28147-89-ParamSetParameters.}

\[
\text{Gost28147-89-ParamSetParameters ::= SEQUENCE { }
\]
\[
\text{eUZ \text{Gost28147-89-UZ,}}
\]
\[
\text{mode \text{INTEGER {}}
\]
\[
\text{gost28147-89-OFB(0),}
\]
\[
\text{gost28147-89-CFB(1),}
\]
\[
\text{cryptoPro-CBC(2)}
\}
\]
\[
\text{shiftBits \text{INTEGER { gost28147-89-block(64) }},}
\]
\[
\text{keyWrap \text{AlgorithmIdentifier {{}}}
\]
\[
\text{Gost28147-89-KeyWrapAlgorithms}
\}
\]
\[
\text{keyMix \text{AlgorithmIdentifier {{}}}
\]
\[
\text{Gost28147-89-KeyMixAlgorithms}
\}
\]
\}
\]

\text{where}

\[
\text{iv } - \text{initialisazation vector;}
\]
\[
\text{eUZ } - \text{S-box;}
\]
\[
\text{mode } - \text{cipher mode;}
\]
shiftBits - cipher parameter;
keyWrap   - key export algorithm identifier;
keyMix    - key meshing algorithm.

The following values for encryptionParamSet are already defined:

\[
\begin{align*}
\text{id-Gost28147-89-TestParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts test(0) } & \}
\end{align*}
\]

\[
\begin{align*}
\text{id-Gost28147-89-CryptoPro-A-ParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts cryptopro-A(1) } & \}
\end{align*}
\]

\[
\begin{align*}
\text{id-Gost28147-89-CryptoPro-B-ParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts cryptopro-B(2) } & \}
\end{align*}
\]

\[
\begin{align*}
\text{id-Gost28147-89-CryptoPro-C-ParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts cryptopro-C(3) } & \}
\end{align*}
\]

\[
\begin{align*}
\text{id-Gost28147-89-CryptoPro-D-ParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts cryptopro-D(4) } & \}
\end{align*}
\]

\[
\begin{align*}
\text{id-Gost28147-89-CryptoPro-Simple-A-ParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts cryptopro-Simple-A(6) } & \}
\end{align*}
\]

\[
\begin{align*}
\text{id-Gost28147-89-CryptoPro-Simple-B-ParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts cryptopro-Simple-B(7) } & \}
\end{align*}
\]

\[
\begin{align*}
\text{id-Gost28147-89-CryptoPro-Simple-C-ParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts cryptopro-Simple-C(8) } & \}
\end{align*}
\]

\[
\begin{align*}
\text{id-Gost28147-89-CryptoPro-Simple-D-ParamSet} & \quad \text{OBJECT IDENTIFIER ::=} \\
\{ \text{id-CryptoPro-encrypts cryptopro-Simple-D(9) } & \}
\end{align*}
\]

6 MAC Algorithms

This section specifies the conventions employed by CMS implementations that support the message authentication code (MAC) based on GOST R 34.11-94 HMAC. This MAC can also be used as a pseudo-random function with 256 bits (32 bytes) internal state size, which can be used to derive keys.

MAC algorithm identifiers are located in the AuthenticatedData macAlgorithm field.
MAC values are located in the AuthenticatedData mac field

6.1 HMAC with GOST R 34.11-94

GOSTR3411_HMAC (K, text) function is based on hash function GOST R 34.11-94, as defined in [HMAC], with the following parameter values: B = 32, L = 32.

OID for GOSTR3411_HMAC, defined by this document:

id-HMACGostR3411-94 OBJECT IDENTIFIER ::= 
   { id-CryptoPro-algorithms hmacgostr3411(10) }

This algorithm has the same parameters, as GOST R 34.11-94 digest algorithm, and uses the same OIDs for their identification (see [CPPK]).

7 Using with S/MIME

This section defines use of the algorithms defined in this document together with S/MIME [RFC 2633].

7.1 Parameter micalg

When using the algorithms defined in this document, micalg parameter should be set to 'unknown', according to [RFC 2633].

7.2 Attribute SMIMECapabilities

S/MIME message, which uses the algorithms defined in this document, should contain the list of algorithm identifiers for digest and encryption algorithms, defined in this document, with their parameters, in it’s SMIMECapabilities attribute.

8 Security Considerations

Parameter values for using cryptographic algorithms affect rigidity of information protection system. It is RECOMMENDED, that software applications verify signature values, subject public keys and algorithm parameters to conform to [GOSTR34102001], [GOSTR341094] standards prior to their use.

The algorithm parameters proposed hereby and described in this document, have been analyzed by special certification laboratory of Scientific and Technical Center "ATLAS" and by Center of Certificational Investigations in appropriate levels of target_of_evaluation (TOE).
In case of different parameters usage, it is RECOMMENDED that they are to be examined by authorized agency with approved methods of cryptographic analysis.

When signed CMS document is used as analogue to a manual signing, in the context of Russian Federal Digital Signature Law [RFDSL], signer certificate MUST contain keyUsage extension, it MUST be critical, and keyUsage MUST NOT include keyEncipherment and keyAgreement.

It is RECOMMENDED to use unique value for ukm. Recipients MAY verify, that ukm, specified by the sender is unique.

9 Appendix ASN.1 Modules

9.1 Gost28147-89-EncryptionSyntax

-- Copyright (C) CRYPTO-PRO Company
Gost28147-89-EncryptionSyntax
{ iso(1) member-body(2) ru(643) rans(2) cryptopro(2)
  other(1) modules(1) gost28147-89-EncryptionSyntax(4) 1 }
DEFINITIONS EXPLICIT TAGS ::= BEGIN
  -- EXPORTS All --
  -- The types and values defined in this module are exported for 
  -- use in the other ASN.1 modules contained within the Russian 
  -- Cryptography "GOST" & "GOST R" Specifications, and for the use 
  -- of other applications which will use them to access Russian 
  -- Cryptography services. Other applications may use them for 
  -- their own purposes, but this will not constrain extensions and 
  -- modifications needed to maintain or improve the Russian 
  -- Cryptography service.
  IMPORTS
    id-CryptoPro-algorithms, id-CryptoPro-encrypts,
    cryptographic-Gost-Useful-Definitions
  FROM Cryptographic-Gost-Useful-Definitions
  { iso(1) member-body(2) ru(643) rans(2)
    cryptopro(2) other(1) modules(1)
    cryptographic-Gost-Useful-Definitions(0) 1 }
  AlgorithmIdentifier, ALGORITHM-IDENTIFIER
  FROM Cryptographic-Gost-Useful-Definitions
  cryptographic-Gost-Useful-Definitions
;
  -- GOST 28147-89 OID
  id-Gost28147-89 OBJECT IDENTIFIER ::= 
    { id-CryptoPro-algorithms gost28147-89(21) }
  -- GOST 28147-89 Cryptographic Parameter Sets OIDs
  id-Gost28147-89-TestParamSet OBJECT IDENTIFIER ::= 
    { id-CryptoPro-encrypts test(0) }
id-Gost28147-89-CryptoPro-A-ParamSet OBJECT IDENTIFIER ::=  
  { id-CryptoPro-encrypts cryptopro-A(1) }
id-Gost28147-89-CryptoPro-B-ParamSet OBJECT IDENTIFIER ::=  
  { id-CryptoPro-encrypts cryptopro-B(2) }
id-Gost28147-89-CryptoPro-C-ParamSet OBJECT IDENTIFIER ::=  
  { id-CryptoPro-encrypts cryptopro-C(3) }
id-Gost28147-89-CryptoPro-D-ParamSet OBJECT IDENTIFIER ::=  
  { id-CryptoPro-encrypts cryptopro-D(4) }
id-Gost28147-89-CryptoPro-Simple-A-ParamSet  
  OBJECT IDENTIFIER ::=  
  { id-CryptoPro-encrypts cryptopro-Simple-A(6) }
id-Gost28147-89-CryptoPro-Simple-B-ParamSet  
  OBJECT IDENTIFIER ::=  
  { id-CryptoPro-encrypts cryptopro-Simple-B(7) }
id-Gost28147-89-CryptoPro-Simple-C-ParamSet  
  OBJECT IDENTIFIER ::=  
  { id-CryptoPro-encrypts cryptopro-Simple-C(8) }
id-Gost28147-89-CryptoPro-Simple-D-ParamSet  
  OBJECT IDENTIFIER ::=  
  { id-CryptoPro-encrypts cryptopro-Simple-D(9) }

-- GOST 28147-89 Types
Gost28147-89-Data ::= OCTET STRING (SIZE (0..4294967294))
Gost28147-89-EncryptedData ::=  
  OCTET STRING (SIZE (0..4294967294))
Gost28147-89-UZ ::= OCTET STRING (SIZE (64))
Gost28147-89-IV ::= OCTET STRING (SIZE (8))
Gost28147-89-Key ::= OCTET STRING (SIZE (32))
Gost28147-89-MAC ::= OCTET STRING (SIZE (1..4))
Gost28147-89-EncryptedKey ::=  
  SEQUENCE {  
    encryptedKey         Gost28147-89-Key,  
    macKey               Gost28147-89-MAC (SIZE (4))  
  }

-- GOST 28147-89 encryption algorithm parameters
Gost28147-89-Parameters ::=  
  SEQUENCE {  
    encryptionParamSet  
    OBJECT IDENTIFIER {  
      id-Gost28147-89-TestParamSet | -- Only for tests use  
      id-Gost28147-89-CryptoPro-A-ParamSet  
      id-Gost28147-89-CryptoPro-B-ParamSet  
      id-Gost28147-89-CryptoPro-C-ParamSet  
      id-Gost28147-89-CryptoPro-D-ParamSet  
      id-Gost28147-89-CryptoPro-Simple-A-ParamSet  
      id-Gost28147-89-CryptoPro-Simple-B-ParamSet  
      id-Gost28147-89-CryptoPro-Simple-C-ParamSet  
      id-Gost28147-89-CryptoPro-Simple-D-ParamSet  
    },
iv

Gost28147-89-IV

Gost28147-89-Algorithms ALGORITHM-IDENTIFIER ::= {
  { Gost28147-89-Parameters IDENTIFIED BY
    id-Gost28147-89 }
}

END -- Gost28147-89-EncryptionSyntax

9.2 Gost28147-89-ParamSetSyntax

-- Copyright(C) CRYPTO-PRO Company
Gost28147-89-ParamSetSyntax
  { iso(1) member-body(2) ru(643) rans(2) cryptopro(2)
    other(1) modules(1) gost28147-89-ParamSetSyntax(6) 1 }
DEFINITIONS EXPLICIT TAGS ::= BEGIN
  -- EXPORTS All --
  -- The types and values defined in this module are exported for
  -- use in the other ASN.1 modules contained within the Russian
  -- Cryptography "GOST" & "GOST R" Specifications, and for the use
  -- of other applications which will use them to access Russian
  -- Cryptography services. Other applications may use them for
  -- their own purposes, but this will not constrain extensions and
  -- modifications needed to maintain or improve the Russian
  -- Cryptography service.
  IMPORTS
    id-CryptoPro-algorithms, id-CryptoPro-encrypts,
    gost28147-89-EncryptionSyntax,
    cryptographic-Gost-Useful-Definitions
  FROM Cryptographic-Gost-Useful-Definitions
    { iso(1) member-body(2) ru(643) rans(2)
      cryptopro(2) other(1) modules(1)
      cryptographic-Gost-Useful-Definitions(0) 1 }
Gost28147-89-UZ,
  id-Gost28147-89-TestParamSet,
  id-Gost28147-89-CryptoPro-A-ParamSet,
  id-Gost28147-89-CryptoPro-B-ParamSet,
  id-Gost28147-89-CryptoPro-C-ParamSet,
  id-Gost28147-89-CryptoPro-D-ParamSet,
  id-Gost28147-89-CryptoPro-Simple-A-ParamSet,
  id-Gost28147-89-CryptoPro-Simple-B-ParamSet,
  id-Gost28147-89-CryptoPro-Simple-C-ParamSet,
  id-Gost28147-89-CryptoPro-Simple-D-ParamSet
FROM Gost28147-89-EncryptionSyntax
  gost28147-89-EncryptionSyntax
  AlgorithmIdentifier, ALGORITHM-IDENTIFIER
FROM Cryptographic-Gost-Useful-Definitions
  cryptographic-Gost-Useful-Definitions
GOST 28147-89 Cryptographic Parameters Set:
-- algorithm & parameters
-- OID for Parameters Set imported from
-- Gost28147-89-EncryptionSyntax
Gost28147-89-ParamSetParameters ::= SEQUENCE {
eUZ          Gost28147-89-UZ,
mode         INTEGER {
gost28147-89-OFB(0),
gost28147-89-CFB(1),
cryptoPro-CBC(2)
},
shiftBits    INTEGER { gost28147-89-block(64) },
keyWrap      AlgorithmIdentifier {{
            Gost28147-89-KeyWrapAlgorithms
}},
keyMix       AlgorithmIdentifier {{
            Gost28147-89-KeyMixAlgorithms
}}
}
Gost28147-89-ParamSetAlgorithms ALGORITHM-IDENTIFIER ::= {
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-TestParamSet } | 
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-CryptoPro-A-ParamSet } | 
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-CryptoPro-B-ParamSet } | 
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-CryptoPro-C-ParamSet } | 
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-CryptoPro-D-ParamSet } | 
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-CryptoPro-Simple-A-ParamSet } | 
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-CryptoPro-Simple-B-ParamSet } | 
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-CryptoPro-Simple-C-ParamSet } | 
{ Gost28147-89-ParamSetParameters IDENTIFIED BY
  id-Gost28147-89-CryptoPro-Simple-D-ParamSet } |
}{ Gost28147-89-CryptoPro-KeyWrap OBJECT IDENTIFIER ::= 
  { id-CryptoPro-algorithms keyWrap(13) cryptoPro(1) } |
{id-Gost28147-89-None-KeyWrap OBJECT IDENTIFIER ::= |
  { id-CryptoPro-algorithms keyWrap(13) none(0) } |
Gost28147-89-KeyWrapAlgorithms ALGORITHM-IDENTIFIER ::= {
{ NULL IDENTIFIED BY id-Gost28147-89-CryptoPro-KeyWrap } | 
{ NULL IDENTIFIED BY id-Gost28147-89-None-KeyWrap } |
id-Gost28147-89-CryptoPro-KeyMix OBJECT IDENTIFIER ::= 
  { id-CryptoPro-algorithms keyMix(14) cryptoPro(1) }

id-Gost28147-89-None-KeyMix OBJECT IDENTIFIER ::= 
  { id-CryptoPro-algorithms keyMix(14) none(0) }

Gost28147-89-KeyMixAlgorithms ALGORITHM-IDENTIFIER ::= 
  { NULL IDENTIFIED BY id-Gost28147-89-CryptoPro-KeyMix } 
  | 
  { NULL IDENTIFIED BY id-Gost28147-89-None-KeyMix }

-- GOST 28147-89 Cryptographic Parameters Set: values
-- Test Parameters Set
gost28147-89-TestParamSetAI
  AlgorithmIdentifier {{
    Gost28147-89-ParamSetAlgorithms
  }} ::= 
  {
    algorithm
    id-Gost28147-89-TestParamSet,
    parameters
    Gost28147-89-ParamSetParameters:
      eUZ '4CDE389C2989EFB6FFEB56C55EC29B029875613B113F896
003970C798AA1D55DE210AD43375DB38EB42C77E7CD46CAFAD66A201F70F41EA4AB
03F22165B844D8'H,
      mode gost28147-89-OFB,
      shiftBits 64,
      keyWrap
      { algorithm id-Gost28147-89-None-KeyWrap },
      keyMix
      { algorithm id-Gost28147-89-None-KeyMix }
  }

-- CryptoPro Parameters Sets
gost28147-89-UZ-CryptoPro-A Gost28147-89-UZ ::= 
  -- K1 K2 K3 K4 K5 K6 K7 K8
  -- 9 3 E E B 3 1 B
  -- 6 7 4 7 5 A D A
  -- 3 E 6 A 1 D 2 F
  -- 2 9 2 C 9 5
  -- 8 8 B D 8 1 7 0
  -- B A 3 1 D 2 A C
  -- 1 F D 3 F 0 6 E
  -- 7 0 8 9 0 B 0 8
  -- A 5 C 0 E 7 8 6
  -- 4 2 F 2 4 5 C 2
  -- E 6 5 B 2 9 4 3
  -- F C A 4 3 4 5 9
  -- C B 0 F C 8 F 1
  -- 0 4 7 8 7 F 3 7
gost28147-89-CryptoPro-A-ParamSetAI
AlgorithmIdentifier {{
  Gost28147-89-ParamSetAlgorithms
}} ::= {
  algorithm id-Gost28147-89-CryptoPro-A-ParamSet,
  parameters Gost28147-89-ParamSetParameters:
    eUZ gost28147-89-UZ-CryptoPro-A,
    mode gost28147-89-CFB,
    shiftBits 64,
    keyWrap { algorithm id-Gost28147-89-CryptoPro-KeyWrap },
    keyMix { algorithm id-Gost28147-89-CryptoPro-KeyMix }
}

--

gost28147-89-UZ-CryptoPro-B Gost28147-89-UZ ::= -- K1 K2 K3 K4 K5 K6 K7 K8
--  8 0 E 7 2 8 5 0
--  4 1 C 5 7 3 2 4
--  B 2 0 0 C 2 A B
--  1 A A D F 6 B E
--  3 4 9 B 9 4 9 8
--  5 D 2 6 5 D 1 3
--  0 5 D 1 A E C 7
--  9 C B 2 B B 3 1
--  2 9 7 3 1 C 7 A
--  E 7 5 A 4 1 4 2
--  A 3 8 C 0 7 D 9
--  C F F F D F 0 6
--  D B 3 4 6 A 6 F
--  6 8 6 E 8 0 F D
--  7 6 1 9 E 9 8 5
--  F E 4 8 3 5 E C

'80E7285041C57324B200C2AB1AADF6BE349B94985D265D1305D1AEC79C
B2BB3129731C7AE75A4142A38C07D9CFFDFD06DB346A6F686E80FD7619E985FE483
5EC'H

gost28147-89-CryptoPro-B-ParamSetAI
AlgorithmIdentifier {{
  Gost28147-89-ParamSetAlgorithms
}}
}} ::= {
  algorithm
  id-Gost28147-89-CryptoPro-B-ParamSet,
  parameters
  Gost28147-89-ParamSetParameters:
    eUZ   gost28147-89-UZ-CryptoPro-B,
    mode  gost28147-89-CFB,
    shiftBits  64,
    keyWrap
    { algorithm id-Gost28147-89-CryptoPro-KeyWrap },
    keyMix
    { algorithm id-Gost28147-89-CryptoPro-KeyMix }
}

--
gost28147-89-UZ-CryptoPro-C Gost28147-89-UZ ::=
  -- K1 K2 K3 K4 K5 K6 K7 K8
  -- 1 0 8 3 8 C A 7
  -- B 1 2 6 D 9 9 4
  -- C 7 5 0 B 6 0
  -- 2 D 0 1 0 1 8 5
  -- 9 B 4 5 4 8 D A
  -- D 4 9 D 5 E E 2
  -- 0 5 F A 1 2 2 F
  -- F 2 A 8 2 4 0 E
  -- 4 8 3 B 7 F C
  -- 5 E 7 2 3 3 3 6
  -- 8 F C 9 C 6 5 1
  -- E C D 7 E 5 B B
  -- A 9 6 E 6 A 4 D
  -- 7 A E F F 0 1 9
  -- 6 6 1 C A F C 3
  -- 3 3 B 4 7 D 7 8
  '10838CA7B126D994C750BB602D0101859B4548DAD49D5EE205FA122FF2
A8240E483B97FC5E7233368FC9C651ECD7E5BBA96E6A4D7AEFF019661CAFC333B47
D78’H

gost28147-89-CryptoPro-C-ParamSetAI
  AlgorithmIdentifier {{
    Gost28147-89-ParamSetAlgorithms
  }} ::= {
    algorithm
    id-Gost28147-89-CryptoPro-C-ParamSet,
    parameters
    Gost28147-89-ParamSetParameters:
      eUZ   gost28147-89-UZ-CryptoPro-C,
shiftBits 64,
keyWrap
  { algorithm id-Gost28147-89-CryptoPro-KeyWrap },
keyMix
  { algorithm id-Gost28147-89-CryptoPro-KeyMix }
}
}
--
gost28147-89-UZ-CryptoPro-D Gost28147-89-UZ ::= -- K1 K2 K3 K4 K5 K6 K7 K8
  -- F B 1 1 0 8 3 1
  -- C 6 C 5 C 0 0 A
  -- 2 3 B E 8 F 6 6
  -- A 4 0 C 9 3 F 8
  -- 6 C F A D 2 1 F
  -- 4 F E 7 2 5 E B
  -- 5 E 6 0 A E 9 0
  -- 0 2 5 D B B 2 4
  -- 7 7 A 6 7 1 D C
  -- 9 D D 2 3 A 8 3
  -- E 8 4 B 6 4 C 5
  -- D 0 8 4 5 7 4 9
  -- 1 5 9 9 4 C B 7
  -- B A 3 3 E 9 A D
  -- 8 9 7 F F D 5 2
  -- 3 1 2 8 1 6 7 E'H
  'FB110831C6C5C00A23BE8F66A40C93F86CFAD21F4FE725EB5E60AE9002
  5DBB2477A671DC9DD23A83E84B64C5D084574915994CB7BA33E9AD897FFD5231281
  67E'H

gost28147-89-CryptoPro-D-ParamSetAI
  AlgorithmIdentifier {{
    Gost28147-89-ParamSetAlgorithms
  }} ::= {
   algorithm
    id-Gost28147-89-CryptoPro-D-ParamSet,
   parameters
    Gost28147-89-ParamSetParameters:
      eUZ  gost28147-89-UZ-CryptoPro-D,
      mode  gost28147-89-CFB,
      shiftBits 64,
      keyWrap
        { algorithm id-Gost28147-89-CryptoPro-KeyWrap },
      keyMix
        { algorithm id-Gost28147-89-CryptoPro-KeyMix }
  }
--
gost28147-89-CryptoPro-Simple-A-ParamSetAI
AlgorithmIdentifier {{
    Gost28147-89-ParamSetAlgorithms
}} ::= {
    algorithm
    id-Gost28147-89-CryptoPro-Simple-A-ParamSet,
    parameters
    Gost28147-89-ParamSetParameters:
    eUZ gost28147-89-UZ-CryptoPro-A,
    mode gost28147-89-CFB,
    shiftBits 64,
    keyWrap
    { algorithm id-Gost28147-89-None-KeyWrap },
    keyMix
    { algorithm id-Gost28147-89-CryptoPro-KeyMix }
}

--

--

--

gost28147-89-CryptoPro-Simple-B-ParamSetAI
AlgorithmIdentifier {{
    Gost28147-89-ParamSetAlgorithms
}} ::= {
    algorithm
    id-Gost28147-89-CryptoPro-Simple-B-ParamSet,
    parameters
    Gost28147-89-ParamSetParameters:
    eUZ gost28147-89-UZ-CryptoPro-B,
    mode gost28147-89-CFB,
    shiftBits 64,
    keyWrap
    { algorithm id-Gost28147-89-None-KeyWrap },
    keyMix
    { algorithm id-Gost28147-89-CryptoPro-KeyMix }
}

--

--

gost28147-89-CryptoPro-Simple-C-ParamSetAI
AlgorithmIdentifier {{
    Gost28147-89-ParamSetAlgorithms
}} ::= {
    algorithm
    id-Gost28147-89-CryptoPro-Simple-C-ParamSet,
    parameters
    Gost28147-89-ParamSetParameters:
    eUZ gost28147-89-UZ-CryptoPro-C,
mode gost28147-89-CFB,
    shiftBits  64,
    keyWrap
    { algorithm id=Gost28147-89-None-KeyWrap },
    keyMix
    { algorithm id=Gost28147-89-CryptoPro-KeyMix }
}

--
gost28147-89-CryptoPro-Simple-D-ParamSetAI
AlgorithmIdentifier {{
    Gost28147-89-ParamSetAlgorithms
}} ::= {
  algorithm
  id=Gost28147-89-CryptoPro-Simple-D-ParamSet,
  parameters
  Gost28147-89-ParamSetParameters:
    eUZ   gost28147-89-UZ-CryptoPro-D,
    mode  gost28147-89-CFB,
    shiftBits  64,
    keyWrap
    { algorithm id=Gost28147-89-None-KeyWrap },
    keyMix
    { algorithm id=Gost28147-89-CryptoPro-KeyMix }
}

} END -- Gost28147-89-ParamSetSyntax

9.3 GostR3410-EncryptionSyntax

-- Copyright (C) CRYPTO-PRO Company
GostR3410-EncryptionSyntax
{ iso(1) member-body(2) ru(643) rans(2) cryptopro(2)
other(1) modules(1) gostR3410-EncryptionSyntax(5) 2 }
DEFINITIONS ::= BEGIN
-- EXPORTS All --
-- The types and values defined in this module are exported for
-- use in the other ASN.1 modules contained within the Russian
-- Cryptography "GOST" & "GOST R" Specifications, and for the use
-- of other applications which will use them to access Russian
-- Cryptography services. Other applications may use them for
-- their own purposes, but this will not constrain extensions and
-- modifications needed to maintain or improve the Russian
-- Cryptography service.
IMPORTS
  id-CryptoPro-algorithms,
gost28147-89-EncryptionSyntax,
gostR3410-94-PKISyntax,
gostR3410-2001-PKISyntax,
cryptographic-Gost-Useful-Definitions
FROM Cryptographic-Gost-Useful-Definitions
  { iso(1) member-body(2) ru(643) rans(2)
cryptopro(2) other(1) modules(1)
cryptographic-Gost-Useful-Definitions(0) 1 }
  id-GostR3410-94,
  GostR3410-94-PublicKeyParameters,
  GostR3410-94-PublicKeyAlgorithms
FROM GostR3410-94-PKISyntax gostR3410-94-PKISyntax
  id-GostR3410-2001,
  GostR3410-2001-PublicKeyParameters,
  GostR3410-2001-PublicKeyAlgorithms
FROM GostR3410-2001-PKISyntax gostR3410-2001-PKISyntax
  id-Gost28147-89-TestParamSet,
  id-Gost28147-89-CryptoPro-A-ParamSet,
  id-Gost28147-89-CryptoPro-B-ParamSet,
  id-Gost28147-89-CryptoPro-C-ParamSet,
  id-Gost28147-89-CryptoPro-D-ParamSet,
  id-Gost28147-89-CryptoPro-Simple-A-ParamSet,
  id-Gost28147-89-CryptoPro-Simple-B-ParamSet,
  id-Gost28147-89-CryptoPro-Simple-C-ParamSet,
  id-Gost28147-89-CryptoPro-Simple-D-ParamSet,
  Gost28147-89-EncryptedKey
FROM Gost28147-89-EncryptionSyntax
  gost28147-89-EncryptionSyntax
    -- id-external-PKIX1Explicit93,
    SubjectPublicKeyInfo, AlgorithmIdentifier, ALGORITHM-IDENTIFIER
FROM PKIX1Explicit88 {iso(1) identified-organization(3)
dod(6) internet(1) security(5) mechanisms(5) pkix(7)
  id-mod(0) id-pkix1-explicit(1)}

-- CMS/PKCS#7 Key transport OID, Algorithm & Parameters
-- OID for CMS/PKCS#7 Key transport is id-GostR3410-94 from
-- GostR3410-94-PKISyntax or id-GostR3410-2001 from
-- GostR3410-2001-PKISyntax
-- Parameters for CMS/PKCS#7 Key transport is
-- GostR3410-94-PublicKeyParameters from
-- GostR3410-94-PKISyntax with encryptionParameterOID or
-- GostR3410-2001-PublicKeyParameters from
-- GostR3410-2001-PKISyntax with encryptionParameterOID
-- Algorithm for CMS/PKCS#7 Key transport is
-- GostR3410-94-PublicKeyAlgorithms from
-- GostR3410-94-PKISyntax or
-- GostR3410-2001-PublicKeyAlgorithms from
--  GostR3410-2001-PKISyntax
--  SMIMECapability for CMS/PKCS#7 Key transport is
--  id-GostR3410-94 from GostR3410-94-PKISyntax or
--  id-GostR3410-2001 from GostR3410-2001-PKISyntax
id-GostR3410-94-KeyTransportSMIMECapability
OBJECT IDENTIFIER ::= id-GostR3410-94
id-GostR3410-2001-KeyTransportSMIMECapability
OBJECT IDENTIFIER ::= id-GostR3410-2001
GostR3410-KeyTransportEncryptedKeyOctetString ::= SEQUENCE {
    sessionEncryptedKey    Gost28147-89-EncryptedKey,
    transportParameters [0] IMPLICIT GostR3410-TransportParameters OPTIONAL
}
GostR3410-TransportParameters ::= SEQUENCE {
    encryptionParamSet
    OBJECT IDENTIFIER {
        id-Gost28147-89-TestParamSet | -- Only for tests use
        id-Gost28147-89-CryptoPro-A-ParamSet
        id-Gost28147-89-CryptoPro-B-ParamSet
        id-Gost28147-89-CryptoPro-C-ParamSet
        id-Gost28147-89-CryptoPro-D-ParamSet
        id-Gost28147-89-CryptoPro-Simple-A-ParamSet
        id-Gost28147-89-CryptoPro-Simple-B-ParamSet
        id-Gost28147-89-CryptoPro-Simple-C-ParamSet
        id-Gost28147-89-CryptoPro-Simple-D-ParamSet
    },
    ephemeralPublicKey   [0] IMPLICIT SubjectPublicKeyInfo OPTIONAL,
    ukm                  OCTET STRING ( SIZE(8) )
}
GostR3410-KeyEncryptionAlgorithms
ALGORITHM-IDENTIFIER ::= {
    { GostR3410-94-PublicKeyParameters IDENTIFIED BY id-GostR3410-94 } |
    { GostR3410-2001-PublicKeyParameters IDENTIFIED BY id-GostR3410-2001 } |
}
END -- GostR3410-94-EncryptionSyntax

9.4  GostR3410-94-SignatureSyntax

--  Copyright(C) CRYPTO-PRO Company
GostR3410-94-SignatureSyntax
{ iso(1) member-body(2) ru(643) rans(2) cryptopro(2)
  other(1) modules(1) gostr3410-94-signaturesyntax(3) 1 }
DEFINITIONS ::=
BEGIN
-- EXPORTS All --
-- The types and values defined in this module are exported for
-- use in the other ASN.1 modules contained within the Russian
-- Cryptography "GOST" & "GOST R" Specifications, and for the use
-- of other applications which will use them to access Russian
-- Cryptography services. Other applications may use them for
-- their own purposes, but this will not constrain extensions and
-- modifications needed to maintain or improve the Russian
-- Cryptography service.
IMPORTS
   gostR3411-94-DigestSyntax,
gostR3410-94-PKISyntax,
cryptographic-Gost-Useful-Definitions
FROM Cryptographic-Gost-Useful-Definitions
   { iso(1) member-body(2) ru(643) rans(2)
cryptopro(2) other(1) modules(1)
cryptographic-Gost-Useful-Definitions(0) 1 } id-GostR3411-94,
GostR3411-94-Digest,
GostR3411-94-DigestParameters,
FROM GostR3411-94-DigestSyntax gostR3411-94-DigestSyntax
   id-GostR3410-94,
GostR3410-94-PublicKeyParameters,
FROM GostR3410-94-PKISyntax gostR3410-94-PKISyntax
   AlgorithmIdentifier, ALGORITHM-IDENTIFIER
FROM Cryptographic-Gost-Useful-Definitions
   cryptographic-Gost-Useful-Definitions;

-- GOST R 34.10-94 Signature Data Type
GostR3410-94-Signature ::= OCTET STRING (SIZE (64))

-- GOST R 34.10-94 Signature Parameters & Algorithm
GostR3410-94-CMSSignatureAlgorithms ALGORITHM-IDENTIFIER ::= {
   { GostR3410-94-PublicKeyParameters IDENTIFIED BY
      id-GostR3410-94 }
}

END -- GostR3410-94-SignatureSyntax
9.6 GostR3410-2001-SignatureSyntax

-- Copyright (C) CRYPTO-PRO Company
GostR3410-2001-SignatureSyntax
{ iso(1) member-body(2) ru(643) rans(2) cryptopro(2)
  other(1) modules(1) gostR3410-2001-SignatureSyntax(10) 1 }
DEFINITIONS ::= BEGIN
-- EXPORTS All --
-- The types and values defined in this module are exported for
-- use in the other ASN.1 modules contained within the Russian
-- Cryptography "GOST" & "GOST R" Specifications, and for the use
-- of other applications which will use them to access Russian
-- Cryptography services. Other applications may use them for
-- their own purposes, but this will not constrain extensions and
-- modifications needed to maintain or improve the Russian
-- Cryptography service.
IMPORTS gostR3410-2001-PKISyntax,
cryptographic-Gost-Useful-Definitions
FROM Cryptographic-Gost-Useful-Definitions
{ iso(1) member-body(2) ru(643) rans(2)
  cryptopro(2) other(1) modules(1)
  cryptographic-Gost-Useful-Definitions(0) 1 }
id-GostR3410-2001,
GostR3410-2001-PublicKeyParameters
FROM GostR3410-2001-PKISyntax gostR3410-2001-PKISyntax
AlgorithmIdentifier, ALGORITHM-IDENTIFIER
FROM Cryptographic-Gost-Useful-Definitions

cryptographic-Gost-Useful-Definitions ;
-- GOST R 34.10-2001 Signature Data Type
GostR3410-2001-Signature ::= OCTET STRING (SIZE (64))
-- GOST R 34.10-2001 Signature Parameters & Algorithm
GostR3410-2001-CMSSignatureAlgorithms
ALGORITHM-IDENTIFIER ::= {
  { GostR3410-2001-PublicKeyParameters IDENTIFIED BY
    id-GostR3410-2001 }
}
END -- GostR3410-2001-SignatureSyntax

10 References

1989. (In Russian);


[CPALGS] Cryptographic Algorithm "CryptoPro CSP"


Acknowledgments

This document was created in accordance with "Russian Cryptographic Software Compatibility Agreement", signed by FGUE STC "Atlas", CRYPTO-PRO, Factor-TC, MD PREI, Infotecs GmbH, SPRCIS (SPbCRCZI), Cryptocom, R-Alpha. The aim of this agreement is to achieve mutual compatibility of the products and solutions.

The authors wish to thank:

Microsoft Corporation Russia for provided information about company products and solutions, and also for technical consulting in PKI.

RSA Security Russia and Demos Co Ltd for active collaboration and critical help in creation of this document.

Russ Hously (Vigil Security, LLC, housley@vigilsec.com) and Vasilij Sakharov (DEMOS Co Ltd, svp@dol.ru) for initiative, creating this document.

This document is based on a contribution of CRYPTO-PRO Company. Any substantial use of the text from this document must acknowledge
CRYPTO-PRO. CRYPTO-PRO requests that all material mentioning or referencing this document identify this as "CRYPTO-PRO CPCMS".

Author’s Addresses

Serguei Leontiev
CRYPTO-PRO
38, Obraztsova,
Moscow, 127018, Russian Federation
EMail: lse@cryptopro.ru

Vladimir Popov
CRYPTO-PRO
38, Obraztsova,
Moscow, 127018, Russian Federation
EMail: vpopov@cryptopro.ru

Alexandr Afanasiev
Factor-TC
office 711, 14, Presnenskij val,
Moscow, 123557, Russian Federation
EMail: aaaf@factor-ts.ru

Nikolaj Nikishin
Infotecs GmbH
p/b 35, 80-5, Leningradskij prospekt,
Moscow, 125315, Russian Federation
EMail: nikishin@infotecs.ru

Boleslav Izotov
FGUE STC "Atlas"
38, Obraztsova,
Moscow, 127018, Russian Federation
EMail: izotov@stcnet.ru

Elena Minaeva
MD PREI
build 3, 6A, Vtoroj Troitskij per.,
Moscow, Russian Federation
EMail: evminaeva@mo.msk.ru

Serguei Murugov
R-Alpha
4/1, Raspletina,
Moscow, 123060, Russian Federation
EMail: msm@office.ru

Igori Ustinov
Cryptocom
office 239, 51, Leninskij prospekt,
Moscow, 119991, Russian Federation
EMail: igus@cryptocom.ru

Anatolij Erkin
SPRCIS (SPbRCZI)
1, Obrucheva,
St.Petersburg, 195220, Russian Federation
EMail: erkin@nevsky.net

Full Copyright Statement

Copyright (C) The Internet Society (2003). All Rights Reserved.

This document and translations of it may be copied and furnished to
others, and derivative works that comment on or otherwise explain it
or assist in its implementation may be prepared, copied, published
and distributed, in whole or in part, without restriction of any kind,
provided that the above copyright notice and this paragraph are
included on all such copies and derivative works. However, this
document itself may not be modified in any way, such as by removing
the copyright notice or references to the Internet Society or other
Internet organizations, except as needed for the purpose of
developing Internet standards in which case the procedures for
copyrights defined in the Internet Standards process must be
followed, or as required to translate it into languages other than
English.

The limited permissions granted above are perpetual and will not be
revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an
"AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING
TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING
BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION
HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF
MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.