Working Implementation Agreements for Open Systems Interconnection Protocols: Part 12 - OS Security

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Foreword

This part of the Working Implementation Agreements was prepared by the Security Special Interest Group (SECSIG) of the Open Systems Environment Implementors' Workshop (OIW). See Procedures Manual for Workshop charter.

Text in this part has been approved by the Plenary of the above-mentioned Workshop. This part replaces the previously existing chapter on this subject. This part has been reformatted from the previous release.

Future changes and additions to this version of these Implementor Agreements will be published as a new part. Deleted and replaced text will be shown as . New and replacement text will be shown as shaded.

Table of Contents

Part 12 - Security 1

0 Introduction 1

1 Scope 1

2 Normative References 1

3 Definitions 1

4 Symbols and Abbreviations 1

5 Application Architectures 2
5.1 Introduction 2
5.2 Application Environments 2
5.3 Security Classes 2
5.4 Guidelines for OIW Application Profile Development 2
5.5 Placement of Security Services 2
5.6 Selection of Mechanisms 3

6 Key Management 4

7 Security Algorithms 4
7.1 Message Digests 4
7.1.1 MDC–2 4
7.2 Reversible Public Key Algorithms 5
7.3 Irreversible Public Key Algorithms 5
7.3.1 El Gamal 5
7.3.2 DSA 5
7.3.3 DSA with Common Parameters 6
7.4 Key Exchange 6
7.4.1 Diffie–Hellman 6
7.4.2 Diffie–Hellman with Common Parameters 6
7.4.3 RSA Key Transport 6
7.5 Signature Algorithms 6
7.5.1 Message Digests with RSA 7
7.5.2 Message Digests with RSA Encryption 7
7.5.3 DSA With SHA 7
7.5.4 DSA With SHA with Common Parameters 7
7.5.5 RSA Signature With MDC–2 7
7.5.6 RSA Signature With SHA 7
7.6 Symmetric Encryption Algorithms 8
7.6.1 Data Encryption Standard 8
7.6.1.1 Padding Rules for DES 8

7.6.1.1.1 RFC 1423 Mechanism . . . 8
7.7 ASN.1 . . . 8
7.8 Security Attributes . . . 8
7.8.1 Liability Limitation . . . 8
7.8.2 Binding Information . . . 9
7.8.3 Certificate Purpose . . . 10
7.8.4 Signature Purpose . . . 10
7.8.5 Role Name . . . 11
7.8.6 Agent Name . . . 11
7.8.7 Document Types . . . 11
7.8.8 Trusted Third Party . . . 12
7.8.9 Cosignature Requirements . . . 12
7.8.10 Relative Identity . . . 13
7.8.11 Trust Specification . . . 13
7.8.12 Transaction Limit . . . 15
7.8.13 Transaction Type . . . 15
7.8.14 Time Of Day . . . 15
7.8.15 Location . . . 16
7.8.16 Authorized Signatory . . . 16
7.8.17 Pre–approved Counter Party . . . 16
7.8.18 Delegation Controls . . . 16

8 Lower Layers Security . . . 18

9 Upper Layers Security . . . 18
9.1 Security Mechanisms . . . 18
9.1.1 Peer Entity Authentication . . . 18
9.1.1.1 Simple–Strong Authentication . . . 18
9.1.1.2 External Authentication Mechanisms . . . 18
9.1.1.2.1 Kerberos Version 5 . . . 18
9.1.1.2.2 Kerberos Version 4 . . . 18
9.1.2 Integrity/Data Origin Authentication Transformation . . . 19

10 Message Handling System (MHS) Security . . . 20

11 Directory Services Security . . . 21

12 Network Management Security . . . 21
12.1 Threats . . . 21
12.2 Security Services . . . 21
12.3 Security Mechanisms . . . 21
12.3.1 Peer–Entity Authentication . . . 21
12.3.2 Connectionless Integrity . . . 21
12.3.3 Data Origination Authentication . . . 21
12.3.4 Connectionless Confidentiality . . . 22

Annex A (normative)

ISPICS Requirements List 23

Annex B (normative)

Errata 24

Annex C (normative)

Security Labels 23

Annex D (normative)

Security Algorithms and Attributes 27

Annex E (normative)

References for Security Algorithms 32

Annex F (informative)

Bibliography 33

Annex G (normative)

El Gamal 34

Annex H (informative)

STATUS 35

Annex I (informative)

Security-SIG Management Plan 36

Annex J (informative)

Key Management 37
J.1 Definition of Key Management 37
J.2 Tutorial on Key Management 37
J.2.1 Requirements of Key Management 37
J.2.2 Key Administration 38
J.2.2.1 Generation 38
J.2.2.2 Validation 38
J.2.2.3 Expiration 39
J.2.2.4 Audit 39
J.2.2.5 Authorization/Authentication 39
J.2.3 Approaches to Key Distribution 39
J.2.3.1 Symmetric 39

J.2.3.1.1 Certificate . . . 40
J.2.3.1.2 Symmetric Generation . . . 40
J.2.3.1.3 Centralized . . . 40
J.2.3.1.4 External . . . 40
J.2.3.2 Asymmetric . . . 40
J.2.3.2.1 Certificate . . . 40
J.2.3.2.2 Centralized . . . 40
J.2.3.2.3 External . . . 40
J.3 Key Management Architectures . . . 40
J.3.1 Existing Systems . . . 40
J.3.1.1 SDNS . . . 40
J.3.1.2 SILS . . . 41
J.3.1.3 ANSI X9.17 . . . 41
J.3.1.4 Kerberos . . . 41
J.3.2 OSI . . . 41
J.4 Current Issues . . . 41
J.5 Related Organizations . . . 41
J.5.1 ANSI X.9 . . . 41
J.5.2 SC21 . . . 41
J.5.3 SC27 . . . 41
J.5.4 IEEE 802.10 . . . 41
J.6 References . . . 41

Annex K (informative)

Base Environment Threats . . . 42

List of Figures

List of Tables

Table 2 - Base Security Services/Mechanisms 3
Table 3 - Distributed Transactions Security Services/Mechanisms 3
Table 4 - WIA Part 12 Changes 24
Table 5 - ISO Status 35
Table 6 - Management Plan 36
Table 7 - Threats to Sevices 42

Part 12 - Security

0 Introduction

Refer to clause 0 of the Stable Implementation Agreements.

1 Scope

2 Normative References

Refer to clause 2 of the Stable Implementation Agreements.

3 Definitions

Editor's Note - This clause will contain all unique terms used in this part, to be determined.

Refer to ISO 7498/2 for definitions of security relevant terms. This base standard contains detailed descriptions of accepted security terms. Refer to ISO TR-10000 for general ISO definitions used in this part. The following security terms are not defined in ISO 7498/2:

a) Authentication;

b) Mechanism;

c) Profile.

Editor's Note - The above terms will be defined as a work item.

4 Symbols and Abbreviations

5 Application Architectures

(See Stable Document).

5.1 Introduction

(See Stable Document).

5.2 Application Environments

(See Stable Document).

5.3 Security Classes

(See Stable Document).

5.4 Guidelines for OIW Application Profile Development

5.5 Placement of Security Services

The following guidelines are provided for other OIW SIGs to use in the preliminary development of their own application specific security profile. It is intended that final completion of the security profiles should be done in a joint manner between the Security SIG and the other OIW SIGs.

> **Editor's Note -** Item a of the following paragraph will be considered for deletion at the next Security SIG meeting.

The steps in the guidelines are as follows:

a) Start with the base Profile (5.3.1);

b) Perform application specific threat analysis. Map the result of this analysis to security services;

c) Map security services onto application specific security services (e.g., the threats identified for MHS in X.402 are mapped against MHS specific security services);

d) Map security services to mechanisms that will be used to provide the services;

e) Describe the security classes and map them to the defined functional groups.

> **Editor's Note -** Steps f and beyond are TBD. It will require further discussion to decide exactly how the

application specific security profile is finally determined, how those profiles can be specified (security context, object identifier?) and how we will specify the mechanisms of choice for the implementation of the profile. Further discussion is needed on Security Policy. This is a priority work item.

5.6 Selection of Mechanisms

Table 2 defines the security mechanisms to use in providing security services to protect against the defined threats.

Table 2 - Base Security Services/Mechanisms

	SECURITY MECHANISMS								
SECURITY SERVICES	ENCY-PHER	DIG. SIG.	ACC. CTRL.	DATA INTG.	AUTH EX.	TRFF PAD.	RT. CTRL	NOT-IZE.	AUD-IT
AUTHENTICATION	X	X			X				1
ACCESS CONTROL			X		X				1
NON-REPUDIATION		X		X				X	1
DATA INTEGRITY	X			X					1
CONFIDENTIALITY	X					X	X		1

NOTE - The security mechanisms of auditing can be used to provide added security to any security service.

Table 3 defines the security mechanisms to use in providing security services to protect against the defined threats.

Table 3 - Distributed Transactions Security Services/Mechanisms

	SECURITY MECHANISMS								
SECURITY SERVICES	ENCY-PHER	DIG. SIG.	ACC. CTRL.	DATA INTG.	AUTH EX.	TRFF PAD.	RT. CTRL	NOT-IZE.	AUD-IT
AUTH. DIALOG					X				
ASSOCIATION	X	X			X				1
ACCESS CONTROL DIALOG			X						
ASSOCIATION			X						1
NON-REPUDIATION		X						X	1
DATA INTEGRITY	X	X		X					1
CONF. CL	X						X		1
TRAFFIC FLOW	X					X	X		1

NOTE - The security mechanisms of auditing can be used to provide added security to any security service.

6 Key Management

Refer to Part 12, clause 6 of the Stable Implementation Agreements.

7 Security Algorithms

(See the Stable Document).

7.1 Message Digests

(See Stable Document)

7.1.1 MDC-2

Editor's Note - This clause will be moved to SIA in December 1993

This is a DES-based hash function [ac] in which the output of each block encryption is fed back as keying material for the next block. It outputs a 128 bit digest.

```
mdc-2 ALGORITHM
PARAMETER NULL
::= { algorithm 19 }
```

7.2 Reversible Public Key Algorithms

(See Stable Document).

7.3 Irreversible Public Key Algorithms

(See the Stable Document)

7.3.1 El Gamal

(See the Stable Document)

7.3.2 DSA

The NIST Digital Signature Algorithm (DSA)[aa] is a variant of ElGamal which produces a shorter signature size. Its object identifier is:

```
dsa ALGORITHM
        PARAMETER DSAParameters
::= { algorithm 12 }
```

The ASN.1 data element subjectPublicKey defined as BIT STRING should be interpreted in the case of DSA as being of type:

```
DSAPublicKey ::= INTEGER

DSAParameters ::= SEQUENCE {
        modulusLength   INTEGER,
        prime1          INTEGER, -- p
        prime2          INTEGER, -- q
        base            INTEGER }-- g
```

The DSAPublicKey is simply an INTEGER, which is encapsulated in the subjectPublicKey BIT STRING in the obvious way: The MSB of the INTEGER becomes the MSB of the BIT STRING, and the LSB of the INTEGER becomes the LSB of the BIT STRING.

In [X.509], the value associated with the ENCRYPTED MACRO (i.e. the signature value) should be interpreted in the case of DSA as being of type:

```
SEQUENCE {
        s INTEGER,
        r INTEGER }
```

7.3.3 DSA with Common Parameters

This version of DSA uses common parameters which are distributed externally. The DSAPublicKey is till an INTEGER as described in the DSA case. The algorithm's object identifier is:

```
dsaCommon ALGORITHM
        PARAMETER NULL
::= { algorithm 20 }
```

7.4 Key Exchange

(See the Stable Document).

7.4.1 Diffie-Hellman

7.4.2 Diffie-Hellman with Common Parameters

7.4.3 RSA Key Transport

RSA key transport is used only for encipherment, typically for transporting symmetric keys. It uses the type 2 padding mechanism of [g]; other padding mechanisms (e.g., those used for signature) are not valid. The algorithm's object identifier is:

```
rsaKeyTransport ALGORITHM
        PARAMETER NULL
::= { algorithm 22 }
```

7.5 Signature Algorithms

(See the Stable Document).

7.5.1 Message Digests with RSA

(See the Stable Document).

7.5.2 Message Digests with RSA Encryption

(See the Stable Document).

7.5.3 DSA With SHA

This signature algorithm produces a 320-bit signature. SHA is the only hash algorithm which may be used with DSA. Its object identifier is

```
dsaWithSHA ALGORITHM
       PARAMETER DSAParameters
::= { algorithm 13)
```

7.5.4 DSA With SHA with Common Parameters

This version DSA with SHA signature algorithm uses common parameters which are distributed externally. Its object identifier is

```
dsaCommonWithSHA ALGORITHM
       PARAMETER NULL
::= { algorithm 21)
```

7.5.5 RSA Signature With MDC-2

Editor's Note - This clause will be moved to SIA in December 1993

This algorithm uses the RSA Signature algorithm to sign the digest produced by the MDC-2 DES-based hash algorithm. Its object identifier is

```
mdc2WithRSASignature
PARAMETER NULL
::= { algorithm 14 }
```

7.5.6 RSA Signature With SHA

(See the Stable Document).

7.6 Symmetric Encryption Algorithms

(See the Stable Document).

7.6.1 Data Encryption Standard

7.6.1.1 Padding Rules for DES

Editor's Note - This clause will be moved to SIA in December 1993. It will be placed between DES-EDE, clause 7.6.1.6, and RC2-CBC, clause 7.6.2

This section describes some useful padding mechanisms for DES in its various modes of operation, for the case where the input is not a multiple of 8 bytes in length.

7.6.1.1.1 RFC 1423 Mechanism

The following padding mechanism from [w] should be used with DES-CBC if the data to be encrypted is octet aligned, unless the security policy dictates otherwise:

The input to the DES CBC encryption process must be padded to a multiple of 8 octet, in the following manner. Let n be the length in octets of the input. Pad the input by appending 8-(n mod 8) octet to the end of the message, each having the value 8-(n mod 8), the number of octets being added. In hexadecimal, the possible paddings are: 01, 0202, 030303, 04040404, 0505050505, 060606060606, 07070707070707, and 0808080808080808. All input is padded with 1 to 8 octets to produce a multiple of 8 octets in length. The padding can be removed unambiguously after decryption.

7.7 ASN.1

(See the Stable Document).

7.8 Security Attributes

This section identifies some useful security attributes which are defined in ANSI X9.30 Part 3, "Certificate Management for DSA."

7.8.1 Liability Limitation

```
LiabilityLimitation ::= CHOICE {
        no-liability        [0]   NULL,
        full-liability      [1]   NULL,
        monetary-limit      [2]   MonetaryValue }
```

```
MonetaryValue ::= SEQUENCE {
        currency            [0]   PrintableString (SIZE 3),   -- per ISO 4217
        amount              [1]   INTEGER }
```

This attribute defines the limits of a CA's liability in the event of key compromise, etc.

```
liability-limitation ATTRIBUTE
        WITH ATTRIBUTE-SYNTAX LiabilityLimitation
        SINGLE VALUE
        ::= id-liability-limitation
```

7.8.2 Binding Information

```
BindingInformation ::= SEQUENCE {
        methodOfDelivery            [0]    DeliveryMethod,
        methodOfIdentification      [1]  IdentificationMethod,
        entityType                  [2]    EntityType }

DeliveryMethod ::= ENUMERATED {
        not-presented-in-person (0),
        presented-in-person (1),
        presented-by-authorized-agent (2),
        split-knowledge (3),
        other (4) }

MethodOfIdentification ::= SEQUENCE {
        IdentificationMethod,
        SEQUENCE OF IdentificationDocument }

IdentificationMethod ::= ENUMERATED {
        reasonable-commercial-practices (0),
        verified-by-trusted-third-party (1),
        dual-control (2),
        other (3) }


IdentificationDocument{ID-Documents} ::= SEQUENCE {
        documentType            ID-DOC.&id({ID-Documents}),
        documentID              ID-DOC.&Type({ID-Documents},
                                {@documentType}) }

ID-DOC ::= TYPE-IDENTIFIER
drivers-license ID-DOC ::= { PrintableString IDENTIFIED BY
        { id-doc-drivers-license } }
```

```
passport ID-DOC ::= { PrintableString IDENTIFIED BY
        { id-doc-passport } }

alien-registration ID-DOC ::= { PrintableString IDENTIFIED BY
        { id-doc-alien-registration } }

birth-certificate ID-DOC ::= { PrintableString IDENTIFIED BY
        { id-doc-birth-certificate } }

EntityType ::= ENUMERATED {
        individual (0),
        corporation (1),
        government (2),
        other (3) }
```

This attribute indicates the criteria used to bind the credentials to the identity of the entity being certified.

```
binding-information ATTRIBUTE
        WITH ATTRIBUTE-SYNTAX BindingInformation
        SINGLE VALUE
        ::= id-binding-information
```

7.8.3 Certificate Purpose

```
CertificatePurpose ::= ENUMERATED {
        any (0),
        encipherment (1),    -- key transport
        signature (2) }
```

This attribute indicates what functions the public key contained in the certificate may be used for.

```
certificate-purpose ATTRIBUTE
        WITH ATTRIBUTE-SYNTAX CertificatePurpose
        SINGLE VALUE
        ::= id-certificate-purpose
```

7.8.4 Signature Purpose

The Signature Purpose attribute indicates the purpose of the originator in applying a signature to a document (e.g., authorizing the document, witnessing another signer's signature, etc.).

```
signaturePurpose ATTRIBUTE
        WITH ATTRIBUTE-SYNTAX OBJECT IDENTIFIER
```

```
::= { attribute 15 }
```

Values for the attribute will be registered at a later date.

7.8.5 Role Name

The Role Name attribute type specifies the designated FUNCTION of an object (generally a human) WITHIN the organization.

Example:

Role="Program Manager, X.500 Project"
Role="Principal Investigator, X.520 Anomalies and Defects"

```
roleName ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax
      (SIZE (1..ub-common-name))
::= { attribute 16 }
```

7.8.6 Agent Name

The Agent Name attribute specifies the FUNCTION of an object whose actions have consequences OUTSIDE of the organization, and are authorized in some sense to speak for, commit, or bind the organization.

Example:

Agent="Chief Financial Officer"
Agent="Purchasing Agent"
Agent="Corporate Spokesperson"

```
agentName ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax
      (SIZE (1..ub-common-name))
::= { attribute 17 }
```

7.8.7 Document Types

Document type OIDs are needed for the binding information attributes. Associated data types for the OIDs can be found in Appendix E of ANSI X9.30 Part 3.

```
doc-type ID ::= { iso(1) identified-organization(3) oiw(14)
secsig(3) doc-type(6) }
id-doc-drivers-license ID ::= { doc-type 1 }
id-doc-passport ID ::= { doc-type 2 }
id-doc-alien-registration ID ::= { doc-type 3 }
```

7.8.8 Trusted Third Party

```
TrustedThirdParty ::= SEQUENCE {
        partyType   ThirdPartyType,
        thirdParty  Name }        -- or SubjectName?

ThirdPartyType ::= ENUMERATED { notary(0), witness(1),
        guardian(2), legal-custodian(3) }
```

This attribute is used when the identification process uses such an entity, e.g. to present identification documents. This allows a complete trail to be constructed from the top-level CA through all involved parties to the certificate subject.

```
trusted-third-party ATTRIBUTE
        WITH ATTRIBUTE-SYNTAX Name
        ::= id-trusted-third-party
```

7.8.9 Cosignature Requirements

This attribute defines any additional signatures required on a certificated signed by the CA to which the attribute refers. It is used to enforce the multiple signature requirement for high-risk applications.

```
CosignatureRequirements ::= SEQUENCE {
        quorum      [0]     INTEGER { allMembers(0) },
        members     [1]     SEQUENCE OF CosignerEntry }

CosignerEntry ::= CHOICE {
        single      [0]     Cosigner,
        list        [1]     CosignatureRequirements }

Cosigner ::= SEQUENCE {
        cosigner    CosignerID,
        weight      INTEGER DEFAULT 1 }

CosignerID ::= CHOICE {
        name            [0]     CosignerName,
        issuerSerial    [1]     IssuerSerial }
```

```
CosignerName ::= SEQUENCE {
        name        Name,
        uniqueID    BIT STRING OPTIONAL }

IssuerSerial ::= SEQUENCE {
        issuer      Name,
        serial      CertificateSerialNumber }

cosignature-requirements ATTRIBUTE
        WITH ATTRIBUTE-SYNTAX CosignatureRequirements
        SINGLE VALUE
::= id-cosignature-requirements
```

7.8.10 Relative Identity

A CA may wish to certify only a portion of a name of an individual in a normal business setting. E.g., the CA may wish to disclaim liability for correctness of an individual's personal name, since the user's signature is binding on the organization in any event. In such a case, the CA would only vouch for the correctness of the organizational part of the user's distinguished name.

```
RelativeIdentity ::= INTEGER
-- number of certified RDNs in the DN

relative-identity ATTRIBUTE
        WITH ATTRIBUTE-SYNTAX RelativeIdentity
        SINGLE VALUE
::= id-relative-identity
```

7.8.11 Trust Specification

One can specify the trust in a given CA with the following ASN.1 type.

```
Trust ::= SIGNED SET {  -- signed by the user
        cross       [0]     CrossCertify OPTIONAL,
        users       [1]     Users OPTIONAL }
```

The two components answer the questions:

a) Which CAs may the CA cross certify?, and

b) Which users may the CA certify?

```
CrossCertify ::= SEQUENCE OF CrossCertifyEntry

CrossCertifyEntry ::= SEQUENCE {
        crossSpec       CrossSpecification,
        trustLevel      [0]     INTEGER OPTIONAL,
        transitive      [1]     INTEGER DEFAULT 0 }

CrossSpecification ::= CHOICE {
        superior        [0]     NULL,   -- my immediate superior
        ancestors       [1]     NULL,   -- all superiors
        subordinates    [2]     NULL,   -- normal CA hierarchy
        descendants     [3]     NULL,   -- any descendant CA
        name            [4]     Name,   -- individual CAs
        group           [5]     Name,   -- group of names (of CAs)
        subtree         [6]     Subtree }   -- all CAs in a subtree
```

The list of CAs which may be cross certified may include CA names, directory subtrees (possibly containing a hierarchy of CAs), group names where the (non hierarchical) group is a list of CA names, and various CAs whose names bear a relationship to the name of the CA in question:

a) the immediate superior CA or all superior CAs (up to the TLCA);
b) all immediately subordinate CAs; and
c) all subordinate CAs at any depth.

An explicit level of trust may be specified, as well as an indication of whether cross-certification applies transitively, i.e. if certificates in a domain which is cross-certified by the CA named in the entry will be trusted. Transitivity is indicated by specifying the number of cross certificates which may be in a chain rooted on the specified CA, i.e. the number of domain boundaries crossed.

The Subtree is defined in X.501 (1993).

```
Users ::= SEQUENCE OF UserEntry

UserEntry ::= SEQUENCE {
      userSpec       UserSpecification,
      trustLevel          [0]  INTEGER OPTIONAL,
      transitive          [1]  INTEGER DEFAULT 0 }

UserSpecification ::= CHOICE {
      subordinates   [0]   NULL,    -- my subordinates
      name           [1]   Name,    -- individuals
      group          [2]   Name,    -- group of names
      subtree        [3]   Subtree }    -- whole subtree
```

The users which a CA may certify may include (all) subordinates (a very common case), as well as individual names, names of groups (Directory entries which contain lists of user names), and subtrees as defined above.

```
trust-specification
      WITH ATTRIBUTE-SYNTAX  TrustSpecification
      SINGLE VALUE
::= id-trust-specification
```

7.8.12 Transaction Limit

This attribute represents the maximum monetary value of a message (transaction) which the entity may sign.

```
TransactionLimit ::= MonetaryValue

transaction-limit ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX TransactionLimit
::= id-transaction-limit
```

7.8.13 Transaction Type

This attribute represents a transaction type which the entity may sign. (Multiple values of the attribute may be present.)

```
TransactionType ::= OBJECT IDENTIFIER

transaction-type ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX TransactionType
::= id-transaction-type
```

7.8.14 Time Of Day

This attribute describes the time periods during which signatures from this entity are considered valid.

```
TimeConstraint ::= SEQUENCE {
      daysOfWeek     BIT STRING { sunday(0), monday(1),
                     tuesday(2), wednesday(3), thursday(4),
                     friday(5), saturday(6) },
      intervalsOfDay      IntervalsOfDay }

IntervalsOfDay ::= SET OF SEQUENCE {
      intervalStart  Time24,
      intervalEnd    Time24 }

Time24 ::= SEQUENCE {
      hour           INTEGER (0..23),
      minute    INTEGER (0..59) }

time-of-day ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX TimeConstraint
::= id-time-of-day
```

7.8.15 Location

This attribute indicates the valid location(s) a transaction may be submitted from.

```
Location ::= CHOICE {
      [0]  PresentationAddress,
      [1]  IPAddress,
      [2]  X121Address }

IPAddress ::= OCTET STRING (SIZE 6)
```

PresentationAddress and X121Address are defined in X.520.

```
location ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX Location
::= id-location
```

7.8.16 Authorized Signatory

This attribute may be used in the attribute certificate of an organizational entity to formally indicate the identities of individuals authorized to sign for the organization.

```
AuthorizedSignatory ::= Name

authorized-signatory ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX AuthorizedSignatory
::= id-authorized-signatory
```

7.8.17 Pre-approved Counter Party

This attribute may be used to indicate entities with which the certified entity is pre-authorized to conduct financial transactions (e.g., customers or suppliers).

```
PreApprovedCounterParty ::= Name

preapproved-counterparty ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX PreApprovedCounterParty
::= id-preapproved-counterparty
```

7.8.18 Delegation Controls

This attribute may be used to indicate the amount of "authority" an entity may delegate to another entity when issuing an attribute certificate.

```
DelegationControl ::= SEQUENCE {
      delegation     Delegation,
      limit          TransactionLimit,
      types          SET OF TransactionType }

delegation ::= ENUMERATED {
      exercise (0),  -- may not delegate
      deputy (1),    -- may delegate exercise of authority
      officer (2),   -- may subdelegate up to deputy
      master (3) }   -- may delegate anything

delegation-control ATTRIBUTE
      WITH ATTRIBUTE-SYNTAX DelegationControl
::= id-delegation-control
```

8 Lower Layers Security

9 Upper Layers Security

Refer to Part 12, clause 9 of the Stable Agreements Document.

9.1 Security Mechanisms

9.1.1 Peer Entity Authentication

9.1.1.1 Simple-Strong Authentication

9.1.1.2 External Authentication Mechanisms

9.1.1.2.1 Kerberos Version 5

One instance of an external authentication mechanism is the Kerberos mechanism defined in [z]. The Kerberos specification assigned the following object identifier to an abstract syntax suitable for use in this way:

```
kerberos-V5     OBJECT IDENTIFIER ::= { iso(1) org(3) dod(6)
                    internet(1) security (5) kerberosV5 (2) }}
```

9.1.1.2.2 Kerberos Version 4

One instance of an external authentication mechanism is the Kerberos mechanism defined in [ai]. The Kerberos specification assigned the following object identifier to an abstract syntax suitable for use in this way:

```
kerberos-V4     OBJECT IDENTIFIER ::= { iso(1) org(3) dod(6)
                    internet(1) security (5) kerberosV4 (1) }
```

9.1.2 Integrity/Data Origin Authentication Transformation

This transformation is a specialization of gulsSignedTransformation, which is defined in clause D.4 of DIS 11586-1. This transformation uses the following parameters, and provides additional details on the operation of the encoding and decoding processes.

1) The initEncRules field has the value { joint-iso-ccitt asn1(1) ber-derived(2) der(1) }, i.e. DER.

2) The signOrSealAlgorithm element shall be keyed-hash-seal:

```
keyed-hash-seal ALGORITHM
        PARAMETER NULL
::= { algorithm 23 }
```

The keyed-hash-seal algorithm is specified in the encoding process description below.

3) The hash algorithm, if the hashAlgorithm element is not present, shall default to md5.

Editor's Note - Points 2 and 3 are redundant with text in the NM Agreements. This should be resolved before progressing to the Stable Agreements.

4) The keyInformation field is not present.

Encoding process: When a value of an abstract syntax is to be sealed for transmission, the following procedures apply:

1) Encode the output data type of the transformation using the ASN.1 Distinguished Encoding Rules, with the shared secret key used as the value of the appendix component. (Since automatic tagging is used, this is equivalent to encoding the unprotectedItem using DER, and enclosing it in the intermediateValue and output data type using BER.)

NOTE - This encoding is only for purposes of the security transformation, and does not mean DER must be used to encode the PDU for transmission, i.e. as the transfer syntax.

2) Hash the complete DER encoding of the value derived in step 1.

NOTE - The current definition of the gulsSignedTransformation is unduly restrictive in that cryptographic operations are only applied to the intermediateValue element of the output data type, rather than the entire type. This is being submitted as a ballot comment on DIS 11586-1.

3) Insert the hash value into the appendix component of the output data type, which is the xformedDataType element of the transmitted PDV.

Encoding process local inputs: Identifier of hash algorithm and any required algorithm parameters, and shared secret key. (Most currently registered hash algorithms have a NULL parameter.)

Decoding process: When a received PDV to be verified, the following procedures apply:

1) Extract and save the received hash value contained in the appendix component of the received xformedDataType component of the received PDV.

2) Replace the value in the appendix component of the xformedDataType component with the shared secret key.

NOTE - The extraction and replacement of the seal field may be performed directly on the ASN.1 encoded PDU if the length of the secret key and the hash digest are equal. Otherwise, the PDU must be decoded and reencoded.

3) Hash the DER encoding of the xformedDataType element. (Reencoding may be avoided if the unprotectedItem encoding is distinguished, and the generic protecting transfer syntax defined in DIS 11586-4 is used.)

4) Compare the hash extracted in step 1 with the hash derived in step 3. If they are equal, then the seal is valid; otherwise an error is signalled.

Decoding process local inputs: Identifier of hash algorithm and any required algorithm parameters, and shared secret key.

Decoding process outputs: Recovered unprotected item. and an indication of whether the seal is valid.

Errors: An error condition occurs if seal verification fails.

Security services: Data origin authentication, data integrity.

10 Message Handling System (MHS) Security

All current MHS security relevant text appears in Part 8.

11 Directory Services Security

12 Network Management Security

12.1 Threats

Refer to clause 12.1 of the Stable Implementation Agreements.

12.2 Security Services

Refer to clause 12.2 of the Stable Implementation Agreements.

12.3 Security Mechanisms

12.3.1 Peer-Entity Authentication

Refer to 12.3.1 of the Stable Implementation Agreements.

12.3.2 Connectionless Integrity

In order to identify whether changes to a data unit have occurred it is proposed that an integrity check value (ICV) be computed over the entire data unit and included in the protocol control information for that data unit. The specification and location for conveying this information is left for further study. Because of the envisaged relationship between the underlying mechanisms employed for data origination authentication and connectionless integrity, they are to be considered jointly.

12.3.3 Data Origination Authentication

The proposed security mechanism for data origination authentication is encipherment and intended to protect the ICV computed for connectionless integrity. Successful peer authentication results in the establishment of a cryptographic association between network management entities. The association allows the originator of a data unit to encrypt it or portions of it, and have the peer recipient verify origination through decryption. In order to minimize computational effort, it is proposed that only the integrity check value be enciphered (i.e., a signature) rather than the entire data unit.

This approach implies that data origination authentication information resides with the integrity check value, and that

an according ASN.1 definition reflect any requirements of the signing algorithm or choice of algorithm. However, there appears to be no appropriate location in the application layer protocols employed by network management to convey such data origination authentication information. This issue is left for further study.

12.3.4 Connectionless Confidentiality

Annex A (normative)

ISPICS Requirements List

Annex B (normative)

Errata

Table 4 - WIA Part 12 Changes

NO. OF ERRATA	TYPE	REFERENCED DOCUMENT	CLAUSE	NOTES
	TECHNICAL	WIA PART - 13	12	ADDED NEW
	TECHNICAL	WIA PART - 13	11	ADDED NEW
	TECHNICAL	WIA PART - 13	5.2/.3	ADDED NEW
	TECHNICAL	WIA PART - 13	8	ADDED NEW
	TECHNICAL	SIA PART - 12	0..12	ADD OUTLINE 2ND LEVEL
	TECHNICAL	SIA PART - 12	9	ADD TEXT
	TECHNICAL	SIA PART - 12	12.1.2	ADD TEXT
	TECHNICAL	SIA PART - 12	12.2.2	ADD TEXT
	TECHNICAL	SIA PART - 12	12.4.1/.2	ADD TEXT

Annex C (normative)

Security Labels

Editor's Note - Agreements about security labels is a future work item.

Annex D (normative)

Security Algorithms and Attributes

```
OIWSECSIGAlgorithmObjectIdentifiers  { iso(1) identified-organization(3)
                        oiw(14) secsig(3)
                        oIWSECSIGAlgorithmObjectIdentifiers(1)}
DEFINITIONS =
BEGIN

EXPORTS
-- to be determined

IMPORTS
-- none

-- category of information object
-- defining our own here; perhaps the definition should be imported from
-- { joint-iso-ccitt ds(5) modules(1) usefulDefinitions(0) }
-- This annex contains OIW registrations only; refer to section 7 algorithm
-- descriptions algorithms IDs.

algorithm      OBJECT IDENTIFIER ::= { iso(1) identified-organization(3)
                            oiw(14) secsig(3) algorithm(2) }



-- macros

-- taken from { joint-iso-ccitt ds(5) modules(1) authenticationFramework(7) }
ALGORITHM MACRO    ::=
BEGIN
TYPE NOTATION      ::= "PARAMETER" type
VALUE NOTATION     ::= value(VALUE OBJECT IDENTIFIER)
END -- of ALGORITHM


-- algorithms

md4WithRSA ALGORITHM
    PARAMETER NULL
    ::= { algorithm 2 }

md5WithRSA ALGORITHM
    PARAMETER NULL
    ::= { algorithm 3 }

md4WithRSAEncryption ALGORITHM
    PARAMETER NULL
    ::= { algorithm 4 }
```

```
desECB ALGORITHM
    PARAMETER NULL
    ::= { algorithm 6 }

desCBC ALGORITHM
    PARAMETER CBCParameter
    ::= { algorithm 7 }

CBCParameter ::= IV

desOFB ALGORITHM
    PARAMETER FBParameter
    ::= { algorithm 8 }

desCFB ALGORITHM
    PARAMETER FBParameter
    ::= { algorithm 9 }

FBParameter ::= SEQUENCE {
    iv IV,
    numberOfBits NumberOfBits}

NumberOfBits ::= INTEGER    -- Number of feedback bits (1 to 64 bits)
```

Editor's Note - Check FIPS PUB 81 for allowed ranges of feedback bits and specify ranges here as a comment.

```
IV ::= OCTET STRING  -- 8 octets

desMAC ALGORITHM
    PARAMETER MACParameter
    ::= { algorithm 10 }

MACParameter ::= INTEGER    -- Length of MAC (16, 24, 32, 40, 40 or 64 bits)
```

Editor's Note - Check FIPS PUB 113 for allowed

```
rsaSignature ALGORITHM
    PARAMETER NULL
    ::= { algorithm 11 }

dsa ALGORITHM
    PARAMETER ~~NULL~~DSAParameters
    ::= { algorithm 12 }

dsaWithSHA ALGORITHM
    PARAMETER DSAParameters
    ::= { algorithm 13}

mdc2WithRSASignature
    PARAMETER NULL
    ::= { algorithm 14 }

shaWithRSASignature
    PARAMETER NULL
    ::= { algorithm 15 }

dhWithCommonModulus ALGORITHM
    PARAMETER NULL
    ::= { algorithm 16 }

desEDE ALGORITHM
    PARAMETER NULL
    ::= { algorithm 17 }
sha ALGORITHM
    PARAMETER NULL
    ::= { algorithm 18 }

mdc-2 ALGORITHM
    PARAMETER NULL
    ::= { algorithm 19 }

~~dsaWithSHA ALGORITHM~~
    ~~PARAMETER NULL~~
    ~~::= {algorithm 13}~~

~~mdc2WithRSASignature~~
    ~~PARAMETER NULL~~
    ~~::= {algorithm 14}~~

~~shaWithRSASignature~~
    ~~PARAMETER NULL~~
    ~~::= {algorithm 15}~~

~~dhWithCommonModulus ALGORITHM~~
    ~~PARAMETER NULL~~
    ~~::= {algorithm 16}~~

~~desEDE ALGORITHM~~
    ~~PARAMETER NULL~~
    ~~::= {algorithm 17}~~
dsaCommon ALGORITHM
          PARAMETER NULL
     ::= { algorithm 20 }
```

```
dsaCommonWithSHA ALGORITHM
    PARAMETER NULL
    ::= { algorithm 21)

    rsaKeyTransport ALGORITHM
          PARAMETER NULL
    ::= { algorithm 22 }

    keyed-hash-seal ALGORITHM
          PARAMETER NULL
    ::= { algorithm 23 }

authentication-mechanism OBJECT IDENTIFIER ::=
    { iso(1) identified-organization(3) oiw(14) secsig(3) auth-mechanism(3) }

attribute OBJECT IDENTIFIER ::=
    { iso(1) identified-organization(3) oiw(14) secsig(3) attribute(4) }
id-liability-limitation OBJECT IDENTIFIER ::= { attribute 1 }
id-binding-information OBJECT IDENTIFIER ::= { attribute 2 }
id-trusted-third-party OBJECT IDENTIFIER ::= { attribute 3 }
id-cosignature-requirements OBJECT IDENTIFIER ::= { attribute 4 }
id-certificate-purpose OBJECT IDENTIFIER ::= { attribute 5 }
id-relative-identity OBJECT IDENTIFIER ::= { attribute 6 }
id-trust-specification OBJECT IDENTIFIER ::= { attribute 7 }
id-transaction-limit OBJECT IDENTIFIER ::= { attribute 8 }
id-transaction-type OBJECT IDENTIFIER ::= { attribute 9 }
id-location OBJECT IDENTIFIER ::= { attribute 10 }
id-time-of-day OBJECT IDENTIFIER ::= { attribute 11 }
id-authorized-signatory OBJECT IDENTIFIER ::= { attribute 12 }
id-preapproved-counterparty OBJECT IDENTIFIER ::= { attribute 13 }
id-delegation-control OBJECT IDENTIFIER ::= { attribute 14 }

doc-type OBJECT IDENTIFIER ::=
    { iso(1) identified-organization(3) oiw(14) secsig(3)
    doc-type(5) }

id-doc-drivers-license OBJECT IDENTIFIER ::= { doc-type 1 }
id-doc-passport OBJECT IDENTIFIER ::= { doc-type 2 }
id-doc-alien-registration OBJECT IDENTIFIER ::= { doc-type 3 }
id-doc-birth-certificate OBJECT IDENTIFIER ::= { doc-type 4 }

module OBJECT IDENTIFIER ::=

     { iso(1) identified-organization(3) oiw(14) secsig(3) module (6) }
x9f1-certmgmt OBJECT IDENTIFIER ::= { module 1 }
```

END -- of Algorithm Object Identifier Definitions

Annex E (normative)

References for Security Algorithms

(See the Stable Document).

Annex F (informative)

Bibliography

(See the Stable Document).

Annex G (normative)

El Gamal

Annex H (informative)

STATUS

Table 5 - ISO Status

DOCUMENT	WD	CD	DIS	IS
ISO/IEC JTC1 SC21/WG1 N5044	X	X	X	6/91
NETWORK LAYER ISO/IEC JTC1 SC6	X	7/91		
TRANSPORT LAYER ISO/IEC JTC1 SC6	X	X	7/91	
LOWER LAYER ISO/IEC JTC1 SC6 6227	X			

NOTE - This table was not included in any motion presented to the Plenary in December 1990.

Annex I (informative)

Security-SIG Management Plan

Table 6 - Management Plan

Document	Next Milestone	Date
ISO/IEC JTC1 SC21 N3614		
ISO/IEC DP 9796		
SDN-601/NIST IR 90-4262	COMPLETED	
SDN-701/NIST IR 90-4250	COMPLETED	
SDN-702/NIST IR 90-4250	COMPLETED	
ISO/IEC JTC1 SC21/WG1 N5002		
SDN-902/NIST IR 90-4262	COMPLETED	
SDN-903/NIST IR 90-4262	COMPLETED	
ISO/IEC JTC1 SC21/WG1 N4110		
SDN-301/NIST IR 90-4250	COMPLETED	
SDN-401/NIST IR 90-4250	COMPLETED	
SDN-906/NIST IR 90-4262	COMPLETED	
ISO/IEC JTC1 SC21/WG1 N5001		
ISO/IEC JTC1 SC21/WG1 F29 N5045		
ISO/IEC JTC1 SC21/WG1 F30		
ISO/IEC JTC1 SC21/WG1 F31 N5047		
ISO/IEC JTC1 SC21/WG1 F32 N5046		
ISO/IEC JTC1 SC21/WG4 N3775		
ISO/IEC JTC1 SC21/WG1 N4110		
ISO/IEC JTC1 SC21/WG7 N4022		
ISO/IEC JTC1 SC21/WG1 N5048		
ISO/IEC JTC1 SC21/WG1 N5049		
ISO/IEC JTC1 SC21/WG1 N5044	IS	6/91
NETWORK LAYER ISO/IEC JTC1 SC6	CD	7/91
TRANSPORT LAYER ISO/IEC JTC1 SC6 6285	DIS	7/91
LOWER LAYER ISO/IEC JTC1 SC6 6227	WD	N/A

Annex J (informative)

Key Management

Many of the security services defined for use within OSI protocols and applications are provided by the use of cryptographic techniques. The use of these techniques requires that cryptographic keys are available.

Key management is the generic name covering the process required to ensure such availability.
A definition of the objective for key management is thus:

a) To provide suitable cryptographic keys to security services that require such keys in a secure and timely manner.

This area has been studied for a number of years and specific solutions produced to address needs in well defined situations; the defense and banking communities are examples.

The general problem of key management in a nonspecific OSI environment has not, however, been addressed. And hence OSI key management standards do not exist; whilst responsibility for them has been assigned, work to produce such standards is only just starting.

J.1 Definition of Key Management

Key management is the collection of procedures and services that support the generation, storage, transport, and destruction of cryptographic key material. Specifically, with respect to OIW agreements, key management supports the security services specified in the OIW protocol ISPs.

J.2 Tutorial on Key Management

This tutorial provides information on the role of key management within an overall security architecture. It addresses the requirements OSI security services place on key management. It describes the issues that arise specifically with regard to the administration of keying material, approaches to key distribution, and the relationship of these approaches to the requirements and concerns referred to above.

J.2.1 Requirements of Key Management

This section identifies the generic and specific requirement that security services and protocols place on key management.

a) Symmetric (private, single key);

All parties belong to the same cryptographic network and hold the same private key which is known only to the

members of that network. This one key is used by all members for both encryption and decryption. The network can be as small as 2, or as large as thousands. However, to minimize damage in the event the key is broken, the network size is kept small.

b) Asymmetric (public, two key);

There is no cryptographic network as in the sense of symmetric keying. Each user holds two keys: an encrypt and a decrypt. The decrypt key is private and known only to the holder. Each user's encrypt key is also placed at a point of public access where all other users can obtain it. A user who wishes to send encrypted information to another user would RETRIEVE the intended recipient's public encrypt key from the common storage area and use it to encrypt the information to be sent to the recipient. The recipient would then use his own private decrypt key to decrypt the information.

c) Intermediary

This key scheme is one in which each user holds his own private key known only to himself and to a trusted intermediary. The users encrypt information to be sent to the intended recipient using his private key and then sends it to the intermediary. The intermediary decrypts the information using the user's private key, re-encrypts the information using the intended recipient's private key, and sends the information to the intended recipient. The intended recipient then decrypts the information using its own private key.

J.2.2 Key Administration

One of the primary tasks of key management is the administration of keying material. There are several general issues which arise in this context.

J.2.2.1 Generation

Key management is responsible for ensuring the availability of keys when required. The provision of cryptographic keys may be by a process internal to [the] key management [system] or by an external process.

Generated keys must be suitable for use by the key requestor. This suitability is determined by the cryptographic algorithm to be used by the requestor.

J.2.2.2 Validation

TBD

J.2.2.3 Expiration

Key management must have provision for expiring keys, including time limit expiration and expiration due to compromise.

J.2.2.4 Audit

Key management must maintain an audit trail of its activities. There must be capabilities for reporting this information in an appropriate fashion.

J.2.2.5 Authorization/Authentication

Key management may require the requesting security service authentication itself to key management to determine the validity of the request.

J.2.3 Approaches to Key Distribution

There are several extant approaches to key management. These include public key and certificate methods, symmetric key techniques, and proposals to use network management for toy manager.

J.2.3.1 Symmetric

Network management provides an alternate view of key management. The basic approach here is to treat keying material as management information to be manipulated.

There are two ways to structure this. The security services could generate a "key management event" and the key management service could respond with a keying material. There are difficulties with this because the difficulty in assuring event delivery.

Alternatively, the security services could be seen as the manager generating get and put commands to enable the communication of keying material.

The largest concern with this approach is that unless combined with one of the others, one merely re-introduces the key-management problem in order to provide peer-entity authentication, integrity, and confidentiality for the key exchange.

J.2.3.1.1 Certificate

J.2.3.1.2 Symmetric Generation

J.2.3.1.3 Centralized

J.2.3.1.4 External

J.2.3.2 Asymmetric

Public key techniques are mostly commonly used for authentication and data integrity where the amount of information being protected is relatively small. These can also be used as an underlying mechanism to implement a symmetric private key exchange.

Public key technology can also be coupled with certificates or other methods of relating public keys to identifies. Doing this provides peer entity authentication based on the strength of the relationship between keys and identities. Directory stored certificated (possibly with local caching) are an example of a method of this type.

J.2.3.2.1 Certificate

J.2.3.2.2 Centralized

J.2.3.2.3 External

J.3 Key Management Architectures

J.3.1 Existing Systems

J.3.1.1 SDNS

J.3.1.2 SILS

J.3.1.3 ANSI X9.17

J.3.1.4 Kerberos

J.3.2 OSI

TBD

J.4 Current Issues

J.5 Related Organizations

J.5.1 ANSI X.9

J.5.2 SC21

J.5.3 SC27

J.5.4 IEEE 802.10

J.6 References

Annex K (informative)

Base Environment Threats

Table 7 defines the services required to protect against various threats in a Base Environment.

Each X in the table identifies a security service which offers protection against the corresponding threat.

Table 7 - Threats to Sevices

	SECURITY SERVICES				
THREAT	AUTH.	ACC. CTRL	DATA CONF.	DATA INTEG.	NON-REPUD.
MASQUERADE	X				
REPLAY			X	X	
MODIFICATION OF MESSAGE		X		X	
DENIAL OF SERVICE		X		X	
TRAP DOOR		X		X	
TROJAN HORSE		X	X	X	
DISCLOSURE		X	X		
REPUDIATION					X