INTERNATIONAL STANDARDIZED PROFILE

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AMENDMENT 1
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Information technology — International Standardized Profiles AFTnn — File Transfer, Access and Management —

Part 2:
Definition of document types, constraint sets and syntaxes

AMENDMENT 1: Additional definitions

Technologies de l'information — Profil normalisé international AFTnn — Transfert, accès et gestion de fichier —

Partie 2: Définition de types de documents, jeux de contraintes et syntaxes

AMENDEMENT 1: Définitions additionnelles

Reference number
ISO/IEC ISP 10607-2: 1990/Amd.1: 1991 (E)

Contents

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental or non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC1. In addition to developing International Standards, ISO/IEC JTC1 has created a Special Group on Functional Standardization for the elaboration of International Standardized Profiles.

An International Standardized Profile is an internationally agreed, harmonized document which identifies a standard or group of standards, together with options and parameters, necessary to accomplish a function or set of functions.

Draft International Standardized Profiles are circulated to national bodies for voting. Publication as an International Standardized Profile requires approval by at least 75 % of the national bodies casting a vote.

International Standardized Profile ISO/IEC ISP 10607-2/Amd.1 was prepared with the collaboration of

- Asia-Oceania Workshop (AOW);
- European Workshop for Open Systems (EWOS);
- OSI Implementors Workshop (OIW).

ISO/IEC ISP 10607 consists of the following parts, under the general title *Information technology - International Standardized Profiles AFTnn - File Transfer, Access and Management :*

- *Part 1: Specification of ACSE, Presentation and Session Protocols for the use by FTAM*
- *Part 2 : Definition of document types, constraint sets and syntaxes*
- *Part 2 : Definition of document types, constraint sets and syntaxes - Amendment 1 : Additional definitions*
- *Part 3 : AFT11 - Simple File Transfer Service (unstructured)*
- *Part 4 : AFT12 - Positional File Transfer Service (flat)*
- *Part 5 : AFT22 - Positional File Access Service (flat)*
- *Part 6 : AFT3 - File Management Service*

Annex A forms an integral part of this part of ISO/IEC ISP 10607.

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Introduction

ISO/IEC ISP 10607-2 contains the definitions of document types, constraint sets, abstract syntaxes and transfer syntaxes as they are referenced in ISO/IEC ISP 10607-3, ISO/IEC ISP 10607-4 and ISO/IEC ISP 10607-5. This amendment specifies additional objects for the use in ISO/IEC ISP 10607-4 and ISO/IEC ISP 10607-5.

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Information technology — International Standardized Profiles AFTnn — File Transfer, Access and Management —

Part 2:
Definition of document types, constraint sets and syntaxes

AMENDMENT 1: Additional definitions

1 Scope

This amendment makes no changes to clause 1.

2 Normative references

Add the following reference at the end of clause 2.

ANSI/IEEE 754:1985, *Standard for Binary Floating-Point Arithmetic.*

3 Definitions

This amendment makes no changes to clause 3.

4 Abbreviations

This amendment makes no changes to clause 4.

5 Conformance

This amendment makes no changes to clause 5.

6 Document type definitions

Insert the following new text after the title of clause 6.

The definition of "lexical order" which appears in some of the following document type definitions, is a local implementation issue.

Add the following new subclauses 6.3 to 6.8.

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6.3 NBS-6 Sequential file document type

6.3.1 Entry number : NBS-6

6.3.2 Information objects

Table 3 - Information objects in NBS-6

document type name	{ iso identified-organization oiw(14) ftamsig(5) document-type(5) sequential(6) } "NBS-6 FTAM sequential file"
abstract syntax names a) name for asname1 b) name for asname2	 { iso identified-organization oiw(14) ftamsig(5) abstract-syntax(2) nbs-as1(1) } "NBS abstract syntax AS1" { iso standard 8571 abstract-syntax(2) ftam-fadu(2) } "FTAM FADU"
transfer syntax names	{ joint-iso-ccitt asn1(1) basic-encoding(1) } "Basic Encoding of a single ASN.1 type"

parameter syntax

```
PARAMETERS    : : =  SEQUENCE OF CHOICE { Parameter0, Parameter1, Parameter2 }

Parameter0    : : =  [0] INTEGER {    univer-time    (23),
                                      gen-time       (24),
                                      boolean        (1),
                                      null           (5)  }

Parameter1    : : =  [1] SEQUENCE    {
                     universal-class-number-1   INTEGER    { int       (2),
                                                              bit       (3),
                                                              ia5       (22),
                                                              graphic   (25),
                                                              general   (27),
                                                              octet     (4)  },
                     string-length              INTEGER  }

Parameter2    : : =  [2] SEQUENCE    {
                     private-class-number       INTEGER    { float (0) },
                     length-1                   INTEGER,
                     length-2                   INTEGER }
```

file model	{ iso standard 8571 file-model(3) hierarchical(1) } "FTAM hierarchical file model"
constraint set	{ iso standard 8571 constraint-set(4) sequential-flat(2) } "FTAM sequential flat constraint set"

file contents

```
Datatype1   : : = PrimType    -- as defined by NBS abstract syntax AS1 in 8.3
Datatype2   : : = Node-Descriptor-Data-Element
```

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6.3.3 Scope and field of application

The document type defines the contents of a file for storage, for transfer and access by FTAM.

NOTE - Storage refers to apparent storage within the virtual filestore.

6.3.4 References

ISO 8571-1:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 1 : General introduction.*

ISO 8571-2:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 2 : Virtual Filestore Definition.*

6.3.5 Definitions

This definition makes use of the terms data element, data unit and file access data unit as defined in ISO 8571-1.

6.3.6 Abbreviations

FTAM File Transfer, Access and Management

6.3.7 Document semantics

The document consists of zero, one or more file access data units. Each FADU contains precisely zero or one data unit which consists of zero, one or more data elements. The order of each of these elements is significant.

The document structure takes any of the forms allowed by the FTAM hierarchical file model as constrained by the sequential flat constraint set (see table 3). These definitions appear in ISO 8571-2. As additional constraints FADU Identity will be limited to begin, end, first and next.

For a specific file the number of data elements in a data unit is given by the parameters. Each data element is a data type from the set of primitive data types defined in 8.3. Each data unit contains the same data element types in the same order as all other data units. These types are determined by the parameters 0 through 2.

For Datatype1, the string-length field of Parameter1 specifies the length of the value in octets for the INTEGER, BIT STRING and OCTET STRING types. For character-type data elements, the string-length indicates the actual number of characters from the specified character set, not including any escape sequences or overhead from the character encoding.

For floating point numbers, finite form, length-1 and length-2 specify the length in bits of mantissa and exponent, respectively. The length-1 and length-2 values are irrelevant for the other choices of floating point numbers.

6.3.8 Abstract syntactic structure

The abstract syntactic structure of the document is a hierarchically structured file as defined in the ASN.1 module ISO8571-FADU in ISO 8571-2, in which each of the file access data units has the abstract syntactic structure of NBS-AS1 as defined by the parameters.

6.3.9 Definition of transfer

6.3.9.1 Datatype definitions

The file consists of data values which are of either

a) Datatype1 defined in table 3, where the PrimType in the datatype is given by the NBS-AS1 definition; or

b) Datatype2 defined in table 3, the ASN.1 datatype declared as "Data-Element" in the ASN.1 module ISO8571-FADU.

6.3.9.2 Presentation data values

The document is transferred as a series of presentation data values, each of which is either

a) one value of the ASN.1 datatype "Datatype1", carrying one of the data elements from the document. All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname1"; or

b) a value of "Datatype2". All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname2".

NOTES

1 Specific carrier standards may impose additional constraints on the presentation context to be used, where the above permits a choice.
2 Any document type defined in this entry either makes no use of Datatype2, or starts with a Datatype2 transmission.

Boundaries between presentation data values in the same presentation context, and boundaries between P-DATA primitives, are chosen locally by the sending entity at the time of transmission, and carry no semantics of the document type. Receivers which support this document type shall accept a document with any of the permitted transfer options (e.g., document type parameters and transfer syntaxes).

6.3.9.3 Sequence of presentation data values

The sequence of presentation data values of type a) and the sequence of presentation data values of types a) and b) is the same as the sequence of data elements within a data unit, and data units in the hierarchical structure, when flattened according to the definition of the hierarchical file model in ISO 8571-2.

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6.3.10 Transfer syntax

An implementation supporting this document type shall support the transfer syntax generation rules named in table 3 for all presentation data values transferred.

Implementations may optionally support other named transfer syntaxes.

6.3.11 ASE specific specifications

6.3.11.1 Structural simplification

This simplification loses information.

The document type NBS-6 may be simplified to the document type FTAM-3 (allowed only when reading the file). The octet representation of the transferred data is unpredictable. It will usually correspond to the data values as stored in the local real filestore of the responder.

6.3.11.2 Access context selection

A document of type NBS-6 may be accessed in any one of the access contexts defined in the sequential flat constraint set. The presentation data units transferred in each case are those derived from the structuring elements defined for that access context in ISO 8571-2.

6.3.11.3 The INSERT operation

When the INSERT operation is applied at the end of file, the transferred material shall be the series of FADUs which would be generated by reading any NBS-6 document with the same parameter values in access context FA.

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6.4 NBS-7 Random access file document type

6.4.1 Entry number : NBS-7

6.4.2 Information objects

Table 4 - Information objects in NBS-7

document type name	{ iso identified-organization oiw(14) ftamsig(5) document-type(5) random-file(7) } "NBS-7 FTAM random access file"
abstract syntax names a) name for asname1 b) name for asname2	 { iso identified-organization oiw(14) ftamsig(5) abstract-syntax(2) nbs-as1(1) } "NBS abstract syntax AS1" { iso standard 8571 abstract-syntax(2) ftam-fadu(2) } "FTAM FADU"
transfer syntax names	{ joint-iso-ccitt asn1(1) basic-encoding(1) } "Basic Encoding of a single ASN.1 type"

parameter syntax

```
PARAMETERS      : : =   SEQUENCE OF CHOICE { Parameter0, Parameter1, Parameter2 }

Parameter0      : : =   [0] INTEGER {     univer-time     (23),
                                          gen-time        (24),
                                          boolean         (1),
                                          null            (5)   }

Parameter1      : : =   [1] SEQUENCE      {
                        universal-class-number-1    INTEGER     { int       (2),
                                                                  bit       (3),
                                                                  ia5       (22),
                                                                  graphic   (25),
                                                                  general   (27),
                                                                  octet     (4)   },
                        string-length               INTEGER   }

Parameter2      : : =   [2] SEQUENCE      {
                        private-class-number        INTEGER     { float (0) },
                        length-1                    INTEGER,
                        length-2                    INTEGER }
```

file model	{ iso standard 8571 file-model(3) hierarchical(1) } "FTAM hierarchical file model"
constraint set	{ iso identified-organization oiw(14) ftamsig(5) constraint-set(4) nbs-ordered-flat(1) } "NBS ordered flat constraint set"

file contents

```
Datatype1   : : = PrimType    -- as defined by NBS abstract syntax AS1 in 8.3
Datatype2   : : = CHOICE { Node-Descriptor-Data-Element,
                           Enter-Subtree-Data-Element,
                           Exit-Subtree-Data-Element }
```

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6.4.3 Scope and field of application

The document type defines the contents of a file for storage, for transfer and access by FTAM.

NOTE - Storage refers to apparent storage within the virtual filestore.

6.4.4 References

ISO 8571-1:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 1 : General introduction.*

ISO 8571-2:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 2 : Virtual Filestore Definition.*

6.4.5 Definitions

This definition makes use of the terms data element, data unit and file access data unit as defined in ISO 8571-1.

6.4.6 Abbreviations

FTAM File Transfer, Access and Management

6.4.7 Document semantics

The document consists of zero, one or more file access data units. Each FADU contains precisely zero or one data unit which consists of zero, one or more data elements. The order of each of these elements is significant.

The document structure takes any of the forms allowed by the FTAM hierarchical file model as constrained by the NBS-ordered-flat constraint set (see table 4). These definitions appear in 7.1.

For a specific file the number of data elements in a data unit is given by the parameters. Each data element is a data type from the set of primitive data types defined in 8.3. Each data unit contains the same data element types in the same order as all other data units. These types are determined by the parameters 0 through 2.

For Datatype1, the string-length field of Parameter1 specifies the length of the value in octets for the INTEGER, BIT STRING and OCTET STRING types. For character-type data elements, the string-length indicates the actual number of characters from the specified character set, not including any escape sequences or overhead from the character encoding.

For floating point numbers, finite form, length-1 and length-2 specify the length in bits of mantissa and exponent, respectively. The length-1 and length-2 values are irrelevant for the other choices of floating point numbers.

6.4.8 Abstract syntactic structure

The abstract syntactic structure of the document is a hierarchically structured file as defined in the ASN.1 module ISO8571-FADU in ISO 8571-2, in which each of the file access data units has the abstract syntactic structure of NBS-AS1 as defined by the parameters.

6.4.9 Definition of transfer

6.4.9.1 Datatype definitions

The file consists of data values which are of either

a) Datatype1 defined in table 4, where the PrimType in the datatype is given by the NBS-AS1 definition; or

b) Datatype2 defined in table 4, the ASN.1 datatype declared as "Data-Element" in the ASN.1 module ISO8571-FADU.

6.4.9.2 Presentation data values

The document is transferred as a series of presentation data values, each of which is either

a) one value of the ASN.1 datatype "Datatype1", carrying one of the data elements from the document. All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname1"; or

b) a value of "Datatype2". All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname2".

NOTES

1 Specific carrier standards may impose additional constraints on the presentation context to be used, where the above permits a choice.

2 Any document type defined in this entry either makes no use of Datatype2, or starts with a Datatype2 transmission.

Boundaries between presentation data values in the same presentation context, and boundaries between P-DATA primitives, are chosen locally by the sending entity at the time of transmission, and carry no semantics of the document type. Receivers which support this document type shall accept a document with any of the permitted transfer options (e.g., document type parameters and transfer syntaxes).

6.4.9.3 Sequence of presentation data values

The sequence of presentation data values of type a) and the sequence of presentation data values of types a) and b) is the same as the sequence of data elements within a data unit, and data units in the hierarchical structure, when flattened according to the definition of the hierarchical file model in ISO 8571-2.

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6.4.10 Transfer syntax

An implementation supporting this document type shall support the transfer syntax generation rules named in table 4 for all presentation data values transferred.

Implementation may optionally support other named transfer syntaxes.

6.4.11 ASE specific specifications

6.4.11.1 Structural simplification

This simplification loses information.

The document type NBS-7 may be accessed as a document type FTAM-3 (allowed only when reading the file) by specifying document type FTAM-3 in the contents type parameter in F-OPEN request, and limiting access context to UA on F-READ.

The octet representation of the transferred data is unpredictable. It will usually correspond to the data values as stored in the local real filestore of the responder.

A document of type NBS-7 can be accessed as a document of type NBS-6 (allowed only when reading the file) by specifying document type NBS-6 with appropriate data type parameters in the contents type parameter on the F-OPEN request.

6.4.11.2 Access context selection

A document of type NBS-7 may be accessed in any one of the access contexts defined in the NBS ordered flat constraint set. The presentation data units transferred in each case are those derived from the structuring elements defined for that access context in ISO 8571-2.

6.4.11.3 The INSERT operation

When the INSERT operation is applied at the end of file, the transferred material shall be the series of FADUs which would be generated by reading any NBS-7 document with the same parameter values in access context FA.

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6.5 NBS-8 Indexed sequential file document type

6.5.1 Entry number : NBS-8

6.5.2 Information objects

Table 5 - Information objects in NBS-8

document type name	{ iso identified-organization oiw(14) ftamsig(5) document-type(5) indexed-file(8) } "NBS-8 FTAM indexed file"
abstract syntax names a) name for asname1 b) name for asname2	 { iso identified-organization oiw(14) ftamsig(5) abstract-syntax(2) nbs-as1(1) } "NBS abstract syntax AS1" { iso standard 8571 abstract-syntax(2) ftam-fadu(2) } "FTAM FADU"
***transfer* syntax names**	{ joint-iso-ccitt asn1(1) basic-encoding(1) } "Basic Encoding of a single ASN.1 type"

parameter syntax

```
PARAMETERS  : : =  SEQUENCE { DataTypes, KeyType, KeyPosition }

DataTypes   : : =  SEQUENCE OF CHOICE { Parameter0, Parameter1, Parameter2 }

KeyType     : : =  CHOICE { Parameter0, Parameter1, Parameter2 }

                   -- Parameter0, Parameter1, Parameter2, as defined for the document types NBS-6
                   -- and NBS-7

KeyPosition : : =  INTEGER
```

file model	{ iso standard 8571 file-model(3) hierarchical(1) } "FTAM hierarchical file model"
constraint set	{ iso standard 8571 constraint-set(4) ordered-flat(3) } "FTAM ordered flat constraint set"

file contents

```
Datatype1  : : = PrimType     -- as defined by NBS abstract syntax AS1 in 8.3
Datatype2  : : = CHOICE { Node-Descriptor-Data-Element,
                          Enter-Subtree-Data-Element,
                          Exit-Subtree-Data-Element }
Datatype3  : : =PrimType      -- as defined by NBS abstract syntax AS1 in 8.3
```

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6.5.3 Scope and field of application

The document type defines the contents of a file for storage, for transfer and access using FTAM.

NOTE - Storage refers to apparent storage within the virtual filestore.

6.5.4 References

ISO 8571-1:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 1 : General introduction.*

ISO 8571-2:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 2 : Virtual Filestore Definition.*

6.5.5 Definitions

This definition makes use of the terms data element, data unit and file access data unit as defined in ISO 8571-1.

6.5.6 Abbreviations

FTAM File Transfer, Access and Management

6.5.7 Document semantics

The document consists of zero, one or more file access data units. Each FADU contains precisely one data unit which consists of zero, one or more data elements. The order of each of these elements is significant.

The document structure takes any of the forms allowed by the FTAM hierarchical file model as constrained by the FTAM ordered flat constraint set (see table 5). These definitions appear in ISO 8571-2.

The following additional requirements are specified for the use of the ordered flat constraint set:

- The FADU Identities first, last, and node number are not required for conformant implementations;
- The identities next and previous are allowed for all FADUs.

Each data element is a data type from the set of primitive data types defined in 8.3. Each data unit contains the same data element types in the same order as all other data units. These types and their respective maximum lengths are defined by the DataTypes parameter.

For Datatype1 and Datatype3, the string-length field of Parameter1 specifies the length of the value in octets for the INTEGER, BIT STRING and OCTET STRING types. For character-type data elements, the string-length indicates the actual number of characters from the specified character set, not including any escape sequences or overhead from the character encoding.

For floating point numbers, finite form, in Datatype1 and Datatype3, length-1 and length-2 specify the length in bits of mantissa and exponent, respectively. The length-1 and length-2 values are irrelevant for the other choices of floating point numbers.

Each data unit in the file has a key associated with it, which is the user-coded form of Node-Name. The key of each data unit is of the same data type as the key of all other data units in the file and is a single data element from the set of primitive data types defined in 8.3.

The type and length of the key are defined by the KeyType parameter.

The primitive data types and minimum size ranges of each unit which an implementation must accept as a key value are given in table 6.

The position of the key in the data unit is specified by the KeyPosition parameter:

- KeyPosition = 0 implies the key is not part of the data;
- KeyPosition > 0 specifies the actual data element in the data unit.

6.5.8 Abstract syntactic structure

The abstract syntactic structure of the document is a hierarchically structured file as defined in the ASN.1 module ISO8571-FADU in ISO 8571-2, in which each of the file access data units has the abstract syntactic structure of NBS-AS1 as defined by the parameters.

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Table 6 - Datatypes for keys

Key Type	Minimum Range (octets)	Order
ASN.1 INTEGER	(1-2)	increasing numeric value
ASN.1 IA5String	(1-16)	lexical order
ASN.1 GraphicString	(1-16)	lexical order
ASN.1 GeneralString	(1-16)	lexical order
ASN.1 OCTET STRING	(1-16)	increasing value
ASN.1 GeneralizedTime		increasing time value
ASN.1 UniversalTime		increasing time value
NBS-AS1 FloatingPointNumber		increasing numeric value

6.5.9 Definition of transfer

6.5.9.1 Datatype definitions

The file consists of data values which are of

a) Datatype1 defined in table 5, where the PrimType in the datatype is given by the NBS-AS1 definition; or

b) Datatype2 defined in table 5, the ASN.1 datatype declared as "Data-Element" in the ASN.1 module ISO8571-FADU; or

c) Datatype3, defined in table 5, which specifies the user-coded form of the Node-Name in the FTAM FADU abstract syntax, where user-coded is defined as an EXTERNAL.

6.5.9.2 Presentation data values

The document is transferred as a series of presentation data values, each of which is

a) one value of the ASN.1 datatype "Datatype1", carrying one of the data elements from the document. All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname1"; or

b) a value of "Datatype2". All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname2"; or

c) a value of "Datatype3" carrying a key. All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname1".

NOTES

1 Specific carrier standards may impose additional constraints on the presentation context to be used, where the above permits a choice.

2 Any document type defined in this entry either makes no use of Datatype2, or starts with a Datatype2 transmission.

Boundaries between presentation data values in the same presentation context, and boundaries between P-DATA primitives, are chosen locally by the sending entity at the time of transmission, and carry no semantics of the document type. Receivers which support this document type shall accept a document with any of the permitted transfer options (e.g., document type parameters and transfer syntaxes).

6.5.9.3 Sequence of presentation data values

The sequence of presentation data values of type a) and the sequence of presentation data values of types a) and b) is the same as the sequence of data elements within a data unit, and data units in the hierarchical structure, when flattened according to the definition of the hierarchical file model in ISO 8571-2.

6.5.10 Transfer syntax

An implementation supporting this document type shall support the transfer syntax generation rules named in table 5 for all presentation data values transferred.

Implementations may optionally support other named transfer syntaxes.

6.5.11 ASE specific specifications

6.5.11.1 Structural simplification

This simplification loses information.

The document type NBS-8 may be accessed as a document type FTAM-3 (allowed only when reading the file) by specifying document type FTAM-3 in the contents type parameter in F-OPEN request, and limiting access context to UA on F-READ.

The octet representation of the transferred data is unpredictable. It will usually correspond to the data values as stored in the local real filestore of the responder.

A document of type NBS-8 can be accessed as a document of type NBS-6 (allowed only when reading the file) by specifying document type NBS-6 with appropriate data type parameters in the contents type parameter on the F-OPEN request. The traversal order of the FADUs must be maintained.

NOTE - The traversal order is as reading the file as NBS-8 in key order.

6.5.11.2 Access context selection

A document of type NBS-8 may be accessed in any one of the access contexts defined in the FTAM ordered flat constraint set. The presentation data units transferred in each case are those derived from the structuring elements defined for that access context in ISO 8571-2.

6.5.11.3 The INSERT operation

When the INSERT operation is applied, the transferred material shall be the series of FADUs which would be generated by reading any NBS-8 document with the same parameter values in access context FA.

The insertion of a new FADU after an already existing FADU will be indicated via a diagnostic on F-TRANSFER-END.

6.5.11.4 The EXTEND operation

This operation is excluded for use with this document type.

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6.6 NBS-10 Random binary access file document type

6.6.1 Entry number : NBS-10

6.6.2 Information objects

Table 7 - Information objects in NBS-10

document type name	{ iso identified-organization oiw(14) ftamsig(5) document-type(5) random-binary(10) } "NBS-10 FTAM random binary access file"
abstract syntax names	
a) name for asname1	{ iso identified-organization oiw(14) ftamsig(5) abstract-syntax(2) nbs-random-binary(4) } "NBS random binary access file abstract syntax"
b) name for asname2	{ iso standard 8571 abstract-syntax(2) ftam-fadu(2) } "FTAM FADU"
c) name for asname3	{ iso identified-organization oiw(14) ftamsig(5) abstract-syntax(2) nbs-node-name(3) } "NBS random access node name abstract syntax"
transfer syntax names	{ joint-iso-ccitt asn1(1) basic-encoding(1) } "Basic Encoding of a single ASN.1 type"
file model	{ iso standard 8571 file-model(3) hierarchical(1) } "FTAM hierarchical file model"
constraint set	{ iso identified-organization oiw(14) ftamsig(5) constraint-set(4) nbs-random-access(2) } "NBS random access constraint set"
file contents	Datatype1 : : = OCTET STRING Datatype2 : : = Node-Name -- The type to be used for Node-Name is defined in ISO8571-FADU -- The only choice for Node-Name is user-coded. Datatype3 : : = NBS-Node-Name -- as defined by NBS random access node name -- abstract syntax in 8.4

6.6.3 Scope and field of application

The document type defines the contents of a file for storage, for transfer and access by FTAM.

6.6.4 References

ISO 8571-1:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 1 : General introduction.*

ISO 8571-2:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 2 : Virtual Filestore Definition.*

6.6.5 Definitions

This definition makes use of the terms data element, data unit and file access data unit as defined in ISO 8571-1.

6.6.6 Abbreviations

FTAM File Transfer, Access and Management

6.6.7 Document semantics

The document consists of zero, one or more file access data units. Each FADU contains precisely one data unit which consists of precisely one data element. The data

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element is made up of one octet. The order of each of these elements is significant. The semantics of the data element is not specified by this document type.

The document structure takes any of the forms allowed by the FTAM hierarchical file model as constrained by the NBS random access constraint set. The definition for FTAM hierarchical file model appears in ISO 8571-2.

There are no size or length limitations imposed by this definition.

6.6.8 Abstract syntactic structure

The abstract syntactic structure of the document is a series of octets.

6.6.9 Definition of transfer

6.6.9.1 Datatype definition

A presentation data value used for transfer is an ASN.1 OCTET STRING.

Datatype2 is used to specify the FADU Identity of name-list in the FTAM PDUs specifying FADU Identity, where name-list is defined as a SEQUENCE OF EXTERNAL. The EXTERNAL is defined as Node-Name in the FTAM FADU abstract syntax. The use of Datatype2 is defined in 7.2 (NBS random access constraint set).

Datatype3 specifies the user-coded form of the Node-Name in the FTAM FADU abstract syntax, where user-coded is defined as an EXTERNAL. That EXTERNAL is defined by Datatype3. The use of Datatype3 is defined in 7.2 (NBS random access constraint set).

6.6.9.2 Presentation data values

The document is transferred as a series of presentation data values. Each presentation data value shall consist of the data from one or more FADUs concatenated together. The result is one value of the ASN.1 data type OCTET STRING. The fadu-count field supplied in the Node-Name specifies the number of FADUs to transfer during a Read operation. The requested FADUs may be transferred as one or more presentation data values.

All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname1" declared in table 7.

NOTE - Specific carrier standards may impose additional constraints on the presentation context to be used, when the above permits a choice.

Boundaries between P-DATA primitives and between presentation data values are chosen locally by the sending entity at the time of transmission. The boundaries are not preserved when the file is stored and they carry no semantics of the document type. Receivers which support this document type shall accept a document with any of the permitted transfer options.

6.6.9.3 Sequence of presentation data values

The sequence of presentation data values is the same as the sequence of data units in the file.

6.6.10 Transfer syntax

An implementation supporting this document type shall support the transfer syntax generation rules named in table 7 for all presentation data values transferred.

Implementations may optionally support other named transfer syntaxes.

6.6.11 ASE specific specifications

6.6.11.1 Simplification

The document type NBS-10 may be simplified to the document type FTAM-3. The resultant document contains the same sequence of data values as would result from accessing the file as an NBS-10 file.

6.6.11.2 The READ operation

A READ operation may be applied to a range of FADUs via the FADU Identity of NodeSeq. The starting-fadu part of the node name specifies the node number of the first FADU; the fadu-count specifies the number of consecutive FADUs to be transferred.

A READ operation applied to a range of FADUs that spans beyond the end of file is valid. All available data in the range is transferred. An informative diagnostic (5005) is returned on the F-DATA-END request indicating that the end of file was reached and a portion of the request was satisfied.

6.6.11.3 The REPLACE operation

When the REPLACE operation is applied to the root FADU of an NBS-10 document, the transferred data shall be any NBS-10 document.

The REPLACE operation applied to a FADU Identity of node number is used to replace a series of FADUs, starting at the specified position in the file, by the new FADUs being transferred. The number of replaced FADUs is determined by the number of transferred FADUs.

If the replacement spans beyond the end of the existing file, then the additional FADUs are inserted at the end of the file.

6.6.11.4 The INSERT operation

When the INSERT operation is applied at the end of file, the transferred data shall be the series of FADUs which would be generated by reading any NBS-10 document in access context UA.

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6.7 NBS-11 Indexed file with unique keys document type

6.7.1 Entry number : NBS-11

6.7.2 Information objects

Table 8 - Information objects in NBS-11

document type name	{ iso identified-organization oiw(14) ftamsig(5) document-type(5) indexed-file-with-unique-keys(11) } "NBS-11 FTAM indexed file with unique keys"
abstract syntax names a) name for asname1 b) name for asname2	 { iso identified-organization oiw(14) ftamsig(5) abstract-syntax(2) nbs-as1(1) } "NBS abstract syntax AS1" { iso standard 8571 abstract-syntax(2) ftam-fadu(2) } "FTAM FADU"
transfer syntax names	{ joint-iso-ccitt asn1(1) basic-encoding(1) } "Basic Encoding of a single ASN.1 type"
parameter syntax PARAMETERS : : = SEQUENCE { DataTypes, KeyType, KeyPosition } DataTypes : : = SEQUENCE OF CHOICE { Parameter0, Parameter1, Parameter2 } KeyType : : = CHOICE { Parameter0, Parameter1, Parameter2 } -- Parameter0, Parameter1, Parameter2 as defined for the document types NBS-6, -- NBS-7 and NBS-8 KeyPosition : : = INTEGER	
file model	{ iso standard 8571 file-model(3) hierarchical(1) } "FTAM hierarchical file model"
constraint set	{ iso standard 8571 constraint-set(4) ordered-flat-unique-names(4) } "FTAM ordered flat constraint set with unique names"
file contents Datatype1 : : = PrimType -- as defined by NBS abstract syntax AS1 in 8.3 Datatype2 : : = CHOICE { Node-Descriptor-Data-Element, Enter-Subtree-Data-Element, Exit-Subtree-Data-Element } Datatype3 : : = PrimType -- as defined by NBS abstract syntax AS1 in 8.3	

6.7.3 Scope and field of application

The document type defines the contents of a file for storage, for transfer and access using FTAM.

NOTE - Storage refers to apparent storage within the virtual filestore.

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6.7.4 References

ISO 8571-1:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 1 : General introduction.*

ISO 8571-2:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 2 : Virtual Filestore Definition.*

6.7.5 Definitions

This definition makes use of the terms data element, data unit and file access data unit as defined in ISO 8571-1.

6.7.6 Abbreviations

FTAM File Transfer, Access and Management

6.7.7 Document semantics

The document consists of zero, one or more file access data units. Each FADU consists of precisely one data unit which consists of zero, one or more data elements. The order of each of these elements is significant.

The document structure takes any of the forms allowed by the FTAM hierarchical file model as constrained by the FTAM ordered flat constraint set with unique names (see table 8). These definitions appear in ISO 8571-2.

The following additional requirements are specified for the use of the ordered flat constraint set with unique names:

- The FADU Identity node number is not required for conformant implementations;
- The identities next and previous are allowed for all FADUs.

Each data element is a data type from the set of primitive data types defined in 8.3. Each data unit contains the same data element types in the same order as all other data units. These types and their respective maximum lengths are defined by the DataTypes parameter.

For Datatype1 and Datatype3, the string-length field of Parameter1 specifies the length of the value in octets for the INTEGER, BIT STRING and OCTET STRING types. For character-type data elements, the string-length indicates the actual number of characters from the specified character set, not including any escape sequences or overhead from the character encoding.

For floating point numbers, finite form, in Datatype1 and Datatype3, length-1 and length-2 specify the length in bits of mantissa and exponent, respectively. The length-1 and length-2 values are irrelevant for the other choices of floating point numbers.

Each data unit in the file has a key associated with it, which is the user-coded form of Node-Name. The key of each data unit is of the same data type as the key of all other data units in the file and is a single data element from the set of primitive data types defined in 8.3.

The type and length of the key are defined by the KeyType parameter. The primitive data types and minimum size ranges of each unit which an implementation must accept as a key value are given in table 9.

The position of the key in the data unit is specified by the KeyPosition parameter:

- KeyPosition = 0 implies the key is not part of the data;
- KeyPosition > 0 specifies the actual data element in the data unit.

6.7.8 Abstract syntactic structure

The abstract syntactic structure of the document is a hierarchically structured file as defined in the ASN.1 module ISO8571-FADU in ISO 8571-2, in which each of the file access data units has the abstract syntactic structure of NBS-AS1 as defined by the parameters.

6.7.9 Definition of transfer

6.7.9.1 Datatype definitions

The file consists of data values which are of

a) Datatype1 defined in table 8, where the PrimType in the datatype is given by the NBS-AS1 definition; or

b) Datatype2 defined in table 8, which is the ASN.1 datatype declared as "Data-Element" in the ASN.1 module ISO8571-FADU; or

Table 9 - Datatypes for keys

Key Type	Minimum Range (octets)	Order
ASN.1 INTEGER	(1-2)	increasing numeric value
ASN.1 IA5String	(1-16)	lexical order
ASN.1 GraphicString	(1-16)	lexical order
ASN.1 GeneralString	(1-16)	lexical order
ASN.1 OCTET STRING	(1-16)	increasing value
ASN.1 GeneralizedTime		increasing time value
ASN.1 UniversalTime		increasing time value
NBS-AS1 FloatingPointNumber		increasing numeric value

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c) Datatype3, defined in table 8, which specifies the user-coded form of the Node-Name in the FTAM FADU abstract syntax, where user-coded is defined as an EXTERNAL.

6.7.9.2 Presentation data values

The document is transferred as a series of presentation data values, each of which is

a) one value of the ASN.1 datatype "Datatype1", carrying one of the data elements from the document. All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname1"; or

b) a value of "Datatype2". All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname2"; or

c) a value of "Datatype3" carrying a key. All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname1".

NOTES
1 Specific carrier standards may impose additional constraints on the presentation context to be used, where the above permits a choice.
2 Any document type defined in this entry either makes no use of Datatype2, or starts with a Datatype2 transmission.

Boundaries between presentation data values in the same presentation context, and boundaries between P-DATA primitives, are chosen locally by the sending entity at the time of transmission, and carry no semantics of the document type. Receivers which support this document type shall accept a document with any of the permitted transfer options (e.g., document type parameters and transfer syntaxes).

6.7.9.3 Sequence of presentation data values

The sequence of presentation data values of type a) and the sequence of presentation data values of types a) and b) is the same as the sequence of data elements within a data unit, and data units in the hierarchical structure, when flattened according to the definition of the hierarchical file model in ISO 8571-2.

6.7.10 Transfer syntax

An implementation supporting this document type shall support the transfer syntax generation rules named in table 8 for all presentation data values transferred.

Implementations may optionally support other named transfer syntaxes.

6.7.11 ASE specific specifications

6.7.11.1 Structural simplification

This simplification loses information.

The document type NBS-11 may be accessed as a document type FTAM-3 (allowed only when reading the file) by specifying document type FTAM-3 in the contents type parameter in F-OPEN request, and limiting access context to UA on F-READ.

The octet representation of the transferred data is unpredictable. It will usually correspond to the data values as stored in the local real filestore of the responder.

A document of type NBS-11 can be accessed as a document of type NBS-6 (allowed only when reading the file) by specifying document type NBS-6 with appropriate data type parameters in the contents type parameter on the F-OPEN request. The traversal order of the FADUs must be maintained.

NOTE - The traversal order is as reading the file as NBS-11 in key order.

A document of type NBS-11 may be accessed as a document of type NBS-8 (allowed only when reading the file) by specifying document type NBS-8 in the contents type parameter in the F-OPEN request.

6.7.11.2 Access context selection

A document of type NBS-11 may be accessed in any one of the access contexts defined in the FTAM ordered flat constraint set with unique names. The presentation data units transferred in each case are those derived from the structuring elements defined for that access context in ISO 8571-2.

6.7.11.3 The INSERT operation

When the INSERT operation is applied, the transferred material shall be the series of FADUs which would be generated by reading any NBS-11 document with the same parameter values in access context FA.

A transferred FADU whose name duplicates that of an already existing FADU will cause the INSERT operation to fail. The failure shall be signalled by issuing an F-CANCEL request with a corresponding diagnostic.

6.7.11.4 The EXTEND operation

This operation is excluded for use with this document type.

6.7.11.5 The REPLACE operation

When the REPLACE operation is applied with FADU Identity begin, a transferred FADU whose name duplicates that of a previously transferred FADU will cause the REPLACE operation to fail. The failure shall be signalled by issuing an F-CANCEL request with a corresponding diagnostic.

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6.8 NBS-12 Simple text file document type

6.8.1 Entry number : NBS-12

6.8.2 Information objects

Table 10 - Information objects in NBS-12

document type name	{ iso identified-organization oiw(14) ftamsig(5) document-type(5) simple-text-file(12) } "NBS-12 FTAM simple text file"
abstract syntax names a) name for asname1 b) name for asname2	 { iso identified-organization oiw(14) ftamsig(5) abstract-syntax(2) nbs-simple-text(5) } "NBS simple text abstract syntax" { iso standard 8571 abstract-syntax(2) ftam-fadu(2) } "FTAM FADU"
transfer syntax names	{ joint-iso-ccitt asn1(1) basic-encoding(1) } "Basic Encoding of a single ASN.1 type"
parameter syntax PARAMETERS : : = SEQUENCE { universal-class-number [0] IMPLICIT INTEGER, maximum-string-length [1] IMPLICIT INTEGER, string-significance [2] IMPLICIT INTEGER { variable (0), fixed (1) }, character-set [3] IMPLICIT OCTET STRING OPTIONAL }	
file model	{ iso standard 8571 file-model(3) hierarchical(1) } "FTAM hierarchical file model"
constraint set	{ iso standard 8571 constraint-set(4) sequential-flat(2) } "FTAM sequential flat constraint set"
file contents Datatype1 : : = NBS-Text -- as defined by NBS simple text abstract syntax in 8.6 Datatype2 : : = Node-Descriptor-Data-Element	

6.8.3 Scope and field of application

The document type defines the contents of a file for storage, for transfer and access by FTAM.

NOTE - Storage refers to apparent storage within the virtual filestore.

6.8.4 References

ISO 6429:1988, *Information processing - Control functions for 7-bit and 8-bit coded character sets for character-imaging devices.*

ISO 8571-1:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 1 : General introduction.*

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ISO 8571-2:1988, *Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 2 : Virtual Filestore Definition.*

ISO/IEC 8824:1990, *Information technology - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1).*

ISO/IEC 8825:1990, *Information technology - Open Systems Interconnection - Basic Encoding Rules for Abstract Syntax Notation One (ASN.1).*

6.8.5 Definitions

This definition makes use of the terms data element, data unit and file access data unit as defined in ISO 8571-1. In addition, it makes use of the terms character string, graphics character and format effector as defined in document type registration entry FTAM-2 in ISO 8571-2.

6.8.6 Abbreviations

FTAM File Transfer, Access and Management

6.8.7 Document semantics

The document consists of zero, one or more file access data units. Each FADU consists of precisely one data unit which consists of precisely one character string. The order of each of these elements is significant. The semantics of the character strings is not specified by this document type.

The document structure takes any of the forms allowed by the FTAM hierarchical file model as constrained by the FTAM sequential flat constraint set. These definitions appear in ISO 8571-2. As additional constraints, FADU Identity will be limited to the following values:

a) begin and end when using the transfer or transfer and management service classes;

b) begin, end, first and next when using the access service class.

Each character string consists of characters from the character set defined by the ASN.1 (ISO 8824) character set type whose universal class number is given by the universal-class-number parameter and by the escape sequences contained in the optional character-set parameter. If the character set type allows explicit escape sequences, the character-set parameter, if present, contains escape sequences which designate and invoke specific character sets. If the character-set parameter is not present, character sets are assumed to be designated and invoked as specified in table 2 in ISO 8825. Character strings shall not contain escape sequences.

There are no size or length limitations imposed by this definition, except those specified here. Each character string is of a length determined by the number of characters given by the maximum-string-length parameter.

NOTE - The length restriction refers to the number of characters from the applicable character set, not to the number of octets in the encoding, nor to the line length in any rendition of the document, where these are different.

The exact significance of the character strings is determined by the string-significance parameter. If its value is variable, the length of the character strings is less than or equal to the length given. If the value is fixed, the length of each character string is exactly equal to the length given.

If the document is interpreted on a character imaging device (outside the scope of ISO 8571), the interpretation depends on the character set in use:

a) If the character set contains format effectors, they shall be interpreted as defined in ISO 6429; end of string and end of file access data unit are given no formatting significance, and do not contribute to the document semantics;

b) If the character set does not contain format effectors, the end of each character string is interpreted as implying carriage return and line feed actions in any rendition. The end of file access data unit is given no formatting significance beyond that attached to the end of string in it.

6.8.8 Abstract syntactic structure

The abstract syntactic structure of the document is a hierarchically structured file as defined in the ASN.1 module ISO8571-FADU and ISO8571-CONTENTS in ISO 8571-2, in which each of the file contents data elements has the abstract syntactic structure of NBS-Text.

6.8.9 Definition of transfer

6.8.9.1 Datatype definitions

The file consists of data values which are of either

a) Datatype1 defined in table 10, the ASN.1 datatype declared as "NBS-Text" in the NBS simple text abstract syntax definition. The choice in "NBS-Text" is determined by the universal-class-number parameter; or

b) Datatype2 defined in table 10, the ASN.1 datatype declared as "Data-Element" in the ASN.1 module ISO8571-FADU.

6.8.9.2 Presentation data values

The document is transferred as a series of presentation data values, each of which is either

a) one value of the ASN.1 datatype "Datatype1", carrying one of the character strings of the document. Each character shall be transmitted using one of the character sets identified by the universal-class-number parameter. All values are transmitted in the same (but any) presen-

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tation context established to support the abstract syntax name "asname1" declared in table 10, or

b) one value of the ASN.1 datatype "Datatype2". All values are transmitted in the same (but any) presentation context established to support the abstract syntax name "asname2" declared in table 10.

NOTES

1 Specific carrier standards may impose additional constraints on the presentation context to be used, where the above permits a choice.

2 Any document type defined in this entry either makes no use of Datatype2, or starts with a Datatype2 transmission.

Boundaries between P-DATA primitives are chosen locally by the sending entity at the time of transmission, and carry no semantics of the document type. Receivers which support this document type shall accept a document with any of the permitted transfer options.

6.8.9.3 Sequence of presentation data values

The sequence of presentation data values of type a) and the sequence of presentation data values of types a) and b) is the same as the sequence of character strings within a data unit, and data units in the hierarchical structure, when flattened according to the definition of the hierarchical file model in ISO 8571-2.

6.8.10 Transfer syntax

An implementation supporting this document type shall support the transfer syntax generation rules named in table 10 for all presentation data values transferred.

6.8.11 ASE specific specifications

6.8.11.1 Simplification and relaxation

6.8.11.1.1 Simplification to FTAM-1

This simplification loses information.

The document type NBS-12 may be accessed as a document type FTAM-1. The resultant document contains the same sequence of data values as would result from accessing the structured text file in access context UA. That is, only the presentation data values in the abstract syntax "asname1" are present. If the character-set parameter was present before the simplification, its contents will be added to the beginning of each string.

NOTE - The boundary between file access data units remains a boundary between strings, but any special significance given to it is lost.

6.8.11.1.2 Relaxation to FTAM-2

The document type NBS-12 may be relaxed to the document type FTAM-2. If the character-set parameter was present before the relaxation, its contents will be added to the beginning of each string.

6.8.11.1.3 Character set relaxation

This operation loses explicit information in the document type identification.

A document of type NBS-12 may be relaxed to a different document of type NBS-12 with

- a different universal-class-number parameter value;
- a different character-set parameter value;
- different values for both of these parameters;
- a different universal-class-number parameter value and no character-set parameter value; or
- no character-set parameter value;

if the resultant document type permits all characters from the original document type. If this relaxation involves including format effectors and none were present before the relaxation, the characters carriage return and line feed shall be added to the end of each string.

NOTE - If the characters carriage return and line feed are not part of the format effectors, the formatting action may be represented by newline or some other implementation specific choice if there is no representation of newline defined.

6.8.11.1.4 String length relaxation

This operation loses explicit information in the document type identification.

A document of type NBS-12 may be relaxed to another document of type NBS-12 with a larger maximum-string-length parameter.

6.8.11.2 Access context selection

A document of type NBS-12 may be accessed in any one of the access contexts defined in the FTAM sequential flat constraint set. The presentation data units transferred in each case are those derived from the structuring elements defined for that access context in ISO 8571-2.

6.8.11.3 The INSERT operation

When the INSERT operation is applied at the end of file, the transferred material shall be the series of FADUs which would be generated by reading any NBS-12 document with the same parameter values in access context FA.

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7 Constraint sets

Insert the following new subclauses 7.1 and 7.2.

7.1 NBS ordered flat constraint set

7.1.1 Field of application

The NBS ordered flat constraint set applies to files which are structured into a sequence of individual FADUs and to which access may be made on an FADU basis by position in the sequence.

7.1.2 Basic constraints

Table 11 - Basic constraints in the NBS ordered flat constraint set

Constraint set descriptor	"NBS ordered flat constraint set"
Constraint set identifier	{ iso identified-organization oiw(14) ftamsig(5) constraint-set(4) nbs-ordered-flat(1) }
Node names	None
File access actions	Locate, Read, Insert, Erase, Replace
Qualified actions	None
Available access contexts	HA, FA, UA
Creation state	Root node without an associated data unit
Location after open	Root node
Beginning of file	Root node
End of file	No node selected; previous gives last node in traversal sequence, current and next give an error
Read whole file	Read in access context FA or UA with FADU Identity of begin
Write whole file (append)	Transfer the series of leaf FADUs which would be generated by reading the whole file in access context FA; perform the transfer with an FADU Identity of end and a file access action of insert.
Write whole file (replace)	Transfer the series of leaf FADUs which would be generated by reading the whole file in access context HA; perform the transfer with FADU Identity of begin and file action of replace.

7.1.3 Structural constraints

The root node shall not have an associated data unit; all children of the root node shall be leaf nodes and may have an associated data unit; all arcs from the root node shall be of length one.

7.1.4 Action constraints

Insert: The insert action is allowed only at the end of file. If the FADU Identity is end, the new node is inserted following all existing nodes in the file. If the FADU Identity is node number, the number must be at least one greater than the node number of the last existing node. Any nodes between the last existing node and the new node are empty, i.e., nodes without data. If the FADU identity is a node number not greater than that of the last existing node, an error will occur.

The location following insert is end.

Erase: The erase action is only allowed at the root node to empty the file, with FADU Identity of begin. The result is a solitary root node without an associated data unit.

NOTE - It is the intention when using this constraint set to allow for emptying an FADU, i.e., leaving an FADU with a DU of data length 0 (or without a DU); afterwards data may be reinserted into this hole. In order to empty an FADU, the replace operation may be used with new data of length zero (or with an FADU whose data-exists bit is set to FALSE and no DU). Refilling the hole is accomplished by a replace operation with the new DU (or with the new FADU, whose data-exists bit is set to TRUE and the new DU).

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7.1.5 Identity constraints

The FADU Identity associated with the file action shall be one of the identities begin, end, first, last, current, next, previous or a node number greater than or equal to one. The actions with which these identities can be used are given in table 12.

Table 12 - Identity constraints in the NBS ordered flat constraint set

Action	Begin	End	First	Last	Current	Next	Previous	Node number
Locate	valid	valid	valid	valid	valid	valid	valid	valid
Read	whole		leaf	leaf	leaf	leaf	leaf	leaf
Insert		leaf						leaf
Erase	whole							
Replace	whole		leaf	leaf	leaf	leaf	leaf	leaf

7.2 NBS random access constraint set

7.2.1 Field of application

The NBS random access constraint set applies to files which are structured into a sequence of individual FADUs and to which access may be made randomly by NodeSeq. Structuring of the file into individual FADUs is determined by the Node-Name.

7.2.2 Basic constraints

The basic constraints of the NBS random access constraint set are given in table 13.

Table 13 - Basic constraints in the NBS random access constraint set

Constraint set descriptor	"NBS random access constraint set"
Constraint set identifier	{ iso identified-organization oiw(14) ftamsig(5) constraint-set(4) nbs-random-access(2) }
Node names	All names shall be of the same type; the type of the names and an ordering of the names shall be defined when reference is made to the constraint set.
File access actions	Locate, Read, Insert, Erase, Replace
Qualified actions	None
Available access contexts	UA
Creation state	Root node without an associated data unit
Location after open	Root node
Beginning of file	Root node
End of file	No node selected
Read whole file	Read in access context UA with FADU Identity of begin
Write whole file	Transfer a series of leaf FADUs which would be generated by reading the whole file in access context UA; perform the transfer with an FADU Identity of end and a file access action of insert, or with an FADU Identity of begin and an action of replace.

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7.2.3 Structural constraints

The root node shall not have an associated data unit; all children of the root node shall be leaf nodes and shall have an associated data unit; all arcs from the root node shall be of length one.

7.2.4 Action constraints

Insert: The insert action is allowed only at the end of file, with FADU Identity of end; the new node is inserted following all existing nodes in the file. The location following the insert is end.

Erase: The erase action is allowed at the root node to empty the file, with FADU Identity of begin. The result is a solitary root node without an associated data unit. Erase with the FADU Identity of node number means truncation of the file.

Replace whole file: The FADU Identity is begin and the complete series of new FADU contents is sent.

Replace new leaves: The FADU Identity is node number and the number of FADUs being replaced is given by the number of FADUs sent.

7.2.5 Identity constraints

The FADU Identity associated with the file action shall be one of the identities begin, end, node number or NodeSeq. The actions with which these identities can be used are given in table 14.

Table 14 - Identity constraints in the NBS random access constraint set

Action	Begin	End	NodeSeq	Node number
Locate				leaf
Read	whole		leaf	
Insert		leaf		
Erase	whole			leaf
Replace	whole			leaf
NOTE - NodeSeq = A sequence of node names with a single member				

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