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Information technology — Common Biometric Exchange Formats Framework —

Part 3: Patron format specifications

Technologies de l'information — Cadre de formats d'échange biométriques communs —

Partie 3: Spécifications de format d'usager

Reference number
ISO/IEC 19785-3:2007(E)

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Contents

Page

Foreword vi

Introduction vii

1 Scope 1

2 Conformance 1

3 Normative references 1

4 Terms and definitions 2
4.1 Terms defined in ISO/IEC 19785-1 2
4.2 Other terms and definitions 3

5 Symbols and abbreviated terms 3
5.1 Symbols and abbreviated terms defined in ISO/IEC 19785-1 3
5.2 Other symbols and abbreviated terms 3

6 ASN.1 type definitions for CBEFF data elements and abstract values 4
6.1 General 4
6.2 CBEFF data elements type definitions module 4

7 Patron format specification: Minimum simple bit-oriented patron format 7
7.1 Patron 7
7.2 Patron identifier 7
7.3 Patron format name 7
7.4 Patron format identifier 7
7.5 ASN.1 object identifier for this patron format 7
7.6 Domain of use 7
7.7 Version identifier 7
7.8 CBEFF version 7
7.9 General 7
7.10 Bit oriented patron format specification and conformance statement 8
7.10.1 Specification 8
7.10.2 Patron format conformance statement 8

8 Patron format specification: Minimum simple byte-oriented patron format 10
8.1 Patron 10
8.2 Patron identifier 10
8.3 Patron format name 10
8.4 Patron format identifier 10
8.5 ASN.1 object identifier for this patron format 10
8.6 Domain of use 10
8.7 Version identifier 10
8.8 CBEFF version 10
8.9 General 10
8.10 Patron format specifications and conformance statement 11
8.10.1 Patron format specification 11
8.10.2 Patron format conformance statement 11

9 Patron format specification: Fixed-length-fields, byte-oriented patron format using presence bit-map 12
9.1 Patron 12
9.2 Patron identifier 12
9.3 Patron format name 12
9.4 Patron format identifier 12
9.5 ASN.1 object identifier for this patron format 12

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9.6 Domain of use 12
9.7 Version identifier 12
9.8 CBEFF version 12
9.9 General 12
9.10 Specification 13
9.11 Patron format conformance statement 15
9.11.1 Identifying information 15
9.11.2 CBEFF-defined data elements and abstract values 16
9.11.3 Patron defined data elements and abstract values 17

10 Patron format specification: Fixed-length-fields, bit-oriented patron format using presence bit-map 18
10.1 Patron 18
10.2 Patron identifier 18
10.3 Patron format name 18
10.4 Patron format identifier 18
10.5 ASN.1 object identifier for this patron format 18
10.6 Domain of use 18
10.7 Version identifier 18
10.8 CBEFF version 18
10.9 General 18
10.10 Specification 19
10.11 Patron format conformance statement 20
10.11.1 Identifying information 20
10.11.2 CBEFF-defined data elements and abstract values 21
10.11.3 Patron defined data elements and abstract values 21

11 Patron format specification: TLV-encoded patron format, for use with smartcards or other tokens 22
11.1 Patron 22
11.2 Patron identifier 22
11.3 Patron format name 22
11.4 Patron format identifier 22
11.5 ASN.1 object identifier for this patron format 22
11.6 Domain of Use 22
11.7 Version identifier 22
11.8 CBEFF version 22
11.9 General 22
11.10 ASN.1 specification 25
11.11 Tabular representations for information 26
11.11.1 The Biometric Information Template used for on-card matching 26
11.11.2 The Biometric Information Template used for off-card matching 28
11.12 The Group BIT Data Object 29
11.13 Abstract values and encodings for biometric type and subtype 30
11.14 Patron format conformance statement 31
11.14.1 Identifying information 31
11.14.2 CBEFF-defined data elements and abstract values 31
11.14.3 Patron-defined data elements and abstract values 31

12 Patron format specification: complex patron format 32
12.1 Patron 32
12.2 Patron identifier 32
12.3 Patron format name 32
12.4 Patron format identifier 32
12.5 ASN.1 object identifier for this patron format 32
12.6 Domain of use 32
12.7 Version identifier 32
12.8 CBEFF version 32
12.9 General 32
12.10 Specification 33
12.11 Illustrative examples 37

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12.12 ASN.1 definition (provided for illustrative purposes only) 40
12.13 Patron format conformance statement 41
12.13.1 Identifying information 41
12.13.2 CBEFF-defined data elements and abstract values 42
12.13.3 Patron-defined data elements and abstract values 43

13 Patron format specification: XML patron format 44
13.1 Patron 44
13.2 Patron identifier 44
13.3 Patron format name 44
13.4 Patron format identifier 44
13.5 ASN.1 object identifier for this patron format 44
13.6 Domain of use 44
13.7 Version identifier 44
13.8 CBEFF version 44
13.9 General 44
13.10 Specification 45
13.11 Element <bir> 45
13.11.1 Syntax 45
13.11.2 Semantics 46
13.12 Element <version> 47
13.12.1 Syntax 47
13.12.2 Semantics 47
13.13 Element <cbeff-version> 47
13.13.1 Syntax 47
13.13.2 Semantics 47
13.14 Element <bir-info> 48
13.14.1 Syntax 48
13.14.2 Semantics 48
13.15 Element <bdb-info> 50
13.15.1 Syntax 50
13.15.2 Semantics 51
13.16 Element <sb-info> 55
13.16.1 Syntax 55
13.16.2 Semantics 56
13.17 Representation of Integers 56
13.18 Representation of Octet Strings 56
13.19 Representation of Date and Time of the Day 57
13.20 Representation of Universally Unique Identifiers 57
13.21 Patron format conformance statement 58
13.21.1 Identifying information 58
13.21.2 CBEFF-defined data elements and abstract values 58
13.21.3 Patron-defined data elements and abstract values 60
13.22 XML schema of the patron format 60
13.23 ASN.1 schema of the patron format 62
13.24 An example of a simple BIR in XML encoding (complying with the ASN.1 schema, the XSD schema, and the normative textual description) 64
13.25 An example of a complex BIR in XML encoding (complying with the ASN.1 schema, the XSD schema, and the normative textual description) 66

Annex A (informative) Guidelines on the specification of patron formats 69
A.1 General 69
A.2 Basic encoding mechanisms 69
A.3 Octet-alignment 70
A.4 Length fields 70
A.5 CBEFF data element values and patron format fields 70
A.6 Historically used encodings of certain abstract values 71
A.7 Variable length data elements 72
A.8 Security Blocks 72

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 19785-3 was prepared by Technical Committee ISO/IEC/TC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

ISO/IEC 19785 consists of the following parts, under the general title *Information technology — Common Biometric Exchange Formats Framework*:

— *Part 1: Data element specification*

— *Part 2: Procedures for the operation of the Biometric Registration Authority*

— *Part 3: Patron format specifications*

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Introduction

Biometric-based authentication systems and applications are expected to support multiple biometric devices and multiple biometric data formats. The Common Biometric Exchange Formats Framework (CBEFF) promotes interoperability of biometric-based application programs and systems developed by different vendors by facilitating biometric data interchange.

ISO/IEC 19785-1 defines the following items that enable standardized biometric data interchange:

a) a 3-part standardized structure for biometric information records (BIRs) consisting of:

   1) standardized biometric headers (SBHs),
   2) biometric data blocks (BDBs, which may be standardized or proprietary), and
   3) optional security blocks (SBs);

b) variations of the 3-part structure to support BIRs containing:

   1) only one SBH, one BDB and possibly one SB (simple BIRs);
   2) more than one BDB along with the SBHs necessary to encode the BIR's structure and some number of SBs (complex BIRs);

c) more than 20 data elements and their associated abstract values that can be used in an SBH to describe attributes of a BDB within a BIR, as well as attributes of the BIR itself;

d) the concept of a CBEFF patron format (but ISO/IEC 19785-1 does not itself define any patron formats), which is a detailed specification of the structure and content of a particular, standardized BIR;

e) the concept of a CBEFF patron, which is a recognized standards organization that has registered with the Biometric Registration Authority and declared its intention to define CBEFF patron format specifications;

f) the concept of the Biometric Registration Authority (RA), which is the mechanism by which unique identifiers are assigned to organizations (standards organizations, vendors and others) that create BDB formats and CBEFF patron formats (ISO/IEC 19785-2 defines the responsibilities and operations of the Biometric RA);

g) CBEFF data elements (see c) above) that support, within the SBH, the unique identifiers assigned by the Biometric RA for biometric organizations, BDB formats, biometric products, patron formats and SB formats.

This part of ISO/IEC 19785 specifies a number of CBEFF patron formats that are considered to be of general utility in a variety of domains of use. Additional SC 37 patron format specifications may be published as new clauses in future amendments to this part of ISO/IEC 19785, or in other SC 37 International Standards.

The CBEFF patron format identifier unambiguously identifies the CBEFF patron format within the scope of the CBEFF patron identifier. The CBEFF patron format identifier is unambiguous within the scope of an ASN.1 Object Identifier (see ISO/IEC 9834-1) that identifies the Biometric Registration Authority (see ISO/IEC 19785-2). That ASN.1 Object Identifier (OID) is itself globally unambiguous within the scope of all ASN.1 Object Identifiers, which forms a widely-used global name-space.

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NOTE ASN.1 Object Identifiers are used by ITU-T, ITU-R, the UPU, many ISO and IEC Standards, to identify some IETF MIME types, and for many other purposes. (These acronyms have not been spelled out, as the precise identification of these organizations is not relevant to this International Standard.)

The combination of the Biometric Registration Authority OID, the CBEFF patron identifier, and the CBEFF patron format identifier forms a larger ASN.1 OID that provides an unambiguous identification of the CBEFF patron format. This part of ISO/IEC 19785 specifies, for each CBEFF patron format that it defines, the ASN.1 OID that unambiguously identifies that CBEFF patron format.

--`,,```,,,,````-`-`,,`,,`,`,,`---

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Information technology — Common Biometric Exchange Formats Framework —

Part 3: Patron format specifications

1 Scope

This part of ISO/IEC 19785 specifies and publishes registered CBEFF patron formats (see ISO/IEC 19785-1) defined by the CBEFF patron ISO/IEC JTC 1/SC 37, and specifies their registered CBEFF patron format identifiers (see ISO/IEC 19785-2) and resulting full ASN.1 Object Identifiers.

2 Conformance

Clause 6 onwards of this part of ISO/IEC 19785 specify at the bit-level the set of bit-patterns (and their semantics) that can form a valid instance of the CBEFF patron format that is defined in that clause, together with the ASN.1 Object Identifier for that set of bit-patterns.

A bit-pattern identified by one of the ASN.1 Object Identifiers allocated in this part of ISO/IEC 19785 conforms to this specification if, and only if, it is one of the bit-patterns in the set identified by that ASN.1 Object Identifier.

If an implementation claims that it supports (and conforms to) a CBEFF patron format defined in this part of ISO/IEC 19785 then it shall either be:

a) capable of generating at least one of the set of bit patterns specified for that CBEFF patron format, and shall never generate bit patterns that are not part of the set; or

b) capable of decoding (determining the semantics of), or in any other way processing all the bit-patterns in the set of bit patterns specified for that CBEFF patron format.

NOTE If a decoding implementation is presented with a bit pattern that purports to be part of the set, but it is not, there is no requirement placed on the action taken by the implementation, but it is normally expected that the implementation will guard against denial of service or other security threats in such circumstances.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7816-4:2005, *Identification cards -– Integrated circuit cards — Part 4: Organization, security and commands for interchange*

ISO/IEC 7816-6:2004, *Identification cards -– Integrated circuit cards — Part 6: Interindustry data elements for interchange*

ISO/IEC 7816-11:2004, *Identification cards — Integrated circuit cards — Part 11: Personal verification through biometric methods*

ISO 8601:2004, *Data elements and interchange formats — Information interchange — Representation of dates and times*

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ISO/IEC 8824-1:2002, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO/IEC 8825-1:2002, *Information technology — ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO/IEC 8825-4:2002, *Information technology — ASN.1 Encoding Rules: XML Encoding Rules (XER)*

ISO/IEC 10646:2003, *Information technology — Universal Multiple-Octet Coded Character Set (UCS)*

ISO/IEC 19785-1, *Information technology — Common Biometric Exchange Formats Framework — Part 1: Date element specification*

4 Terms and definitions

4.1 Terms defined in ISO/IEC 19785-1

For the purposes of this document, the following terms defined in ISO/IEC 19785-1 apply.

a) BDB format identifier

b) BDB format owner

c) biometric

d) biometrics

e) biometric data block (BDB)

f) biometric information record (BIR)

g) biometric product

h) biometric product identifier

i) biometric product owner

j) CBEFF biometric organization

k) CBEFF biometric organization identifier

l) CBEFF patron

m) CBEFF patron format

n) CBEFF root header

o) CBEFF sub-header

p) complex CBEFF BIR structure

q) domain of use

r) intermediate biometric sample

s) processed biometric sample

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t) raw biometric sample

u) security block format identifier

v) security block format owner

w) simple CBEFF BIR structure

x) standard biometric header (SBH)

4.2 Other terms and definitions

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

4.2.1
TLV encoding
common form of encoding (with many variants) in which every field in the encoding has an assigned type (or tag) that is unambiguous in some context, a length determinant, and a value part that may contain further TLV components, nested to any depth

5 Symbols and abbreviated terms

5.1 Symbols and abbreviated terms defined in ISO/IEC 19785-1

For the purposes of this document, the following symbols and abbreviated terms defined in ISO/IEC 19785-1 apply.

a) BDB

b) BIR

c) BSP

d) CBEFF

e) MAC

f) SB

g) SBH

h) UTC

5.2 Other symbols and abbreviated terms

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

TLV Type (or Tag) Length and Value

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6 ASN.1 type definitions for CBEFF data elements and abstract values

6.1 General

This clause specifies in 6.2 an ASN.1 module **CBEFF-DATA-ELEMENTS** that defines types (see ITU-T Rec. X.680 | ISO/IEC 8824-1) for each of the CBEFF data elements. These type definitions are fully aligned with the abstract values of CBEFF data elements specified in ISO/IEC 19785-1 (conforming to CBEFF version "major(2) minor(0)", and do not in themselves specify encodings of those abstract values. Encodings are determined by the patron formats specified in ASN.1 in this part of ISO/IEC 19785.

6.2 CBEFF data elements type definitions module

```
CBEFF-DATA-ELEMENTS
{iso standard 19785 modules(0) types-for-cbeff-data-elements(1)}
DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN

BDBFormat ::= SEQUENCE {
      format-owner      INTEGER (1..65535),
      format-type       INTEGER (1..65535) }

EncryptionOptions ::= BOOLEAN
      -- NO ENCRYPTION = false, ENCRYPTION = true.

IntegrityOptions ::= BOOLEAN
      -- NO INTEGRITY = false, INTEGRITY = true.

SubheaderCount ::= INTEGER (0..255)

BiometricType ::= BIT STRING
      {no-value-available               (0),
       multiple-biometric-types         (1),
       scent                            (2),
       dna                              (3),
       ear                              (4),
       face                             (5),
       finger                           (6),
       foot                             (7),
       hand-geometry                    (8),
       vein                             (9),
       iris                             (10),
       retina                           (11),
       voice                            (12),
       gait                             (13),
       keystroke                        (14),
       lip-movement                     (15),
       signature-sign                   (16)
      } (SIZE (17), ...)

BiometricSubtype ::= CHOICE
      { any             Any-sub-type,
        vein-only       Vein-only}

      -- The abstract value no-value-available is encoded as
      -- the CHOICE value any:'0000000'

      Any-sub-type ::= BIT STRING
      {
       left                             (6),
       right                            (5),
       thumb                            (4),
       pointer-finger                   (3),
       middle-finger                    (2),
       ring-finger                      (1),
```


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```
       little-finger                    (0)}(SIZE (7))

      Vein-only ::= BIT STRING
       {
       left                             (6),
       right                            (5),
       palm                             (4),
       back-of-hand                     (3),
       wrist                            (2)
       reserved1                        (1)
       reserved2                        (0)} (SIZE (7))

ChallengeResponse ::= OCTET STRING
      -- A patron format that uses this type shall specify
      -- its encoding for no-value-available

BDBCreationDate ::= Date-Time
      -- A patron format that uses this type shall specify
      -- its encoding for no-value-available

BDBIndex ::= OCTET STRING (SIZE(16))
      -- A patron format that uses this type shall specify
      -- its encoding for no-value-available

ProcessedLevel ::= ENUMERATED
      {no-value-available,
       raw,
       intermediate,
       processed}

Product ::= SEQUENCE {
      product-owner          INTEGER (1..65535) OPTIONAL,
      product-type           INTEGER (1..65535) OPTIONAL}

Purpose ::= ENUMERATED
      {no-value-available,
       verify,
       identify,
       enroll,
       enroll-verify,
       enroll-identify,
       audit
      }

Quality ::= INTEGER
      {no-value-available    (-3),
       quality-not-supported (-2),
       quality-not-recorded  (-1)} (-3..100)

BDBValidityPeriod ::= SEQUENCE
      {not-valid-before      Date-Time OPTIONAL,
       not-valid-after       Date-Time OPTIONAL}

BIRCreationDate ::= Date-Time
      -- A patron format that uses this type shall specify
      -- its encoding for no-value-available

Creator ::= UTF8String
      -- A patron format that uses this type shall specify
      -- its encoding for no-value-available

BIRIndex ::= OCTET STRING (SIZE(16))
      -- A patron format that uses this type shall specify
      -- its encoding for no-value-available

PatronFormat ::= SEQUENCE {
      patron-format-owner    INTEGER (1..65535) OPTIONAL,
      patron-format-type     INTEGER (1..65535) OPTIONAL}

Payload ::= OCTET STRING
      -- A patron format that uses this type shall specify
      -- its encoding for no-value-available
```

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```
BIRValidityPeriod ::= SEQUENCE
      {not-valid-before      Date-Time OPTIONAL,
       not-valid-after       Date-Time OPTIONAL}

HeaderVersion ::= SEQUENCE {
      header-major           INTEGER  {version1(1)} (0..15),
      header-minor           INTEGER  {version0(0)} (0..15)}
      --no-value-available is encoded by {header-major 0, header-minor 0}

SBFormat ::= SEQUENCE {
      sb-owner    INTEGER (1..65535) OPTIONAL,
      sb-type     INTEGER (1..65535) OPTIONAL}

CBEFFVersion ::= SEQUENCE {
      cbeff-major      INTEGER  {version2(2)} (0..15),
      cbeff-minor      INTEGER  {version0(0)} (0..15)}
      --no-value-available is encoded by {cbeff-major 0, cbeff-minor 0}

BiometricDataBlock ::= OCTET STRING

SecurityBlock ::= OCTET STRING

Date-Time ::= TIME (SETTINGS
            "Basic=Date-Time
             Date=YMD
             Year=Basic
             Time=HMS
             Midnight = Start
             Local-or-UTC=Z")

OneByte ::= INTEGER (0..255)

TwoByte ::= INTEGER (0..65535)

ThreeByte ::= INTEGER (0..16777215)

FourByte ::= INTEGER (0..4294967295)

OneBit ::= INTEGER (0..1)

TwoBit ::= INTEGER (0..3)

ThreeBit ::= INTEGER (0..7)

FourBit ::= INTEGER (0..15)

END
```


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7 Patron format specification: Minimum simple bit-oriented patron format

7.1 Patron

ISO/IEC JTC 1/SC 37

7.2 Patron identifier

257 (0101Hex). This has been allocated by the Registration Authority for ISO/IEC 19785-2.

7.3 Patron format name

ISO/IEC JTC 1/SC 37 minimum simple bit-oriented patron format

7.4 Patron format identifier

1 (0001 Hex). This has been registered in accordance with ISO/IEC 19785-2.

7.5 ASN.1 object identifier for this patron format

{iso registration-authority cbeff(19785) biometric-organization(0) jtc1-sc37(257) patron-format(1) simple-bit-oriented(1)}

or, in XML value notation,

1.1.19785.0.257.1.1

7.6 Domain of use

This clause provides the definition of a minimum patron format for simple BIR structures that may be of general utility in domains of use that wish to minimise the overhead of the SBH in order to reduce storage or transfer bandwidth and processing costs at the expense of information content, and that are able to accept loss of byte alignment, and do not need to support ENCRYPTION and INTEGRITY.

7.7 Version identifier

This patron format specification has a version identifier of (major 0, minor 0).

7.8 CBEFF version

This specification conforms to CBEFF version (major 2, minor 0).

7.9 General

This clause defines a minimum conforming patron format. The formal specification of the actual bits-on-the-line for this patron format is provided by a reference to the ASN.1 encoding rules.

The **MinimumElementsBitOriented** patron format is formally defined as the ASN.1 PER-unaligned encoding rules applied to the **MinimumElementsBitOriented** type specified in 7.10.1.

An example of the encoding produced by an assignment of abstract values for this patron format, showing the size and encoding of each field of the SBH, is given in Table 7.1. The size of the SBH is **one octet** for BDB formats standardized by SC 37, but can be greater for other BDB formats. The BDB length encoding is one

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octet if the BDB encoding is less than 128 bytes, making the total size of the BIR 2 octets plus the length of the BDB.

Table 7.1— Bit oriented minimum SBH (1 byte)

Format owner is SC 37? 0	Format type is <64? 0	Format type value
← 8 bits →		

7.10 Bit oriented patron format specification and conformance statement

7.10.1 Specification

```
CBEFF-MINIMUM-SUPPORT-BIT-ORIENTED
{iso standard 19785 modules(0) minimumElementsWithDefaultsBitOriented(2)}
DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN

IMPORTS BiometricDataBlock
      FROM CBEFF-DATA-ELEMENTS
      {iso standard 19785 modules(0) types-for-cbeff-data-elements(1)};

MinimumElementsBitOriented ::= SEQUENCE {

      /* This patron format contains only mandatory data elements and uses bit-level
      encoding for optimal use of encoding space.*/

      /* This patron format supports only the abstract values NO ENCRYPTION and NO
      INTEGRITY, which are encoded as zero length fields.*/

      format   SEQUENCE {
                 owner INTEGER (0.. 65535) DEFAULT 257,
                       -- 257 is the biometric organization identifier of
                       -- ISO/IEC JTC 1/SC 37
                 type  INTEGER (0..63, ..., 64 .. 65535)},
      bdb              BiometricDataBlock (SIZE(0..127, ..., 128 .. MAX))}


END
```

7.10.2 Patron format conformance statement

7.10.2.1 Identifying information

Required Information	Patron format reference
Patron name	See 7.1
Patron identifier	See 7.2
Patron format name	See 7.3
Patron format identifier	See 7.4
Patron format ASN.1 object identifier	See 7.5
Domain of use description	See 7.6
Patron format version	See 7.7
CBEFF version	See 7.8

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7.10.2.2 CBEFF-defined data elements and abstract values

CBEFF data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
CBEFF_BDB_format_owner	Mandatory	owner	Yes	Yes
CBEFF_BDB_format_type	Mandatory	type	Yes	Yes
CBEFF_BDB_encryption_options	Mandatory	zero length field	Yes	Yes
CBEFF_BIR_integrity_options	Mandatory	zero length field	Yes	Yes

7.10.2.3 Patron defined data elements and abstract values

Patron format data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
none	n/a	n/a	n/a	n/a

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8 Patron format specification: Minimum simple byte-oriented patron format

8.1 Patron

ISO/IEC JTC 1/SC 37

8.2 Patron identifier

257 (0101Hex). This has been allocated by the Registration Authority for ISO/IEC 19785-2.

8.3 Patron format name

ISO/IEC JTC 1/SC 37 minimum simple byte-oriented patron format.

8.4 Patron format identifier

2 (0002 Hex). This has been registered in accordance with ISO/IEC 19785-2.

8.5 ASN.1 object identifier for this patron format

{iso registration-authority cbeff(19785) biometric-organization(0) jtc1-sc37(257) patron-format(1) simple-byte-oriented(2)}

or, in XML value notation,

1.1.19785.0.257.1.2

8.6 Domain of use

This clause provides the definition of a minimum patron format for simple BIR structures that may be of general utility in domains of use that wish to minimise the overhead of the SBH in order to reduce storage or transfer bandwidth and processing costs at the expense of information content, and that require byte alignment, and do not require ENCRYPTION and INTEGRITY.

8.7 Version identifier

This patron format specification has a version identifier of (major 0, minor 0).

8.8 CBEFF version

This specification conforms to CBEFF version (major 2, minor 0).

8.9 General

An example of the encoding produced by an assignment of abstract values for this patron format, showing the size and encoding of each field of the SBH, is given in Table 8.1. The size of the SBH for this patron format is fixed at 4 octets.

Table 8.1 – Byte oriented minimum SBH

Format Owner (16 bits)	Format Type (16 bits)

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8.10 Patron format specifications and conformance statement

8.10.1 Patron format specification

CBEFF data element name	Field name	Length	Abstract values	Encoding
CBEFF_BDB_format_owner CBEFF_BDB_format_type	format owner type	2 bytes 2 bytes	integer 1...65535 integer 1...65535	1...65535 1...65535
CBEFF_BDB_encryption_options	zero length field	0 bytes	NO ENCRYPTION	zero length
CBEFF_BIR_integrity_options	zero length field	0 bytes	NO INTEGRITY	zero length
BDB	bdb	variable	See NOTE	See NOTE
NOTE The length, content and encoding of the BDB are not specified by CBEFF nor by this patron format specification.				

8.10.2 Patron format conformance statement

8.10.2.1 Identifying information

Required Information	Patron format reference
Patron name	See 8.1
Patron identifier	See 8.2
Patron format name	See 8.3
Patron format identifier	See 8.4
Patron format ASN.1 object identifier	See 8.5
Domain of use description	See 8.6
Patron format version	See 8.7
CBEFF version	See 8.8

8.10.2.2 CBEFF-defined data elements and abstract values

CBEFF data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
CBEFF_BDB_format_owner	Mandatory	owner	Yes	Yes
CBEFF_BDB_format_type	Mandatory	type	Yes	Yes
CBEFF_BDB_encryption_options	Mandatory	zero length field	Yes	Yes
CBEFF_BIR_integrity_options	Mandatory	zero length field	Yes	Yes

8.10.2.3 Patron defined data elements and abstract values

Patron format data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
none	n/a	n/a	n/a	n/a

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9 Patron format specification: Fixed-length-fields, byte-oriented patron format using presence bit-map

9.1 Patron

ISO/IEC JTC 1/SC 37

9.2 Patron identifier

257 (0101Hex). This has been allocated by the Registration Authority for ISO/IEC 19785-2.

9.3 Patron format name

ISO/IEC JTC 1/SC 37 Maximum simple patron format (byte oriented) using presence bit-map.

9.4 Patron format identifier

3 (0003 Hex). This has been registered in accordance with ISO/IEC 19785-2.

9.5 ASN.1 object identifier for this patron format

{iso registration-authority cbeff(19785) biometric-organization(0) jtc-sc37 (257) patron-format (1) presence-byte-oriented (3)}}

or, in XML value notation,

1.1.19785.0.257.1.3

9.6 Domain of use

This clause provides a definition of a patron format that may be of general utility to applications that do not wish to define their own patron formats but wish to allow generators of SBHs to decide how much information to include, and wish to have a byte-oriented encoding to ease implementations.

9.7 Version identifier

This patron format specification has a version identifier of (major 0, minor 0).

9.8 CBEFF version

This specification conforms to CBEFF version (major 2, minor 0).

9.9 General

This patron format supports the 12 fixed length, optional CBEFF data elements and their abstract values that are permitted in a simple BIR format (thus excluding CBEFF_BIR_patron_format_owner and CBEFF_BIR_patron_format_type), plus CBEFF_subheader_count, plus the patron-format-defined field bdbLength. It contains an initial bit map that identifies the optional fields present in an encoded SBH. The omission of these fields either encodes NO VALUE AVAILABLE, or encodes a specific default value (specified in the patron format specification) for the CBEFF data element. The presence bit map adds two octets, so if all optional fields have the default values, the size of this SBH would be 6 octets. This patron format does not support ENCRYPTION or INTEGRITY, and thus does not support CBEFF_SB_format_owner and CBEFF_SB_format_type.

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9.10 Specification

CBEFF data element name	Field name	Length (octets)	Abstract values and Encodings[a]
n/a: patron-defined data element	present	2	
	bioType-p	1 bit	PRESENT: b'1' or
	bioSubtype-p	1 bit	NOT PRESENT: b'0'
	bdbCreation-p	1 bit	for each
	procLevel-p	1 bit	
	product-p	1 bit	
	purpose-p	1 bit	
	quality-p	1 bit	
	bdbValidity-p	1 bit	
	birCreation-p	1 bit	
	birValidity-p	1 bit	
	patronHdrVers-p	1 bit	
	vers-p	1 bit	
	subHeadCt-p	1 bit	
	bdbLength-p	1 bit	
	reserved	2 bits	b'00'
	BDB-format	4	
CBEFF_BDB_format_owner	owner	2	Integer: 0...65535
CBEFF_BDB_format_type	type	2	Integer: 0...65535
CBEFF_BDB_encryption_options	n/a	0	NO ENCRYPTION
CBEFF_BDB_integrity_options	n/a	0	NO INTEGRITY
CBEFF_BDB_biometric_type	bioType	3	*This encoding is a 3 octet bitmap. NO VALUE AVAILABLE is encoded as all 0 bits. If MULTIPLE BIOMETRIC TYPES is set, other bits may also be set to enumerate the types contained in the BDB.* NO VALUE AVAILABLE: X'00 00 00' MULTIPLE BIOMETRIC TYPES: X'00 00 01' FACE: X'00 00 02' VOICE: X'00 00 04' FINGER: X'00 00 08' IRIS: X'00 00 10' RETINA: X'00 00 20' HAND GEOMETRY: X'00 00 40' SIGNATURE OR SIGN: X'00 00 80' KEYSTROKE: X'00 01 00' LIP MOVEMENT: X'00 02 00' GAIT: X'00 10 00' VEIN: X'00 20 00' DNA: X'00 40 00' EAR: X'00 80 00' FOOT: X'01 00 00' SCENT: X'02 00 00'
CBEFF_BDB_biometric_subtype	bioSubtype	1	*This encoding is a 1 octet bitmap.* *Combinations of abstract values are permitted (by ORing the encodings for those values) when the abstract value encoded in CBEFF_BDB_biometric_type represents a biometric technology that can*

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CBEFF data element name	Field name	Length (octets)	Abstract values and Encodings[a]
			create a BDB where multiple subtypes are supported. NO VALUE AVAILABLE: b'0000 0000' LEFT: b'0000 0001' RIGHT: b'0000 0010' LEFT THUMB: b'0000 0101' LEFT POINTER FINGER: b'0000 1001' LEFT MIDDLE FINGER: b'0001 0001' LEFT RING FINGER: b'0010 0001' LEFT LITTLE FINGER: b'0100 0001' RIGHT THUMB: b'0000 0110' RIGHT POINTER FINGER: b'0000 1010' RIGHT MIDDLE FINGER: b'0001 0010' RIGHT RING FINGER: b'0010 0010' RIGHT LITTLE FINGER: b'0100 0010' LEFT PALM: b'1000 0101' LEFT BACK OF HAND: b'1000 1001' LEFT WRIST: b'1001 0001' RIGHT PALM: b'1000 0110' RIGHT BACK OF HAND: b'1000 1010' RIGHT WRIST: b'1001 0010'
CBEFF_BDB_creation_date	bdbCreation	7	NO VALUE AVAILABLE: seven 0 octets date/time value: fourteen BCD digits (YYYYMMDDHHMMSS)
CBEFF_BDB_processed_level	procLevel	1	NO VALUE AVAILABLE: 0 RAW: 1 INTERMEDIATE: 2 PROCESSED: 3 RESERVED: 4...15
CBEFF_BDB_product_owner CBEFF_BDB_product_type	product owner identifier	4 2 2	NO VALUE AVAILABLE: 0 Integer: 1...65535 Integer: 1...65535
CBEFF_BDB_purpose	purpose	1	NO VALUE AVAILABLE: 0 VERIFY: 1 IDENTIFY: 2 ENROLL: 3 ENROLL FOR VERIFICATION ONLY: 4 ENROLL FOR IDENTIFICATION ONLY: 5 AUDIT: 6 RESERVED: 7...15 (shall not be encoded)
CBEFF_BDB_quality	quality	1	NO VALUE AVAILABLE: 0 QUALITY NOT SUPPORTED - BY BDB CREATOR: 255 QUALITY SUPPORTED BY BDB-CREATOR BUT NOT SET: 254 INTEGER VALUE: 0...100
CBEFF_BDB_validity_period	bdbValidity	8	NO VALUE AVAILABLE: eight 0 octets pair of dates (not before, not after): sixteen BCD digits (YYYYMMDDYYYYMMDD)
CBEFF_BIR_creation_date	birCreation	7	NO VALUE AVAILABLE: seven 0 octets date/time value: fourteen BCD digits (YYYYMMDDHHMMSS)
CBEFF_BIR_validity_period	birValidity	8	NO VALUE AVAILABLE: eight 0 octets pair of dates (not before, not after): sixteen BCD digits (YYYYMMDDYYYYMMDD)

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CBEFF data element name	Field name	Length (octets)	Abstract values and Encodings[a]
CBEFF_patron_header_version	patronFmtVers	1	INTEGER: 0
CBEFF_version	vers	1	Major '2' and Minor '0': X'20'
CBEFF_subheader_count	subHeadCt	1	Integer: 0
n/a: patron-defined data element	bdbLength	4	Integer: 0...4294967295
BDB	bdb	See NOTE	See NOTE
NOTE The length, content and encoding of the BDB are not specified by CBEFF nor by this CBEFF-defined patron format specification.			
a Encodings are specified as binary integers unless otherwise indicated.			

9.11 Patron format conformance statement

9.11.1 Identifying information

Required Information	Patron format reference
Patron name	See 9.1
Patron identifier	See 9.2
Patron format name	See 9.3
Patron format identifier	See 9.4
Patron format ASN.1 object identifier	See 9.5
Domain of use description	See 9.6
Patron format version	See 9.7
CBEFF version	See 9.8

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9.11.2 CBEFF-defined data elements and abstract values

CBEFF data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
CBEFF_BDB_format_owner	Mandatory	format.owner	Yes	Yes
CBEFF_BDB_format_type	Mandatory	format.type	Yes	Yes
CBEFF_BDB_encryption_options	Mandatory	encryptOpts	Yes	Yes
CBEFF_BIR_integrity_optons	Mandatory	integOpts	Yes	Yes
CBEFF_subheader_count	Optional	subHeadCt	Yes	Yes
CBEFF_BDB_biometric_type	Optional	biotype	Yes	Yes
CBEFF_BDB_biometric_subtype	Optional	bioSubtype	Yes	Yes
CBEFF_BDB_creation_date	Optional	bdbCreation	Yes	Yes
CBEFF_BDB_processed_level	Optional	procLevel	Yes	Yes
CBEFF_BDB_product_owner	Optional	product.owner	Yes	Yes
CBEFF_BDB_product_type	Optional	product.type	Yes	Yes
CBEFF_BDB_purpose	Optional	purpose	Yes	Yes
CBEFF_BDB_quality	Optional	quality	Yes	Yes
CBEFF_BDB_validity_period	Optional	bdbValidity	Yes	Yes
CBEFF_BIR_creation_date	Optional	birCreation	Yes	Yes
CBEFF_BIR_validity_period	Optional	birValidity	Yes	Yes
CBEFF_patron_header_version	Optional	patronFmtVers	Yes	Yes
CBEFF_version	Optional	vers	Yes	Yes
BDB	Mandatory	bdb	n/a	n/a

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9.11.3 Patron defined data elements and abstract values

Patron format data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
bioType-p	Mandatory	(same)	Yes	Yes
bioSubtype-p	Mandatory	(same)	Yes	Yes
bdbCreation-p	Mandatory	(same)	Yes	Yes
procLevel-p	Mandatory	(same)	Yes	Yes
product-p	Mandatory	(same)	Yes	Yes
purpose-p	Mandatory	(same)	Yes	Yes
quality-p	Mandatory	(same)	Yes	Yes
bdbValidity-p	Mandatory	(same)	Yes	Yes
birCreation-p	Mandatory	(same)	Yes	Yes
patronFormat-p	Mandatory	(same)	Yes	Yes
birValidity-p	Mandatory	(same)	Yes	Yes
vers-p	Mandatory	(same)	Yes	Yes
subHeadCt-p	Mandatory	(same)	Yes	Yes
bdbLength-p	Mandatory	(same)	Yes	Yes
bdbLength	Optional	(same)	Yes	Yes

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10 Patron format specification: Fixed-length-fields, bit-oriented patron format using presence bit-map

10.1 Patron

ISO/IEC JTC 1/SC 37

10.2 Patron identifier

257 (0101Hex). This has been allocated by the Registration Authority for ISO/IEC 19785-2.

10.3 Patron format name

ISO/IEC JTC 1/SC 37 fixed-length-fields, bit-oriented patron format using presence bit-map.

10.4 Patron format identifier

4 (0004 Hex). This has been registered in accordance with ISO/IEC 19785-2.

10.5 ASN.1 object identifier for this patron format

{iso registration-authority cbeff(19785) biometric-organization(0) jtc1-sc37(257) patron-format(1) bit-oriented(4)}

or, in XML value notation,

1.1.19785.0.257.1.4

10.6 Domain of use

This clause provides a definition of a patron format that may be of general utility to applications that do not wish to define their own patron formats but wish to allow generators of SBHs to decide how much information to include.

10.7 Version identifier

This patron format specification has a version identifier of (major 0, minor 0).

10.8 CBEFF version

This specification conforms to CBEFF version (major 2, minor 0).

10.9 General

The **AllElementsWithDefaultsBitOriented** patron format uses fixed-width bit-wide fields that are just sufficient to encode the range of abstract values in version 2 of the CBEFF specification, with some reserved abstract values for future addition of abstract values to some CBEFF data elements. Formally, the fields of this patron format are defined by application of the ASN.1 unaligned packed encoding rules (PER-UNALIGNED). All fields in this patron format are assigned default values (including fields that CBEFF requires all patron formats to support) with their presence or absence indicated by an initial bit map. The size of the encoding is 6 octets if all data elements have the default value (usually **no-value-available**), or are absent.

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10.10 Specification

```
CBEFF-FULL-SUPPORT-WITH-DEFAULTS-BIT-ORIENTED
{iso standard 19785 modules(0) allElementsWithDefaultsBitOriented(4)}
DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN

IMPORTS BDBFormat, EncryptionOptions, IntegrityOptions, SubheaderCount,
BiometricType, BiometricSubtype, ChallengeResponse, BDBCreationDate, BDBIndex,
ProcessedLevel, Product, Purpose, Quality, BDBValidityPeriod, BIRCreationDate,
Creator, BIRIndex, PatronFormat, Payload, BIRValidityPeriod, HeaderVersion,
SBFormat, CBEFFVersion, BiometricDataBlock, OneByte, TwoByte, ThreeByte, FourByte,
OneBit, TwoBit, ThreeBit, FourBit
      FROM CBEFF-DATA-ELEMENTS
      {iso standard 19785 modules(0) types-for-cbeff-data-elements(1)};

AllElementsWithDefaultsBitOriented ::= SEQUENCE {

      /* This patron format contains all data elements, but makes full use of
         default values to allow omission of fields. It encodes each CBEFF
         data element into a fixed-width bit field.
         A 14-bit bit map is present at the start of the
         encoding to determine which fields are present. */

      format           BDBFormat,
      encryptOpts      EncryptionOptions DEFAULT FALSE,
      integOpts        IntegrityOptions DEFAULT FALSE,
      subHeaderCount   SubheaderCount DEFAULT 0,
      bdbLength        INTEGER (0..4294967295) DEFAULT 0,
      bioType          BiometricType DEFAULT no-value-available,
      bioSubtype       BiometricSubtype DEFAULT any:'0000000',
      chaResp          ChallengeResponse OPTIONAL,
      bdbCreation      BDBCreationDate OPTIONAL,
      bdbIndex         BDBIndex OPTIONAL,
      procLevel        ProcessedLevel DEFAULT no-value-available,
      product          Product DEFAULT { },
      purpose          Purpose DEFAULT no-value-available,
      quality          Quality DEFAULT no-value-available,
      bdbValidity      BDBValidityPeriod,
      birCreation      BIRCreationDate OPTIONAL,
      birCreator       Creator OPTIONAL,
      birIndex         BIRIndex OPTIONAL,
      patronFormat     PatronFormat DEFAULT { },
      payload          Payload OPTIONAL,
      birValidity      BIRValidityPeriod,
      patronHdrVersion HeaderVersion DEFAULT {header-major 0, header-minor 0},
      sbFormat         SBFormat DEFAULT {},
      cbeffVers        CBEFFVersion DEFAULT {cbeff-major 2, cbeff-minor 0},
      bdb              BiometricDataBlock }

END
```

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10.11 Patron format conformance statement

10.11.1 Identifying information

Required Information	Patron format reference
Patron name	See 10.1
Patron identifier	See 10.2
Patron format name	See 10.3
Patron format identifier	See 10.4
Patron format ASN.1 object identifier	See 10.5
Domain of use description	See 10.6
Patron format version	See 10.7
CBEFF version	See 10.8

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10.11.2 CBEFF-defined data elements and abstract values

CBEFF data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
CBEFF_BDB_format_owner	Mandatory	format.owner	Yes	Yes
CBEFF_BDB_format_type	Mandatory	format.type	Yes	Yes
CBEFF_BDB_encryption_options	Mandatory	encryptOpts	Yes	Yes
CBEFF_BIR_integrity_optons	Mandatory	integOpts	Yes	Yes
CBEFF_subheader_count	Optional	subheaderCount	Yes	Yes
CBEFF_BDB_biometric_type	Optional	biotype	Yes	Yes
CBEFF_BDB_biometric_subtype	Optional	bioSubtype	Yes	Yes
CBEFF_BDB_challenge_response	Optional	chaResp	Yes	Yes
CBEFF_BDB_creation_date	Optional	bdbCreation	Yes	Yes
CBEFF_BDB_index	Optional	bdbIndex	Yes	Yes
CBEFF_BDB_processed_level	Optional	procLevel	Yes	Yes
CBEFF_BDB_product_owner	Optional	product.owner	Yes	Yes
CBEFF_BDB_product_type	Optional	product.type	Yes	Yes
CBEFF_BDB_purpose	Optional	purpose	Yes	Yes
CBEFF_BDB_quality	Optional	quality	Yes	Yes
CBEFF_BDB_validity_period	Optional	bdbValidity	Yes	Yes
CBEFF_BIR_creation_date	Optional	birCreation	Yes	Yes
CBEFF_BIR_creator	Optional	birCreator	Yes	Yes
CBEFF_BIR_index	Optional	birIndex	Yes	Yes
CBEFF_BIR_patron_format_owner	Optional	PATRON FORMAT OWNER	Yes	Yes
CBEFF_BIR_patron_format_type	Optional	PATRON FORMAT TYPE	Yes	Yes
CBEFF_BIR_payload	Optional	payload	Yes	Yes
CBEFF_BIR_validity_period	Optional	birValidity	Yes	Yes
CBEFF_patron_header_version	Optional	patronFmtVers	Yes	Yes
CBEFF_SB_format_owner	Optional	SB OWNER	Yes	Yes
CBEFF_SB_format_type	Optional	SB TYPE	Yes	Yes
CBEFF_version	Optional	cbeffVers	Yes	Yes
BDB	Mandatory	bdb	n/a	n/a

10.11.3 Patron defined data elements and abstract values

Patron format data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
bdbLength	Optional	(same)	Yes	Yes

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11 Patron format specification: TLV-encoded patron format, for use with smartcards or other tokens

11.1 Patron

ISO/IEC JTC 1/SC 37

11.2 Patron identifier

257 (0101Hex). This has been allocated by the Registration Authority for ISO/IEC 19785-2.

11.3 Patron format name

ISO/IEC JTC 1/SC 37 TLV-encoded patron format, for use with smartcards or other tokens.

11.4 Patron format identifier

5 (0005 Hex). This has been registered in accordance with ISO/IEC 19785-2.

11.5 ASN.1 object identifier for this patron format

{iso registration-authority cbeff(19785) biometric-organization(0) jtc1-sc37(257) patron-format(1) tlv-encoded(5)}

or, in XML value notation,

1.1.19785.0.257.1.5

11.6 Domain of Use

The domain of use is applications complying with ISO/IEC 7816-11. This patron format is applicable for both on-card and off-card matching.

11.7 Version identifier

This patron format specification has a version identifier of (major 1, minor 1).

11.8 CBEFF version

This specification conforms to CBEFF version (major 2, minor 0).

11.9 General

11.9.1 This clause specifies in 11.10:

a) the CBEFF patron format named "ISO/IEC JTC 1/SC 37 TLV-encoded patron format, for use with smart cards or other tokens"

b) a TLV encoding for a number of CBEFF data elements (together with distinct TLV tags) that can be used by any TLV-encoded application that needs to make reference to such data elements.

NOTE – The particular form of TLV encoding specified in this clause is that provided by the ASN.1 Basic Encoding Rules (see ISO/IEC 8825-1).

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11.9.2 ISO/IEC 7816-4 and ISO/IEC 7816-11 define the necessary exchanges to support:

a) On-card matching:

   1) retrieval of information from a smartcard or other token prior to an external biometric verification process;

   2) commands for performing a biometric verification on a smartcard;

   3) strategies for enrollment (recording of information on a smartcard or other token);

   4) security mechanisms for establishing a trusted channel between a smartcard and an external system.

b) Off-card matching:

   1) commands for retrieval of the biometric related data from a smartcard to be used in a service system, e.g. a cross border control system;

   2) security mechanisms for the protection of the biometric related data.

11.9.3 This version of the CBEFF patron format named "ISO/IEC JTC 1/SC 37 TLV-encoded patron format, for use in a smartcard environment" is formally defined as the ASN.1 type **`BiometricInformationTemplate`** (see 11.10) encoded using the ASN.1 Distinguished Encoding Rules (see ISO/IEC 8825-1). A diagrammatic specification of this patron format is provided in 11.11. The version number of this version of this patron format is "major 1, minor 1".

NOTE – The term Biometric Information Template is used in ISO/IEC 7816-11, together with the abbreviation BIT. This term and the abbreviation are synonymous with Biometric Information Record and BIR, and are used in this clause where the relation with ISO/IEC 7816-11 is important.

11.9.4 The components of the ASN.1 type **`BiometricHeaderTemplate`** (with their context-specific tags, see 11.10), encoded using the ASN.1 Basic Encoding Rules are also defined as Data Objects for use in ISO/IEC 7816-11.

NOTE – The term Biometric Header Template is used in ISO/IEC 7816-11, together with the abbreviation BHT. This term and the abbreviation are synonymous with Standard Biometric Header and SBH, and are used in this clause where the relation with ISO/IEC 7816-11 is important.

11.9.5 The term Biometric Information Data Object is used in ISO/IEC 7816-11 to refer to the TLV-encoding of a specific ASN.1 type. Table 11.1 records the Biometric Information Data Objects that are defined in 11.10 for use in ISO/IEC 7816-11.

NOTE – As ISO/IEC 7816-11 normally describes tags by their hex values, these are included here.

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Table 11.1 – Biometric Information Data Objects with the Biometric Header Template Data Objects defined in 11.10

Biometric Information Data Object	ASN.1 type or component name (see 11.10)	Tag (hex)
Biometric Information Template	**BiometricInformationTemplate**	'7F60'
Group BIT	**GroupBIT**	'7F61'
BDB Reference Data	**bdbReferenceData**	'5F2E'
BDB Reference Data Template	**bdbReferenceDataTemplate**	'7F2E'
BIR Payload	**birPayLoad**	'53' or '73'
For use only in Biometric Reference Data Template:		
BDB Reference Data with Standardised Format (Primitive)	**standardBDBReferenceData**	'81'
BDB Reference Data with Standardised Format (Constructed)	**standardBDBReferenceDataTemplate**	'A1'
BDB Reference Data with Proprietary Format (Primitive)	**proprietaryBDBReferenceData**	'82'
BDB Reference Data with Proprietary Format (Constructed)	**proprietaryBDBReferenceDataTemplate**	'A2'
For use only in Biometric Information Template:		
Biometric Header Template	**biometricHeaderTemplate**	'A1'
Algorithm Reference	**algorithmReference**	'80'
Reference Data Qualifier	**referenceDataQualifier**	'83'
For use only in Biometric Header Template:		
Patron Header Version	**patronHeaderVersion**	'80'
BDB Biometric Type	**bdbBiometricType**	'81'
BDB Biometric Subtype	**bdbBiometricSubType**	'82'
BDB Creation Date	**bdbCreationDate**	'83'
BIR Creator	**birCreator**	'84'
BDB Validity Period	**bdbValidityPeriod**	'85'
BDB PID	**bdbPID**	'86'
BDB Format Owner	**bdbFormatOwner**	'87'
BDB Format Type	**bdbFormatType**	'88'
BIR Index	**birIndex**	'90'
Matching Algorithm Parameters	**matchingAlgParameters**	'91' or 'B1'

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11.9.6 CBEFF-compliance requires the NO VALUE AVAILABLE abstract value to be supported by this patron format for CBEFF data elements that are not fully supported. To meet this requirement, tags are assigned and reserved by this part of ISO/IEC 19785 in Table 11.2 for Data Objects appearing in the Biometric Header Template. These tag values shall not be assigned by any other tag authority to Data Objects that can appear in the Biometric Header Template. These Data Objects shall never appear in encodings of this version of this patron format, and their omission represents the NO VALUE AVAILABLE abstract value of the corresponding CBEFF data element.

NOTE – Subsequent versions of this patron format may define these Data Objects to support the corresponding CBEFF data element.

Table 11.2 – Reserved tag values

ASN.1 tag value	Tag (hex) value	Corresponding CBEFF data element
[19]	'93'	CBEFF_BDB_challenge_response
[20]	'94'	CBEFF_BDB_index
[21]	'95'	CBEFF_BDB_processed_level
[22]	'96'	CBEFF_BDB_purpose
[23]	'97'	CBEFF_BDB_quality
[24]	'98'	CBEFF_BIR_creation_date
[25]	'99'	CBEFF_BIR_patron_format_owner
[26]	'9A'	CBEFF_BIR_patron_format_type
[27]	'9B'	CBEFF_BIR_validity_period
[28]	'9C'	CBEFF_version

11.10 ASN.1 specification

```
CBEFF-SMARTCARD-BIDO
-- The abbreviation BIDO is used for Biometric Information Data Object
{iso standard 19785 modules(0) types-for-smartcard(8)}
DEFINITIONS
IMPLICIT TAGS ::=

BEGIN

-- In all cases, omission of an optional component that represents a
-- CBEFF data element is the encoding of the NO VALUE AVAILABLE for
-- that data element.

PatronHeaderVersion  ::= OCTET STRING (SIZE(2))
      -- CBEFF_patron_header_version
      -- The first octet encodes the major version number
      -- The second octet encodes the minor version number

BiometricType        ::= OCTET STRING (SIZE(1..3))
      -- CBEFF_BDB_biometric_type

      -- The encoding of the abstract values in the value part of the
      -- TLV shall be the Recommended Encodings specified in Table 11.5.
      -- Note that this is different from the encoding of this type in
      -- clause 9.10 and in other patron formats specified in this part of
      -- ISO/IEC 19785.

BiometricSubType     ::= OCTET STRING (SIZE(1))
      -- CBEFF_BDB_biometric_subtype
      -- The encoding of the abstract values in the value part of the
      -- TLV shall be the Recommended Encodings specified in Table 11.6.
      -- Note that this is different from the encoding of this type in
```

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```
      -- Table A.2 and in other patron formats specified in this part of
      -- ISO/IEC 19785.

BCDTime              ::= OCTET STRING (SIZE(7))
      -- BCD encoded timestamp with format ' YYYYMMDDHHMMSS'

Creator              ::= UTF8String
      -- CBEFF_BIR_creator

BCDDate              ::= OCTET STRING (SIZE(4))
      -- BCD encoded date with format 'YYYYMMDD'

BCDDatePeriod ::= OCTET STRING (SIZE(8))
      -- Two concatenated BCD encoded dates with format YYYYMMDDYYYYMMDD

ProductID            ::= OCTET STRING (SIZE(4))
      -- CBEFF_BDB_product_owner in the first two octets
      -- CBEFF_BDB_product_type in the last two octets

FormatOwner          ::= OCTET STRING (SIZE(2))
      -- CBEFF_BDB_format_owner

FormatType           ::= OCTET STRING (SIZE(2))
      -- CBEFF_BDB_format_type

BIRIndex             ::= OCTET STRING
      -- CBEFF_BIR_index

BiometricInformationTemplate ::= [APPLICATION 96] SET {
      algorithmReference [0] OCTET STRING (SIZE(1)) OPTIONAL,
      -- A non-CBEFF data element – see ISO/IEC 7816-11
      referenceDataQualifier [3] OCTET STRING (SIZE(1)) OPTIONAL,
      -- A non-CBEFF data element – see ISO/IEC 7816-11
      biometricHeaderTemplate [1] BiometricHeaderTemplate,
      bdbReferenceData [APPLICATION 46] EXTERNAL OPTIONAL,
      -- A CBEFF BDB, mandatory for off-card-matching
      birPayLoad [APPLICATION 19] OCTET STRING OPTIONAL
      -- CBEFF_BIR_payload, contents defined by ISO/IEC 7816-11
      }

GroupBIT ::= [APPLICATION 97] SET OF BiometricInformationTemplate

BiometricHeaderTemplate ::= SET {
      patronHeaderVersion      [0]  PatronHeaderVersion
                                    DEFAULT'0101'H,
      -- The absence of this Data Object represents NO VALUE AVAILABLE
      bdbBiometricType         [1]  BiometricType OPTIONAL,
      bdbBiometricSubType      [2]  BiometricSubType OPTIONAL,
      -- Required to be absent unless bdbBiometricType is present
      bdbCreationDate          [3]  BCDTime OPTIONAL,
      -- CBEFF_BDB_creation_date
      birCreator               [4]  Creator OPTIONAL,
      bdbValidityPeriod        [5]  BCDDatePeriod OPTIONAL,
      bdbPID                   [6]  ProductID OPTIONAL,
      bdbFormatOwner           [7]  FormatOwner,
      bdbFormatType            [8]  FormatType,
      birIndex                 [16] BIRIndex OPTIONAL,
      matchingAlgParameters    [17] OCTET STRING OPTIONAL
      -- A non-CBEFF data element – see ISO/IEC 7816-11
      }

END
```

11.11 Tabular representations for information

11.11.1 The Biometric Information Template used for on-card matching

Table 11.3 shows the Biometric Information Template (BIT) used for on-card matching. The BIT has the following substructure:

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a) Data Objects (with hex tags '80' and '83') as defined in ISO/IEC 7816-11, containing values relevant for interindustry commands used for biometric verification as defined in ISO/IEC 7816-4;

b) Biometric Header Template (BHT) with tag 'A1' as defined in ISO/IEC 7816-11. The tag allocation authority for the Data Objects nested in the BHT is ISO/IEC JTC 1/SC 37 (default tag allocation authority);

NOTE - The ASN.1 object identifier for this tag allocation authority is **{iso standard 19785 part(3) tag-allocation(1) clause-11(0)}**.

c) Data Objects for CBEFF data elements that are relevant for on-card matching;

d) Biometric Data Objects which are on-card matching specific and only defined in this clause (the biometric matching algorithm parameters Data Object with hex tag '91' or 'B1').

Table 11.3 — The Biometric Information Template used for on-card matching

Tag	**Length**	**Value**					**Presence**
'7F60'	Var.	Biometric Information Template (BIT)					
		Tag	**Length**	**Value**			
		'80'	1	Algorithm reference for use in the VERIFY / EXT. AUTHENTICATE / MANAGE SE command as defined in ISO/IEC 7816-4			Optional
		'83'	1	Reference data qualifier for use in the VERIFY / EXT. AUTHENTICATE / MANAGE SE command as defined in ISO/IEC 7816-4			Optional
		'A1'	Var.	Biometric Header Template (BHT) Tag allocation authority: ISO/IEC JTC 1/SC 37			Mandatory
				Tag	**Length**	**Value**	
				'80'	2	CBEFF_patron_header_version (default '0101')	Mandatory (if absent, the default value applies)
				'90'	Var.	CBEFF_BIR_index, unique identifier used for referencing this biometric data set in an application context outside the card	Optional
				'81'	1-3	CBEFF_BDB_biometric_type, see Table 11.5.	Optional
				'82'	1	CBEFF_BDB_biometric_subtype, see Table 11.6.	Optional, use with biometric type only
				'83'	7	CBEFF_BDB_creation_date, creation date and time of biometric reference data: fourteen BCD digits (YYYYMMDDHHMMSS)	Optional
				'84'	Var.	CBEFF_BIR_creator	Optional
				'85'	8	CBEFF_BDB_validity_period, a pair of dates (not before, not after): sixteen BCD digits (YYYYMMDDYYYYMMDD)	Optional
				'86'	4	CBEFF_BDB_product_owner, CBEFF_BDB_product_type. Concatenation of product owner and product type, identifying the product that created the biometric reference data	Optional
				'87'	2	CBEFF_BDB_format_owner, format owner of the biometric verification data, value assigned by the biometrics registration authority	Mandatory

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Tag	Length	Value					Presence
				'88'	2	CBEFF_BDB_format_type, format type of biometric verification data, specified by format owner	Mandatory
				'91' / 'B1'	Var.	Biometric matching algorithm parameters (primitive / constructed), see note 4	Optional

NOTE 1 In Table 11.3 the biometric data block as defined in Part 1 of this International Standard is not present, since the biometric reference data are stored separately in the card and not in this BIT. The biometric verification data (format owner and format type indicated in the Data Objects with tag '87' and '88') have to be presented to the card using e.g. a ISO/IEC 7816 VERIFY command.

NOTE 2 In Table 11.3 no payload is present, since usually access to a payload, if used by the application, is granted after successful completion of the biometric verification. The payload may be retrieved using ISO/IEC 7816 interindustry access commands like GET DATA or READ BINARY.

NOTE 3 The outside world uses format owner / format type for identifying the required structure for the verification data. The matching algorithm in the card, which is able to process the verification data according to format owner / format type, is addressed by the algorithm reference, if the algorithm reference DataObject is present.

NOTE 4 The biometric matching algorithm Data Object provides any special parameters of an on-card matching algorithm implementation, e.g. maximum number of minutiae expected in the biometric verification data. The content of this Data Object is defined by the BDB format owner (see e.g. ISO/IEC 19794-2).

The use of the BIT shown in Table 11.3, which is intended to be retrieved prior to a biometric user verification, and the verification process itself with the related interindustry commands and their security requirements, are specified in ISO/IEC 7816-11.

11.11.2 The Biometric Information Template used for off-card matching

Table 11.4 shows the Biometric Information Template BIT used for off-card matching. The BIT has the following substructure:

a) Biometric Header Template (BHT) with tag 'A1' as defined in ISO/IEC 7816-11. The tag allocation authority for the Data Objects nested in the BHT is ISO/IEC JTC 1/SC 37 (default tag allocation authority);

   NOTE - The ASN.1 object identifier for this tag allocation authority is **`{iso standard 19785 part(3) tag-allocation(1) clause-11(0)}`**.

b) Biometric Data Objects for CBEFF data elements that are relevant for off-card matching;

c) A biometric reference Data Object (primitive or constructed) with tags as defined in ISO/IEC 7816-11, representing the CBEFF Biometric Data Block (BDB);

d) Payload as the content of an optional Data Object with tag '53' or '73' as defined in ISO/IEC 7816-6.

The use of the data structure shown in Table 11.4 is not restricted to smartcards. The data structure may also be used in other types of cards, e.g. magnetic stripe cards, optical memory cards or cards with 2-dimensional barcodes.

Table 11.4 — The Biometric Information Template used for off-card matching

Tag	Length	Value			Presence
'7F60'	var.	Biometric Information Template (BIT)			
		Tag	Length	Value	
		'A1'	var.	Biometric Header Template (BHT) Tag allocation authority: ISO/IEC JTC 1/SC 37	Mandatory

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Tag	Length	Value					Presence
				Tag	**Length**	**Value**	
				’80’	2	CBEFF_patron_header_version (default ‘0101’)	Mandatory (if absent, the default value applies)
				‘81’	1-3	CBEFF_BDB_biometric_type, see Table 11.5.	Optional
				‘82’	1	CBEFF_BDB_biometric_subtype, see Table 11.6.	Optional, use together with biometric type only
				‘83’	7	CBEFF_BDB_creation_date, creation date and time of biometric reference data: fourteen BCD digits (YYYYMMDDHHMMSS)	Optional
				‘84’	var.	CBEFF_BIR_creator	Optional
				‘85’	8	CBEFF_BDB_validity_period, a pair of dates (not before, not after): sixteen BCD digits (YYYYMMDDYYYYMMDD)	Optional
				‘86’	4	CBEFF_BDB_product owner, CBEFF_BDB_product_type. Concatenation of product owner and product type, identifying the product that created the biometric reference data	Optional
				‘87’	2	CBEFF_BDB_format_owner, format owner of the biometric reference data, value assigned by the biometrics registration authority	Mandatory
				‘88’	2	CBEFF_BDB_format_type, format type of biometric reference data, specified by format owner	Mandatory
				‘90’	var.	CBEFF_BIR_index, unique identifier used for referencing this biometric data set in an application context outside the card	Optional
		'5F2E' / '7F2E'	var.	CBEFF BDB, biometric reference data (primitive / constructed); see note 3			Mandatory
		'53' / '73'	var.	CBEFF_BIR_payload, optional data for payload (primitive / constructed)			Optional
NOTE The structure of the biometric reference data in the case of constructed allows the integration of a biometric challenge for user prompting (e.g. a phrase to be spoken) and a concatenation of biometric data with standardized and proprietary structure. The respective Data Objects are specified in ISO/IEC 7816-11.							

11.12 The Group BIT Data Object

Several BITs may be nested in a group BIT (tag ‘7F61’ as defined in ISO/IEC 7816-11). The construction and use of group BIT Data Objects both for on-card and off-card matching are specified in ISO/IEC 7816-11.

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11.13 Abstract values and encodings for biometric type and subtype

Table 11.5 – CBEFF_BDB_biometric_type abstract values and encodings

Abstract value name	Value encoding	Subtype applies
NO VALUE AVAILABLE	'00'	
MULTIPLE BIOMETRIC TYPES	'01'	
FACE	'02'	
VOICE	'04'	
FINGER	'08'	x
IRIS	'10'	x
RETINA	'20'	x
HAND GEOMETRY	'40'	x
SIGNATURE/SIGN	'80'	
KEYSTROKE	'01 00'	
LIP MOVEMENT	'02 00'	
THERMAL FACE	'04 00'	
THERMAL HAND	'08 00'	
GAIT	'10 00'	
BODY ODOR	'20 00'	
DNA	'40 00'	
EAR	'80 00'	x
FINGER GEOMETRY	'01 00 00'	
PALM GEOMETRY	'02 00 00'	
VEIN PATTERN	'04 00 00'	
FOOT PRINT	'08 00 00'	

Table 11.6 – CBEFF_BDB_biometric_subtype abstract values and encodings

b8 b7 b6 b5 b4 b3 b2 b1	Biometric Subtype
0 0 0 0 0 0 0 0	NO INFORMATION GIVEN
0 1	RIGHT
1 0	LEFT
0 0 0	NO MEANING
0 0 1	THUMB
0 1 0	POINTER FINGER
0 1 1	MIDDLE FINGER
1 0 0	RING FINGER
1 0 1	LITTLE FINGER
x x x	RESERVED FOR FUTURE USE

NOTE This optional field denotes which sample of the biometric type is to be presented (e.g. right pointer finger). This field is only useful in conjunction with the field CBEFF_BDB_biometric_type in cases denoted in Table 11.5.

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11.14 Patron format conformance statement

11.14.1 Identifying information

Required Information	Patron format reference
Patron name	See 11.1
Patron identifier	See 11.2
Patron format name	See 11.3
Patron format identifier	See 11.4
Patron format ASN.1 object identifier	See 11.5
Domain of use description	See 11.6
Patron format version	See 11.7
CBEFF version	See 11.8

11.14.2 CBEFF-defined data elements and abstract values

CBEFF data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
CBEFF_patron_header_version	Mandatory	CBEFF_patron_header_version	Yes	Yes
CBEFF_BIR_index	Optional	CBEFF_BIR_index	Yes	Yes
CBEFF_BDB_biometric_type	Optional	CBEFF_BDB_biometric_type	Yes	Yes
CBEFF_BDB_biometric_subtype	Optional	CBEFF_BDB_biometric_subtype	Yes	Yes
CBEFF_BDB_creation_date	Optional	CBEFF_BDB_creation_date	Yes	Yes
CBEFF_BIR_creator	Optional	CBEFF_BIR_creator	Yes	Yes
CBEFF_BDB_validity_period	Optional	CBEFF_BDB_validity_period	Yes	Yes
CBEFF_BDB_product_owner	Optional	CBEFF_BDB_product_owner	Yes	Yes
CBEFF_BDB_product_type	Optional	CBEFF_BDB_product_type	Yes	Yes
CBEFF_BDB_format_owner	Mandatory	CBEFF_BDB_format_owner	Yes	Yes
CBEFF_BDB_format_type	Mandatory	CBEFF_BDB_format_type	Yes	Yes
CBEFF_BIR_payload	Optional	CBEFF_BIR_payload	Yes	Yes
BDB (on-card matching)	n/a	See Note 1 of Table 11.3	n/a	n/a
BDB (off-card matching)	Mandatory	BDB	n/a	n/a

11.14.3 Patron-defined data elements and abstract values

Patron format data element name	Mandatory/ optional	Patron format field name	Abstract values specified?	Encodings specified?
Algorithm reference	Optional	Same	Yes	Yes
Reference data qualifier	Optional	Same	Yes	Yes
Biometric matching algorithm parameters	Optional	Same	Yes	Yes

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12 Patron format specification: complex patron format

12.1 Patron

ISO/IEC JTC 1/SC 37

12.2 Patron identifier

257 (0101Hex). This has been allocated by the Registration Authority for ISO/IEC 19785-2.

12.3 Patron format name

ISO/IEC JTC 1/SC 37 complex patron format.

12.4 Patron format identifier

6 (06 Hex). This has been registered in accordance with ISO/IEC 19785-2.

12.5 ASN.1 object identifier for this patron format

{iso registration-authority cbeff(19785) biometric-organization(0) jtc1-sc37(257) patron-format(1) complex(6)}

or, in XML value notation,

1.1.19785.0.257.1.6

12.6 Domain of use

This clause provides a definition of a patron format that may be of general utility to applications that need to carry one or more BIRs (of either the same or different patron formats) in a single complex BIR structure, with explicit identification of the patron format(s) being used.

12.7 Version identifier

This patron format specification has a version identifier of **1.**

12.8 CBEFF version

This specification conforms to CBEFF version (major 2, minor 0).

12.9 General

12.9.1 This patron format supports all the mandatory and optional data elements specified in ISO/IEC 19785-1. It can support either a simple BIR or a complex BIR structure where each intermediate node or leaf of the structure is itself a BIR (called a "child BIR") and can be represented in any patron format.

12.9.2 The patron format of each child BIR is explicitly identified in its parent by a pair: patron format owner / patron format type, and can be either this patron format (in which case the child BIR may itself have children), or a different patron format (in which case the child BIR is considered a leaf of this patron format although it may be a complex BIR in its own regard).

12.9.3 Most fields in this patron format are optional. The presence of each optional field is encoded as a single bit of a 24-bit field ("fieldPresence") at the beginning of the format, which has one bit for each optional

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field defined in the patron format. The bit value '1' in a given position of that field means that the corresponding field is present in the BIR instance.

12.9.4 All character strings and octet strings are preceded by a length prefix, which can be one, two, or four octets long, as specified for each field.

12.9.5 All integer values, including lengths, are encoded in big-endian order.

12.9.6 Dates and date intervals are encoded as character strings in a way conforming to ISO 8601.

12.9.7 An instance of a BIR or child BIR contains either a BDB or one or more BIR children, but never contains both.

12.10 Specification

An instance of a BIR shall contain the fields specified below, in exactly the same order and with no gaps between the fields.

CBEFF data element name	Field name	Length and optionality[a]	Abstract values and Encodings[b]
The following fields shall occur at most once			
CBEFF_patron_header_version	patronHeaderVersion	1, mandatory	1
CBEFF_version	cbeffVersion	1, mandatory	Major '2' and Minor '0': X'20' (32)
not a standard CBEFF data element	fieldPresence	3, mandatory	A 24-bit field containing one bit for each optional field in the patron format. The bit value '1' means that the corresponding field is present in the BIR instance. Bit position (1=most significant, 24=least significant) and corresponding optional field: 1 bdbFormat Owner & Type 2 bdbEncryption 3 bdbBiometricType 4 bdbBiometricSubtype 5 bdbChallengeResponse 6 bdbCreationDate 7 bdbIndex 8 bdbProcessedLevel 9 bdbProduct Owner & Type 10 bdbPurpose 11 bdbQuality 12 bdbValidityPeriod 13 birCreationDate 14 birCreator 15 birIndex 16 birPayload 17 birValidityPeriod 18 sbFormat Owner & Type 19 bdb 20 sb 21..24 not used (shall be '0')

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CBEFF data element name	Field name	Length and optionality[a]	Abstract values and Encodings[b]
CBEFF_BDB_format_owner	bdbFormatOwner	2, mandatory if a BDB is present, optional if a BDB is not present.	0..65535
CBEFF_BDB_format_type	bdbFormatType	2, mandatory if a BDB is present, optional if a BDB is not present.	0..65535
CBEFF_BDB_encryption_options	bdbEncryption	1; mandatory if a BDB is present, other-wise required to be absent.	NO ENCRYPTION: 0 ENCRYPTION: 1
CBEFF_BIR_integrity_options	birIntegrity	1, mandatory	NO INTEGRITY: 0 INTEGRITY: 1
CBEFF_BDB_biometric_type	bdbBiometricType	3	*This encoding is a 3 octet bitmap. NO VALUE AVAILABLE is encoded as all 0 bits. If MULTIPLE BIOMETRIC TYPES is set, other bits may also be set to enumerate the types contained in the BDB.* NO VALUE AVAILABLE: X'00 00 00' MULTIPLE BIOMETRIC TYPES: X'00 00 01' FACE: X'00 00 02' VOICE: X'00 00 04' FINGER: X'00 00 08' IRIS: X'00 00 10' RETINA: X'00 00 20' HAND GEOMETRY: X'00 00 40' SIGNATURE OR SIGN: X'00 00 80' KEYSTROKE: X'00 01 00' LIP MOVEMENT: X'00 02 00' GAIT: X'00 10 00' VEIN: X'00 20 00' DNA: X'00 40 00' EAR: X'00 80 00' FOOT: X'01 00 00' SCENT: X'02 00 00'
CBEFF_BDB_biometric_subtype	bdbBiometricSubtype	1	*This encoding is a 1 octet bitmap.* *Combinations of abstract values are permitted (by ORing the encodings for those values) when the abstract value encoded in CBEFF_BDB_biometric_type represents a biometric technology that can create a BDB where multiple subtypes are supported.* NO VALUE AVAILABLE: b'0000 0000' LEFT: b'0000 0001' RIGHT: b'0000 0010' LEFT THUMB: b'0000 0101' LEFT POINTER FINGER: b'0000 1001' LEFT MIDDLE FINGER: b'0001 0001' LEFT RING FINGER: b'0010 0001' LEFT LITTLE FINGER: b'0100 0001' RIGHT THUMB: b'0000 0110'

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CBEFF data element name	Field name	Length and optionality[a]	Abstract values and Encodings[b]
			RIGHT POINTER FINGER: b'0000 1010' RIGHT MIDDLE FINGER: b'0001 0010' RIGHT RING FINGER: b'0010 0010' RIGHT LITTLE FINGER: b'0100 0010' LEFT PALM: b'1000 0101' LEFT BACK OF HAND: b'1000 1001' LEFT WRIST: b'1001 0001' RIGHT PALM: b'1000 0110' RIGHT BACK OF HAND: b'1000 1010' RIGHT WRIST: b'1001 0010'
CBEFF_BDB_challenge_response	bdbChallengeResponse	2 + 0..65535	Variable-length octet string, preceded by a 16-bit integer field containing the length (octets).
CBEFF_BDB_creation_date	bdbCreationDate	1 + 8..15	Variable-length ASCII character string, preceded by an 8-bit integer field containing the length (characters). The string shall represent a date (or date and a time of the day)[c].
CBEFF_BDB_index	bdbIndex	2 + 0..65535	Variable-length octet string, preceded by a 16-bit integer field containing the length (octets). Shall not appear in any BIR in which numChildren is not x'00'.
CBEFF_BDB_processed_level	bdbProcessedLevel	1	RAW: 1 INTERMEDIATE: 2 PROCESSED: 3
CBEFF_BDB_product_owner	bdbProductOwner	2	1..65535
CBEFF_BDB_product_type	bdbProductType	2	1..65535
CBEFF_BDB_purpose	bdbPurpose	1	VERIFY: 1 IDENTIFY: 2 ENROLL: 3 ENROLL FOR VERIFICATION ONLY: 4 ENROLL FOR IDENTIFICATION ONLY: 5 AUDIT: 6
CBEFF_BDB_quality	bdbQuality	1	QUALITY NOT SUPPORTED BY BDB CREATOR: 255 QUALITY SUPPORTED BY BDB CREATOR BUT NOT SET: 254 INTEGER VALUE: 0 – 100
CBEFF_BDB_validity_period	bdbValidityPeriod	1 + 17..31	Variable-length ASCII character string, preceded by an 8-bit integer field containing the length (characters). The string shall represent an interval of two dates (or date and time of the day)[d].
CBEFF_BIR_creation_date	birCreationDate	1 + 8..15	Variable-length ASCII character string, preceded by an 8-bit integer field containing the length (characters). The string shall represent a date (or date and a time of the day)[c].
CBEFF_BIR_creator	birCreator	2 + 0..65535	Variable-length ISO/IEC 10646 character string, encoded in UTF-8, and preceded

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CBEFF data element name	Field name	Length and optionality[a]	Abstract values and Encodings[b]
			by a 16-bit integer field containing the length of the UTF-8 encoding (octets).
CBEFF_BIR_index	birIndex	2 + 0..65535	Variable-length octet string, preceded by a 16-bit integer field containing the length (octets). Shall not inherit its value from any other level BIR.
CBEFF_BIR_payload	birPayload	2 + 0..65535	Variable-length octet string, preceded by a 16-bit integer field containing the length (octets). Shall not inherit its value from any other level BIR.
CBEFF_BIR_validity_period	birValidityPeriod	1 + 17..31	Variable-length ASCII character string, preceded by an 8-bit integer field containing the length (characters). The string shall represent an interval of two dates (or date and time of the day)[d].
CBEFF_SB_format_owner	sbFormatOwner	2	1..65535
CBEFF_SB_format_type	sbFormatType	2	1..65535
BDB	bdb	4 + 0..4294967295	Variable-length octet string, preceded by a 32-bit integer field containing the length (octets). If this field is present in a BIR instance (as indicated in bit 19 of the field *fieldPresence*), then no child BIRs shall be included (*numChildren* shall have the value 0). Otherwise, at least one child BIR shall be included (*numChildren* shall have a value greater than 0). NOTE - The content and encoding of the BDB are not specified by CBEFF nor by this patron format specification.
CBEFF_subheader_count	numChildren	1, mandatory	0..255
The following 3 fields shall occur as a group as many times as specified in the field numChildren (0..255)			
CBEFF_BIR_patron_format_owner	childBirPatronFormatOwner	2, mandatory if no BDB is present, other-wise required to be absent.	1..65535
CBEFF_BIR_patron_format_type	childBirPatronFormatType	2, mandatory if no BDB is present, other-wise required to be absent.	1..65535
not a standard CBEFF data element	childBir	4 + 0..4294967295, mandatory if no BDB is present,	Variable-length octet string, preceded by a 32-bit integer field containing the length (octets)[e].

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CBEFF data element name	Field name	Length and optionality[a]	Abstract values and Encodings[b]
		otherwise required to be absent.	
The following field shall occur at most once			
SB	sb	4 + 0..4294967295	Variable-length octet string, preceded by a 32-bit integer field containing the length (octets).

a) The date shall be represented in the ISO 8601 basic format YYYYMMDDTHHMMSS, where the last 2, the last 4, or the last 7 characters may be omitted.

Examples: 20050103, 20050106T11, 20050106T1230, and 20050106T145504.

b) Each date shall be represented in the ISO 8601 basic format YYYYMMDDTHHMMSS, where the last 2, the last 4, or the last 7 characters may be omitted. The two dates shall be separated by a SOLIDUS ("/") character, and shall have the same number of digits.

Examples: 20050103/20060103, 20050106T11/20050306T11, and 20050106T113300/20050306T113259.

c) A BIR consists of either: 1) an SBH, BDB, optional SB, and numChildren value of zero, or 2) an SBH, no BDB, and numChildren value greater than zero.

12.11 Illustrative examples

Table 12.1 — "Simple" BIR (one BDB)

Field Name	Length	Abstract Value	Encoding
patronHeaderVersion	1	1	x'01'
cbeffVersion	1	Major 2, Minor 0	x'20'
fieldPresence	3	bdbFormatOwner and Type bdbEncryption bdbBiometricType bdbQuality bdb	x'E0 20 20'
bdbFormatOwner	2	ISO/IEC JTC 1/SC 37	257, x'01 01'
bdbFormatType	2	Face image	x'00 08'
bdbEncryption	1	NO ENCRYPTION	x'00'
birIntegrity	1	NO INTEGRITY	x'00'
bdbBiometricType	3	FACE-IMAGE	x'40 00 00'
bdbQuality	1	75/100	x'4B'
bdb	4 + 4096	octet string	x'00 00 10 00' + 4096 octets
numChildren	1	zero	x'00'

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Table 12.2 — Complex BIR fields and abstract values corresponding to Figure 2 in ISO/IEC 19785-1

1. patronHeaderVersion = 1 *(beginning of the root header BIR)*
2. cbeffVersion = 2:0
3. fieldPresence = sbFormatOwner/Type
4. birIntegrity = INTEGRITY *(integrity is applied to the entire complex BIR via the SB on line 90)*
5. sbFormatOwner = *a security vendor*
6. sbFormatType = *that vendor's security block format* *(see the final SB on line 90)*
7. numChildren = 2
8. childBirPatronFormatOwner = SC 37
9. childBirPatronFormatType = 8 (*this format*)
10. ► *(denotes the beginning of the next BIR)*
11. patronHeaderVersion = 1
12. cbeffVersion = 2:0
13. fieldPresence = bdbBiometricType
14. birIntegrity = NO INTEGRITY
15. bdbBiometricType = FINGER *(the next 3 BIRs inherit this value)*
16. numChildren = 3
17. childBirPatronFormatOwner = SC 37
18. childBirPatronFormatType = 8 (*this format*)
19. ►
20. patronHeaderVersion = 1
21. cbeffVersion = 2:0
22. fieldPresence = bdbFormatOwner/Type; bdbEncryption; bdbBiometricSubtype; bdb
23. bdbFormatOwner = SC 37
24. bdbFormatType = *a standardized BDB format*
25. bdbEncryption = NO ENCRYPTION
26. birIntegrity = NO INTEGRITY
27. bdbBiometricSubtype = LEFT POINTER FINGER
28. bdb
29. numChildren=0
30. ►
31. patronHeaderVersion = 1
32. cbeffVersion = 2:0
33. fieldPresence = bdbFormatOwner/Type; bdbEncryption; bdbBiometricSubtype; bdb
34. bdbFormatOwner = *vendor ABC*
35. bdbFormatType = *non standard BDB format A*
36. bdbEncryption = NO ENCRYPTION
37. birIntegrity = NO INTEGRITY
38. bdbBiometricSubtype = LEFT MIDDLE FINGER
39. bdb
40. numChildren=0
41. ►
42. patronHeaderVersion = 1
43. cbeffVersion = 2:0
44. fieldPresence = bdbFormatOwner/Type; bdbEncryption; bdbBiometricSubtype; bdb
45. bdbFormatOwner = *vendor XYZ*
46. bdbFormatType = *non standard BDB format B*
47. bdbEncryption = NO ENCRYPTION
48. birIntegrity = NO INTEGRITY
49. bdbBiometricSubtype = LEFT RING FINGER
50. bdb
51. numChildren=0
52. ►
53. patronHeaderVersion = 1
54. cbeffVersion = 2:0
55. fieldPresence = bdbBiometricType
56. birIntegrity = NO INTEGRITY
57. bdbBiometricType = IRIS *(the next 2 BIRs inherit this type)*

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```
58.   numChildren = 2
59.   childBirPatronFormatOwner = SC 37
60.   childBirPatronFormatType = 8 (this format)
61.      ►
62.      patronHeaderVersion = 1
63.      cbeffVersion = 2:0
64.      fieldPresence = bdbFormatOwner/Type; bdbEncryption; bdbBiometricSubtype;
                sbFormatOwner/Type; bdb; sb
65.      bdbFormatOwner = SC 37
66.      bdbFormatType = an iris format
67.      bdbEncryption = ENCRYPTION
68.      birIntegrity = NO INTEGRITY
69.      bdbBiometricSubtype = LEFT
70.      sbFormatOwner = an encryption vendor
71.      sbFormatType = a security block format  (see SB on line 74)
72.      bdb
73.      numChildren=0
74.      sb                                      (see SB format identifier on lines 70-71)
75.      ►
76.      patronHeaderVersion = 1
77.      cbeffVersion = 2:0
78.      fieldPresence = bdbFormatOwner/Type; bdbEncryption; bdbBiometricSubtype;
                sbFormatOwner/Type;      bdb; sb
79.      bdbFormatOwner = vendor PQR
80.      bdbFormatType = vendor's format C
81.      bdbEncryption = ENCRYPTION
82.      birIntegrity = NO INTEGRITY
83.      bdbBiometricSubtype = RIGHT
84.      sbFormatOwner = an encryption vendor
85.      sbFormatType = a security block format  (see SB on line 88)
86.      bdb
87.      numChildren=0
88.      sb                                      (see SB format identifier on lines 84-85)
89. ►
90. sb                                           (see SB format identifier in root header on line 6)
```

Table 12.3 — BIR wrapped in an enveloping BIR

Field Name	Length	Abstract Value	Encoding
patronHeaderVersion	1	1	x'01'
cbeffVersion	1	Major 2, Minor 0	x'20'
fieldPresence	3	all optional fields absent in the enveloping BIR	x'00 00 00'
birIntegrity	1	NO INTEGRITY	x'00'
numChildren	1	one child *(the enveloped BIR)*	x'01'
childBirPatronFormatOwner)	2	patron format owner of the enveloped BIR	*variable*
childBirPatronFormatType	2	patron format type of the enveloped BIR	*variable*
childBir (length of the child BIR)	4	length of the enveloped BIR	*variable*
childBir (octets of the child BIR	*variable*	octets of the enveloped BIR	*variable*

Table 12.3 shows how the Complex patron format specified in this clause can be used as a simple envelope around a BIR of an arbitrary patron format in order to provide identification of its format and specify its length. When using the Complex patron format in this way, the portion of the enveloping BIR preceding the enveloped

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BIR can be thought of as a fixed-length prefix to the enveloped BIR. Since all the optional fields of the enveloping BIR are absent, the length of the prefix is only 15 octets, given by:

a) 7 octets with the fixed values x'01 20 00 00 00 00 01'; plus

b) 4 octets containing the patron format owner and type of the enveloped BIR; plus

c) 4 octets containing the length of the enveloped BIR.

12.12 ASN.1 definition (provided for illustrative purposes only)

The following ASN.1 specification provides an abstract description of the patron format, and may be useful to some readers of this part of ISO/IEC 19785. It is not intended to provide an alternative specification of the encodings of this patron format.

```
CBEFF-COMPLEX-PATRON-FORMAT
{iso standard 19785 modules(0) complex-BIR(10)}
DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN
BIR ::= SEQUENCE {
      patronHeaderVersion INTEGER(0..255),
      cbeffVersion              INTEGER(0..255),

      fieldPresence SEQUENCE {
            bdbFormat                 BOOLEAN,
            bdbEncryption             BOOLEAN,
            bdbBiometricType    BOOLEAN,
            bdbBiometricSubtype BOOLEAN,
            bdbChallengeResponse      BOOLEAN,
            bdbCreationDate           BOOLEAN,
            bdbIndex                  BOOLEAN,
            bdbProcessedLevel   BOOLEAN,
            bdbProduct                BOOLEAN,
            bdbPurpose                BOOLEAN,
            bdbQuality                BOOLEAN,
            bdbValidityPeriod   BOOLEAN,
            birCreationDate           BOOLEAN,
            birCreator                BOOLEAN,
            birIndex                  BOOLEAN,
            birValidityPeriod   BOOLEAN,
            sbFormat                  BOOLEAN,
            bdb                       BOOLEAN,
            children                  BOOLEAN,
            sb                        BOOLEAN
      },
      bdbFormat                 SEQUENCE {
            bdbFormatOwner      INTEGER(0..65535),
            bdbFormatType       INTEGER(0..65535)
      } OPTIONAL,
      bdbEncryption             INTEGER(0..255) OPTIONAL,
      birIntegrity        INTEGER(0..255),
      bdbBiometricType          INTEGER(0..16777215) OPTIONAL,
      bdbBiometricSubtype INTEGER(0..255) OPTIONAL,
      bdbChallengeResponse      OCTET STRING (SIZE(0..65535)) OPTIONAL,
      bdbCreationDate           OCTET STRING (SIZE(8..15)) OPTIONAL,
      bdbIndex                  OCTET STRING (SIZE(0..65535)) OPTIONAL,
      bdbProcessedLevel         INTEGER(0..255) OPTIONAL,
      bdbProduct                SEQUENCE {
            bdbProductOwner     INTEGER(0..65535),
            bdbProductType      INTEGER(0..65535)
      } OPTIONAL,
      bdbPurpose                INTEGER(0..255) OPTIONAL,
      bdbQuality                INTEGER(0..255) OPTIONAL,
      bdbValidityPeriod         OCTET STRING (SIZE(15..31)) OPTIONAL,
      birCreationDate           OCTET STRING (SIZE(8..15)) OPTIONAL,
      birCreator                OCTET STRING (SIZE(0..65535)) OPTIONAL,
```

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```
        birIndex                OCTET STRING (SIZE(0..65535)) OPTIONAL,
        birPayload              OCTET STRING (SIZE(0..65535)) OPTIONAL,
        birValidityPeriod       OCTET STRING (SIZE(15..31)) OPTIONAL,
        sbFormat                SEQUENCE {
              sbFormatOwner     INTEGER(0..65535),
              sbFormatType INTEGER(0..65535)
        } OPTIONAL,
        bdb                     OCTET STRING (SIZE(0..4294967295)) OPTIONAL,
        children                SEQUENCE (SIZE(0..255)) OF
              child             SEQUENCE {
                    childBirPatronFormat      SEQUENCE {
                          childBirPatronFormatOwner INTEGER(0..65535),
                          childBirPatronFormatType  INTEGER(0..65535)
                    },
                    childBir    OCTET STRING (SIZE(0..4294967295))
              }
        },
        sb    OCTET STRING (SIZE(0..4294967295)) OPTIONAL
}
```

12.13 Patron format conformance statement

12.13.1 Identifying information

Required Information	Patron format reference
Patron name	See 12.1
Patron identifier	See 12.2
Patron format name	See 12.3
Patron format identifier	See 12.4
Patron format ASN.1 object identifier	See 12.5
Domain of use description	See 12.6
Patron format version	See 12.7
CBEFF version	See 12.8

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12.13.2 CBEFF-defined data elements and abstract values

CBEFF data element name	Mandatory/ optional/ absent	Patron format field name	Abstract values specified?	Encodings specified?
CBEFF_BDB_format_owner	Mandatory if a BDB is present	bdbFormatOwner	Yes	Yes
CBEFF_BDB_format_type	Mandatory if a BDB is present	bdbFormatType	Yes	Yes
CBEFF_BDB_encryption_options	Mandatory if a BDB is present	bdbEncryption	Yes	Yes
CBEFF_BIR_integrity_options	Mandatory	birIntegrity	Yes	Yes
CBEFF_BDB_subheader_count	Mandatory	numChildren	Yes	Yes
CBEFF_BDB_biometric_type	Optional	bdbBiometricType	Yes	Yes
CBEFF_BDB_biometric_subtype	Optional	bdbBiometricSubtype	Yes	Yes
CBEFF_BDB_challenge_response	Optional	bdbChallengeResponse	Yes	Yes
CBEFF_BDB_creation_date	Optional	bdbCreationDate	Yes	Yes
CBEFF_BDB_index	Optional	bdbIndex	Yes	Yes
CBEFF_BDB_product_owner	Optional	bdbProductOwner	Yes	Yes
CBEFF_BDB_processed_level	Optional	bdbProcessedLevel	Yes	Yes
CBEFF_BDB_product_type	Optional	bdbProductType	Yes	Yes
CBEFF_BDB_purpose	Optional	bdbPurpose	Yes	Yes
CBEFF_BDB_quality	Optional	bdbQuality	Yes	Yes
CBEFF_BDB_validity_period	Optional	bdbValidityPeriod	Yes	Yes
CBEFF_BIR_creation_date	Optional	birCreationDate	Yes	Yes
CBEFF_BIR_creator	Optional	birCreator	Yes	Yes
CBEFF_BIR_index	Optional	birIndex	Yes	Yes
CBEFF_BIR_patron_format_owner	Mandatory if no BDB is present	childBirPatronFormatOwner	Yes	Yes
CBEFF_BIR_patron_format_type	Mandatory if no BDB is present	childBirPatronFormatType	Yes	Yes
CBEFF_BIR_payload	Optional	birPayload	Yes	Yes
CBEFF_SB_format_owner	Optional	sbFormatOwner	Yes	Yes
CBEFF_SB_format_type	Optional	sbFormatType	Yes	Yes
CBEFF_BIR_validity_period	Optional	birValidityPeriod	Yes	Yes
patron_header_version	Mandatory	patronHeaderVersion	Yes	Yes
CBEFF_version	Mandatory	cbeffVersion	Yes	Yes
BDB	Optional	bdb	Yes	Yes
SB	Optional	sb	Yes	Yes

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12.13.3 Patron-defined data elements and abstract values

Patron format data element name	Mandatory/optional	Patron format field name	Abstract values specified?	Encodings specified?
fieldPresence	Mandatory	fieldPresence	Yes	Yes
childBir	Mandatory if no BDB is present	childBir	Yes	Yes

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13 Patron format specification: XML patron format

13.1 Patron

ISO/IEC JTC 1/SC 37

13.2 Patron identifier

257 (0101Hex). This has been allocated by the Registration Authority for ISO/IEC 19785-2.

13.3 Patron format name

ISO/IEC JTC 1/SC 37 XML patron format.

13.4 Patron format identifier

7 (0007 Hex). This has been registered in accordance with ISO/IEC 19785-2.

13.5 ASN.1 object identifier for this patron format

{iso registration-authority cbeff(19785) biometric-organization(0) jtc1-sc37(257) patron-format(1) xml(7)}

or, in XML value notation,

1.1.19785.0.257.1.7

13.6 Domain of use

This clause specifies a patron format based on XML that may be of general utility to applications that need to carry one or more BIRs in a simple or complex BIR structure and benefit from the use of XML over a binary format.

13.7 Version identifier

This patron format specification has a version identifier of (major 0, minor 0).

13.8 CBEFF version

This specification conforms to CBEFF version (major 2, minor 0).

13.9 General

13.9.1 This patron format is based on W3C XML 1.0. It supports all the mandatory and optional data elements specified in ISO/IEC 19785-1. It can support either a simple BIR or a complex BIR structure where each intermediate node or leaf of the structure is itself a BIR (called a "child BIR").

13.9.2 Most fields in this patron format are optional. Some mandatory and optional fields are represented by XML elements, others are represented by attributes of XML elements. The presence of an optional field in a BIR is signalled by simply including the corresponding element or attribute, and its absence is signalled by simply omitting the corresponding element or attribute.

13.9.3 Special encodings are specified for integers (see 13.17), octet strings (see 13.18), and date and time-of-the-day abstract values (see 13.19).

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13.9.4 An instance of a BIR or child BIR contains either a BDB or one or more BIR children, but never contains both.

13.9.5 An extension mechanism is specified, which enables the inclusion of application-specific data (not standardized) within a BIR or child BIR (see 13.11.1.6).

13.10 Specification

13.10.1 In the rest of this clause, the terms "element" and "attribute" are used with the meaning of "XML element" and "XML attribute", respectively.

13.10.2 The namespace with the name "**urn:oid:1.1.19785.0.257.1.7.0**" is called the patron format namespace of this patron format. This namespace name corresponds to the following ASN.1 object identifier:

{iso registration-authority cbeff(19785) biometric-organization(0) jtc1-sc37(257) patron-format(1) xml(7) namespace(0)}

13.10.3 All elements defined in this patron format have the patron format namespace name. All attribute names are unqualified.

13.10.4 An instance of a BIR shall be represented as a **<bir>** element (see 13.11).

13.10.5 The **<bir>** element may be the root of an XML document, but this is not required.

13.10.6 The portion of the XML document consisting of the **<bir>** element and its whole content shall be valid according to the XML schema provided in 13.22.

NOTE 1 – Validity according to that XML schema does not imply that the **<bir>** element satisfies all the requirements in the normative text of this specification, as there are some requirements that cannot be (or are not) formally expressed in the XML schema.

NOTE 2 – When the **<bir>** element is the root of an XML document, the UTF-8 character encoding is recommended for the XML document, because it will usually produce a smaller encoding.

13.10.7 The abstract value NO VALUE AVAILABLE, for any CBEFF data element that supports this abstract value, shall be encoded as the omission of the corresponding element or attribute both in the **<bir>** element and in all of its ancestor **<bir>** elements.

NOTE – The inheritance mechanism specified in 13.14.2.1, 13.15.2.1 and 13.16.2.1 causes a data element of a BIR to inherit an abstract value (different from NO VALUE AVAILABLE) from its closest ancestor **<bir>** element that contains that element or attribute when the **<bir>** element in question does not contain it. If any **<bir>** element in a hierarchy of **<bir>** elements specifies an abstract value for a given data element, that abstract value can be overridden by a different abstract value in any of its descendant **<bir>** elements, but the overriding abstract value can never be NO VALUE AVAILABLE.

13.11 Element <bir>

13.11.1 Syntax

13.11.1.1 This element shall have no attributes, and shall have a content consisting of the following (in order):

a) an optional **<version>** element (see 13.12);

b) an optional **<cbeff-version>** element (see 13.13);

c) zero or more application-specific elements;

d) a mandatory **<bir-info>** element (see 13.14);

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e) an optional **<bdb-info>** element (see 13.15);

f) an optional **<sb-info>** element (see 13.16);

g) zero or more **<bir>** elements (see 13.11);

h) an optional **<bdb>** element – the content of this element shall be a valid representation of an octet string (see 13.18);

i) an optional **<sb>** element – the content of this element shall be a valid representation of an octet string.

13.11.1.2 The **<bdb>** element shall not be present if one or more child <**bir>** elements are present, and shall be present if no child <**bir>** elements are present.

13.11.1.3 The **<sb>** element shall be absent unless its presence is required by 13.14.2.2 or permitted by 13.15.2.3.

13.11.1.4 If the **<bdb>** element is present, then the **<bdb-info>** element shall also be present.

13.11.1.5 If the **<sb>** element is present, then the **<sb-info>** element shall also be present.

13.11.1.6 The number of application-specific elements and their name, namespace name, attributes, and content are not defined in this patron format specification. However, the namespace name of those elements shall be different from the patron format namespace name (see 13.10.2).

13.11.2 Semantics

13.11.2.1 This element is either a complex or a simple BIR, depending on which child elements are present. If a child **<bdb>** element is present, this element is a simple BIR. If one or more child **<bir>** elements are present, this element is a complex BIR.

13.11.2.2 The elements **<version>**, **<cbeff-version>**, **<bir-info>**, **<bdb-info>**, and **<sb-info>** and their content form the standard biometric header of the BIR.

13.11.2.3 The **<version>** element (if present) carries the major and minor version number of this patron format.

13.11.2.4 The **<cbeff-version>** element (if present) carries the major and minor version number of the CBEFF standard.

13.11.2.5 Each **<bir>** element is a whole BIR (of the same patron format) that is a child BIR of the BIR.

13.11.2.6 The **<bdb>** element (if present) carries the biometric data block (BDB) of the BIR.

NOTE – A **<bdb>** element and a **<bir>** element cannot coexist as children of the same **<bir>** element (see 13.11.1.2).

13.11.2.7 The **<sb>** element (if present) carries the security block (SB) of the BIR.

NOTE – A **<sb>** element can coexist with either a **<bir>** element or a **<bdb>** element that is a child of the same **<bir>** element.

13.11.2.8 The **<bir-info>** element carries information about both the BIR and (possibly) about its descendant BIRs (if the **<bir>** element has one or more child **<bir>** elements), as specified in 13.14.2.1.

13.11.2.9 The **<bdb-info>** element (if present) carries information about either the BDB of the BIR (if the **<bir>** element has a child **<bdb>** element) or about the BDBs of the descendant BIRs that have a child **<bdb>** element (if the **<bir>** element has one or more child **<bir>** elements), as specified in 13.15.2.1.

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13.11.2.10 The **<sb-info>** element (if present) carries information about either the SB of the BIR (if the **<bir>** element has a child **<sb>** element) or about the SBs of the descendant BIRs that have a child **<sb>** element (if the **<bir>** element has one or more child **<bir>** elements but no child **<sb>** element), as specified in 13.16.2.1.

13.12 Element <version>

13.12.1 Syntax

This element shall have the following attributes:

a) **major** (required) – the value of this attribute shall be a valid representation of an integer in the range 0 to 15 (see 13.17);

b) **minor** (required) – the value of this attribute shall be a valid representation of an integer in the range 0 to 15.

13.12.2 Semantics

13.12.2.1 This element represents the data element CBEFF_patron_header_version, and carries the (major and minor) version number of the patron format. The number assigned to this version of the patron format is major 0, minor 0.

13.12.2.2 The **major** attribute represents the major version number (0 in this version).

13.12.2.3 The **minor** attribute represents the minor version number (0 in this version).

13.12.2.4 If this element is not present, the attribute values **major="0" minor="0"** are implied.

13.12.2.5 A child **<bir>** element shall have the same (major and minor) version number as its parent **<bir>** element.

NOTE – This implies that the **<version>** element, if present in a child **<bir>** element, has to carry the same values as the **<version>** element in the parent **<bir>** element. This is equivalent to omitting the **<version>** element. Therefore, this element is normally omitted in child **<bir>** elements.

13.13 Element <cbeff-version>

13.13.1 Syntax

This element shall have the following attributes:

a) **major** (required) – the value of this attribute shall be a valid representation of an integer in the range 0 to15 (see 13.17);

b) **minor** (required) – the value of this attribute shall be a valid representation of an integer in the range 0 to 15.

13.13.2 Semantics

13.13.2.1 This element represents the data element CBEFF_version, and carries the version number of the CBEFF standard supported by this patron format. The number assigned to the version of CBEFF supported by this patron format is major=2, minor=0.

13.13.2.2 The **major** attribute represents the major version number (2 in this version).

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13.13.2.3 The **minor** attribute represents the minor version number (0 in this version).

13.13.2.4 If this element is not present, the attribute values **major="2" minor="0"** are implied.

13.13.2.5 A child **<bir>** element shall have the same CBEFF version number (major and minor) as its parent **<bir>** element.

NOTE – Thus, the **<cbeff-version>** element is normally omitted from all child **<bir>** elements, as it would be redundant.

13.14 Element <bir-info>

13.14.1 Syntax

13.14.1.1 This element shall have the following attributes:

a) **integrity** (required) – the value of this attribute shall be one of the character strings in the third cell of the corresponding row of Table 13.1;

b) **creation-date** (optional) – the value of this attribute shall be a valid representation of a date and time of the day (see 13.19);

c) **not-valid-before** (optional) – the value of this attribute shall be a valid representation of a date and time of the day;

d) **not-valid-after** (optional) – the value of this attribute shall be a valid representation of a date and time of the day.

13.14.1.2 This element shall have a content consisting of the following (in order):

a) an optional **<creator>** element – the content of this element shall be a string of ISO/IEC 10646 characters;

b) an optional **<index>** element – the content of this element shall be a valid representation of a universally unique identifier (see 13.20), and shall not inherit its value from any other level BIR;

c) an optional **<payload>** element – the content of this element shall be a valid representation of an octet string, and shall not inherit its value from any other level BIR.

13.14.2 Semantics

13.14.2.1 The **<bir-info>** element carries information about the BIR. In addition, if the BIR has one or more child BIRs (the **<bir>** element has one or more child **<bir>** elements), the information carried by the attributes and child elements of the **<bir-info>** element is inherited by those child BIRs except where overridden by a corresponding attribute or child element of the **<bir-info>** element of a child BIR. The information inherited by a BIR applies to that BIR, and (if the BIR has itself child BIRs) is further inherited by its child BIRs in the same way (and so on recursively).

NOTE – Since the **integrity** attribute is required and the **<bir-info>** element is mandatory in all **<bir>** elements, inheritance of the **integrity** attribute can never occur.

13.14.2.2 The **integrity** attribute indicates whether integrity information about this BIR is provided within the security block (SB) of the BIR (the child **<sb>** element of the parent **<bir>** element of this **<bir-info>** element).

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NOTE – This information may consist of a digital signature or MAC, a reference to a key or certificate, an encrypted key (with or without a reference to the key used to encrypt that key), or other parameters of the digital signing (or MAC) process.

13.14.2.3 If the value of the **`integrity`** attribute is "**`true`**", then the parent **`<bir>`** element of this **`<bir-info>`** element shall have a child **`<sb>`** element.

13.14.2.4 Table 13.1 specifies the correspondence between the attributes and child elements of this element and CBEFF data elements, and specifies the supported abstract values and their encodings (see also 13.10.7).

NOTE - This element represents all CBEFF data elements whose name begins with "CBEFF_BIR_".

Table 13.1 – BIR information

CBEFF data element name	XML attribute or element	Supported abstract values and encodings	Reference
CBEFF_BIR_integrity_options	integrity	The following abstract values are supported. The abstract values shall be encoded as shown below. NO INTEGRITY: "**`false`**" INTEGRITY: "**`true`**"	
CBEFF_BIR_creation_date	creation_date	All date and time-of-the-day abstract values permitted by CBEFF are supported. The abstract values shall be encoded as specified in 13.19.	
CBEFF_BIR_validity_period (lower end)	not_valid_before	All date and time-of-the-day abstract values permitted by CBEFF are supported. The abstract values shall be encoded as specified in 13.19.	
CBEFF_BIR_validity_period (upper end)	not_valid_after	All date and time-of-the-day abstract values permitted by CBEFF are supported. The abstract values shall be encoded as specified in 13.19.	
CBEFF_BIR_creator	<creator>	All ISO/IEC 10646 character strings are supported. The character string shall be encoded as the string itself.	
CBEFF_BIR_index	<index>	All well-formed UUIDs are supported. The UUIDs shall be encoded as specified in 13.20. Shall not inherit its value from any other BIR level.	

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CBEFF data element name	XML attribute or element	Supported abstract values and encodings	Reference
CBEFF_BIR_payload	<payload>	All octet strings are supported. The octet strings shall be encoded as specified in 13.18. Shall not inherit its value from any other BIR level.	

13.15 Element <bdb-info>

13.15.1 Syntax

13.15.1.1 This element shall have the following attributes:

a) **`format-owner`** (optional) – the value of this attribute shall be a valid representation of an integer in the range 1 to 65535 (see 13.17);

b) **`format-type`** (optional) – the value of this attribute shall be a valid representation of an integer in the range 1 to 65535;

c) **`encryption`** (optional) – the value of this attribute shall be one of the character strings in the third cell of the corresponding row of Table 13.2;

d) **`creation-date`** (optional) – the value of this attribute shall be a valid representation of a date and time of the day (see 13.19);

e) **`not-valid-before`** (optional) – the value of this attribute shall be a valid representation of a date and time of the day;

f) **`not-valid-after`** (optional) – the value of this attribute shall be a valid representation of a date and time of the day;

g) **`type`** (optional) – the value of this attribute shall be one of the character strings in the third cell of the corresponding row of Table 13.2;

h) **`subtype`** (optional) – the value of this attribute shall be one of the character strings in the third cell of the corresponding row of Table 13.2;

i) **`level`** (optional) – the value of this attribute shall be one of the character strings in the third cell of the corresponding row of Table 13.2;

j) **`product-owner`** (optional) – the value of this attribute shall be a valid representation of an integer in the range 1..65535 (see 13.17);

k) **`product-type`** (optional) – the value of this attribute shall be a valid representation of an integer in the range 1..65535;

l) **`purpose`** (optional) – the value of this attribute shall be one of the character strings in the third cell of the corresponding row of Table 13.2;

m) **`quality`** (optional) – the value of this attribute shall be a valid representation of an integer in the range –2..100 (see 13.17), as specified in the third cell of the corresponding row of Table 13.2.

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13.15.1.2 This element shall have a content consisting of the following (in order):

a) an optional **<challenge-response>** element – the content of this element shall be a valid representation of an octet string (see 13.18);

b) an optional **<index>** element – the content of this element shall be a valid representation of a universally unique identifier (see 13.20).

13.15.1.3 If the parent **<bir>** element has a child **<bdb>** element, then the **encryption** attribute shall be present in this **<bdb-info>** element unless it is present in the child **<bdb-info>** element of an ancestor **<bir>** element (see also 13.11.1.4).

13.15.1.4 If the parent **<bir>** element has a child **<bdb>** element, then the **format-owner** attribute shall be present in this **<bdb-info>** element unless it is present in the child **<bdb-info>** element of an ancestor **<bir>** element (see also 13.11.1.4).

13.15.1.5 If the parent **<bir>** element has a child **<bdb>** element, then the **format-type** attribute shall be present in this **<bdb-info>** element unless it is present in the child **<bdb-info>** element of an ancestor **<bir>** element (see also 13.11.1.4).

NOTE – The ancestor **<bir>** elements mentioned in the last three subclauses above need not be the same.

13.15.2 Semantics

13.15.2.1 If the BIR has a BDB (the **<bir>** element has a child **<bdb>** element), then the **<bdb-info>** element carries information about that BDB. Otherwise, the information carried by the attributes and child elements of the **<bdb-info>** element is inherited by all the BIRs that are children of the BIR except where overridden by a corresponding attribute or child element of the **<bdb-info>** element of a child BIR. The information inherited by a BIR with a BDB applies to that BDB, whereas the information inherited by a BIR that has itself child BIRs is further inherited by all the BIRs that are children of the BIR in the same way (and so on recursively).

13.15.2.2 If the BIR has a BDB and encryption is applied to that BDB (either by including the **encryption** attribute with the value "**true**" in the **<bdb-info>** element or by having the BIR inherit that attribute value from its parent BIR), then the BDB in the **<bdb>** element shall be encrypted.

13.15.2.3 If the BDB of a BIR is encrypted, information about the encryption process may be provided within the security block (SB) of that BIR (the child **<sb>** element of the parent **<bir>** element of this **<bir-info>** element).

NOTE – This information may consist of a reference to an encryption key, an encrypted key (with or without a reference to the key used to encrypt that key), or other parameters of the encryption process.

13.15.2.4 Table 13.2 specifies the correspondence between the attributes and child elements of this element and CBEFF data elements, and specifies the supported abstract values and their encodings (see also 13.10.7).

NOTE – This element represents all CBEFF data elements whose name begins with "CBEFF_BDB_".

Table 13.2 – BDB information

CBEFF data element name	XML attribute or element	Supported abstract values and encodings	Reference
CBEFF_BDB_format_owner	format_owner	All integers in the range 1 to 65535 are supported. The integers shall be encoded as specified in 13.17.	

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CBEFF data element name	XML attribute or element	Supported abstract values and encodings	Reference
CBEFF_BDB_format_type	format_type	All integers in the range 1 to 65535 are supported. The integers shall be encoded as specified in 13.17.	
CBEFF_BDB_encryption_options	encryption	The following abstract values are supported. The abstract values shall be encoded as shown below. NO ENCRYPTION: "**false**" ENCRYPTION: "**true**"	
CBEFF_BDB_creation_date	creation_date	All date and time-of-the-day abstract values permitted by CBEFF are supported. The abstract values shall be encoded as specified in 13.19.	
CBEFF_BDB_validity_period (lower end)	not_valid_before	All date and time-of-the-day abstract values permitted by CBEFF are supported. The abstract values shall be encoded as specified in 13.19.	
CBEFF_BDB_validity_period (upper end)	not_valid_after	All date and time-of-the-day abstract values permitted by CBEFF are supported. The abstract values shall be encoded as specified in 13.19.	
CBEFF_BDB_biometric_type	type	The following abstract values and all their unordered combinations are supported. A single abstract value shall be encoded as the corresponding string shown below. A combination of two or more abstract values shall be encoded as the concatenation of the corresponding strings, using a single space as separator. SCENT: "**scent**" DNA: "**dna**" EAR: "**ear**" FACE: "**face**" FINGER: "**finger**" FOOT: "**foot**" VEIN:	

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CBEFF data element name	XML attribute or element	Supported abstract values and encodings	Reference
		"**vein**" HAND GEOMETRY: "**hand-geometry**" IRIS: "**iris**" RETINA: "**retina**" VOICE: "**voice**" GAIT: "**gait**" KEYSTROKE: "**keystroke**" LIP MOVEMENT: "**lip-movement**" SIGNATURE OR SIGN: "**signature-sign**"	
CBEFF_BDB_biometric_subtype	subtype	The following abstract values are supported. The abstract values shall be encoded as shown below. LEFT: "**left**" RIGHT: "**right**" LEFT THUMB: "**left-thumb**" LEFT POINTER FINGER: "**left-pointer**" LEFT MIDDLE FINGER: "**left-middle**" LEFT RING FINGER: "**left-ring**" LEFT LITTLE FINGER: "**left-little**" RIGHT THUMB: "**right-thumb**" RIGHT POINTER FINGER: "**right-pointer**" RIGHT MIDDLE FINGER: "**right-middle**" RIGHT RING FINGER: "**right-ring**" RIGHT LITTLE FINGER: "**right-little**" LEFT PALM: "**left-palm**"	

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CBEFF data element name	XML attribute or element	Supported abstract values and encodings	Reference
		LEFT BACK OF HAND: **"left-back-of-hand"** LEFT WRIST: **"left-wrist"** RIGHT PALM: **"right-palm"** RIGHT BACK OF HAND: **"right-back-of-hand"** RIGHT WRIST: **"right-wrist"**	
CBEFF_BDB_processed_level	level	The following abstract values are supported. The abstract values shall be encoded as shown below. RAW: "**raw**" INTERMEDIATE: "**intermediate**" PROCESSED: "**processed**"	
CBEFF_BDB_product_owner	product_owner	All integers in the range 1 to 65535 are supported. The integers shall be encoded as specified in 13.17.	
CBEFF_BDB_product_type	product_type	All integers in the range 1 to 65535 are supported. The integers shall be encoded as specified in 13.17.	
CBEFF_BDB_purpose	purpose	The following abstract values are supported. The abstract values shall be encoded as shown below. VERIFY: "**verify**" IDENTIFY: "**identify**" ENROLL: "**enroll**" ENROLL FOR VERIFICATION ONLY: "**enroll-verify**" ENROLL FOR IDENTIFICATION ONLY: "**enroll-identify**" AUDIT: "**audit**"	
CBEFF_BDB_quality	quality	The following abstract values are supported. The integers shall be encoded as	

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CBEFF data element name	XML attribute or element	Supported abstract values and encodings	Reference
		specified in 13.17. The other abstract values shall be encoded as shown below. INTEGER QUALITY NOT SUPPORTED BY BDB CREATOR: "**-2**" QUALITY SUPPORTED BY BDB CREATOR BUT NOT SET: "**-1**"	
CBEFF_BDB_challenge_response	<challenge_response>	All octet strings are supported. The octet strings shall be encoded as specified in 13.18. Shall appear only in BIRs that have a BDB.	
CBEFF_BDB_index	<index>	All well-formed UUIDs are supported. The UUIDs shall be encoded as specified in 13.20 Shall appear only in BIRs that have a BDB.	

13.16 Element <sb-info>

13.16.1 Syntax

13.16.1.1 This element shall have the following attributes:

a) **format-owner** (optional) – the value of this attribute shall be a valid representation of an integer in the range 1 to 65535 (see 13.17);

b) **format-type** (optional) – the value of this attribute shall be a valid representation of an integer in the range 1 to 65535

and shall have an empty content.

13.16.1.2 If the parent **<bir>** element has a child **<sb>** element, then the **format-owner** attribute shall be present in this **<sb-info>** element unless it is present in the child **<sb-info>** element of an ancestor **<bir>** element (see also 13.11.1.5).

13.16.1.3 If the parent **<bir>** element has a child **<sb>** element, then the **format-type** attribute shall be present in this **<sb-info>** element unless it is present in the child **<sb-info>** element of an ancestor **<bir>** element (see also 13.11.1.5).

NOTE 1 – The ancestor **<bir>** elements mentioned in the last two subclauses above need not be the same.

NOTE 2 – When the parent **<bir>** element has a child **<sb>** element and one omits both attributes of the **<sb-info>** element, the **<sb-info>** element will have no attributes and an empty content. Omission of the **<sb-info>** element is not allowed in this case (see 13.11.1.5).

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13.16.2 Semantics

13.16.2.1 If the BIR has an SB (the **<bir>** element has a child **<sb>** element), then the **<sb-info>** element carries information about that SB. In addition, if the BIR has one or more child BIRs (the **<bir>** element has one or more child **<bir>** elements), the information carried by the child element of the **<sb-info>** element is inherited by those child BIRs except where overridden by a corresponding child element of the **<sb-info>** element of a child BIR. The information inherited by a BIR with an SB applies to that SB, and (if the BIR has itself child BIRs) is further inherited by its child BIRs in the same way (and so on recursively).

13.16.2.2 Table 13.3 specifies the correspondence between the attributes and child elements of this element and CBEFF data elements, and specifies the supported abstract values and their encodings (see also 13.10.7).

NOTE – This element represents all CBEFF data elements whose name begins with "CBEFF_SB_".

Table 13.3 – SB information

CBEFF data element name	XML attribute or element	Supported abstract values and encodings	Reference
CBEFF_SB_format_owner	format_owner	All integers in the range 1 to 65535 are supported. The integers shall be encoded as specified in 13.17.	
CBEFF_SB_format_type	format_type	All integers in the range 1 to 65535 are supported. The integers shall be encoded as specified in 13.17.	

13.17 Representation of Integers

13.17.1 A non-negative integer shall be represented as a string of one or more ISO/IEC 10646 characters in the range DIGIT ZERO to DIGIT NINE ("**0**" to "**9**") in decimal notation.

13.17.2 A negative integer shall be represented as the corresponding positive integer, preceded by a HYPHEN-MINUS character ("**-**").

13.17.3 Arbitrary whitespace is allowed before and after the encoding, but is forbidden inside the encoding.

13.18 Representation of Octet Strings

13.18.1 An octet string shall be represented as a string of the following ISO/IEC 10646 characters:

a) LATIN CAPITAL LETTER A to LATIN CAPITAL LETTER Z;

b) LATIN SMALL LETTER A to LATIN SMALL LETTER Z;

c) DIGIT ZERO to DIGIT NINE;

d) PLUS SIGN;

e) SOLIDUS;

f) EQUALS SIGN.

forming the Base64 encoding of the octet string (see IETF RFC 2045), with all whitespace removed.

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13.18.2 Arbitrary whitespace is allowed before and after the encoding, but is forbidden inside the encoding.

13.19 Representation of Date and Time of the Day

13.19.1 A date and time of the day shall be represented as a string of ISO/IEC 10646 characters in the following format, which conforms to ISO 8601.

13.19.2 The encoding shall be the concatenation of three or more of the following components (in order):

a) the "year" component, consisting of the year encoded in four digits ("**2000**" to "**2999**") ;

b) the "month" component, consisting of the month encoded in two digits ("**01**" to "**12**");

c) the "day" component, consisting of the day encoded in two digits ("**01**" to "**31**");

d) the letter "**T**";

e) the "hour" component, consisting of the hour encoded in two digits ("**00**" to "**23**");

f) the "minute" component, consisting of the minute encoded in two digits ("**00**" to "**59**");

g) the "second" component, consisting of the second encoded in two digits ("**00**" to "**59**");

h) the letter "**Z**".

13.19.3 The "year", "month" and "day" components shall be present.

13.19.4 The letter "**T**" shall be present if and only if the "hour" component is present.

13.19.5 The "second" component shall only be present if the "minute" component is present, and the "minute" component shall only be present if the "hour" component is present.

13.19.6 The letter "**Z**" shall be present whether or not the "hour" component is present.

NOTE This letter indicates that the date and time of the day are UTC.

13.19.7 Arbitrary whitespace is allowed before and after the encoding, but is forbidden inside the encoding.

13.20 Representation of Universally Unique Identifiers

NOTE: The following subclauses describe the same representation of a UUID as is specified in ISO/IEC 9834-8, clause 8. An example of such a representation is: f81d4fae-7dec-11d0-a765-00a0c91e6bf6

13.20.1 A universally unique identifier (UUID) shall be represented as a string of ISO/IEC 10646 characters. Each string shall contain exactly 36 characters from the union of the following sets:

a) DIGIT ZERO to DIGIT NINE ("**0**" to "**9**"), each representing a hexadecimal digit 0 through 9;

b) LATIN CAPITAL LETTER A to LATIN CAPITAL LETTER F ("**A**" to "**F**"), each representing a hexadecimal digit A through F;

c) LATIN SMALL LETTER A to LATIN SMALL LETTER F ("**a**" to "**f**"), each representing a hexadecimal digit A through F; and

d) HYPHEN-MINUS ("**-**").

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13.20.2 Each of the positions 9, 14, 19, and 24 of an encoding shall contain a character from set (d). The other 32 positions shall contain characters from sets (a) through (c).

13.20.3 Arbitrary whitespace is allowed before and after the encoding, but is forbidden inside the encoding.

13.21 Patron format conformance statement

13.21.1 Identifying information

Required Information	Patron format reference
Patron name	See 13.1
Patron identifier	See 13.2
Patron format name	See 13.3
Patron format identifier	See 13.4
Patron format ASN.1 object identifier	See 13.5
Domain of use description	See 13.6
Patron format version	See 13.7
CBEFF version	See 13.8

13.21.2 CBEFF-defined data elements and abstract values

CBEFF data element name	Mandatory/ optional/ absent	Patron format field name	Abstract values specified?	Encodings specified?
CBEFF_BDB_format_owner	Mandatory (specified or inherited) if a BDB is present	**`format_owner`** attribute of **`<bdb-info>`**	Yes	Yes
CBEFF_BDB_format_type	Mandatory (specified or inherited) if a BDB is present	**`format_type`** attribute of **`<bdb-info>`**	Yes	Yes
CBEFF_BDB_encryption_options	Mandatory (specified or inherited) if a BDB is present	**`encryption`** attribute of **`<bdb-info>`**	Yes	Yes
CBEFF_BIR_integrity_options	Mandatory	**`integrity`** attribute of **`<bir-info>`**	Yes	Yes
CBEFF_BDB_subheader_count	Mandatory	implied in the number of occurrences of the child **`<bir>`** element	No (implied)	No (implied)
CBEFF_BDB_biometric_type	Optional	**`type`** attribute of **`<bdb-info>`**	Yes	Yes
CBEFF_BDB_biometric_subtype	Optional	**`subtype`** attribute of **`<bdb-info>`**	Yes	Yes
CBEFF_BDB_challenge_response	Optional	**`<challenge-response>`** child of **`<bdb-info>`**	Yes	Yes

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CBEFF data element name	Mandatory/ optional/ absent	Patron format field name	Abstract values specified?	Encodings specified?
CBEFF_BDB_creation_date	Optional	**creation_date** attribute of **<bdb-info>**	Yes	Yes
CBEFF_BDB_index	Optional	**<index>** child of **<bdb-info>**	Yes	Yes
CBEFF_BDB_product_owner	Optional	**product_owner** attribute of **<bdb-info>**	Yes	Yes
CBEFF_BDB_processed_level	Optional	**level** attribute of **<bdb-info>**	Yes	Yes
CBEFF_BDB_product_type	Optional	**product_type** attribute of **<bdb-info>**	Yes	Yes
CBEFF_BDB_purpose	Optional	**purpose** attribute of **<bdb-info>**	Yes	Yes
CBEFF_BDB_quality	Optional	**quality** attribute of **<bdb-info>**	Yes	Yes
CBEFF_BDB_validity_period	Optional	**not_valid_before** and **not_valid_after** attributes of **<bdb-info>**	Yes	Yes
CBEFF_BIR_creation_date	Optional	**creation_date** attribute of **<bir-info>**	Yes	Yes
CBEFF_BIR_creator	Optional	**<creator>** child of **<bir-info>**	Yes	Yes
CBEFF_BIR_index	Optional	**<index>** child of **<bdb-info>**	Yes	Yes
CBEFF_BIR_patron_format_owner	N/A		No	No
CBEFF_BIR_patron_format_type	N/A		No	No
CBEFF_BIR_payload	Optional	**<payload>** child of **<bdb-info>**	Yes	Yes
CBEFF_SB_format_owner	Optional	**format_owner** attribute of **<sb-info>**	Yes	Yes
CBEFF_SB_format_type	Optional	**format_type** attribute of **<sb-info>**	Yes	Yes
CBEFF_BIR_validity_period	Optional	**not_valid_before** and **not_valid_after** attributes of **<bir-info>**	Yes	Yes
patron_header_version	Optional	**major** and **minor** attributes of **<version>**	Yes	Yes
CBEFF_version	Optional	**major** and **minor** attributes of **<cbeff-version>**	Yes	Yes
BDB	Optional	**<bdb>**	Yes	Yes
SB	Optional	**<sb>**	Yes	Yes

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13.21.3 Patron-defined data elements and abstract values

Patron format data element name	Mandatory/optional	Patron format field name	Abstract values specified?	Encodings specified?
None				

13.22 XML schema of the patron format

```
<?xml version='1.0' encoding="utf-8"?>
    <xs:schema
        xmlns:xs="http://www.w3.org/2001/XMLSchema"
        xmlns=" urn:oid:1.1.19785.0.257.1.7.0"
        targetNamespace=" urn:oid:1.1.19785.0.257.1.7.0"
        elementFormDefault="qualified"
        attributeFormDefault="unqualified">

        <xs:element name="bir" type="BIR"/>

        <xs:complexType name="BIR">
            <xs:sequence>
                <xs:element name="version" type="Version" minOccurs="0"/>
                <xs:element name="cbeff-version" type="Version" minOccurs="0"/>
                <xs:any namespace="##other" processContents="skip"
                        minOccurs="0" maxOccurs="unbounded"/>
                <xs:element name="bir-info" type="BIR-info"/>
                <xs:element name="bdb-info" type="BDB-info" minOccurs="0"/>
                <xs:element name="sb-info" type="SB-info" minOccurs="0"/>
                <xs:element name="bir" type="BIR"
                        minOccurs="0" maxOccurs="unbounded"/>
                <xs:element name="bdb" type="xs:base64Binary" minOccurs="0"/>
                <xs:element name="sb" type="xs:base64Binary" minOccurs="0"/>
            </xs:sequence>
        </xs:complexType>

        <xs:complexType name="Version">
            <xs:attribute name="major" type="Version-number" use="required"/>
            <xs:attribute name="minor" type="Version-number" use="required"/>
        </xs:complexType>

        <xs:complexType name="BIR-info">
            <xs:sequence>
                <xs:element name="creator" type="xs:string" minOccurs="0"/>
                <xs:element name="index" type="UUID" minOccurs="0"/>
                <xs:element name="payload" type="xs:base64Binary" minOccurs="0"/>
            </xs:sequence>
            <xs:attribute name="integrity" type="Boolean" use="required"/>
            <xs:attribute name="creation-date" type="Date-time"/>
            <xs:attribute name="not-valid-before" type="Date-time"/>
            <xs:attribute name="not-valid-after" type="Date-time"/>
        </xs:complexType>

        <xs:complexType name="BDB-info">
            <xs:sequence>
                <xs:element name="challenge-response" type="xs:base64Binary" minOccurs="0"/>
                <xs:element name="index" type="UUID" minOccurs="0"/>
            </xs:sequence>
            <xs:attribute name="format-owner" type="Registered-int"/>
            <xs:attribute name="format-type" type="Registered-int"/>
            <xs:attribute name="encryption" type="Boolean"/>
            <xs:attribute name="creation-date" type="Date-time"/>
            <xs:attribute name="not-valid-before" type="Date-time"/>
            <xs:attribute name="not-valid-after" type="Date-time"/>
            <xs:attribute name="type" type="Multiple-types"/>
            <xs:attribute name="subtype" type="Subtype"/>
            <xs:attribute name="level" type="Processed-level"/>
            <xs:attribute name="product-owner" type="Registered-int"/>
            <xs:attribute name="product-type" type="Registered-int"/>
            <xs:attribute name="purpose" type="Purpose"/>
            <xs:attribute name="quality" type="Quality"/>
        </xs:complexType>
```


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```
<xs:complexType name="SB-info">
        <xs:attribute name="format-owner" type="Registered-int"/>
        <xs:attribute name="format-type" type="Registered-int"/>
</xs:complexType>

<xs:simpleType name="Version-number">
        <xs:restriction base="xs:integer">
                <xs:minInclusive value="0"/>
                <xs:maxInclusive value="15"/>
        </xs:restriction>
</xs:simpleType>

<xs:simpleType name="Registered-int">
        <xs:restriction base="xs:integer">
                <xs:minInclusive value="1"/>
                <xs:maxInclusive value="65535"/>
        </xs:restriction>
</xs:simpleType>

<xs:simpleType name="Quality">
        <xs:restriction base="xs:integer">
                <xs:minInclusive value="-2"/>
                <xs:maxInclusive value="100"/>
        </xs:restriction>
</xs:simpleType>

<xs:simpleType name="Boolean">
        <xs:restriction base="xs:token">
                <xs:enumeration value="false"/>
                <xs:enumeration value="true"/>
        </xs:restriction>
</xs:simpleType>

<xs:simpleType name="Single-type">
        <xs:restriction base="xs:token">
                <xs:enumeration value="scent"/>
                <xs:enumeration value="dna"/>
                <xs:enumeration value="ear "/>
                <xs:enumeration value="face"/>
                <xs:enumeration value="finger"/>
                <xs:enumeration value="foot"/>
                <xs:enumeration value="vein"/>
                <xs:enumeration value="hand-geometry"/>
                <xs:enumeration value="iris"/>
                <xs:enumeration value="retina"/>
                <xs:enumeration value="voice"/>
                <xs:enumeration value="gait"/>
                <xs:enumeration value="keystroke"/>
                <xs:enumeration value="lip-movement"/>
                <xs:enumeration value="signature-sign"/>
        </xs:restriction>
</xs:simpleType>

<xs:simpleType name="Multiple-types">
        <xs:list itemType="Single-type"/>
</xs:simpleType>

<xs:simpleType name="Single-any-subtype">
        <xs:restriction base="xs:token">
                <xs:enumeration value="left"/>
                <xs:enumeration value="right"/>
                <xs:enumeration value="thumb"/>
                <xs:enumeration value="pointer-finger"/>
                <xs:enumeration value="middle-finger"/>
                <xs:enumeration value="ring-finger"/>
                <xs:enumeration value="little-finger"/>
        </xs:restriction>
</xs:simpleType>

<xs:simpleType name="Single-vein-only-subtype">
        <xs:restriction base="xs:token">
                <xs:enumeration value="left-vein"/>
                <xs:enumeration value="right-vein"/>
                <xs:enumeration value="palm"/>
                <xs:enumeration value="back-of-hand"/>
                <xs:enumeration value="wrist"/>
                <xs:enumeration value="reserved1"/>
```

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```
                <xs:enumeration value="reserved2"/>
            </xs:restriction>
        </xs:simpleType>

        <xs:simpleType name="Multiple-any-subtypes">
            <xs:list itemType="Single-any-subtype"/>
        </xs:simpleType>

        <xs:simpleType name="Multiple-vein-only-subtypes">
            <xs:list itemType="Single-vein-only-subtype"/>
        </xs:simpleType>

        <xs:simpleType name="Subtype">
            <xs:union memberTypes=
            "Multiple-any-subtypes Multiple-vein-only-subtypes"/>
        </xs:simpleType>

        <xs:simpleType name="Processed-level">
            <xs:restriction base="xs:token">
                <xs:enumeration value="raw"/>
                <xs:enumeration value="intermediate"/>
                <xs:enumeration value="processed"/>
            </xs:restriction>
        </xs:simpleType>

        <xs:simpleType name="Purpose">
            <xs:restriction base="xs:token">
                <xs:enumeration value="verify"/>
                <xs:enumeration value="identify"/>
                <xs:enumeration value="enroll"/>
                <xs:enumeration value="enroll-verify"/>
                <xs:enumeration value="enroll-identify"/>
                <xs:enumeration value="audit"/>
            </xs:restriction>
        </xs:simpleType>

        <xs:simpleType name="Date-time">
            <xs:restriction base="xs:token">
                <xs:pattern value="[0-9]{8}(T[0-9]{2}([0-9]{2}([0-9]{2})?)?)?Z"/>
            </xs:restriction>
        </xs:simpleType>

        <xs:simpleType name="UUID">
            <xs:restriction base="xs:token">
                <xs:pattern value="[a-fA-F0-9]{8}\-([a-fA-F0-9]{4}\-){3}[a-fA-F0-9]{12}"/>
            </xs:restriction>
        </xs:simpleType>

    </xs:schema>
```

NOTE NO VALUE AVAILABLE is encoded by the absence of optional fields in the XML encoding. There is little value in, for example, having the following string appear in a record: <level> no value available <level>.

13.23 ASN.1 schema of the patron format

```
 XML-PATRON-FORMAT DEFINITIONS
 XER INSTRUCTIONS
 AUTOMATIC TAGS ::=
 BEGIN
IMPORTS BDBCreationDate, BDBIndex, BiometricDataBlock, BIRCreationDate, BIRIndex,
CBEFFVersion, ChallengeResponse, Creator, Date-Time,  EncryptionOptions,
HeaderVersion, IntegrityOptions, Payload, ProcessedLevel, Purpose, Quality,
SecurityBlock
      FROM CBEFF-DATA-ELEMENTS
      {iso standard 19785 modules(0) types-for-cbeff-data-elements(1)};

 BIR ::= SEQUENCE {
      version       HeaderVersion OPTIONAL,
      cbeff-version CBEFFVersion OPTIONAL,
      elem-list     [UNTAGGED] SEQUENCE OF elem UTF8String (CONSTRAINED BY
                    {/* Shall conform to the "AnyElementFormat" specified
                        in ITU-T Rec. X.693 | ISO/IEC 8825-4, clause 19 */}),
      bir-info      BIR-info,
```


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```
      bdb-info      BDB-info OPTIONAL,
      sb-info       SB-info OPTIONAL,
      bir-list      [UNTAGGED] SEQUENCE OF bir BIR,
      bdb           [BASE64] BiometricDataBlock OPTIONAL,
      sb            [BASE64] SecurityBlock OPTIONAL
      }

BIR-info ::= SEQUENCE {
      creation-date    [ATTRIBUTE] BIRCreationDate OPTIONAL,
      integrity        [ATTRIBUTE] IntegrityOptions,
      not-valid-after  [ATTRIBUTE] Date-Time OPTIONAL,
      not-valid-before [ATTRIBUTE] Date-Time OPTIONAL,
      creator          Creator OPTIONAL,
      index            UUID OPTIONAL,
      payload          [BASE64] Payload OPTIONAL
      }

BDB-info ::= SEQUENCE {
      creation-date      [ATTRIBUTE] Date-Time OPTIONAL,
      encryption         [ATTRIBUTE] EncryptionOptions OPTIONAL,
      format-owner       [ATTRIBUTE] Registered-int OPTIONAL,
      format-type        [ATTRIBUTE] Registered-int OPTIONAL,
      level              [ATTRIBUTE] ProcessedLevel OPTIONAL,
      not-valid-after    [ATTRIBUTE] Date-Time OPTIONAL,
      not-valid-before   [ATTRIBUTE] Date-Time OPTIONAL,
      product-owner      [ATTRIBUTE] Registered-int OPTIONAL,
      product-type       [ATTRIBUTE] Registered-int OPTIONAL,
      purpose            [ATTRIBUTE] Purpose OPTIONAL,
      quality            [ATTRIBUTE] Quality OPTIONAL,
      subtype            [ATTRIBUTE] Subtype OPTIONAL,
      type               [ATTRIBUTE] [LIST] SEQUENCE OF Single-type OPTIONAL,
      challenge-response [BASE64] ChallengeResponse OPTIONAL,
      index              UUID OPTIONAL
      }

SB-info ::= SEQUENCE {
      format-owner [ATTRIBUTE] Registered-int OPTIONAL,
      format-type  [ATTRIBUTE] Registered-int OPTIONAL
      }

Registered-int ::= INTEGER (1..65535)

Single-type ::= ENUMERATED {
      scent,
      dna,
      ear,
      face,
      finger,
      foot,
      hand-geometry,
      vein,
      iris,
      retina,
      voice,
      gait,
      keystroke,
      lip-movement,
      signature-sign
      }

Single-any-subtype ::= ENUMERATED {
    left,
    right,
    thumb,
    pointer-finger,
    middle-finger,
    ring-finger,
    little-finger
```

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```
    }

Single-vein-only-subtype ::= ENUMERATED {
    left-vein,
    right-vein,
    palm,
    back-of-hand,
    wrist,
    reserved1,
    reserved2
    }

Multiple-any-subtypes ::= [LIST] SEQUENCE OF Single-any-subtype

Multiple-vein-only-subtypes ::= [LIST] SEQUENCE OF Single-vein-only-subtype

Subtype ::= [USE-UNION] CHOICE {
    multiple-any-subtypes       [NAME AS CAPITALIZED] Multiple-any-subtypes,
    multiple-vein-only-subtypes [NAME AS CAPITALIZED] Multiple-vein-only-subtypes
    }

UUID ::= VisibleString (SIZE(36)) (FROM "0123456789abcdefABCDEF-")

ENCODING-CONTROL XER
      GLOBAL-DEFAULTS MODIFIED-ENCODINGS
      GLOBAL-DEFAULTS CONTROL-NAMESPACE
                "http://www.w3.org/2001/XMLSchema-instance" PREFIX "xsi"
      NAMESPACE ALL, ALL IN ALL AS "urn:oid:1.1.19785.0.257.1.7.0" PREFIX "ns"
      NOT NAMESPACE ALL IN BIR-info, ALL IN BDB-info, ALL IN SB-info
      NAMESPACE index, payload IN BIR-info, index, challenge-response IN BDB-info
                AS "urn:oid:1.1.19785.0.257.1.7.0" PREFIX "ns"
      TEXT BDB-info.type.*:ALL, Single-any-subtype:ALL,
            Single-vein-only-subtype:ALL, BDB-info.level:ALL, BDB-info.purpose:ALL
      ANY-ELEMENT BIR.elem-list.elem EXCEPT ABSENT
                "urn:oid:1.1.19785.0.257.1.7.0"
      NAME BIR AS LOWERCASED
END
```

13.24 An example of a simple BIR in XML encoding (complying with the ASN.1 schema, the XSD schema, and the normative textual description)

```
<?xml version='1.0' encoding="utf-8"?>
    <bir xmlns="urn:oid:1.1.19785.0.257.1.7.0">
    <version major="0" minor="0"/>
    <cbeff-version major="2" minor="0"/>

        <bir-info
                integrity="true"
                creation-date="20040302T150315Z"
                not-valid-before="20040302T15Z"
                not-valid-after="20040302T4415Z">
                <creator>
                        ABCDE
                </creator>
                <index>
                        86CA3100-43F3-0D23-A941-7871E519A00E ==
                </index>
                <payload>
                        1Aa873ab3auE61cCa91723d6P==
                </payload>
        </bir-info>

        <bdb-info
                format-owner="51"
                format-type="88"
                encryption="true"
                creation-date="20040302T15Z"
                not-valid-before="20040302T15Z"
                not-valid-after="20040302T15Z"
```

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```
                type="iris"
                subtype="left"
                level="processed"
                product-owner="16"
                product-type="2"
                purpose="verify"
                quality="100">
                <challenge-response>
                        1Aa873ab3auE61cCa91723d6P==
                </challenge-response>
                <index>
                        1Aa873ab3auE61cCa91723d6P==
                </index>
        </bdb-info>

        <sb-info
                format-owner="51"
                format-type="99"/>

        <bdb>
                1Aa873ab3auE61cCa91723d6P==
        </bdb>

        <sb>
                1Aa873ab3auE61cCa91723d6P==
        </sb>
</bir>
```

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13.25 An example of a complex BIR in XML encoding (complying with the ASN.1 schema, the XSD schema, and the normative textual description)

```
<?xml version='1.0' encoding="utf-8"?>
    <bir  xmlns="urn:oid:1.1.19785.0.257.1.7.0">
        <version major="0" minor="0"/>
        <cbeff-version major="2" minor="0"/>

        <bir-info
                integrity="true"
                creation-date="20040302T150315Z"
                not-valid-before="20040302T15Z"
                not-valid-after="20040302T4415Z">
                <creator>
                        ABCDE
                </creator>
                <index>
                        86CA3100-43F3-0D23-A941-7871E519A00E ==
                </index>
                <payload>
                        1Aa873ab3auE61cCa91723d6P==
                </payload>
        </bir-info>

        <sb-info
                format-owner="51"
                format-type="99"/>

        <bir>
                <bir-info
                        integrity="false"
                        creation-date="20040302Z"
                        not-valid-before="20040302T15Z"
                        not-valid-after="20040302T1533Z">
                        <creator>
                                ABCDE
                        </creator>
                        <index>
                                1Aa873ab3auE61cCa91723d6P==
                        </index>
                        <payload>
                                1Aa873ab3auE61cCa91723d6P==
                        </payload>
                </bir-info>

                <bdb-info
                        format-owner="51"
                        format-type="88"
                        encryption="true"
                        creation-date="20040302T15Z"
                        not-valid-before="20040302T15Z"
                        not-valid-after="20040302T15Z"
                        type="iris"
                        subtype="left"
                        level="processed"
                        product-owner="16"
                        product-type="2"
                        purpose="verify"
                        quality="100">
                        <challenge-response>
                                1Aa873ab3auE61cCa91723d6P==
                        </challenge-response>
                        <index>
                                1Aa873ab3auE61cCa91723d6P==
                        </index>
                </bdb-info>

                <sb-info
                        format-owner="51"
                        format-type="99"/>

                <bdb>
                        1Aa873ab3auE61cCa91723d6P==
                </bdb>
```


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```
        <sb>
                1Aa873ab3auE61cCa91723d6P==
        </sb>
</bir>

<bir>
        <bir-info
                integrity="true"
                creation-date="20040302T15Z"
                not-valid-before="20040302T15Z"
                not-valid-after="20040302T15Z">
            <creator>
                ABCDE
            </creator>
            <index>
                1Aa873ab3auE61cCa91723d6P==
            </index>
            <payload>
                1Aa873ab3auE61cCa91723d6P==
            </payload>
        </bir-info>

        <bdb-info
                format-owner="51"
                format-type="88"
                type="iris"
                level="processed"
                product-owner="16"
                product-type="2"
                purpose="enroll">
            <challenge-response>
                1Aa873ab3auE61cCa91723d6P==
            </challenge-response>
            <index>
                1Aa873ab3auE61cCa91723d6P==
            </index>
        </bdb-info>

        <sb-info
                format-owner="51"
                format-type="99"/>

        <bir>
            <bir-info  integrity="false"/>

            <bdb-info
                encryption="true"
                creation-date="20040302T15Z"
                not-valid-before="20040302T15Z"
                not-valid-after="20040302T15Z"
                subtype="left"
                quality="100"/>

            <sb-info
                format-owner="51"
                format-type="99"/>

            <bdb>
                1Aa873ab3auE61cCa91723d6P==
            </bdb>

            <sb>
                1Aa873ab3auE61cCa91723d6P==
            </sb>
        </bir>

        <bir>
            <bir-info  integrity="false"/>

            <bdb-info
                encryption="true"
                creation-date="20040302T15Z"
                not-valid-before="20040302T15Z"
                not-valid-after="20040302T15Z"
                subtype="right"
```

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```
                    quality="90"/>
            <sb-info
                    format-owner="51"
                    format-type="99"/>

            <bdb>
                    1Aa873ab3auE61cCa91723d6P==
            </bdb>

            <sb>
                    1Aa873ab3auE61cCa91723d6P==
            </sb>
        </bir>

        <sb>
            1Aa873ab3auE61cCa91723d6P==
        </sb>
    </bir>

    <sb>
        1Aa873ab3auE61cCa91723d6P==
    </sb>
</bir>
```

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Annex A
(informative)

Guidelines on the specification of patron formats

A.1 General

A.1.1 This part of ISO/IEC 19785 requires that a CBEFF patron format be defined that encodes some or all of the values of some or all of the CBEFF data elements.

A.1.2 For CBEFF data elements defined as mandatory, there is a requirement to encode at least one of the specified abstract values, possibly by a null encoding.

NOTE – Inclusion of an additional abstract value denoting NO VALUE AVAILABLE is not permitted (see ISO/IEC 19785-1, subclauses 6.5.1 through 6.5.4).

A.1.3 For CBEFF data elements defined as optional, the patron format has 3 options:

1) The data element can be supported only for one abstract value (which may be the NO VALUE AVAILABLE abstract value). In this case, a null encoding is used (zero bits).

2) The CBEFF data element can be encoded as a mandatory field in the patron format.

   i) The format would then require NO VALUE AVAILABLE to be encoded as an explicit encoding of that field.

   ii) The format may, but need not, define encodings of that field for other CBEFF-defined abstract values.

   iii) The format may, but need not, define encodings of that field for additional abstract values defined by the format.

3) The CBEFF data element can be encoded as an optional field in the patron format.

   i) The abstract value NO VALUE AVAILABLE would then normally be encoded by the absence of the optional field, but any other abstract value can be chosen as the default.

   ii) The format may, but need not, define encodings of that field for other CBEFF-defined abstract values.

   iii) The format may, but need not, define encodings of that field for additional abstract values defined by the format.

   iv) The format has to specify how the presence or absence of this optional field is determined.

A.1.4 Patrons that are defining a new patron format should give due consideration to inclusion of optional CBEFF data elements and abstract values that may be required for the successful processing of BDB formats that are expected to be associated with the new patron format.

A.2 Basic encoding mechanisms

A.2.1 Where only a single value of a CBEFF data element (for example, the NO VALUE AVAILABLE or NO ENCRYPTION abstract values) is to be supported, this can be encoded using zero bits - that is, by not having

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a field for that data element. This would be the normal support for optional CBEFF data elements that are to be supported only with the NO VALUE AVAILABLE value.

A.2.2 Where multiple values are to be supported (either because the CBEFF patron wishes to support more than one value of a CBEFF data element or because a mandatory CBEFF data element is being encoded) this can be done in many ways.

A.2.3 The simplest form of encoding is a fixed-length field (not necessarily a multiple of eight bits) with a distinct encoding for each supported value. Any further encodings of the fixed length field can either be reserved, or can be used to carry values that are not CBEFF data element values, but are determined by the CBEFF patron.

A.2.4 If there are encodings of the fixed-length field that do not correspond to CBEFF data element values or to values defined by the CBEFF patron, then the patron format would normally specify that such encodings should not be generated, and should be treated as NO VALUE AVAILABLE on reading. (This is equivalent to saying that these encodings are reserved for future use.)

A.2.5 Another common form of encoding is to use a single "presence bit" to indicate whether a field is present. If absent, then one of the values being supported is implied. (This will usually be the NO VALUE AVAILABLE value**,** but can in principle be any CBEFF-defined or patron-defined value). If present, the field would again be fixed length, and would encode the remaining supported values.

A.2.6 This can generalize into what is called a Huffman encoding, in which one bit is used to represent the most commonly used value, and an increasing number of bits are used to represent increasingly uncommon values.

A.3 Octet-alignment

A.3.1 There is no requirement for the fields of a patron format to be an integral multiple of eight bits, nor to start on an octet boundary.

A.3.2 Decisions to include padding bits, or to use octet alignment in the patron format specification, are taken by the CBEFF patron.

A.3.3 If padding bits are included, it will be normal to require that they be set to a fixed value when generated (typically zero), and are ignored on reading.

A.4 Length fields

A.4.1 All CBEFF patron formats are required to be an integral number of octets in the complete encoding, but are not required to be self-delimiting.

A.4.2 Self-delimiting means that the end of an encoding can always be determined using only knowledge of the encoding itself. This can be achieved by the use of one or more length fields, or by particular terminating patterns, or by a combination of these and other mechanisms, or by specifying the patron format as being of fixed length. Normally, however, a patron format encoding (a BIR) will be included in a database, a C-structure, or a message between systems, where the delimitation of the BIR will be provided by the containing mechanism.

A.5 CBEFF data element values and patron format fields

A.5.1 There is no requirement for a one-to-one correspondence between CBEFF data elements and patron format fields.

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A.5.2 For example, if five values of one CBEFF data element and three values of a second CBEFF data element are to be supported, this requires fifteen distinct encodings that can, if desired, be provided as the values of a single 4-bit field, rather than as the values of two separate 3-bit and 2-bit fields. This would be a decision taken by the CBEFF patron when defining the CBEFF patron format.

A.6 Historically used encodings of certain abstract values

Earlier, non-ISO versions of CBEFF specified abstract values and encodings for the data elements equivalent to CBEFF_BDB_biometric_type and CBEFF_BDB_biometric_subtype. Patron formats requiring compatibility with these encodings should specify them as described in Table A.1 and Table A.2.

Table A.1 – Historical abstract values and encodings for biometric type

Abstract value	Encoding (hex)
Multiple Biometrics Used	'000001'
Facial Features	'000002'
Voice	'000004'
Fingerprint	'000008'
Iris	'000010"
Retina	'000020'
Hand Geometry	'000040'
Signature Dynamics	'000080'
Keystroke Dynamics	'000100'
Lip Movement	'000200'
Thermal Face Image	'000400'
Thermal Hand Image	'000800'
Gait	'001000'
Body Odor	'002000'
DNA	'004000'
Ear Shape	'008000'
Finger Geometry	'010000'
Palm Print	'020000'
Vein Pattern	'040000'
Foot Print	‘080000’

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Table A.2 – Historical abstract values and encodings for biometric subtype

b8 b7 b6 b5 b4 b3 b2 b1	Biometric Subtype
0 0 0 0 0 0 0 0	No information given
0 1	Right
1 0	Left
0 0 0	No meaning
0 0 1	Thumb
0 1 0	Pointer finger
0 1 1	Middle finger
1 0 0	Ring finger
1 0 1	Little finger
x x x	Reserved for future use

A.7 Variable length data elements

A.7.1 CBEFF defines certain data elements (for example, CBEFF_BDB_challenge_response and CBEFF_BIR_creator) that can only be encoded as variable length encodings if all abstract values are to be supported. These data elements support abstract values that are strings of transparent octets, or of ISO/IEC 10646 characters.

A.7.2 Patron formats should insure that when variable length fields are encoded in SBHs it is possible to easily determine the location of the BDB. This may require a field that encodes the length of the entire SBH.

A.8 Security Blocks

A.8.1 Earlier, non-ISO versions of CBEFF defined abstract values of MAC and SIGNATURE for the INTEGRITY data element. Those versions of CBEFF defined an unstructured "signature block", requiring that the specific message authentication code or digital signature algorithm be inferred from the domain of use. In addition, if encryption was used, those versions of CBEFF did not provide a standard way of conveying the parameters of the encryption (such as algorithms, key references, or session keys) in the BIR.

A.8.2 This version of CBEFF defines the security block (SB) as the top level of a structure containing security information for the BIR, which may include BDB encryption information (algorithms and parameters), BIR integrity information (algorithms, parameters, and a signature or MAC), or both.

A.8.3 CBEFF also defines data elements for an SB format owner and an SB format identifier, which are supported by the CBEFF Registration Authority and together provide a universally unique identification for any SB format, analogous with BDB format identifiers. Each SB format owner / SB format identifier pair identifies the specification of the information in the SB of a BIR and the format of the SB. For example, if an SB format supports the encryption of a BDB using any of several specified encryption algorithms, that SB format would specify encodings of the SB such that processes that need to decrypt a BDB would be able to determine which algorithm (with what parameters) and which key to use. Similarly, if an SB format supports the use of MACs to insure the integrity of a BIR, that SB format would specify the SB such that a processor could use information encoded in the SB to verify the BIR's integrity.

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