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Information technology — Common Biometric Exchange Formats Framework

Part 1: Data element specification

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee IST/44, Biometrics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Part 1: Data element specification

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

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, SC 37, *Biometrics*.

This second edition cancels and replaces the first edition (ISO/IEC 19785-1:2006), which has been technically revised.

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 3: Patron format specifications*

— *Part 4: Security block format specifications*

This is the second ISO/IEC standard on CBEFF. Previous versions were published by the National Institute of Standards and Technology (an agency of the government of the United States of America) and the Biometric Consortium Working Group. Since the last official non-ISO/IEC release was designated Version 1.1, the first version of this ISO/IEC 19785-1 International Standard was designated Version 2.0, and this version is designated Version 3.0. This is to distinguish the versions of CBEFF products in the marketplace. Version 3.0 is fully backward compatible with Version 2.0.

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Introduction

The Common Biometric Exchange Formats Framework (CBEFF) promotes interoperability of biometric-based applications and systems by specifying standard structures for biometric information records (BIRs) and a set of abstract data elements and values that can be used to create the header part of a CBEFF-compliant BIR.

A biometric information record (BIR) is an encoding in accordance with a CBEFF patron format (see below). It is a unit of biometric data for storage in a database or for interchange between systems or parts of systems. A BIR always has at least two parts: a) a standard biometric header (SBH); b) at least one biometric data block (BDB). It may also have a third part called the security block (SB). CBEFF places no requirements on the content and encoding of a BDB except that its length is to be an integral number of octets; the several parts of ISO/IEC 19794 specify standardized BDB formats for a number of biometric types.

The primary purpose of CBEFF is to define abstract data elements (data elements with a set of defined abstract values, with their semantics) that are expected to be of general utility as parts of the SBH in biometric information records. This part of ISO/IEC 19785 defines these data elements.

A CBEFF patron format is defined for a particular domain of use. A CBEFF patron format is a full bit-level specification of encodings that can carry some or all of the abstract values of the CBEFF data elements defined in this part of ISO/IEC 19785 (possibly with additional abstract values determined by the CBEFF patron), together with one or more biometric data blocks (BDBs) containing biometric data. It is intended that there be a limited number of CBEFF patron formats in any given domain of use. However, new technologies may evolve that need new encoding rules (or support of more or different CBEFF data elements) and hence may require new CBEFF patron formats for a given domain of use.

CBEFF also has a requirement that a Biometric Registration Authority exists to assign unique identifiers to biometric organizations, to biometric data block (BDB) formats, to security block (SB) formats, and to CBEFF patron format specifications (see below), to publish them where appropriate, and to ensure that no conflicts occur between identifiers.

CBEFF introduces the concept of assigning a unique identifier to a biometric organization. A CBEFF biometric organization is any organization, public or private, that requests and receives a biometric organization identifier from the Biometric Registration Authority.

CBEFF also introduces the concept of a CBEFF patron. A CBEFF patron is an organization (registered as a biometric organization) that specifies or intends to specify one or more CBEFF patron formats in an open and public manner. Only public standards organizations such as a standards body, working group, or industry consortium can register as CBEFF patrons (other CBEFF biometric organizations are not CBEFF patrons). A CBEFF patron obtains a biometric organization identifier from the Biometric Registration Authority but has privileges beyond those of ordinary CBEFF biometric organizations: it can define, register, and publish one or more CBEFF patron formats. The biometric organization identifier of a CBEFF patron can (but need not) be encoded in BIRs conforming to the patron formats defined by that CBEFF patron.

CBEFF also defines the concept of a CBEFF biometric data block (BDB) format owner. A CBEFF BDB format owner is an organization (registered as a CBEFF biometric organization) that specifies one or more BDB format specifications. A BDB format owner obtains a CBEFF biometric organization identifier from the Biometric Registration Authority. A BDB format owner can be a public standards organization (that would, coincidentally, also qualify as a CBEFF patron) or any organization that has a need to define its own vendor-specific BDB formats, whether they are to be published or not.

A CBEFF BDB format owner defines one or more BDB formats and assigns a BDB format identifier that unambiguously identifies that BDB format within those defined by the BDB format owner. A BDB format identifier (and the corresponding format) may, but need not, be registered with the Biometric Registration Authority.

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CBEFF also defines the concepts of CBEFF biometric product owner as well as owners or vendors for the following specific product types: a) capture device; b) feature extraction algorithm; c) comparison algorithm; d) quality algorithm; e) compression algorithm; f) presentation attack detection (PAD) technique. A CBEFF biometric product owner is an organization (registered as a CBEFF biometric organization) that assigns a biometric product identifier to a biometric product. A biometric product owner can be a public standards organization such as a standards body, working group, or industry consortium (such an organization would, coincidentally, also qualify as a CBEFF patron), or any organization, such as a vendor or integrator, that has a need to assign biometric product identifiers to biometric products. A given organization can be the owner of one or more entities in one or more of these categories (also including BDB formats and SB formats as additional categories) with no restrictions on the number of entities owned by the organization or on which categories those entities may belong to.

A CBEFF biometric product owner assigns biometric product identifiers to one or more biometric products. The identified products can be hardware or software products or a combination of hardware and software. Examples of biometric products are biometric service providers (BSPs as defined by ISO/IEC 19784-1) and biometric transforming applications, as well as the specific product types mentioned in the previous paragraph. A biometric product identifier unambiguously identifies a biometric product within those that have been assigned an identifier by the biometric product owner. A biometric product identifier may, but need not, be registered with the Biometric Registration Authority.

A CBEFF capture device type owner, feature extraction algorithm owner, comparison algorithm owner, quality algorithm owner, compression algorithm owner, or PAD technique vendor assigns capture device type identifiers (or feature extraction algorithm identifiers, etc.) to one or more capture device types (or feature extraction algorithms, etc.), respectively. A capture device type identifier (or feature extraction algorithm identifier, etc.) unambiguously identifies a capture device type (or feature extraction algorithm, etc.) within those that have been assigned an identifier by the owner/vendor. A capture device type identifier (or feature extraction algorithm identifier, etc.) may, but need not, be registered with the Biometric Registration Authority.

CBEFF also defines the concept of a CBEFF security block (SB) format owner. A CBEFF security block format owner is an organization (registered as a CBEFF biometric organization) that assigns a security block format identifier to a security block format. A CBEFF security block format owner can be a public standards organization such as a standards body, working group, or industry consortium (such an organization would, coincidentally, also qualify as a CBEFF patron) or any organization, such as a vendor or integrator, that has a need to assign security block format identifiers to security block formats. A security block format owner can also, but need not, be a BDB format owner and vice versa.

A CBEFF security block format owner assigns security block format identifiers to one or more security block formats. A security block format identifier unambiguously identifies a security block format within those that have been assigned an identifier by the biometric security block format owner. A security block format identifier may, but need not, be registered with the Biometric Registration Authority.

This part of ISO/IEC 19785 specifies a simple CBEFF BIR structure (the format of which can only be inferred from the domain of use in which such a BIR is encountered) and a complex CBEFF BIR structure (the format of which can also only be inferred from the domain of use in which such a BIR is encountered) and gives the requirements for the specification of a CBEFF patron format based on either of these abstract data structures.

This part of ISO/IEC 19785 also specifies a self-identifying simple CBEFF BIR structure that includes mandatory data elements that identify the format of the structure.

This part of ISO/IEC 19785 also specifies a multiple CBEFF BIR structure upon which patrons can specify BIR formats that support one or more sub-BIRs. BIR formats conforming to this structure may or may not be self-identifying.

This part of ISO/IEC 19785 also specifies transformations of BIRs from one CBEFF patron format into a different CBEFF patron format.

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Clause 2 specifies the conformance requirements for CBEFF patrons that define CBEFF patron formats. It also specifies the conformance requirements for biometric transforming applications and for implementations claiming conformance to a specific patron format.

Clause 9 specifies the CBEFF-defined abstract data elements and the transformation requirements for each data element. CBEFF permits CBEFF patrons to specify additional abstract data elements.

Annex A is normative. It defines a patron format conformance statement that patrons are to complete and publish as part of their patron format specifications as assurance that the format fully complies with CBEFF requirements.

Annex B is informative. It explains the naming conventions used for data elements and abstract values specified in this part of ISO/IEC 19785 and in ISO/IEC 19785-3.

Annex C is informative. It identifies the CBEFF Registration Authority.

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Information technology — Common Biometric Exchange Formats Framework —

Part 1: Data element specification

1 Scope

This part of ISO/IEC 19785 defines structures and data elements for biometric information records (BIRs).

This part of ISO/IEC 19785 defines the concept of a domain of use to establish the applicability of a standard or specification that complies with CBEFF requirements.

This part of ISO/IEC 19785 defines the concept of a CBEFF patron format, which is a published BIR format specification that complies with CBEFF requirements, specified by a CBEFF patron.

This part of ISO/IEC 19785 defines the abstract values (and associated semantics) of a set of CBEFF data elements to be used in the definition of CBEFF patron formats.

This part of ISO/IEC 19785 specifies the use of CBEFF data elements by a CBEFF patron to define the content and encoding of a standard biometric header (SBH) to be included in a biometric information record (i.e. the definition of a CBEFF patron format).

This part of ISO/IEC 19785 provides the means for identification of the formats of the BDBs in a BIR but the standardization and interoperability of BDB formats are not in the scope of this part of ISO/IEC 19785. It also provides a means (the security block) for BIRs to carry information about the encryption of a BDB in the BIR and about integrity mechanisms applied to the BIR as a whole; the structure and content of security blocks are not in the scope of this part of ISO/IEC 19785. Further, the specification of encryption mechanisms for BDBs and of integrity mechanisms for BIRs is not in the scope of this part of ISO/IEC 19785.

This part of ISO/IEC 19785 specifies transformations from one CBEFF patron format to a different CBEFF patron format.

The encoding of the abstract values of CBEFF data elements to be used in the specification of CBEFF patron formats is not in the scope of this part of ISO/IEC 19785.

ISO/IEC 19785-3 specifies several patron format specifications for which ISO/IEC JTC 1 SC 37 is the CBEFF patron.

ISO/IEC 19785-4 specifies several security block format specifications for which ISO/IEC JTC 1 SC 37 is the CBEFF patron.

Protection of the privacy of individuals from inappropriate dissemination and use of biometric data is not in the scope of this part of ISO/IEC 19785 but may be subject to national regulation.

2 Conformance

2.1 A conforming CBEFF patron

a) shall define CBEFF patron formats in accordance with the requirements of 7.2 (CBEFF simple BIR structure) or in accordance with the requirements of 7.3 (CBEFF complex BIR structure) or in accordance with the requirements of 7.4 (self-identifying simple CBEFF BIR structure) or in accordance with the requirements of 7.5 (multiple CBEFF BIR structure).

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b) shall include in the specification of a patron format

1) the (human-readable) name of the CBEFF patron,

2) the decimal and hex values of the patron identifier assigned by the Biometric Registration Authority,

3) the (human-readable) patron format name,

4) the decimal and hex values of the patron format identifier that the CBEFF patron has assigned to this patron format,

5) the full ASN.1 object identifier for this patron format in both ASN.1 value notation and in XML value notation formats,

6) a description of the intended domain of use,

7) the version identifier of the patron format,

8) the version of CBEFF under which the patron format is specified,

9) the specification of the CBEFF-defined data elements and abstract values that are supported, and

10) the specification of any additional patron-defined data elements and abstract values that are supported, and

c) shall include a completed patron format conformance statement in its patron format specification.

2.2 A conforming biometric transformation implementation shall transform a BIR in one CBEFF patron format into a BIR in the same or a different CBEFF patron format in accordance with the requirements of Clause 8.

2.3 An implementation shall claim to support a (specified) CBEFF patron format if and only if it is capable of encoding abstract values into or decoding abstract values from that (specified) CBEFF patron format.

3 Normative references

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

ISO/IEC 2382-37, *Information technology — Vocabulary — Part 37: Biometrics*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 2382-37 and the following apply.

4.1
BDB format identifier
unique (within a biometric organization) identifier of a format for a BDB, where that format has been fully defined by a CBEFF biometric organization called the *BDB format owner* (4.2)

4.2
BDB format owner
CBEFF biometric organization that defines a BDB format and assigns a BDB format identifier to it

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4.3
biometric
pertaining to the field of biometrics

Note 1 to entry: "biometric" should never be used as a noun.

4.4
biometrics
automated recognition of individuals based on their behavioural and biological characteristics

4.5
biometric data block
BDB
block of data conforming to a defined format

Note 1 to entry: The BDB is normally opaque to the processing of an SBH and is not required to be self-delimiting.

4.6
biometric information record
BIR
data structure containing one or more BDBs together with information identifying the BDB formats and possibly further information such as whether a BDB is encrypted or the BIR is signed

4.7
biometric product
software or hardware product or a combination of software and hardware, which is assigned a biometric product identifier by a CBEFF biometric organization called the biometric product owner of the biometric product

4.8
biometric product identifier
identifier assigned to a biometric product that unambiguously identifies the biometric product within the biometric products that have been assigned an identifier by a biometric product owner

4.9
biometric product owner
CBEFF biometric organization that assigns biometric product identifiers to biometric products

Note 1 to entry: The organization may or may not be the manufacturer of the products.

4.10
biometric sample
analog or digital representation of biometric characteristics prior to biometric feature extraction

EXAMPLE A record containing the image of a finger is a biometric sample.

4.11
biometric template
set of stored biometric features comparable directly to probe biometric features

4.12
biometric transformation
transformation of a BIR in an initial patron format into a BIR in a target patron format

Note 1 to entry: This can (but need not) include processing of the content of the BDB (see 9.23 and 9.26).

4.13
capture device type
hardware product or a combination of software and hardware which is assigned a capture device type identifier by a CBEFF biometric organization

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4.14
capture device type identifier
identifier assigned to a capture device by a capture device type owner that unambiguously (given the capture device type owner) identifies the capture device

4.15
capture device type owner
CBEFF biometric organization that assigns capture device type identifiers to capture devices

Note 1 to entry: The organization may or may not be the manufacturer of the capture devices.

4.16
captured biometric sample
biometric sample resulting from a biometric capture process

4.17
CBEFF biometric organization
organization that is accepted for registration with the Biometric Registration Authority

Note 1 to entry: A CBEFF biometric organization can define BDB formats, assign BDB format identifiers to them, assign biometric product identifiers to biometric products, assign capture device identifiers to capture devices, assign feature extraction algorithm identifiers to feature extraction algorithms, assign comparison algorithm identifiers to comparison algorithms, assign quality algorithm identifiers to quality algorithms, assign compression algorithm identifiers to compression algorithms, assign PAD technique identifiers to PAD techniques, and define SB formats and assign SB format identifiers to them. If the organization is also accepted as a CBEFF patron, it can also define CBEFF patron formats.

4.18
CBEFF biometric organization identifier
unique identifier assigned to a CBEFF biometric organization when it registers with the Biometric Registration Authority

4.19
CBEFF patron
recognized standards development organization (which can be a standards body, working group, or industry consortium) that has been accepted for registration with the Biometric Registration Authority as a CBEFF patron and that can therefore specify one or more CBEFF patron formats

4.20
CBEFF patron format
format for a BIR that is fully defined by a CBEFF patron

Note 1 to entry: See 7.2, 7.3, 7.4, and 7.5.

4.21
CBEFF root header
CBEFF standard biometric header that precedes all other standard biometric headers in a complex CBEFF BIR structure or a multiple CBEFF BIR structure and which does not have a BDB associated with it

4.22
CBEFF sub-header
CBEFF standard biometric header in a complex CBEFF BIR structure that follows the CBEFF root header and that either immediately precedes a BDB or is followed by further CBEFF sub-headers

Note 1 to entry: See 7.3.

4.23
comparison algorithm
algorithm which is assigned a comparison algorithm identifier by a CBEFF biometric organization

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4.24
comparison algorithm identifier
identifier assigned to a comparison algorithm that unambiguously (given the comparison algorithm owner) identifies the algorithm

4.25
comparison algorithm owner
CBEFF biometric organization that assigns comparison algorithm identifiers to comparison algorithms

Note 1 to entry: The organization may or may not be the intellectual property owner of the comparison algorithms.

4.26
complex CBEFF BIR structure
structure for a CBEFF BIR that can contain multiple BDBs, each having its own SBH, plus additional SBHs that express the relationships among the BDBs

Note 1 to entry: See 7.3.

4.27
compression algorithm
algorithm which is assigned a compression algorithm identifier by a CBEFF biometric organization

4.28
compression algorithm identifier
identifier assigned to a compression algorithm that unambiguously (given the compression algorithm owner) identifies the algorithm

4.29
compression algorithm owner
CBEFF biometric organization that assigns compression algorithm identifiers to compression algorithms

Note 1 to entry: The organization may or may not be the intellectual property owner of the compression algorithms.

4.30
domain of use
application space defined by a CBEFF patron where a CBEFF patron format specified by that patron is intended to be used

4.31
feature extraction algorithm
algorithm which is assigned a feature extraction algorithm identifier by a CBEFF biometric organization

4.32
feature extraction algorithm identifier
identifier assigned to a feature extraction algorithm that unambiguously (given the feature extraction algorithm owner) identifies the algorithm

4.33
feature extraction algorithm owner
CBEFF biometric organization that assigns feature extraction algorithm identifiers to feature extraction algorithms

Note 1 to entry: The organization may or may not be the intellectual property owner of the feature extraction algorithms.

4.34
intermediate biometric sample
biometric sample resulting from intermediate biometric sample processing

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4.35
multiple CBEFF BIR structure
structure for a CBEFF BIR that can contain one or more BIRs and that is not a complex CBEFF BIR

Note 1 to entry: *complex CBEFF BIR structure* (4.26).

4.36
PAD technique
technique that is assigned a PAD technique identifier by a CBEFF biometric organization

4.37
PAD technique identifier
identifier assigned to a PAD technique that unambiguously (given the PAD technique vendor) identifies the technique

4.38
PAD technique vendor
CBEFF biometric organization that assigns PAD technique identifiers to PAD techniques

4.39
processed biometric sample
biometric sample suitable for comparison

4.40
quality algorithm
algorithm which is assigned a quality algorithm identifier by a CBEFF biometric organization

4.41
quality algorithm identifier
identifier assigned to a quality algorithm that unambiguously (given the quality algorithm owner) identifies the algorithm

4.42
quality algorithm owner
CBEFF biometric organization that assigns quality algorithm identifiers to quality algorithms

Note 1 to entry: The organization may or may not be the intellectual property owner of the quality algorithms.

Note 2 to entry: For the purposes of this part of ISO/IEC 19785, quality algorithm owner is generally synonymous with the term "quality algorithm vendor" used in some parts of ISO/IEC 19794.

4.43
security block
SB
block of data with a defined format that contains information concerning the encryption of BDBs in a BIR and the integrity of the BIR

4.44
security block format identifier
unique (within a biometric organization) identifier of a format for a security block, where that format has been fully defined by a CBEFF biometric organization (called the security block format owner)

4.45
security block format owner
CBEFF biometric organization that defines a security block format and assigns a security block format identifier to it

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