
**Information technology — Computer
graphics — Metafile for the storage and
transfer of picture description
information —**

**Part 3:
Binary encoding**

*Technologies de l'information — Infographie — Métafichier de stockage
et de transfert des informations de description d'images —*

Partie 3: Codage binaire

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 8632 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 8632-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 24, *Computer graphics and image processing*.

This second edition cancels and replaces the first edition (ISO/IEC 8632-3:1992), which has been technically revised. It also incorporates Amendment 1:1994 and Amendment 2:1995. Note that the previous edition of ISO/IEC 8632-3, published in 1992, was a first edition but second edition was indicated by error on its cover page and in the foreword.

ISO/IEC 8632 consists of the following parts, under the general title *Information technology — Computer graphics — Metafile for the storage and transfer of picture description information*:

- *Part 1: Functional specification*
- *Part 3: Binary encoding*
- *Part 4: Clear text encoding*

Annex A forms a normative part of this part of ISO/IEC 8632. Annexes B and C are for information only.

NOTE In previous editions of ISO/IEC 8632, Part 2 defined a Character Encoding. Part 2 was withdrawn in 1998, due to its lack of implementation and use.

Introduction

0.1 Purpose of the Binary Encoding

The Binary Encoding of the Computer Graphics Metafile (CGM) provides a representation of the Metafile syntax that can be optimized for speed of generation and interpretation, while still providing a standard means of interchange among computer systems. The encoding uses binary data formats that are much more similar to the data representations used within computer systems than the data formats of the other encodings.

Some of the data formats may exactly match those of some computer systems. In such cases processing is reduced very much relative to the other standardized encodings.

On most computer systems processing requirements for the Binary Encoding will be substantially lower than another encoding.

In cases where a computer system's architecture does not match the standard formats used in the Binary Encoding, and where absolute minimization of processing requirements is critical, and where interchange among dissimilar systems does not matter, it may be more appropriate to use a private encoding, conforming to the rules specified in clause 7 of ISO/IEC 8632-1.

0.2 Objectives

This encoding has the following features.

- a) Partitioning of parameter lists: metafile elements are coded in the Binary Encoding by one or more partitions (see clause 5); the first (or only) partition of an element contains the opcode (Element Class plus Element Id).
- b) Alignment of elements: every element begins on a word boundary. When the data of an element (whether partitioned or not) does not terminate on an even-octet boundary, then the following element is aligned by padding after the data of the preceding element with zero bits to the next even-octet boundary. A no-op element is available in this encoding. It is skipped and ignored by interpreters. It may be used to align data on machine-dependent record boundaries for speed of processing.
- c) Uniformity of format: all elements have an associated parameter length value. The length is specified as an octet count. As a result, it is possible to scan the metafile, without interpreting it, at high speed.
- d) Alignment of coordinate data: at default precisions and by virtue of alignment of elements, coordinate data always start on word boundaries. This minimises processing by ensuring, on a wide class of computing systems, that single coordinates do not have to be assembled from pieces of multiple computer words.
- e) Efficiency of encoding integer data: other data such as indexes, colour and characters are encoded as one or more octets. The precision of every parameter is determined by the appropriate precision as given in the Metafile Descriptor.
- f) Order of bit data: in each word, or unit within a word, the bit with the highest number is the most significant bit. Likewise, when data words are accessed sequentially, the least significant word follows the most significant.
- g) Extensibility: the arrangement of Element Class and Element Id values has been designed to allow future growth, such as new graphical elements.
- h) Format of real data: real numbers are encoded using either IEEE floating point representation or a metafile fixed-point representation.
- i) Run length encoding: if many adjacent cells have the same colour (or colour index) efficient encoding is possible. For each run a cell count is specified followed by the colour (or colour index).
- j) Packed list encoding: if adjacent colour cells do not have the same colour (or colour index) the metafile provides bit-stream lists in which the values are packed as closely as possible.

0.3 Relationship to other International Standards

The floating point representation of real data in this part of ISO/IEC 8632 is that in ANSI/IEEE 754-1986.

The representation of character data in this part of ISO/IEC 8632 follows the rules of ISO/IEC 646 and ISO 2022.

For certain elements, the CGM defines value ranges as being reserved for registration. The values and their meanings will be defined using the established procedures (see ISO/IEC 8632-1, 6.12.)

Information technology — Computer graphics — Metafile for the storage and transfer of picture description information —

Part 3: Binary encoding

1 Scope

This part of ISO/IEC 8632 specifies a binary encoding of the Computer Graphics Metafile. For each of the elements specified in ISO/IEC 8632-1, this part specifies an encoding in terms of data types.

For each of these data types, an explicit representation in terms of bits, octets and words is specified. For some data types, the exact representation is a function of the precisions being used in the metafile, as recorded in the Metafile Descriptor.

This encoding of the Computer Graphics Metafile will, in many circumstances, minimize the effort required to generate and interpret the metafile.

2 Conformance

Conformance of metafiles to ISO/IEC 8632 is defined in terms of profiles. A metafile conforms to this encoding if it conforms to a profile and meets the following criteria:

- Each metafile element described in this part shall be encoded in the manner described in this part of this International Standard and a profile.
- Metafile elements which are not defined in Part 1 or in this encoding are all encoded using the GENERALIZED DRAWING PRIMITIVE or ESCAPE metafile elements as appropriate. According to the profile rules of Part 1 (see clause 9, subclause 9.5.2.8), such elements shall either be profile defined or registered, in order that the profile be valid. Inclusion of private elements is not permissible in a valid profile of ISO/IEC 8632 and this encoding.
- Values of index parameters, which are used as enumeration selectors from lists of implicitly defined attribute values, shall either be standard, registered, or profile defined. The standard and registered values are all non-negative, and the profile-defined shall be negative. Use of private, implicitly-defined negative index values which are not profile defined is not permissible in a valid profile of ISO/IEC 8632 and this encoding.
- Values specified as being "reserved for registered values" shall not be used unless their meaning has been registered or standardized.
- Inclusion of non-graphical data in the metafile shall be accomplished with the APPLICATION DATA element or with the APPLICATION STRUCTURE ATTRIBUTE element.

See clause 10 for additional conformance information about this encoding.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 8632. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 8632 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*.

ISO 2022:1986, *Information processing — ISO 7-bit and 8-bit coded character sets — Code extension techniques*.

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