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

Part 1: Functional specification

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

Partie 1: Description fonctionnelle

Reference number
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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 8632-1 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 8632-1:1992), which has been technically revised. Note that the previous edition of ISO/IEC 8632-1, 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*

Annexes A, B, C, H and I form a normative part of this part of ISO/IEC 8632. Annexes D to G 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

The Computer Graphics Metafile provides a file format suitable for the storage and retrieval of picture information. The file format consists of a set of elements that can be used to describe pictures in a way that is compatible between systems of different architectures and devices of differing capabilities and design. This picture description includes the capability for describing static pictures. Static pictures are those where elements which may lead to dynamic effects (for example those leading to regeneration) are prohibited within the picture body.

0.2 Reasons for this International Standard

The main reasons for producing a standard computer graphics metafile are

a) to allow picture information to be stored in an organized way on a graphical software system;

b) to facilitate transfer of picture information between different graphical software system;

c) to enable picture information to be transferred between graphical devices;.

d) to enable picture information to be transferred between different computer graphics installations.

0.3 Design requirements

To reach these objectives, a number of design principles were adopted:

a) The metafile should provide a suitable set of elements for the transfer of a wide range of pictorial information.

b) The metafile should address the more usual and essential features found on graphical devices directly and should provide access to less common facilities via an escape mechanism.

c) The design of the metafile should not preclude extension of ISO/IEC 8632 at a later stage to cover facilities beyond those included in this version of the Standard. It should also not preclude further extensions to support future standards.

d) The metafile should be usable from GKS (Graphical Kernel System — ISO 7942) with both metafile input and metafile output functions. It should include the capability to support ISO 7942 (GKS) static picture capture.

e) ISO/IEC 8632 should address the needs of different applications that have conflicting requirements for size of metafile, speed of generation and interpretation, readability, editability and ease of transfer through different transport mechanisms.

0.4 Design criteria

The requirements of 0.3 were used to formulate the following criteria which were used to decide between different design possibilities.

a) Completeness: In any area of ISO/IEC 8632, the functionality specified by ISO/IEC 8632 should be complete in itself.

b) Conciseness: Redundant elements or parameters should be avoided.

c) Consistency: Contradictory elements should be avoided.

d) Extensibility: The ability to add new elements and generality to ISO/IEC 8632 should not be precluded.

e) Fidelity: The minimal results and characteristics of elements should be well defined.

f) Implementability: An element should be able to be supported efficiently on most host systems and/or graphics hardware.

g) Orthogonality: The elements of the metafile should be independent of each other, or any dependencies should be structured and well defined.

h) Predictability: ISO/IEC 8632 should be such that the recommended or proper use of standard elements guarantees the results of using a particular element.

i) Standard practice: Only those elements that reflect existing practice, that are necessary to support existing practice, or that are necessary to support proposed standards should be standardized.

j) Usefulness: Functions should be powerful enough to perform useful tasks.

k) Well-structured: The assumptions that elements make about each other should be minimized. An element should have a well-defined interface and a simply stated unconditional purpose. Multipurpose elements and side effects should be avoided.

0.5 Access to a metafile

The metafile has been designed so that, although its main usage is anticipated as being with completely sequential access, non-sequential access is also possible. Once the basic environment of the metafile has been established, individual pictures may be accessible if the medium, the encoding and the implementation support this form of access.

0.6 Generation and interpretation of metafiles

The specific mechanisms of metafile generation and interpretation are not described by ISO/IEC 8632, although it does describe the intended result of such interpretation. The basic set of metafile elements includes a capability for the addition of application-dependent data, which do not have graphical meaning and for which no intended interpretation results are described.

0.7 Distinction between formal specification and encodings

The functionality provided by the metafile is separated from the specification of any particular encoding format. ISO/IEC 8632 provides for both standard and private encodings of the elements described in this part of ISO/IEC 8632. Guidelines for private encodings are specified in annex E; these guidelines do not form part of ISO/IEC 8632.

Standardized encodings are specified in parts 3 and 4 of ISO/IEC 8632. Each of the standardized encodings is capable of representing the full functionality described in this part of ISO/IEC 8632. Translation between the standardized encodings is possible without loss of picture information, although subsequent translation back into the original encoding may not result in precisely the same data stream, due to different quantizations of precisions in the different encodings.

The binary encoding specified in ISO/IEC 8632-3 provides an encoding that requires least effort to generate and interpret on many systems, and which is relatively compact as well.

The clear text encoding specified in ISO/IEC 8632-4 provides an encoding that can be created, viewed and edited with standard text editors. It is therefore also suitable for transfer through networks that support only transfer of text files.

0.8 Relationship to other International Standards

ISO/IEC 8632 draws extensively for its model of a graphics system on GKS (Graphical Kernel System — ISO 7942). In addition, ISO/IEC 8632 specifies a metafile that may be used as a static picture-capture metafile by GKS.

This part of ISO/IEC 8632 uses font concepts and the font architecture defined in ISO/IEC 9541-1 for defining CGM references to fonts and font resources. The font properties of ISO/IEC 9541-1 are adopted, where appropriate, to define CGM mechanisms to provide information useful for font substitution between parties interchanging Metafiles. This part of ISO/IEC 8632 includes the minimum font description subset defined in ISO/IEC 9541-2. Clause 3

contains a number of glossary definitions that are taken from, and are identical to, those found in ISO/IEC 9541-1. This part of ISO/IEC 8632 also defines access to extended families of glyph based on the principles and procedures of ISO/IEC 10036.

This part of ISO/IEC 8632 uses a colorimetrically precise reference colour space to allow for interchange of precise colour specifications. It uses concepts defined in ISO/IEC 8613/Amd.2 which are based on CIE publications. ISO/IEC 8613/Amd.2 provides tutorial material on relevant definitions and colour concepts, which is useful for understanding the material in this Standard but is not incorporated into this Standard in that amount of detail.

The binary encoding specified in ISO/IEC 8632-3 employs the mechanism for representing floating point numbers specified in ANSI/IEEE 754-1986.

For certain elements, the CGM defines value ranges of parameters as being reserved for registration. The meanings of these values will be defined using the established procedures (see subclause 6.12) of the ISO International Registration Authority for Graphical Items. These procedures do not apply to values and value ranges defined as being reserved for private use; these values and ranges are not standardized. There is a very close relationship between many of the elements in ISO 8632 and a subset of the functions in the CGI (Computer Graphics Interface — ISO/IEC 9636).

0.9 Versions

ISO/IEC 8632 defines several versions of the Computer Graphics Metafile. A version is defined by a formal grammar and additional specifications contained in clauses 6, 7, and 8.

The following versions are currently defined: Version 1 (one); Version 2 (two); Version 3 (three); and Version 4 (four).

NOTE 1 A valid Version 3 metafile is also a valid Version 4 metafile. A valid Version 2 metafile is also a valid Version 3 metafile. A valid Version 1 metafile is also a valid Version 2 metafile.

NOTE 2 Version 1 metafiles are as defined by the original CGM standard, which was designated ISO 8632:1987. Version 2 metafiles are as defined by the first amendment to the CGM standard, which was designated ISO 8632:1987/Amd.1:1990. Version 3 metafiles are as defined by an amendment to Version 2 of the CGM standard. This amendment was originally designated ISO/IEC 8632:1987/Amd.3:1991, but was never published as an amendment. Instead all documents were consolidated to produce the 1992 revision of ISO 8632; Versions 1, 2, and 3 were all defined by the 1992 revision. Version 4 metafiles were originally defined by ISO/IEC 8632:1992/Amd.2-1995, which has been integrated into this (1999) revision of ISO/IEC 8632; Versions 1, 2, 3, and 4 are all defined by this revision

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

Part 1:
Functional specification

1 Scope

ISO/IEC 8632 provides a file format suitable for the storage and retrieval of picture description information. The file format consists of an ordered set of elements that may be used to describe pictures in a way that is compatible between systems of different architectures, compatible with devices of differing capabilities and design, and meaningful to application constituencies. This picture description includes the capability for describing static images.

The elements specified provide for the representation of a wide range of pictures on a wide range of graphical devices. The elements are organized into groups that delimit major structures (metafiles, pictures, and application structures), that specify the representations used within the metafile, that control the display of the picture, that perform basic drawing actions, that control the attributes of the basic drawing actions, that allow application-specific structuring to be overlaid on the graphical content, and that provide access to non-standard device capabilities.

The metafile is defined in such a way that, in addition to sequential access to the whole metafile, random access to individual pictures and individual context-independent application structures is well-defined. Applications which require random access to pictures and/or context-independent application structures within pictures may, within the metafile, define directories to these pictures and/or context-independent application structures. The metafile may then be opened and randomly accessed without interpreting the entire metafile.

In addition to a functional specification, two standard encodings of the metafile syntax are specified. These encodings address the needs of applications that require small metafile size plus minimum effort to generate and interpret, and maximum flexibility for a human reader or editor of the metafile.

This part of ISO/IEC 8632 describes the format using an abstract syntax. The remaining parts of ISO 8632 specify standardized encodings that conform to this syntax: ISO/IEC 8632-3 specifies a binary encoding; ISO/IEC 8632-4 specifies a clear text encoding.

2 Conformance

ISO/IEC 8632 defines specific criteria for conformance of metafiles, conformance of metafile generators, and conformance of metafile interpreters to this International Standard. Conformance is defined in terms of profiles. Specific conformance criteria for metafiles, generators, and interpreters are defined in clause 9. The criteria for valid, conforming profiles, plus a Model Profile, are specified in clause 9 and annex I. A methodology for defining valid profiles, and a pro forma (Profile Proforma, or PPF) for writing profiles, are defined in clause 9 and annex I.

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.*

ISO 2375:1985, *Data processing — Procedure for registration of escape sequences.*

ISO 7942:1985, *Information processing systems — Computer graphics — Graphical Kernel System (GKS) functional description.*

ISO 8601:1988, *Data elements and interchange formats — Information interchange — Representation of dates and time.*

ISO 8859-1:1987, *Information processing — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*.

ISO/IEC 9541-1:1991, *Information technology — Font information interchange — Part 1: Architecture.*

ISO/IEC 9541-2:1991, *Information technology — Font information interchange — Part 2: Interchange format.*

ISO/IEC 9636-1:1991, *Information technology — Computer graphics — Interfacing techniques for dialogues with graphical devices (CGI) — Functional specification — Part 1: Overview, profiles, and conformance.*

ISO/IEC 9636-2:1991, *Information technology — Computer graphics — Interfacing techniques for dialogues with graphical devices (CGI) — Functional specification — Part 2: Control.*

ISO/IEC 9636-3:1991, *Information technology — Computer graphics — Interfacing techniques for dialogues with graphical devices (CGI) — Functional specification — Part 3: Output.*

ISO/IEC 9636-4:1991, *Information technology — Computer graphics — Interfacing techniques for dialogues with graphical devices (CGI) — Functional specification — Part 4: Segments.*

ISO/IEC TR 9973:1988, *Information processing — Procedures for registration of graphical items.*

ISO/IEC 10036, *Information technology — Font information interchange — Procedure for registration of glyph and glyph collection identifiers.*

ISO/IEC TR 10000-1:1992, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 1: Framework.*

ISO/IEC TR 10000-2:1992, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 2: Taxonomy of OSI Profiles.*

ISO/IEC 10646-1:1993, *Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and Basic Multilingual Plane.*

ISO/IEC 10646-1:1993, Amd.2:1996, *Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and Basic Multilingual Plane, Amendment 2: UCS Transformation Format 8 (UTF-8).*

CCITT Recommendation T.4 (1988), *Standardization of group 3 facsimile apparatus for document transmission.*

CCITT Recommendation T.6 (1988), *Standardization of group 4 facsimile apparatus for document transmission.*

CIE Publication 15.2, *Colorimetry, 1986 (2nd edition).*

CIE Publication S002, *Colorimetric Observers, 1986 (1st edition).*