International Standard

ISO/IEC 18181-2

Information technology — JPEG XL image coding system —

Part 2: File format

Technologies de l'information — Système de codage d'images JPEG XL —

Partie 2: Format de fichiers

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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.

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 or www.iec.ch/members_experts/refdocs).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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This third edition cancels and replaces the second edition (ISO/IEC 18181-2:2024), which has been technically revised.

The main changes are as follows:

— 9.11 was added, specifying a new HDR gain map box;

— an informative note was added related to the combination of JUMBF and Brotli compression;

— clarifications were added to Annex A (JPEG bitstream reconstruction procedure).

A list of all parts in the ISO/IEC 18181 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Information technology — JPEG XL image coding system —

Part 2: File format

1 Scope

This document specifies the transport and container formats for JPEG XL codestreams as specified in ISO/IEC 18181-1. This document specifies how to add metadata and extensions to JPEG XL codestreams. A file as described by this document is called a JPEG XL file.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 18181-1:2024, *Information technology — JPEG XL image coding system — Part 1: Core coding system*

ISO/IEC 10918-1:1994, *Information technology — Digital compression and coding of continuous-tone still images: Requirements and guidelines*

ISO/IEC 19566-5, *Information technologies — JPEG systems — Part 5: JPEG universal metadata box format (JUMBF)*

IETF RFC 7932, *J. Alakuijala, & Z. Szabadka. Brotli Compressed Data Format. RFC Series. Available from*[1)]

ISO 21496-1, *Digital photography — Gain map metadata for image conversion — Part 1: Dynamic range conversion*

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3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
alternate image
image reconstructed from the *baseline image* (3.2) and the information in the HDR gain map *box* (3.3)

3.2
baseline image
image decoded from the primary JPEG XL codestream contained in a *JPEG XL file* (3.7), ignoring the information in the HDR gain map *box* (3.3)

1) https://www.rfc-editor.org/info/rfc7932.

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3.3
box
structured collection of data describing the image or the image decoding process

3.4
box content
data wrapped within the *box* (3.3) structure

3.5
box type
kind of information stored within the *box* (3.3)

3.6
file format
set of data structures for the storage of metadata and extensions of a codestream

3.7
JPEG XL file
data file encoded in the *file format* (3.6) defined by this document

3.8
superbox
box (3.3) that carries other boxes as payload data

4 General

This document defines the file format of a JPEG XL file.

A JPEG XL file shall contain a codestream as specified in ISO/IEC 18181-1, and may contain additional metadata and extensions. The IANA media type for JPEG XL files is image/jxl and it shall be registered in accordance with Annex B.

A JPEG XL file shall come in one of the following forms:

— a box structure, as defined in Clause 5;

— a direct JPEG XL codestream without box structure.

The rest of this document only defines the box structure. The codestream without box structure is valid but is completely specified in ISO/IEC 18181-1.

A JPEG XL file shall follow either the structure of a codestream without box structure, or it shall follow the box structure as defined in Clause 5 and follow all box requirements in Clauses 6 to 9. A decoder can extract the codestream from the box structure and decode the image from the codestream using the procedure specified in ISO/IEC 18181-1, and can decode the contents of other boxes following their respective specifications in this document.

NOTE A direct JPEG XL codestream without box structure is also a valid JPEG XL file. This allows, for example, a more efficient encoding of images for the web, in cases where information encoded in other boxes than the codestream is not required.

5 File organization

A JPEG XL file using the box structure is formed as a series of boxes. These boxes contain all data within the file, including the initial signature required by the file format.

NOTE This box-based file format is based on the same syntax as described in ISO/IEC 15444-1:2024, Annex I or ISO/IEC 15444-2:2023, Annex M, or ISO/IEC 21122-3. The binary format of a box is also described in Clause 8.

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Boxes of different types contain different types of data, such as the file signature, metadata and the codestream. Clause 9 defines box types that may appear in a JPEG XL file and their requirements. Boxes with an unrecognized type shall be ignored and skipped by the decoder.

A JPEG XL file shall contain a JPEG XL codestream. The codestream can be split across multiple boxes: JPEG XL partial codestream boxes. In this case, the codestream is formed by the concatenation of the content of all those boxes.

Any boxes, content and codestreams present in a superbox, such as another JPEG XL file in a JUMBF superbox, shall not be taken into account for the syntactic requirements of this document; they recursively follow their applicable specification.

Tables 1 and 2 each show a conceptual box structure of a JPEG XL file, that is a possible series of different box types that form the file, respectively with a single full codestream box and with multiple partial codestream boxes. Boxes that may appear multiple times are indicated with '…', optional boxes are indicated with brackets and required boxes are indicated in **bold**. Tables 1 and 2 are only an indication and do not imply any ordering or counting requirements for the boxes. The decoder shall not make any assumptions about the ordering of any boxes after the first two, except where indicated.

Table 1 — Conceptual structure (example) of a JPEG XL file using a full codestream box

`JXL␣`: JPEG XL Signature box
`ftyp`: File Type box
`jxlc`: JPEG XL Codestream box
`brobExif`: (Brotli-compressed box containing Exif)
`brobxml␣`: (Brotli-compressed box containing XML)
`jbrd`: (JPEG Bitstream Reconstruction box)

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Table 2 — Conceptual structure (example) of a JPEG XL file using partial codestream boxes

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`JXL␣`: JPEG XL Signature box
`ftyp`: File Type box
`jxll`: Level box
`jxlp`: JPEG XL Partial Codestream box …
`jxli`: (JPEG XL Frame Index box)
`jumb`: (JUMBF box) …
`jxlp`: JPEG XL Partial Codestream box …
`Exif`: (Exif box)
`jxlp`: JPEG XL Partial Codestream box …
`jxlp`: JPEG XL Partial Codestream box …
`xml␣`: (XML box) …

6 Data types and numerical values

Data types used in this document shall be interpreted by the decoder as follows.

— u16_be: a 16-bit unsigned integer encoded in big endian order (2 bytes).

— u32_be: a 32-bit unsigned integer encoded in big endian order (4 bytes).

— u64_be: a 64-bit unsigned integer encoded in big endian order (8 bytes).

— Varint(): an unsigned integer value of up to 63 bits as a variable length integer in little endian order as specified in ISO/IEC 18181-1:2024, E.4.2.

— U32(), u(n), Bool: as specified in ISO/IEC 18181-1:2024, B.2.

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