
**Information technology — Scalable
compression and coding of
continuous-tone still images —**

**Part 3:
Box file format**

*Technologies de l'information — Compression échelonnable et codage
d'images plates en ton continu —*

Partie 3: Format de la liste 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. 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).

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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 29, Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 18477 contains the following parts under the general title *Information technology — Scalable compression and coding of continuous-tone still images*:

- *Part 1: Scalable compression and coding of continuous-tone still images*
- *Part 2: Extensions for high dynamic range images*
- *Part 3: Box file format*
- *Part 6: IDR Integer Coding*
- *Part 7: HDR Floating-Point Coding*
- *Part 8: Lossless and Near-lossless Coding*
- *Part 9: Alpha Channel Coding*

The following parts are under preparation:

- *Part 4: Conformance testing*
- *Part 5: Reference software*

Introduction

This part of ISO/IEC 18477 specifies an extensible file format, denoted as JPEG XT, which is built on top of the existing Rec. ITU-T T.81 | ISO/IEC 10918-1 codestream definition. While typically file formats encapsulate codestreams by means of additional syntax elements such as boxes, the file format structure specified here rather embeds the syntax elements of the file format, called boxes, into the codestream. The necessity for this unusual arrangement is the backwards compatibility to the legacy standard and the application toolchain built around it; that is, legacy applications conforming to Rec. ITU-T T.81 | ISO/IEC 10918-1 will be able to decode image information embedded in files conforming to the family of ISO/IEC 18477 standards, though will only be able to recover a three component, 8 bits per sample, lower quality version of the image described by the full file.

For more demanding applications, it is not uncommon to use a bit depth of 16, providing 65 536 representable values to describe each channel within a pixel, resulting on over $2,8 \times 10^{14}$ representable colour values. In some less common scenarios, even greater bit depths are used, and sometimes the dynamic range of the image is so high that a floating point based encoding is desirable. In addition to image information, some applications also require an additional opacity channel, a feature not available from the legacy standard.

Most common photo and image formats use an 8-bit or 16-bit unsigned integer value to represent some function of the intensity of each colour channel. While it might be theoretically possible to agree on one method for assigning specific numerical values to real world colours, doing so is not practical. Since any specific device has its own limited range for colour reproduction, the device's range may be a small portion of the agreed-upon universal colour range. As a result, such an approach is an extremely inefficient use of the available numerical values, especially when using only 8 bits (or 256 unique values) per channel. To represent pixel values as efficiently as possible, devices use a numeric encoding optimized for their own range of possible colours or gamut.

JPEG XT is designed to extend the legacy JPEG standard towards higher bitdepth, higher dynamic range, wide colour gamut content while simultaneously allowing legacy applications to decode the image data in the codestream to a standard low dynamic range image represented by only eight bits per channel. The goal is to provide a backwards compatible coding specification that allows legacy applications and existing toolchains to continue to operate on codestreams conforming to the family of ISO/IEC 18477 standards.

JPEG XT has been designed to be backwards compatible to legacy applications while at the same time having a small coding complexity; JPEG XT uses, whenever possible, functional blocks of Rec. ITU-T T.81 | ISO/IEC 10918-1 to extend the functionality of the legacy JPEG Coding System.

This part of ISO/IEC 18477 is an extension of ISO/IEC 18477-1, a compression system for continuous tone digital still images which is backwards compatible with Rec. ITU-T T.81 | ISO/IEC 10918-1. That is, legacy applications conforming to Rec. ITU-T T.81 | ISO/IEC 10918-1 will be able to reconstruct streams generated by an encoder conforming to this part of ISO/IEC 18477, though will possibly not be able to reconstruct such streams in full dynamic range, full quality or other features defined in this part of ISO/IEC 18477.

The aim of this part of ISO/IEC 18477 is to provide a flexible and extensible framework to enrich ISO/IEC 18477-1 compliant codestreams with side-channels and metadata. The syntax chosen in this part of ISO/IEC 18477 defines a mechanism to embed syntax elements denoted as "Boxes" into Rec. ITU-T T.81 | ISO/IEC 10918-1 compliant codestreams. The box syntax used here is identical to that defined in the JPEG family of standards, for example JPEG 2000 (Rec. ITU-T T. 800 | ISO/IEC 15444-1). Boxes will then carry either additional image data, to enable encoding of images of higher bitdepth, high dynamic range, include alpha channels etc., or will carry metadata that describes the decoding process of the legacy Rec. ITU-T T.81 | ISO/IEC 10918-1 codestream and the side channels to an extended or high dynamic range image.

Information technology — Scalable compression and coding of continuous-tone still images —

Part 3: Box file format

1 Scope

This part of ISO/IEC 18477 specifies a coding format, referred to as JPEG XT, which is designed primarily for continuous-tone photographic content.

2 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 10646, *Information technology — Universal Coded Character Set (UCS)*

ISO/IEC 18477-1:2015, *Information technology — Scalable compression and coding of continuous-tone still images — Part 1: Scalable compression and coding of continuous-tone still images*

Rec. ITU-T T.81 | ISO/IEC 10918-1, *Information Technology — Digital Compression and Coding of Continuous Tone Still Images – Requirements and Guidelines*

Rec. ITU-T T.871 | ISO/IEC 10918-5, *Information technology — Digital compression and coding of continuous-tone still images: JPEG File Interchange Format*

3 Terms, definitions, abbreviated terms and symbols

3.1 Terms and definitions

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

3.1.1

ASCII encoding

encoding of text characters and text strings according to ISO/IEC 10646

3.1.2

base decoding path

process of decoding legacy codestream and refinement data to the base image, jointly with all further steps until residual data is added to the values obtained from the residual codestream

3.1.3

base image

collection of sample values obtained by entropy decoding the DCT coefficients of the legacy codestream and the refinement codestream, and inversely DCT transforming them jointly

3.1.4

binary decision

choice between two alternatives