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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

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.

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*.

This second edition cancels and replaces the first edition (ISO/IEC 18477-3:2015), which has been technically revised.

The main changes are as follows:

— editorial improvements on the usage of the JPEG XT marker segment.

A list of all parts in the ISO/IEC 18477 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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Introduction

This document 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. This means that 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 document, although it is possible that they will not be able to reconstruct such streams in full dynamic range or quality or using other features defined in this document.

This document provides a flexible and extensible framework to enrich ISO/IEC 18477-1 conforming codestreams with side-channels and metadata. The syntax chosen in this document defines a mechanism to embed syntax elements denoted as "boxes" into Rec. ITU-T T.81 | ISO/IEC 10918-1 conforming codestreams. The box syntax used in this document is identical to that defined in the JPEG series, for example JPEG 2000 image coding system (Rec. ITU-T T.800 | ISO/IEC 15444-1). Boxes will then carry either additional image data, to enable encoding of images of higher bit depth, high-dynamic range (HDR), including alpha channels, etc., or 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 HDR image.

This document 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 in this document 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. This means that 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 this document, although they will only be able to recover a three component, 8 bit 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 2.8×10^{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 can 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 can 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 bit depth, higher dynamic range, and wide colour gamut content, while simultaneously allowing legacy applications to decode the image data in the codestream to a standard low-dynamic range (LDR) image represented by only 8 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 this document.

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.

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

Part 3:
Box file format

1 Scope

This document specifies box-based container format, referred to as JPEG XT, which is designed primarily for continuous-tone photographic content.

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 18477-1, *Information technology — Scalable compression and coding of continuous-tone still images — Part 1: Core coding system specification*

Rec. ITU-T T.81 | ISO/IEC 10918-1, *Information technology — Digital compression and coding of continuous-tone still images: Requirements and guidelines*

3 Terms, definitions, abbreviated terms and symbols

3.1 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/

3.1.1
ASCII encoding
encoding of text characters and text strings according to ISO/IEC 10646-1

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 discrete cosine transformation (DCT) coefficients of the legacy codestream and the refinement codestream, and inversely DCT transforming them jointly

3.1.4
bit stream
partially encoded or decoded sequence of bits comprising an entropy-coded segment

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