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Information technology — JPEG 2000 image coding system —

Part 2: **Extensions**

Technologies de l'information — Système de codage d'images JPEG 2000 —

Partie 2: Extensions

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Foreword

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This document was prepared by ITU-T as Rec. ITU-T T.801 and drafted in accordance with its editorial rules, in collaboration with 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 15444-2:2004), which has been technically revised. It also incorporates the Amendments ISO/IEC 15444-2:2004/Amd 2:2006, ISO/IEC 15444-2:2004/Amd 3:2015 and ISO/IEC 15444-2:2004/Amd 4:2015 and the Technical Corrigenda ISO/IEC 15444-2:2004/Cor 3:2005 and ISO/IEC 15444-2:2004/Cor 4:2007.

The main changes compared to the previous edition are as follows:

— signalling for HTJ2K codestreams, as specified in Rec. ITU-T T.814 | ISO/IEC 15444-15, is added;

— the RLT marker segment is added;

— signalling for codestreams that conform to ISO/IEC 21122-1 is added;

— parameterized colourspace is added to the Colour Specification box;

— outstanding amendments and corrigenda are consolidated; and

— the definition of the CAP marker segment is removed, having been moved to Rec. ITU-T T.800 (2019) | ISO/IEC 15444-1:2019.

A list of all parts in the ISO/IEC 15444 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 Recommendation | International Standard defines a set of lossless (bit-preserving) and lossy compression methods for coding continuous-tone, bi-level, grey-scale, colour digital still images, or multi-component images.

This Recommendation | International Standard:

- specifies extended decoding processes for converting compressed image data to reconstructed image data;
- specifies an extended codestream syntax containing information for interpreting the compressed image data;
- specifies an extended file format;
- specifies a container to store image metadata;
- defines a standard set of image metadata;
- provides guidance on extended encoding processes for converting source image data to compressed image data;
- provides guidance on how to implement these processes in practice.

Information technology — JPEG 2000 image coding system — Extensions

1 Scope

This Recommendation | International Standard defines a set of lossless (bit-preserving) and lossy compression methods for coding continuous-tone, bi-level, grey-scale, colour digital still images, or multi-component images.

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- defines a standard set of image metadata;
- provides guidance on extended encoding processes for converting source image data to compressed image data;
- provides guidance on how to implement these processes in practice.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- Recommendation ITU-T T.81 (1992) | ISO/IEC 10918-1:1994, *Information technology – Digital compression and coding of continuous-tone still images: Requirements and guidelines.*
- Recommendation ITU-T T.82 (1993) | ISO/IEC 11544:1993, *Information technology – Coded representation of picture and audio information – Progressive bi-level image compression.*
- Recommendation ITU-T T.84 (1996) | ISO/IEC 10918-3:1997, *Information technology – Digital compression and coding of continuous-tone still images: Extensions.*
- Recommendation ITU-T T.84 (1996)/Amd.1 (1999) | ISO/IEC 10918-3:1997/Amd.1:1999, *Information technology – Digital compression and coding of continuous-tone still images: Extensions – Amendment 1: Provisions to allow registration of new compression types and versions in the SPIFF header.*

- Recommendation ITU-T T.800 (06/2019) | ISO/IEC 15444-1:2019, *Information technology – JPEG 2000 image coding system: Core coding system.*
- Recommendation ITU-T T.814 (06/2019) | ISO/IEC 15444-15:2019, *Information technology – JPEG 2000 image coding system: High-throughput JPEG 2000.*
- Recommendation ITU-T T.805 | ISO/IEC 15444-6, Information technology – JPEG 2000 image coding system – Part 6: Compound image file format.
- Recommendation ITU-T T.832 (06/19) | ISO/IEC 29199-2:2020, Information technology – JPEG XR image coding system – Image coding specification.
- Recommendation ITU-T H.273 | ISO/IEC 23001-8, Information technology — MPEG systems technologies -- Part 8: Coding-independent code points.

2.2 Additional references

- Recommendation ITU-T T.45 (2000), Run-length Colour Encoding. – Recommendation ITU-T T.42 (07/03), *Continuous-tone colour representation method for facsimile.*
- ISO 3166-1, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes.*
- ISO 3166-2, *Codes for the representation of names of countries and their subdivisions – Part 2: Country subdivision code.*
- ISO/IEC 15938 (all parts), *MPEG-7.*
- ISO 10126-2:1991, *Banking – Procedures for message encipherment (wholesale) – Part 2: DEA algorithm.*
- IETF RFC 1321 (1992), *The MD5 Message-Digest Algorithm.*
- IETF RFC 2630 (1999), *Cryptographic Message Syntax.*
- ISO/IEC 21112-1, Information technology — JPEG XS low-latency lightweight image coding system — Part 1: Core coding system.
- ISO/IEC 15076-1, Image technology colour management – Architecture, profile format and data structure – Part 1: Based on ICC.1:2010.
- IEC 61966-2-1:1999, *Multimedia systems and equipment – Colour measurement and management: Part 2-1: Colour management – Default RGB colour space – sRGB, plus its Amendment 1: 2003.*
- PIMA 7666. *Photography-Electronics still picture imaging-Reference Output Medium Metric RGB Color encoding: ROMM-RGB*.
- PIMA 7667:2001. *Photography-Electronics still picture imaging-Extended sRGB color encoding e-sRGB*.
- Federal Information Processing Standard Publication (FIPS PUB) 186-2, Digital Signature Standard (DSS). <http://www.itl.nist.gov/fipspubs/fip186-2.pdf>
- ANSI X9.30.2:1997, *Public Key Cryptography for the Financial Services Industry – Part 2: The Secure Hash Algorithm (SHA-1)*. <http://www.itl.nist.gov/fipspubs/fip180-1.htm>
- W3C Recommendation. Extensible Markup Language (XML 1.0), second edition (6 October 2000), <https://www.w3.org/TR/2000/REC-xml-20001006>.
- W3C Recommendation. Namespaces in XML, (14 January 1999), <https://www.w3.org/TR/1999/REC-xml-names-19990114/>.
- W3C Recommendation, XML Schema Part 1: Structures (2 May 2001), <http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/>.
- W3C Recommendation. XML Schema Part 2: Datatypes (2 May 2001), <http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/>
- ISO/IEC/IEEE 60559, Binary floating-point arithmetic for microprocessor systems.
- IEC 61966-2-2, Multimedia systems and equipment – Colour measurement and management – Part 2-2: Colour management – Extended RGB colourspace – scRGB.

3 Definitions

For the purposes of this Recommendation | International Standard, the following definitions apply. The definitions defined in Rec. ITU-T T.800 (2019/06) | ISO/IEC 15444-1:2019, Clause 3 also apply to this Recommendation | International Standard except for the terms decomposition level, sub-band and resolution which are redefined in this clause.

3.1
attribute

XML construct that is a name-value pair extending or qualifying the meaning of an element.

3.2
cell

optional subdivision of a tile used for low-memory encoding and decoding.

3.3
component collection

A subset of intermediate components used as inputs to a multiple component transformation stage, and a subset of intermediate components obtained as outputs from a multiple component transformation stage, where the subset's constituent components can occur in an arbitrary order, i.e., permuted with respect to their order of appearance in the set of input or output intermediate components.

3.4
component reconstruction arrays

general term that refers to any of the following; decorrelation transformation array, dependency transformation array or offset array.

3.5
compositing

act of combining two compositing layers into a single, non-redundant set of image channels.

3.6
compositing layer

set of non-redundant channels drawn from one or more codestreams that shall be treated as a group.

3.7
deadzone

interval within which all sub-band coefficients are quantized to 0.

3.8
decomposition level

collection of sub-bands where each coefficient has the same spatial impact or span with respect to the original samples, including the LL, LH, HL, HH, LX, HX, XL, and XH sub-band splits out of decomposition sublevels.

3.9
decomposition sub-level

collection of sub-bands that result from splits of a sub-band from a lower decomposition sub-level or splits of either LL, LX or XL sub-bands from a higher decomposition level.

3.10
decorrelation transformation array

array of coefficients that maps the input components of a component collection to the output components of the collection via a multiple component decorrelation transformation.

3.11
dependency transformation array

array of coefficients that maps the input components of a component collection to the output components of the collection via a multiple component dependency transformation.