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Coding of Still Pictures

JBIG

Joint Bi-level Image
Experts Group

JPEG

Joint Photographic
Experts Group

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Privacy, Security and IPR features

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Information technology:

**ISO/IEC 19566-4 JPEG Systems Part 4:
Privacy, Security and IPR features**

International Standard

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard (“state of the art”, for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 19566-4, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

Introduction

This Recommendation | International standard contributes to the specification of system level functionalities that can provide a degree of trust while sharing image content and metadata, and simultaneously also allowing the signalling of the associated access policies.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – INFORMATION TECHNOLOGY – JPEG SYSTEMS PART 4: PRIVACY, SECURITY AND IPR FEATURES

1 Scope

This Recommendation | International standard contributes to a system layer for JPEG standards, referred to as JPEG Systems. It gives an overview about the existing JPEG ecosystem in order to show their relation and their features.

This Recommendation | International standard:

- specifies an access policy definition;
- specifies an image layer structure;
- specifies a box-based file format;
- provide a signalling mechanism to identify an applied access policy and data protection tools
- provide guidance on how to implement an image repository with controlled access

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. 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.

ISO/IEC 19566-1: Information Technology – JPEG Systems – Part 1: Packaging of information using codestream and file formats

ISO/IEC 18477-3: Information Technology - Scalable Compression and Coding of Continuous-Tone Still Images: Box file format

ISO/IEC 29100: Information Technology – Security techniques – Privacy framework

2.1 Additional references

Rec. ITU-T T.800 | ISO/IEC 15444-1: Information technology – JPEG 2000 Image Coding System – Part 1: Core coding system

ISO/IEC 14496-12, ISO/IEC 15444-12: Information technology - JPEG 2000 image coding system - Part 12: ISO base media file format

Rec. ITU-T T.805 | ISO/IEC 15444-6: Information technology -- JPEG 2000 image coding system -- Part 6: Compound image file format

Rec. ITU-T T.807 | ISO/IEC 15444-8: Information technology -- JPEG 2000 image coding system: Secure JPEG 2000

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

Exif

JPSearch

ISO/TC 130, ISO 16684-1: Graphic technology – Extensible metadata platform (XMP) specification – Part 1: Data model, serialization and core properties

IPTC

PROV

XACML

3 Definitions, Abbreviations and Symbols

3.1 Definitions

For the purposes of this Recommendation | International Standard, the following definitions apply.

backward compatibility: A standard is backward compatible when the new specification includes the old one. This means that any devices implementing the new standard can also interpret all data compliant with the old version of the standard. An old device, however, only compliant with the old version of the standard might not be able to interpret the data compliant with the new version of the standard.

bit stream: Partially encoded or decoded sequence of bits comprising an entropy-coded segment.

box: a structured collection of data describing the image or the image decoding process. See Annex B.2 for the definition of boxes.

box-based file format: A file format whose composing elements are well defined, hierarchically structured boxes.

byte: A group of 8 bits.

coder: An embodiment of a coding process.

coding: Encoding or decoding.

coding model: A procedure used to convert input data into symbols to be coded.

(coding) process: A general term for referring to an encoding process, a decoding process, or both.

compression: Reduction in the number of bits used to represent source image data.

component: A two-dimensional array of samples having the same designation in the output or display device. An image typically consists of several components, e.g. red, green and blue.

continuous-tone image: An image whose components have more than one bit per sample.

decoder: An embodiment of a decoding process.

decoding process: A process which takes as its input compressed image data and outputs a continuous-tone image.

dequantization: The inverse procedure to quantization by which the decoder recovers a representation of the DCT coefficients.

downsampling: A procedure by which the spatial resolution of a component is reduced.

encoder: An embodiment of an encoding process.

encoding process: A process which takes as its input a continuous-tone image and outputs compressed image data.

entropy-coded (data) segment: An independently decodable sequence of entropy encoded bytes of compressed image data.

entropy decoder: An embodiment of an entropy decoding procedure.

entropy decoding: A lossless procedure which recovers the sequence of symbols from the sequence of bits produced by the entropy encoder.

entropy encoder: An embodiment of an entropy encoding procedure.

entropy encoding: A lossless procedure which converts a sequence of input symbols into a sequence of bits such that the average number of bits per symbol approaches the entropy of the input symbols.

forward compatibility: If a new standard is forward compatible, then devices only compliant with the old version of the standard are nevertheless able to interpret the data conforming with the new standard. However, it might be possible that the obtained results are not as good as when using a device compliant with the new version of the standard

grayscale image: A continuous-tone image that has only one component.

high dynamic range: An image or image data comprised of more than eight bits per sample, coded in floating point representation.

Intermediate dynamic range: An image or image data comprised of more than eight bits per sample

Joint Photographic Experts Group; JPEG: The informal name of the committee which created this Specification. The “joint” comes from the ITU-T and ISO/IEC collaboration.

legacy decoder: An embodiment of a decoding process conforming to Rec. ITU-T T.81|ISO/IEC 10918-1, confined to the lossy DCT process and the baseline, sequential or progressive modes, decoding at most four components to eight bits per component.

lossless: A descriptive term for encoding and decoding processes and procedures in which the output of the decoding procedure(s) is identical to the input to the encoding procedure(s).

lossless coding: The mode of operation which refers to any one of the coding processes defined in this Specification in which all of the procedures are lossless.

lossy: A descriptive term for encoding and decoding processes which are not lossless.

low-dynamic range: An image or image data comprised of data with no more than eight bits per sample.

marker: A two-byte code in which the first byte is hexadecimal FF and the second byte is a value between 1 and hexadecimal FE.

marker segment: A marker together with its associated set of parameters.

metadata: Additional data associated with the image data beyond the image data.

minimum coded unit; MCU: The smallest group of data units that is coded.

pixel: A collection of sample values in the spatial image domain having all the same sample coordinates, e.g. a pixel may consist of three samples describing its red, green and blue value.

point transform: Scaling of a sample or DCT coefficient by a factor.

precision: Number of bits allocated to a particular sample or DCT coefficient.

procedure: A set of steps which accomplishes one of the tasks which comprise an encoding or decoding process.

quantization value: An integer value used in the quantization procedure.

quantize: The act of performing the quantization procedure for a DCT coefficient.

residual scan: An additional pass over the image data invisible to legacy decoders which provides additive and/or multiplicative correction data of the legacy scans to allow reproduction of high-dynamic range or wide color gamut data.

refinement scan: An additional pass over the image data invisible to legacy decoders which provides additional least significant bits to extend the precision of the DCT transformed coefficients.

sample: One element in the two-dimensional image array which comprises a component.

sample grid: A common coordinate system for all samples of an image. The samples at the top left edge of the image have the coordinates (0,0), the first coordinate increases towards the right, the second towards the bottom.

scan: A single pass through the data for one or more of the components in an image.

scan header: A marker segment that contains a start-of-scan marker and associated scan parameters that are coded at the beginning of a scan.

table specification data: The coded representation from which the tables used in the encoder and decoder are generated and their destinations specified.

(uniform) quantization: The procedure by which DCT coefficients are linearly scaled in order to achieve compression.

upsampling: A procedure by which the spatial resolution of a component is increased.

vertical sampling factor: The relative number of vertical data units of a particular component with respect to the number of vertical data units in the other components in the frame.

zero byte: The 0x00 byte.

3.2 Symbols

X	Width of the sample grid in positions
Y	Height of the sample grid in positions
Nf	Number of components in an image
$S_{i,x}$	Subsampling factor of component i in horizontal direction
$S_{i,y}$	Subsampling factor of component i in vertical direction
H_i	Subsampling indicator of component i in the frame header
V_i	Subsampling indicator of component i in the frame header
$v_{x,y}$	Sample value at the sample grid position x,y
h	Additional number of DCT coefficients bits represented by refinement scans, $8+h$ is the number of non-fractional bits (i.e. bits in front of the "binary dot") of the output of the inverse DCT process.
Rb	Additional bits in the HDR image. $8+Rb$ is the sample precision of the reconstructed HDR image.

3.3 Abbreviations

For the purposes of this Recommendation | International Standard, the following abbreviations apply.

ASCII	American Standard Code for Information Interchange
XACML	eXtensible Access Control Markup Language
XMP	Extensible metadata platform

4 Conventions

4.1 Conformance language

This Recommendation | International Standard consists of normative and informative text.

Normative text is that text which expresses mandatory requirements. The word "shall" is used to express mandatory requirements strictly to be followed in order to conform to this Specification and from which no deviation is permitted. A conforming implementation is one that fulfils all mandatory requirements.

Informative text is text that is potentially helpful to the user, but not indispensable and can be removed, changed or added editorially without affecting interoperability. All text in this Recommendation | International Standard is normative, with the following exceptions: the Introduction, any parts of the text that are explicitly labelled as "informative", and statements appearing with the preamble "NOTE" and behaviour described using the word "should". The word "should" is used to describe behaviour that is encouraged but is not required for conformance to this Specification.

The keywords "may" and "need not" indicate a course of action that is permissible in a conforming implementation.

The keyword "reserved" indicates a provision that is not specified at this time, shall not be used, and may be specified in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be specified in the future.

4.2 Operators

NOTE – Many of the operators used in this Recommendation | International Standard are similar to those used in the C programming language.

5 General

The purpose of this clause is to give an informative overview of the elements specified in this Specification. Another purpose is to introduce many of the terms which are defined in clause 3. These terms are printed in *italics* upon first usage in this clause.

There are three elements specified in this Specification:

a) An *encoder* is an embodiment of an *encoding process*. An encoder takes as input *digital source image data* and *encoder specifications*, and by means of a specified set of *procedures* generates as output a *codestream*.

b) A *decoder* is an embodiment of a *decoding process*. A decoder takes as input a *codestream*, and by means of a specified set of *procedures* generates as output *digital reconstructed image data*.

c) The *codestream* is a compressed image data representation which includes all necessary data to allow a (full or approximate) reconstruction of the sample values of a digital image. Additional data might be required that define the interpretation of the sample data, such as color space or the spatial dimensions of the samples.

Annex A: Access policy definition

(This Annex is informative only and is not an integral part of this Recommendation | International Standard)

Annex B: Protection tools

(This Annex is informative only and is not an integral part of this Recommendation | International Standard)

Annex C: Layers

(This Annex is informative only and is not an integral part of this Recommendation | International Standard)

Annex D: Box file format

(This Annex is informative only and is not an integral part of this Recommendation | International Standard)

Annex E: File format protection

(This Annex is informative only and is not an integral part of this Recommendation | International Standard)

Annex F: Backward compatibility

(This Annex is informative only and is not an integral part of this Recommendation | International Standard)

F.1 General

F.2 ISO/IEC 10918-1

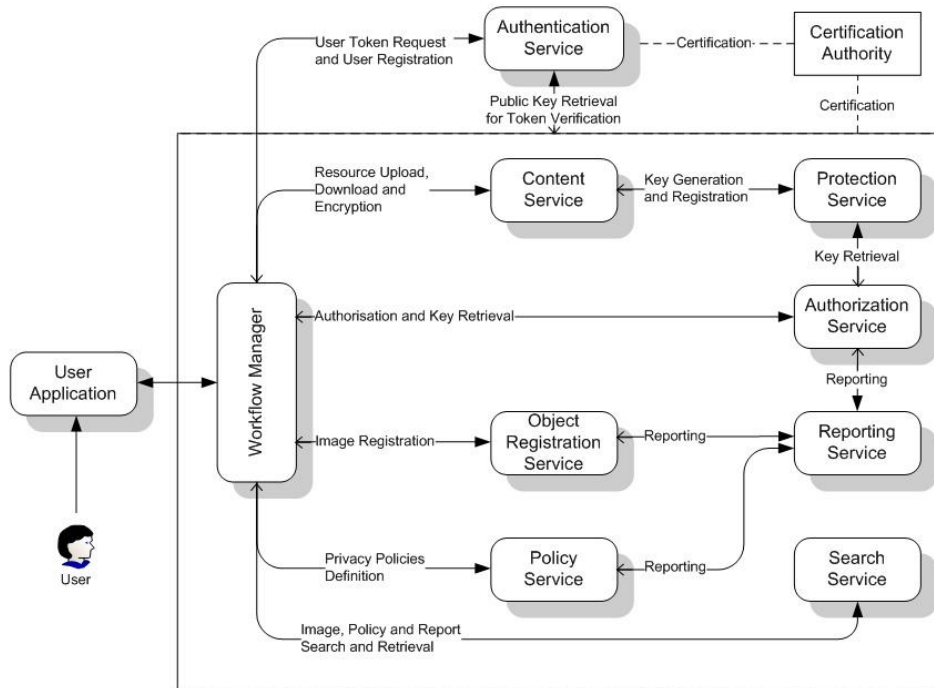
F.3 ISO/IEC 15444-1

Annex G: Implementation guideline

(This Annex is informative only and is not an integral part of this Recommendation | International Standard)

G.1 General

G.2 MIPAMS



G.3 Creator and consumer with protection tools

