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Part 5:
JPEG universal metadata box format (JUMBF)

Technologies de l'information — Systèmes JPEG —

Partie 5: Format universel de fichier de métadonnées pour JPEG (JUMBF)

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Foreword

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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*.

A list of all parts in the ISO/IEC 19566 series can be found on the ISO website.

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.

Introduction

The JPEG universal metadata box format (JUMBF) provides a mechanism to embed and refer generic metadata in JPEG files. Specific content types can be assigned to identify the specific type of the embedded metadata. In addition to the content types defined in this document, other types can be defined by other standards or by third parties. ISO/IEC 19566-4 and ISO/IEC 19566-6 both use JUMBF to embed additional metadata in JPEG images. The JPEG XT file format (see ISO/IEC 18477-3) is used to embed JUMBF boxes in JPEG-1 images (see ITU-T.81 | ISO/IEC 10918-1).

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Information technologies — JPEG systems —

Part 5:
JPEG universal metadata box format (JUMBF)

1   Scope

This document describes the JPEG universal metadata box format (JUMBF), which provides a universal format to embed any type of metadata in any box-based JPEG file format. This document defines the syntax of the JUMBF box and the mechanism to assign specific content types. In particular, this document specifies XML, JSON, codestream and UUID types. In addition, this document defines the syntax to reference or request the embedded metadata content within or outside the image.

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

ISO/IEC 11578, *Information technology — Open Systems Interconnection — Remote Procedure Call (RPC)*

ISO/IEC 21778, *Information technology — The JSON data interchange syntax*

FIPS PUB 180-4[1], *Secure Hash Standard (SHS)*

W3C, Extensible Markup Language (XML 1.0), 5th edition, <https://www.w3.org/TR/xml>

3   Terms, definitions and abbreviated terms

3.1   Terms and definitions

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

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

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

— IEC Electropedia: available at <http://www.electropedia.org/>

3.1.1
box
binary structure that encapsulates an object embedded in a file

3.1.2
codestream
sequence of bits representing a compressed image and associated metadata

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[1]   http://dx.doi.org/10.6028/NIST.FIPS.180-4

3.1.3
JUMBF content box
content box
box ([3.1.1](#)) of any type embedded in a *JUMBF superbox* ([3.1.8](#)) except the JUMBF description box

3.1.4
JUMBF content
content
set of all *content boxes* ([3.1.3](#)) embedded in a *JUMBF superbox* ([3.1.8](#))

3.1.5
JUMBF content type
content type
specific type of *content* ([3.1.4](#)) embedded in a JUMBF box with an associated *JUMBF type* ([3.1.6](#))

3.1.6
JUMBF type
UUID that implies the type of *content* ([3.1.4](#)) embedded in a JUMBF box

3.1.7
parent image
main image *content* ([3.1.4](#)) of the image file in which the JUMBF box is embedded

3.1.8
superbox
box ([3.1.1](#)) that only contains other boxes

3.2   Abbreviated terms

JPEG	Joint Photographic Experts Group
JPEG-1	image complying to ISO/IEC 10918-1
JSON	JavaScript object notation
JUMBF	JPEG universal metadata box format
URI	uniform resource identifier
XML	extensible markup language

4   Conventions

4.1   Conformance language

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   Naming conventions for numerical values

Integer numbers are expressed as bit patterns, hexadecimal values, or decimal numbers. Bit patterns and hexadecimal values have both a numerical value and an associated particular length in bits.

Hexadecimal notation, indicated by prefixing the hexadecimal number by "0x", may be used instead of binary notation to denote a bit pattern having a length that is an integer multiple of 4. For example, 0x41 represents an eight-bit pattern having only its second most significant bit and its least significant bit equal to 1. Numerical values that are indicated as "binary" are bit pattern values (specified as a string of digits equal to 0, 1 or x in which the left-most bit is considered the most-significant bit and 'x' means

either 0 or 1). Other numerical values not prefixed by "0x" are decimal values. When used in expressions, a hexadecimal value is interpreted as having a value equal to the value of the corresponding bit pattern evaluated as a binary representation of an unsigned integer (i.e., as the value of the number formed by prefixing the bit pattern with a sign bit equal to 0 and interpreting the result as a two's complement representation of an integer value). For example, the hexadecimal value 0xF is equivalent to the 4-bit pattern '1111' and is interpreted in expressions as being equal to the decimal number 15.

4.3 Boxes and superboxes

The annexes of this document focus on the definition of boxes. The details for embedding boxes in specific file formats are defined in the particular documents, for example ISO/IEC 15444-1 for JPEG 2000, ISO/IEC 18477-3 for JPEG-1 / JPEG XT or the more generic ISO/IEC 14496-12 ISO base media file format (ISOBMFF).

In general, each object in the file is encapsulated within a binary structure called a box. A box that only contains other boxes is called a superbox. The binary structure is given in Figure 1.

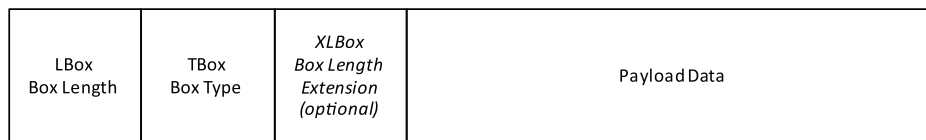| LBox Box Length	TBox Box Type	XLBox Box Length Extension (optional)	Payload Data

Figure 1 — Binary structure of a box

— **LBox**: box length. This field specifies the length of the box, stored as a 4-byte big-endian unsigned integer. This value includes all of the fields of the box, including the length and type. If the value of this field is 1, then the XLBox field shall exist and the value of that field shall be the actual length of the box. If the value of this field is 0, then the length of the box was not known when the LBox field was written. In this case, this box contains all bytes up to the end of the file. If a box of length 0 is contained within another box (its superbox), then the length of that superbox shall also be 0. This means that this box is the last box in the file. The values 2-7 are reserved for ITU-T | ISO/IEC use.

— **TBox**: box type. This field specifies the type of information found in the Payload Data field. The value of this field is encoded as a 4-byte big-endian unsigned integer. However, boxes are generally referred to by an ISO/IEC 646 character string translation of the integer value. For all box types defined within this document, box types will be indicated as both character string (normative) and as 4-byte hexadecimal integers (informative). Also, a space character is shown in the character string translation of the box type as "\040". All values of TBox not defined within this document are reserved for ITU-T | ISO/IEC use.

— **XLBox**: box extended length. This field specifies the actual length of the box if the value of the LBox field is 1. This field is stored as an 8-byte big-endian unsigned integer. The value includes all of the fields of the box, including the LBox, TBox and XLBox fields.

— **Payload Data**: box contents. This field contains the actual information contained within this box. The format of the box contents depends on the box type and will be defined individually for each type.

4.4 Graphical descriptions

Box definitions contain graphical description figures to illustrate the structure of the box. These figures should be interpreted as follows.

— The figures do not include box type and size fields.

— A sequence of rectangles is used to indicate the fields of the box and their order.

— The width of the rectangle indicates the length of the field, a square rectangle indicates a 16 bit field.

— A grey background indicates a variable length field.

— Optional fields have a dashed border.

[Figure 2](#) shows an illustrative example of a box with four fields:

— A: 8 bit required field;

— B: 16 bit required field;

— C: variable length required field;
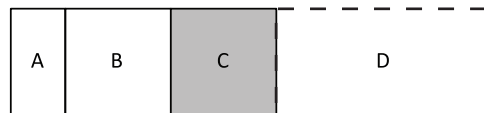
— D: optional 32 bit field.

Figure 2 — Box with four fields

5 Organization of the document

JUMBF allows embedding any type of metadata in JPEG images that adopt a box-based file format and enables referencing to the embedded data internally or externally to the image.

The JUMBF Box Format shall be implemented as defined in Annex A. JUMBF Content Types for common metadata such as XML, JSON and image codestreams shall be used in accordance with Annex B. The referencing and requesting mechanism shall be as specified in Annex C. Annex D describes how to embed JUMBF boxes in JPEG-1 images using the JPEG XT Box Format.

Annex A
(normative)

JUMBF box file format

A.1 Overview

This annex defines the JUMBF Box Format. Table A.1 lists all boxes defined in this annex. Indentation within the table indicates the hierarchical containment structure of the boxes.

Table A.1 — Defined boxes

Box name	Type	Superbox	Required?	Comments
JUMBF box	'jumb' (0x6A75 6D62)	Yes	Required	This superbox encapsulates the JUMBF Description box and JUMBF Content Boxes.
JUMBF Description box	'jumd' (0x6A75 6D64)	No	Required	This box is always contained within a JUMBF superbox and specifies the content and behaviour of the JUMBF box.

A.2 JUMBF superbox

A JUMBF box is a superbox that shall contain exactly one JUMBF Description box followed by one or more Content Boxes. The type of the Content Boxes is implied by the JUMBF type field in the JUMBF Description box. JUMBF boxes can be nested, i.e. the Content Boxes may be JUMBF boxes, if implied by the JUMBF type. The JUMBF Description box shall always be the first box in the JUMBF superbox.

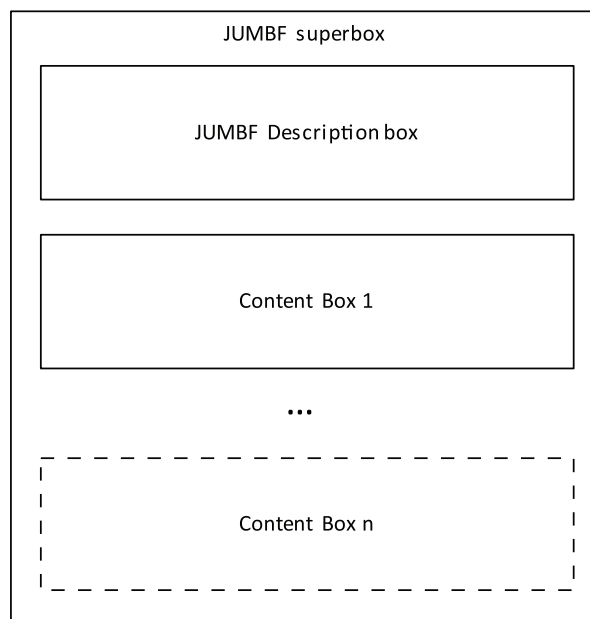The type of a JUMBF box shall be 'jumb' (0x6A75 6D62). The structure of the JUMBF box is illustrated in Figure A.1.

Figure A.1 — Structure of the JUMBF superbox