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SERIES T: TERMINALS FOR TELEMATIC SERVICES  
Still-image compression – JPEG XR

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**Information technology – JPEG XR image  
coding system – Motion JPEG XR**

Recommendation ITU-T T.833



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**Information technology – JPEG XR image coding system –  
Motion JPEG XR**

**Summary**

Recommendation ITU-T T.833 is technically aligned with ISO/IEC 29199-3 but is not published as identical text. It was drafted in collaboration with ISO/IEC JTC 1/SC 29/WG 1 (which is informally known as "JPEG").

This Recommendation | International Standard is the Motion JPEG XR file format specification. The Motion JPEG XR file format is designed to contain one or more motion sequences of JPEG XR images, with their timing. The format is based on the ISO base media file format. It is intended as a 'building block', specifying only the video format. An application would be expected to combine Motion JPEG XR with suitable audio, metadata, etc., for a complete application specification; that specification would normally select profiles and levels of Motion JPEG XR, and could also specify application profiles and levels that apply to the integration.

Motion JPEG XR is expected to be used in a variety of applications, particularly where JPEG XR image coding technology is already available for other reasons, or where the high-quality frame-based approach, with no inter-frame coding, is appropriate.

Motion JPEG XR is a flexible format, permitting a wide variety of usages, such as editing, display interchange, and streaming.

**History**

Edition	Recommendation	Approval	Study Group
1.0	ITU-T T.833	2010-09-13	16

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## **Introduction**

This Recommendation | International Standard is the Motion JPEG XR specification, based on the ISO base media file format.

This Recommendation | International Standard specifies the use of JPEG XR coding for timed sequences of images. The Motion JPEG XR file format is designed to contain one or more motion sequences of JPEG XR images, with their timing. It is intended as a 'building block', specifying only the video format. An application would be expected to combine Motion JPEG XR with suitable audio, metadata, etc., for a complete application specification; that specification would normally select profiles and levels of Motion JPEG XR, and could also specify application profiles and levels that apply to the integration.

Motion JPEG XR is expected to be used in a variety of applications, particularly where JPEG XR coding technology is already available for other reasons, or where the high-quality frame-based approach, with no inter-frame coding, is appropriate. These application areas include:

- digital still cameras;
- error-prone environments such as wireless and the Internet;
- video capture;
- high quality digital video recording for professional broadcasting and motion picture production from film-based to digital systems; and
- high-resolution medical and satellite imaging.

Motion JPEG XR is a flexible format, permitting a wide variety of usages, such as editing, display, interchange, and streaming.

This Recommendation | International Standard is technically aligned with ISO/IEC 29199-3 but is not published as identical text.

## Information technology – JPEG XR image coding system – Motion JPEG XR

### 1 Scope

This Recommendation | International Standard specifies the use of JPEG XR coding for timed sequences of images (Motion JPEG XR sequences) within files based on the ISO base media file format (ISO/IEC 15444-12, technically identical to ISO/IEC 14496-12).

### 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.

#### 2.1 Paired Recommendations | International Standards equivalent in technical content

- Recommendation ITU-T T.832 (2009) | ISO/IEC 29199-2:2009, *Information technology – JPEG XR image coding system – Image coding specification*.

#### 2.2 Additional references

- ISO 15076-1:2010, *Image technology colour management – Architecture, profile format and data structure – Part 1: Based on ICC.1:2010*.
- ISO/IEC 15444-12:2008, *Information technology – JPEG 2000 image coding system – Part 12: ISO base media file format (technically identical to ISO/IEC 14496-12)*.

### 3 Terms and definitions

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

- 3.1 Motion JPEG XR sequence:** Timed sequence of JPEG XR images.

### 4 Compatibility and technology derivation

#### 4.1 Family members

This is a 'building block' specification; it defines how to store Motion JPEG XR sequences in a file format based on the ISO base media file format. It stands as a member of a family of specifications with common formatting.

Since this is a building block specification, if audio is needed, then suitable audio support should be selected from other specifications using the ISO base media file format, or from the MP4 registration authority (as defined in ISO/IEC 15444-12).

The other family members include the ISO base media file format ISO/IEC 15444-12, and file formats based on it.

These specifications share a common definition for the structure of a file (a sequence of objects, called boxes here, and atoms in other similar file formats), and a common definition of the general structure of an object (the size and type).

All these specifications require that readers ignore objects that are unrecognizable to them.

This Recommendation | International Standard takes precedence over those on which it is based, in any case where there are differences or conflicts; however, no such conflicts are known to exist.

## 4.2 Conformance

Except as otherwise specified herein (if any such differences exist), files conforming to this Recommendation | International Standard shall conform to the file format specified in ISO/IEC 15444-12.

Implementations of Motion JPEG XR decoders shall support the decoding of video tracks using JPEG XR coding technology (as specified in Rec. ITU-T T.832 | ISO/IEC 29199-2) in files conforming to this Recommendation | International Standard.

Files conforming to this Recommendation | International Standard shall contain at least one Motion JPEG XR sequence.

## 4.3 Profiles and levels

The conformance to these restricted profiles is indicated in the file type box by the addition of the compatible profiles as brands within the compatibility list. Annex A defines the available profiles in this Recommendation | International Standard. Derived and application specifications based on this Recommendation | International Standard may define additional brands.

# 5 Motion JPEG XR sequences

## 5.1 Sample Entry and sample formats

### 5.1.1 Definition

Box Types: 'mjxr'  
Container: Sample Table Box ('stbl')  
Mandatory: Yes  
Quantity: Exactly one

The format of a sample when the sample entry name is 'mjxr' is a CODED\_IMAGE() as defined in Rec. ITU-T T.832 | ISO/IEC 29199-2, *without* the IMAGE\_HEADER(). Each image presented to a JPEG XR decoder is logically formed by appending the content of each sample to the content of the JPEG XR Header Box in its associated Visual Sample Entry.

NOTE 1 – Offset values in the coded image apply to this complete set of data that is supplied to the decoder, i.e., the result of the append of the JPEG XR Header Box and the sample data.

All images in the sequence obey the constraints of the profile and level indicators in the JPEG XR Profile Box, if present; if no specific profile is indicated, then the Advanced Profile of Rec. ITU-T T.832 | ISO/IEC 29199-2 shall be inferred.

The values present in the VisualSampleEntry, its constituent boxes including the JPEG XR Header Box, and the codestreams that these boxes describe, must agree, to the extent that the format and precision of fields allow. This agreement includes, but is not limited to, width and height information, and the resolution declaration (within the accuracy permitted by the different representations). Files with conflicts are non-conforming and readers may attempt to decide which values are correct, or reject the file.

The fields `horizresolution` and `vertresolution` in the Visual Sample Entry indicate the highest resolution component of the image (which is typically, but not required to be, the luminance, in an image in which not all components have the same spatial sampling density).

If the coded images contain an alpha plane, a suitable value of 'depth', as indicated in the Visual Sample Entry, shall be used.

NOTE 2 – Only one CODED\_IMAGE() is supported per 'mjxr' sample entry. Hence, the concept of a 'separate alpha image plane' as specified in Annex A of Rec. ITU-T T.832 | ISO/IEC 29199-2 is not supported here.

Colour information may be supplied in one or more ColourInformationBox. These should be placed in order in the sample entry starting with the most accurate (and potentially the most expensive to process), in progression to the least. These are advisory and concern rendering and colour conversion, and there is no normative behaviour associated with them; a reader may choose to use the most suitable. A ColourInformationBox with an unknown colour type may be ignored. Values of the field `colour_type` other than those documented here are reserved.

NOTE 3 – The ColourInformationBox is specific to the VideoSampleEntry and should not be confused with the 'colr' box defined in other standards such as the JPX File Format (see Rec. ITU-T T.801 | ISO/IEC 15444-2), which can be discriminated both by context and by the initial bytes of the box.

The ICC profile chosen may be a restricted one, under the code 'rICC', which permits simpler processing. Such a restricted profile shall be of either the Monochrome or Three-Component Matrix-Based class of input profiles, as defined by ISO 15076-1. If the profile is of another class, then the 'prof' indicator must be used.

NOTE 4 – If there were a need for two images in each file-format sample, for example, for support of interlaced coding or separate alpha coding, a different Visual Sample Entry name would be used.

### 5.1.2 Syntax

```
// Visual Sequences
class MJXRSampleEntry() extends VisualSampleEntry('mjxr'){
    JPEGXRInfoBox();
    JPEGXRHeaderBox();
    JPEGXRProfileBox();          // optional
    ColourInformationBox();      // optional
}

class JPEGXRInfoBox() extends FullBox('jxri', 0, version=0){
    UInt8[16]      PIXEL_FORMAT;
    UInt8          IMAGE_BAND_PRESENCE;
    UInt8          ALPHA_BAND_PRESENCE;
}

class JPEGXRHeaderBox() extends FullBox('jxrh', 0, version=0){
    IMAGE_HEADER();
    IsCurrPlaneAlphaFlag := FALSE;
    IMAGE_PLANE_HEADER();
    if (ALPHA_IMAGE_PLANE_FLAG) {
        IsCurrPlaneAlphaFlag := TRUE;
        IMAGE_PLANE_HEADER();
    }
}

class JPEGXRProfileBox() extends Box('jxrp'){
    PROFILE_LEVEL_INFO();
}

class ColourInformationBox extends Box('colr'){
    unsigned int(32) colour_type;
    if (colour_type == 'nclx') /* on-screen colours */
    {
        unsigned int(16) colour primaries;
        unsigned int(16) transfer_characteristics;
        unsigned int(16) matrix_coefficients;
        unsigned int(1) full_range_flag;
        unsigned int(7) reserved = 0;
    } else if (colour_type == 'rICC')
    {
        ICC_profile;          // restricted ICC profile
    }
    else if (colour_type == 'prof')
    {
        ICC_profile;          // unrestricted ICC profile
    }
}
}
```

### 5.1.3 Semantics

In the Visual Sample Entry:

Compressorname the value "\016Motion JPEG XR" is suggested but not required (\016 is 14, the length of the string in bytes)

depth takes one of the following values; other values are reserved, and if found, the composition behaviour is undefined

0x18 – images are in colour with no alpha

0x28 – images are in grayscale with no alpha  
0x20 – images have alpha (gray or colour)

In the JPEG XR Header Box:

IMAGE\_HEADER() as defined in clause 8.3 of Rec. ITU-T T.832 | ISO/IEC 29199-2  
IMAGE\_PLANE\_HEADER() as defined in clause 8.4 of Rec. ITU-T T.832 | ISO/IEC 29199-2  
IsCurrPlaneAlphaFlag is not a field in this structure, but a local variable used in the decoding of the  
IMAGE\_PLANE\_HEADER();  
ALPHA\_IMAGE\_PLANE\_FLAG is not a field in this structure, but a field in the IMAGE\_HEADER() which is  
tested here  
PIXEL\_FORMAT as defined in clause A.7.18 of Rec. ITU-T T.832 | ISO/IEC 29199-2  
IMAGE\_BAND\_PRESENCE as defined in clause A.7.31 of Rec. ITU-T T.832 | ISO/IEC 29199-2  
ALPHA\_BAND\_PRESENCE as defined in clause A.7.32 of Rec. ITU-T T.832 | ISO/IEC 29199-2

In the JPEG XR Profile Box:

PROFILE\_LEVEL\_INFO() as defined in clause 8.6 of Rec. ITU-T T.832 | ISO/IEC 29199-2

In the Colour Information Box:

for colour\_type 'nclx': these fields are exactly the four bytes defined for PTM\_COLOR\_INFO( ) in clause A.7.21  
of Rec. ITU-T T.832 | ISO/IEC 29199-2

ICC\_profile: an ICC profile as defined, e.g., in ISO 15076-1 or ICC.1:2001-04 is supplied.

## Annex A

### File and codestream profiles

(This annex forms an integral part of this Recommendation | International Standard)

#### A.1 Profile introduction

This annex normatively specifies the Motion JPEG XR profiles. The brand of the Motion JPEG XR Advanced profile shall be in the `compatible_brands` field of the filetype box ('ftyp') in files conforming to this Recommendation | International Standard.

#### A.2 Motion JPEG XR Advanced profile

Files conforming to the Motion JPEG XR Advanced profile have the following characteristics:

- 1) At least one video track is present, using at least one `MJXRSampleEntry`.
- 2) All images conform to the Advanced profile of the JPEG XR image coding specification (Rec. ITU-T T.832 | ISO/IEC 29199-2).

NOTE – The Motion JPEG XR Advanced Profile is a 'catch all' that permits any features of initial edition of the JPEG XR image coding specification and the ISO base media file format.

#### A.3 Motion JPEG XR Sub-Baseline profile

Files conforming to the Motion JPEG XR Sub-Baseline profile have the following characteristics:

- 1) All images conform to the Sub-Baseline profile of the JPEG XR image coding specification (Rec. ITU-T T.832 | ISO/IEC 29199-2).
- 2) Each track shall have exactly one sample description, used by all samples.
- 3) The file is self-contained; no data references are used, and therefore all media data is contained within the single file.
- 4) The media data in the Media Data Box(es) is placed within the box(es) in temporal order.
- 5) If more than one track is present, the media data for the tracks is interleaved, with a granularity no greater than the greater of (a) the duration of a single 'sample' (in file format terms) or (b) one second.

#### A.4 Profile indicators

The profile indicators for these profiles are as follows. Since this is a building block specification, these would not normally be used as the `major_brand`; however, if one of these is the `major_brand`, the `minor_version` must be zero.

Advanced Profile	'mjxr '
Sub-Baseline Profile	'mjxs '

## Bibliography

- [1] ICC.1:2001-04, *File format for color profiles*, International Color Consortium.
- [2] Recommendation ITU-T T.801 (2002) | ISO/IEC 15444-2:2004, *Information technology – JPEG 2000 image coding system – Extensions*.



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