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**Information technology — Generic coding  
of moving pictures and associated audio  
information: Systems**

**AMENDMENT 5: Transport of JPEG 2000  
Part 1 (ITU-T Rec T.800 | ISO/IEC 15444-1)  
video over ITU-T Rec H.222.0 |  
ISO/IEC 13818-1**

*Technologies de l'information — Codage générique des images  
animées et du son associé: Systèmes*

*AMENDEMENT 5: Transport de video de la partie 1 de JPEG 2000  
(ITU-T Rec T.800 | ISO/IEC 15444-1) sur ITU-T Rec H.222.0 |  
ISO/IEC 13818-1*



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Published by ISO in 2012

Published in Switzerland

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## Foreword

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ISO/IEC 13818-1:2007/Amd.5 was prepared jointly by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*, in collaboration with ITU-T. The identical text is published as ITU-T Rec. H.222.0 (05/2011)/Amd.5.

INTERNATIONAL STANDARD  
RECOMMENDATION ITU-TInformation technology – Generic coding of moving pictures and  
associated audio information: Systems

## Amendment 5

Transport of JPEG 2000 Part 1 (ITU-T T.800 | ISO/IEC 15444-1)  
video over ITU-T H.222.0 | ISO/IEC 13818-1

## 1) Clause 1.2.3

In 1.2.3, *Additional References*, add the following reference:

- Recommendation ITU-T T.800 (2002) | ISO/IEC 15444-1:2004, *Information technology – JPEG 2000 image coding system: Core coding system*.

## 2) New clauses 2.1.89 to 2.1.92

After 2.1.88, add 2.1.89 to 2.1.92:

**2.1.89 JPEG 2000 (J2K) video access unit:** An access unit defined in Rec. ITU-T T.800 (2002)/Amd.3 (2010) | ISO/IEC 15444-1:2004/Amd.3:2010 which includes all the parameters required to decode the access unit and display the decoded data.

**2.1.90 J2K video elementary stream:** Video elementary stream consisting of a succession of J2K video access units.

**2.1.91 J2K video sequence:** J2K video elementary stream where all the access units have the same profile/level, J2K video access unit coding parameters and video parameters.

**2.1.92 J2K still picture (system):** J2K video access unit as defined in 2.1.89 with constraints as specified in S.2.

## 3) New clause 2.4.2.10

After 2.4.2.9, add 2.4.2.10:

**2.4.2.10 T-STD extensions for carriage of J2K video elementary streams**

The interpretation, extensions, use and constraints for syntax elements in the adaptation header (2.4.3.4 and 2.4.3.5) for JPEG 2000 part 1 video are defined in S.5.

The interpretation, extensions, use and constraints for syntax elements in the PES header (2.4.3.6 and 2.4.3.7) for JPEG 2000 Part 1 video are defined in S.5.

To define the decoding of J2K video elementary streams carried in a Transport Stream, the T-STD model needs to be extended. The T-STD extensions and T-STD parameters for decoding of J2K video elementary streams conforming to one or more profiles defined in Rec. ITU-T T.800 (2002) | ISO/IEC 15444-1:2004 are defined in S.6.

NOTE – No extensions are specified for P-STD model, as carriage of J2K video elementary streams in program streams is not supported.

4) **Clause 2.4.3.7**

In 2.4.3.7, replace Table 2-22 with the following:

**Table 2-22 – Stream\_id assignments**

| stream_id | Notes   | Stream coding                                                                                                                            |
|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------|
| 1011 1100 | 1       | program_stream_map                                                                                                                       |
| 1011 1101 | 2 and 9 | private_stream_1                                                                                                                         |
| 1011 1110 |         | padding_stream                                                                                                                           |
| 1011 1111 | 3       | private_stream_2                                                                                                                         |
| 110x xxxx |         | ISO/IEC 13818-3 or ISO/IEC 11172-3 or ISO/IEC 13818-7 or ISO/IEC 14496-3 audio stream number x xxxx                                      |
| 1110 xxxx |         | Rec. ITU-T H.262   ISO/IEC 13818-2 or ISO/IEC 11172-2 or ISO/IEC 14496-2 or Rec. ITU-T H.264   ISO/IEC 14496-10 video stream number xxxx |
| 1111 0000 | 3       | ECM_stream                                                                                                                               |
| 1111 0001 | 3       | EMM_stream                                                                                                                               |
| 1111 0010 | 5       | Rec. ITU-T H.222.0   ISO/IEC 13818-1 Annex A or ISO/IEC 13818-6_DSMCC_stream                                                             |
| 1111 0011 | 2       | ISO/IEC_13522_stream                                                                                                                     |
| 1111 0100 | 6       | Rec. ITU-T H.222.1 type A                                                                                                                |
| 1111 0101 | 6       | Rec. ITU-T H.222.1 type B                                                                                                                |
| 1111 0110 | 6       | Rec. ITU-T H.222.1 type C                                                                                                                |
| 1111 0111 | 6       | Rec. ITU-T H.222.1 type D                                                                                                                |
| 1111 1000 | 6       | Rec. ITU-T H.222.1 type E                                                                                                                |
| 1111 1001 | 7       | ancillary_stream                                                                                                                         |
| 1111 1010 |         | ISO/IEC14496-1_SL-packetized_stream                                                                                                      |
| 1111 1011 |         | ISO/IEC14496-1_FlexMux_stream                                                                                                            |
| 1111 1100 |         | metadata stream                                                                                                                          |
| 1111 1101 | 8       | extended_stream_id                                                                                                                       |
| 1111 1110 |         | reserved data stream                                                                                                                     |
| 1111 1111 | 4       | program_stream_directory                                                                                                                 |

The notation x means that the values '0' or '1' are both permitted and results in the same stream type. The stream number is given by the values taken by the x's.

NOTE 1 – PES packets of type program\_stream\_map have unique syntax specified in 2.5.4.1.

NOTE 2 – PES packets of type private\_stream\_1 and ISO/IEC\_13522\_stream follow the same PES packet syntax as those for Rec. ITU-T H.262 | ISO/IEC 13818-2 video and ISO/IEC 13818-3 audio streams.

NOTE 3 – PES packets of type private\_stream\_2, ECM\_stream and EMM\_stream are similar to private\_stream\_1 except no syntax is specified after PES\_packet\_length field.

NOTE 4 – PES packets of type program\_stream\_directory have a unique syntax specified in 2.5.5.

NOTE 5 – PES packets of type DSM-CC\_stream have a unique syntax specified in ISO/IEC 13818-6.

NOTE 6 – This stream\_id is associated with stream\_type 0x09 in Table 2-29.

NOTE 7 – This stream\_id is only used in PES packets, which carry data from a Program Stream or an ISO/IEC 11172-1 System Stream, in a Transport Stream (refer to 2.4.3.8).

NOTE 8 – The use of stream\_id 0xFD (extended\_stream\_id) identifies that this PES packet employs an extended syntax to permit additional stream types to be identified.

NOTE 9 – JPEG 200 video streams (stream\_type = 0x21) are carried using the same PES packet syntax as private\_stream\_1.

## 5) Clause 2.4.4.9

In 2.4.4.9, Semantic definition of fields in Transport Stream program map section, replace Table 2-34 with the following:

**Table 2-34 – Stream type assignments**

| Value     | Description                                                                                                                                                                                                                                                                   |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x00      | ITU-T   ISO/IEC Reserved                                                                                                                                                                                                                                                      |
| 0x01      | ISO/IEC 11172-2 Video                                                                                                                                                                                                                                                         |
| 0x02      | Rec. ITU-T H.262   ISO/IEC 13818-2 Video or ISO/IEC 11172-2 constrained parameter video stream                                                                                                                                                                                |
| 0x03      | ISO/IEC 11172-3 Audio                                                                                                                                                                                                                                                         |
| 0x04      | ISO/IEC 13818-3 Audio                                                                                                                                                                                                                                                         |
| 0x05      | Rec. ITU-T H.222.0   ISO/IEC 13818-1 private_sections                                                                                                                                                                                                                         |
| 0x06      | Rec. ITU-T H.222.0   ISO/IEC 13818-1 PES packets containing private data                                                                                                                                                                                                      |
| 0x07      | ISO/IEC 13522 MHEG                                                                                                                                                                                                                                                            |
| 0x08      | Rec. ITU-T H.222.0   ISO/IEC 13818-1 Annex A DSM-CC                                                                                                                                                                                                                           |
| 0x09      | Rec. ITU-T H.222.1                                                                                                                                                                                                                                                            |
| 0x0A      | ISO/IEC 13818-6 type A                                                                                                                                                                                                                                                        |
| 0x0B      | ISO/IEC 13818-6 type B                                                                                                                                                                                                                                                        |
| 0x0C      | ISO/IEC 13818-6 type C                                                                                                                                                                                                                                                        |
| 0x0D      | ISO/IEC 13818-6 type D                                                                                                                                                                                                                                                        |
| 0x0E      | Rec. ITU-T H.222.0   ISO/IEC 13818-1 auxiliary                                                                                                                                                                                                                                |
| 0x0F      | ISO/IEC 13818-7 Audio with ADTS transport syntax                                                                                                                                                                                                                              |
| 0x10      | ISO/IEC 14496-2 Visual                                                                                                                                                                                                                                                        |
| 0x11      | ISO/IEC 14496-3 Audio with the LATM transport syntax as defined in ISO/IEC 14496-3                                                                                                                                                                                            |
| 0x12      | ISO/IEC 14496-1 SL-packetized stream or FlexMux stream carried in PES packets                                                                                                                                                                                                 |
| 0x13      | ISO/IEC 14496-1 SL-packetized stream or FlexMux stream carried in ISO/IEC 14496_sections                                                                                                                                                                                      |
| 0x14      | ISO/IEC 13818-6 Synchronized Download Protocol                                                                                                                                                                                                                                |
| 0x15      | Metadata carried in PES packets                                                                                                                                                                                                                                               |
| 0x16      | Metadata carried in metadata_sections                                                                                                                                                                                                                                         |
| 0x17      | Metadata carried in ISO/IEC 13818-6 Data Carousel                                                                                                                                                                                                                             |
| 0x18      | Metadata carried in ISO/IEC 13818-6 Object Carousel                                                                                                                                                                                                                           |
| 0x19      | Metadata carried in ISO/IEC 13818-6 Synchronized Download Protocol                                                                                                                                                                                                            |
| 0x1A      | IPMP stream (defined in ISO/IEC 13818-11, MPEG-2 IPMP)                                                                                                                                                                                                                        |
| 0x1B      | AVC video stream conforming to one or more profiles defined in Annex A of Rec. ITU-T H.264   ISO/IEC 14496-10 or AVC video sub-bitstream, as defined in 2.1.78, or MVC base view sub-bitstream, as defined in 2.1.85, or AVC video sub-bitstream of MVC, as defined in 2.1.88 |
| 0x1C      | ISO/IEC 14496-3 Audio, without using any additional transport syntax, such as DST, ALS and SLS                                                                                                                                                                                |
| 0x1D      | ISO/IEC 14496-17 Text                                                                                                                                                                                                                                                         |
| 0x1E      | Auxiliary video stream as defined in ISO/IEC 23002-3                                                                                                                                                                                                                          |
| 0x1F      | SVC video sub-bitstream of an AVC video stream conforming to one or more profiles defined in Annex G of Rec. ITU-T H.264   ISO/IEC 14496-10                                                                                                                                   |
| 0x20      | MVC video sub-bitstream of an AVC video stream conforming to one or more profiles defined in Annex H of Rec. ITU-T H.264   ISO/IEC 14496-10                                                                                                                                   |
| 0x21      | Video stream conforming to one or more profiles as defined in Rec. ITU-T T.800   ISO/IEC 15444-1                                                                                                                                                                              |
| 0x22-0x7E | Rec. ITU-T H.222.0   ISO/IEC 13818-1 Reserved                                                                                                                                                                                                                                 |
| 0x7F      | IPMP stream                                                                                                                                                                                                                                                                   |
| 0x80-0xFF | User Private                                                                                                                                                                                                                                                                  |

**6) Clause 2.6.1**

In 2.6.1, Semantic definition of fields in program and program element descriptors, replace Table 2-45 with:

**Table 2-45 – Program and program element descriptors**

| descriptor_tag | TS  | PS  | Identification                                             |
|----------------|-----|-----|------------------------------------------------------------|
| 0              | N/A | N/A | Reserved                                                   |
| 1              | N/A | X   | Forbidden                                                  |
| 2              | X   | X   | video_stream_descriptor                                    |
| 3              | X   | X   | audio_stream_descriptor                                    |
| 4              | X   | X   | hierarchy_descriptor                                       |
| 5              | X   | X   | registration_descriptor                                    |
| 6              | X   | X   | data_stream_alignment_descriptor                           |
| 7              | X   | X   | target_background_grid_descriptor                          |
| 8              | X   | X   | video_window_descriptor                                    |
| 9              | X   | X   | CA_descriptor                                              |
| 10             | X   | X   | ISO_639_language_descriptor                                |
| 11             | X   | X   | system_clock_descriptor                                    |
| 12             | X   | X   | multiplex_buffer_utilization_descriptor                    |
| 13             | X   | X   | copyright_descriptor                                       |
| 14             | X   |     | maximum_bitrate_descriptor                                 |
| 15             | X   | X   | private_data_indicator_descriptor                          |
| 16             | X   | X   | smoothing_buffer_descriptor                                |
| 17             | X   |     | STD_descriptor                                             |
| 18             | X   | X   | IBP_descriptor                                             |
| 19-26          | X   |     | Defined in ISO/IEC 13818-6                                 |
| 27             | X   | X   | MPEG-4_video_descriptor                                    |
| 28             | X   | X   | MPEG-4_audio_descriptor                                    |
| 29             | X   | X   | IOD_descriptor                                             |
| 30             | X   |     | SL_descriptor                                              |
| 31             | X   | X   | FMC_descriptor                                             |
| 32             | X   | X   | external_ES_ID_descriptor                                  |
| 33             | X   | X   | MuxCode_descriptor                                         |
| 34             | X   | X   | FmxBufferSize_descriptor                                   |
| 35             | X   |     | multiplexBuffer_descriptor                                 |
| 36             | X   | X   | content_labeling_descriptor                                |
| 37             | X   | X   | metadata_pointer_descriptor                                |
| 38             | X   | X   | metadata_descriptor                                        |
| 39             | X   | X   | metadata_STD_descriptor                                    |
| 40             | X   | X   | AVC video descriptor                                       |
| 41             | X   | X   | IPMP_descriptor (defined in ISO/IEC 13818-11, MPEG-2 IPMP) |
| 42             | X   | X   | AVC timing and HRD descriptor                              |
| 43             | X   | X   | MPEG-2_AAC_audio_descriptor                                |
| 44             | X   | X   | FlexMuxTiming_descriptor                                   |
| 45             | X   | X   | MPEG-4_text_descriptor                                     |
| 46             | X   | X   | MPEG-4_audio_extension_descriptor                          |
| 47             | X   | X   | Auxiliary_video_stream_descriptor                          |
| 48             | X   | X   | SVC extension descriptor                                   |
| 49             | X   | X   | MVC extension descriptor                                   |

Table 2-45 – Program and program element descriptors

| descriptor_tag | TS  | PS  | Identification                                |
|----------------|-----|-----|-----------------------------------------------|
| 50             | X   | n/a | J2K video descriptor                          |
| 51-63          | n/a | n/a | Rec. ITU-T H.222.0   ISO/IEC 13818-1 Reserved |
| 64-255         | n/a | n/a | User Private                                  |

## 7) New clauses 2.6.80 and 2.6.81

After 2.6.79, add 2.6.80 and 2.6.81:

### 2.6.80 J2K video descriptor

For J2K video elementary streams conforming to one or more profiles defined in Rec. ITU-T T.800 | ISO/IEC 15444-1, the J2K video descriptor provides information that may be present in each J2K access unit as well as for the J2K video sequence. In addition, it provides information to signal J2K still pictures. This descriptor shall be included for each J2K video elementary stream component in the PMT with stream\_type equal to 0x21.

Table AMD5-1 – J2K video descriptor

| Syntax                   | No. of bits | Mnemonic |
|--------------------------|-------------|----------|
| J2K_video_descriptor() { |             |          |
| descriptor_tag           | 8           | uimsbf   |
| descriptor_length        | 8           | uimsbf   |
| profile_and_level        | 16          | uimsbf   |
| horizontal_size          | 32          | uimsbf   |
| vertical_size            | 32          | uimsbf   |
| max_bit_rate             | 32          | uimsbf   |
| max_buffer_size          | 32          | uimsbf   |
| DEN_frame_rate           | 16          | uimsbf   |
| NUM_frame_rate           | 16          | uimsbf   |
| color_specification      | 8           | bslbf    |
| still_mode               | 1           | bslbf    |
| interlaced_video         | 1           | bslbf    |
| reserved                 | 6           | bslbf    |
| for (i=0; i<N; i++) {    |             |          |
| private_data_byte        | 8           | bslbf    |
| }                        |             |          |
| }                        |             |          |

### 2.6.81 Semantics of fields in J2K video descriptor

**profile\_and\_level** – This field shall be in the range 0x0101-0x04ff and coded as defined in Table A.10 of Rec. ITU-T T.800 | ISO/IEC 15444-1 and indicates broadcast profile and level values.

**horizontal\_size** – This field shall be coded the same as Xsiz parameter found in the J2K codestream main header, as defined in Annex A of Rec. ITU-T T.800 | ISO/IEC 15444-1.

**vertical\_size** – This field shall be coded the same as Ysiz parameter found in the J2K codestream main header, as defined in Annex A of Rec. ITU-T T.800 | ISO/IEC 15444-1.

**max\_bit\_rate** – This field may be coded the same as the Maxbr value in the j2k\_brat field box specified in Table S.1 and shall not exceed the maximum compressed bit rate value for the profile and level specified in Table S.2. This field shall be set appropriately and signalled when profile\_and\_level = 0x0307, where no maximum bit rate is specified.

**max\_buffer\_size** – This field shall not exceed the Maximum buffer size value for the profile and level specified in the j2k\_brat box in Table S.2. When profile\_and\_level = 0x0307, the max\_buffer\_size shall be set appropriately and shall not exceed (max\_bit\_rate/1.60E5), where max\_bit\_rate is expressed in bit/s.

**DEN\_frame\_rate** – This field shall be coded the same as frat\_denominator field in the j2k\_frat box specified in Table S.1 (see Annex S).

**NUM\_frame\_rate** – This field shall be coded the same as `frat_numerator` field in the `frat` box specified in Table S.1 (see Annex S).

NOTE – J2K frame rate is derived from the `DEN_frame_rate` and `NUM_frame_rate` values. Table AMD5-2 lists examples of typical broadcast frame rates with associated values of `DEN_frame_rate` and `NUM_frame_rate`.

**Table AMD5-2 – Example frame rates based on `DEN_frame_rate` and `NUM_frame_rate` values**

| <code>DEN_frame_rate</code> | <code>NUM_frame_rate</code> | Frame rate ratio<br>(decimal representation) | Frame rate |
|-----------------------------|-----------------------------|----------------------------------------------|------------|
| 0000 0000 0000 0000         |                             |                                              | Forbidden  |
| 0000 0011 1110 1001         | 0101 1101 1100 0000         | 24 000 / 1001                                | 23.976     |
| 0000 0000 0000 0001         | 0000 0000 0001 1000         | 24 / 1                                       | 24.0       |
| 0000 0000 0000 0001         | 0000 0000 0001 1001         | 25 / 1                                       | 25.0       |
| 0000 0011 1110 1001         | 0111 0101 0011 0000         | 30 000 / 1001                                | 29.97      |
| 0000 0000 0000 0001         | 0000 0000 0001 1110         | 30 / 1                                       | 30.0       |
| 0000 0000 0000 0001         | 0000 0000 0011 0010         | 50 / 1                                       | 50.0       |
| 0000 0011 1110 1001         | 1110 1010 0110 0000         | 60 000 / 1001                                | 59.94      |
| 0000 0000 0000 0001         | 0000 0000 0011 1100         | 60 / 1                                       | 60.00      |

**color\_specification** – This field shall be coded the same as the `bcol_colrc` 8-bit field of the `j2k_bcol` box as specified in Table S.1 (see Annex S).

**still\_mode** – This 1-bit field, when set to '1', indicates that the J2K video stream may include J2K still pictures. When set to '0', then the associated J2K video stream shall not contain J2K still pictures.

**interlaced\_video** – This 1-bit field indicates whether the J2K video stream contains interlaced video. When this flag is set to '1' the J2K access unit elementary stream header (see Table S.1) shall include the syntax elements `Auf2`, `fiel_box_code`, `fic` and `fio`. When this flag is set to '0', these syntax elements shall not be present in the J2K access unit elementary stream header.

## 8) Annex S

After Annex R, add the following annex:

### Annex S

#### Carriage of JPEG 2000 part 1 video over MPEG-2 Transport Streams

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

##### S.1 Introduction

This annex specifies normative constraints for the carriage of JPEG 2000 video in an MPEG-2 transport stream. The parameters specified include mapping of J2K video streams into MPEG-2 transport packets, signalling of J2K video streams as well as T-STD parameters for various profiles. Transport of J2K video shall be limited to transport stream only. Program stream support may be added in the future based on application requirements.

##### S.2 J2K video access unit, J2K video elementary stream, J2K video sequence and J2K still picture

The J2K video access unit contains the elementary stream (elsm) header created in a manner following Annex M of Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3 concatenated with self-contained Rec. ITU-T T.800 | ISO/IEC 15444-1 codestream(s). The (elsm) header contains all video-related parameters necessary to display the decoded codestream(s). Multiple codestreams may comprise an access unit when, for instance, the access unit is an interlaced frame. The J2K video elementary stream is a progression of J2K access units and the J2K video sequence is a subset of J2K video elementary stream where all the J2K access units have the same parameters in the (elsm) header.

The J2K still picture (system) consists of a J2K video sequence which contains exactly one J2K access unit. This still picture has an associated PTS and the presentation time of succeeding pictures, if any, is later than that of the still picture by at least two picture periods. The J2K still picture (system) mode is used to support transmission of J2K video access units at a rate much lower than the display frame rate (determined by the difference in PTS values between successive J2K access units). J2K still picture can be used in applications such as 'slide show' and 'stills with Music'.

### S.3 Elementary stream header (elsm) and mapping to PES packets

Table S.1 shows each portion of the elsm header as defined in Annex M of Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3 and the concatenation of detailed metadata boxes within the elsm header.

**Table S.1 – J2K Access unit elementary stream header**

| Syntax                          | No. of bits | Mnemonic |
|---------------------------------|-------------|----------|
| j2k_es() {                      |             |          |
| j2k_elsm '0x656c 736d'          | 32          | bslbf    |
| // j2k_frat                     |             |          |
| frat_box_code '0x6672 6174'     | 32          | bslbf    |
| frat_denominator                | 16          | uimsbf   |
| frat_numerator                  | 16          | uimsbf   |
| // j2k_brat                     |             |          |
| brat_box_code = '0x6272 6174'   | 32          | bslbf    |
| Maxbr                           | 32          | uimsbf   |
| Auf1                            | 32          | uimsbf   |
| // If (interlaced_video == 1) { |             |          |
| Auf2                            | 32          | uimsbf   |
| }                               |             |          |
| // j2k_fiel                     |             |          |
| // If (interlaced_video == 1) { |             |          |
| fiel_box_code = 0x6669 656c     | 32          | bslbf    |
| fic                             | 8           | uimsbf   |
| fio                             | 8           | uimsbf   |
| }                               |             |          |
| // j2k_tcod                     |             |          |
| tocd_code = 0x7463 6f64         | 32          | bslbf    |
| HH (0-23)                       | 8           | uimsbf   |
| MM (0-59)                       | 8           | uimsbf   |
| SS (0-59)                       | 8           | uimsbf   |
| FF (1-60)                       | 8           | uimsbf   |
| // j2k_bcol                     |             |          |
| bcol_code = 0x6263 686c         | 32          | bslbf    |
| bcol_colcr                      | 8           | uimsbf   |
| reserved                        | 8           | bslbf    |
| }                               |             |          |

**j2k\_frat** – A field box defined in Annex M of Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3 corresponding to the required frat box containing frame rate coding.

**j2k\_brat** – A field box defined in Annex M of Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3 corresponding to the required brat box containing the maximum instantaneous bit rate of the elementary stream.

**j2k\_fiel** – A field box defined in Annex M of Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3 corresponding to the optional fiel box containing interleaved field coding. If the j2k\_fiel is present, there shall be two contiguous codestreams present.

**j2k\_tcod** – A field box defined in Annex M of Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3 corresponding to the required tcod box containing time code and frame count information of the J2K video access unit.

**j2k\_bcol** – A field box defined in Annex M of Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3 corresponding to the required bcol box containing broadcast color specification coding.

Figure S.1 shows the structure and mapping of J2K video access unit into PES packets. JPEG 2000 represents each frame as one or two Part 1 (Rec. ITU-T T.800 | ISO/IEC 15444-1) contiguous codestreams. The codestream main header, included within each contiguous condestream contains all information to decode its image, including the image

size and the profile indicator, called a SIZ marker in Rec. ITU-T T.800 | ISO/IEC 15444-1. In addition to each codestream's main header, Annex M of Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3 adds an elementary stream (elsm) header containing video-related information, as shown in Table S.1 and the j2k\_video\_descriptor in 2.6.80.

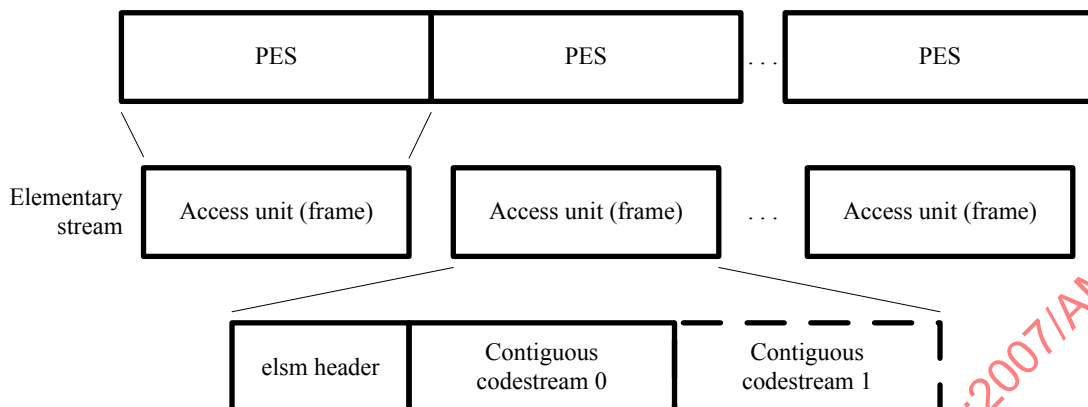


Figure S.1 – Structure and order of JPEG 2000 access units

#### S.4 J2K transport constraints

When a J2K video elementary stream conforming to one or more profiles as defined in Rec. ITU-T T.800 | ISO/IEC 15444-1 is transported using MPEG-2 systems, the following constraints apply:

- 1) Each J2K access unit shall contain an elementary stream header (elsm) defined in Table S.1 (as specified in Rec. ITU-T T.800 (2002)/Amd.3 | ISO/IEC 15444-1:2004/Amd.3) followed by one or two codestream(s).
- 2) Each J2K codestream main header contains a SIZ marker segment that includes a RSIZ capability parameter. Both the SIZ marker segment and RSIZ capability parameter are defined in Annex A of Rec. ITU-T T.800 | ISO/IEC 15444-1 equating to the profile\_and\_level parameter (see 2.6.81).
- 3) The J2K video access units shall be ordered in the J2K video elementary stream in a monotonic display order.
- 4) Each J2K video access unit shall include a PES header with PTS and each PES packet shall contain exactly one J2K video access unit.
- 5) For successive J2K video access units, the increments to PTS shall be consistent with increments to corresponding J2K\_tcod parameters in the elsm header.
- 6) The following constraints apply to the coding of syntax elements in the adaptation header for transport of J2K video elementary stream:
  - a) Both random\_access\_indicator and elementary\_stream\_priority\_indicator flags can be set to '1' for each J2K video access unit contained in the transport packet. Applications may limit the signalling of random access based on their use cases. Any J2K video access unit is also a J2K video 'access point' required for random access.
  - b) All other flags should be set appropriately.
- 7) The following constraints apply to the coding of syntax elements in the PES header for transport of J2K video elementary stream:
  - a) stream\_id shall be set to 0xBD (same as Private\_stream\_1).
  - b) PES\_packet\_length shall be set to 0x0000.
  - c) data\_alignment\_indicator shall be set to '1'. Also see S.5 for alignment constraints.
  - d) PTS\_DTS\_flags shall be set to '10'. This precludes display re-ordering for J2K video access units.
  - e) All other flags should be set appropriately.