INTERNATIONAL STANDARD

ISO/IEC 13818-1

Fifth edition
2015-07-01

AMENDMENT 6
2016-10-15

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

Part 1: Systems

AMENDMENT 6: Carriage of Quality Metadata in MPEG-2 Systems

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

Partie 1: Systèmes

AMENDEMENT 6: Transport des métadonnées de qualité dans les systèmes MPEG-2

Reference number
ISO/IEC 13818-1:2015/Amd.6:2016(E)

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Amendment 6 to ISO/IEC 13818-1:2015 was prepared 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 Rec. ITU-T H.222.0 (07/2016)/Amd.6.

INTERNATIONAL STANDARD
ITU-T RECOMMENDATION

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

Amendment 6

Carriage of quality metadata in MPEG-2 systems

1) Clause 1.2.3

In clause 1.2.3 add:

– ISO/IEC 23001-10:2015, *Information technology — MPEG systems technologies — Part 10: Carriage of timed metadata metrics of media in ISO base media file format*.

2) Clause 2.1

In clause 2.1 add the following after clause 2.1.128:

2.1.129 quality access unit: An access unit that contains dynamic quality metadata as defined in ISO/IEC 23001-10.

3) Table 2-31

Replace Table 2-31 by the following:

Table 2-31 – table_id assignment values

Value	Description
0x00	program_association_section
0x01	conditional_access_section (CA_section)
0x02	TS_program_map_section
0x03	TS_description_section
0x04	ISO_IEC_14496_scene_description_section
0x05	ISO_IEC_14496_object_descriptor_section
0x06	Metadata_section
0x07	IPMP_Control_Information_section (defined in ISO/IEC 13818-11)
0x08	ISO_IEC_14496_section
0x09	ISO/IEC 23001-11 (Green Access Unit) section
0x0A	ISO/IEC 23001-10 (Quality Access Unit) section
0x0B-0x37	Rec. ITU-T H.222.0 | ISO/IEC 13818-1 reserved
0x38-0x3F	Defined in ISO/IEC 13818-6
0x40-0xFE	User private
0xFF	Forbidden

4) Table 2-34

In Table 2-34 add the following:

0x2F	Quality Access Units carried in sections
0x30-0x7E	Rec. ITU-T H.222.0 | ISO/IEC 13818-1 reserved

5) Clause 2.6.90

Replace Table 2-105 with:

Table 2-105 – Extension descriptor

Syntax	No. of bits	Mnemonic
Extension_descriptor () {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
extension_descriptor_tag	**8**	**uimsbf**
if (extension_descriptor_tag == 0x02) {		
ObjectDescriptorUpdate()		
}		
else if (extension_descriptor_tag == 0x03) {		
HEVC_timing_and_HRD_descriptor()		
}		
else if (extension_descriptor_tag == 0x04) {		
af_extension_descriptor()		
}		
else if (extension_descriptor_tag == 0x05) {		
HEVC_operation_point_descriptor()		
}		
else if (extension_descriptor_tag == 0x06) {		
HEVC_hierachy_extension_descriptor()		
}		
else if (extension_descriptor_tag == 0x07) {		
Green_extension_descriptor ()		
}		
else if (extension_descriptor_tag == 0x08) {		
MPEG-H_3dAudio_descriptor()		
}		
else if (extension_descriptor_tag == 0x09) {		
MPEG-H_3dAudio_config_descriptor()		
}		
else if (extension_descriptor_tag == 0x0A) {		
MPEG-H_3dAudio_scene_descriptor()		
}		
else if (extension_descriptor_tag == 0x0B) {		
MPEG-H_3dAudio_text_label_descriptor()		
}		
else if (extension_descriptor_tag == 0x0C) {		
MPEG-H_3dAudio_multi-stream_descriptor()		
}		
else if (extension_descriptor_tag == 0x0D) {		
MPEG-H_3dAudio_drc_loudness_descriptor()		
}		
else if (extension_descriptor_tag == 0x0E) {		
MPEG-H_3dAudio_command_descriptor()		
}		
else if (extension_descriptor_tag == 0x0F) {		
Quality_extension_descriptor ()		
else {		

Table 2-105 – Extension descriptor

Syntax	No. of bits	Mnemonic

for (i=0; i<N; i++) {
reserved
}
}
}
	8	**bslbf**

6) Clause 2.6.91

Add the following immediately before Table 2-106:

Quality_extension_descriptor() – This structure is defined in 2.6.119.

Replace Table 2-106 with:

Table 2-106 – Extension descriptor tag values

Extension_descriptor_tag	TS	PS	Identification
0	n/a	n/a	Reserved
1	n/a	X	Forbidden
2	X	X	ODUpdate_descriptor
3	X	n/a	HEVC_timing_and_HRD_descriptor()
4	X	n/a	af_extensions_descriptor()
5	X	n/a	HEVC_operation_point_descriptor()
6	X	n/a	hierarchy_extension_descriptor()
7	X	n/a	Green_extension_descriptor()
8	X	n/a	MPEG-H_3dAudio_descriptor()
9	X	n/a	MPEG-H_3dAudio_config_descriptor()
0x0A	X	n/a	MPEG-H_3dAudio_scene_descriptor()
0x0B	X	n/a	MPEG-H_3dAudio_text_label_descriptor()
0x0C	X	n/a	MPEG-H_3dAudio_multi-stream_descriptor()
0x0D	X	n/a	MPEG-H_3dAudio_drc_loudness_descriptor()
0x0E	X	n/a	MPEG-H_3dAudio_command_descriptor()
0x0F	X	n/a	Quality_extension_descriptor()
0x10-0xFF	n/a	n/a	Rec. ITU-T H.222.0 | ISO/IEC 13818-1 Reserved

7) Clause 2.6.119

Add the following clause after clause 2.6.118:

2.6.119 Quality extension descriptor

The Quality extension descriptor shall be sent once per event or program and hence is signalled using a descriptor in the Program Map Table. This descriptor shall appear in the elementary stream loop of the PID for which quality information is provided.

Dynamic quality metadata is stored in access units and is associated with one or more video frames. These access units are encapsulated in MPEG sections identified by stream_type value of 0x2F.

The Quality extension descriptor describes metrics that are present in each Quality Access Unit, and the constant field size that is used for the values. The quality metrics are defined in clause 4.3 of ISO/IEC 23001-10.

The syntax of Quality extension descriptor containing static metadata is shown in Table 111*terdecies*.

Table 2-111*terdecies* – Quality extension descriptor

Syntax	No. bits	Mnemonic
Quality_extension_descriptor() {		
field_size_bytes	**8**	**uimsbf**
metric_count	**8**	**uimsbf**
for (i=0; i < metric_count; i++) {		
metric_code[i]	**32**	**uimsbf**
}		
}		

field_size_bytes indicates the constant size in bytes of the value for a metric in each Quality Access Unit

metric_count: The number of metrics for quality values in each Quality Access Unit

metric_code is the code name of the metrics in the Quality Access Unit

Semantics for all the syntax elements above are specified in clause 4.2 of ISO/IEC 23001-10. The quality metrics to be signalled can also be found in clause 4.3 of ISO/IEC 23001-10 and include:

- PSNR = Peak Signal to Noise Ratio
- SSIM = Structural Similarity Index
- MS-SSIM = Multi-Scale Structural Similarity Index
- VQM = Video Quality Metric
- PEVQ = Perceptual Evaluation of Video Quality
- MOS = Mean Opinion Score
- FSIG = Frame significance

7) Clause 2.20

Add the following clause after clause 2.19:

2.20 Carriage of Quality Access Units in MPEG-2 sections

2.20.1 General Description

Quality Access Units carrying dynamic quality metadata associated with one or more video frames, i.e., a given quality metric sample can be applicable for multiple video frames for a given DTS interval, until a new quality metric sample is declared. These access units are encapsulated in MPEG sections identified by stream_type value of 0x2F.

Each Quality Access Unit contains configuration and timing information, as well as an array of quality values, corresponding one for one to the declared metrics. Each value is padded by preceding zero bytes, as needed, to the number of bytes indicated by field_size_bytes.

Quality_access_unit shall be carried in MPEG sections.

Every Quality Access Unit shall be a random access point.

NOTE – In order to make processing easier, each Quality Access Unit should be contained in a single TS packet.

The syntax for the Quality Access Units is provided in Table 2-124. The attribute definitions are aligned with those in ISO/IEC 23001-10.

Table 2-124 – Quality Access Unit

Syntax	No. bits	Mnemonic
Quality_Access_Unit() {		
field_size_bytes	**8**	**uimsbf**
metric_count	**8**	**uimsbf**
for (i = 0; i < metric_count; i++) {		
metric_code	**32**	**uimsbf**
sample_count	**8**	**uimsbf**
for (j = 0; j < sample_count; j++) {		
'0010'	**4**	**bslbf**
media_DTS [32..30]	**3**	**uimsbf**
marker_bit	**1**	**bslbf**
media_DTS [29..15]	**15**	**uimsbf**
marker_bit	**1**	**bslbf**
media_DTS [14..0]	**15**	**uimsbf**
marker_bit	**1**	**bslbf**
quality_metric_sample	**N**	**uimsbf**
}		
}		
}		

field_size_bytes: size of the quality_metric_sample field. As such, N=8*field_size_bytes

metric_count: The number of metrics for quality values in the Quality Access Unit, as defined in clause 4.2 of ISO/IEC 23001-10

metric_code: The code name of the metrics in the Quality Access unit, as defined in clause 4.2 of ISO/IEC 23001-10

sample_count: Number of quality metric samples per metric

media_DTS: DTS of the media access unit described by the quality metric sample.

As such, quality_metric_sample is an array signalled using the 'i' and 'j' values of the loop.

2.20.2 Buffer model for processing Quality Access Units

The buffer model reflects processing required to handle Quality Access Units. The model can be used to establish constraints which can be used to verify the validity of dynamic Quality metadata prepared in accordance with this Standard.

Figure 2-*3bis* illustrates the buffer model for processing Quality Access Units.

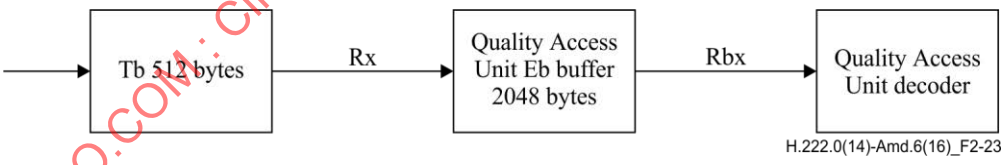

Figure 2-23 – Quality Access Unit decoder processing model

MPEG-2 Transport Stream packets come into the model at the left, and are filtered by PID. Packets whose PID matches the Quality Access Unit PID flow into the 512 byte transport buffer. These buffered packets are removed at a rate of Rx = 300 kbps (kilobits/second) and stored in the Quality Access Unit Eb buffer (2048 Bytes). Quality Access Unit table sections are removed from the Eb buffer immediately after the full access unit is available (based on section length) and these are passed onto the Quality Access Unit decoder at a rate Rbx = 300 kbps for decoding and association with the corresponding video frames. Eb buffer shall not overflow and the Quality Access Unit section shall be available in the Eb buffer to meet the requirement of DTS earlier than the DTS of the latest media access unit described in the corresponding Quality Access Unit.