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Amendment 8
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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Transmission multiplexing and synchronization

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

Amendment 8: Signaling HDR and WCG video content in MPEG-2 systems

CAUTION !

PREPUBLISHED RECOMMENDATION

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INTERNATIONAL STANDARD ISO/IEC 13818-1:2015 AMD 8:2017

ITU-T RECOMMENDATION ITU-T H.222.0 (2014) Amd.8 (2017)

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

Amendment 8
Signaling HDR and WCG video content in MPEG-2 systems

Summary

The capability to encode and decode Wide Color Gamut (WCG) and High Dynamic Range (HDR) video content using HEVC Main 10 profile has been added to ITU-T H.265 | ISO/IEC 23008-2. This capability allows the signaling of transfer functions and associated information as part of SEI messages and VUI for HDR content and signaling of BT.2020 color information in VUI for WCG content. All Main 10 Profile based receivers will be able to decode the video but may not be able to do appropriate processing required to make video presentable on a non-HDR or non-WCG display. Therefore, in many applications (such as broadcast) that use the MPEG-2 TS it will be beneficial to signal presence of WCG and HDR video content as well as additional information at a program level. This enables HDR and WCG capable receivers to process the information in video ES and render the decoded content correctly. Receivers that do not have the capability to process WCG and HDR can either ignore the content or do their best effort to render the content on non-WCG and non-HDR display devices. This amendment specifies MPEG-2 TS 'signaling' to indicate presence of WCG and HDR video in the HEVC elementary stream.

This amendment does not specify a new stream_type when HDR content is present in the HEVC elementary stream as video can be decoded by conventional HEVC decoders that conform to the 10-bit profile. Key signaling that is proposed is an extension to the HEVC video descriptor to indicate that the video component includes WCG and/or HDR video. The amendment uses two of the 'reserved' bits in the descriptor to create an indicator to signal SDR, SDR+WCG or HDR+WCG video, or "no indication".

1) Replace clause 2.6.95 by the following

For an HEVC video stream, the HEVC video descriptor provides basic information for identifying coding parameters, such as profile and level parameters of that HEVC video stream. For an HEVC temporal video sub-bitstream or an HEVC temporal video subset, the HEVC video descriptor provides information such as the associated HEVC highest temporal sub-layer representation contained in the elementary stream to which it applies. This descriptor can also be used to indicate presence of WCG and HDR video components in the associated PID as well as additional parameters to assist decoders with HDR capability to render intended video data on HDR capable display devices. In addition, this can assist non-HDR capable decoders to use the information appropriately.

NOTE 1 – In case that the video characteristics change over time, care should be taken that the descriptor is updated accordingly.

2) Replace Table 2-109 by

Table 2-109 – HEVC video descriptor

Syntax	No. Of bits	Mnemonic
HEVC_descriptor() {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
profile_space	**2**	**uimsbf**
tier_flag	**1**	**bslbf**
profile_idc	**5**	**uimsbf**
profile_compatibility_indication	**32**	**bslbf**
progressive_source_flag	**1**	**bslbf**
interlaced_source_flag	**1**	**bslbf**
non_packed_constraint_flag	**1**	**bslbf**
frame_only_constraint_flag	**1**	**bslbf**
copied_44bits	**44**	**bslbf**
level_idc	**8**	**uimsbf**
temporal_layer_subset_flag	**1**	**bslbf**
HEVC_still_present_flag	**1**	**bslbf**
HEVC_24hr_picture_present_flag	**1**	**bslbf**
sub_pic_hrd_params_not_present_flag	**1**	**bslbf**
reserved	**2**	**bslbf**
HDR_WCG_idc	**2**	**uimsbf**
if (temporal_layer_subset_flag == '1') {		
temporal_id_min	**3**	**uimsbf**
reserved	**5**	**bslbf**
temporal_id_max	**3**	**uimsbf**
reserved	**5**	**bslbf**
}		
}		

3) Replace clause 2.6.96 by the following

2.6.96 Semantic definition of fields in HEVC video descriptor

profile_space, tier_flag, profile_idc, profile_compatibility_indication, **progressive_source_flag, interlaced_source_flag, non_packed_constraint_flag, frame_only_constraint_flag, level_idc** – When the HEVC video descriptor applies to an HEVC video stream or to an HEVC complete temporal representation, these fields shall be coded according to the semantics defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 for *general_profile_space*, *general_tier_flag*, *general_profile_idc*, *general_profile_compatibility_flag[i]*, *general_progressive_source_flag*, *general_interlaced_source_flag*, *general_non_packed_constraint_flag*, *general_frame_only_constraint_flag*, *general_level_idc*, respectively, for the corresponding HEVC video stream or HEVC complete temporal representation, and the entire HEVC video stream or HEVC complete temporal representation to which the HEVC video descriptor is associated shall conform to the information signalled by these fields.

When the HEVC video descriptor applies to an HEVC temporal video sub-bitstream or HEVC temporal video subset of which the corresponding HEVC highest temporal sub-layer representation is not an HEVC complete temporal representation, these fields shall be coded according to the semantics defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 for *sub_layer_profile_space*, *sub_layer_tier_flag*, *sub_layer_profile_idc*, *sub_layer_profile_compatibility_flag[i]*, *sub_layer_progressive_source_flag*, *sub_layer_interlaced_source_flag*, *sub_layer_non_packed_constraint_flag*, *sub_layer_frame_only_constraint_flag*, *sub_layer_level_idc*, respectively, for the corresponding HEVC highest temporal sub-layer representation, and the entire HEVC highest temporal sub-layer

representation to which the HEVC video descriptor is associated shall conform to the information signalled by these fields.

NOTE 1 – In one or more sequences in the HEVC video stream the level may be lower than the level signalled in the HEVC video descriptor, while also a profile may occur that is a subset of the profile signalled in the HEVC video descriptor. However, in the entire HEVC video stream, only subsets of the entire bitstream syntax shall be used that are included in the profile signalled in the HEVC video descriptor, if present. If the sequence parameter sets in an HEVC video stream signal different profiles, and no additional constraints are signalled, then the stream may need examination to determine which profile, if any, the entire stream conforms to. If an HEVC video descriptor is to be associated with an HEVC video stream that does not conform to a single profile, then the HEVC video stream should be partitioned into two or more sub-streams, so that HEVC video descriptors can signal a single profile for each such sub-stream.

Copied_44bits – When the HEVC video descriptor applies to an HEVC video stream or to an HEVC complete temporal representation, this bit field shall be coded according to the semantics of the syntax elements defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 for the 44 bits found in the profile_tier_level() syntax element between *general_frame_only_constraint_flag* and *general_level_idc* for the corresponding HEVC video stream or HEVC complete temporal representation, and the entire HEVC video stream or HEVC complete temporal representation to which the HEVC video descriptor is associated shall conform to the information signalled by these fields.

When the HEVC video descriptor applies to an HEVC temporal video sub-bitstream or HEVC temporal video subset of which the corresponding HEVC highest temporal sub-layer representation is not an HEVC complete temporal representation, this bit field shall be coded according to the semantics of the syntax elements defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 for the 44 bits found in the profile_tier_level() syntax element between *sub_layer_frame_only_constraint_flag* and *sub_layer_level_idc* for the corresponding HEVC highest temporal sub-layer representation, and the entire HEVC highest temporal sub-layer representation to which the HEVC video descriptor is associated shall conform to the information signalled by these fields.

Temporal_layer_subset_flag – This 1-bit flag, when set to '1', indicates that the syntax elements describing a subset of temporal layers are included in this descriptor. This field shall be set to 1 for HEVC temporal video subsets and for HEVC temporal video sub-bitstreams. When set to '0', the syntax elements temporal_id_min and temporal_id_max are not included in this descriptor.

HEVC_still_present_flag – This 1-bit field, when set to '1', indicates that the HEVC video stream or the HEVC highest temporal sub-layer representation may include HEVC still pictures. When set to '0', then the associated HEVC video stream shall not contain HEVC still pictures.

NOTE 2 – According to Recommendation. ITU-T H.265 | ISO/IEC 23008-2, IDR pictures are always associated with a TemporalId value equal to 0, Consequently, if the HEVC video descriptor applies to an HEVC temporal video subset, HEVC still pictures can only be present in the associated HEVC temporal video sub-bitstream.

HEVC_24_hour_picture_present_flag – This 1-bit flag, when set to '1', indicates that the associated HEVC video stream or the HEVC highest temporal sub-layer representation may contain HEVC 24-hour pictures. For the definition of an HEVC 24-hour picture, see clause 2.1.97. If this flag is set to '0', the associated HEVC video stream shall not contain any HEVC 24-hour pictures.

Sub_pic_hrd_params_not_present_flag – This 1-bit field, when set to '0', indicates that the VUI in the HEVC video stream shall have the syntax element sub_pic_hrd_params_present_flag set to '1'. When the sub_pic_hrd_params_not_present_flag is set to '1', the associated HEVC video stream may not contain sub_pic_hrd_params_present_flag in the VUI or the flag may be set to '0'.

NOTE 3 – Decoders that support the sub-picture processing mode are expected to manage the T-RECOMMENDATION using the appropriate delay values in the HEVC video stream specified in the relevant SEI messages defined in ISO/IEC 23008-2:2013 and in addition in Annex C.2.3 (timing of decoding unit removal and decoding of decoding unit) instead of the time stamp values in the PES header.

HDR_WCG_idc – The value of this syntax element indicates the presence or absence of high dynamic range (HDR) and/or wide color gamut (WCG) video components in the associated PID according to Table 2-109bis. HDR is defined to be video that has high dynamic range if the video stream EOTF is higher than the Recommendation. ITU-R BT.1886 reference EOTF. This field also shall not be set to 2 unless bit_depth_luma_minus8 as defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 in the associated video is greater than or equal to 2. WCG is defined to be video that is coded using colour primaries with a colour gamut not contained within Recommendation. ITU-R BT.709. This field also shall not be set to 1 or 2 unless bit_depth_chroma_minus8 as defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 in the associated video is greater than or equal to 2.

Temporal_id_min – This 3-bit field indicates the minimum value of the *TemporalId*, as defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2, of all HEVC access units in the associated elementary stream.

Temporal_id_max – This 3-bit field indicates the maximum value of the *TemporalId*, as defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2, of all HEVC access units in the associated elementary stream.

Table 2-109bis – Semantics of HDR_WGC_idc

HDR_WCG_idc	Description
0	SDR, i.e. video is based on the Recommendation. ITU-R BT.1886 reference EOTF with a color gamut that is contained within Recommendation. ITU-R BT.709 with a Recommendation. ITU-R BT.709 container. (see Note 4)
1	WCG only, i.e. video color gamut in a Recommendation ITU-R BT.2020 container that exceeds Recommendation ITU-R BT.709 (see Note 5)
2	Both HDR and WCG are to be indicated in the stream (see Note 6)
3	No indication made regarding HDR/WCG or SDR characteristics of the stream

NOTE 4 – An example where it would be desirable to set HDR_WCG_idc to 0 would be when the colour_description_present_flag, as defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2, is set to '0', with colour_primaries and transfer_characteristics not present in the video stream.

NOTE 5 – An example where it would be desirable to set HDR_WCG_idc to 1 would be when colour_primaries as defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 is equal to 9 to indicate Recommendation. ITU-R BT.2020.

NOTE 6 – An example where it would be desirable to set HDR_WCG_idc to 2 would be when transfer_characteristics as defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 is equal to 16 to indicate BT.2100 PQ EOTF or equal to 18 to indicate BT.2100 HLG EOTF, and when colour_primaries as defined in Recommendation. ITU-T H.265 | ISO/IEC 23008-2 is equal to 9 to indicate Recommendation. ITU-R BT.2020.

4) Replace in clause 1.2.3 the following

– Recommendation ITU-R BT.601-6 (2007), *Studio encoding parameters of digital television for standard 4:3 and wide-screen 16.9 aspect ratios*.

With

– Recommendation ITU-R BT.601-6 (2007), *Studio encoding parameters of digital television for standard 4:3 and wide-screen 16.9 aspect ratios*.

– Recommendation ITU-R BT.709-6 (06-2015), *Parameter values for the HDTV standards for production and international programme exchange*.

– Recommendation ITU-R BT.1886, *Reference electro-optical transfer function for flat panel displays used in HDTV studio production.*

– Recommendation ITU-R BT.2100, *Image parameter values for high dynamic range television for use in production and international programme exchange*.