INTERNATIONAL STANDARD

ISO/IEC 23000-19

Second edition
2020-03

AMENDMENT 1
2021-05

Information technology — Multimedia application format (MPEG-A) —

Part 19: Common media application format (CMAF) for segmented media

AMENDMENT 1: Additional CMAF HEVC media profiles

Technologies de l'information — Format pour application multimédia (MPEG-A) —

Partie 19: Format CMAF (Common Media Application Format) pour médias segmentés

AMENDEMENT 1: Profils médias CMAF HEVC supplémentaires

Reference number
ISO/IEC 23000-19:2020/Amd.1:2021(E)

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Published in Switzerland

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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*.

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Subclause 9.3.5.2

Replace the second paragraph with the following:

For NAL structured video, CTA 608/708 caption data (CTA-608-E, CTA-708-E) may be stored in SEI messages in coded video sequences in CMAF fragments described as user data registered by Rec. ITU-T Recommendation T.35, with SEI `payloadType = 4` and the registered identifier in the field `user_data_registered_itu_t_t35`. See ISO/IEC 23008-2 for supplemental enhancement information user data.

Annex B

Replace Clause B.1 with the following:

B.1 HEVC video CMAF tracks

This annex defines HEVC video tracks and specific CMAF media profiles with HEVC elementary stream constraint sets. Applications that do not conform to the HEVC video track or any of these CMAF media profiles can either specifiy their own HEVC video track definition or CMAF media profile or both. Applications can also signal brand conformance to just a CMAF structural brand defined in this document (e.g. `'cmfc'` or `'cmf2'`).

HEVC tracks shall conform to 9.3, as additionally constrained in this annex.

Subclause B.2.4

Replace the first bullet item with the following:

— As specified in subclause 9.3.5.1, video captured or colour graded with characteristics other than ITU-R Recommendation BT.709 defaults should include one or more SEI NALs with additional transfer characteristics or colour volume information stored in the `HEVCDecoderConfigurationRecord` to enable colour and dynamic range calibration during decoder and display initialization. This may include the following for supplemental enhancement information (SEI) messages specified in ISO/IEC 23008-2:

Subclause B.3.3.2

Delete subclause B.3.3.2 (and renumber all subsequent subclauses in subclause B.3.3).

Subclause B.3.3.3

Replace subclause B.3.3.3 with the following:

B.3.3.3 Video parameter sets (VPS)

Each HEVC video media sample in the CMAF track shall reference the VPS in the CMAF header sample entry. VPS shall not change within CMAF tracks or between CMAF tracks in a CMAF switching set. A CMAF HEVC track shall conform to ISO/IEC 23008-2 with the following additional constraints.

— The condition of the following fields shall not change throughout an HEVC elementary stream:

  — `general_profile_space`

  — `general_profile_idc`

  — `general_tier_flag`

  — `general_level_idc`

Clause B.5

Replace Clause B.5 as follows:

B.5 HEVC video CMAF media profiles and brands

A set of HEVC CMAF video media profiles are defined, together with an ISO BMFF brand and constraints in Table B.1.

All pictures shall be encoded as coded frames and shall not be encoded as coded fields.

For a CMAF track to comply with one of the CMAF media profiles in Table B.1, it:

— shall have pre-determined values as follows:

  — `general_progressive_source_flag` shall be set to 1;

  — `general_frame_only_constraint_flag` shall be set to 1;

  — `general_interlaced_source_flag` shall be set to 0;

— shall conform to 9.3 NAL structured video CMAF tracks;

— shall not exceed the tier, profile or level listed in the table;

— shall conform to the `colour_primaries`, `transfer_characteristics` and `matrix_coefficients` values from the options listed in Table B.1 with the values defined in ISO/IEC 23008-2;

  NOTE ISO/IEC 23091-2[12] may be consulted for additional details on the exact details of the values of these parameters.

— shall not exceed the width, height or frame rate listed in Table B.1, even if the HEVC level would permit higher values;

— shall not exceed the bit depth of the HEVC profile listed;

— should include the CMAF File Brand listed in its CMAF header.

NOTE CMAF tracks conform to more than one CMAF media profile if they meet the requirements for multiple CMAF media profiles. For example, a CMAF track would conform to both the HHD8 and UHD8 media profiles if its dimensions were within the constraints for the HHD8 profile (the UHD8 profile has higher dimension constraints and codec level) and the `colour_primaries`, `transfer_characteristics` and `matrix_coefficients` are values which are common to both profiles. HHD8 also conforms to UHD10 because an HEVC Main10 decoder will decode the HEVC Main 8-bit content with Rec 709 video characteristics.

See Annex C for detailed encoding examples.

Add new Clauses B.6 and B.7 as follows:

B.6 High frame rate HD

HEVC Levels 5.0 and 5.1 support greater than 60 Hz, e.g. when the resolution is not at the maximum. These profiles relax the frame rate constraints of Table B.1 profiles “UHD8”, UHD10”, “HDR10”, and “HLG10” to allow what Levels 5.0 and 5.1 permit. The profiles defined in Table B.2 are identical to the corresponding Table B.1 CMAF media profiles, except for the “Max Frame Rate” column in Table B.1. These new profiles can support the maximum resolution or maximum frame rate but not both concurrently due to HEVC level constraints.

Table B.2 — HEVC video CMAF media profiles – High frame rate

Media profile	Corresponding Table B.1 media profile	Max frame rate	CMAF file brand
UHD8H	UHD8	120	'cud9'
UHD10H	UHD10	120	'cud2'
HDR10H	HDR10	120	'chd2'
HLG10H	HLG10	120	'clg2'

B.7 Interlaced

B.7.1 Overview

The interlaced media profile (INT10) uses '`cint`' as the interlaced CMAF file brand. The following general constraints apply to all interlaced video in CMAF HEVC elementary streams. Interlaced content is field-coded. Interlaced content is limited to SDTV and HDTV such as those identified in Table C.1.

B.7.2 Profile, tier, level syntax

For the profile_tier_level syntax contained in VPS and SPS information, the syntax shall conform to ISO/IEC 23008-2 with the following additional constraints.

The following fields shall have pre-determined values as follows for interlaced content:

— `general_progressive_source_flag` shall be set to 0;

— `general_frame_only_constraint_flag` shall be set to 0;

— `general_interlaced_source_flag` shall be set to 1.

NOTE The Picture Timing SEI message is carried with each AU and additional interlaced information is carried within the pic_struct element.

The values of the following fields shall not change within CMAF tracks or between CMAF tracks in a CMAF switching set, and are constrained as follows:

— `general_profile_space = 0;`

— `general_profile_idc = 2 (Main 10);`

— general_tier_flag = 0 (Main Tier);

— general_level_idc <= 123 (level 4.1).

B.7.3 Video parameter sets (VPS)

Each HEVC video media sample in the CMAF track shall reference the VPS in the CMAF header sample entry. VPS shall not change within CMAF tracks or between CMAF tracks in a CMAF switching set. A CMAF HEVC track shall conform to ISO/IEC 23008-2 with the additional constraints in the profile_tier_level syntax indicated in subclause B.7.2.

B.7.4 Sequence parameter sets (SPS)

B.7.4.1 A CMAF HEVC track shall conform to ISO/IEC 23008-2 with the additional constraints in the profile_tier_level syntax in the SPS as indicated in subclause B.7.2. This information shall not change within CMAF tracks or between CMAF tracks in a CMAF switching set.

B.7.4.1 SPS fields

Sequence parameter set NAL units that occur within a CMAF HEVC track shall conform to ISO/IEC 23008-2 with the following additional constraints.

The following fields shall have pre-determined values as follows:

— vui_parameters_present_flag shall be set to 1;

— bit_depth_luma_minus8 and bit_depth_chroma_minus8 shall be set identically to either 0 for 8-bit or 2 for 10-bit encoding.

B.7.4.2 Visual usability information (VUI) parameters

VUI parameters that occur within a CMAF HEVC track shall conform to ISO/IEC 23008-2 with the following additional constraints.

The following fields shall have pre-determined values as follows:

— aspect_ratio_info_present_flag shall be set to 1;

— video_full_range_flag shall be set to 0.

The following fields have the following values:

— colour_description_present_flag shall be set to 1;

— colour_primaries = 1;

— transfer_characteristics = 1;

— matrix_coefficients = 1;

— overscan_info_present_flag shall be set to 0, therefore, overscan_appropriate_flag shall not be present.

NOTE 1 As defined in ISO/IEC 23008-2, if the colour_description_present_flag is set to 1, the colour_primaries, transfer_characteristics and matrix_coeffs fields are present in the VUI.

NOTE 2 This value corresponds to Rec. ITU-R BT.709.

The values of the following fields shall not change throughout a CMAF track and CMAF switching set:

— low_delay_hrd_flag;

— colour_description_present_flag;

— colour_primaries;

— `transfer_characteristics`;

— `matrix_coeffs`, when present.

The values of the following fields should not change throughout a CMAF track:

— `vui_time_scale`;

— `vui_num_units_in_tick`.

Annex C

Change the title of Annex C to:

Source formats

Clause C.1

Insert a new Clause C.1 and renumber all existing clauses and tables (and the cross-references to them):

C.1 Source formats of display resolution operating point sets and frame rate operating point sets

Tables C.1 and C.2 list commonly used display resolution operating point sets and frame rate operating point sets used in television distribution. CMAF media profiles addressing the broadcast industry are expected to support and scale to a subset of these resolution and frame rate combinations depending on the profile and level indication of the stream and the intended production format.

Table C.1 — Resolution operating point sets

Vertical size (lines)	Horizontal size (pixels)	aspect_ ratio_idc (see ISO/IEC 23008-2)	Display aspect ratio	Production format
2160	3840	1	16:9	UHDTV1
1080	1920	1	16:9	HDTV
1080	1440	14	16:9	HDTV
720	1280	1	16:9	HDTV
576	704	4	16:9	SDTV
576	704	2	4:3	SDTV
576	544	12	16:9	SDTV
576	544	4	4:3	SDTV
480	720	3	4:3	SDTV
480	720	5	16:9	SDTV
480	704	3	4:3	SDTV
480	704	5	16:9	SDTV
480	640	1	4:3	SDTV

Table C.2 — Frame rate operating point sets

Interlaced or progressive	Frame rate
Progressive	24/1.001 Hz
Progressive	24 Hz
Progressive	25 Hz
Interlaced (encoded as frames)	25 Hz
Interlaced (encoded as fields)	25 Hz
Progressive	30/1.001 Hz
Interlaced (encoded as frames)	30/1.001 Hz
Interlaced (encoded as fields)	30/1.001 Hz
Progressive	30 Hz
Progressive	50 Hz
Progressive	60/1.001 Hz
Progressive	60 Hz
Progressive	10 Hz
Progressive	120 Hz
Progressive	120/1.001 Hz

Subclause H.4.2.5.1

Replace the first paragraph with the following:

Each scalable HEVC video sample in the CMAF track shall reference the VPS in the CMAF header sample entry according to ISO/IEC 14496-15. VPS shall not change within CMAF tracks or between CMAF tracks in a switching set. A CMAF scalable HEVC track shall conform to the multi-layer extensions and scalable high efficiency video coding specified in ISO/IEC 23008-2 with the following additional constraints:

Subclause H.4.2.5.2

Replace the first paragraph with the following:

VPS VUI parameters that occur within a CMAF scalable HEVC track shall conform to the multi-layer extensions and scalable high efficiency video coding specified in ISO/IEC 23008-2 with the following additional constraints:

Subclause H.4.2.6.1

Replace the first paragraph with the following:

Sequence parameter set NAL units that occur within a CMAF scalable HEVC track shall conform to the multi-layer extensions and scalable high efficiency video coding specified in ISO/IEC 23008-2 with the following additional constraints: