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

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

AMENDMENT 2: XHE-AAC and other media profiles

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

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

AMENDEMENT 2: XHE-AAC et autres profils médias

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Clause 2

Add the following new normative references.

ISO/IEC 23003-3:2012, *Information technology — MPEG audio technologies — Part 3: Unified speech and audio coding*

IETF RFC 6381, The 'Codecs' and 'Profiles' Parameters for "Bucket" Media Types, August 2011.

3.2

Add a new term and definition at the end of subclause 3.2.

3.2.10
CMAF supplemental data
data that can be present in a *CMAF track* (3.2.1) and its contained *media samples* (3.3.15) conformant to a set of requirements identified by a brand

Clause 5

Add new paragraphs at the end of Clause 5.

Annex K specifies the CMAF media profile for MPEG-D USAC.

Annex L specifies the CMAF media profile for IMSC 1.1.

6.5.5

In subclause 6.5.5.1, replace the first bullet in the list with the following.

— CMAF specifies CMAF media profiles, CMAF supplemental data, and ISOBMFF brands for widely used audio, video, and subtitle formats. Each CMAF media profile specifies constraints on codecs, media samples, CMAF fragments, and CMAF tracks to identify encoder/decoder interoperability and optional functionality including random access and seamless adaptive switching specified as CMAF switching set constraints. CMAF also specifies guidelines for the specification of CMAF media profiles and matching brands to enable other specifications to define CMAF media profiles that conform to general CMAF requirements. See Table A.1, Table B.1, Table A.2, and Table A.3.

Add a new subclause 6.5.5.4 and renumber the subsequent subclauses in 6.5.5.

6.5.5.4 Signalling of supplemental data in CMAF tracks

CMAF defines brands, called "supplemental data brands" to identify the presence of additional information in a CMAF track that is not required by the CMAF media profile of that track. For example, NAL units, SEI messages, ISOBMFF Boxes can be added to an otherwise conformant CMAF track file, where this supplemental data does not make the CMAF track file non-conformant. Signalling its presence may be useful during production workflow, and to decoders for track selection and decoder initialization.

In 6.5.5.6, replace the second bullet in the list with the following.

— CMAF media profiles and CMAF supplemental data are specified in A.2, A.3, A.4, and B.5.

7.3.5

Delete the NOTE.

9.3.5.2

Replace the first paragraph of subclause 9.3.5.2 with the following.

CTA 608/708 caption data (CTA-608-E, CTA-708-E) may be stored in video SEI messages defined by the associated video codec specification (see 11.4). Video embedded captions are not considered a CMAF subtitle track, and it is expected that many CMAF compatible players will ignore these messages in video CMAF tracks. The presence of CTA 608/708 caption data in such SEI messages is CMAF supplemental data and should be indicated by the addition of the 'ccea' compatibility brand in the CMAF header, as specified in A.4.

10.1

Add the following bullet to the end of the list.

— see Annex K for MPEG-D USAC.

11.1

Add the following text to the end of subclause 11.1.

An additional CMAF media profile for IMSC 1.1 is defined in Annex L.

11.3.1

Replace the text of Clause 11.3.1 with the following.

W3C IMSC1 and W3C IMSC1.1 are profiles of the timed text markup language (TTML) for subtitle and caption delivery. W3C IMSC1 defines a text-only profile and an image-only profile. W3C IMSC1.1 also defines a text-only profile and an image-only profile. W3C IMSC1.1 is a superset of W3C IMSC1, such that a valid W3C IMSC1 text or image profile document is a valid W3C IMSC1.1 text or image profile document, respectively.

An IMSC1 Text track is a CMAF track that conforms to the provisions of subclauses 11.3.2 and 11.3.3.

An IMSC1 Image track is a CMAF track that conforms to the provisions of subclauses 11.3.2 and 11.3.4.

An IMSC1.1 text track is a CMAF track that conforms to the provisions of subclauses 11.3.2 and L.2.

An IMSC1.1 image track is a CMAF track that conforms to the provisions of subclauses 11.3.2 and L.3.

11.3.2

Replace subclause 11.3.2 with the following.

The CMAF track shall conform to ISO/IEC 14496-30.

The `namespace` field of the `XMLSubtitleSampleEntry` box shall contain one instance of the string "`http://www.w3.org/ns/ttml`".

NOTE The `schema_location` field of the `XMLSubtitleSampleEntry` box is not expected to be set for the purpose of profile signalling. The CMAF media profile brand can be used to determine the profile.

The `XMLSubtitleSampleEntry` shall contain a `MIMEBox` as specified in ISO/IEC 14496-12 and its `content_type` field shall be constrained as follows.

— The type shall be "`application`".

— The subtype shall be "`ttml+xml`".

— The codecs parameter shall be present and set according to 11.3.3 and 11.3.4.

The media type of the CMAF track, as specified in RFC 6381, shall conform to the following.

— The type shall be "`application`".

— The subtype shall be "`mp4`".

— The `codecs` parameter shall be present.

11.3.4

Replace the last paragraph and the note with the following.

NOTE 1 Since W3C IMSC1 requires images to conform to W3C PNG, the auxiliary_mime_types field of the XMLSubtitleSampleEntry box includes one instance of the media type "image/png" if any image is used.

NOTE 2 Annex A.4 specifies a file compatibility brand that signals that a track is an IMSC1 image subtitle CMAF track.

11.4

Replace the NOTE in subclause 11.4 with the following.

NOTE A.4 specifies a CMAF supplemental data compatibility brand that signals that a video track contains CTA 608/708 captions in SEI messages and can be included in addition to the video CMAF media profile compatibility brand.

Annex A

Change the title of Annex A to:

CMAF presentation profiles, media profiles and supplemental data

In subclause A.4, replace Table A.3 with:

Table A.3 — Subtitle and caption CMAF media profiles

Media profile	Format	Notes	File brand
WebVTT	Specified in 11.2	ISO/IEC 14496-30	`'cwvt'`
TTML IMSC1 text	Specified in 11.3.3	IMSC1 text profile	`'im1t'`
TTML IMSC1 image	Specified in 11.3.4	IMSC1 image profile	`'im1i'`
TTML IMSC1.1 text	Specified in L.2	IMSC1.1 text profile	`'im2t'`
TTML IMSC1.1 image	Specified in L.3	IMSC1.1 image profile	`'im2i'`

At the end of A.4 add a new subclause:

A.5 CMAF supplemental data

CMAF supplemental data is shown in Table A.4.

Table A.4 — CMAF supplemental data

Supplemental Data	Format	Notes	Target CMAF Tracks	File brand
CTA Captions	CTA-608 and CTA-708 Specified in 11.4	Caption data is embedded in SEI messages in video track; multiple closed caption streams may be present.	Video Media Profiles, including AVC and HEVC.	`'ccea'`
NOTE The `'ccea'` compatibility brand can be included in addition to a video CMAF media profile compatibility brand to indicate the presence of captions embedded in the video elementary stream.				

Annex J

After Annex J add a new Annex K and Annex L.

Annex K
(normative)

MPEG-D USAC track format and CMAF media profile

K.1 General

CMAF tracks containing MPEG-D USAC audio as defined in ISO/IEC 23003-3 shall conform to the general audio CMAF track format, defined in subclause 10.2, with the additional constraints defined in this annex.

K.2 Codecs parameter signalling

The signalling of the codecs MIME parameter is according to IETF RFC 6381, as shown in Table K.1.

Table K.1 — USAC codecs parameter according to RFC 6381

Codec	MIME type	Codecs parameter
MPEG-D USAC	audio/mp4	mp4a.40.42

K.3 Considerations for MPEG-D USAC encoding

The audio signals shall be encoded according to the extended high efficiency AAC (xHE-AAC) profile level 4, as specified in ISO/IEC 23003-3. Channel configurations shall be as given in Table K.2.

Additionally, since CMAF is targeting adaptive streaming scenarios, the encoding of audio content shall be performed following the guidelines described in ISO/IEC 23003-3:2012, B.26 and F.2.

K.4 Considerations for MPEG-D DRC encoding

CMAF tracks containing MPEG-D USAC audio as defined in ISO/IEC 23003-3 shall contain the metadata sets conforming to the loudness control profile or to the dynamic range control profile, level 1 or higher, as specified in ISO/IEC 23003-4.

The required basic loudness metadata as defined in ISO/IEC 23003-4 shall be present in the first sample, or in the track user-data box if it is carried at the ISO BMFF level. A track user-data box can be used to override the in-stream loudness metadata as defined in ISO/IEC 23003-4. In case of a loudness update occurring at a subsequent fragment, this fragment and each following one for which this loudness update applies shall carry basic loudness metadata in-stream of every sample that is a random-access point, or in the track fragment's user-data box if the metadata is carried at the ISO BMFF level.

Loudness metadata should be consistently conveyed either in-stream or in the track user data box at ISO BMFF level.

K.5 Storage of USAC in ISO BMFF

K.5.1 General

Carriage of MPEG-D USAC in ISO BMFF is specified by ISO/IEC 14496-3:2009/Amd.3:2012. The MPEG-4 audio framework is used to convey USAC encoded audio and, therefore, the 'mp4a' sample entry shall be used. One ISO BMFF audio sample shall consist of one single USAC access unit.

K.5.2 CMAF fragment random access constraints

The first sample of a CMAF fragment shall be of SAP type 1. For USAC this is referred to as immediate playout frame (IPF), as defined in ISO/IEC 23003-3.

NOTE Unlike previous MPEG audio codecs, not every USAC file format sample is a sync sample. Only IPFs are considered sync samples and marked as such in the ISOBMFF sync sample table. Additional means of random access can be signalled using sample groups.

K.5.3 MPEG-D USAC audio CMAF media profile and brand

Table K.2 summarizes the key parameters and the ISO BMFF brand to identify the MPEG-D USAC CMAF media profile defined in this annex.

Table K.2 — MPEG-D USAC audio CMAF media profile

Media Profile	Audio Codec	Audio Profile	Audio Level	Metadata Codec	Metadata Profile	Metadata Level	Channel Configurations	Max Sampling Rate	File Brand
xHE-AAC	MPEG-D USAC	Extended high efficiency AAC (xHE-AAC)	4	MPEG-D DRC	Loudness control or dynamic range control	1 or higher	Allowed values for channelConfigurationIndex as defined in ISO/IEC 23003-3:2012 are 1, 2, 3, 4, 5, 6, 9, 10	48 kHz	'cxha'

Annex L
(normative)

IMSC 1.1 media profiles

L.1 General

As specified in TTML Profiles for Internet Media Subtitles and Captions 1.1, an IMSC1.1 text track should be associated with each IMSC1.1 image track present within a given presentation such that, when image content is encountered, assistive technologies have access to its corresponding text form.

L.2 IMSC1.1 text track constraints

All subtitle media samples of the CMAF track shall conform to the text profile specified in TTML Profiles for Internet Media Subtitles and Captions 1.1.

The `codecs` parameter of the `content_type` field of the MIME box within the `XMLSubtitleSampleEntry` box (see 11.3.2) shall contain the value `"im2t"`, which signals that an IMSC1.1 text processor is required, as specified in the W3C, TTML Media Type Definition and Profile Registry.

The `codecs` parameter of the media type of the CMAF track shall contain the value `"stpp.ttml.im2t"`. Other TTML profiles the track conforms to may be additionally listed in the `codecs` parameter.

NOTE A document that conforms to EBU-TT-D, as specified in EBU TECH 3380, also generally conforms to IMSC1.1 Text Profile.

EXAMPLE 1 `"application/ttml+xml;codecs=im2t|etd1"` signals that the documents contained in an IMSC1.1 text track also conform to EBU TECH 3380.

EXAMPLE 2 `@mimeType="application/mp4"` and `@codecs="stpp.ttml.im2t"` signal an IMSC1.1 text subtitle CMAF track in a DASH manifest.

L.3 IMSC1.1 image track constraints

All subtitle media samples of the CMAF track shall conform to the image profile specified in W3C IMSC1.1.

The `codecs` parameter of the `content_type` field of the MIME box within the `XMLSubtitleSampleEntry` box (see 11.3.2) shall contain the value `"im2i"`, which signals that an IMSC1.1 image processor is required, as specified in the W3C, TTML Media Type Definition and Profile Registry.

EXAMPLE 1 `"application/ttml+xml;codecs=im2i"` is a possible value for the `content_type` field of an IMSC1.1 image track.

EXAMPLE 2 `"application/mp4;codecs=stpp.ttml.im2i"` is the media type of an IMSC1 image track.

The `codecs` parameter of the media type of the CMAF track shall contain the value `"stpp.ttml.im2i"`.

EXAMPLE 3 `@mimeType="application/mp4"` and `@codecs="stpp.ttml.im2i"` signal an IMSC1 image track in a DASH manifest.

Each `src` attribute of an `image` element and each `smpte:backgroundImage` attribute shall be a URN as specified in ISO/IEC 14496-30 that may conform to the following `bg-image-urn` syntax expressed using RFC 5234: