

First edition
2018-01-30

AMENDMENT 2
2019-01

**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



Reference number
ISO/IEC 23000-19:2018/Amd.2:2019(E)

© ISO/IEC 2019

STANDARDSISO.COM : Click to view the full PDF of ISO/IEC 23000-19:2018/Amd 2:2019



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see <http://patents.iec.ch>).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

A list of all parts in the ISO/IEC 23000 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

STANDARDSISO.COM : Click to view the full PDF of ISO/IEC 23000-19:2018/Amd 2:2019

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

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 ISO/BMFF 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 'ceca' 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 ISO BMFF 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 channel configuration index as defined in ISO/IEC 23003-3:2012 are 1, 2, 3, 4, 5, 6, 9, 10 | 48 kHz | 'cxha' |

STANDARDSISO.COM : Click to view the full PDF of ISO/IEC 23000-19:2018/Amd.2:2019

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: