DASH-IF IOP-7 V5.0.0 (2022-05)

DASH-IF Interoperability Points;
Part 7: Video

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Important notice

The present document can be downloaded from:
http://www.dashif.org/guidelines

1 Contents

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Foreword

This Technical Specification (TS) has been produced by the DASH-IF Technical Working Group.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in deliverables except when used in direct citation.

Executive summary

The present document defines the CMAF Media Profiles and the DASH signalling for video tracks. This work was derived from IOP v4.3 [i.1], but does not contain non-CMAF profiles.

Introduction

The present document is Part 7 of a multipart set of documents, collectively called “IOP V5.0.0”. All the parts are:

1. Overview, architecture and interfaces
2. Core principles and CMAF mapping
3. On-demand services
4. Live and low-latency live services
5. Ad insertion
6. Content protection
7. Video
8. Audio
9. Text
10. Events

11. Additional functionalities
12. Conformance and reference tools

1 Scope

The present document defines the CMAF Media Profiles and the DASH signalling for video tracks. This work was derived from IOP v4.3 [i.1], but does not contain non-CMAF profiles.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, DASH-IF cannot guarantee their long-term validity.

The following referenced documents are necessary for the application of the present document.

[1] DASH-IF IOP v5.0.0, Part 2, “Core principles and CMAF mapping”

[2] ISO/IEC 23009-1: “Information technology — Dynamic adaptive streaming over HTTP (DASH) — Part 1: Media presentation description and segment formats”

[3] ISO/IEC 23000-19 “Information technology — Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media”

[4] ISO/IEC 14496-12: Information technology - Coding of audio-visual objects -Part 12: ISO base media file format

[5] ISO/IEC 14496-15: Information technology — Coding of audio-visual objects — Part 15: Carriage of network abstraction layer (NAL) unit structured video in ISO base media file format

[6] ITU-T Rec. H.264: Advanced video coding for generic audiovisual services | ISO/IEC 14496-10: Information technology — Coding of audio-visual objects —Part 10: Advanced Video Coding

[7] ITU-T Rec. H.265: High efficiency video coding | ISO/IEC 23008-2: Information technology — High efficiency coding and media delivery in heterogeneous environments — Part 2: High efficiency video coding

[8] ITU-T Rec. H.266: Versatile video coding | ISO/IEC 23090-3: Information technology — Coded representation of immersive media — Part 3: Versatile video coding

[9] ITU-T Rec. H.274: Versatile supplemental enhancement information messages for coded video bitstreams | ISO/IEC 23002-7: Information technology — MPEG video technologies — Part 7: Versatile supplemental enhancement information messages for coded video bitstreams

[10] ISO/IEC 23094-1: Information technology — General video coding – Part 1: Essential video coding

[11] SCTE 215-1-1:2020b, “HEVC Video Constraints for Cable Television Part 1-1 HDR”

[12] ITU-T Rec. H.273: Coding-independent code points for video signal type identification | ISO/IEC 23091-2: Information technology — Coding-independent code points — Part 2: Video

[13] ISO/IEC 23091-1: Information technology — Coding-independent code points — Part 1: Systems

[14] ISO/IEC 13818-1: Information technology — Generic coding of moving pictures and associated audio information — Part 1: Systems

[15] CTA-5003: Web Application Video Ecosystem (WAVE): Device Playback Capabilities Specification, available at https://cdn.cta.tech/cta/media/media/resources/standards/pdfs/cta-5003-final.pdf

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are not necessary for the application of the present document, but they assist the user with regard to a particular subject area.

[i.1] DASH-IF IOP v4.3, "Guidelines for Implementation: DASH-IF Interoperability Points"

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

3.2 Symbols

For the purposes of the present document, the following symbols apply:

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CMAF	Common Media Application Format
DASH	Dynamic Adaptive Streaming over HTTP
IEC	International Electrotechnical Commission
IOP	InterOperability Points
ISO	International Standards Organization
Kbps	Kilobits per second
MPD	Media Presentation Description

4 CMAF Media Profiles

All video tracks shall conform to DASH-IF v5.0.0, Part 2 [1]. The recommended CMAF Video Media Profiles and some of their properties needed for signalling are summarized in Table 1. These codecs, along with any additional codecs added since this publication can be found in the online DASH-IF specification repository found here: https://dashif.org/codecs/video/.

Table 1 Recommended CMAF Video Media Profiles

Media Profile	File Brand	Video Codec	Codec Profile	Codec Tier	Codec Level	Example @codecs values	Reference
AVC SD	cfsd	AVC [6]	High	n\a	3.1	avc1.64001F avc3.64001F	ISO/IEC 23000-19 [3]
AVC HD	cfhd	AVC [6]	High	n\a	4.0	avc1.640028 avc3.640028	ISO/IEC 23000-19 [3]
AVC HDHF	chdf	AVC [6]	High	n\a	4.2	avc1.64002A avc3.64002A	ISO/IEC 23000-19 [3]
HEVC HHD8	chhd	HEVC [7]	Main	Main	4.1	hev1.1.6.L123.B0 hvc1.1.6.L123.B0	ISO/IEC 23000-19 [3]

HEVC HHD10	chh1	HEVC [7]	Main 10	Main	4.1	hev1.2.4.L123.B0 hvc1.2.4.L123.B0	ISO/IEC 23000-19 [3]
HEVC UHD8	cud8	HEVC [7]	Main	Main	5.0	hev1.1.6.L150.B0 hvc1.1.6.L150.B0	ISO/IEC 23000-19 [3]
HEVC UHD10	cud1	HEVC [7]	Main 10	Main	5.1	hev1.2.4.L153.B0 hvc1.2.4.L153.B0	ISO/IEC 23000-19 [3]
HEVC HDR10	chd1	HEVC [7]	Main 10	Main	5.1	hev1.2.4.L153.B0 hvc1.2.4.L153.B0	ISO/IEC 23000-19 [3]
HEVC HLG10	clg1	HEVC [7]	Main 10	Main	5.1	hev1.2.4.L153.B0 hvc1.2.4.L153.B0	ISO/IEC 23000-19 [3]

Additional non-CMAF video profiles can be found in DASH-IF IOP v4.3 [i.1].

5 Mapping to delivery

5.1 File format track definition

If AVC [6] media conforming to one of the AVC media profiles listed in Table 1 is provided in a bitstream and the media is encapsulated in an ISO BMFF track [4], then the file format track shall conform with the requirements of the codec entry `'avc1'` or `'avc3'` as defined in ISO/IEC 14496-15 [5].

If HEVC [7] media conforming to one of the HEVC media profiles listed in Table 1 is provided in a bitstream and the media is encapsulated in an ISO BMFF track [4], then the file format track shall conform with the requirements of the codec entry `'hvc1'` or `'hev1'` as defined in ISO/IEC 14496-15 [5].

If VVC [8] media conforming to the VVC media profile listed in **Error! Reference source not found.** is provided in a bitstream and the media is encapsulated in an ISO BMFF track [4], then the file format track shall conform with the requirements of the codec entry `'vvc1'` or `'vvci'` as defined in ISO/IEC 14496-15 [5].

If EVC [10] media conforming to one of the EVC media profiles listed in **Error! Reference source not found.** is provided in a bitstream and the media is encapsulated in an ISO BMFF Track [4], then the file format track shall conform with the requirements of the codec entry `'evc1'` as defined in ISO/IEC 14496-15:2019 AMD 3 **Error! Reference source not found.**.

5.2 CMAF track definition

If video media conforming to a particular media profile listed in Table 1 or **Error! Reference source not found.** is provided in an CMAF track, then the CMAF track shall conform with all of the following:

- The requirements of the ISO BMFF track defined in subclause 5.1 for the particular media profile,
- The general CMAF track constraints in ISO/IEC 23000-19 [3] clause 7, and
- The general video track constraints defined in ISO/IEC 23000-19 [3] clause 9.

5.3 CMAF switching set definition

If video media conforming to a particular media profile listed in Table 1 or **Error! Reference source not found.** is provided in an CMAF switching set, then each CMAF track in the CMAF switching set shall conform with all of the following:

- The requirements of CMAF track in specified in subclause 5.2,
- The general CMAF switching set constraints in ISO/IEC 23000-19 [3] clause 7, and
- The general CMAF switching set constraints defined in ISO/IEC 23000-19 [3] clause 9.

5.4 Content requirements

In addition to the general provisions defined in IOP V5 part 2 [1] additionally Adaptation Sets shall comply with the provisions of Table 2.

Table 2 Video track Adaptation Set attributes and elements

DASH Attribute or Element	Use for media type	Detailed Usage in DASH-IF IOPs
`@mimeType`	M	See ISO/IEC 23009-1 [2], clause 5.3.7.2, Table 14. This shall be set to "`video/mp4`".
`@codecs`	M	See ISO/IEC 23009-1 [2], clause 5.3.7.2, Table 14. This element shall be present and set to a valid value, including the codec, profile and level. See **Error! Reference source not found.** for example values for this attribute.
`@lang`	O	See ISO/IEC 23009-1 [2], clause 5.3.3.2, Table 5. If present with **Accessibility**, the `@lang` attribute signals the language of closed signing present in the video.
Accessibility	0 … N	See ISO/IEC 23009-1 [2], clause 5.3.4.2, Table 8. In DASH-IF IOPs the following two schemes for accessibility are defined: - the Role scheme as defined by MPEG-DASH (ISO/IEC 23009-1 [2]), clause 5.8.5.5, i.e., urn:mpeg:dash:role:2011, should be used The DASH role scheme with the following values is expected to be recognized by a DASH-IF client for media type "video" together with the Accessibility descriptor: o sign o captions - the scheme when CEA-608 is used as defined in clause 6.4.3.3, with `@schemeIdUri` set to "`urn:scte:dash:cc:cea-608:2015`" If the video contains open or closed signing, the **Accessibility** element shall be present. In DASH IOPS Only the Role scheme as defined in ISO/IEC 23009-1 [2], clause 5.8.5.5, should be used, with `@schemIdUri` set to `urn:mpeg:dash:role:2011`; and the `@value` shall be set to "`caption`"
Role	0 … N	See ISO/IEC 23009-1 [2], clause 5.3.3.2, Table 5. In DASH-IF IOPs only the Role scheme as defined by MPEG-DASH (ISO/IEC 23009-1 [2]), clause 5.8.5.5, should be used, with `@schemIdUri` set to `urn:mpeg:dash:role:2011`. The DASH role scheme with the following values is expected to be recognized by a DASH-IF client for media type "video" together with the Role descriptor: - `caption` - `subtitle` - `main` - `alternate` - `supplementary` - `sign`

DASH Attribute or Element	Use for media type	Detailed Usage in DASH-IF IOPs
		- `emergency` If not present, the role is assumed to be `main`.

5.5 Video source metadata signalling

Video source data may be used to provide details of the video content source. In general, such characteristics of video are logically independent of the compression format. In the context of DASH they are typically used in order to select a proper Adaptation Set. This clause focuses on source format description using either an **`EssentialProperty`** or **`SupplementalProperty`** descriptor.

Table 3 lists a set of `@schemeIdUri` values (defined in this document or other documents) for identifying such video source characteristics.

Table 3 `@schemeIdUri` values of descriptors that signal video source metadata

`@schemeIdUri`	Reference	Clause	Comment
`urn:mpeg:mpegB:cicp:ColourPrimaries`	ISO/IEC 23090-1 [13]	5.4	Indicating the chromaticity coordinates of the source colour primaries. The `@value` is the value as defined for **`ColourPrimaries`** in [12].
`urn:mpeg:mpegB:cicp:TransferCharacteristics`	ISO/IEC 23090-1 [13]	5.4	Indicating the opto-electronic transfer characteristic of the source colour primaries. The `@value` is the value as defined for **`TransferCharacteristics`** in [12].
`urn:mpeg:mpegB:cicp:MatrixCoefficients`	ISO/IEC 23090-1 [13]	5.4	Indicating the matrix coefficients used in deriving luma and chroma signals from the green, blue, and red primaries. The `@value` is the value as defined for **`MatrixCoefficients`** in [12].
`urn:mpeg:mpegB:cicp:VideoFullRangeFlag`	ISO/IEC 23090-1 [13]	5.4	Indicating the scaling and offset values applied in association with the matrix colour coefficients. The `@value` is the value as defined for **`VideoFullRangeFlag`** in [12].
`urn:mpeg:mpegB:cicp:VideoFramePackingType`	ISO/IEC 23090-1 [13]	5.4	Indicating the type of packing arrangement used in video frames. The `@value` is the value as defined for **`VideoFramePackingType`** in [12].
`urn:mpeg:mpegB:cicp:QuincunxSamplingFlag`	ISO/IEC 23090-1 [13]	5.4	Indicating whether a quincunx sampling structure is used in the frame packed video representation. The `@value` is the value as defined for **`QuincunxSamplingFlag`** in [12].
`urn:mpeg:mpegB:cicp:PackedContentInterpretationType`	ISO/IEC 23090-1 [13]	5.4	Indicating the intended interpretation of the constituent frames. The `@value` is the value as defined for **`PackedContentInterpretationType`** in [12].
`urn:mpeg:dash:14496:10:frame_packing_arrangement_type:2011`	ISO/IEC 23009-1 [2]	5.8.5.3	For Adaptation Sets or Representations that contain a video component that conforms to ISO/IEC 14496-10 [6], this value of

			`@schemeIdUri` (in this case the descriptor becomes the **FramePacking** element as defined in [2]) may also be used for backward-compatibility. In this case the `@value` is the value as defined for **`VideoFramePackingType`** in [12]. However, it is recommended to use the value `urn:mpeg:mpegB:cicp:VideoFramePackingType` instead.
`urn:mpeg:dash:13818:1:stereo_video_format_type:2011`	ISO/IEC 23009-1 [2]	5.8.5.3	For Adaptation Sets or Representations that contain a video component that conforms to ISO/IEC 13818-1 [14], this value of `@schemeIdUri` (in this case the descriptor becomes the **FramePacking** element as defined in [2]) may also be used for backward-compatibility. In this case the `@value` is the value as defined for **`VideoFramePackingType`** in [12]. However, it is recommended to use the value `urn:mpeg:mpegB:cicp:VideoFramePackingType` instead.
`urn:mpeg:dash:stereoid:2011`	ISO/IEC 23009-1 [2]	5.8.5.6	When this value of `@schemeIdUri` is in use, the descriptor is also referred to as a **Role** element as specified in [2], clause 5.8.5.6. If N views are available that can be combined into M valid stereo pairs, the `Role@schemeIdURI` equal to this identifier signals which views form a stereo pair and which one is the left view and which one is the right view of each stereo pair. The @value of the Role element contains a space-delimited list of view indicators 'li' or 'rj' where i, j are non-negative decimal integers.

6 Playback requirements and recommendations

For a client supporting a media profile listed in Table 1 or **Error! Reference source not found.**, the following applies:

- It shall support the following playback requirements as documented in clause 8 of CTA-WAVE 5003 [15] for any content conforming to a CMAF switching set as defined in subclause 5.3:
  - 8.2 Sequential Track Playback
  - 8.3 Random Access to Fragment
  - 8.4 Random Access to Time
  - 8.5 Switching Set Playback
  - 8.6 Regular Playback of Chunked Content
  - 8.7 Regular Playback of Chunked Content, non-aligned append
- It should support the following playback requirements as documented in clause 8 of CTA-WAVE 5003 [15] for any content conforming to a CMAF switching set as defined in subclause 5.3:
  - 8.9 Out-Of-Order Loading
  - 8.10 Overlapping Fragments

- 8.12 Playback of Encrypted Content

Annex A (informative): Change History

Date	Version	Information about changes
<Month year>	<#>	<Changes made are listed in this cell>
2021-07-09	Initial draft	By Michael Dolan, with a Skelton of which codecs should be in this document, with the intent to capture all known CMAF video profiles and aligning with WAVE.
2021-09-02	Second draft	By Ye-Kui Wang, with the following changes made, along with various minor improvements: - Added a bunch of references, including for the codec specs, some additional file format specs, the latest CICP video and systems specs, and CTA-5003. - Split the VVC and EVC media profiles to a separate table, such that they are “CMAF Video Media Profiles provided for information”, while the AVC and HEVC media profiles are “Recommended CMAF Video Media Profiles”. - Added four columns to the tables, for video codec, profile, tier, and level, and added missing example @codecs values. - Changed the title of Clause 5 from “Adaption Set requirements and recommendations” to “Mapping to delivery”, in a manner similar to what is in 3GPP TS 26.511, and then added the following subcluases similarly as in 3GPP TS 26.511: o 5.1 File format track definition o 5.2 CMAF track definition o 5.3 CMAF switching set definition - Added a subclause with the integration of the video source metadata signalling (i.e., the `@schemeIdUri` values) from https://dashif.org/identifiers/video_source_metadata/, with some updates, e.g., by referencing to the latest CICP specs, etc. - Added Clause 6, titled "Playback requirements and recommendations", similarly as in 3GPP TS 26.511.
2021-12-29	Third draft	By Ye-Kui Wang, with the following changes made: - Added executive summary - Updated references - Removed some of the video media profiles and added a pointer to the DASH-IF video codec registration page
2022-05-31	V5.0.0	Published on DASH-IF web page