

First edition
2018-01

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

Part 19:

Common media application format (CMAF) for segmented media

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

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



Reference number
ISO/IEC 23000-19:2018(E)

© ISO/IEC 2018



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2018

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, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Published in Switzerland

This is a preview of "ISO/IEC 23000-19:201...". Click here to purchase the full version from the ANSI store.

Contents

	Page
Foreword	vi
Introduction	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Abbreviated terms	6
5 Document organization	6
6 CMAF hypothetical application model, media object model, and profiles	7
6.1 Overview of the hypothetical application model and media object model.....	7
6.2 CMAF content processing model.....	9
6.3 Late binding CMAF track synchronization.....	10
6.4 Adaptive switching of CMAF tracks in CMAF switching sets.....	11
6.5 CMAF specified objects and profiles.....	12
6.5.1 Object derivation and interoperability code points.....	12
6.5.2 Encoded media objects.....	12
6.5.3 Logical media object sets.....	12
6.5.4 Addressable media objects.....	12
6.5.5 CMAF profiles, brand, and identifiers.....	13
6.6 CMAF media object model.....	14
6.6.1 CMAF fragments.....	14
6.6.2 CMAF tracks.....	15
6.6.3 CMAF track files.....	15
6.6.4 CMAF segments.....	16
6.6.5 CMAF chunks.....	16
6.6.6 CMAF switching sets and adaptive switching.....	17
6.6.7 CMAF selection sets and late binding.....	20
6.6.8 CMAF presentation timing model.....	21
6.6.9 Manifest information.....	23
6.6.10 CMAF addressable media objects, resources, and resource identifiers.....	24
7 CMAF track format	24
7.1 Overview.....	24
7.2 CMAF brands.....	24
7.3 CMAF media objects.....	25
7.3.1 CMAF boxes.....	25
7.3.2 CMAF track media objects.....	28
7.3.3 CMAF addressable media objects.....	32
7.3.4 CMAF switching sets.....	34
7.3.5 CMAF selection sets.....	37
7.3.6 CMAF presentations.....	38
7.4 Additional boxes, not defined in the ISO Base Media File Format.....	38
7.4.1 Track Encryption Box (' tenc ').....	38
7.4.2 Sample Encryption Box (' senc ').....	39
7.4.3 Protection System Specific Header Box (' pssh ').....	39
7.4.4 Media profile specific boxes.....	39
7.4.5 Event Message Box (' emsg ').....	39
7.5 Constraints on ISO Base Media File Format boxes.....	40
7.5.1 Movie Header Box (' mvhd ').....	40
7.5.2 Metadata Boxes.....	40
7.5.3 Kind Box (' kind ').....	40
7.5.4 Track Header Box (' tkhd ').....	40
7.5.5 Media Header Box (' mdhd ').....	41
7.5.6 Video Media Header Box (' vmhd ').....	41

7.5.7	Sound Media Header Box ('smhd')	41
7.5.8	Subtitle Media Header Box ('sthd')	41
7.5.9	Data Reference Box ('dref')	42
7.5.10	Sample Description Box ('stsd')	42
7.5.11	Protection Scheme Information Box ('sinf')	42
7.5.12	Track contained media sample information boxes	42
7.5.13	Edit List Box ('elst')	43
7.5.14	Track Extends Box ('trex')	43
7.5.15	Movie Fragment Header Box ('mfhd')	44
7.5.16	Track Fragment Header Box ('tfhd')	44
7.5.17	Track Run Box ('trun')	44
7.5.18	Sample Group Description Box ('sgpd')	45
7.5.19	Media Data Box ('mdat')	45
7.5.20	Sub-sample Information Box ('subs')	45
8	Common Encryption of CMAF tracks	45
8.1	Multiple DRM system support	45
8.2	Track encryption	46
8.2.1	General requirements	46
8.2.2	CMAF track constraints	47
8.2.3	Encryption constraints	48
8.2.4	CMAF presentation encryption	49
9	Video CMAF tracks	49
9.1	Overview	49
9.2	General video CMAF track format	50
9.2.1	General video CMAF track structure and constraints	50
9.2.2	Video Media Header ('vmhd')	50
9.2.3	Track Header Box ('tkhd')	51
9.2.4	Sample Description Box ('stsd')	51
9.2.5	Video CMAF fragment presentation time	52
9.2.6	Video media sample dependencies	52
9.2.7	Video edit lists	52
9.2.8	General video CMAF fragment random access constraints	52
9.2.9	Additional random access pictures within CMAF video fragments	53
9.2.10	Image framing and encoding constraints	53
9.2.11	General video CMAF switching set constraints	53
9.3	NAL structured video CMAF tracks	55
9.3.1	Overview	55
9.3.2	CMAF track format constraints for NAL structured video	55
9.3.3	NAL structured video Access Units contained in media samples	56
9.3.4	NAL structured video coding sequences corresponding to CMAF fragments	56
9.3.5	Elementary stream constraints	57
9.3.6	General CMAF switching set constraints for NAL structured video	57
9.3.7	Single initialization CMAF switching set constraints for NAL structured video tracks and media profiles	57
9.4	AVC video CMAF tracks	58
9.4.1	Storage of AVC elementary streams	58
9.4.2	Constraints on AVC elementary streams	59
9.5	AVC video Internet Media Type parameters	61
9.5.1	AVC signalling of "codecs" parameters	61
10	Audio CMAF tracks	61
10.1	Overview	61
10.2	General audio CMAF track format	61
10.2.1	Derivation	61
10.2.2	Track Header Box ('tkhd')	61
10.2.3	Sound Media Header Box ('smhd')	62
10.2.4	Sample Description Box ('stsd')	62
10.2.5	AudioSampleEntry	62

This is a preview of "ISO/IEC 23000-19:201...". Click here to purchase the full version from the ANSI store.

10.2.6	Audio offset edit list.....	62
10.3	AAC audio CMAF tracks.....	62
10.3.1	Overview.....	62
10.3.2	"codecs" parameter signalling.....	62
10.3.3	Considerations for AAC audio encoding.....	63
10.3.4	AAC track constraints.....	64
10.3.5	AAC elementary stream constraints.....	65
10.4	AAC core audio CMAF media profile.....	66
10.5	AAC adaptive switching audio CMAF media profile.....	67
10.5.1	General constraints.....	67
10.5.2	CMAF fragment encoding constraints.....	67
10.5.3	General considerations and requirements.....	67
10.5.4	Constraints for AAC-LC.....	68
10.5.5	Constraints for HE-AAC.....	68
10.5.6	Constraints for HE-AACv2.....	69
11	Subtitles and captions.....	70
11.1	Overview.....	70
11.2	WebVTT.....	70
11.3	IMSC text and image tracks.....	71
11.3.1	General.....	71
11.3.2	Common constraints.....	71
11.3.3	IMSC1 text track constraints.....	71
11.3.4	IMSC1 image track constraints.....	72
11.4	CTA-608 and CTA-708.....	72
11.5	Metadata for subtitles.....	72
12	CMAF media profiles and CMAF presentation profiles.....	73
12.1	CMAF media profiles.....	73
12.1.1	General guidelines for specifying CMAF media profiles.....	73
12.1.2	Guidelines for audio CMAF media profiles.....	74
12.1.3	Guidelines for video CMAF media profiles.....	74
12.2	CMAF presentation profiles.....	75
12.2.1	General.....	75
12.2.2	CMAF profile conformance.....	75
	Annex A (normative) CMAF presentation profiles and media profiles.....	78
	Annex B (normative) HEVC video CMAF track format and CMAF media profiles.....	82
	Annex C (informative) Subsampling of NAL structured video tracks in CMAF switching sets.....	88
	Annex D (informative) Hypothetical player model.....	98
	Annex E (informative) Event messages.....	101
	Annex F (informative) Error handling for missing media.....	102
	Annex G (informative) Recommendations for AAC CMAF switching set encoding.....	103
	Bibliography.....	106

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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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 ISO documents 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 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).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, 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.

This is a preview of "ISO/IEC 23000-19:201...". [Click here to purchase the full version from the ANSI store.](#)

Introduction

Common Media Application Format (CMAF) combines and constrains several MPEG specifications to define a multimedia format that is optimized for delivery of a single adaptive multimedia presentation to a variety of devices, using a variety of adaptive streaming, broadcast, download, and storage methods.

Several MPEG specifications have been adopted for much of the video delivered over the Internet and other IP networks (cellular, cable, broadcast, etc.). Various organizations have taken MPEG's core coding, file format and system standards and combined them into their own specifications for their specific application. While these specifications are similar, their differences result in unnecessary duplication of engineering effort and duplication of identical content in slightly different formats, which results in increased storage and delivery costs.

CMAF provides a common media specification that application specifications, such as MPEG Dynamic Adaptive Streaming over HTTP (DASH), can reference and a common media format that allows a single encoded multimedia presentation to be used by many applications.