

ISO/IEC 23000-19:2020-03 (E)

Information technology - Multimedia application format (MPEG-A) - Part 19: Common media application format (CMAF) for segmented media

Contents		Page
Foreword		vii
Introduction		viii
1	Scope	1
2	Normative references	1
3	Terms and definitions	2
3.1	Media objects	3
3.2	Logical structure	3
3.3	Application model	4
4	Abbreviated terms	6
5	Document organization	8
6	CMAF hypothetical application model, media object model and profiles	10
6.1	Overview of the hypothetical application model and media object model	10
6.2	CMAF content processing model	11
6.3	Late binding CMAF track synchronization	12
6.4	Adaptive switching of CMAF tracks in CMAF switching sets	13
6.5	CMAF specified objects and profiles	14
6.5.1	Object derivation and interoperability code points	14
6.5.2	Encoded media objects	14
6.5.3	Logical media object sets	14
6.5.4	Addressable media objects	14
6.5.5	CMAF profiles, brand and identifiers	15
6.6	CMAF media object model	16
6.6.1	CMAF fragments	16
6.6.2	CMAF tracks	17
6.6.3	CMAF track files	17
6.6.4	CMAF segments	18
6.6.5	CMAF chunks	18
6.6.6	CMAF switching sets and adaptive switching	19
6.6.7	CMAF selection sets and late binding	22
6.6.8	CMAF presentation timing model	23
6.6.9	Manifest information	26
6.6.10	CMAF addressable media objects, resources, and resource identifiers	26
7	CMAF track format	27
7.1	Overview	27
7.2	CMAF brands	27
7.3	CMAF media objects	28
7.3.1	CMAF boxes	28
7.3.2	CMAF track media objects	30
7.3.3	CMAF addressable media objects	34
7.3.4	CMAF switching sets	36
7.3.5	CMAF selection sets	39
7.3.6	CMAF presentations	39
7.4	Additional boxes, not defined in the ISO Base Media File Format	40

7.4.1	Track Encryption Box ('tenc')	40
7.4.2	Sample Encryption Box ('senc')	40
7.4.3	Protection System Specific Header Box ('pssh')	40
7.4.4	Media profile specific boxes	40
7.4.5	Event Message Box ('emsg')	40
7.5	Constraints on ISO Base Media File Format boxes	41
7.5.1	Movie Header Box ('mvhd')	41
7.5.2	Metadata Boxes	41
7.5.3	Kind Box ('kind')	41
7.5.4	Track Header Box ('tkhd')	42
7.5.5	Media Header Box ('mdhd')	42
7.5.6	Video Media Header Box ('vmhd')	42
7.5.7	Sound Media Header Box ('smhd')	43
7.5.8	Subtitle Media Header Box ('sthd')	43
7.5.9	Data Reference Box ('dref')	43
7.5.10	Sample Description Box ('stsd')	43
7.5.11	Protection Scheme Information Box ('sinf')	43
7.5.12	Track contained media sample information boxes	43
7.5.13	Edit List Box ('elst')	44
7.5.14	Track Extends Box ('trex')	44
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')	45
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')	46
7.6	The Structural CMAF Brand 'cmfc'	46
7.7	The structural CMAF Brand 'cmf2'	46
7.7.1	General	46
7.7.2	Edit List Box ('elst')	46
7.7.3	Track Run Box ('trun')	46
8	Common encryption of CMAF tracks	46
8.1	Multiple DRM system support	46
8.2	Track encryption	47
8.2.1	General requirements	47
8.2.2	CMAF track constraints	48
8.2.3	Encryption constraints	49
8.2.4	CMAF presentation encryption	50
9	Video CMAF tracks	50
9.1	Overview	50
9.2	General video CMAF track format	51
9.2.1	General video CMAF track structure and constraints	51
9.2.2	Video Media Header ('vmhd')	51
9.2.3	Track Header Box ('tkhd')	52
9.2.4	Sample Description Box ('stsd')	52
9.2.5	Video CMAF fragment presentation time	53
9.2.6	Video media sample dependencies	53
9.2.7	Video edit lists	53
9.2.8	General video CMAF fragment random access constraints	53
9.2.9	Additional random access pictures within CMAF video fragments	53
9.2.10	Image framing and encoding constraints	54
9.2.11	General video CMAF switching set constraints	54
9.3	NAL structured video CMAF tracks	55
9.3.1	Overview	55
9.3.2	CMAF track format constraints for NAL structured video	56
9.3.3	NAL structured video access units contained in media samples	57
9.3.4	NAL structured video coding sequences corresponding to CMAF fragments	57
9.3.5	Elementary stream constraints	58
9.3.6	General CMAF switching set constraints for NAL structured video	58

9.3.7	Single initialization CMAF switching set constraints for NAL structured video tracks and media profiles	58
9.4	AVC video CMAF tracks	59
9.4.1	Storage of AVC elementary streams	59
9.4.2	Constraints on AVC elementary streams	60
9.5	AVC video Internet Media Type parameters	61
9.5.1	AVC signalling of "codecs" parameters	61
10	Audio CMAF tracks	62
10.1	Overview	62
10.2	General audio CMAF track format	62
10.2.1	Derivation	62
10.2.2	Track Header Box ('tkhd')	62
10.2.3	Sound Media Header Box ('smhd')	63
10.2.4	Sample Description Box ('stsd')	63
10.2.5	AudioSampleEntry	63
10.2.6	Audio offset edit list	63
10.3	AAC audio CMAF tracks	63
10.3.1	Overview	63
10.3.2	"codecs" parameter signalling	63
10.3.3	Considerations for AAC audio encoding	64
10.3.4	AAC track constraints	65
10.3.5	AAC elementary stream constraints	66
10.4	AAC core audio CMAF media profile	67
10.5	AAC adaptive switching audio CMAF media profile	67
10.5.1	General constraints	67
10.5.2	CMAF fragment encoding constraints	68
10.5.3	General considerations and requirements	68
10.5.4	Constraints for AAC-LC	68
10.5.5	Constraints for HE-AAC	69
10.5.6	Constraints for HE-AACv2	70
11	Subtitles and captions	71
11.1	Overview	71
11.2	WebVTT	71
11.3	IMSC text and image tracks	72
11.3.1	General	72
11.3.2	Common constraints	72
11.3.3	IMSC1 text track constraints	73
11.3.4	IMSC1 image track constraints	73
11.4	CTA-608 and CTA-708	73
11.5	Metadata for subtitles	74
12	CMAFmediaprofilesandCMAFpresentationprofiles	74
12.1	CMAF media profiles	74
12.1.1	General guidelines for specifying CMAF media profiles	74
12.1.2	Guidelines for audio CMAF media profiles	75
12.1.3	Guidelines for video CMAF media profiles	75
12.2	CMAF presentation profiles	76
12.2.1	General	76
12.2.2	CMAF profile conformance	76
Annex A (normative)	CMAFpresentationprofiles,mediaprofilesandsupplementaldata	79
Annex B (normative)	HEVCvideoCMAFtrackformatandCMAFmediaprofiles	83
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
Annex H (normative) Scalable HEVC media profile and track format	106
Annex I (normative) AAC multichannel CMAF media profiles and track format	112
Annex J (normative) MPEG-H 3D audio track format and CMAF media profile	115
Annex K (normative) MPEG-DUSAC track format and CMAF media profile	120
Annex L (normative) IMSC 1.1 media profiles	122
Bibliography	124