

ISO/IEC 23000-19:2024-02 (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	3
3.1	Media objects	3
3.2	Logical structure	3
3.3	Application model	5
4	Abbreviated terms	6
5	Document organization	9
6	CMAF hypothetical application model, media object model and profiles	9
6.1	Overview of the hypothetical application model and media object model	9
6.2	CMAF content processing model	10
6.3	Late binding CMAF track synchronization	11
6.4	Adaptive switching of CMAF tracks in CMAF switching sets	12
6.5	CMAF specified objects and profiles	13
6.5.1	Object derivation and interoperability code points	13
6.5.2	Encoded media objects	13
6.5.3	Logical media object sets	13
6.5.4	Addressable media objects	13
6.5.5	CMAF profiles, brand and identifiers	14
6.6	CMAF media object model	15
6.6.1	CMAF fragments	15
6.6.2	CMAF tracks	16
6.6.3	CMAF track files	16
6.6.4	CMAF segments	17
6.6.5	CMAF chunks	17
6.6.6	CMAF switching sets and adaptive switching	18
6.6.7	CMAF selection sets and late binding	21
6.6.8	CMAF presentation timing model	22
6.6.9	Manifest information	24
6.6.10	CMAF addressable media objects, resources, and resource identifiers	24
7	CMAF track format	25
7.1	Overview	25
7.2	CMAF brands	25
7.3	CMAF media objects	27
7.3.1	CMAF boxes	27
7.3.2	CMAF track media objects	29
7.3.3	CMAF addressable media objects	34
7.3.4	CMAF switching sets	35
7.3.5	CMAF selection sets	38
7.3.6	CMAF presentations	38
7.4	Additional boxes, not defined in the ISO Base Media File Format	39

7.4.1	Track Encryption Box ('tenc')	39
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	40
7.4.5	Event Message Box ('emsg')	40
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')	41
7.5.4	Track Header Box ('tkhd')	41
7.5.5	Media Header Box ('mdhd')	41
7.5.6	Video Media Header Box ('vmhd')	42
7.5.7	Sound Media Header Box ('smhd')	42
7.5.8	Subtitle Media Header Box ('sthd')	42
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')	43
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')	44
7.5.19	Media Data Box ('mdat')	45
7.5.20	Sub-sample Information Box ('subs')	45
7.6	The Structural CMAF Brand 'cmfc'	45
7.7	The structural CMAF Brand 'cmf2'	45
7.7.1	General	45
7.7.2	Edit List Box ('elst')	45
7.7.3	Track Run Box ('trun')	45
8	Common encryption of CMAF tracks	46
8.1	Multiple DRM system support	46
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	52
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	54
9.3.1	Overview	54
9.3.2	CMAF track format constraints for NAL structured video	54
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	56
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	58
9.5	AVC video Internet Media Type parameters	60
9.5.1	AVC signalling of "codecs" parameters	60
9.6	Video media profiles	60
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
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	70
10.6	Audio media profiles	70
11	Subtitles and captions	70
11.1	Overview	70
11.2	WebVTT	71
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	72
11.3.4	IMSC1 image track constraints	72
11.4	CTA-608 and CTA-708	73
11.5	Metadata for subtitles	73
11.6	Sparsity in Subtitle Tracks	73
11.7	11.7	
	Subtitle media profiles	73
12	CMAFmediaprofilesandCMAFpresentationprofiles	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	75
12.2	CMAF presentation profiles	76
12.2.1	General	76
12.2.2	CMAF profile conformance	76
13	Timed metadata tracks	77
	Annex A (normative)CMAFpresentationprofiles,mediaprofilesandsupplementaldata	79

Annex B (normative)HEVCvideoCMAFtrackformatandCMAFmediaprofiles	83
Annex C (informative) Soure formats	91
Annex D (informative) Hypothetical player model	102
Annex E (informative) Event messages	105
Annex F (informative) Error handling for missing media	106
Annex G (informative) Recommendations for AAC CMAF switching set encoding	107
Annex H (normative)ScalableHEVCmediaprofileandtrackformat	110
Annex I (normative)AACmultichannelCMAFmediaprofilesandtrackformat	116
Annex J (normative)MPEG-H3DaudiotrackformatandCMAFmediaprofile	119
Annex K (normative)MPEG-DUSACtrackformatandCMAFmediaprofile	124
Annex L (normative)IMSC1.1mediaprofiles	126
Annex M (normative)CMAFtrackandmediaprofilesforVVC	128
Annex N (normative)CMAFtrackandmediaprofilesforEVC	138
Bibliography	142