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 Termsanddefinitions 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 CMAFhypotheticalapplicationmodel,mediaobjectmodelandprofiles 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