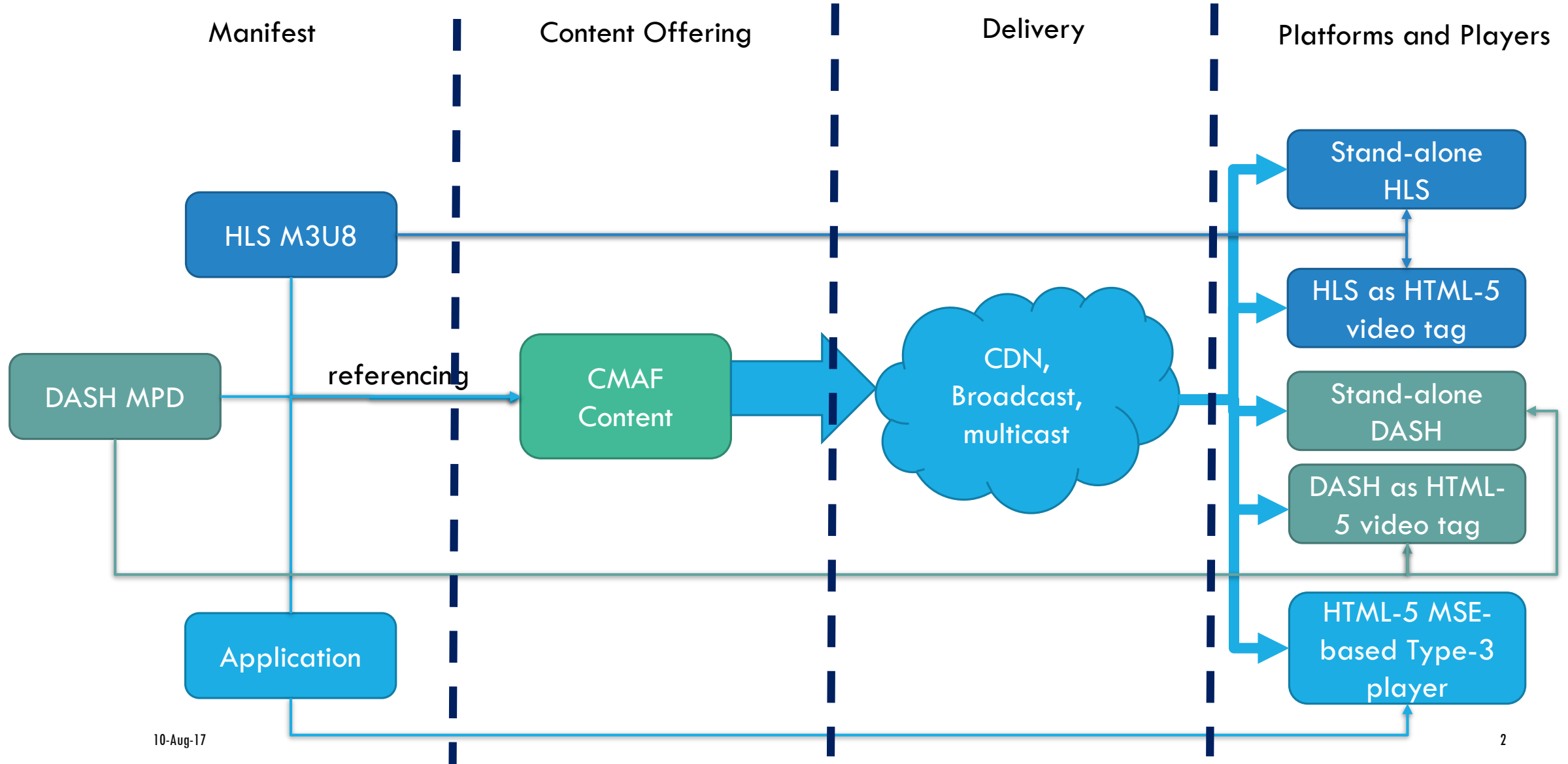




DASH, CMAF AND CTA WAVE

Dr. Thomas Stockhammer
DASH-IF IOP Chair & CTA WAVE
Device Playback TF Chair
Qualcomm Incorporated
August 10, 2017

DIFFERENT PLAYERS – SINGLE ENCODING AND COMMON DELIVERY





COMMON MEDIA APPLICATION FORMAT (CMAF)

MPEG'S CMAF

Started at MPEG's 114th meeting, Feb 2016.

Requirement proposal: Adobe, Akamai, Apple, BBC, Cisco, Comcast, DTG, Ericsson, Fraunhofer, iStreamPlanet, LG Electronics, Microsoft, MLBAM, Qualcomm, Samsung, Starz, Telecom Italia, Turner, Verimatrix, WWE

Technical proposal: Apple, Microsoft, MLBAM, Cisco, Comcast, Akamai

Several LSs were sent out including to DVB (received as TM5330)

MPEG approved the followings:

No.	Title
	ISO/IEC 23000-20 – Common Media Application Format
N16144	Requirements for the Common Media Application Format
N15947	WD v.1 of Common Media Application Format

CMAF

23000-19 Common Media Application Format

- ISO/IEC FDIS 23000-19 Common Media Application Format
- ISO/IEC 23000-19 FDAM 1 SHVC media profile and additional audio media profiles
- ISO/IEC 23000-19 WD Additional Media Profiles
- Workplan for CMAF conformance

OVERVIEW CMAF COMMITTEE DRAFT

CMAF Scope, Definition and Media Object Model

Common Media Application Format File (“CMAF Track”)

- Usage of the ISO BMFF for CMAF, constraints and extensions

Common Encryption of Tracks

Video Tracks: General Constraints & specific constraints for AVC/HEVC

Audio Tracks: General Constraints & specific ones for AAC & HE-AAC

Subtitles and Captions

CMAF Presentation and Media Profiles (WebVTT, TTML IMSC1, CEAx08)

Informational Annexes

CMAF INTEROPERABILITY AND CONFORMANCE CODE POINTS

CMAF Presentation Profile

- Defines the minimum required Media Profiles and optional encryption schemes required in a Presentation of this Profile

CMAF Media Profiles and ISO BMFF Compatibility Brand

- identify CMAF media sample and track format interoperability by specifying track and encoding constraints specific to a codec

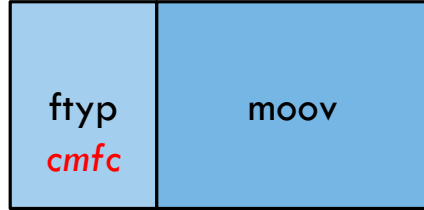
CMAF Switching Set

- identify CMAF Switching Sets that conform to Media Profile specified Switching Set constraints that enable seamless switching using a specified processing model

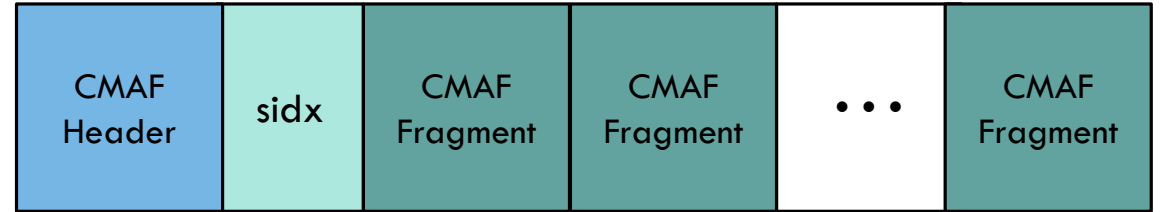
Compatibility Brand for CMAF Addressable Objects

- CMAF Addressable Objects for CMAF Tracks provide the ability to offer CMAF Tracks as physical resources to delivery and storage applications

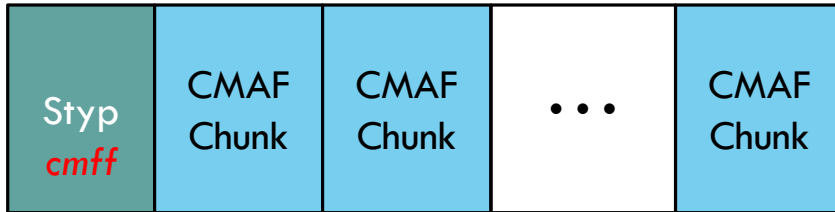
CMAF Header



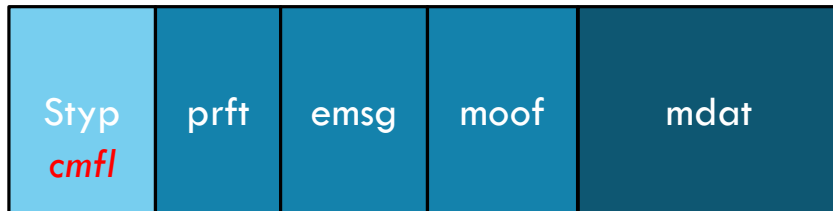
CMAF Track File



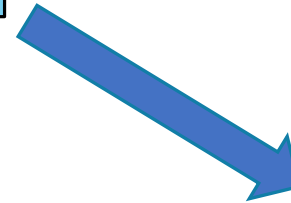
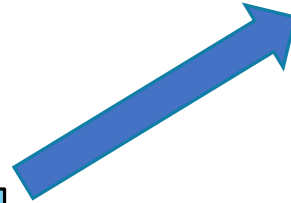
CMAF Fragment

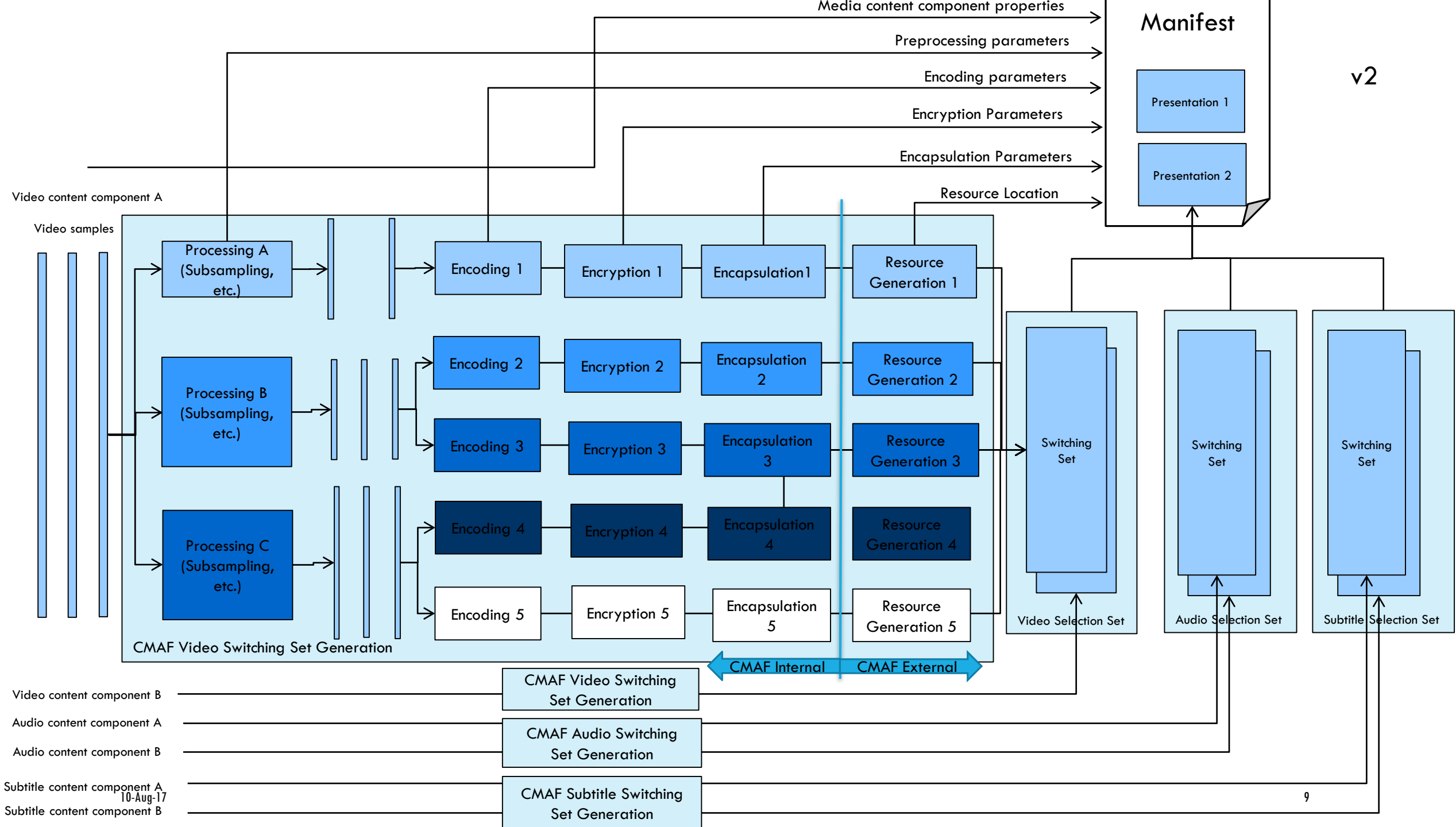


CMAF Chunk



CMAF Segment





VIDEO MEDIA PROFILES

Media Profile	Codec	Profile	Level	Color Coding	Transfer Characteristics	Max Frame Height	Max Frame Width	Max Frame Rate	CMAF File Brand
SD	AVC	High	3.1	BT.709 or BT.601	BT.709 or BT.601 OETF	576	854	60	'cfsd'
HD	AVC	High	4.0	BT.709	BT.709 OETF	1080	1920	60	'cfhd'
HDHF	AVC	High	4.2	BT.709	BT.709 OETF	1080	1920	60	'chdf'
HHD8	HEVC	Main MainTier	4.1	BT.709	BT.709 OETF	1080	1920	60	'chhd'
HHD10	HEVC	Main10 MainTier	4.1	BT.709	BT.709 OETF	1080	1920	60	'chh1'
UHD8	HEVC	Main8 MainTier	5.0	BT.709	BT.709 OETF	2160	3840	60	'cud8'
UHD10	HEVC	Main10 MainTier 10-bit	5.1	BT.709, BT.2020	BT.709 OETF, BT.2020 OETF	2160	3840	60	'cud1'
HDR10	HEVC	Main10 MainTier 10-bit	5.1	BT-2020	ST-2084 EOTF	2160	3840	60	'chr1'

AUDIO AND SUBTITLE TRACK PROFILES

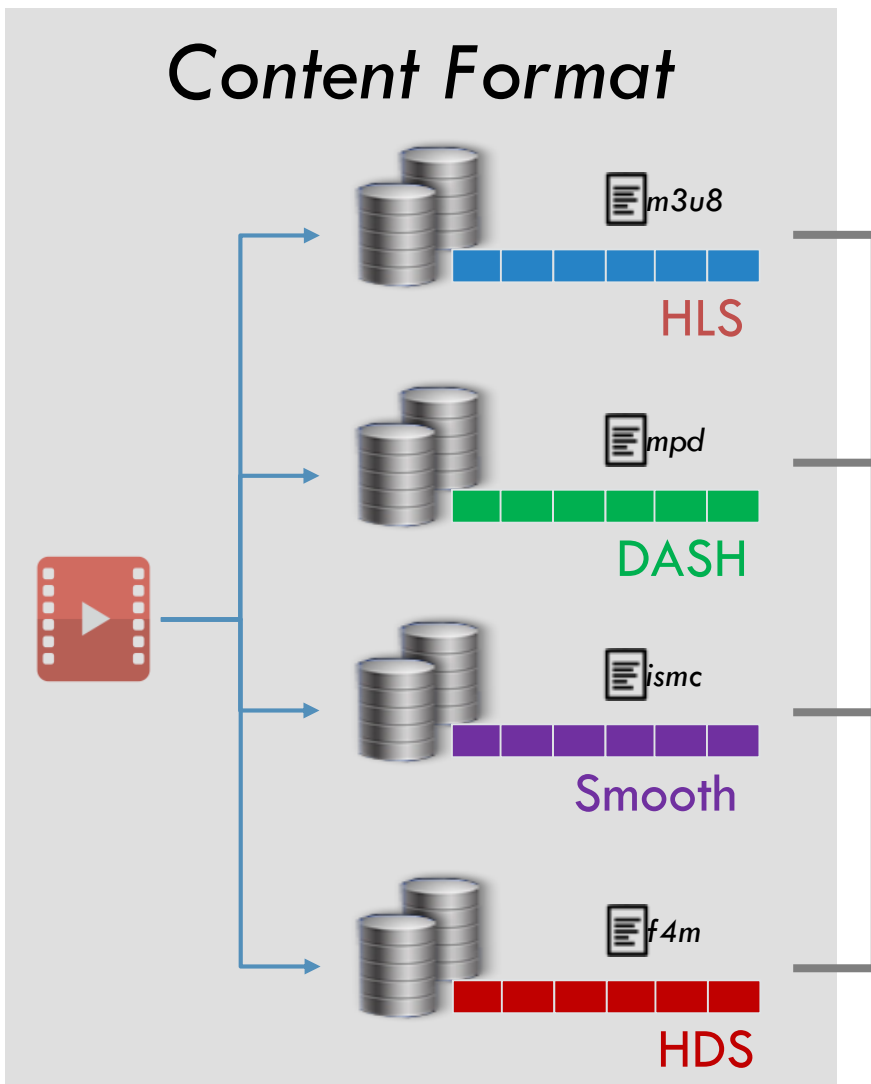
Media Profile	Codec and Profile	Number of channels	Max Sampling Rate	File Brand
AAC Core	AAC-LC, HE-AAC or HE-AAC v2	Mono or Stereo	48 kHz	'caac'

Media Profile	Format	Notes	File Brand
WebVTT	WebVTT, Version 1.0	—pending normative reference https://w3c.github.io/webvtt/	'cwvt'
TTML IMSC Text	TTML W3C IMSC Version 1	Text Profile http://www.w3.org/TR/ttml-imsc1/#text-profile	'cttt'
TTML IMSC1 Image	TTML W3C IMSC Version 1	Image Profile http://www.w3.org/TR/ttml-imsc1/#image-profile	'ctti'
CEA	CEA-608 and CEA-708	Caption data is embedded in SEI messages in video track; multiple closed caption streams may be present	'ccea'



CTA WAVE

COMMERCIAL OTT VIDEO ISSUES: CONTENT FORMAT ISSUES



Each asset copied to multiple media formats

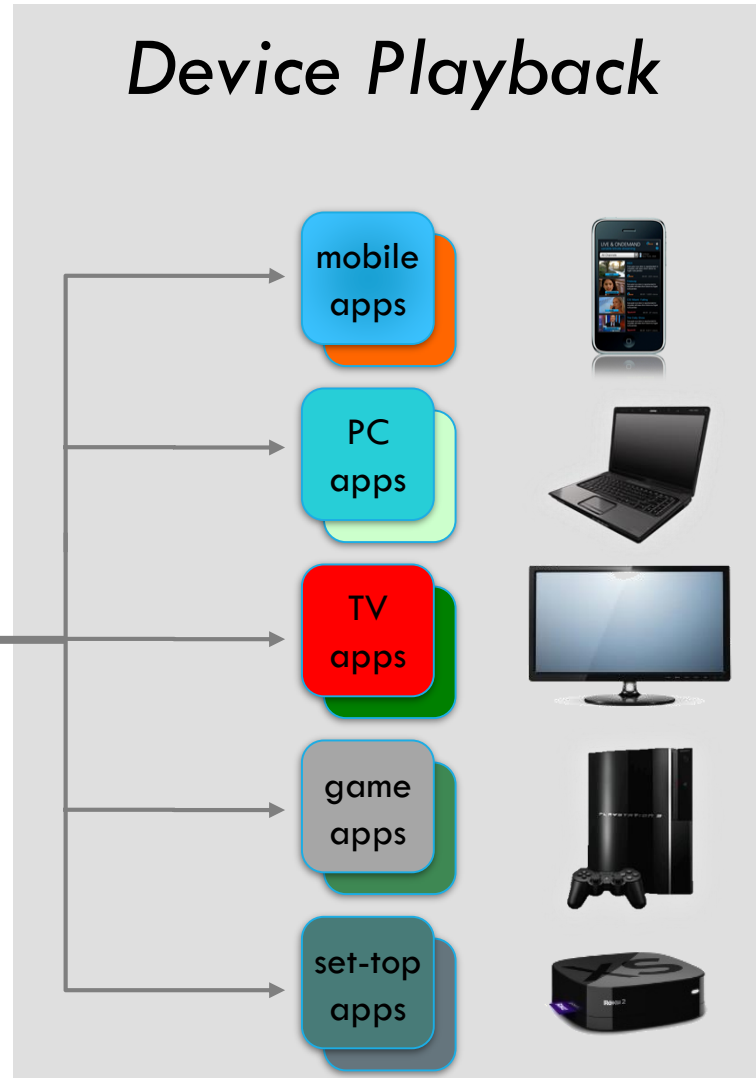
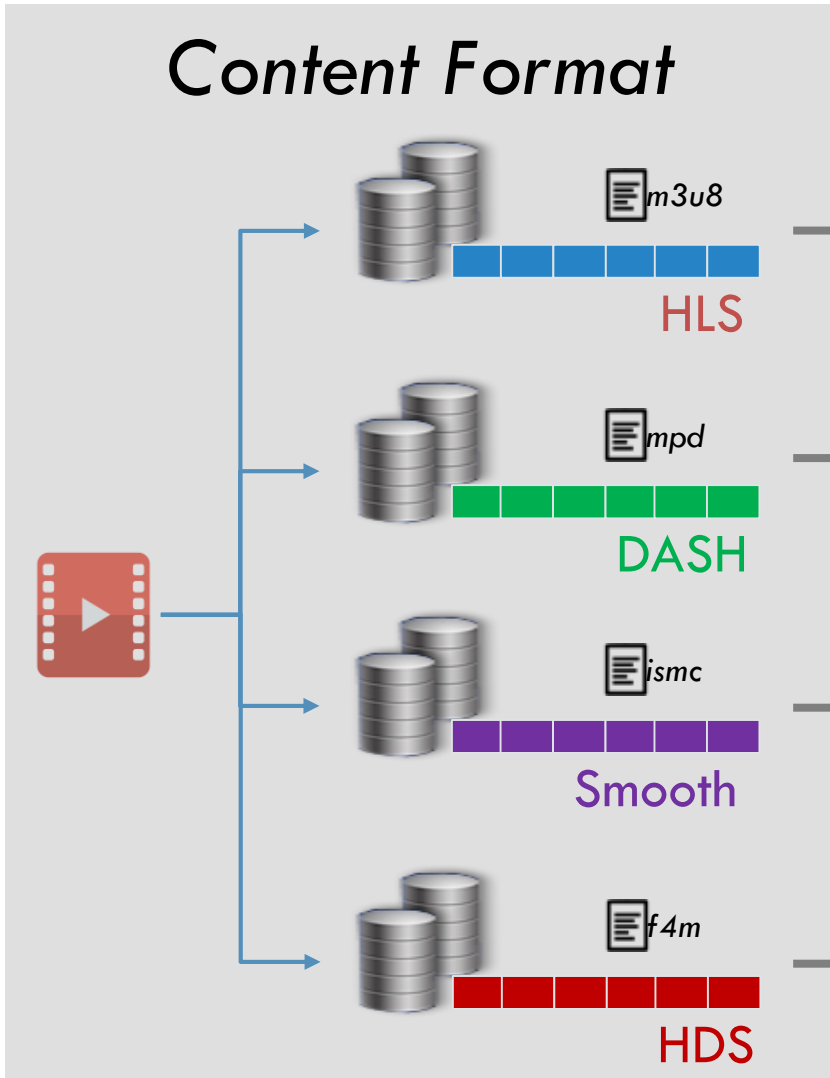
- different video codecs
- different audio codecs
- Regional frame rates

Cost to content creators and distributors

Inefficiencies in content delivery networks (CDNs)

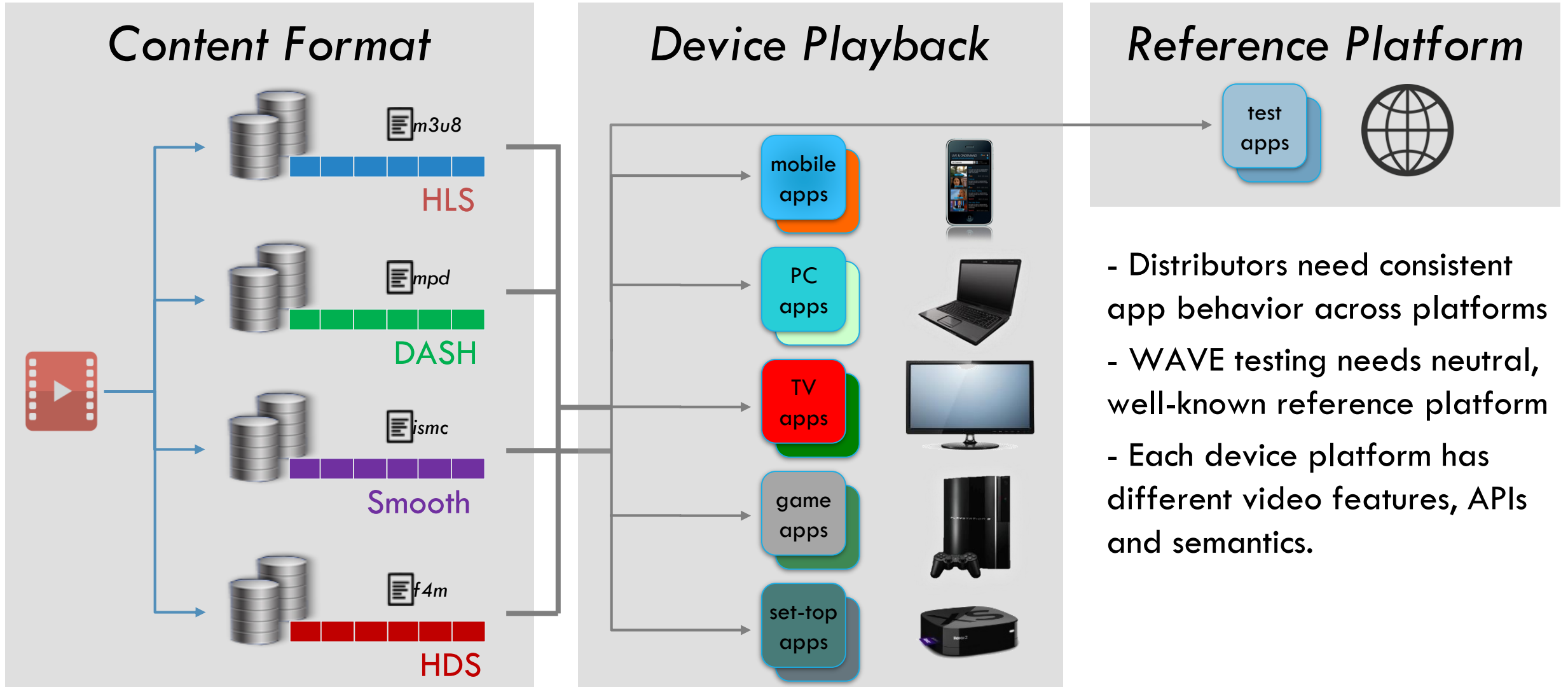
Storage costs

COMMERCIAL OTT VIDEO ISSUES: DEVICE PLAYBACK ISSUES



- Switching bitrate glitches
- Codec incompatibility
- Scaling display issues
- Partial profile support
- Long-term playback instability
- Audio discontinuities
- Request protocol deficiencies
- Memory problems
- CPU weakness
- Variable HDR support
- Unknown capabilities
- Ad splicing problems

COMMERCIAL OTT VIDEO ISSUES: REFERENCE PLATFORM ISSUES



COMMERCIAL OTT VIDEO ISSUES: WAVE SOLUTION

Content Specification

Content Specification based upcoming ISO MPEG Common Media Application Format (CMAF), compatible with DASH and HLS.

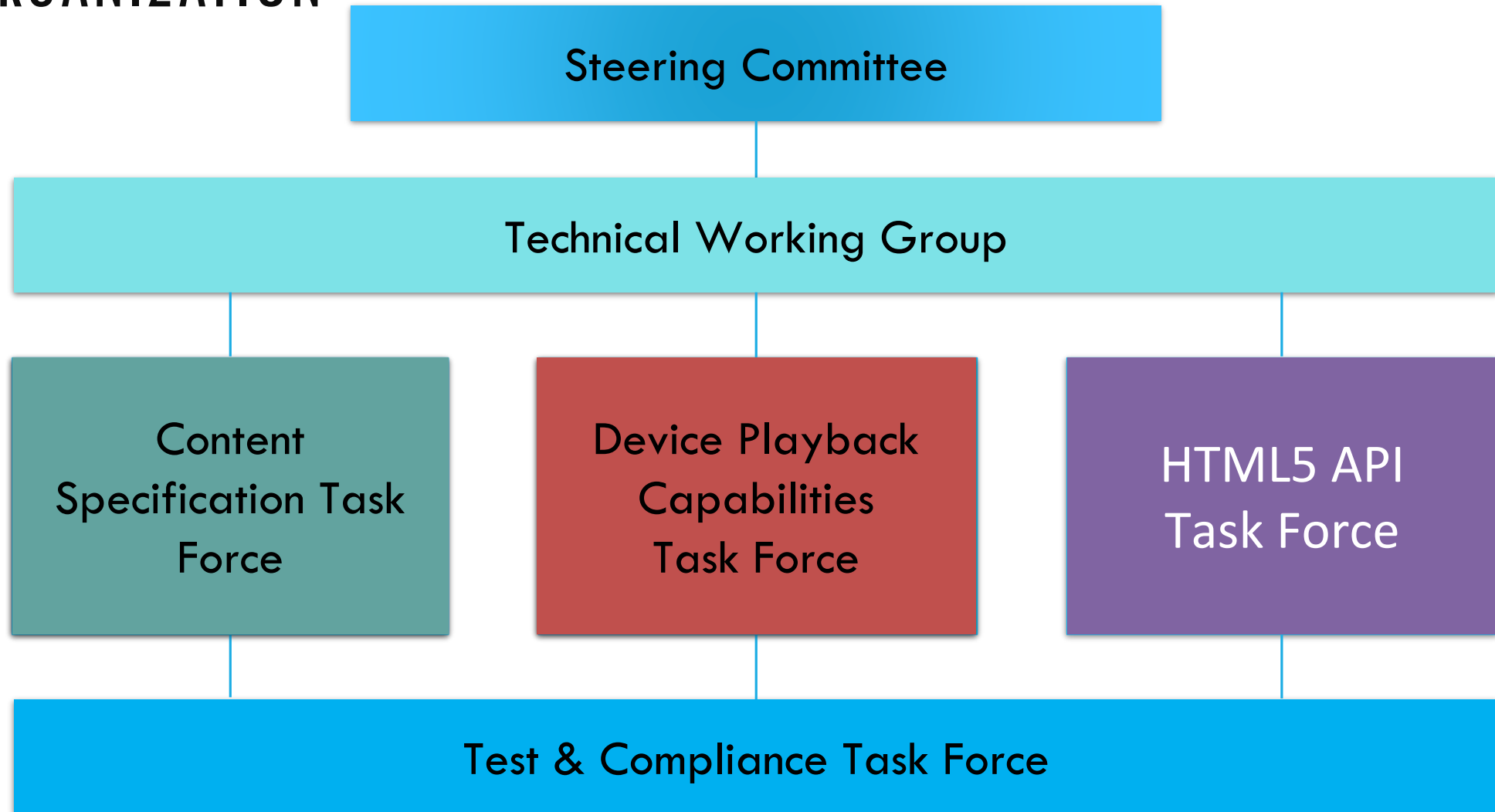
Device Playback Requirements

Testable requirements covering the most common device playback interoperability issues.

HTML5 Reference Platform

Reference application framework based on HTML5 providing functional guidelines for playback interoperability.

WAVE ORGANIZATION



CURRENT WAVE MEMBERSHIP

Adobe	Comcast	Google	Opera	Toshiba
AGP	Cisco	HBO	Qualcomm	TP Vision
Akamai	CTA	Intel	RKDE	UStudio
Amazon	Cox	JW Player	Samsung	Verance
Apple	Discovery	LG	Sharp	Verimatrix
AT&T	Disney	Microsoft	Sky	Verizon
AwoX	Dolby	MLBAM	SCTE	Viacom
BBC	DTS	MPAA	Solekai	Vizio
BitRouter	Ericsson	MovieLabs	Sony	W3C
Brightcove	Eurofins	Nagravision	Starz	WWE
CableLabs	Facebook	NAB	StreamRoot	
castLabs	Fraunhofer	Netflix	TBT	
				[Bold = WAVE Steering Committee.]



THE END OF DASH?

DISCLAIMER: PERSONAL OPINION

No, it is actually the re-start of DASH, just a delay of 5 years

CMAF HD Presentation Profile is DASH-264/AVC as published in 2012

DASH-264/AVC content is CMAF conforming

- Proof 1: CMAF conformance software is largely DASH conformance
- Proof 2: CMAF conformance software shows that vectors conform
- Proof 3: DASH vectors play on iOS devices
 - Waqar developed a small tool to playback DASH on iOS using a Javascript conversion from MPD to M3U8 locally.
 - The tool has been provided here: <http://vm1.dashif.org/DASHtoHLS/>
 - The MPD URL box has a drop down list of possible MPDs that have been tested, but you may try your own

How do we move from here?

- The encryption problem will remain, not expected that this will be solved
- DASH is years ahead of DASH-264/AVC, we have HEVC, multichannel audio, HDR, NGA, VR, Low-Latency and so on
- We may have to check if this contradicts with CMAF (expected no, but CMAF is silent about most of this)
- Continue innovation based on practical problems – or wait until HLS makes decisions?

DASH-IF will support the innovation around DASH – taking into account the CMAF constraints

HOW CAN YOU PARTICIPATE?

Join DASH-IF

<http://dashif.org>



