Live Media Ingest Specification

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Summary of DASH-IF specification under community review

Thanks to DASH-IF ingest TF for the contributions

Streaming at Scale: some moving parts

- A. Contribution/broadcast encoders
- B. Live ABR encoders
- C. Just in Time Packagers/origin servers/content stitching
- D. Content delivery networks
- E. Ad insertion (optional)
- F. Players

Standardization is more than just a player format

Live OTT at Scale Beyond the ABR encoder

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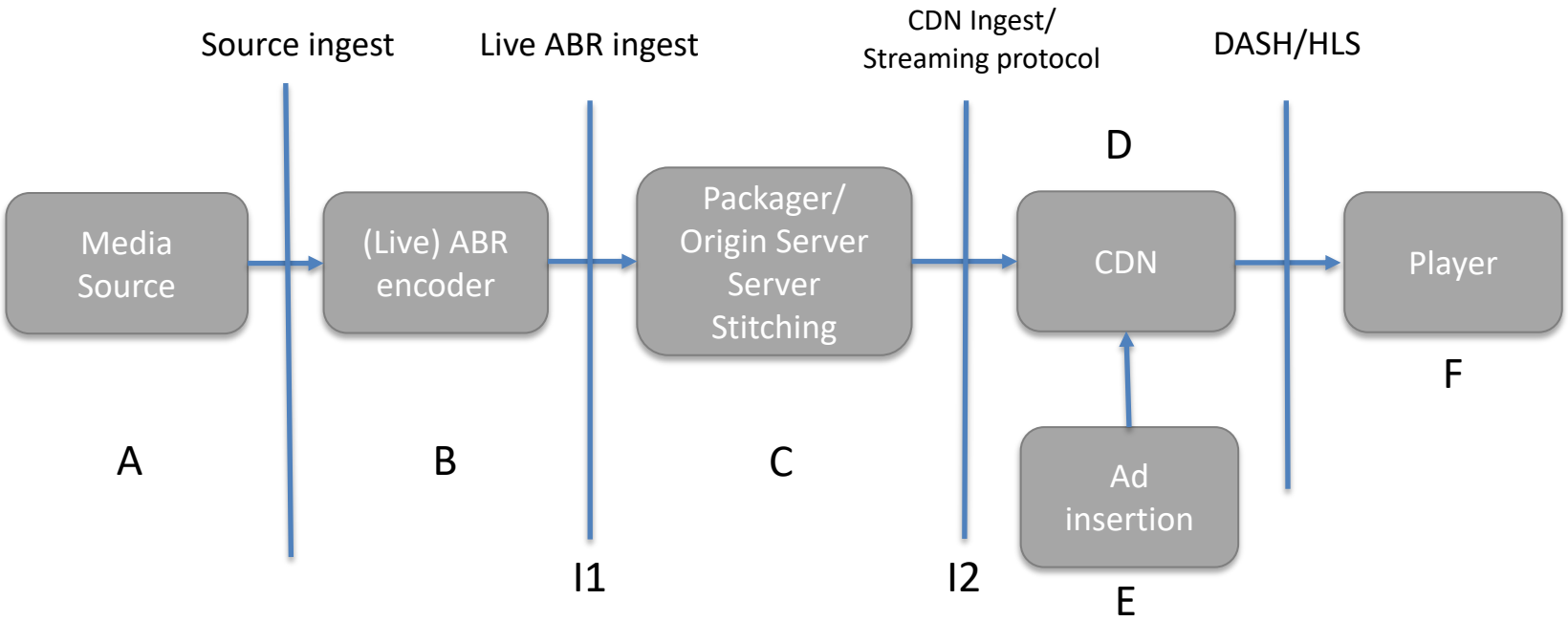

Goal: bring industry together and define interface for point I1 and optionally I2!

https://dashif-documents.azurewebsites.net/Ingest/master/DASH-IF-Ingest.html

Why a new protocol for live ingest ?

- RTMP/Smooth becoming deprecated (no HEVC, VVC, HDR, CMAF, MPEG-H)
- Fmp4/CMAF becoming the dominant media segment format for OTT
  -> CMAF ingest makes sense
- Push Based DASH and HLS are common but under specified -> spec needed
- Timed metadata & content splice information -> enable JITP & ad Insertion
- Fault tolerance, low latency and redundancy for large scale streaming
- Industry Convergence, document current best practices

Pull versus Push in streaming

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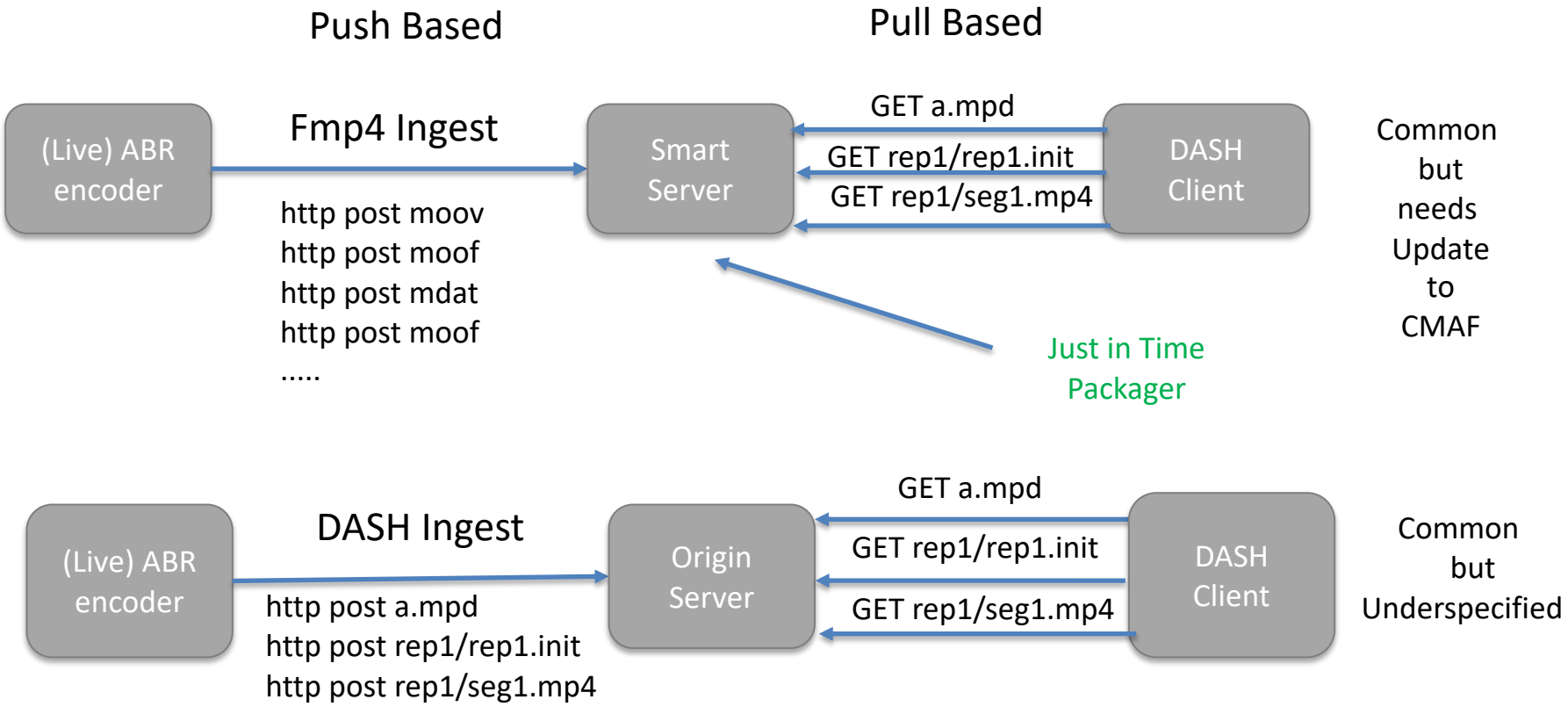

DASH-IF Live Media Ingest Spec.

Supporting companies (initial):

Project timeline

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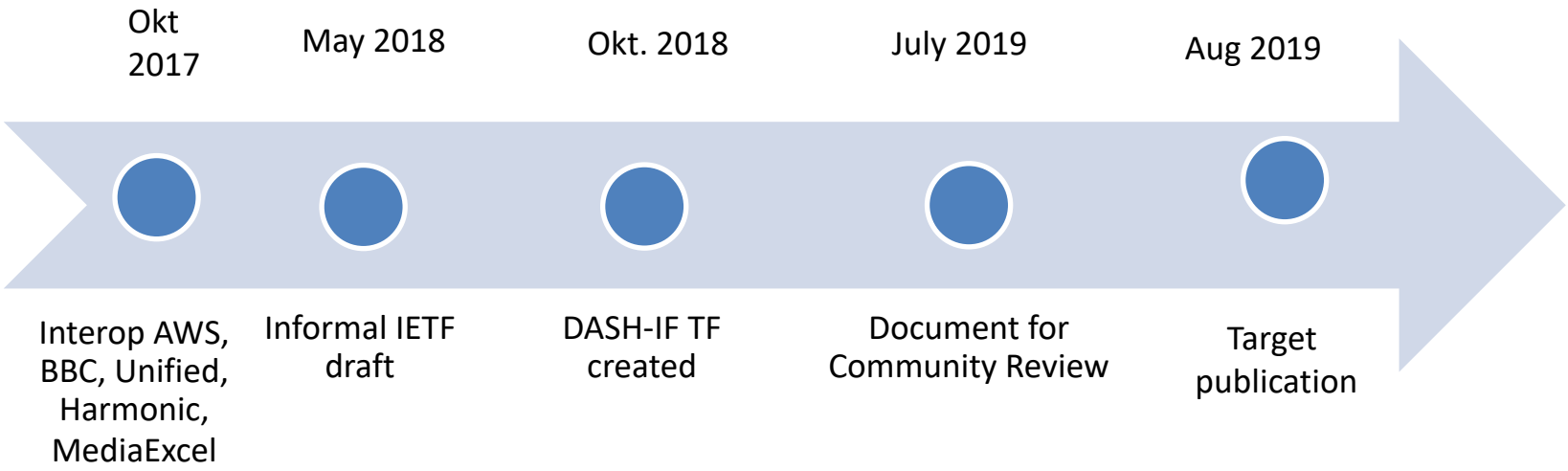

Two interfaces defined for live media ingest

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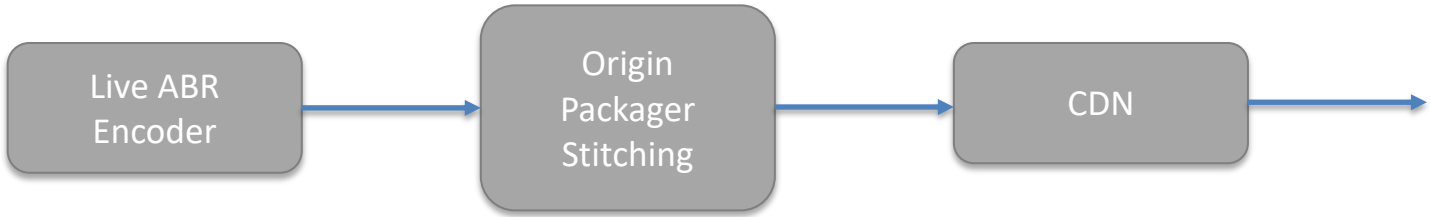
1. *Interface 1:* CMAF Ingest
2. *Interface 2:* DASH/HLS Ingest

All are HTTP POST (or HTTP PUT) based



CMAF Ingest simplified (I1)

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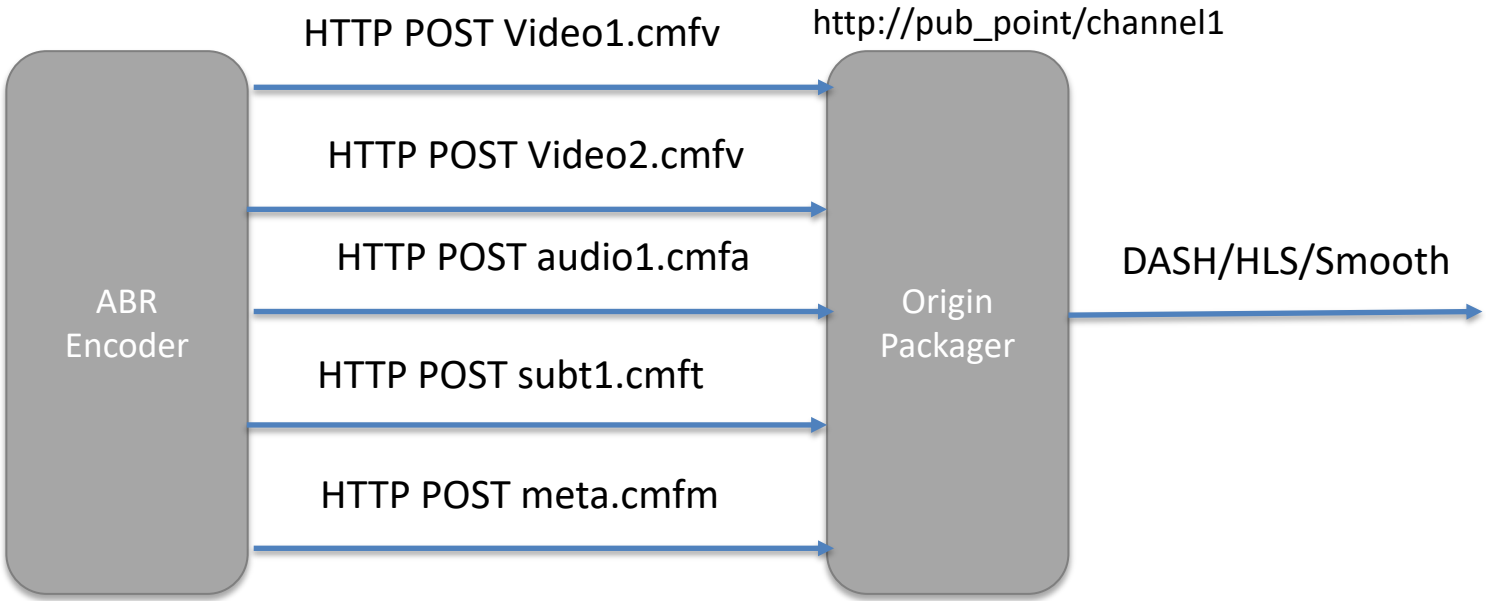

Long running POST (1 POST command per track)
or short running POST (1 HTTP Post per fragment)
For more detail see the specification (i.e. Handling error conditions)

CMAF Ingest: basics (I1)

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- CMAF tracks: *video*, *audio*, *timed text*, *subtitle*, *timed metadata*
- One TCP connection per track
- Continuity: increasing fragment timestamp and or sequence number
- Fmp4/CMAF fragment boundaries for retransmission and identification
- New optional boxes introduced in CMAF and DASH
- Signal key properties in CMAF tracks (kind boxes)

On sending (new) CMAF Boxes (I1)

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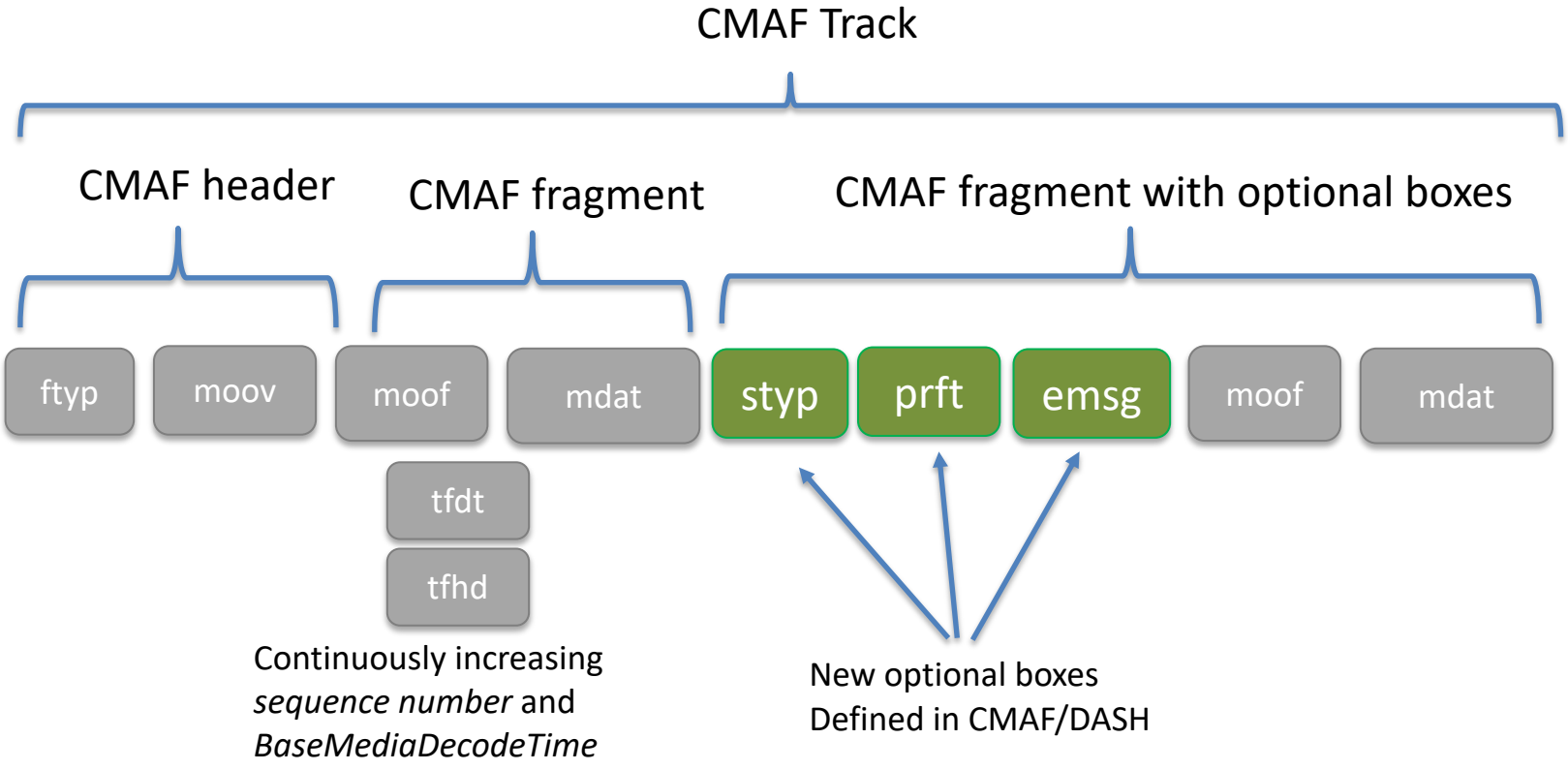

CMAF Ingest security and network (I1)

- HTTPS, TLS client certificates or Basic authentication
- Harmonized *error response codes over HTTP* with the other ingest interface for DASH/HLS
- Typically the source resends the *CMAF header* and *last fragment* in case of failure
- The protocol is kept simple as a design requirement, however many aspects that SHOULD be supported are included

CMAF Ingest: Switching Set constraints/signaling (I1)

Box	***General CMAF header constraints in a CMAF switching set***
ftyp	Shall be identical except for media profile brands (see 1 in 7.3.4.1)
mvhd	Shall be identical except for creation_time, and modification_time
tkhd	Shall be identical except for width, height, creation_time, and modification_time. See NOTE 1.
trex	identical
elst	Shall be identical except for video CMAF track files with a different composition offset
mdhd	Shall be identical except for creation_time, and modification_time
mehd	Global overview, targets duplicate presentations
meta	May contain different boxes and data
udta	May contain different boxes and data
Cprt, kind, elng, hdlr,vmhd,smhd,sthd,dref	identical
stsd	Sample entries shall have the same codingname (four-character code)

Redundancy and hot failover (I1)

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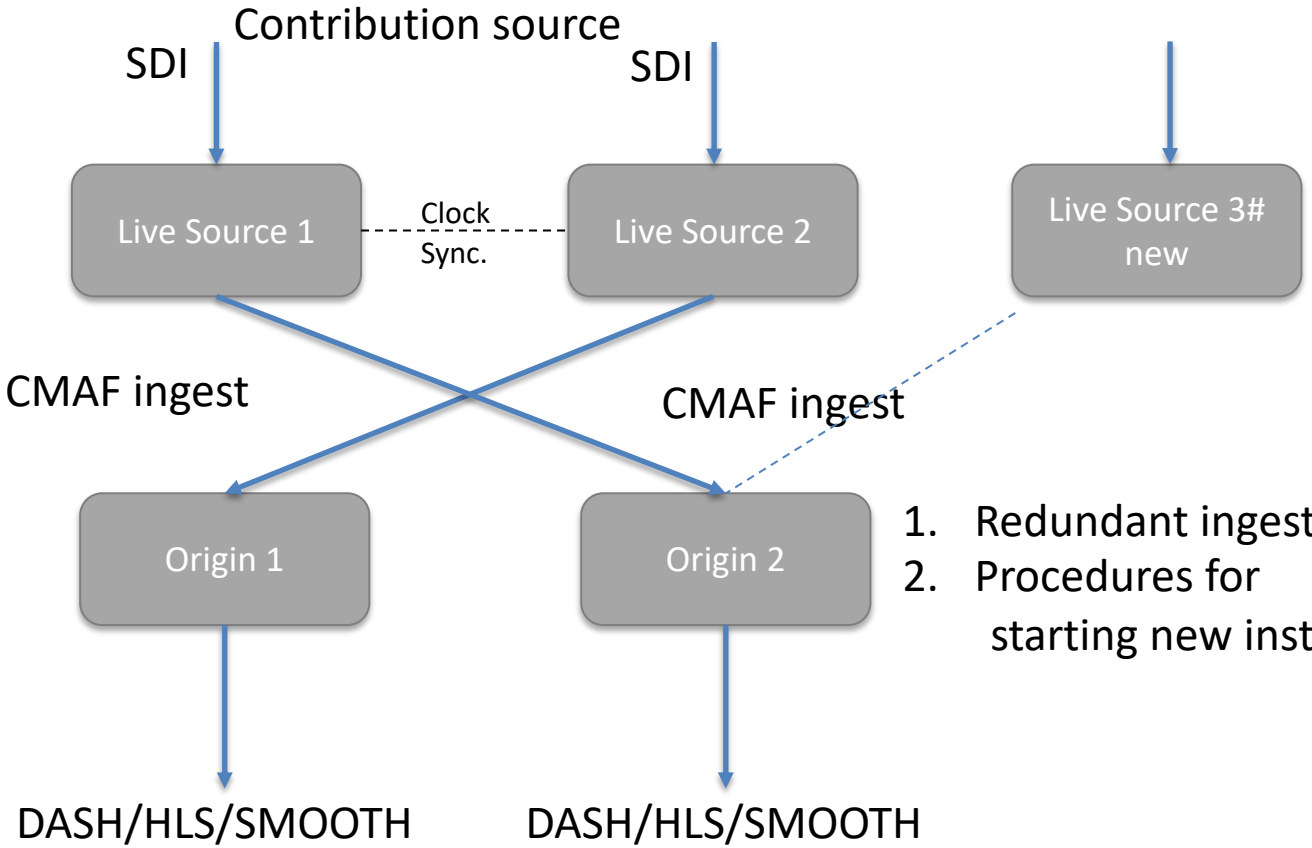

1. Redundant ingest/cross post
2. Procedures for starting new instance

Timed Metadata CMAF Track (I1)

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- To enable fast processing fragmented timed metadata track is defined
  - ISOBMFF Samples carrying DashEventMessageBox
  - Avoid timeline problem with top level DashEventMessageBoxes

- Separate track with SCTE-35/id3 and other timed metadata information,
  - schemeIdUri **urn:scte:scte35:2013:bin** (see SCTE-214)

- Id3 in DashEventMessageBox as defined in aom by Microsoft and Apple
  - https://aomediacodec.github.io/av1-id3/

- Splice conditions set IDR frame at corresponding time point

- Metadata track is technology under consideration in CMAF at MPEG

Timed Metadata CMAF Track (I1)

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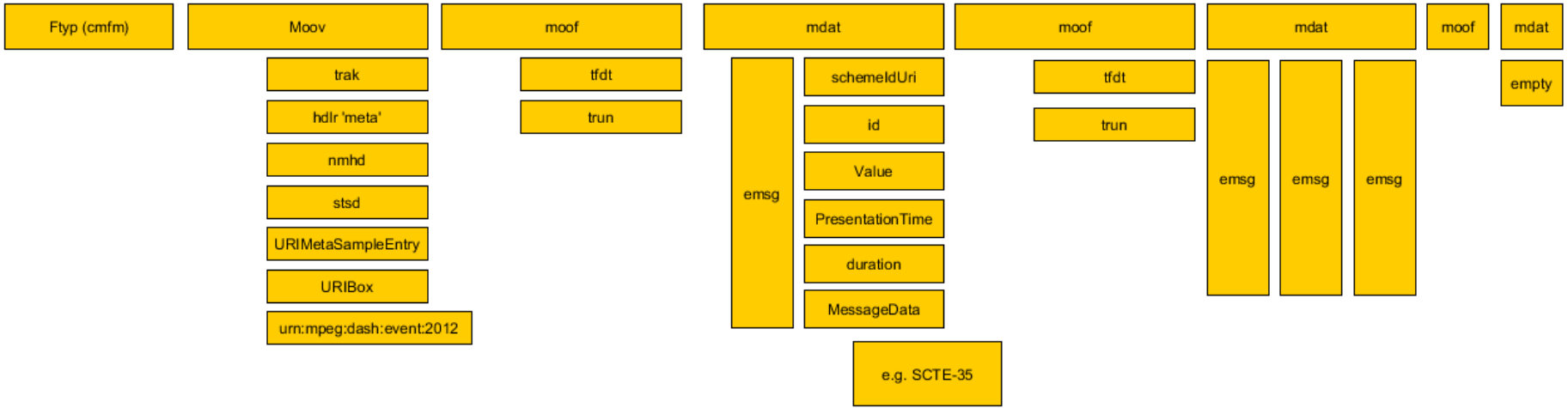
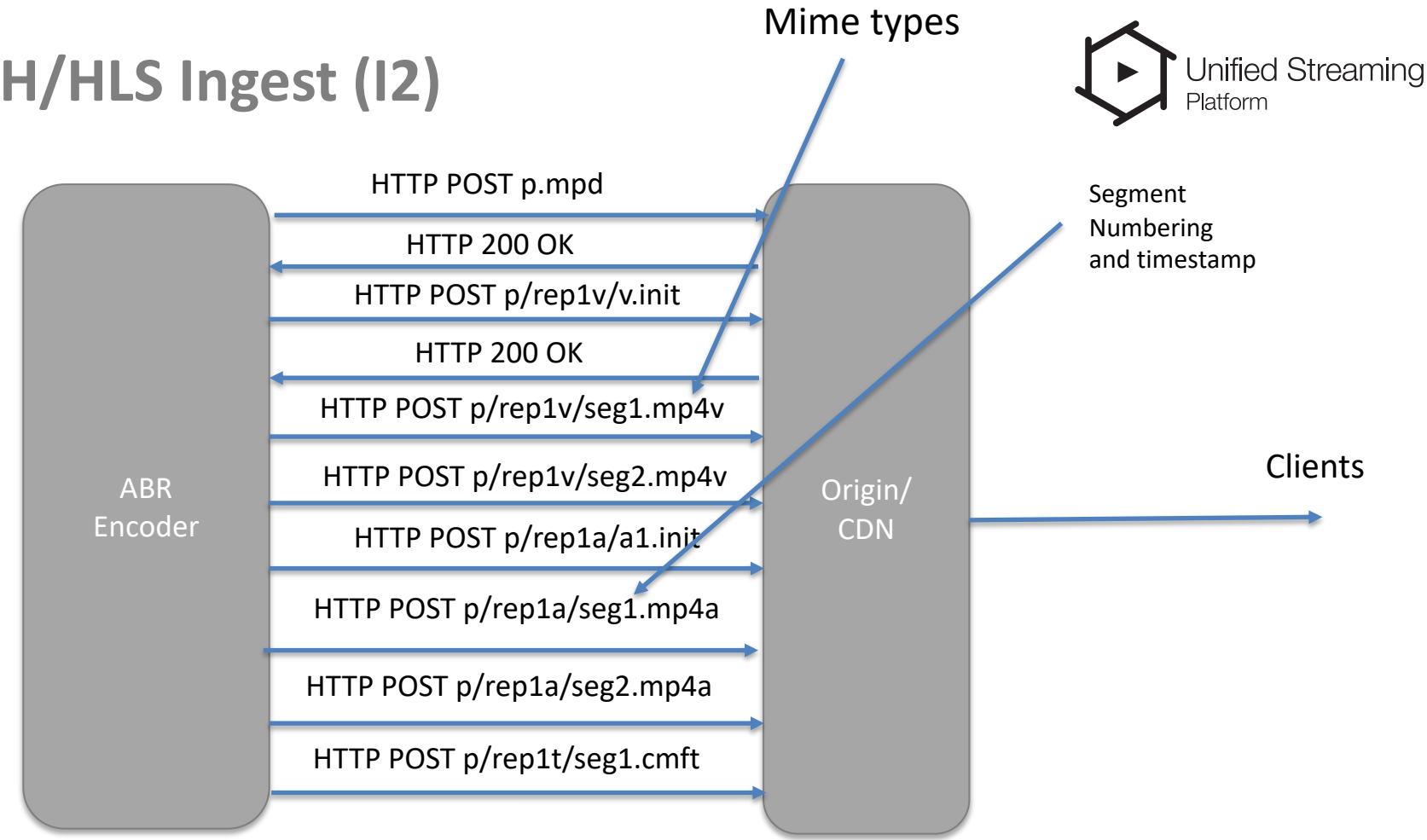


DASH/HLS Ingest (I2)



DASH/HLS + CMAF Ingest (i1 + i2)=i3?

- Both interfaces combined in one (under consideration)

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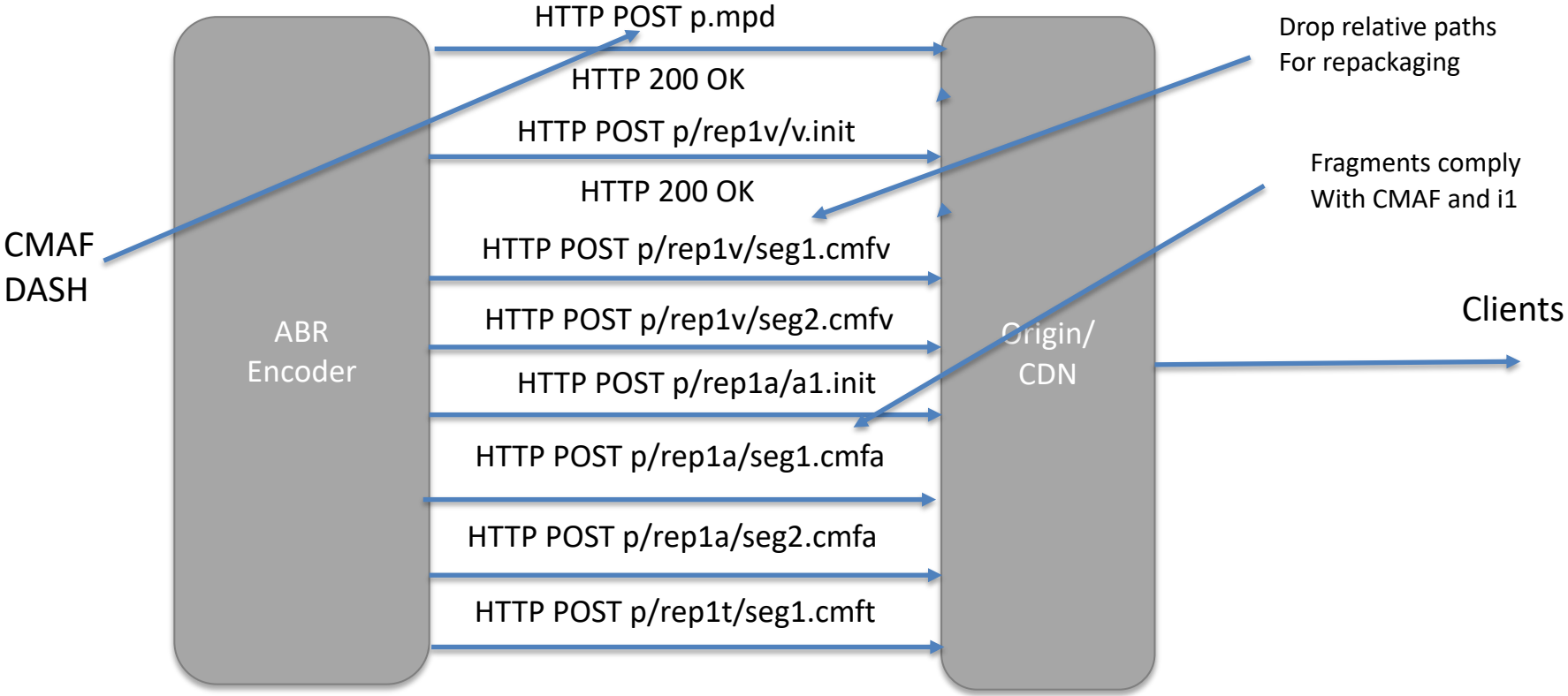

Summary

- ***Harmonize encoder output and processing entity ingest***
- ***Allow Best of breed encoder + best of breed packaging/encryption***
- Key to fast adoption of HEVC/VVC/Encryption in streaming workflows
- CMAF ingest and DASH/HLS ingest defined
- Timed metadata track is key for fast processing
- Security, fault tolerance and redundancy defined
- CMAF ingest does not need manifest, but optional additional manifest can be added aligning it with CMAF DASH

Reference Software + demo

- **Live ingest of CMAF files using CMAF ingest profile**
  - https://github.com/unifiedstreaming/fmp4-ingest/tree/master/ingest-tools
  - fmp4Ingest (ingest cmaf files using CMAF ingest)
  - Tools for converting cmaf timed metadatatrack
- **Demo with Unified origin and docker compose:**
  - *https://github.com/unifiedstreaming/cmaf-ingest-demo*

Next Steps

- **Publish Document as a DASH-IF document**
- Encourage deployment in live encoders
- Test vectors and reference software
- Incoporate the comments from community review
- Formally standardize the specification
- https://github.com/Dash-Industry-Forum/Ingest

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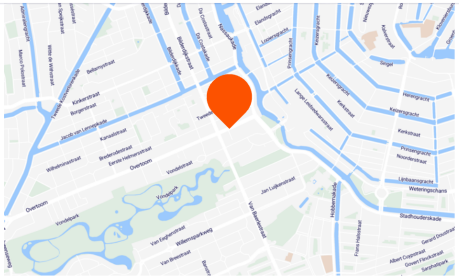
Thank you for your attention!

- Questions ?
- Contact: Rufael@unified-streaming.com



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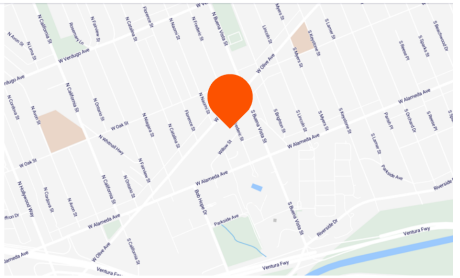

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