DVB-I Webinar Series

Part 1 of 3

27 March 2020

Introduction

Paul Higgs – TM-I Chair - Huawei

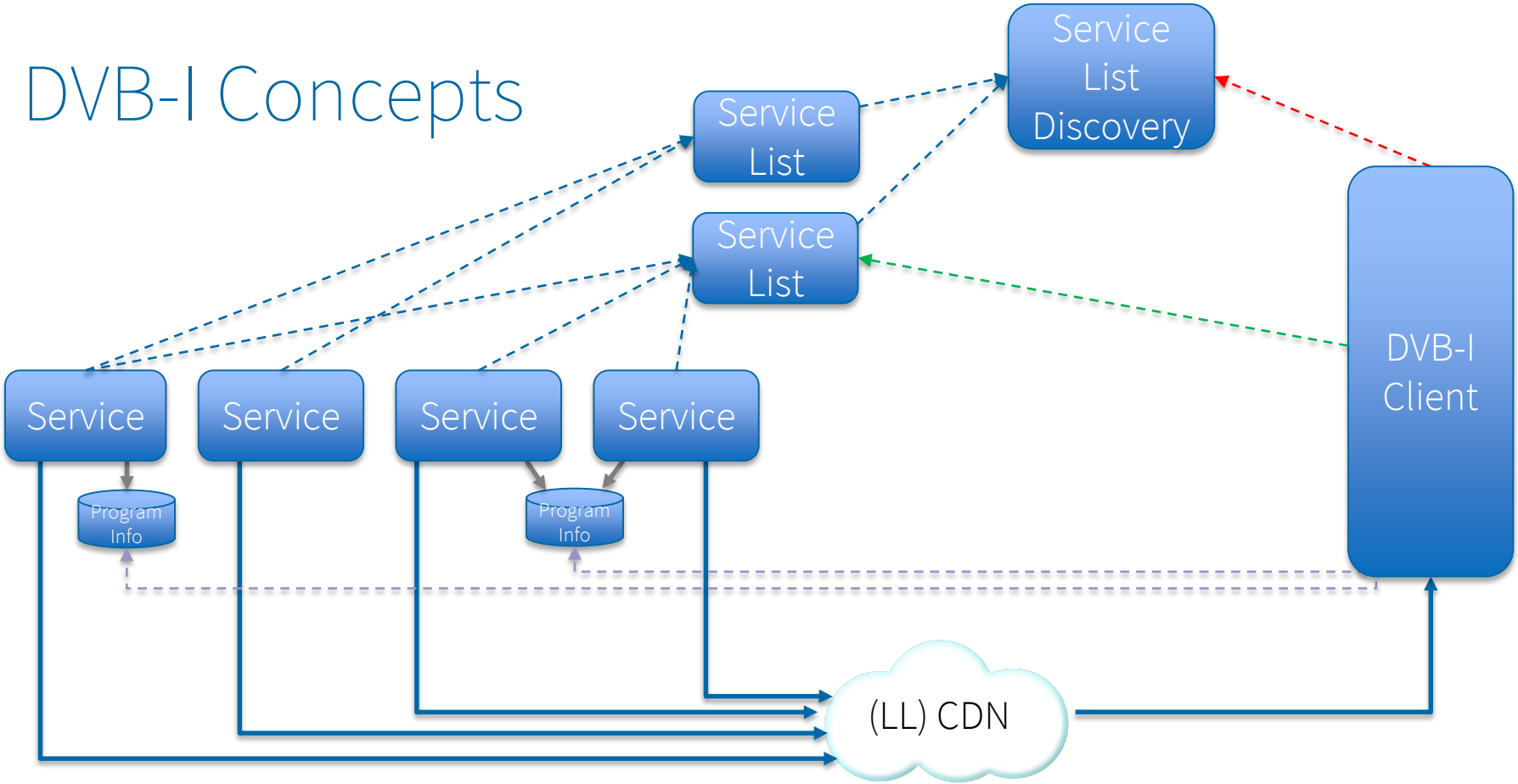
Road to DVB-I

- DVB-C, DVB-T, DVB-S
  - Broadcast television services
- HbbTV
  - Add interactive elements and ondemand content to existing broadcast services
- DVB-IPTV
  - Television services delivered over managed/private IP networks
- DVB-I
  - Broadcast television services delivered over the Internet

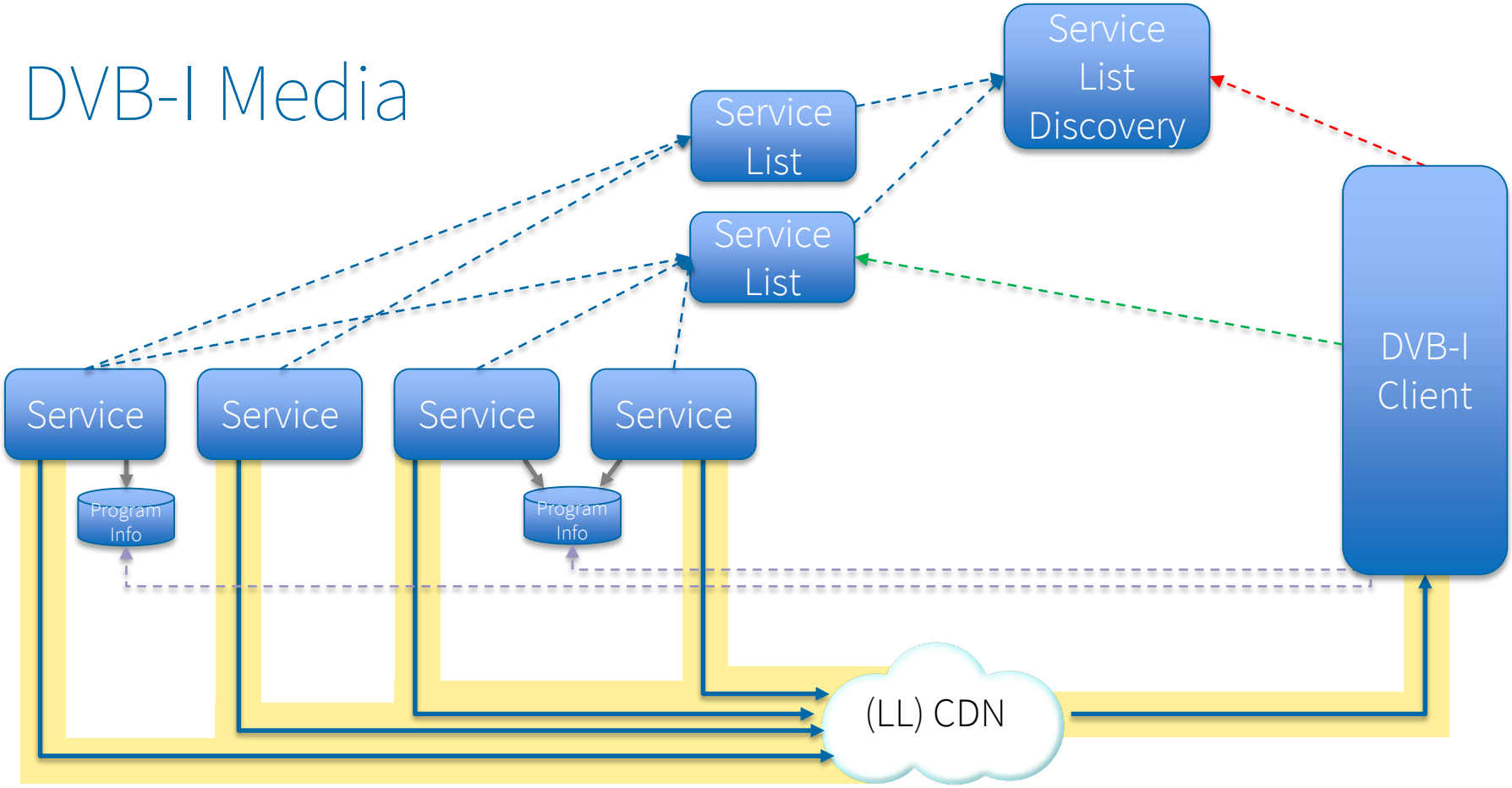
The ecosystem

- A177 – DVB-I Service Discovery and Programme Information
  - The “internet channel scan” and EPG
- A168 – DVB-DASH with Low Latency
  - Media format for linear broadband television services (On Demand also)
- A176 – Multicast ABR (DVB-mABR)
  - Efficient delivery of DVB DASH over IP networks
- A178 – Targeted Advertising (DVB-TA)
  - Personalizing advertisements for television services

DVB-I Concepts



DVB-I Media


Service List Discovery
Service List
Service List
DVB-I Client
Service
Service
Service
Service
Program Info
Program Info
(LL) CDN

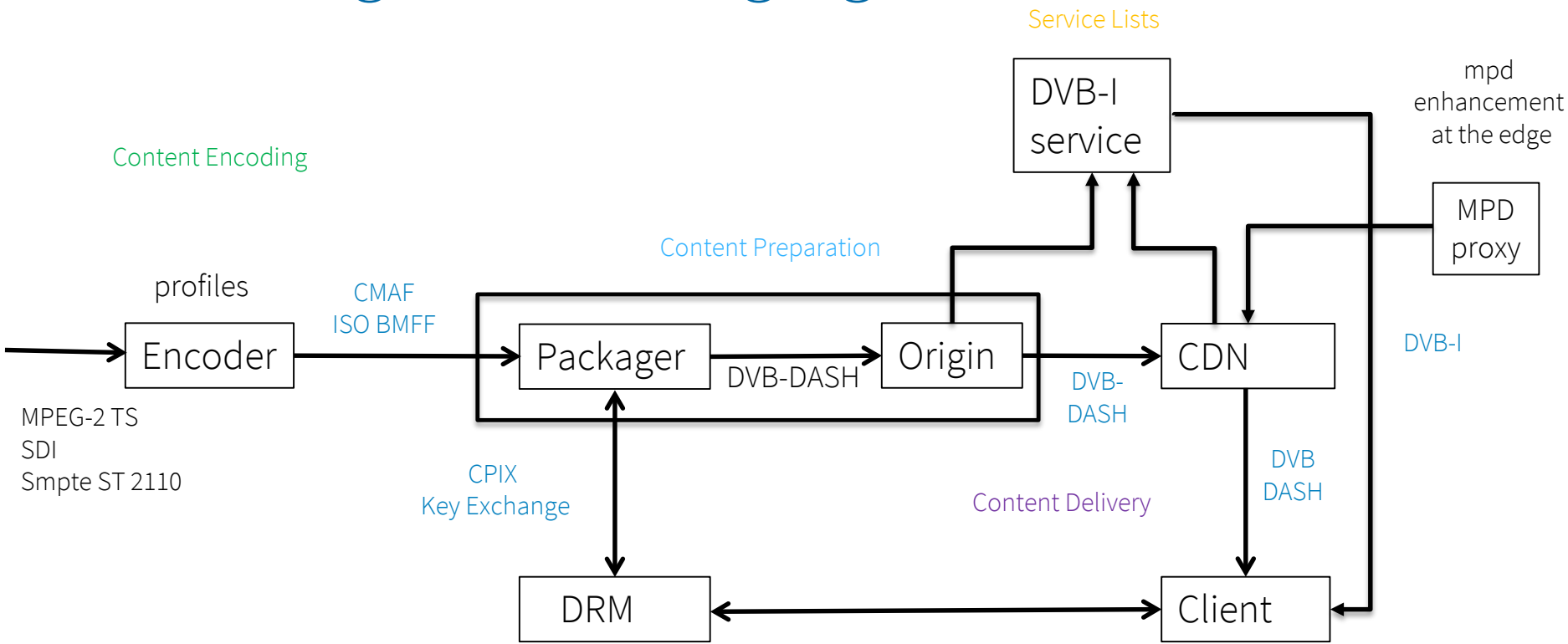
Part 1: Encoding & Packaging

Rufael Mekuria - Unified Streaming
Dirk Griffioen - Unified Streaming

Packaging and Encoding DVB-I

- DVB-I servies are *Live* services
- DVB-I services use the DVB-DASH format as transmission format
- MPD's referenced in service lists are provided by Origin servers
- *How to create the live feeds ?*
- The reference architecture includes different components (see next slide)
- Goals:
  - a) interoperability with DVB DASH devices
  - b) Interoperability with other devices (e.g. HLS devices)
  - c) content interoperability, re-use content for catch-up/VoD, re-broadcast
  - d) interoperability between components in the architecture
  - e) support commercial DRM
  - f) support content insertion/replacement

Encoding and Packaging for DVB-I



* Based on DASH-IF architecture for low latency

Encoding profiles for DVB DASH

Video Coding Profiles for DVB DASH

ETSI TS 101 154 Sect L: https://www.etsi.org/deliver/etsi_ts/101100_101199/101154/02.04.01_60/ts_101154v020401p.pdf (sect. L)

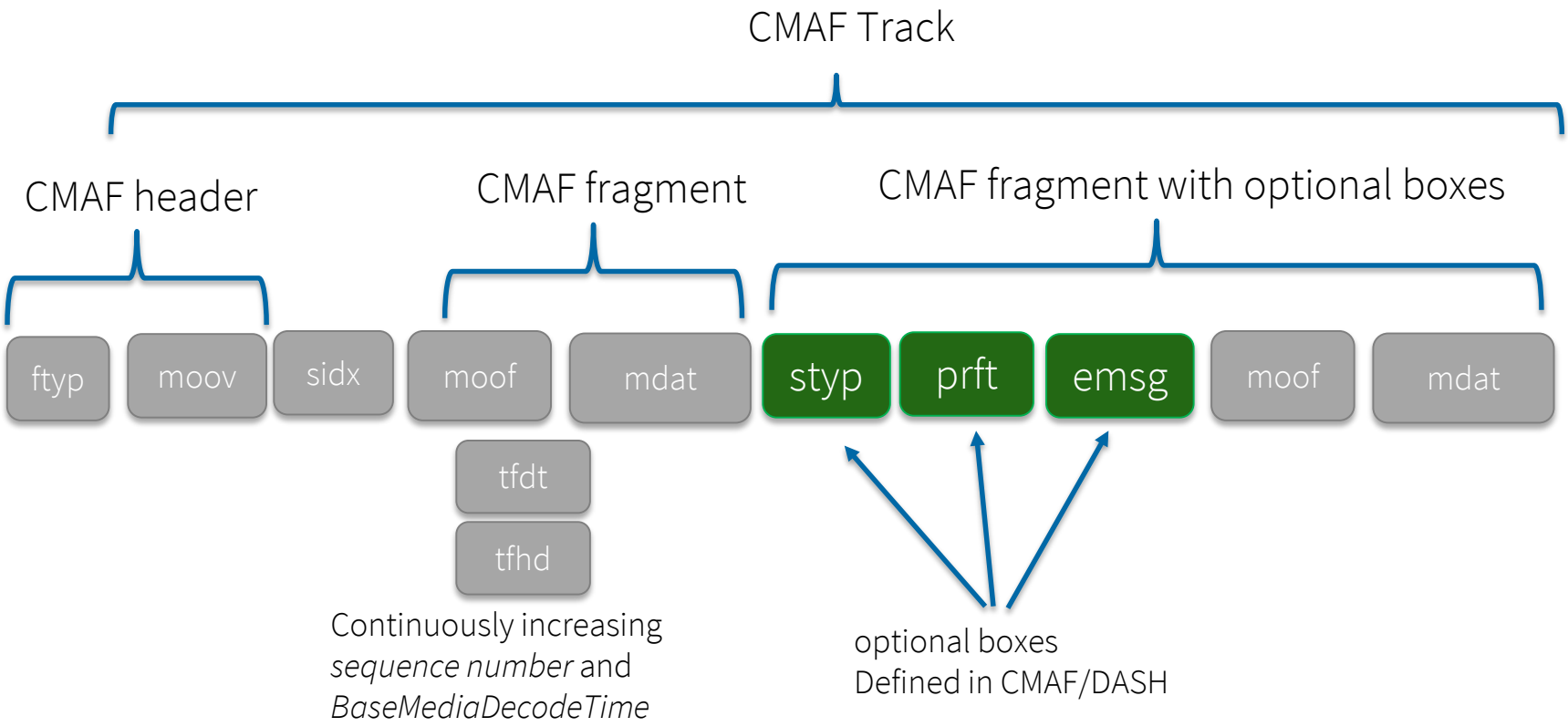
CMAF media Profiles: https://www.iso.org/standard/71975.html

DVB DASH 2014 features: SD/HD/stereo/multi-channel, AVC,HEVC, aac-he v2 …
DVB DASH 2017 additional features : Next gen audio (MPEG-H audio), HDR, HFR …..

Live ABR Encoder input output

- Input could be an other DVB broadcast feed
- For mezannine, SDI, Zixi, SRT or other inputs could be used
- SMPTE ST 2110
- For ABR delivery, encoders should output CMAF based fragmented MP4 content for best results

Example CMAF Track



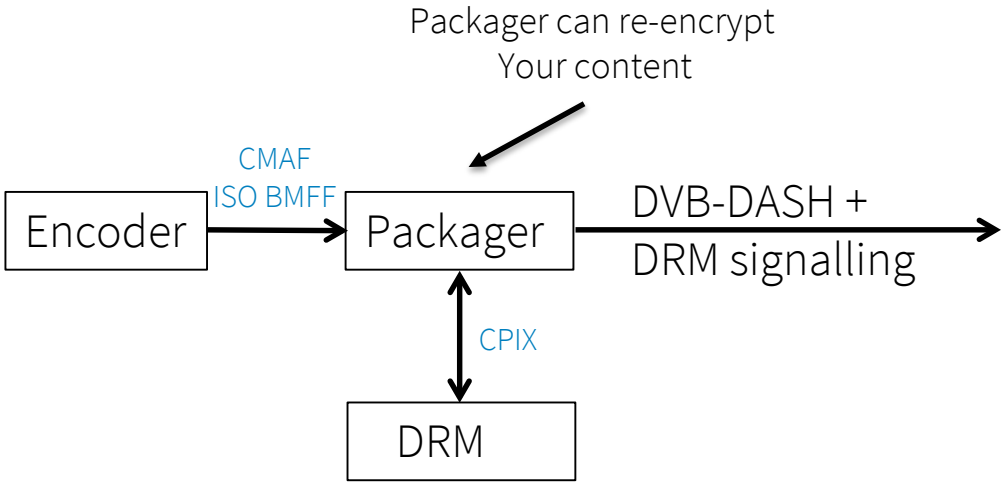
Specification for live uplink/ingest

- Live encoder feed with CMAF tracks must be ingested to origin servers/packagers
- It is recommended to use the HTTP POST method for this
- The detailed protocol was specified in collaboration with companies in the DASH-IF and published as a DASH-IF technical specification
- The CMAF ingest of tracks is defined in section 5 of:
  - https://dashif-documents.azurewebsites.net/Ingest/master/DASH-IF-Ingest.html

Benefits of using CMAF as ingest

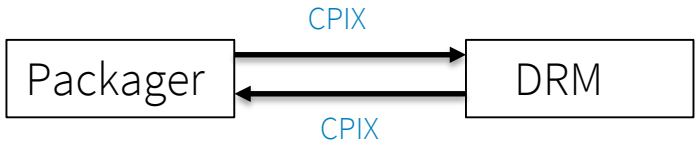
- Can be used by different manifest formats
- Common format for VoD and Live
- Features like chunking Segments can achieve lower latency in workflows
- CMAF allows signalling track role, language, bit-rate, etc. in a commonly accepted standard
- By not yet publishing the manifest, late binding can be applied, i.e. Selecting the relevant tracks for the presentation
- Live support through DASH-IF ingest specification
- Support for common encryption (CENC)

Key Information Exchange



DVB DASH can support any DRM
e.g.:
Widevine
Playready
Marlin

By using CPIX key information can be exchanged




```
<?xml version='1.0' encoding='UTF-8'?>
<CPIX xmlns:pskc="urn:ietf:params:xml:ns:keyprov:pskc" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xmlns="urn:dashif:org:cpix" xsi:schemaLocation="urn:dashif:org:cpix cpix.xsd">
 <ContentKeyList>
  <ContentKey kid="e82f184c-3aaa-57b4-ace8-606b5e3febad">
   <Data>
    <pskc:Secret>
     <pskc:PlainValue>wvr2bihSzExKdR8KKpQf2w==</pskc:PlainValue>
    </pskc:Secret>
   </Data>
  </ContentKey>
 </ContentKeyList>
 <DRMSystemList>
  <!-- Widevine -->
  <DRMSystem kid="e82f184c-3aaa-57b4-ace8-606b5e3febad" systemId="edef8ba9-79d6-4ace-a3c8-
27dcd51d21ed">
   <PSSH>AAAAMnBzc2gAAAAA7e+LqXnWSs6jyCfc1R0h7QAAABIiCnVzcHd2dGVzdDNI49yVmwY=</PSSH>
   <ContentProtectionData />
   <HLSSignalingData />
  </DRMSystem>
 </DRMSystemList>
</CPIX>
```

- CPIX defines an XML schema
- ContentKeyID
- ContentKeyList
- CPIX documents can be used for
- Exchanging key information
- Example API AWS Speke = CPIX
- Recommended for complex cases like Multi-drm, multi-key and so on.

https://dashif-documents.azurewebsites.net/CPIX/master/Cpix.html

DVB DASH delivery

- For DVB-I DVB-DASH is the broadband delivery format
- Track role and accessibility signalling (DASH 4th edition)
- MP4 fragmented subitles encapsulating ttml
- Constraints on mpd and segments (e.g. Non-multiplexed)
- DVB Programme metadata (MPD Event)

https://dvb.org/wp-content/uploads/2019/12/a168_dvb_mpeg-dash_oct_2019.pdf

DVB DASH with low latency

Feature	Explanation	Usage
PlayBackRate	Allows setting min and max playback rate	For player catchup to live edge
Chunked segments	Enables smaller granularity processing @segmentProfiles includes cmfl	For chunked delivery to clients
ProducerReferenceTime	Element to signal wallclock time and utc timing element for synchronizing server and client	For computing the latency at clients
Scope Element	New element in Service Description	Useful for distinguishing low latency and non low latency AdaptationSets
ServiceDescription	Used to set the requirements for the service description, may include Latency and playbackrate Elements	Used by client to find the service requiremenst
Latency	Element to signal Latency (target, min,max)	Used by clients to check if they can playback the content as required

Example DVB DASH Service Description

```
<ServiceDescription id="1">
<Scope schemeIdUri="urn:dvb:dash:lowlatency:scope:2019" />
    <Latency target="2000" max="6000" min="1000" />
    <PlaybackRate max="1.5" min="0.5" />
</ServiceDescription>
```

Program information in live streams

```
<?xml version="1.0" encoding="UTF-8"?>
<MPD
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns="urn:mpeg:dash:schema:mpd:2011"
 xsi:schemaLocation="urn:mpeg:dash:schema:mpd:2011 DASH-MPD.xsd"
 ... etc ...>

 <BaseURL>http://cdn1.example.com/</BaseURL>
 <BaseURL>http://cdn2.example.com/</BaseURL>

 <Period id="1">
 <EventStream schemeIdUri="urn:dvb:iptv:cpm:2014" value="1">
 <Event presentationTime="300" duration="1500" id="0"><![CDATA[<BroadcastEvent>
 <Program crid="crid://broadcaster.example.com/ABCDEF"/>
 <InstanceDescription>
 <Title xml:lang="en">The title</Title>
 <Synopsis xml:lang="en" length="medium">The description</Synopsis>
 <ParentalGuidance>
 <mpeg7:ParentalRating href="urn:dvb:iptv:rating:2014:15"/>
 <mpeg7:Region>GB</mpeg7:Region>
 </ParentalGuidance>
A168 (Oct 2019)
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 </InstanceDescription>
</BroadcastEvent>]]></Event>
 </EventStream>
 <AdaptationSet>
 ... etc ...
 </AdaptationSet>
 </Perio
```
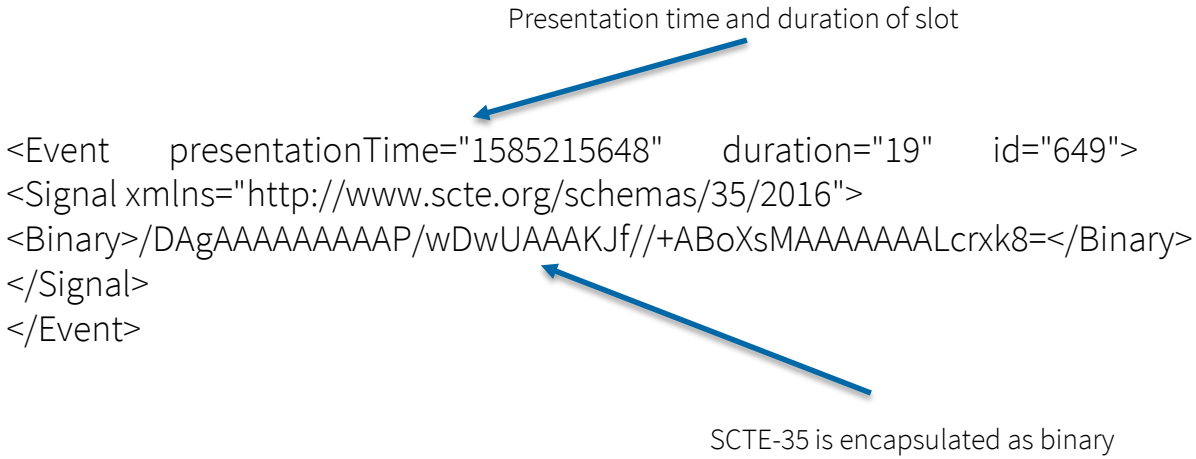

If not in MPD it could be in the Service List Desciption

MPD Events
Are used to carry meta information in DVB DASH

Splice Information in live streams

- HLS uses EXT-X-DATERANGE for carrying SCTE-35 used for ad insertion
- The DASH analogue is an MPD event carrying SCTE-35 according to SCTE 214/DASH IOP 4.3
- The MPD Proxy or ad insertion service, can use this information for inserting or replacing content, given that the splice timing of the MPD event and the scte-35 match.



MPD Proxy

- Some features are manifest only changes, and can be handled by an MPD proxy
- The MPD proxy changes the manifest, but not the segments
  - Single to Multi period
  - Adding supplemental descriptors (e.g. Adaptationset switching)
  - Adding metadata
  - Changing the ServiceDescription Elements
  - Content insertion of stitching (based on segments already in the CDN)

Origin Server Tips

- Challenge of origin server is handling scale
- Errors (404) can be problematic as they can mitigate through to CDN
- For live streaming CDN offloading is rather effective
- Per channel dimensioning of servers is sometimes deployed, making a small virtual server for each channel.
- This way channels will be isolated in case of failures

DVB-I Service and play list

- Reference the mpd’s
- In case of live mpd’s only, channels could be fixed running on different origins 24x7
- It may be necessary to have some more methods for notification of changes/updates (TBD)

Summary

- Distributed Workflow for encoding and packaging
- Reference architecture with standardized interfaces
- Encoder can produce CMAF and media encoded with the DVB profile
- Packager creates DVB-DASH and commercial encryption
- Origin is used for Distribution via CDN
- Splice information is carried in MPD Events
- Programme metadata is carried in MPD events
- Proxy can add MPD properties and/or insert/replace content based on MPD Event or HLS DateRange tags
- Proxy could also make specific geo-specific localization changes for DVB-I to the manifest

End