



DASH-IF Special Session: ROUTE/DASH/CMAF for ATSC3.0

June 3, 2022

Thomas Stockhammer (Qualcomm Incorporated)
DASH-IF Interoperability WG Chair

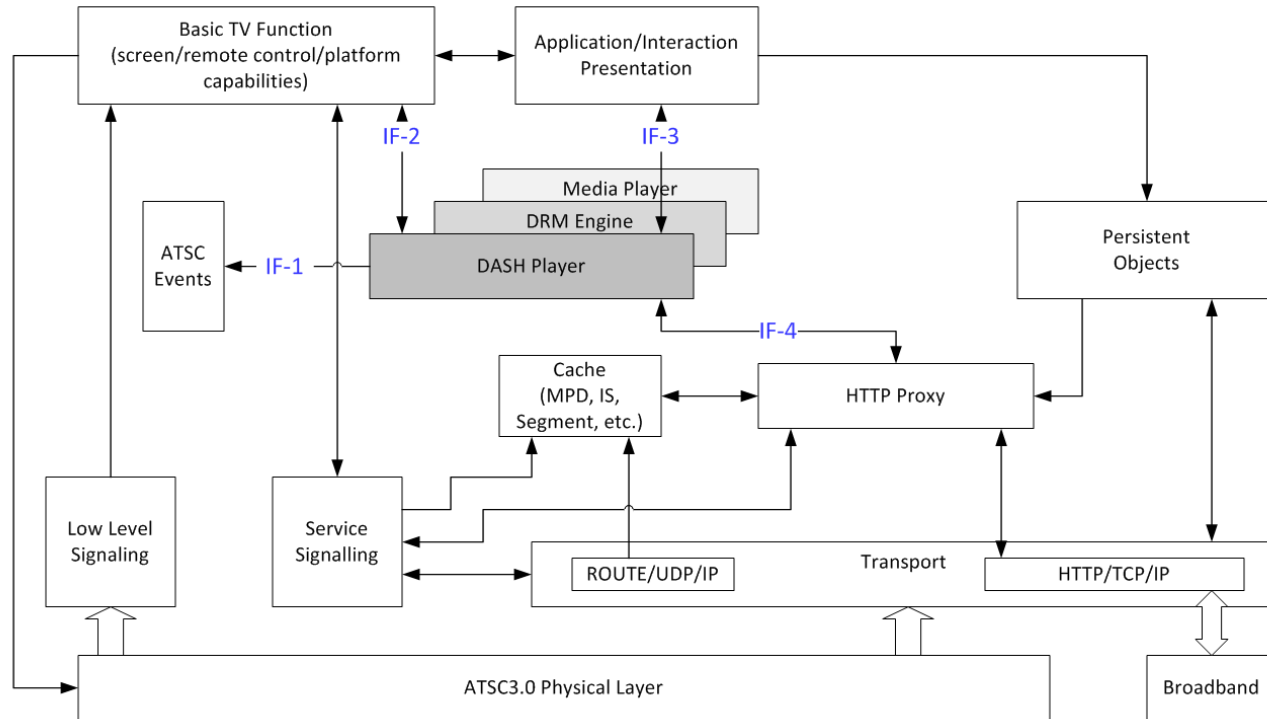
Agenda

- Background (Thomas Stockhammer)
- Introduction to ROUTE RFC 9223 (Waqar Zia)
- ATSC needs to upgrade to DASH/CMAF (Michael Dolan)
- ROUTE/DASH/CMAF - Design options and opportunities (Thomas Stockhammer)
- LL-DASH over ROUTE: Implementation in GPAC (Romain Bouqueau)
- Other interest in unidirectional DASH/CMAF delivery
- Discussion:
 - Creation of a DASH/CMAF over ROUTE profile
 - support for ATSC
 - other interest

Background

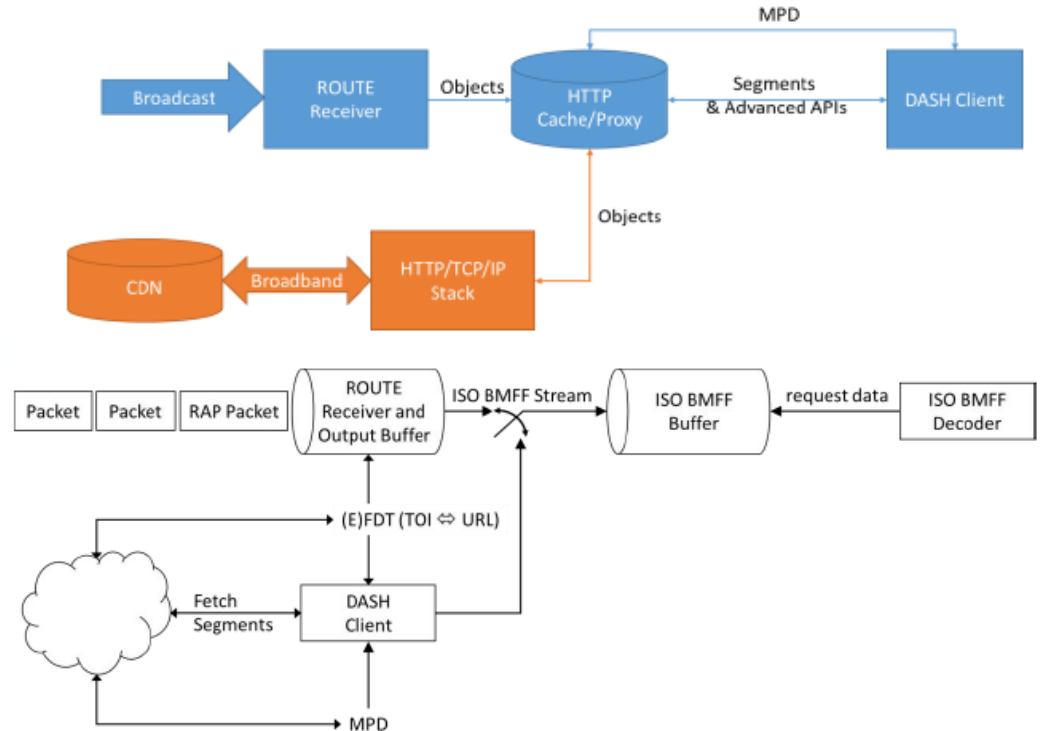
- Guidelines for Implementation: DASH-IF Interoperability Point for ATSC 3.0
- Scope
 - The scope of this document is to provide a DASH interoperability point that is based on DASH-IF-IOPs and provides extensions to address use cases and requirements of ATSC 3.0.
 - Comments and bugs may be submitted through the [public github repository](#).
- Latest Version
 - Version 1.1: Guidelines for Implementation: DASH-IF Interoperability Point for ATSC 3.0 ([pdf](#) | [diff to v1.0](#))
 - This updated version adds the following aspects:
 - Update of references to refer to the latest correct versions
 - Clarification on track selection in clause 3.3 and addition of a new clause 2.7.5
 - Addition of a placeholder for a non-real time profile in clause 1.3
 - Updates to the ROUTE protocol constraints when used with \$TIME\$ in clause 2.2
 - Clarification on the usage of @r=-1 with the Segment timeline in clause 3.1.
 - Reference to DASH-IF IOP for joining, initial buffering and playout in clause 4.
 - Addition of High Dynamic Range (HDR) video in clause 3.3.
 - Clarification on ATSC events and DASH events in clause 6.3
 - Update to xlink behavior in clause 5.1
 - Miscellaneous editorial updates

Receiver Architecture



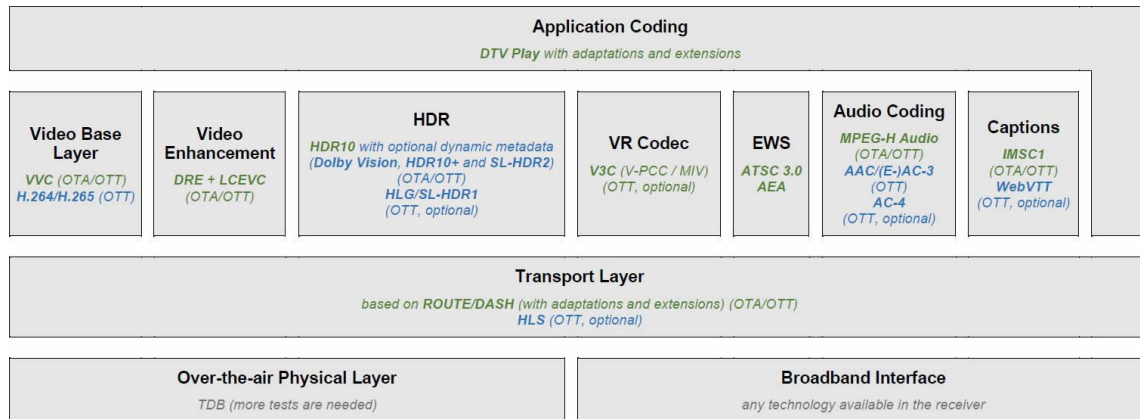
Architecture

- Regular Mode with Segments
 - Can be operated through unicast and multicast and switched on segment boundaries
- Low-latency mode, for which the ROUTE receiver does not recover the entire segment, but forwards the data directly to the ISO BMFF Buffer
 - In this case, switch needs to be based on RAP points.



What happened over the last 5 years ...

- ATSC3.0 is rolled out and deployed in several countries
- DVB developed ABR multicast specification that includes ROUTE
- Brazil has selected DASH/ROUTE
- CMAF is available for the convergence of DASH/HLS
- DASH-IF developed a low-latency mode for streaming based on CMAF
- DASH-IF is in the progress of releasing all v5 documents
- 5G Broadcast
- DVB NIP
- Etc.



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DASH-IF Special Session: ROUTE/DASH/CMAF - Design options and opportunities

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Overview

- 5th edition
 - DASH Profile for CMAF content
 - Resync
 - Low-Latency Streaming with Chunking
- Combinations with ROUTE
 - Low-Latency and ROUTE
- Discussion Points

ISO/IEC 23009-1:2021(X)

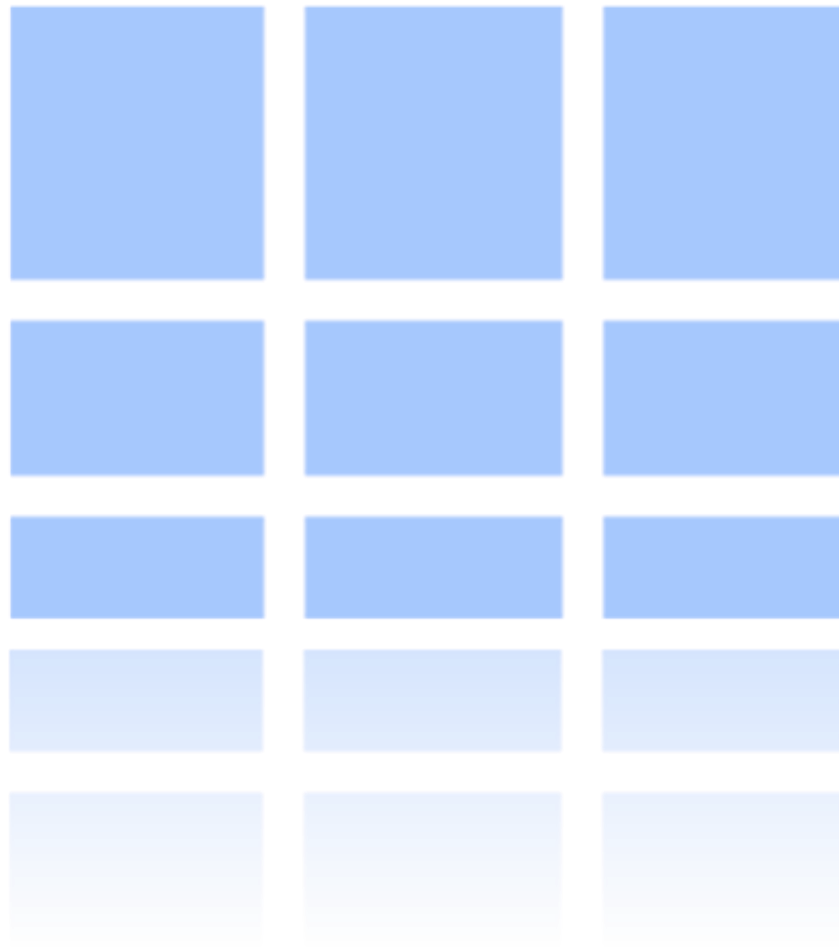
ISO/IEC JTC 1/SC 29/WG 3

Date: 2021-10-04

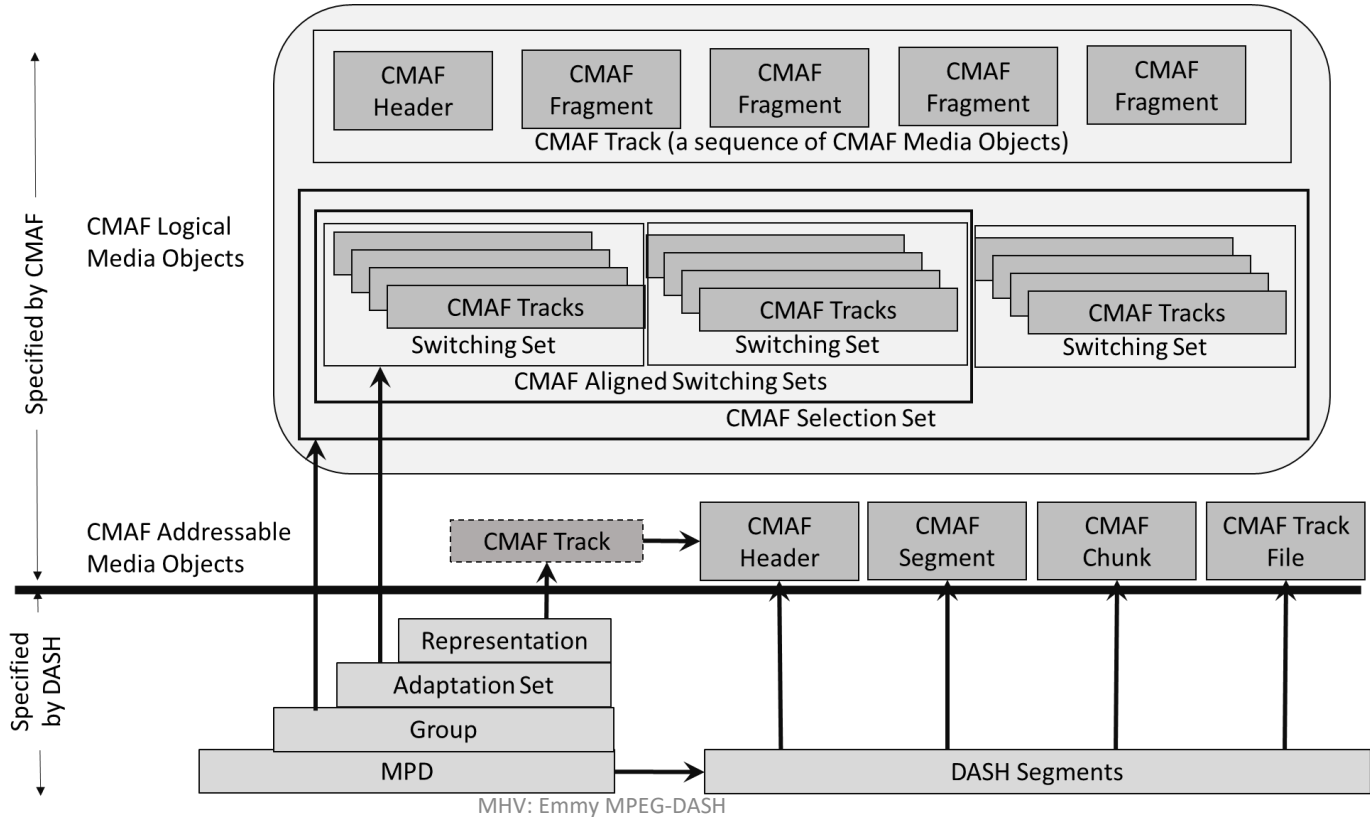
**Information technology — Dynamic adaptive streaming over
HTTP (DASH) — Part 1: Media presentation description and
segment formats**

FDIS stage

The 5th edition



DASH Profiles for CMAF content



Constraints – Documenting the obvious

Segment and Representation Constraints

- Mapping of CMAF Resources to DASH Manifest Signaling according to diagram
- Mapping of CMAF internal parameters to MPD

Adaptation Set Constraints

- Signaling of internal parameters to MPD Adaptation Set parameters for different media type
- Content Protection Signaling

Period Constraints

- One or multiple CMAF Presentations, differentiated by a Subset
- Timeline Mapping, including presentation time offset

Multi-Period and Media Presentation Constraints

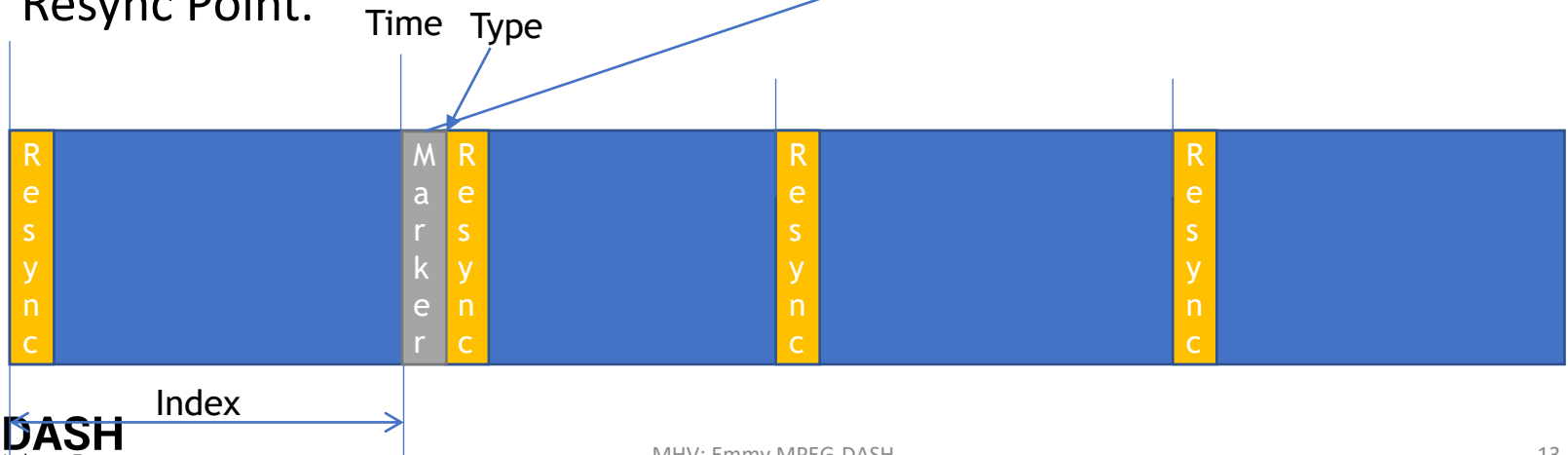
- Detailed sequencing requirements, only overlaps, no gaps
- Core Profile: Video Adaptation Set shall be exactly the Period duration
- Extended Profile: Video Adaptation Set may overlap at the Period end

MSE and dash.js compatible

Resync – Chunk Signaling

- signaling the existence of Resynchronization Points in a Media Segment with additional information that permits to easily locate the Resync Point.

NL 0	Cardinality	Specification	Constraints	Description
styp	0/1	ISO/IEC 14496-12	DASH/CMAF constraints	Segment Type Signalling compatibility to CMAF Chunk
prft	0/1	ISO/IEC 14496-12	DASH/CMAF constraints	Producer Reference Time
emsg	*	ISO/IEC 23009-1	DASH/CMAF constraints	Event Message
free	*	ISO/IEC 14496-12	none	free box
skip	*	ISO/IEC 14496-12	none	skip box
moof	1	ISO/IEC 14496-12	DASH/CMAF constraints	Movie Fragment box and the boxes it contains
mdat	1	ISO/IEC 14496-12	DASH/CMAF constraints	Media Data container for media samples



Low-Latency Streaming with Chunking

MPD

IS

Encoder



CH = CMAF Header

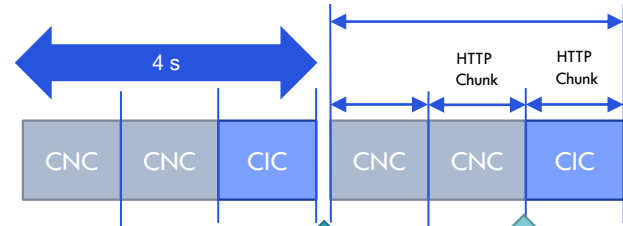
CNC = CMAF non-initial chunk

CIC = CMAF initial chunk

Many technical details are in
DASH-IF IOP v5
<http://www.dashif.org/guidelines>

Service
Description

DASH
Packager



10s

Regular
DASH
Client

3s

Low-Latency
DASH
Client

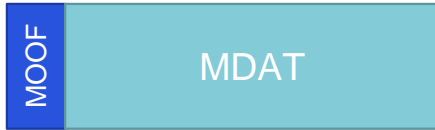
Segments

CDN stores
Segments

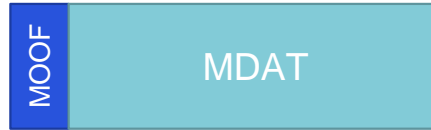
Chunks

Chunked Segment Distribution

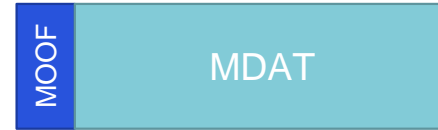
ENCODER



CDN



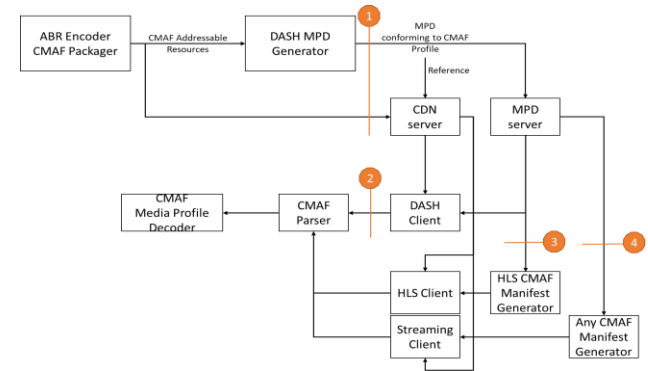
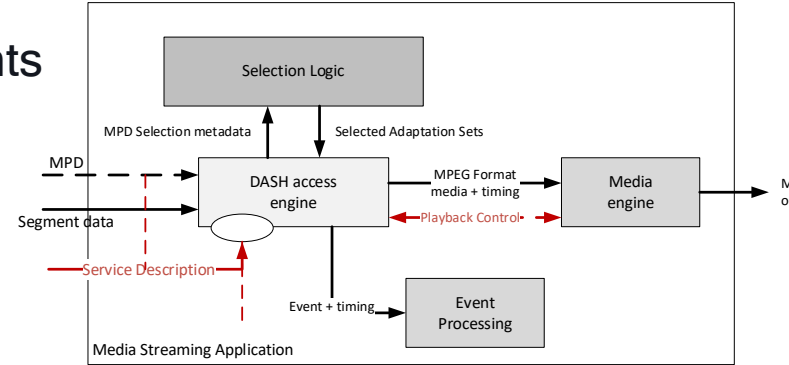
PLAYER



MPEG DASH supporting work

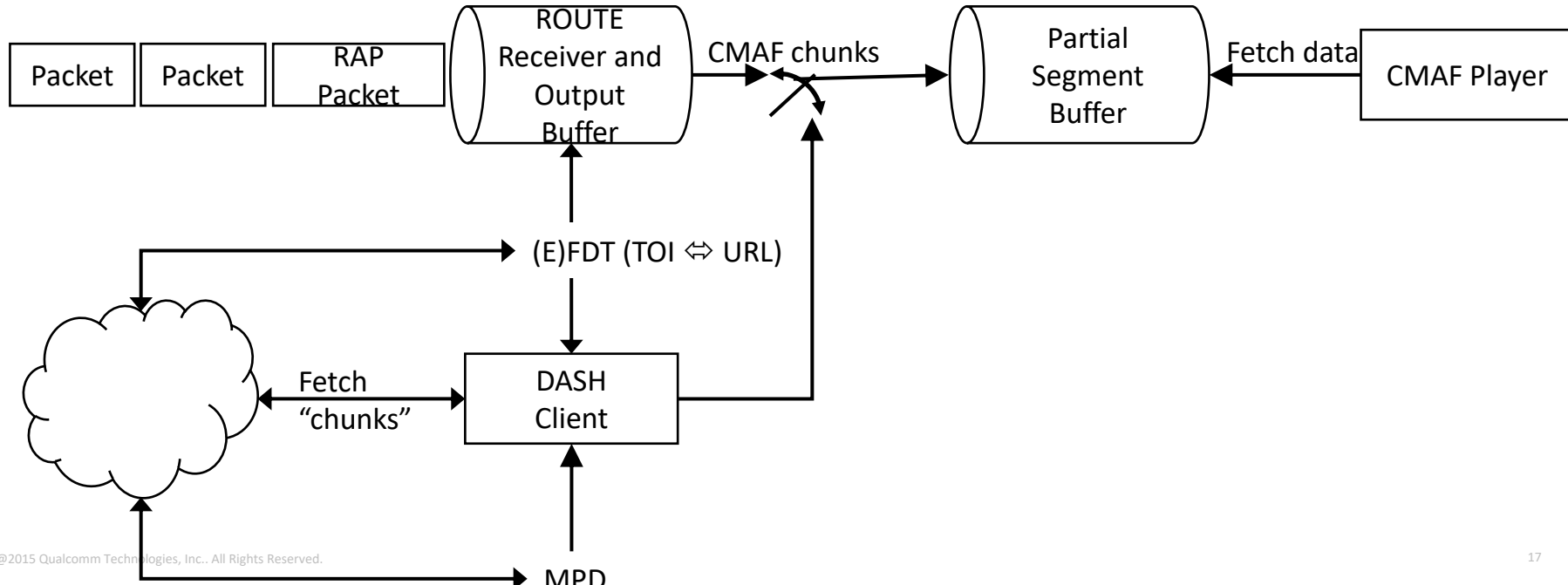
- As part of ISO/IEC 23009-1 4th and 5th edition
- Producer Reference Time in MPD and segments
 - Enables media encoding including wall-clock anchor times
 - Permits DASH client to determine, monitor and control latency.
- Service Description
 - Addresses service provider's influence on DASH client operation
 - Target Latencies, Playback Control
- Updates on Event Processing
- DASH Profile for CMAF Content
- Resynchronization
 - Enables chunk signaling
 - Enables fast downswitching and random access

CHANGE REQUEST				
DASH-IF IOP	CR	rev -	Current version:	V4.3
Status:	<input type="checkbox"/> Draft	<input type="checkbox"/> Internal Review	<input checked="" type="checkbox"/> Community Review	<input type="checkbox"/> Agreed
Title:	Low-latency Modes for DASH			
Source:	Live TF			
Supporting Companies:	Akamai, Amazon Elemental, castLabs, Comcast, Elemental Technologies, Ericsson, Frontier Communications Harmonic, Hulu, Qualcomm Incorporated, Sony, TNO, Unified Streaming,			
Category:	A			Date: 2020-02-21

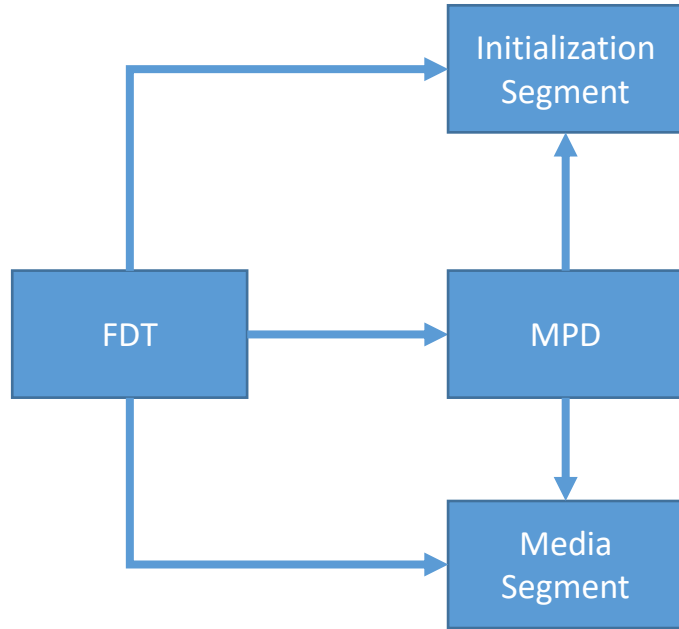


Combination of ROUTE with Low-Latency

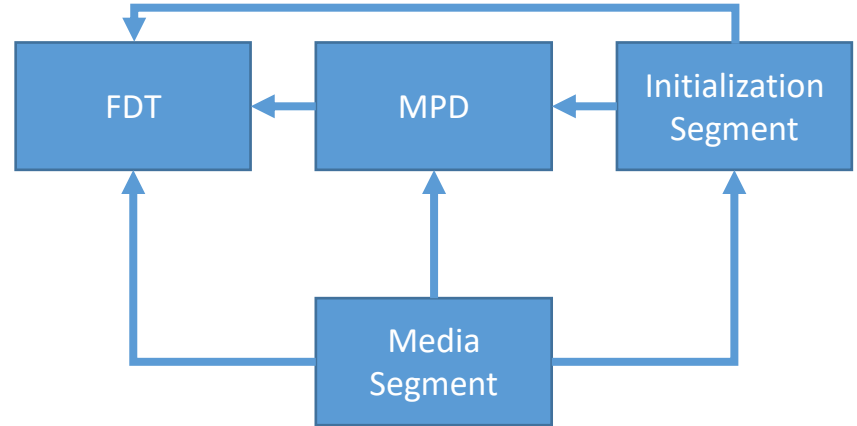
- The lower-layer signaling provides additional functional information to access the service
- Low-latency operation is supported across the receiver



Service Entry: IP/port + MPD URL Referencing



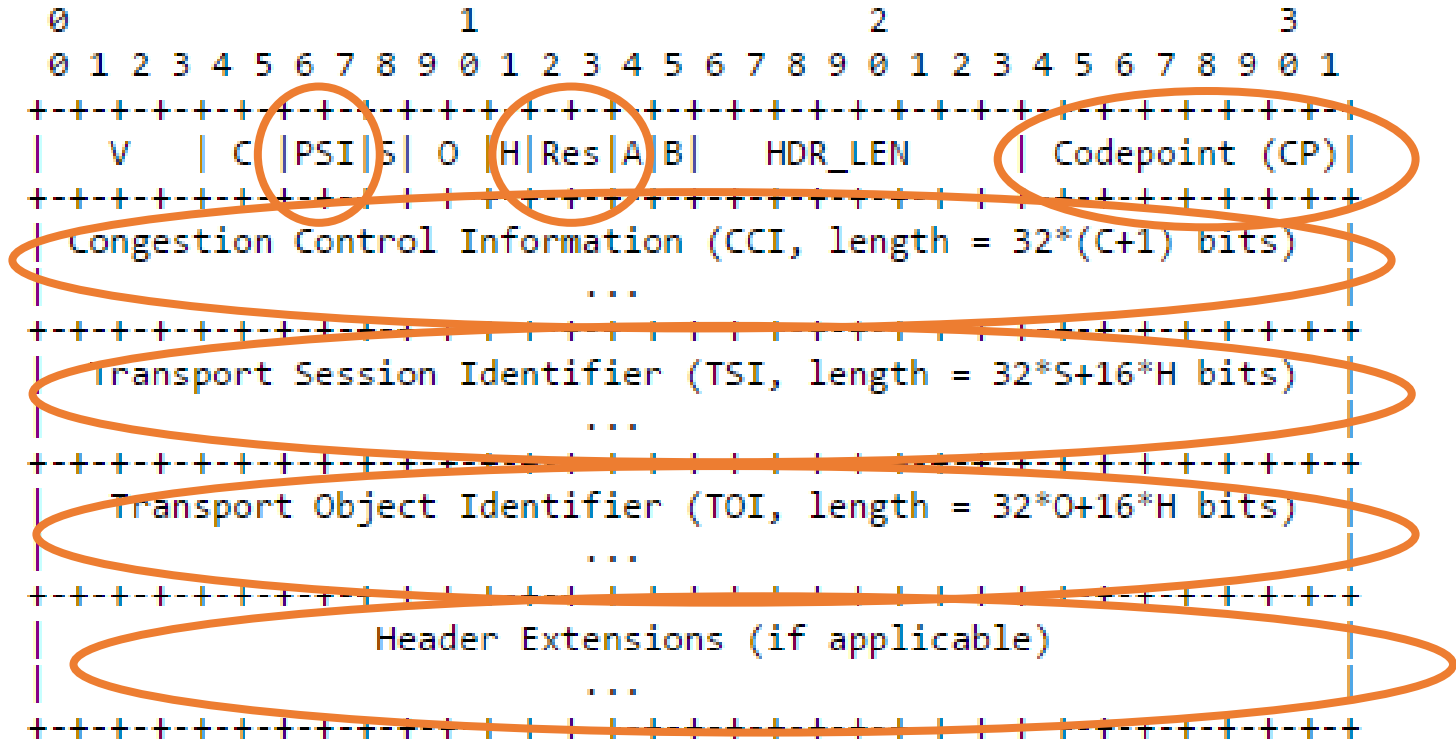
Processing Dependency

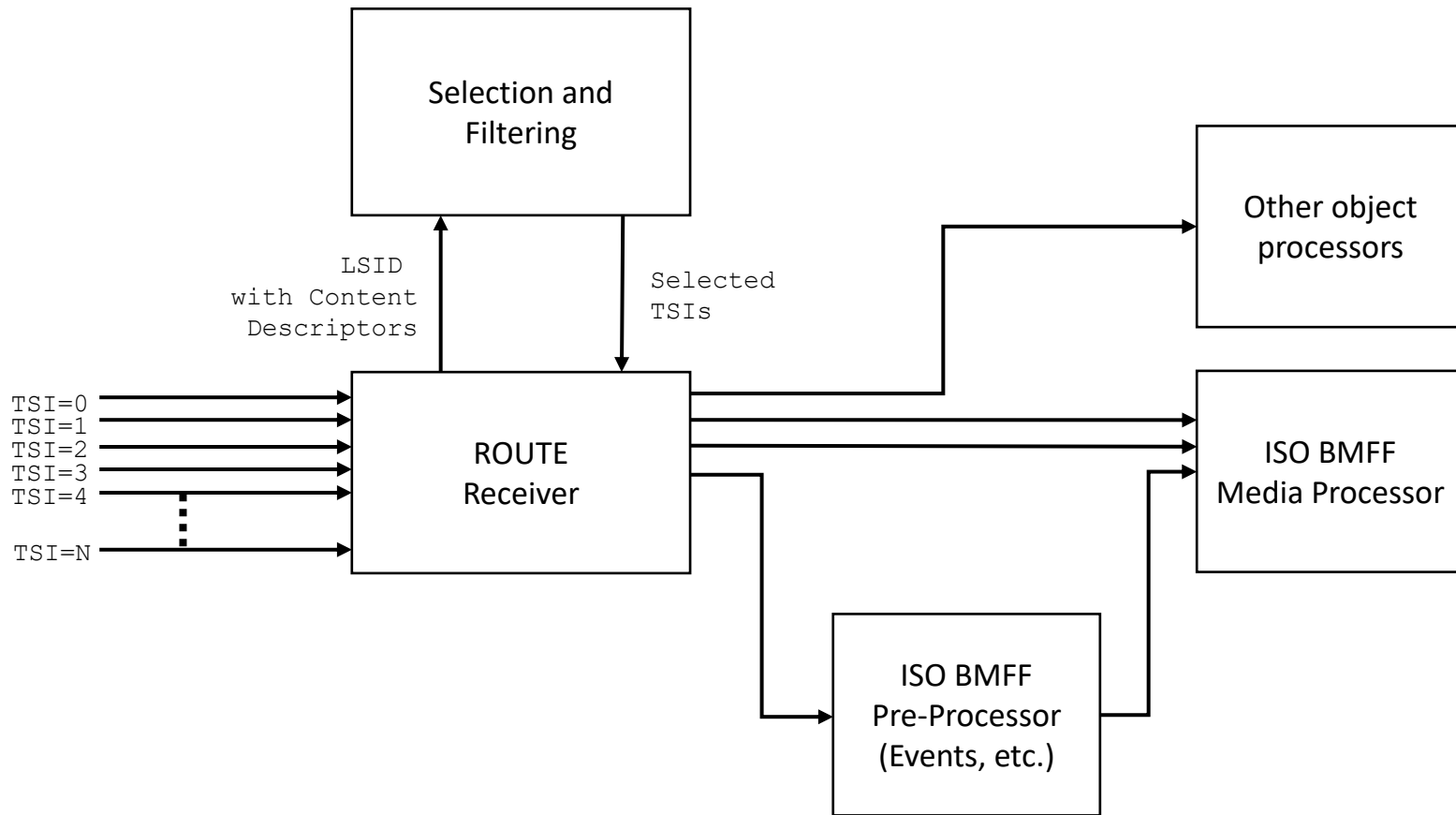


Typical Sending Order:



ROUTE/LCT Header Fields





Code Point for Objects

Codepoint value	Semantics
0	Reserved (not used)
1	Non Real Time (NRT) - File Mode
2	NRT - Entity Mode
3	NRT - Unsigned Package Mode
4	NRT - Signed Package Mode
5	New IS, timeline changed
6	New IS, timeline continued
7	Redundant IS
8	Media Segment, File Mode
9	Media Segment, Entity Mode
10	Media Segment, File Mode with CMAF Random Access chunk
11 - 255	Reserved, service-specific

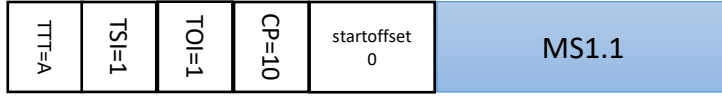
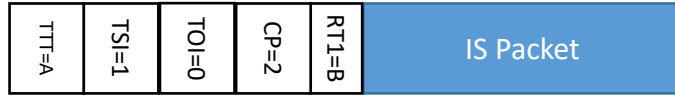
Initialization Segment

Media Segment 1

Media Segment 2

Initialization Segment

Media Segment 1



Packet Sending Order

Initialization Segment

RAP chunk 1.1

chunk 1.2

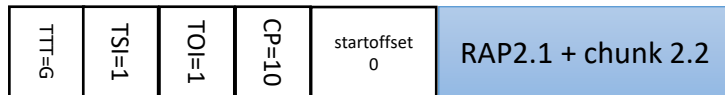
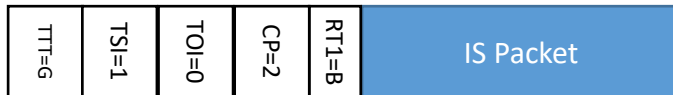
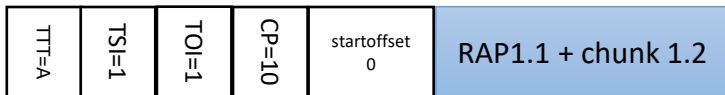
RAP chunk 1.3

chunk 1.4

RAP chunk 2.1

chunk 2.2

RAP chunk 2.3



Packet Sending Order

Decision and discussion points

- CMAF
- Low-Latency DASH with chunks
- Random Access
- Improved Timing signaling
- Receiver models
- Other v5 aspects: Content protection, Event Messages, Ad Insertion
- Harmonization: DVB, ATSC, 3GPP?

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Thank you

*Please join and support
us at <http://dashif.org>*

