ROUTE Overview

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Qualcomm

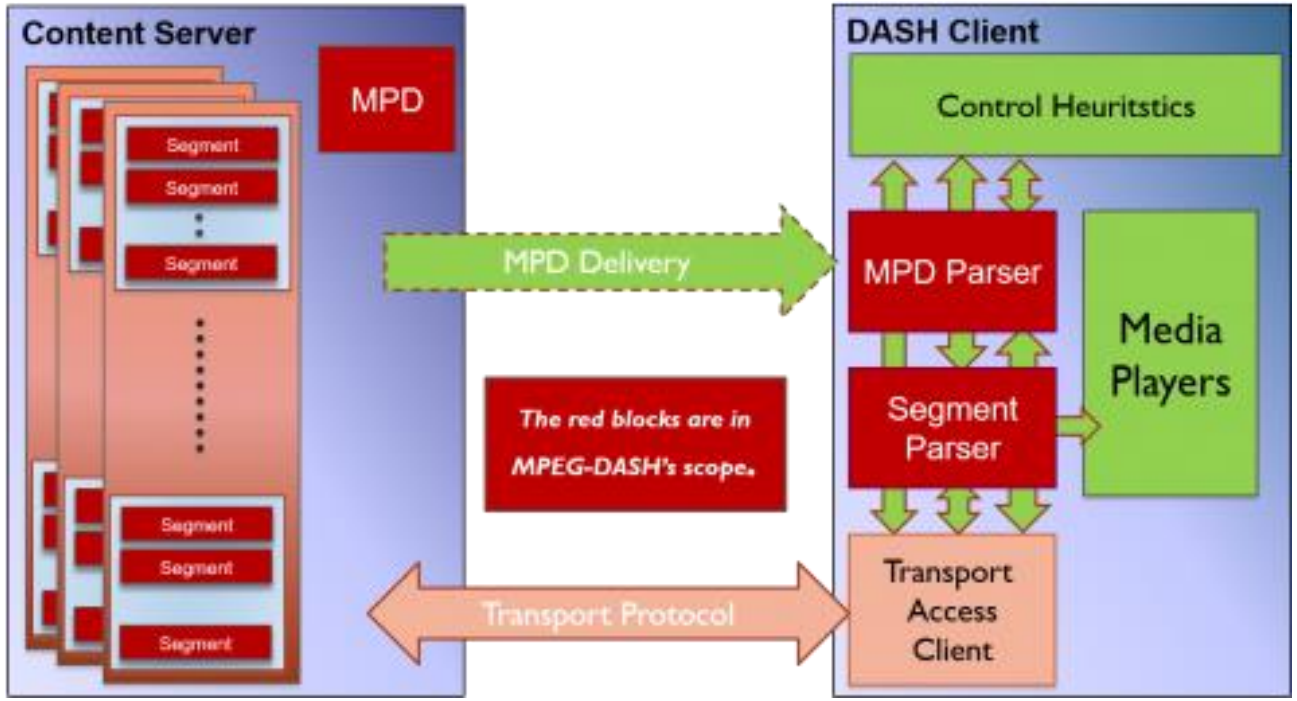
Outline

- Brief Summary: Adaptive Streaming, Real-time object delivery and ROUTE
  - DASH
  - DASH over IP Multicast
  - DASH for eMBMS
  - DASH over ROUTE in ATSC
    - Brief summary of technical features
  - ROUTE for DVB
- Status of ROUTE I-D
  - Standards track vs. independent submission
- Outlook

Adaptive Streaming, Real-time object delivery and ROUTE

Background: Adaptive Streaming

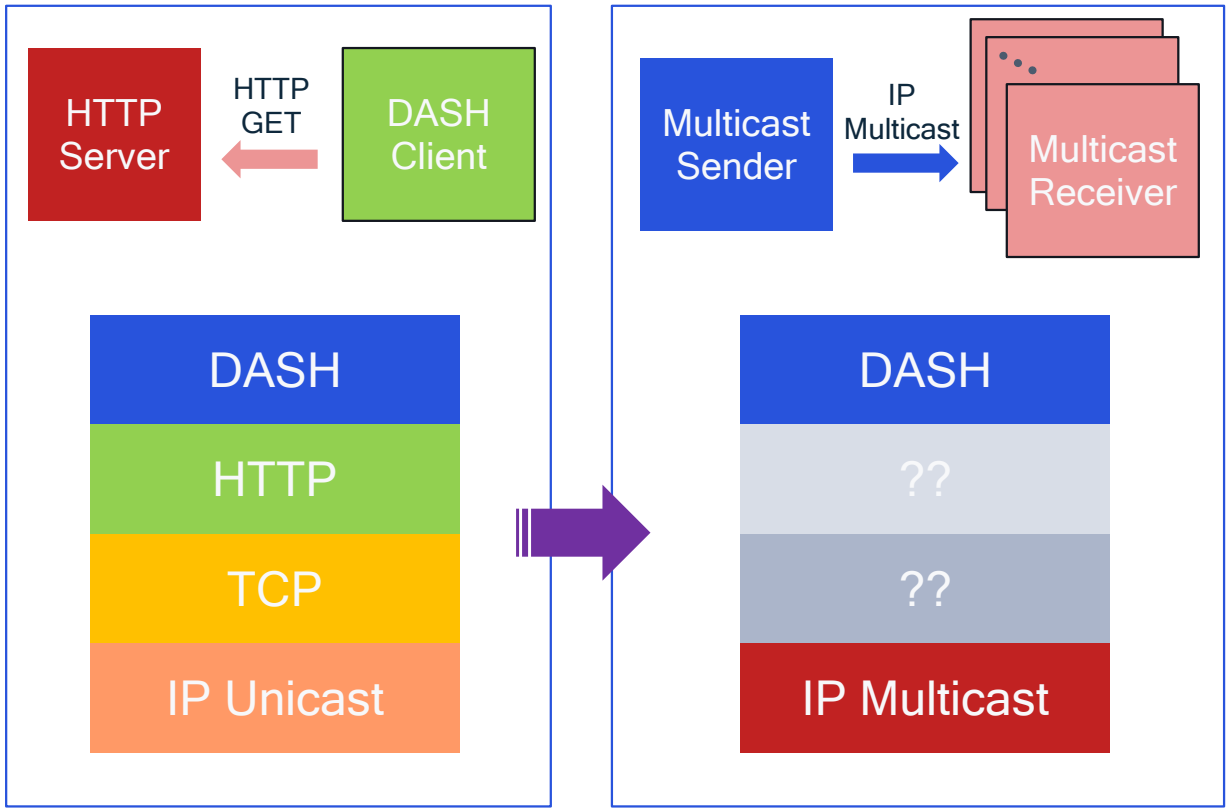
- Here we use DASH, applicable to HLS



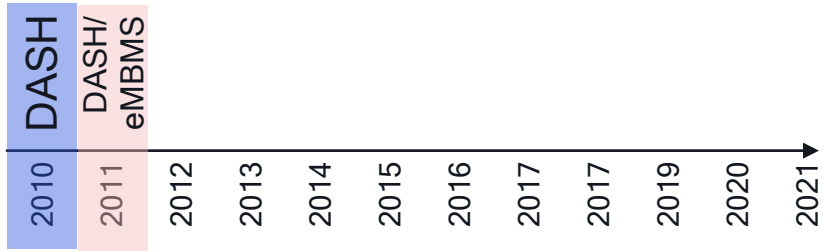
[1] https://mpeg.chiariglione.org/news/dash-behind-scenes

DASH for IP Multicast

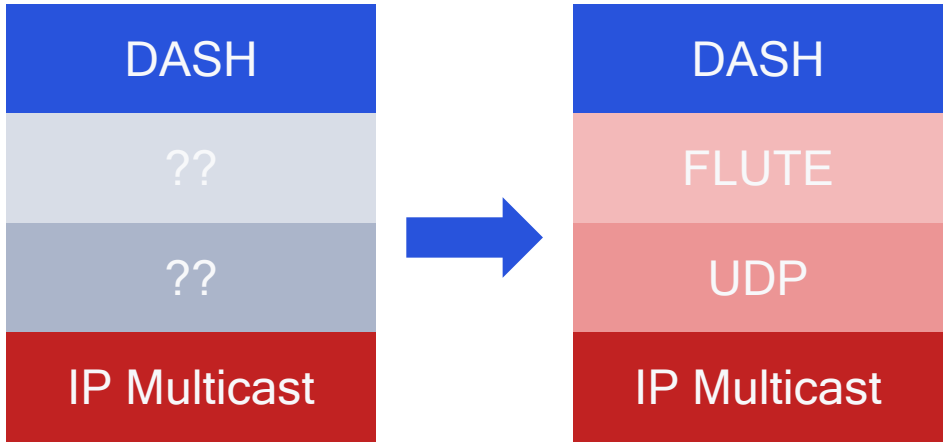
- Why, how?
  1. DASH is designed for client driven HTTP in contrast to Multicast push delivery
  2. The notion of “adaption” of quality is a bit alien to Multicast delivery
- Motivation
  - On high level: to exploit commonality of ecosystem
  - In human speak: being able to **reuse**
    - **Content** (allows common unicast and multicast formats, major headache of content providers), and
    - Players, reusing the code base
- Answers to
  - How#1: We need to support the different architecture with a different protocol stack
  - How#2: In most basic deployment, let’s just pick one quality of audio/video



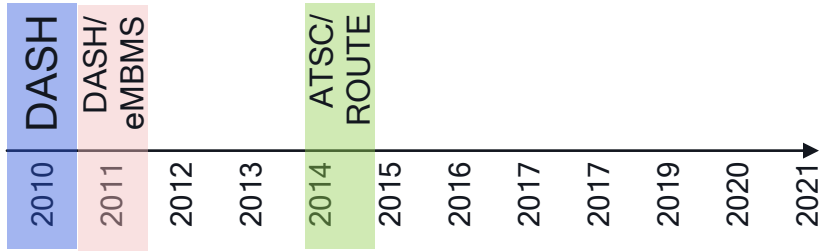
Case scenario DASH over (e)MBMS



- Already existing FLUTE-File Delivery over Unidirectional Transport at the time
  - For IP multicast delivery of *files*
  - DASH is basically an ensemble of files (segments, MPD)
  - [RFC6726] Paila, T., Luby, M., Lehtonen, R., Roca, V., Walsh, R., "FLUTE-File Delivery over Unidirectional Transport." 2012.
- DASH built for reliable HTTP: FLUTE FEC + Unicast repair



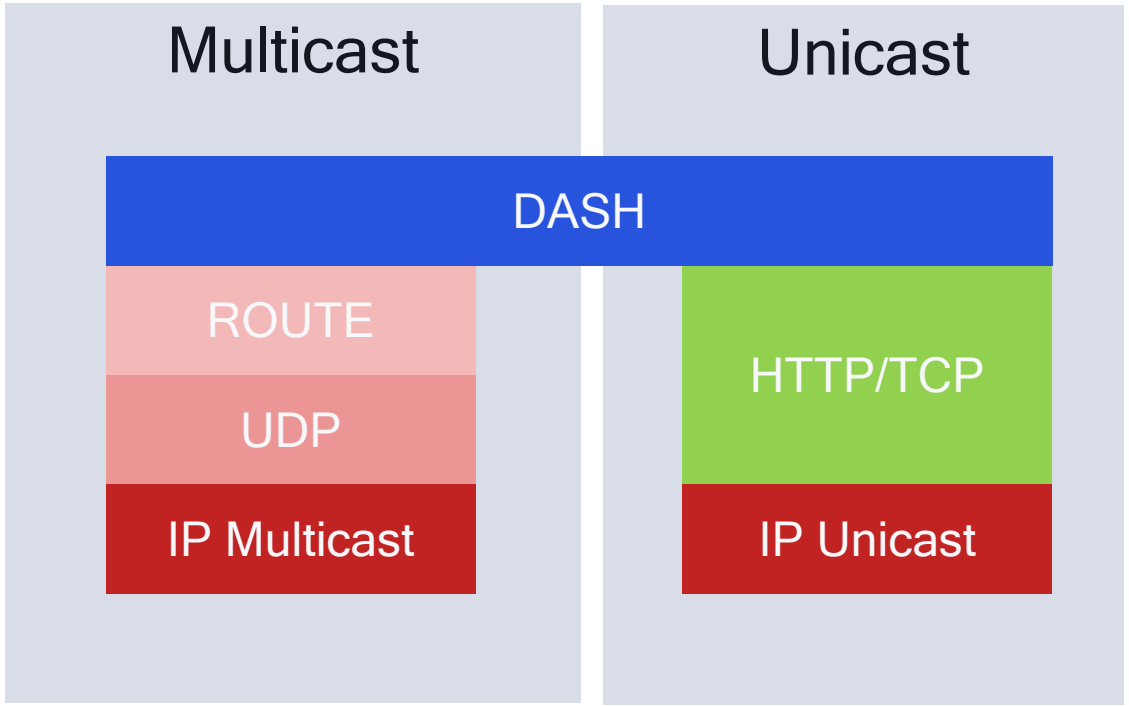
ROUTE - Real-time Transport Object delivery over Unidirectional Transport



- In context of further interest, ATSC 3.0, ROUTE was developed by extending FLUTE
  - FLUTE designed for large files (OTA and the likes) ➔Heavy on amount of metadata per file
    - For DASH live streaming, ~1 audiovisual file per second, 3600 files in 1 hours
  - Real-time delivery, e.g. latency optimizations for a live streaming event
- ROUTE optimization principles
  - Reduction in metadata frequency using template mechanism
  - Enhanced metadata embedding in (ROUTE) packet header
    - Alleviating needs to know file sizes before start of sending to optimize end to end latency
  - …
- [ATSCA331] ATSC A/331:2019: "ATSC Standard: Signaling, Delivery, Synchronization, and Error Protection", 20 June 2019.

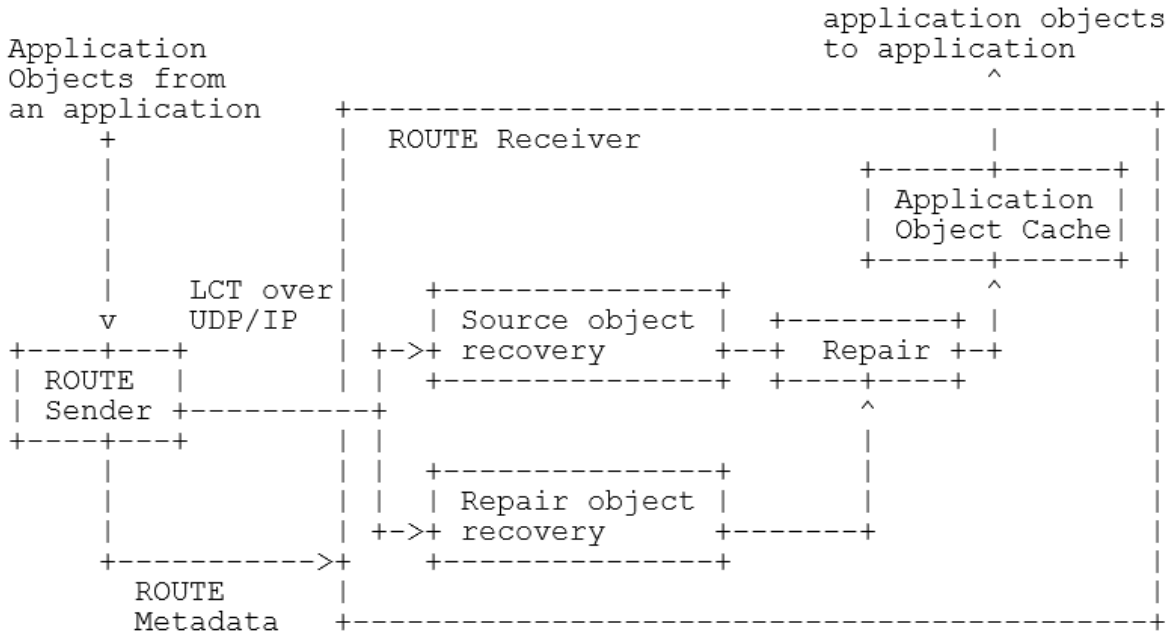
ROUTE technical details

- Using ROUTE for hybrid unicast/broadcast delivery



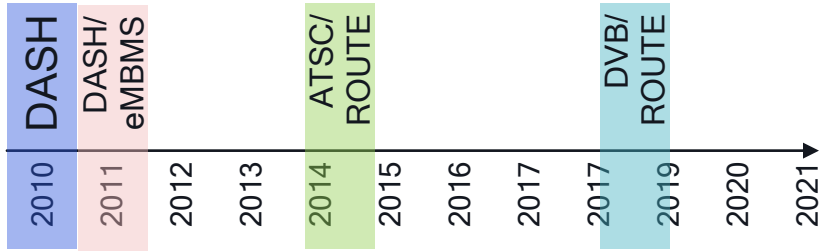
ROUTE technical details (contd)

- ROUTE Functional Blocks and Metadata



- Metadata
  1. LCT Packet header, header extensions
  2. File (Application object) related metadata (location, size)
     a. LCT packet payload as HTTP formatted header
     b. Separate file: eFDT
  3. Service signaling to set up session

ROUTE further standardization



- ROUTE profile adapted by DVB:
  - "Digital Video Broadcasting (DVB); Adaptive media streaming over IP multicast", ETSI TS 103 769 V1.1.1
- During standardization phase, the standardization group in DVB noted that ATSC Annex is not the best independent reference to ROUTE
  - It is heavily linked to ATSC A/331 service layer, while DVB has its own service layer
  - Addressed at the time by carefully profiling and referencing exact subclauses, reproducing text where needed
  - ➔Clear motivation for an independent, referenceable document, in IETF

ROUTE I-D status

Overview

- As noted in the previous slides, using ROUTE in various SDOs gave rise to need for this I-D as a reference.
- Current draft in 2nd revision: draft-zia-route-02 (ietf.org)
- Currently receiving, reviewing, and integrating feedback
  - From IETF (via usual review cycle)
  - From ATSC on random access aspects
  - Independent feedback from individual contributors

Feedback/Implementation Status

Input	Status	Version
Paris Tech	Addressed	v01
RFC Editor	Addressed	v01
BBC	Addressed	v02
Early reviewer feedback	Addressed	v02
1st External reviewer	Partially addressed	v02
2nd External reviewer	Review awaited	
ATSC feedback	To be implemented	

Why not standards track?

- The purpose of ROUTE I-D is to gather ROUTE delivery object protocol aspects *already specified in ATSC* in a clean, referenceable standalone document.
- ATSC ROUTE has already been commercially deployed in products by various companies: we should not change ROUTE in IETF, otherwise it breaks compatibility with deployed protocols.
  - Qualcomm continues to coordinate in such SDOs and keeps ensuring interoperability
- Not an independently deployable “Internet Standard” per-se: does not specify a service layer beyond giving some recommendations, so cannot be deployed on its own. A service-layer is needed (examples are the ATSC and DVB specifications).

Next steps

- Complete integrating reviews and follow publication process in IETF as an informational RFC

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