RFC 9223 ROUTE and services

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Outline

- ROUTE introduction
- Overview of technology
- Status w.r.t. ATSC and DVB
- Takeaway
- Next steps

Reference to publication

RFC 9223

Real-Time Transport Object Delivery over Unidirectional Transport (ROUTE)

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https://www.rfc-editor.org/rfc/rfc9223.html

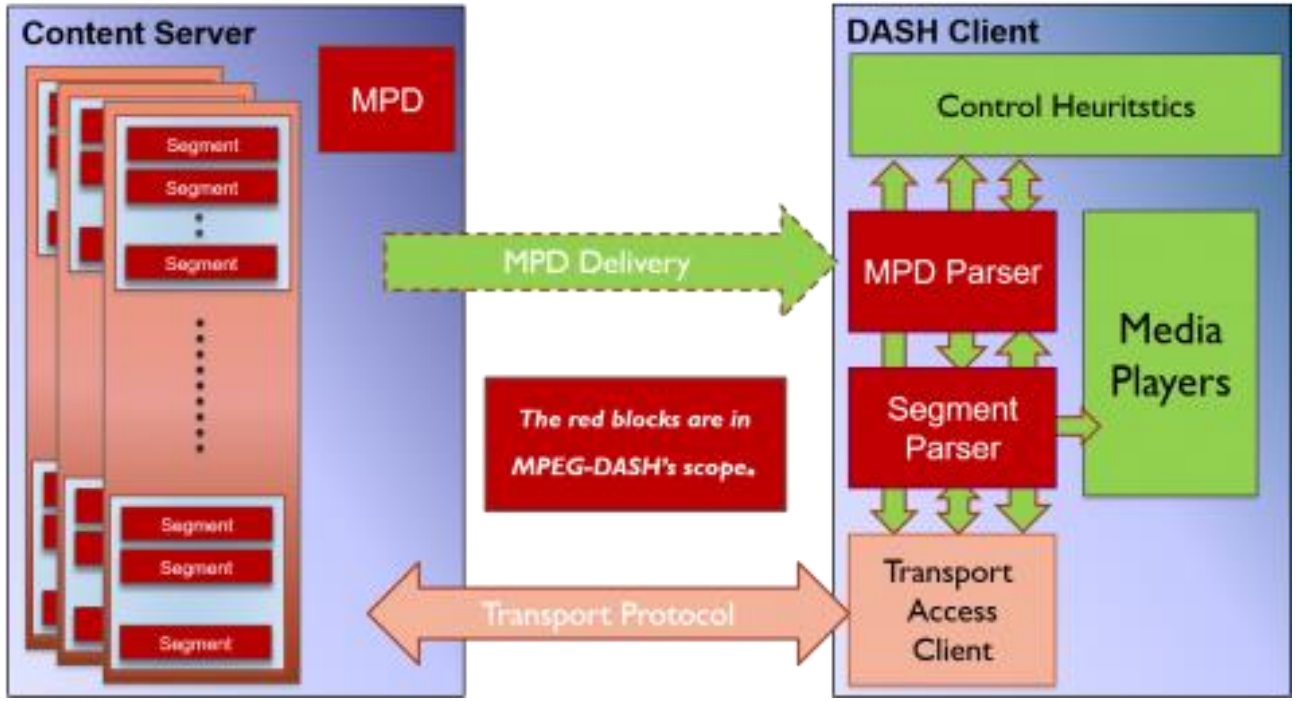
Overview

- RFC 9223 provides a complete, independent reference of underlying ROUTE technology
- A service, such as ATSC 3.0/DVB mABR or others in future
  - May define a service layer (e.g. XML signalling service metadata above transport such as endpoint IP addresses, ports, content rating,……..)
  - May add new features
  - May restrict some features

From Adaptive Streaming to ROUTE: 5 slide summary

Background: Adaptive Streaming

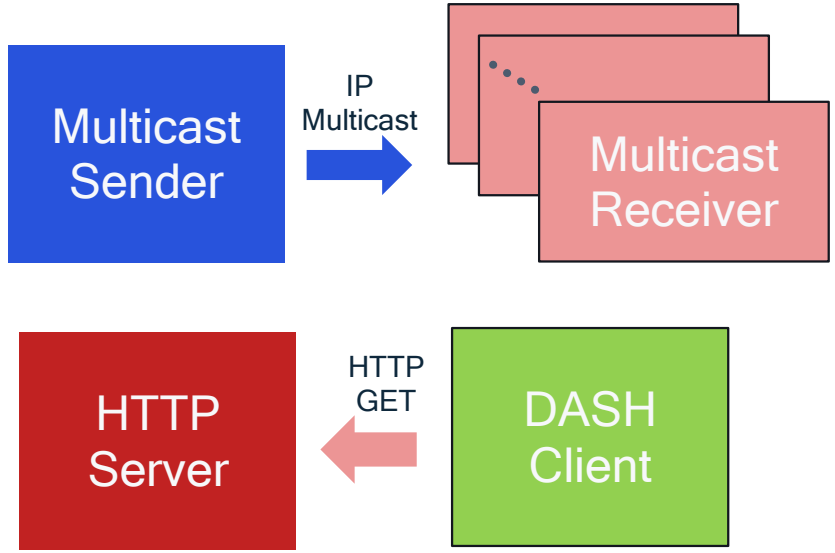
- Here we use DASH, applicable to HLS

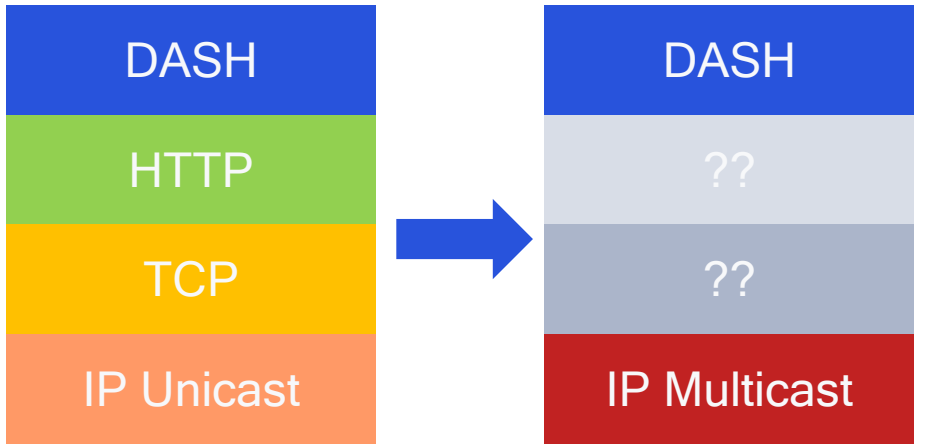


[1] https://mpeg.chiariglione.org/news/dash-behind-scenes

DASH for IP Multicast

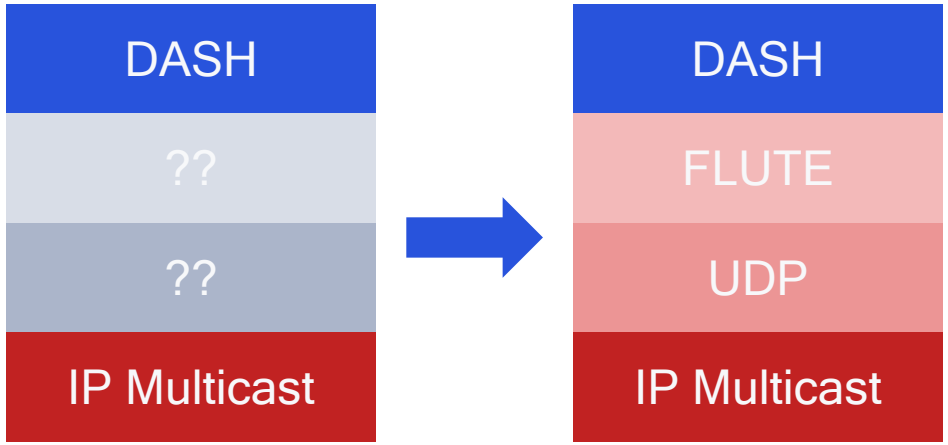
- Why, how?
  1. DASH is designed for client driven HTTP in contrast to Multicast push delivery
  2. The notion of “adaption” of quality is a bit alien to Multicast delivery
- Motivation
  - On high level: to exploit commonality of ecosystem
  - In human speak: being able to **reuse**
    - **Content** (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, lets just pick one quality of audio/video



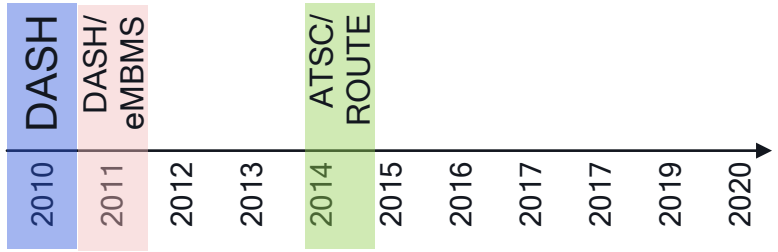


Case scenario DASH over (e)MBMS

- Already existing FLUTE-File Delivery over Unidirectional Transport at the time
  - For IP multicast delivery of *files*
  - DASH is but 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

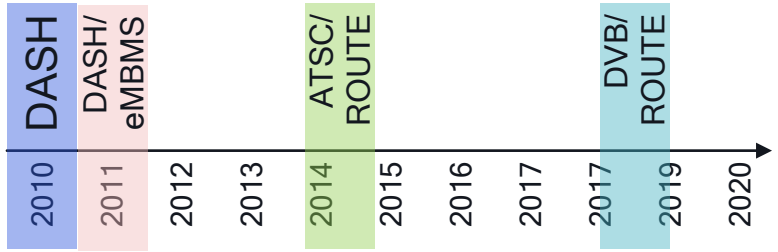


ROUTE - Real-time Transport Object delivery over Unidirectional Transport



- 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.

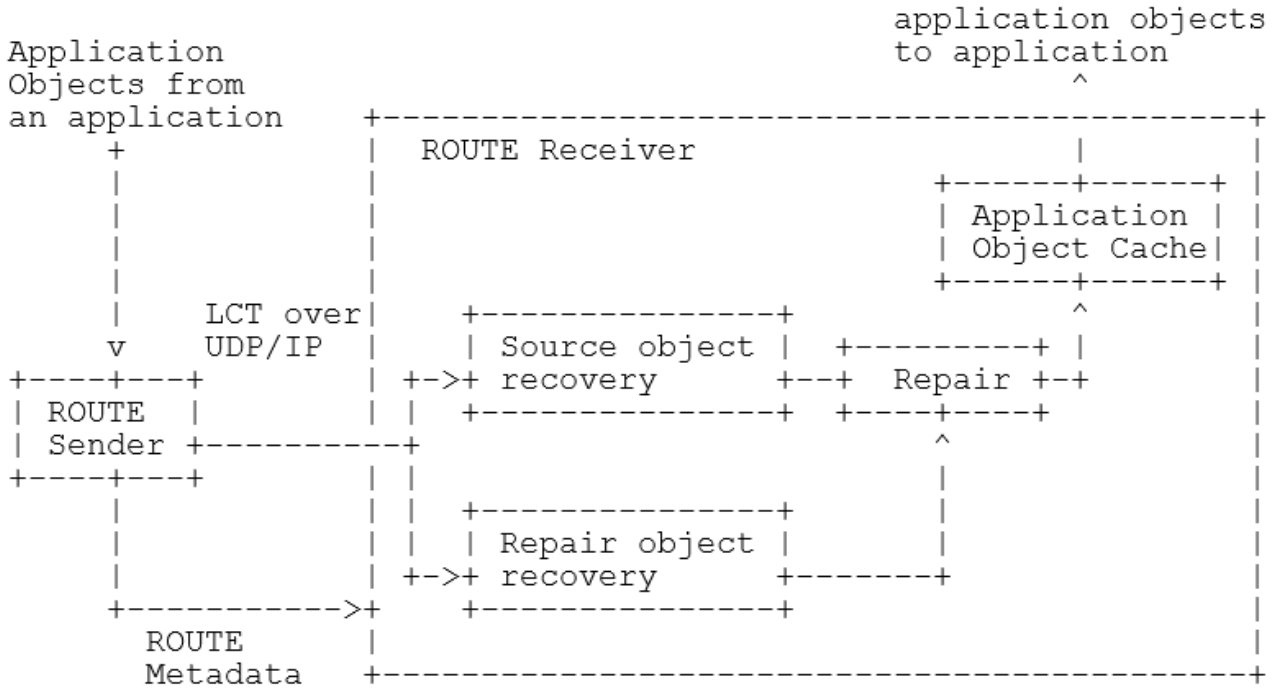
ROUTE (continued)



- ROUTE profile adapted by DVB
- Several years before DVB adoption: motivation to have ROUTE IETF draft
  - ATSC Annex is not the best independent reference to ROUTE
  - Is heavily linked to ATSC A/331 service layer
- Not concluded due to resource issue
  - Interest in IETF such as MOPs WG (more to follow)

ROUTE Overview

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

IETF publication effort

- Drafting started March 2020
- Initial draft submitted June 2020
- First feedback received Jan 2021
- Presented to IETF TSVAREA on 30th July at IETF 111e: broad agreement on the approach
- From that point till Feb 2022: 6 revisions provided
- RFC 9223 published April 2022 after some further revisions

ROUTE and Services aspects, Takeaway

- In ATSC still ROUTE versioning hardcoded in LCT header
  - RFC 9223 has service-layer signalling for this
- CMAF RAP access signalling via Codepoint
  - Implementation and alignment in ATSC/DVB
- Further some minor aspects
- ATSC/DVB to reference the RFC 9223

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Thank you

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