

Framework for Authoring and Delivery of Targeted Media Presentations using Smart Edge Proxy Cache

MHV2023 – Day 2

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Targeted Media Presentations

1. Use existing or live content
2. Personalized or targeted content
3. Different pre-, mid-, post-rolls (e.g., ads and main content) per user
4. FAST channels (ad supported targeted channels)
5. More chance that the user likes what it will see and hear



State of the Art



- ▷ Transcoding – Full transcode to new personalized presentation

Computationally Expensive

- ▷ Player logic,
- ▷ player based ad insertion etc..x

Customized player behavior
backward compatibility



Offline transcoding
+
Just-in-time packaging

Reaching all devices with repurpose content

▷ MP4



▷ Microsoft Smooth Streaming (HSS)



▷ HTTP Live Streaming (HLS)

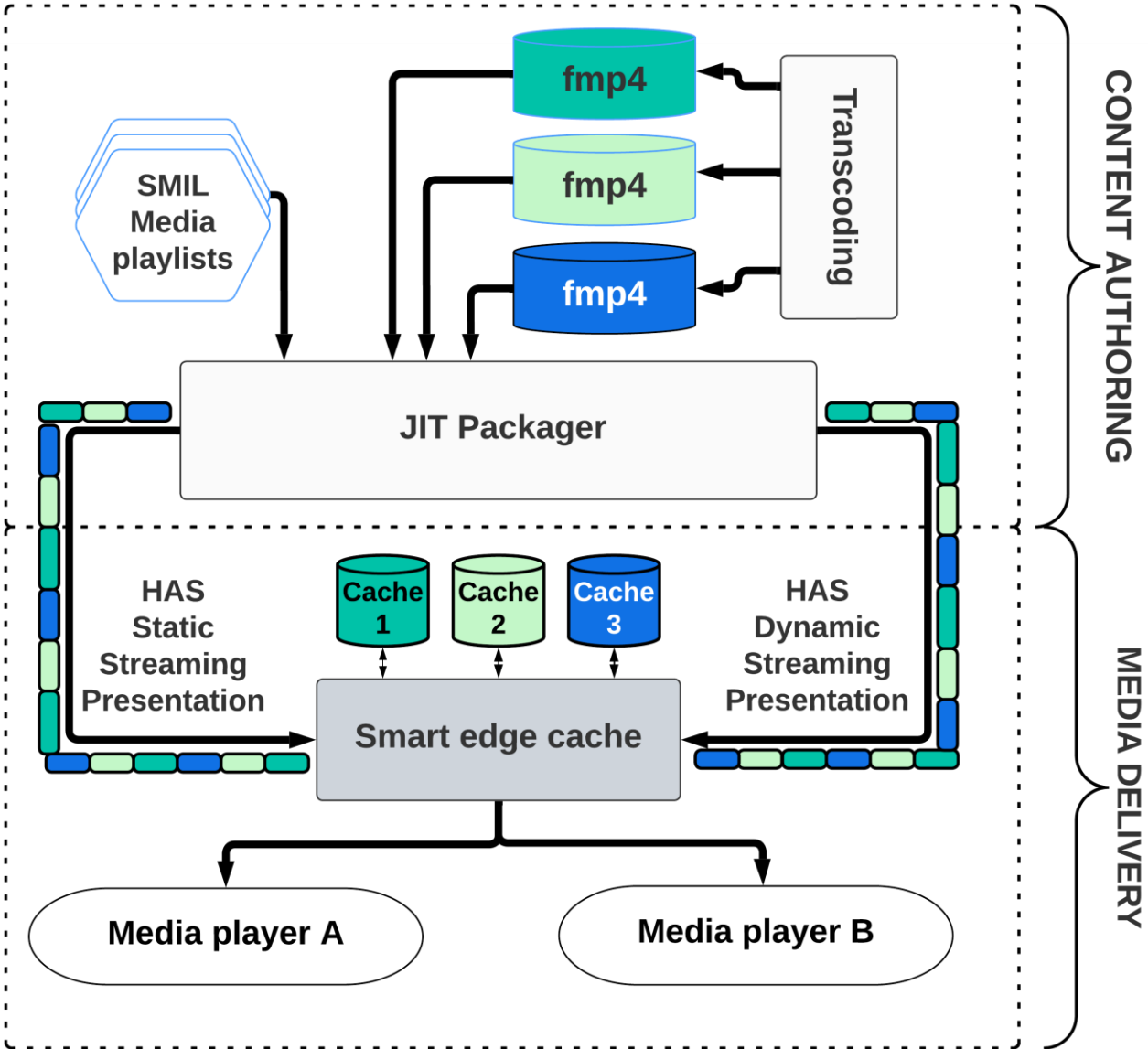


▷ DASH (including early versions)



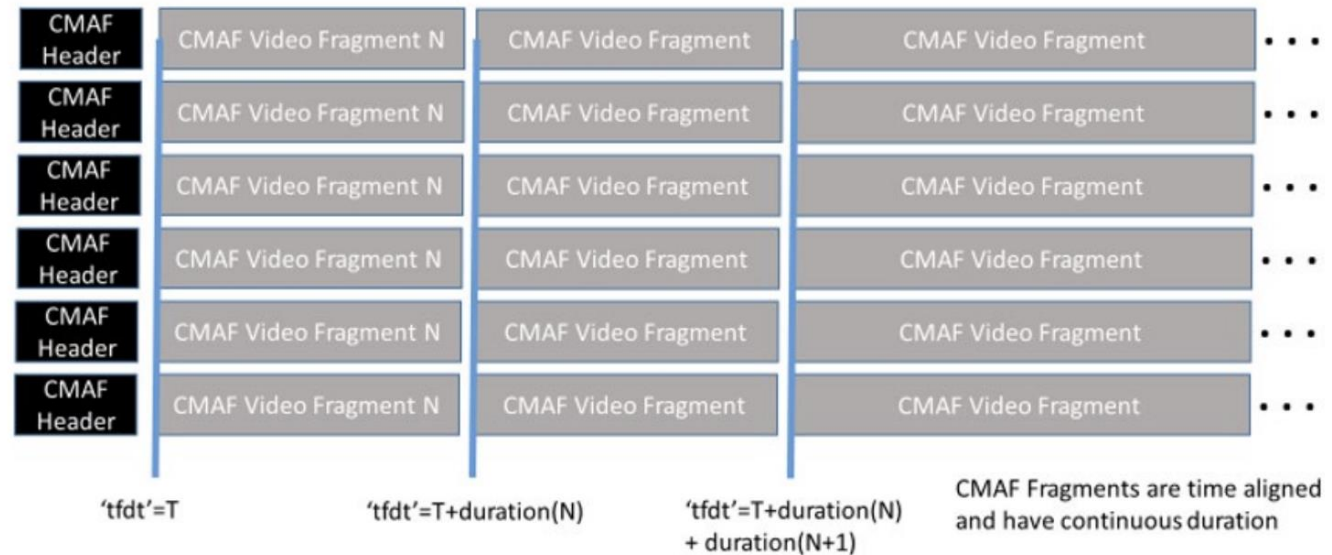
- ▷ Common denominator is using a single media timeline as required in MP4
- ▷ Our solution is re-packaging to a continuous timeline to enable all delivery formats

Authoring of Targeted Media Presentations Framework (Sec.2.2)



CMAF Transcoding component (Sec. 3.1)

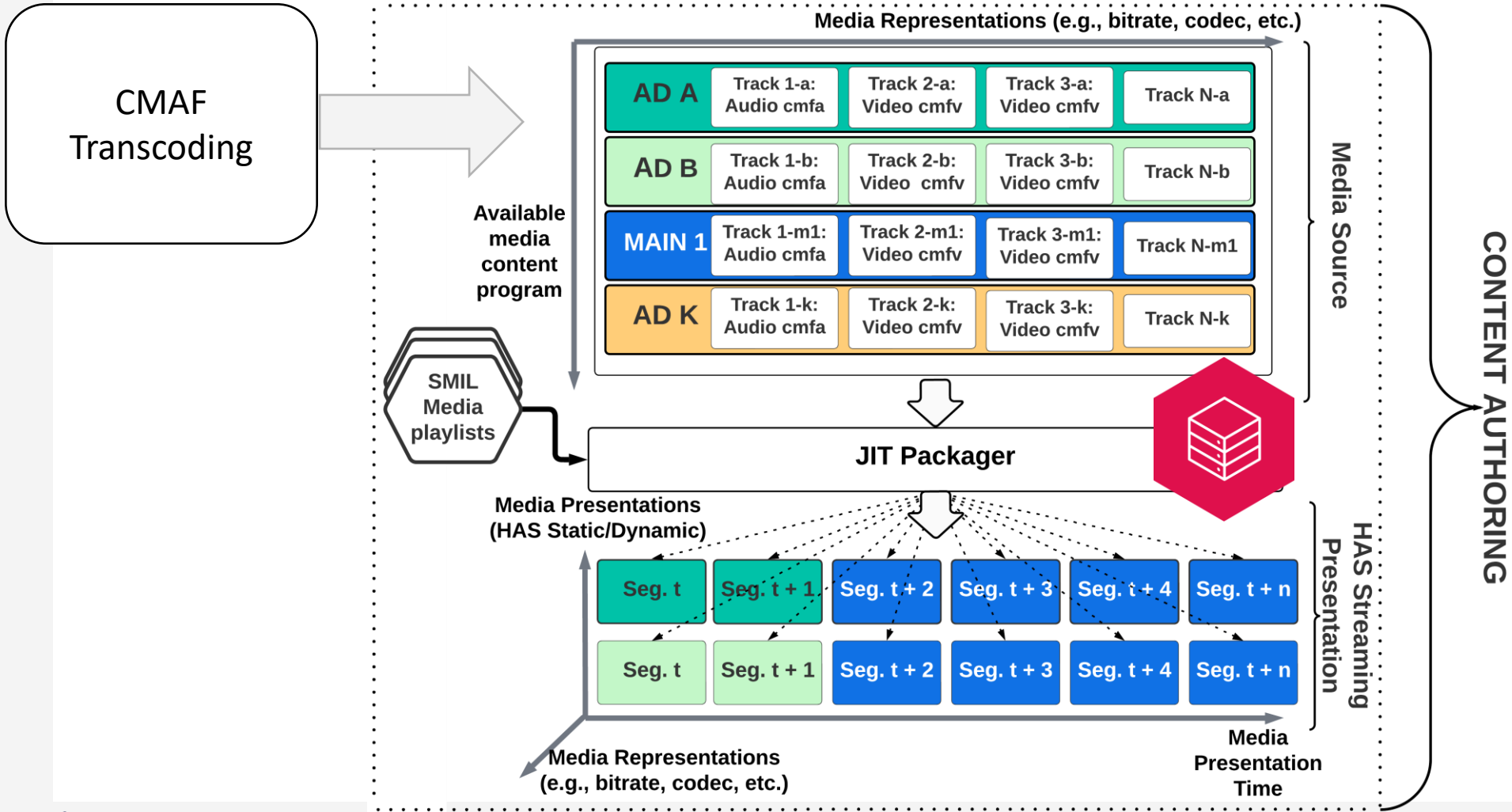
- ▷ Bitrate alignment
- ▷ Same segment duration
- ▷ Segment boundary alignment
- ▷ Interchangeable segments
- ▷ Audio & timed text is also transcoded



Source: https://cdn.cta.tech/cta/media/media/resources/standards/pdfs/cta-5001-c_final.pdf

ISO/IEC 23000-19:2020, (24-27)

Content Authoring overview



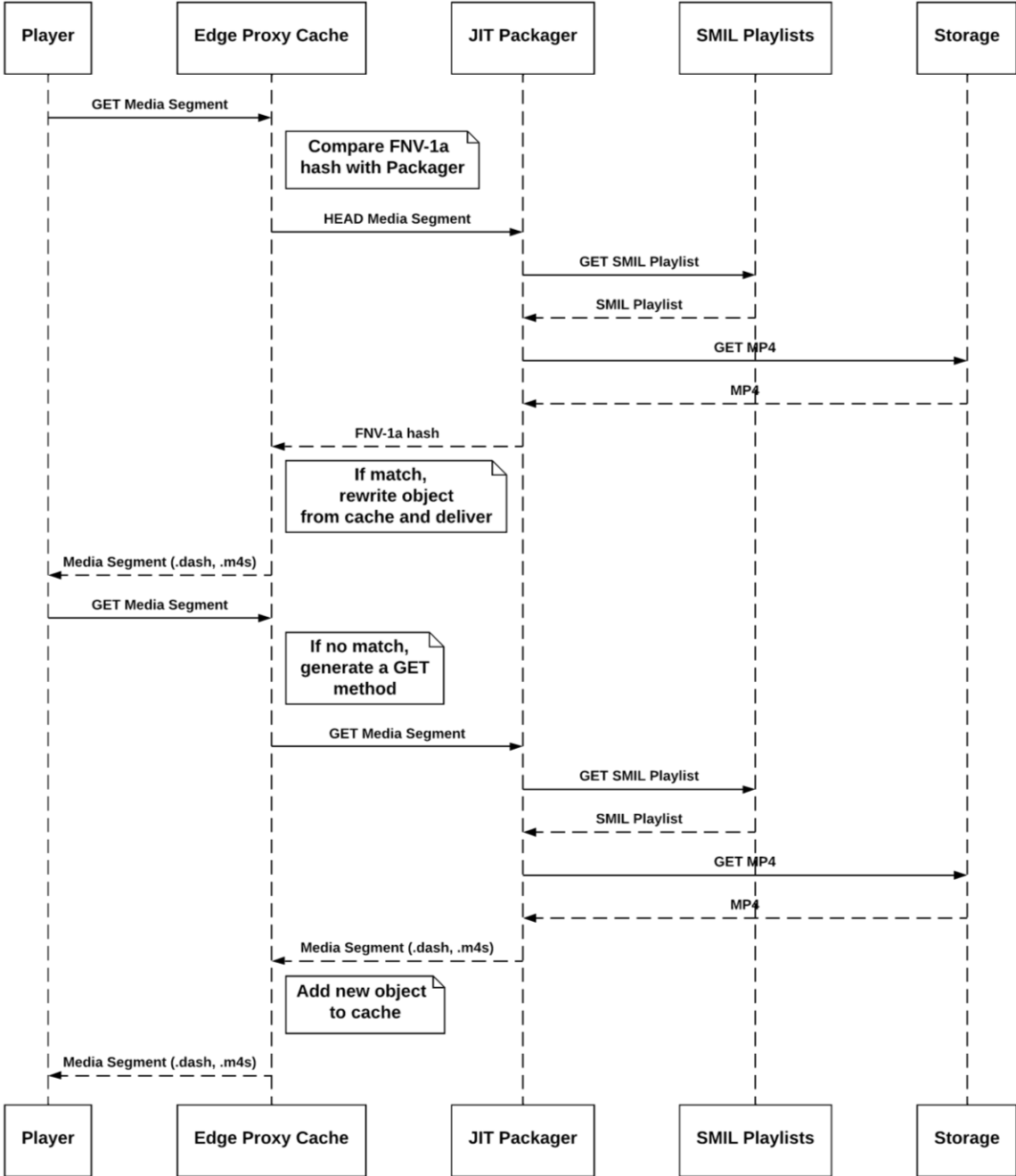
Media Delivery (Sec. 4)

- ▷ HTTP based media delivery
- ▷ Content delivery
- ▷ Cache keys – Different cache keys for Each presentation
- ▷ Re-purpose content delivery component is introduced based on a smart edge cache using Varnish and use case specific caching logic

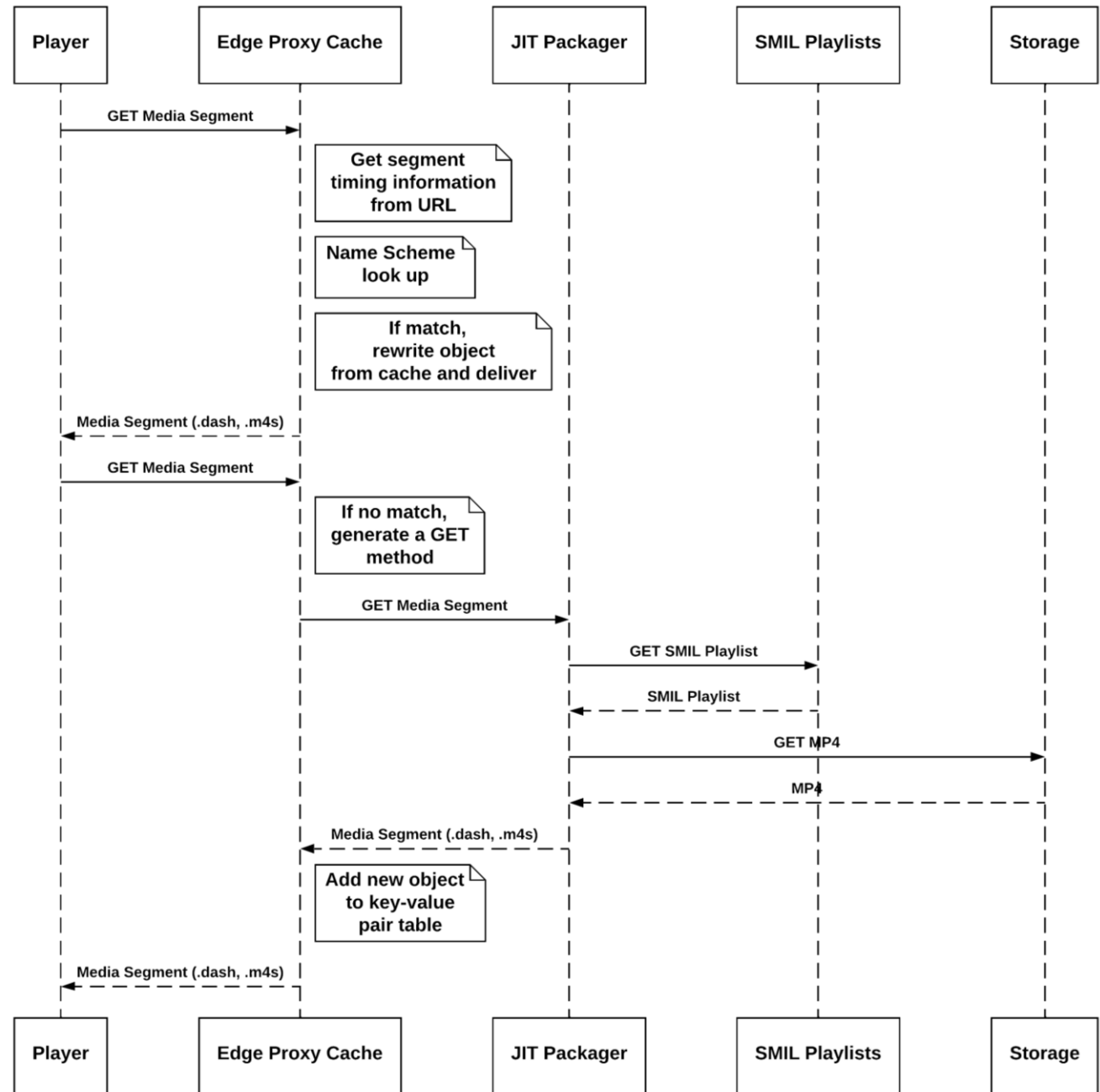


Hash based approach (Sec. 4.3)

- ▷ FNV-1a hash
- ▷ HTTP HEAD request



Name Scheme approach (Sec. 4.1)



Segment Naming Scheme (4.1)

Augmented Backus-Naur (ABNF) form

```
segment-name = *(AssetId sep start
                sep duration [sep assetTimeOff])
                sep contentType sep CodecType
                sep bitRate sep Time fileType

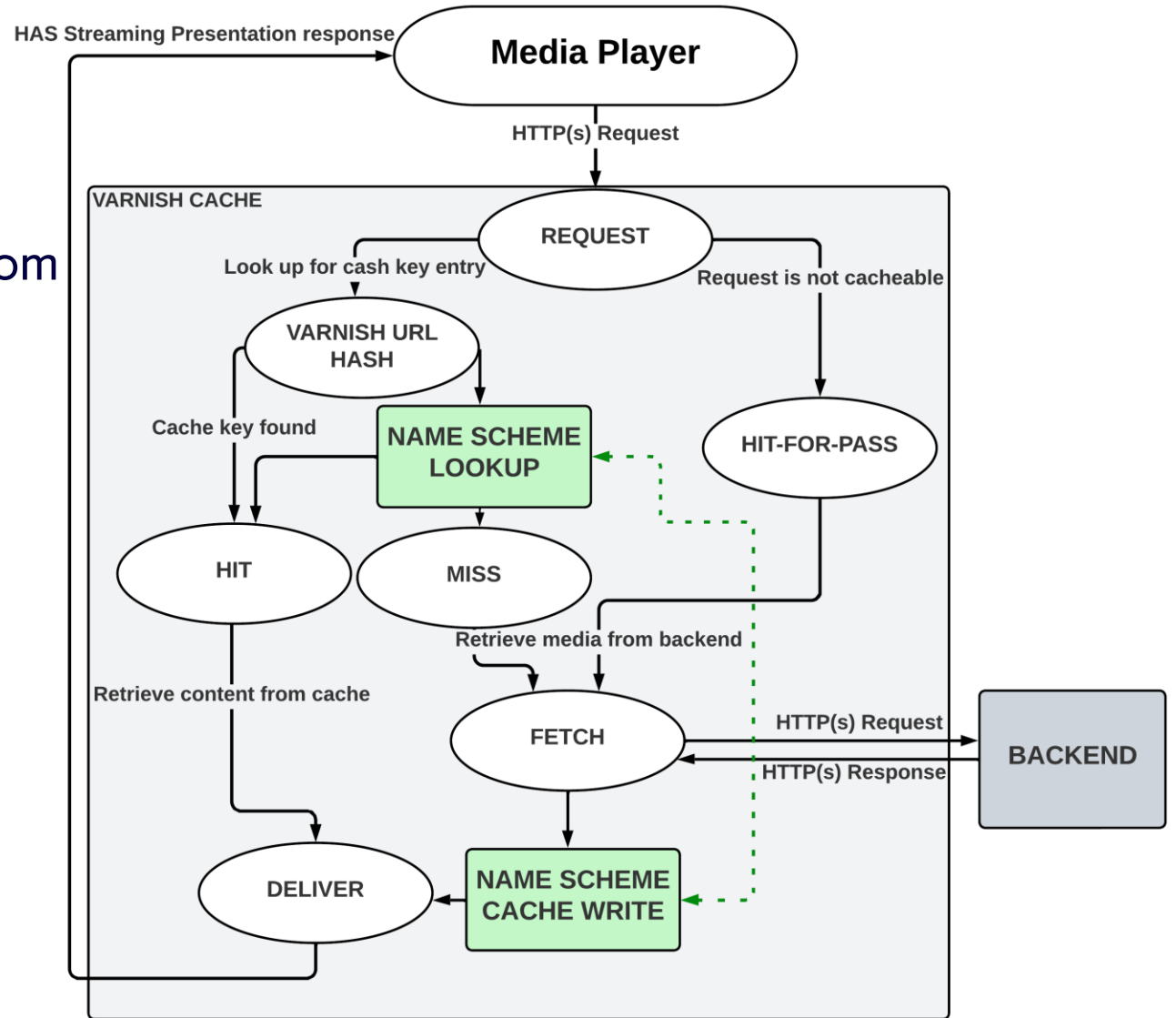
DIGIT        = %x30-39; 0-9
ALPHA        = %x41-5A / %x61-7A; A-Z / a-z
sep          = - / _
assetID      = ALPHA *(ALPHA / DIGIT)
start        = *DIGIT
assetOff     = *DIGIT
duration     = *DIGIT
contentType  = "audio" / "video" / "text" / "meta"
codecType    = 4(DIGIT / ALPHA)
bitRate      = *DIGIT
time         = *DIGIT
filetype     = .m4s / .mp4 / .dash / .cmfs
```

ABNF: <https://www.rfc-editor.org/rfc/rfc5234>

Name Scheme delivery implementation using Varnish

- ▶ Multi-thread based processing
- ▶ HTTP Routing and Header manipulation
- ▶ Independent client request/response from backend fetch.
- ▶ Implement using Varnish Configuration Language

Cache key-value pair store table	
<CACHE_KEY>	<CACHE_VALUE>
<AssetID>-	<playlistName>/dash/
<\$RepresentationID\$>-	<playlistName>-
<\$Time\$>	<\$RepresentationID\$>-
	<\$Time\$>



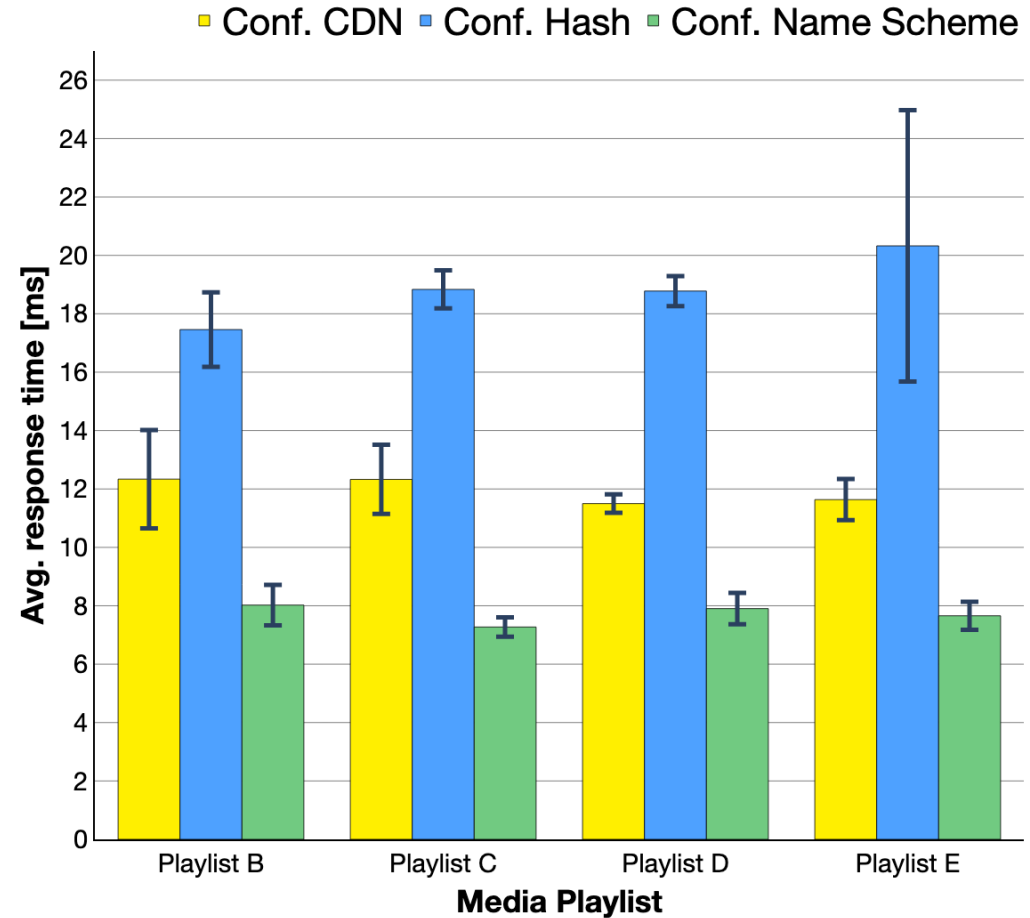
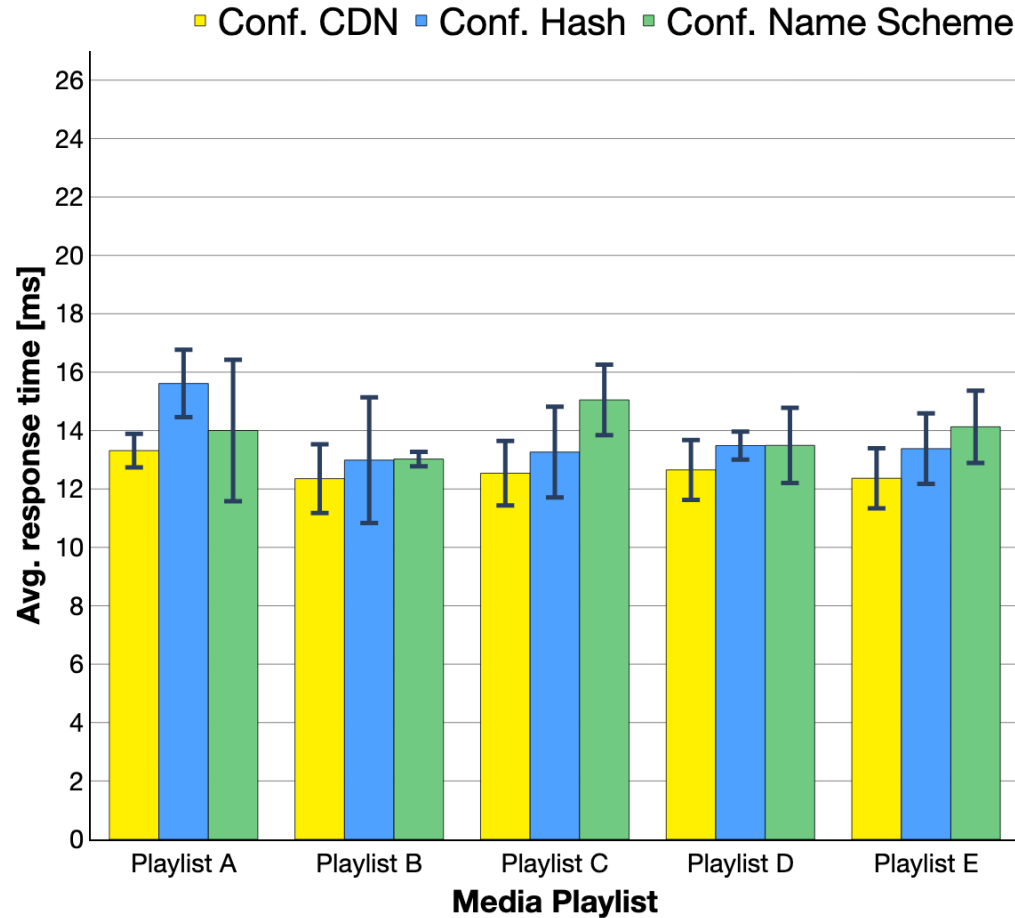
Example test cases

- ▷ Test of playlists with different pre-roll and mid rolls
- ▷ Cache not loaded
- ▷ Cache loaded with 1 other stream (playlist A)



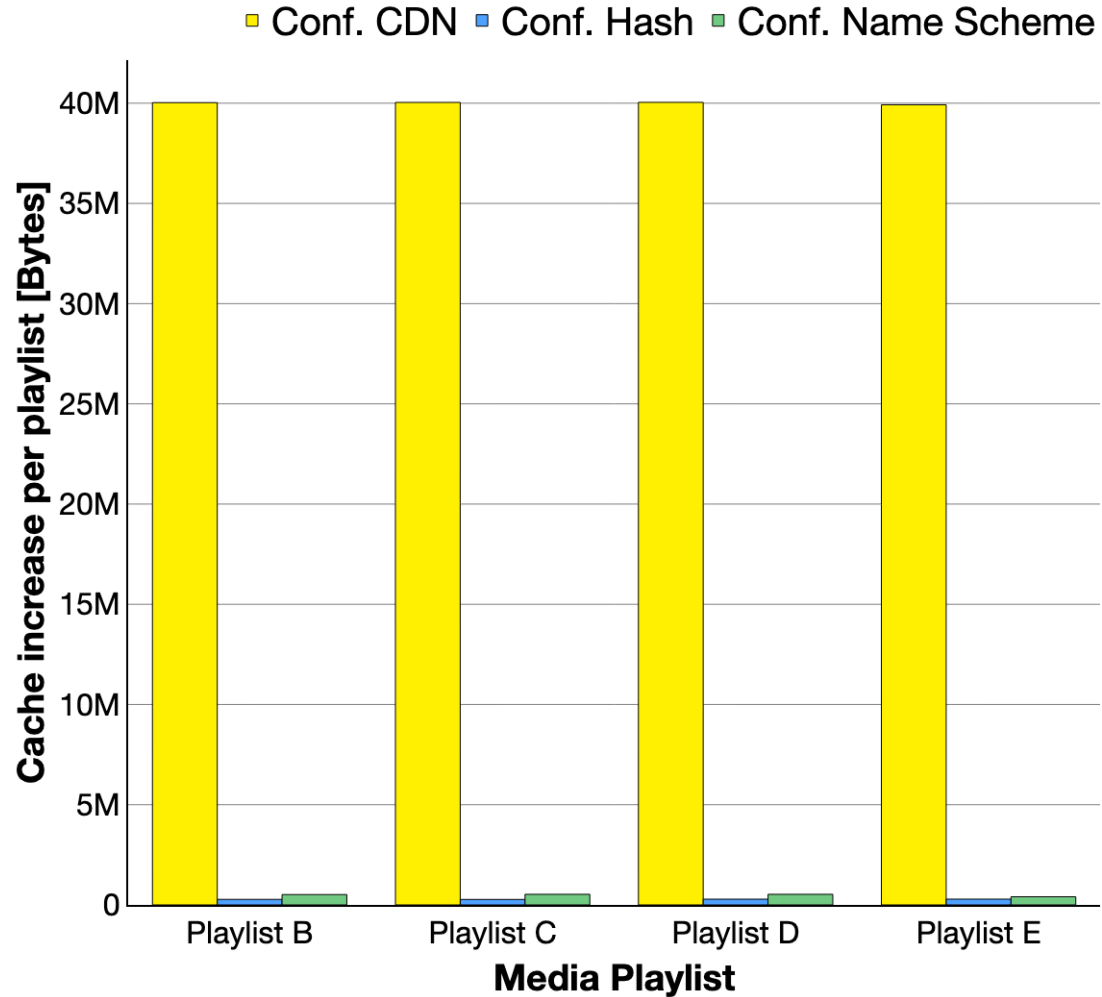
Avg. response time

Cache not loaded (Sec 5.3) VS Pre-loaded cache (Sec. 5.4)

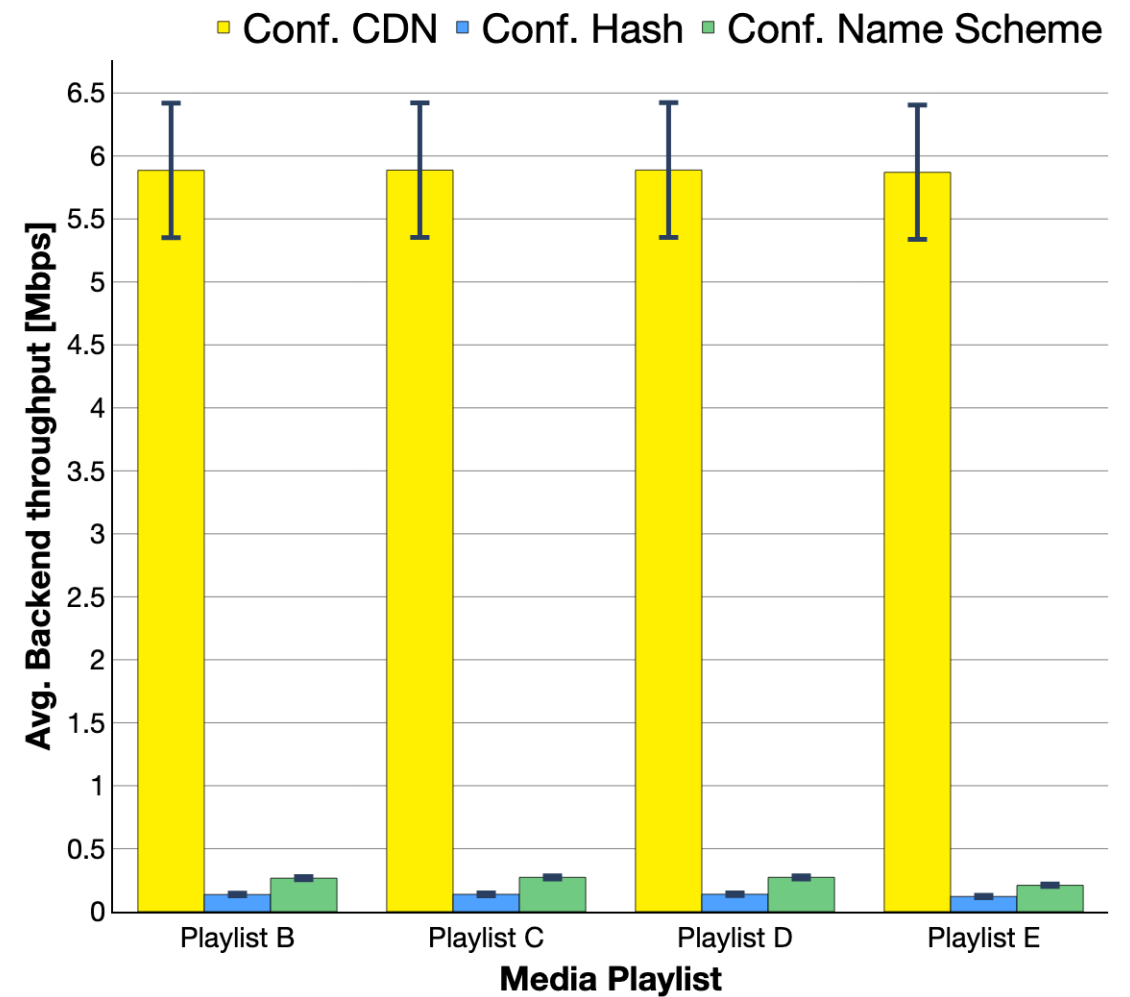


Pre-loaded Cache (5.4)

Cache size [Bytes]



Backend traffic [Mbps]



Summary

- ▶ Re-purposed content streaming to a broad range of devices.
- ▶ Authoring component using offline CMAF transcoding with segment and bit-rate alignment.
- ▶ Authoring component using just-in-time packaging to create the re-purposed presentations on-the-fly.
- ▶ HTTP Delivery component with two optimized caching approaches, using a naming scheme or a hashing scheme
- ▶ PoC using Varnish Enterprise and Unified Origin was implemented and evaluated.
- ▶ Low response time overhead, reduced backend traffic and reduced cache sizes.
- ▶ Next steps we are looking to deploy this at a larger scale and in production.

Questions?



Antwoord aan: amsterdam@fotodeboer.nl

Dear Customer,

Please find your photo in attachment.

IMG_22684-NL Passport-2023-03-13.jpg

Kind Regards,

Ton
Foto de Boer

Thank you!

For any questions, feel free to contact me or
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<https://doi.org/10.1145/3588444.3591005>

