



Implementing DASH low latency in FFmpeg

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Open Source Multimedia

- Jean-Baptiste Kempf
 - President VideoLAN
 - Developer on VLC, x264 and other libraries
- Open Source multimedia communities
 - VideoLAN: VLC, x264, dav1d
 - FFmpeg: command line utility to process video
 - Xiph, Handbrake, GStreamer
 - Fully and truly open source projects
 - Volunteers
 - Patents and Open Source

What is FFmpeg?

- FFmpeg
 - Swiss Knife of multimedia
 - Everything multimedia processing
 - Libraries and Programs
- Features
 - Decode/Encode/Transcode but also Demux/Mux/Remux
 - Device input and output
 - Filters, scaling and Chroma
 - All platforms
 - Used in VLC, Chrome, Firefox, Linux distributions...

FFmpeg and the ecosystem

- FFmpeg
 - Defacto standard for most of the OTT/cloud encoding
 - Often used with x264, libvpx and other open source libraries
 - Numerous non-open-source libraries plugins for FFmpeg
 - Numerous MAM and cloud APIs are just rewrapping FFmpeg
- Adaptive
 - HLS input and output support
 - Dash input and output support
 - Probably Non-compliant :)

FFmpeg and Dash-LL project

- Compliance
 - Biggest worry of the project (*dash+dash-ll*)
 - Fix MP4/MOV generation
Introduce some CMAF support and fixes
 - Numerous changes to MP4 **avcc** box
Producer Reference Time **prft** box
 - Options to set different segment durations for each adaptation set
and Set chunk/fragment duration in general
 - New profiles, notably for DVB
 - New Latency, Resync elements
 - New Trick Mode

FFmpeg and Dash-LL project

- Server
 - Doing the redirections from ffmpeg to output
 - Node.Js origin with Apache <https://gitlab.com/fflabs/originjs>
 - Python simple server with Nginx https://gitlab.com/fflabs/dash_server
- Clients
 - Dash.Js player
 - VLC player and libVLC SDK
 - Tested on Windows, iOS and Android

<https://gitlab.com/fflabs>

Dash-LL options

- New Dash options:
 - -seg_duration,
 - -frag_duration,
 - -frag_type,
 - -mpd_profile,
 - -http_opts
- Dash-LL new options:
 - -target_latency,
 - -write_prft,
 - -ldash

As usual, the FFmpeg command line is quite horrible to read:)

Graph is hard to show on a command line

```
47
48 ${FF} \
49 -framerate ${INPUT_FPS} \
50 -i ${INPUT} \
51 -f lavfi -i sine \
52 -pix_fmt yuv420p \
53 -c:v ${VCODEC} -b:v:0 500K -b:v:1 200K -s:v:0 960x400 -s:v:1 720x300 \
54 -map 0:v:0 -map 0:v:0 \
55 -c:a ${ACODEC} -b:a 96K -ac 2 \
56 -map 1:a:0 \
57 -use_timeline 0 \
58 -utc_timing_url "http://time.akamai.com" \
59 -format_options "movflags=cmaf" \
60 -frag_type duration \
61 -adaptation_sets "id=0,seg_duration=8,frag_duration=2,streams=0,1 id=1,seg_duration=1,frag_type=none,streams=2" \
62 -g:v 20 -keyint_min:v 20 -sc_threshold:v 0 -streaming 1 -ldash 1 -tune zerolatency \
63 -export_side_data prft \
64 -write_prft 1 \
65 -target_latency ${TARGET_LATENCY} \
66 -color_primaries ${COLOR} -color_trc ${COLOR} -colorspace ${COLOR} \
67 -f dash \
68 ${HTTP_OPTS} \
69 ${PROTO}://${SERVER}:${PORT}/${ID}/${ID}.mpd \
70 ${TS_OUT_CMD}
```


Dash-LL command line (*base*)

ffmpeg

-framerate \${INPUT_FPS} \

-i \${INPUT} \

-f lavfi -i sine -pix_fmt yuv420p \

-color_primaries \${COLOR} -color_trc \${COLOR} -colorspace \${COLOR} \

-http_opts key_file=\${TLS_KEY},cert_file=\${TLS_CRT},ca_file=\${TLS_CA},tls_verify=1 \

...

Dash-LL command line (*Dash*)

ffmpeg

...

-c:v \${VCODEC} -b:v:0 500K -b:v:1 200K -s:v:0 960x400 -s:v:1 720x300 \

-map 0:v:0 -map 0:v:0 \

-c:a \${ACODEC} -b:a 96K -ac 2 \

-map 1:a:0 \

-f dash \

-use_timeline 0 \

-utc_timing_url "http://time.akamai.com" \

-frag_type duration \

\${PROTO}://\${SERVER}:\${PORT}/\${ID}/\${ID}.mpd ...

Dash-LL command line (*Dash-LL*)

ffmpeg

...

-format_options "movflags=cmaf" \

-adaptation_sets "id=0,seg_duration=8,frag_duration=2,streams=0,1
id=1,seg_duration=1,frag_type=none,streams=2" \

-g:v 20 -keyint_min:v 20 -sc_threshold:v 0 \

-export_side_data prft -write_prft 1 \

-streaming 1 \

-ldash 1 \

-tune zerolatency \

-target_latency 3.5

Dash-LL documentation

Documentation

- <https://ffmpeg.org/ffmpeg-formats.html#dash-2>
- 45 different options for Dash generation

Everything is in FFmpeg master

- Mailing lists
- IRC
- Check out the code

Demos

- Multi-codec demo

Questions

- Questions to me

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