

LL-DASH over ROUTE: GPAC open-source implementation

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(presenter)

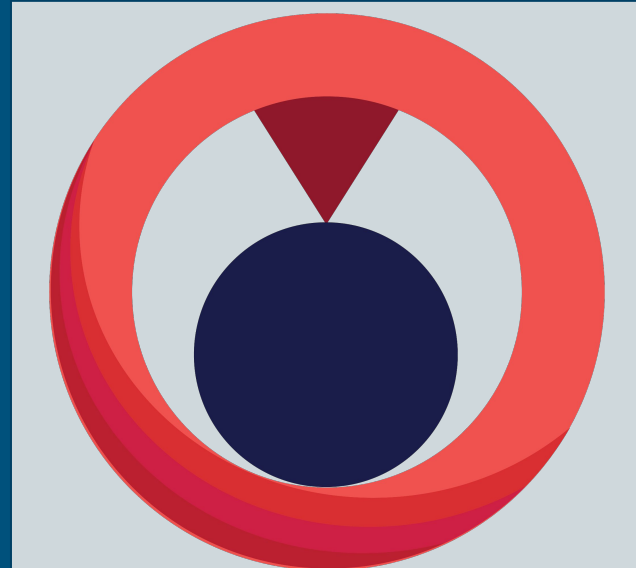
About me

- **Romain Bouqueau**
- Open-source & standard contributor
- 2005-2009 Allegro DVT (now ATEME)
 - Video encoder quality
 - Performances
- 2009-2012 Telecom ParisTech (academic lab)
 - R&D engineer: mux/streaming, OSS, standards, ...
- 2012-... Founder at Motion Spell / GPAC Licensing & various startups
- <https://www.linkedin.com/in/rbouqueau/>



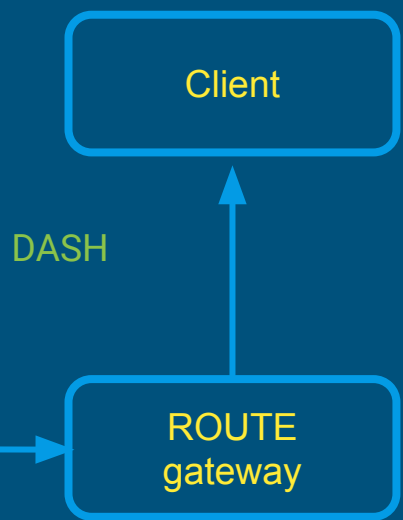
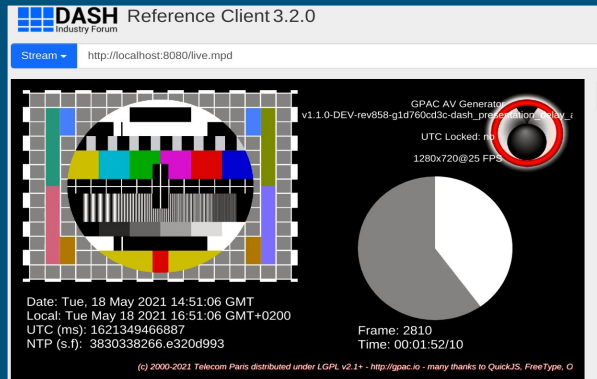
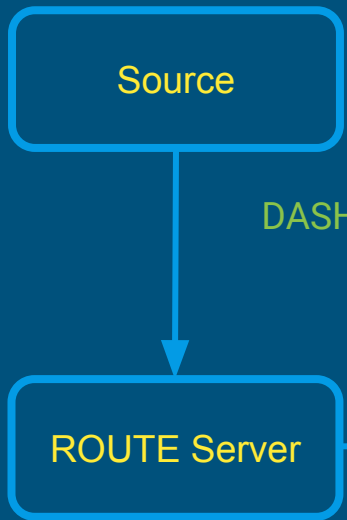
GPAC (<http://gpac.io>)

- De-facto standard for ISOBMFF/MP4/CMAF manipulation
- Core team involved in standardization
- License: LGPLv2.1+ or commercial
- **Community**: researchers, enthusiasts, professionals (GPAC Licensing)
- Since GPAC 1.0 “Filters”: **complex pipeline capabilities** à-la GStreamer
- Since GPAC 2.0: many bindings (JS/Node, Python, ...)



GPAC and ROUTE

- **IP-based**: broadcast = multicast UDP
- Several flavors: ATSC3 (US), ATSC3 (Korean), DVB-MABR, generic
 - NAB Innovation Award (2018) for pioneering work on this
- Support HLS and DASH:
 - **Low latency** mode
 - fMP4/CMAF, ...
 - Encryption
- Still quite some tests and interoperability to do...
 - **Feedbacks are welcome!**
 - <https://github.com/gpac/gpac/issues>



GPAC filters: first time

- `gpac -i INPUT PROCESSING-FILTERS -o OUTPUT`
- automatic graph solver:
 - use @ symbol
- options: `FILTER:opt1=val1:opt2=val2 ...`
 - inheritance
 - special :gpac: separator
- show processing graph with `-graph`
- useful filters:
 - `avgen`: beepop source
 - `reframer:rt=on`: real-time pace
 - `c=aac`: audio encoder
 - `c=avc`: video encoder

Source

```
gpac -i avgen reframer:rt=on c=avc c=aac -o  
http://127.0.0.1:8080/live.mpd:profile=live:dmode=dynami  
c:segdur=2:cdur=0.1:asto=1.9:reqlog='*':cors=auto:rdirs=  
gmem:tsb=3600:max_cache_segs=30
```

1. DASHer options
 - a. Calls the MP4 muxer
2. HTTP out options

Raw source
(avgen)

Real-time dispatch
(reframer:rt=on)

A/V encoding

Muxer

DASHer

HTTP
output

Output

ROUTE server

```
gpac -i http://127.0.0.1:8080/live.mpd dashin:forward=file @ -o  
route://225.1.1.0:6000:llmode
```

Tell the DASH demuxer to only forward the un-demuxed files

ROUTE gateway

```
gpac -i route://225.1.1.0:6000/:max_segs=40 dashin:forward=file @  
httpout:port=8081:rdirs=gmem:reqlog='*':cors=auto:max_cache_segs=30
```

ROUTE input option

Tell the DASH demuxer to only forward the un-demuxed files

HTTP out options

Client

- Filters:
 - aout: audio output
 - vout: video output
- `gpac -i http://127.0.0.1:8081/live.mpd aout vout`
- Alias: `gpac -play http://127.0.0.1:8081/live.mpd`

<https://reference.dashif.org/dash.js/v3.2.0/samples/dash-if-reference-player/index.html?mpd=http://localhost:8080/live.mpd>

<https://reference.dashif.org/dash.js/v3.2.0/samples/dash-if-reference-player/index.html?mpd=http://localhost:8081/live.mpd>

Demo!

Fallback videos:

- https://www.gpac-licensing.com/downloads/qualcomm/20210224_qualcomm_gpac_route_demo_content_only.mp4
- https://www.gpac-licensing.com/downloads/qualcomm/20210224_qualcomm_gpac_route_demo.mp4

How to reproduce: get the software

- Binary installers (recommended for Windows)
 - <http://gpac.io/downloads/gpac-nightly-builds/>
- Build from source:
 - <https://github.com/gpac/gpac/wiki/GPAC-Build-Guide-for-Linux>
 - install dev tools and multimedia deps:
 - `sudo apt-get install build-essential pkg-config g++ git scons cmake yasm`
 - `sudo apt-get install zlib1g-dev libfreetype6-dev libjpeg62-dev libpng-dev libmad0-dev libfaad-dev libogg-dev libvorbis-dev libtheora-dev liba52-0.7.4-dev libavcodec-dev libavformat-dev libavutil-dev libswscale-dev libavdevice-dev libxv-dev x11proto-video-dev libgl1-mesa-dev x11proto-glx-dev libxvidcore-dev libssl-dev libjack-dev libasound2-dev libpulse-dev libsdl2-dev dvb-apps mesa-utils`
 - git clone <https://github.com/gpac/gpac.git> & cd gpac & ./configure & make -j & sudo make install
 - Wait for 30s. You're done!

Command-lines

1. Source:

- a. `gpac -i avgen reframer:rt=on c=avc c=aac -o
http://127.0.0.1:8080/live.mpd:profile=live:dmode=dynamic:segdur=2:cdur=0.
1:asto=1.9:reqlog='*':cors=auto:rdirs=gmem:tsb=3600:max_cache_segs=30`

2. ROUTE server:

- a. `gpac -i http://127.0.0.1:8080/live.mpd dashin:forward=file @ -o route://225.1.1.0:6000:llmode`

3. ROUTE gateway to DASH

- a. `gpac -i route://225.1.1.0:6000/:max_segs=40 dashin:forward=file @
httpout:port=8081:rdirs=gmem:reqlog='*':cors=auto:max_cache_segs=30`

4. Clients:

- a. `gpac -play http://localhost:8081/live.mpd:gpac:spd=4000`
- b. `https://reference.dashif.org/dash.js/v3.2.0/samples/dash-if-reference-player/index.html?mpd=http:
//localhost:8081/live.mpd`

Documentation

- ROUTE How-to: <https://github.com/gpac/gpac/wiki/route>
- GPAC documentation: <https://github.com/gpac/gpac/wiki>