HTTP Live Streaming (HLS)

Sanchayan Maity

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Open source contributions

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- gst-plugins-rs

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- u-boot

Agenda

- Whirlwind tour of GStreamer

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- What's HTTP Live Streaming (HLS)

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- What's HTTP Live Streaming (HLS)
- HLS implementation

GStreamer

- Multiplatform Pipeline based multimedia framework

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- Bindings for various languages

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  - Empathy (VOIP and video conferencing)

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  - Rygel (DLNA streaming server and renderer)

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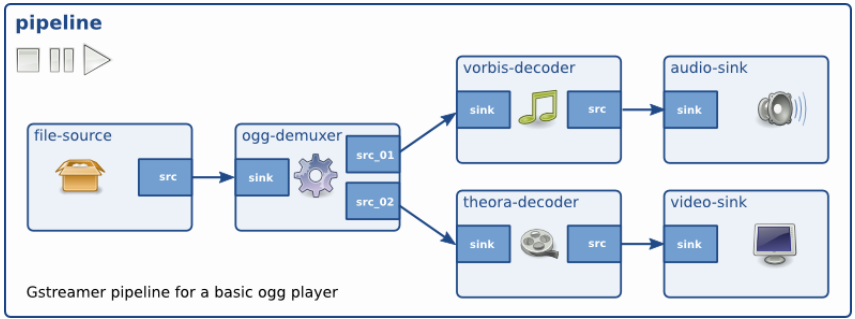
  - Rygel (DLNA streaming server and renderer)
  - Totem (movie player for the GNOME desktop)

Simple pipeline

```
gst-launch-1.0 videotestsrc ! autovideosink
gst-launch-1.0 audiotestsrc ! autoaudiosink
```

Media pipeline[1]



[1] Dynamic Pipelines

Hls

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- Developed by Apple and released in 2009
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- HTTP traffic, unlike UDP-based protocols such as RTP
- Content can be offered from conventional HTTP servers
- Delivered over widely available HTTP-based content delivery networks

Playlist[2]

```
#EXTM3U
#EXT-X-TARGETDURATION:10
#EXT-X-VERSION:3
#EXTINF:9.009,
http://media.example.com/first.ts
#EXTINF:9.009,
http://media.example.com/second.ts
#EXTINF:3.003,
http://media.example.com/third.ts
#EXT-X-ENDLIST
```

[2] RFC 8216

Master playlist[3]

```
#EXTM3U
#EXT-X-STREAM-INF:BANDWIDTH=1280000,AVERAGE-BANDWIDTH=1000000
http://example.com/low.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=2560000,AVERAGE-BANDWIDTH=2000000
http://example.com/mid.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=7680000,AVERAGE-BANDWIDTH=6000000
http://example.com/hi.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=65000,CODECS="mp4a.40.5"
http://example.com/audio-only.m3u8
```

[3] RFC 8216

Master playlist[4]

```
#EXTM3U
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="aac",NAME="English", \
   DEFAULT=YES,AUTOSELECT=YES,LANGUAGE="en", \
   URI="main/english-audio.m3u8"
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="aac",NAME="Deutsch", \
   DEFAULT=NO,AUTOSELECT=YES,LANGUAGE="de", \
   URI="main/german-audio.m3u8"
#EXT-X-STREAM-INF:BANDWIDTH=1280000,CODECS="...",AUDIO="aac"
low/video-only.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=2560000,CODECS="...",AUDIO="aac"
mid/video-only.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=7680000,CODECS="...",AUDIO="aac"
hi/video-only.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=65000,CODECS="mp4a.40.5",AUDIO="aac"
main/english-audio.m3u8
```

[4] RFC 8216

Implementation

- New GStreamer plugin

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- Open MR:
  https://gitlab.freedesktop.org/gstreamer/gst-plugins-rs/-/merge_requests/1515

Demo

Using

- videojs

Demo

Using

- videojs
- `python3 -m http.server`

Demo

Using

- videojs
- `python3 -m http.server`
- Sample GStreamer Rust Code[5]

[5] HLS sample app

References

- RFC 8216

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- HLS in depth

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- HTTP Live Streaming - A Practical Guide

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- HTTP Live Streaming - Wikipedia

Questions

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