

HTTP Live Streaming (HLS)

Sanchayan Maity

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 - ▶ Language Polyglots

Open source contributions

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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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 - ▶ Rygel (DLNA streaming server and renderer)

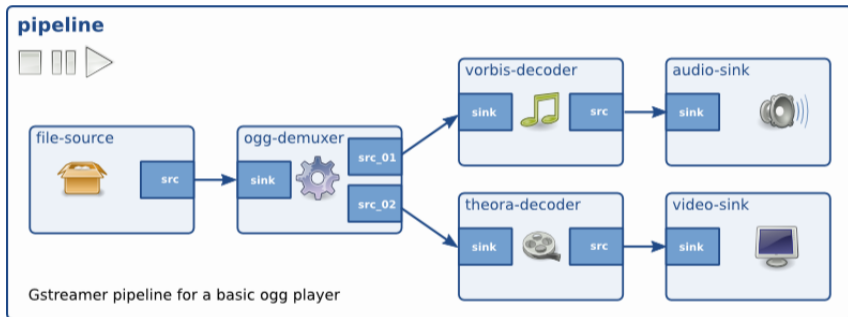
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 - ▶ Rygel (DLNA streaming server and renderer)
 - ▶ Totem (movie player for the GNOME desktop)

Simple pipeline

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

Media pipeline¹



¹Dynamic Pipelines

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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

Motivation

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 - ▶ Alternate media renditions
- ▶ Live content
 - ▶ Reuse the same mechanism

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 - ▶ Variants using a bit rate ladder
 - ▶ Alternate media renditions
- ▶ Live content
 - ▶ Reuse the same mechanism
 - ▶ Trading off lower cost distribution via CDN at the cost of latency over real time

Playlist²

```
#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
```

²RFC 8216

Master playlist³

```
#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
```

³RFC 8216

Master playlist⁴

```
#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
```

⁴RFC 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 Code⁵

⁵HLS sample app

References

- ▶ RFC 8216

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- ▶ HLS in depth

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- ▶ RFC 8216
- ▶ HLS in depth
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- ▶ HTTP Live Streaming - A Practical Guide

References

- ▶ [RFC 8216](#)
- ▶ [HLS in depth](#)
- ▶ [LL-HLS in depth](#)
- ▶ [HTTP Live Streaming - A Practical Guide](#)
- ▶ [HTTP Live Streaming - Wikipedia](#)

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