

**Live streaming:
куда жать, чтобы
протестировать?**

mayflower.work



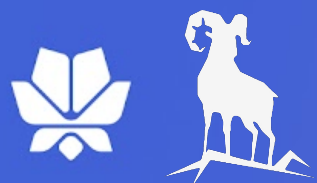


mayflower.work



**Егор Сатурьянц,
QA 8+ лет**

1. Что такое Mouflon Media Engine
2. Стек тестирования
3. Автоматизация подачи
4. Автоматизация проверки транскодинга
5. Автоматизация проверки плейбека
6. Проверки на стадии концепта



1. Что такое Mouflon Media Engine

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транскодинга

5. Автоматизация проверки плейбека

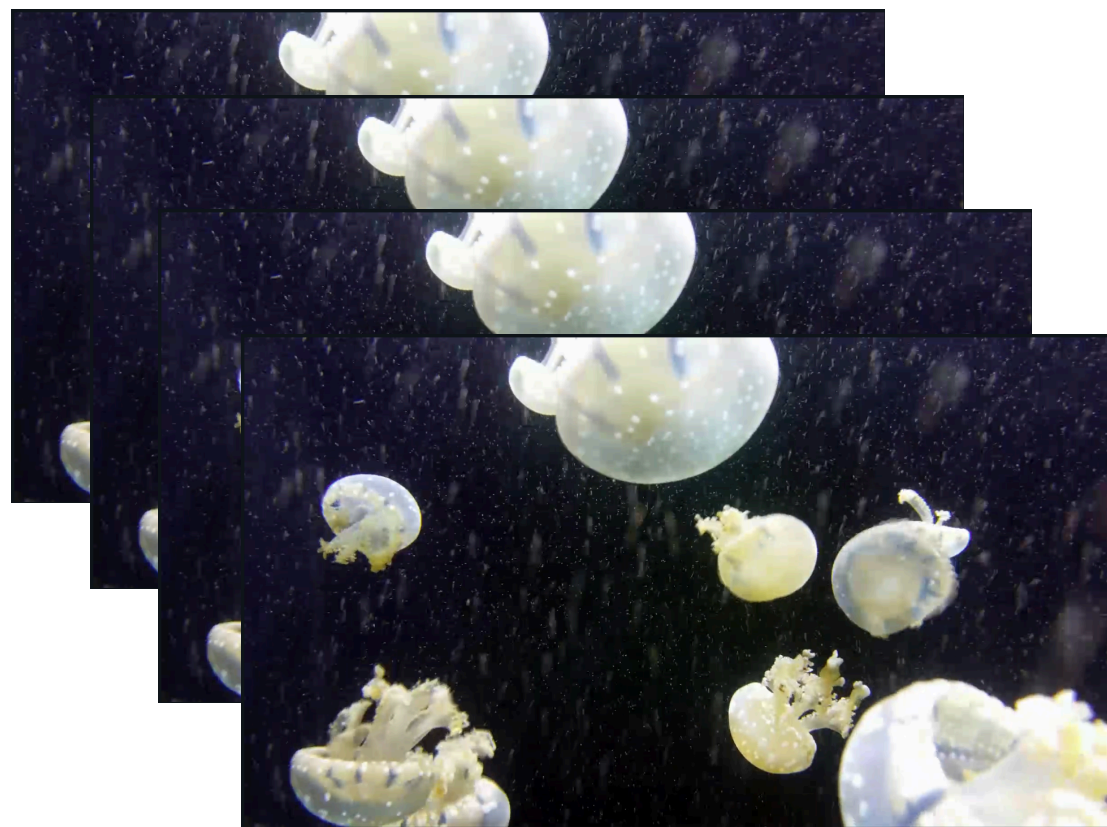
6. Проверки на стадии концепта



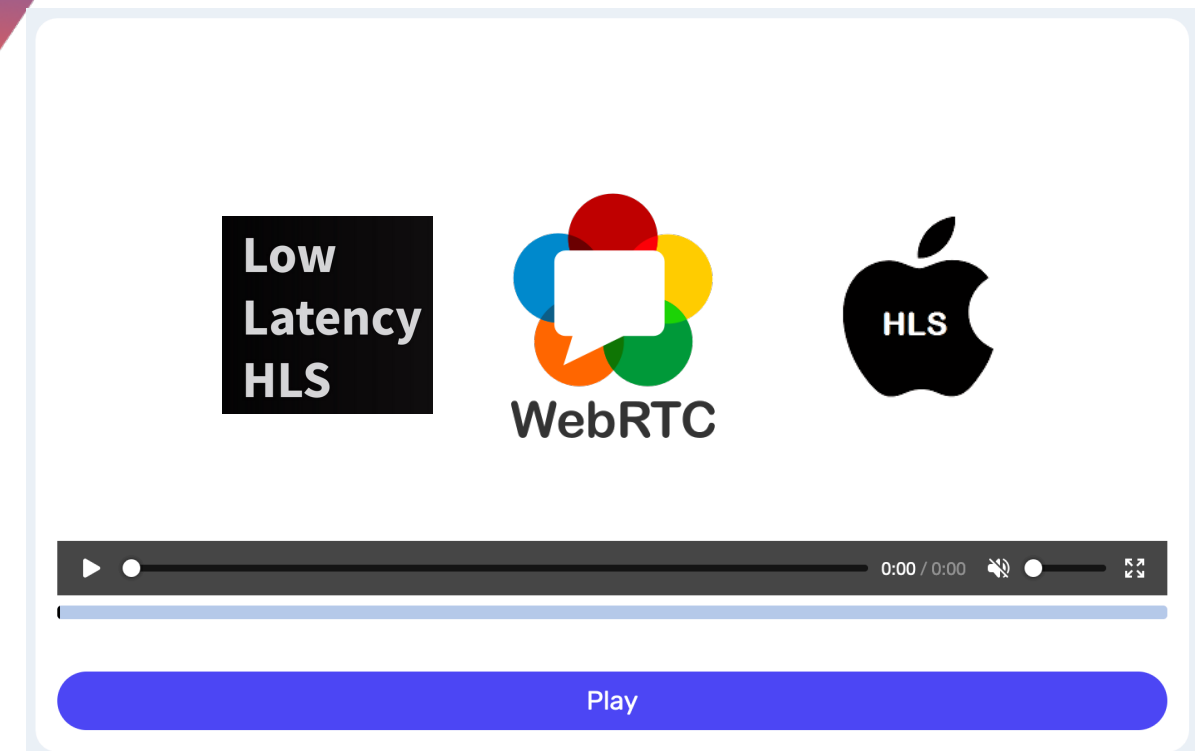
Mouflon Media Engine

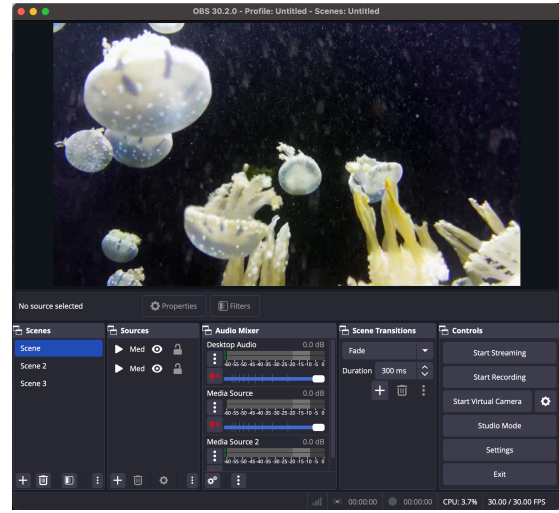


10,000 Live бroadкастеров одновременно

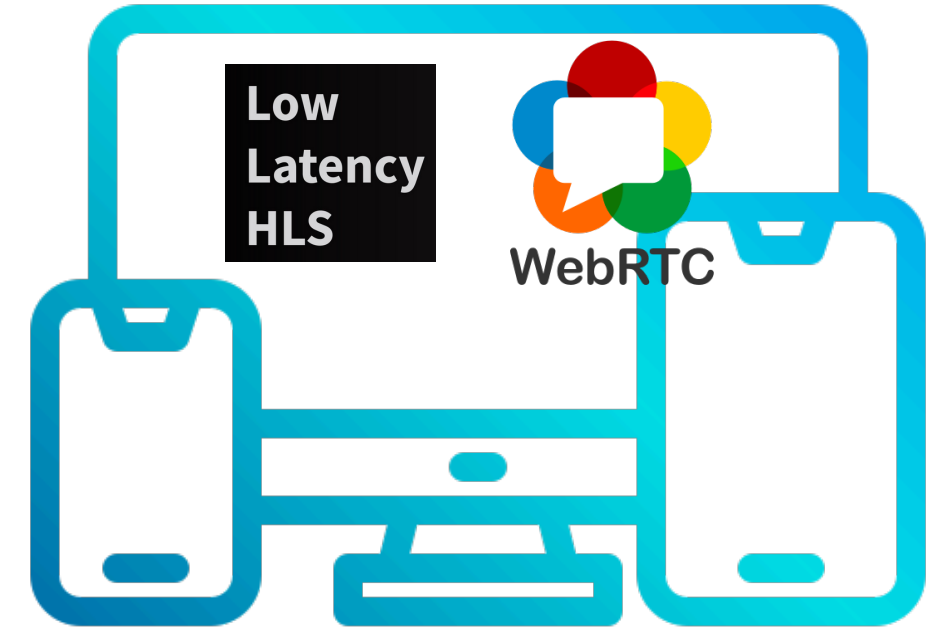


1,000,000 СТРИМОВ НА ПРОСМОТР ОДНОВРЕМЕННО



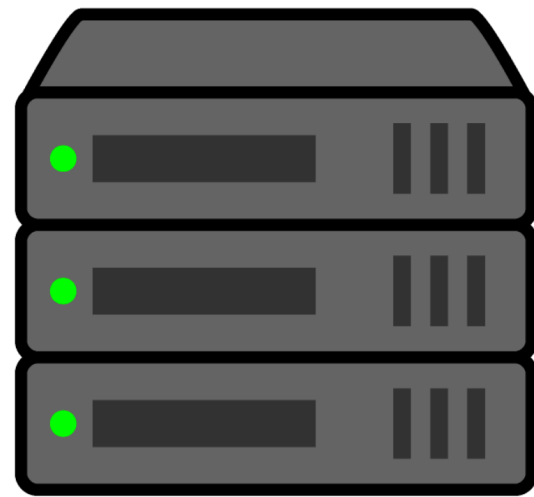


CDN

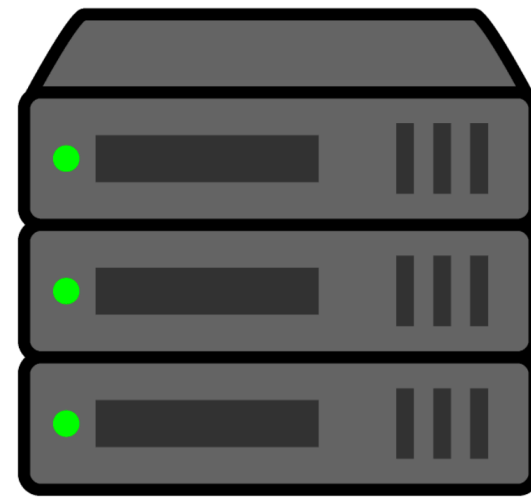


RTMP

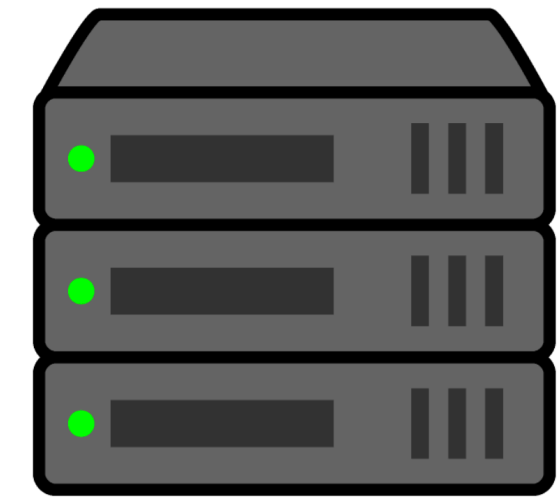
WebRTC



Origins



Transcoders



Edges



Требования

- **Необходим низкий latency**
- **Необходим быстрый старт воспроизведения**
- **Поддержка большого парка устройств**



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Стек
тестирования



Python



FFmpeg



Selenium



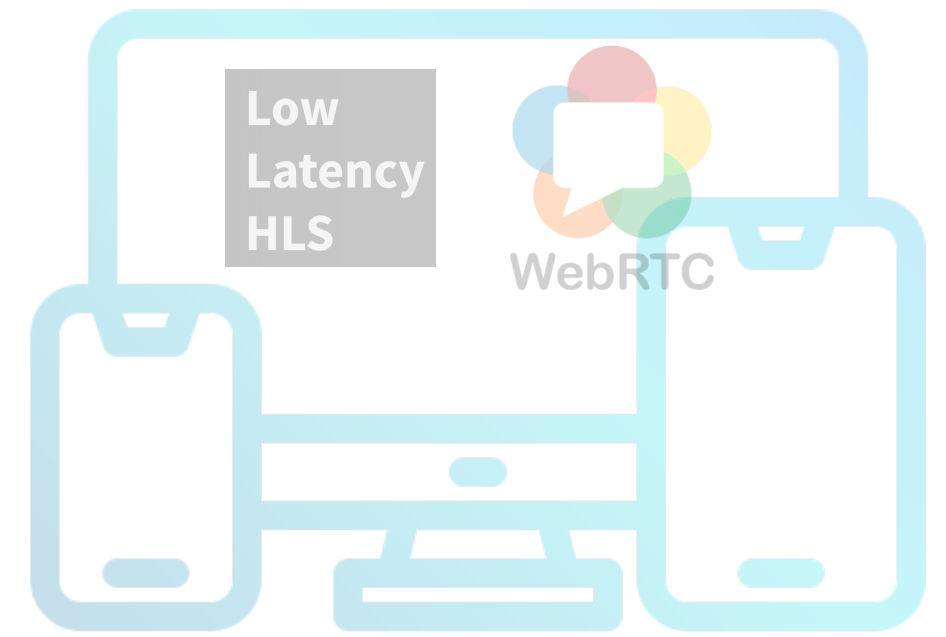
GitLab CI

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CDN



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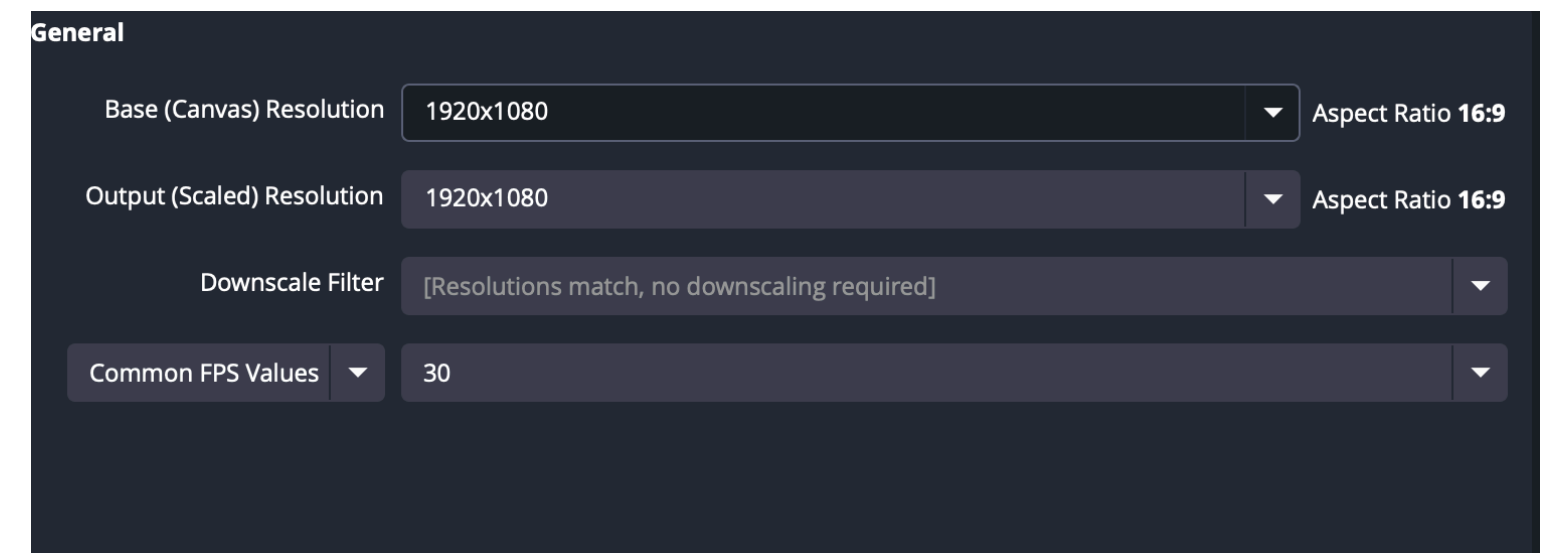
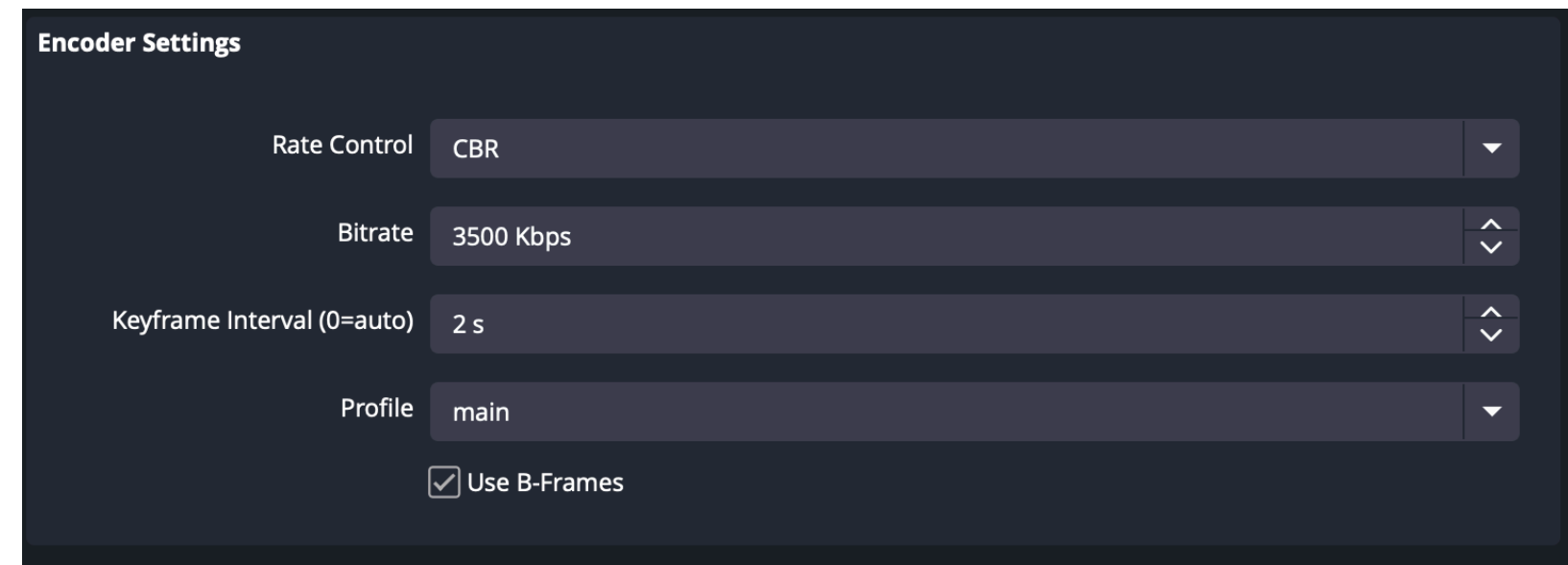
Протоколы
подачи

RTMP



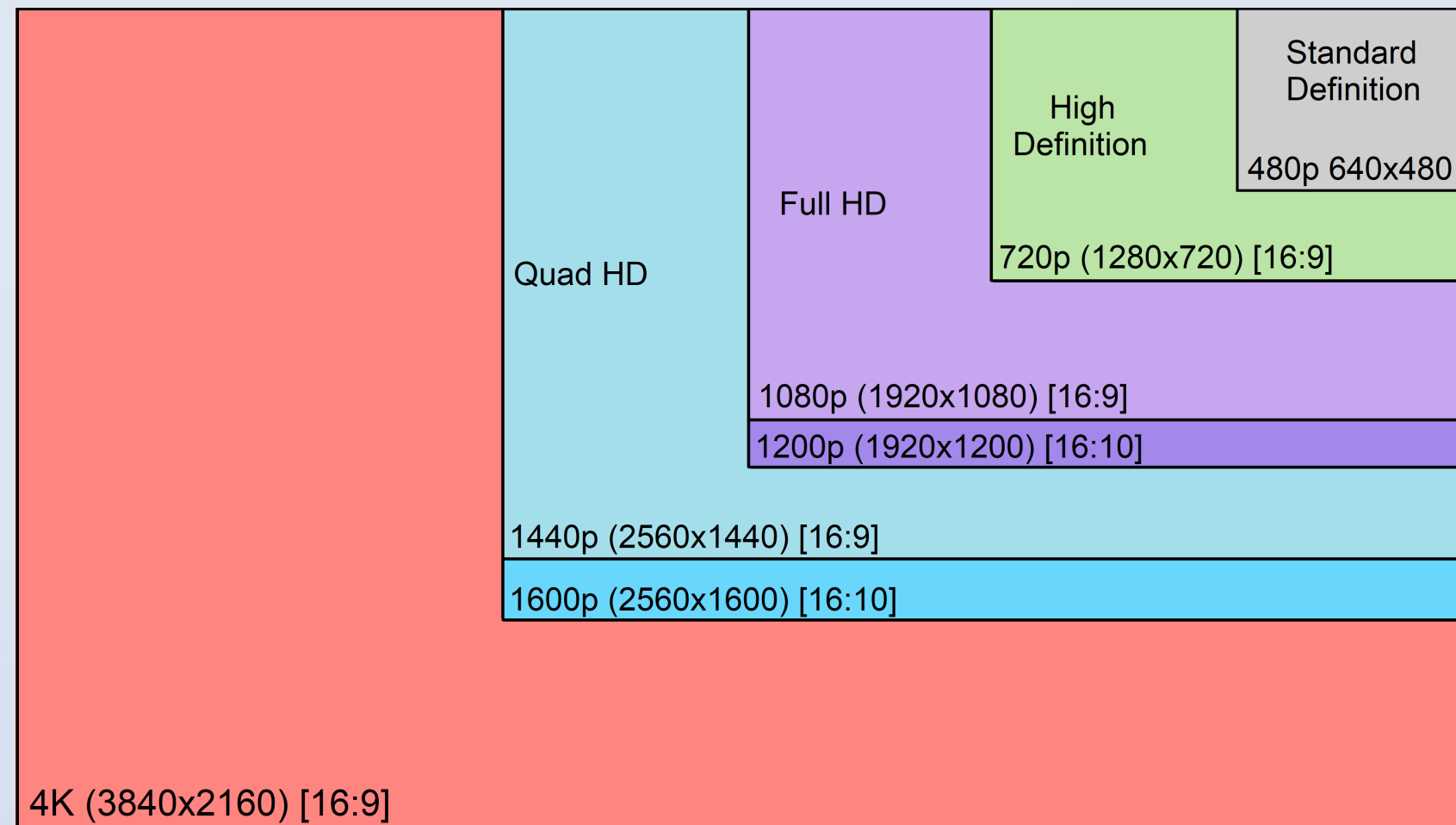
Подача RTMP

- ▶ Разрешение
- ▶ Bitrate
- ▶ Framerate
- ▶ Кодек (h264, h265)
- ▶ GOP
- ▶ B-frames
- ▶ Аудио



RTMP

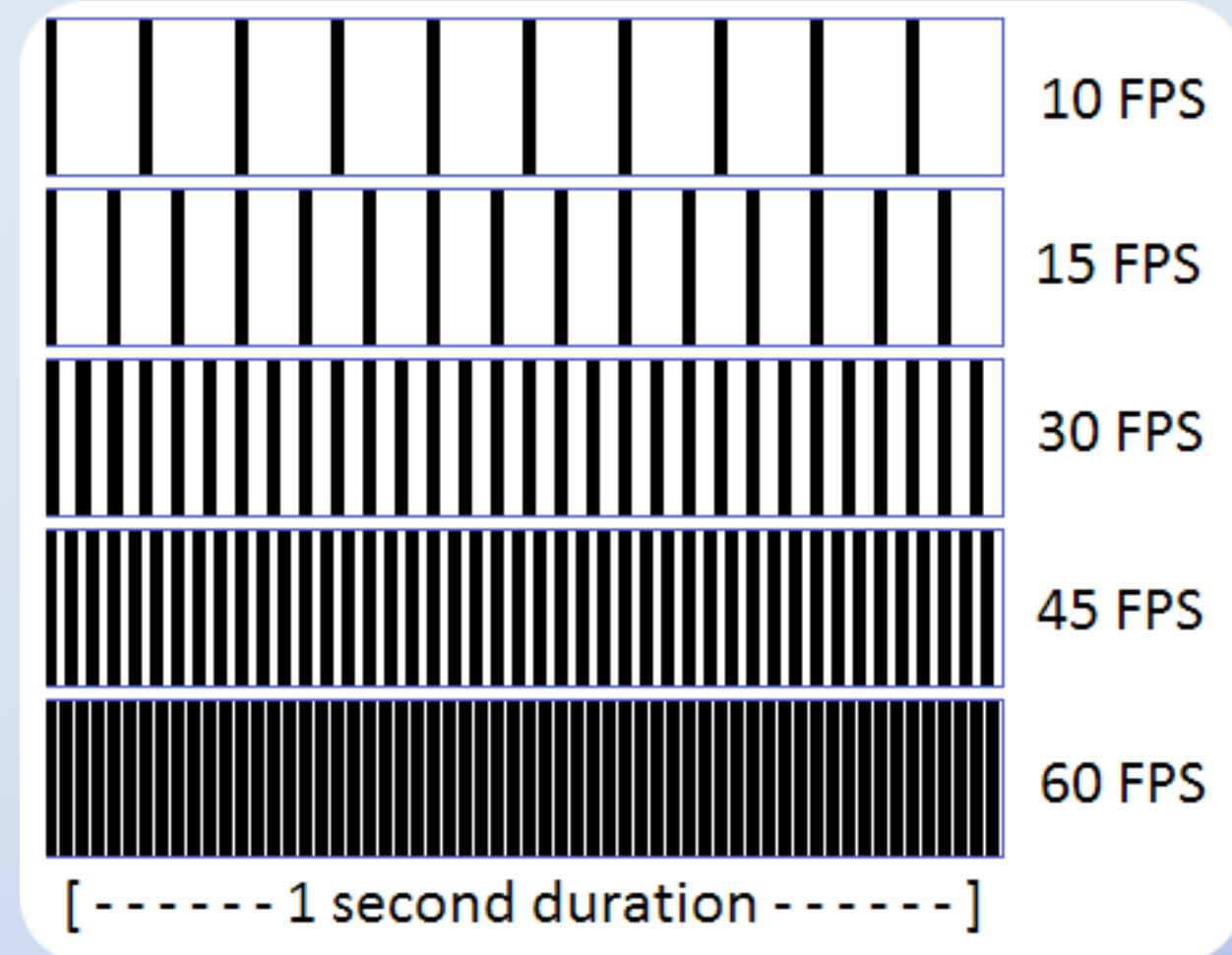
Подача по rtmp: Разрешение



```
> ffmpeg -re -stream_loop -1 -i "/path_to_file" \  
> -c:v libx264 \  
> -vf scale=1980x1080 \  
> -f flv "rtmp://live-str3.nda.dev/"
```



Подача по rtmp: framerate



```
> ffmpeg -re -stream_loop -1 -i "/path_to_file" \  
> -c:v libx264 \  
> -vf scale=1980x1080,fps=fps=60 \  
> -f flv "rtmp://live-str3.nda.dev/"
```



RTMP

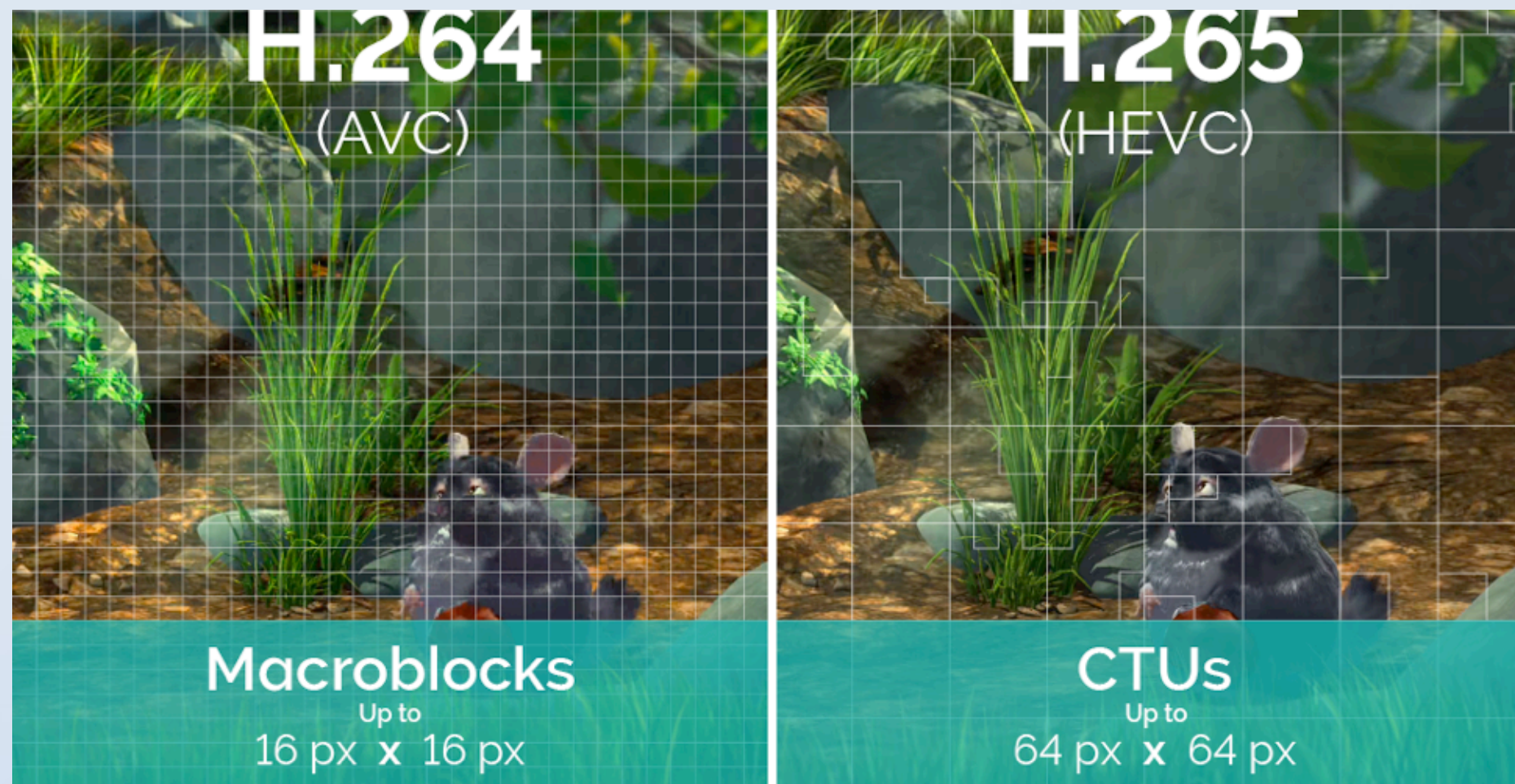
Подача по rtmp: bitrate



```
> ffmpeg -re -stream_loop -1 -i "/path_to_file" \  
> -c:v libx264 \  
> -b:v 3000k \  
> -f flv "rtmp://live-str3.nda.dev/"
```



Подача по rtmp: Кодек



```
> ffmpeg -re -stream_loop -1 -i "/path_to_file" \  
> -c:v libx265 \  
> -f flv "rtmp://live-str3.nda.dev/"
```



Подача по rtmp: GOP



```
> ffmpeg -re -stream_loop -1 -i "/path_to_file" \  
> -c:v libx264 \  
> -g 60 -keyint_min 60 \  
> -f flv "rtmp://live-str3.nda.dev/"
```



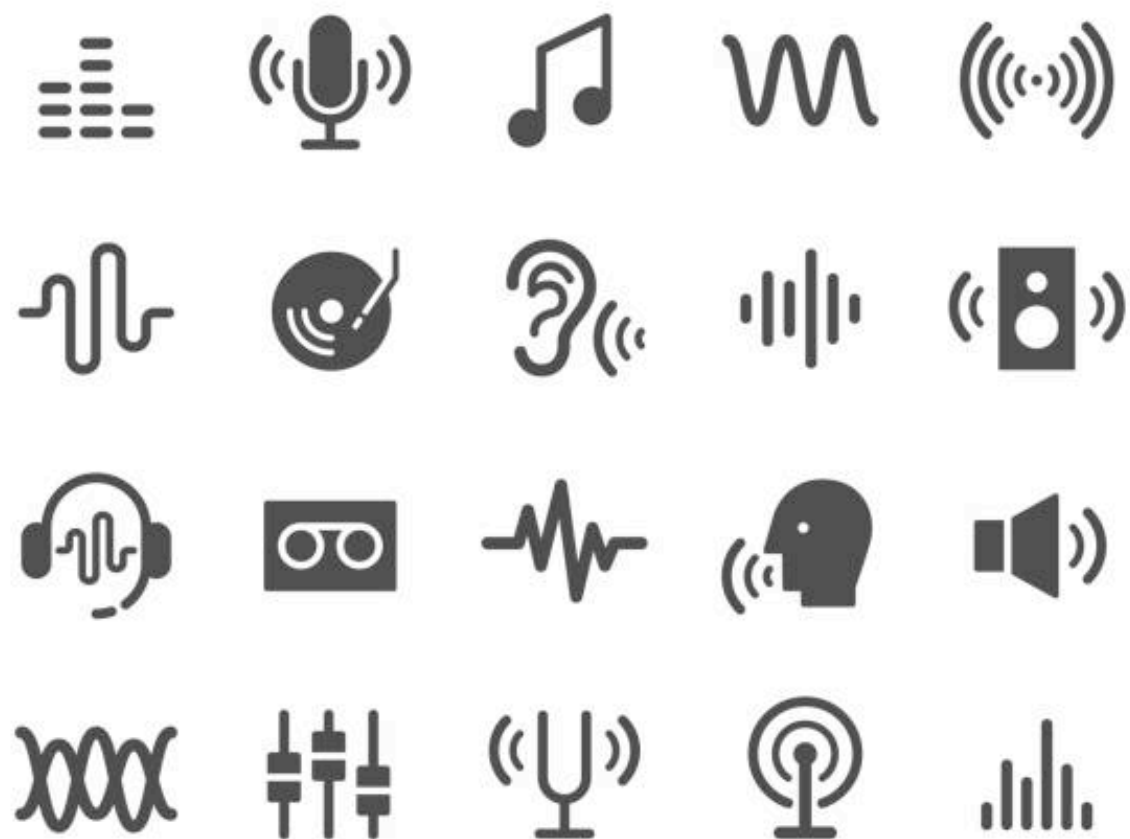
Подача по rtmp: B-frames



```
> ffmpeg -re -stream_loop -1 -i "/path_to_file" \  
> -c:v libx264 \  
> -bf 1 \  
> -f flv "rtmp://live-str3.nda.dev/"
```



Подача по rtmp: Аудио



```
> ffmpeg -re -stream_loop -1 -i "/path_to_file" \  
> -c:v libx264 \  
> -an \  
> -f flv "rtmp://live-str3.nda.dev/"
```

```
> ffmpeg -re -stream_loop -1 -i "/path_to_file" \  
> -c:v libx264 \  
> -ac 1 \  
> -f flv "rtmp://live-str3.nda.dev/"
```



Подача WebRTC (аргументы Chrome)

- `--use-fake-device-for-media-stream`
- `--use-file-for-fake-audio-capture=<filename>`
- `--use-file-for-fake-video-capture=<filename>`
- `--use-fake-ui-for-media-stream`

Подача WebRTC

- ▶ Разрешение
- ▶ Framerate
- ▶ Аудио

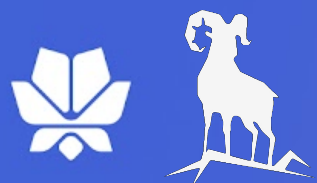
Подача WebRTC (аргументы Chrome)

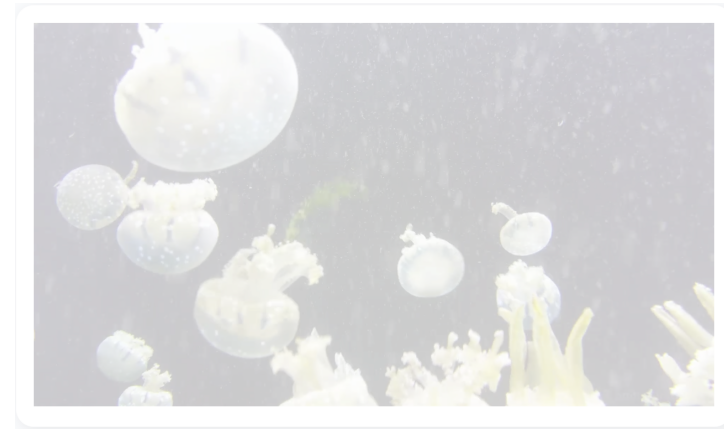
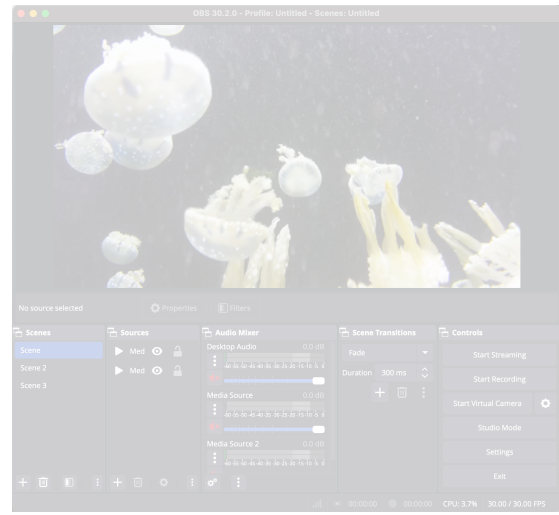
- `--use-fake-device-for-media-stream`
- `--use-file-for-fake-audio-capture=<filename>`
- `--use-file-for-fake-video-capture=<filename>`
- `--use-fake-ui-for-media-stream`

YUV4MPEG2

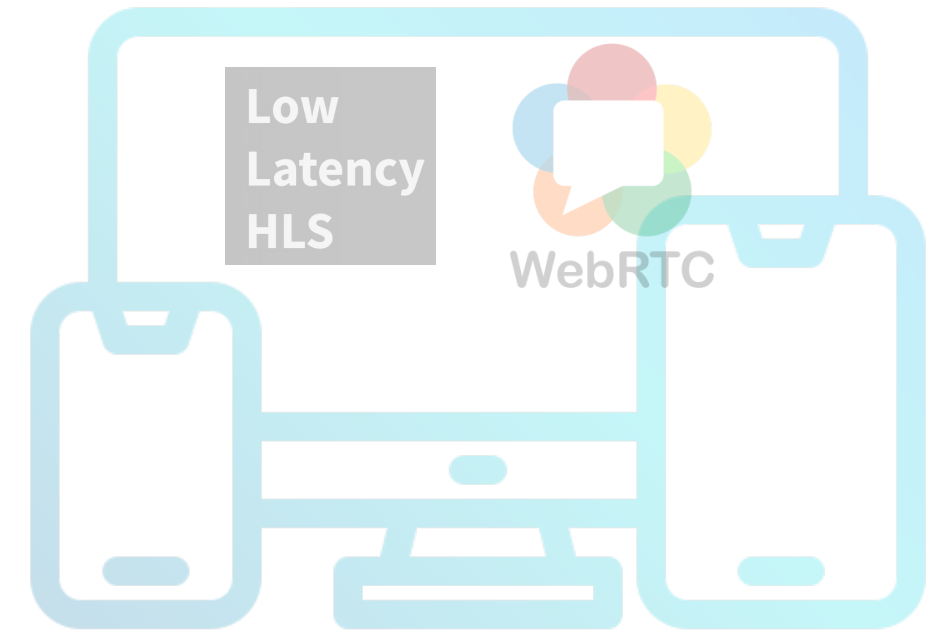


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CDN

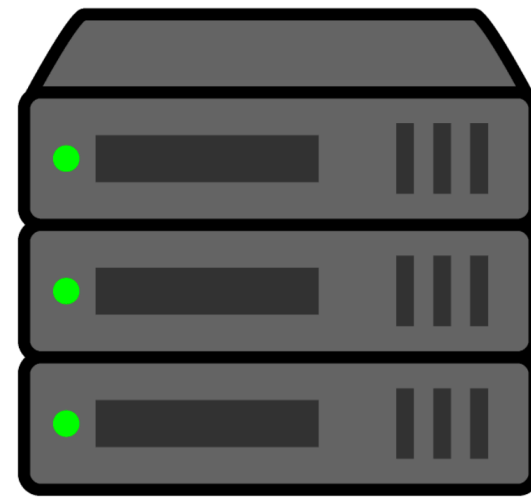


RTMP

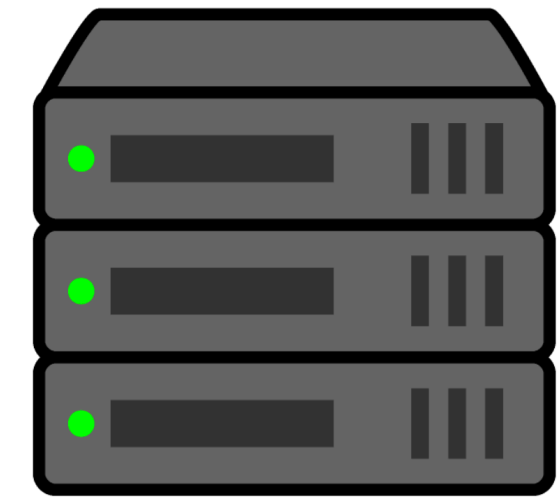
WebRTC



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Transcoders



Edges

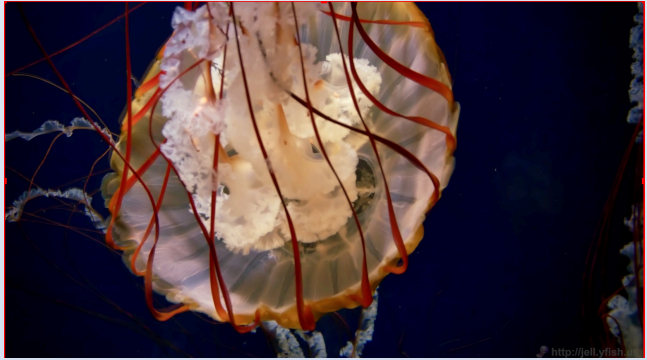


Разрешение

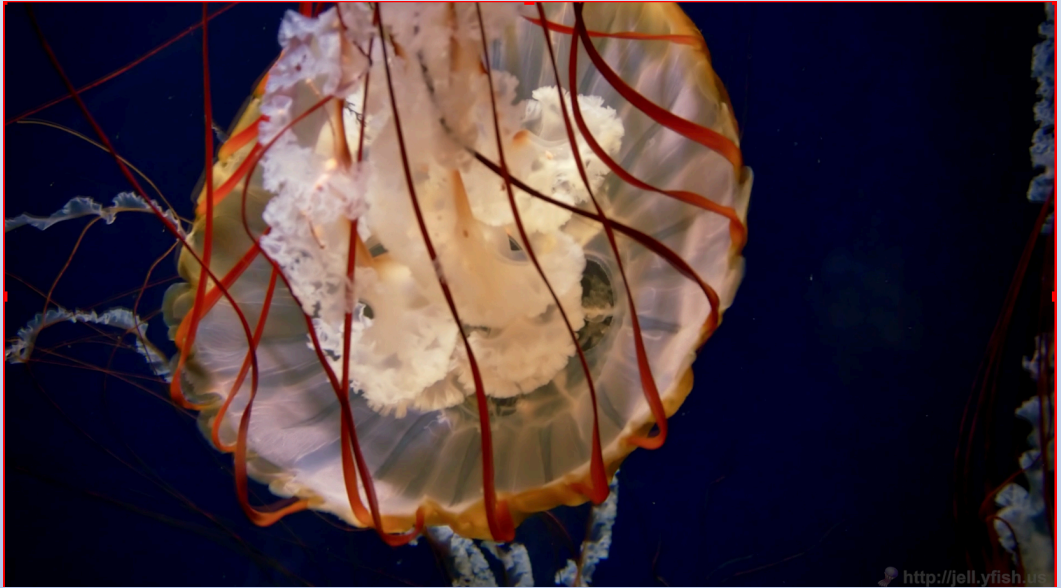
720p



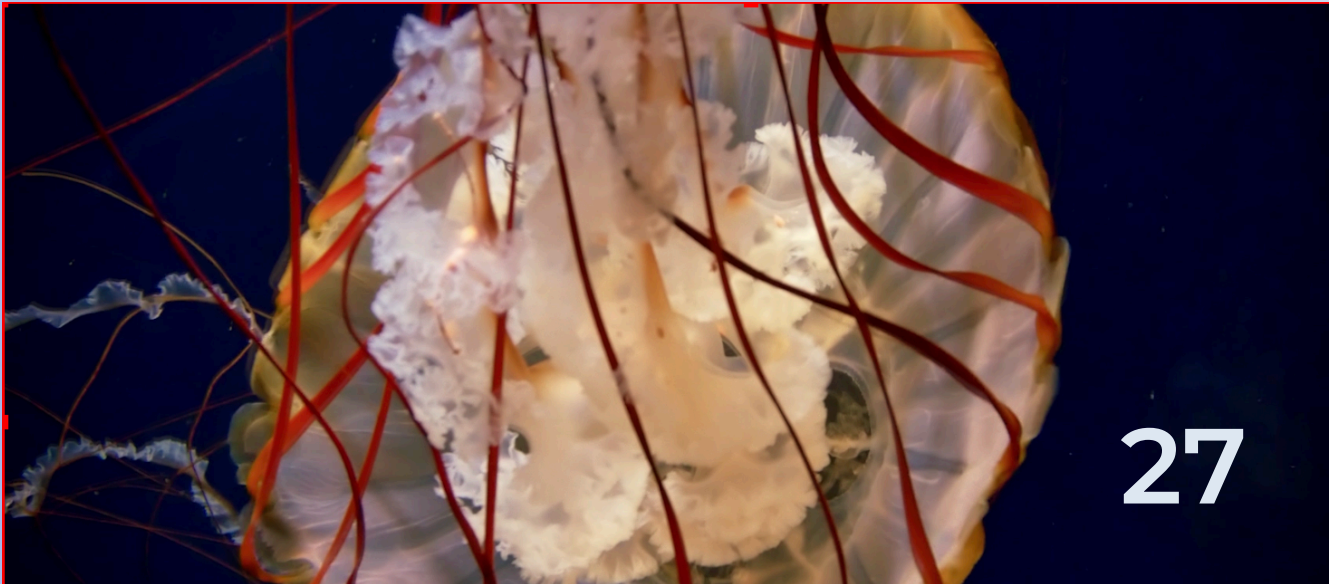
240p



480p



720p



B-frames (Live WebRTC)



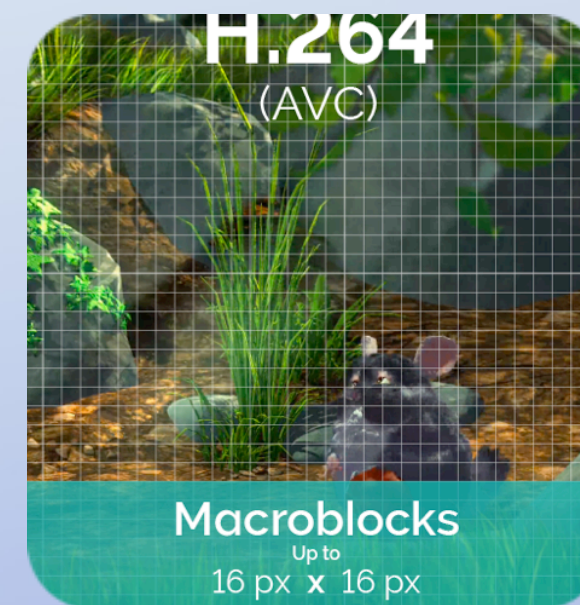
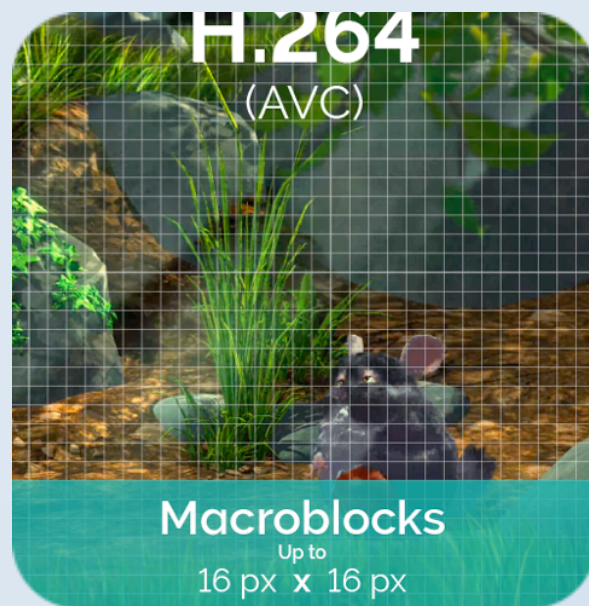
ЕСТЬ



Нет



Кодек



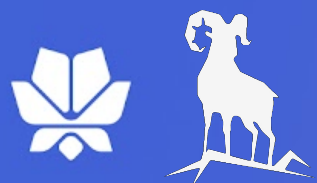
Probing

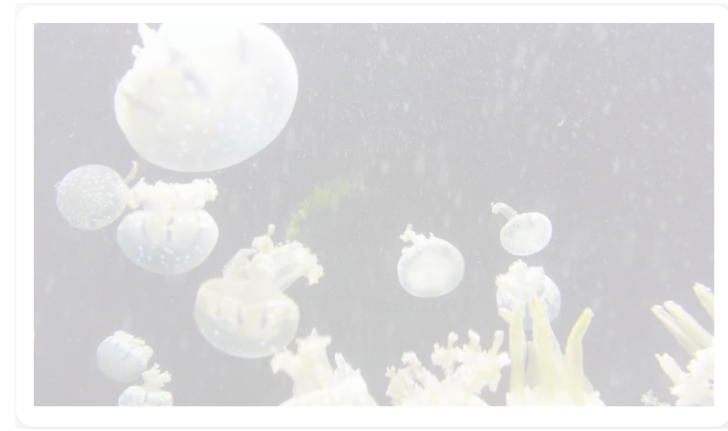
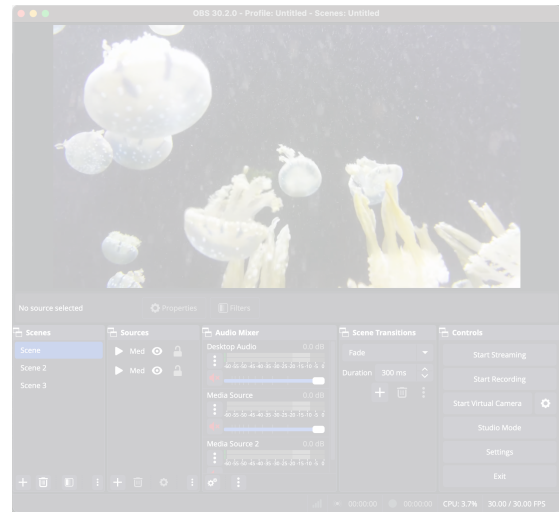
```
> ffprobe -show_streams -print_format json -loglevel quiet \  
> 'https://b-hls-kilo1-str3.nda.dev/hls/id/master/id.m3u8'
```

```
{  
  "streams": [  
    {  
      "index": 0,  
      "codec_name": "h264",  
      "codec_long_name": "H.264 / AVC / MPEG-4 AVC / MPEG-4 part 10",  
      "profile": "Constrained Baseline",  
      "codec_type": "video",  
      "codec_tag_string": "avc1",  
      "codec_tag": "0x31637661",  
      "width": 1280,  
      "height": 720,  
      "coded_width": 1280,  
      "coded_height": 720,  
      "closed_captions": 0,  
      "film_grain": 0,  
      "has_b_frames": 0,  
      "sample_aspect_ratio": "1:1",  
      "display_aspect_ratio": "16:9",  
      "pix_fmt": "yuv420p",  
      "level": 32,  
      "chroma_location": "left",  
      "refs": 1,  
      "is_avc": "true",  
      "nal_length_size": "4",  
      "r_frame_rate": "60/1",  
      "avg_frame_rate": "60/1",
```

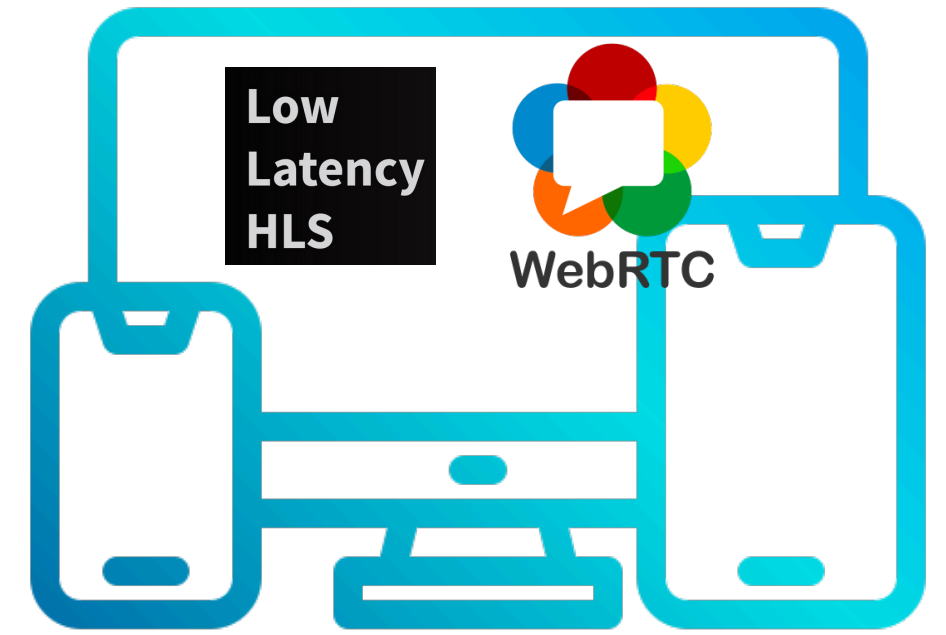


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CDN



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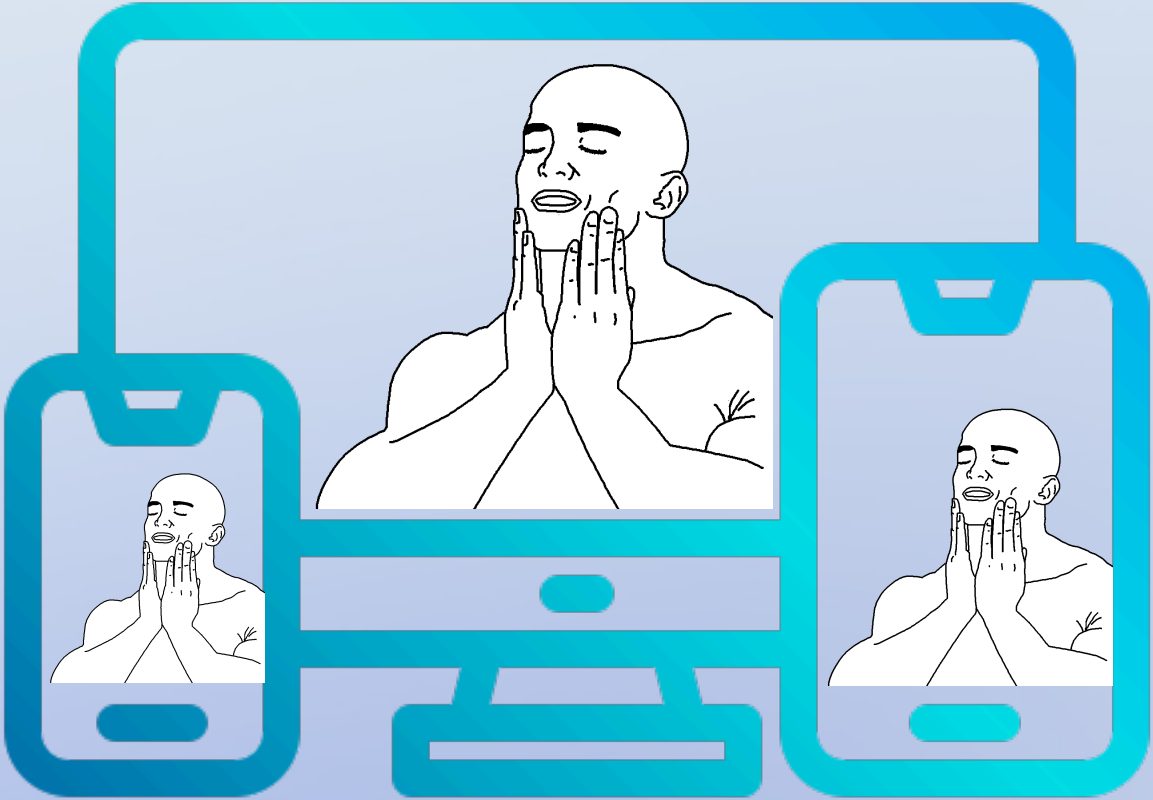


Edges



Плеер

Low
Latency
HLS



Проверки WebRTC

- ▶ **Старт воспроизведения**

HLS

Informational
Internet-Draft
Obsoletes: [8216](#) (if approved)
Intended status: Informational
Expires: 11 November 2024

R. Pantos, Ed.
Apple Inc.
10 May 2024

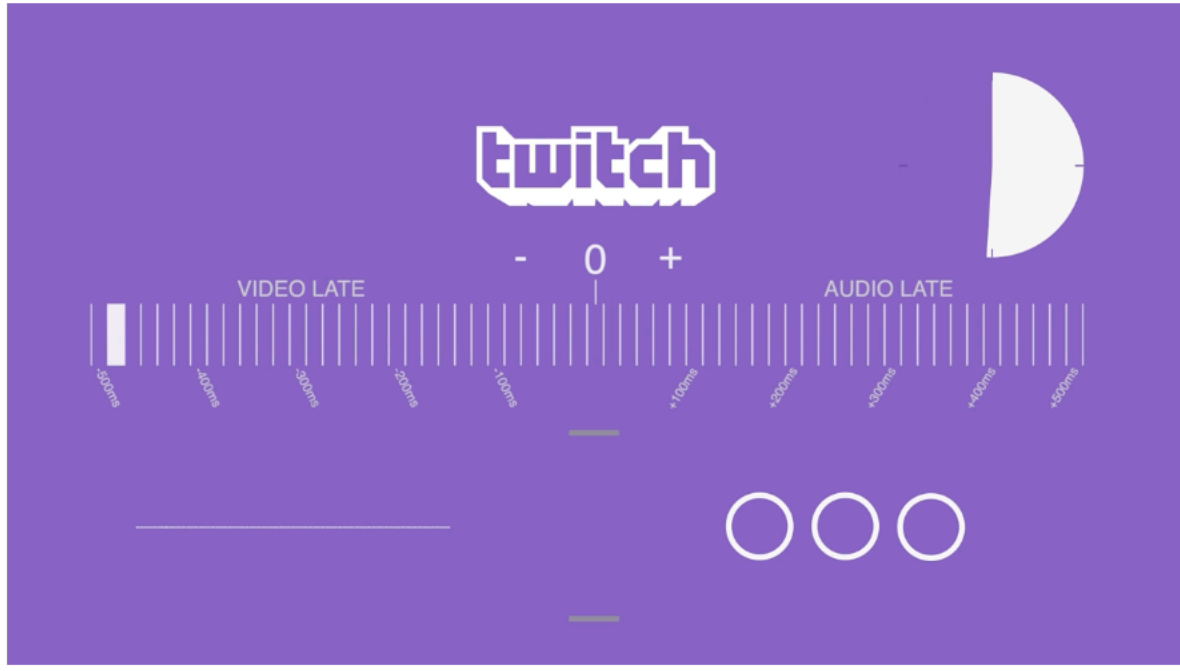
**HTTP Live Streaming 2nd Edition
draft-pantos-hls-rfc8216bis-15**



HLS

...ter/570000203_auto.m3u8?playlistType=lowLatency Select resolution

```
> base_test
  > big_gop
    > live
    > vod
      > mp4
      > ts
        auto.m3u8
        big_001.ts
        big_002.ts
        big_003.ts
        manifest_0.m3u8
    > buffer_gaps
```



Stop

Playback metrics
currentTimestamp: 112112.000

playedVideoFrames: 942.000

NDA

playbackSpeed: 1.050

NDA

totalVideoFrames: 942.000
droppedVideoFrames: 0.000
realFPS: 64.103
playbackFPS: 60.198

NDA

isPaused: false
targetBuffer: 1.500



Переключение между кодеками

```
#EXTM3U
#EXT-X-VERSION:6
#EXT-X-STREAM-INF:BANDWIDTH=342425, CODECS="avc1.42c00c, mp4a.40.2", FRAME-RATE=30.000, NAME="160p"
http://...-player.demo/streams/different_codec/580000212_160p.m3u8?playlistType=lowLatency
#EXT-X-STREAM-INF:BANDWIDTH=217395, CODECS="avc1.4d400c", FRAME-RATE=20.000, NAME="160p_blurred"
http://...-player.demo/streams/different_codec/580000212_160p_blurred.m3u8?playlistType=lowLatency
```



Network

Settings ×

- Preferences
- Workspace
- Experiments
- Ignore List
- Devices
- Throttling**
- Locations
- Shortcuts

Network Throttling Profiles

[Add custom profile...](#)

1600			1600 ms	0%	0	Off
2400			2400 ms	0%	0	Off
4mb	4.0 Mbit/s		0 ms	0%	0	Off
1mb	1.0 Mbit/s		0 ms	0%	0	Off
1.2	1.2 Mbit/s		0 ms	0%	0	Off
loss			0 ms	99%	100	On

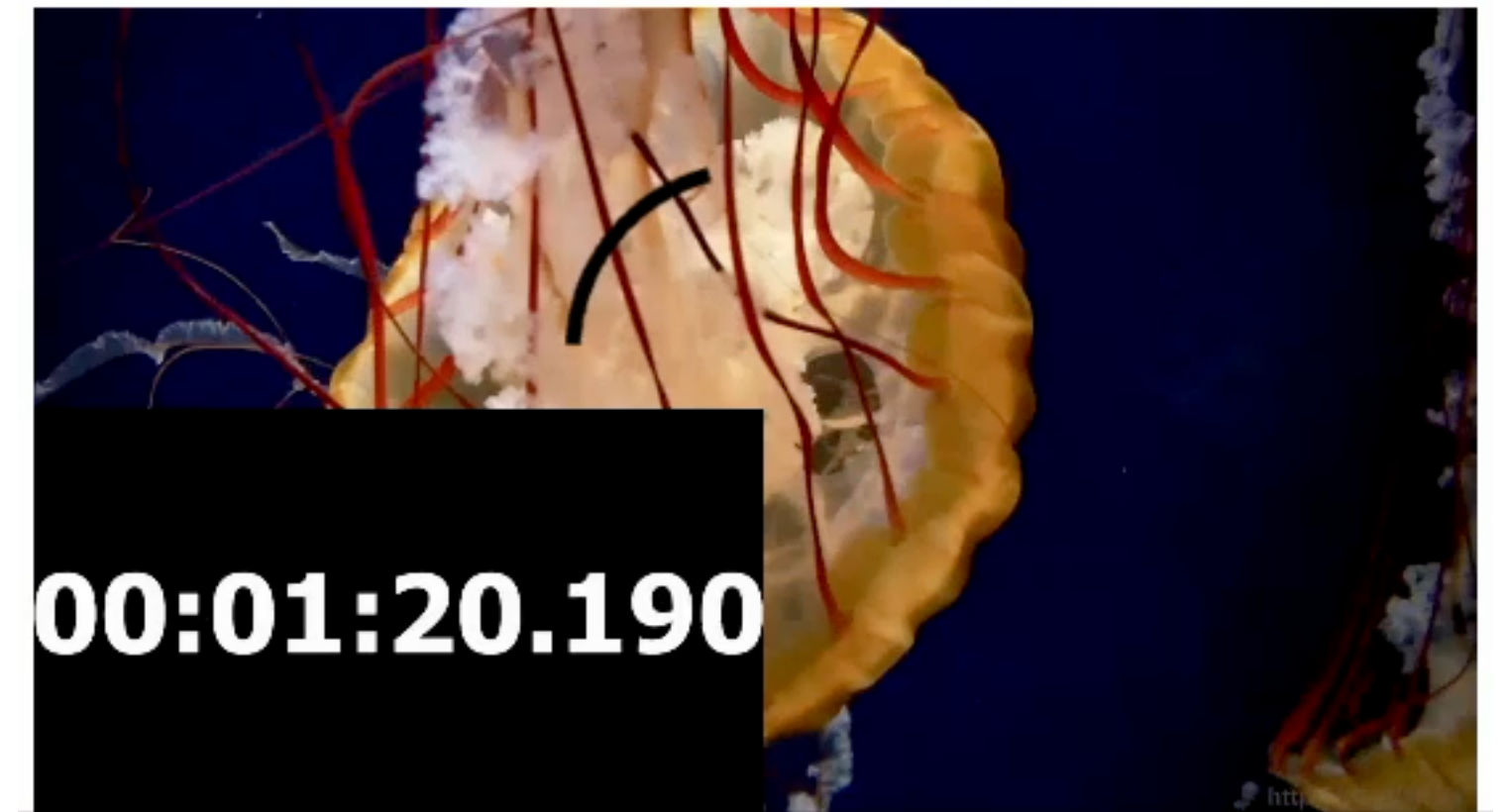
Profile Name	Download	Upload	Latency	Packet Loss	Packet Queue Length	Pac Rec
<input type="text"/>	<input type="text" value="kbit/s"/> optional	<input type="text" value="kbit/s"/> optional	<input type="text" value="ms"/> optional	<input type="text" value="percent"/> optional	<input type="text" value="packet"/> optional	



Network

Chrome DevTools Protocol

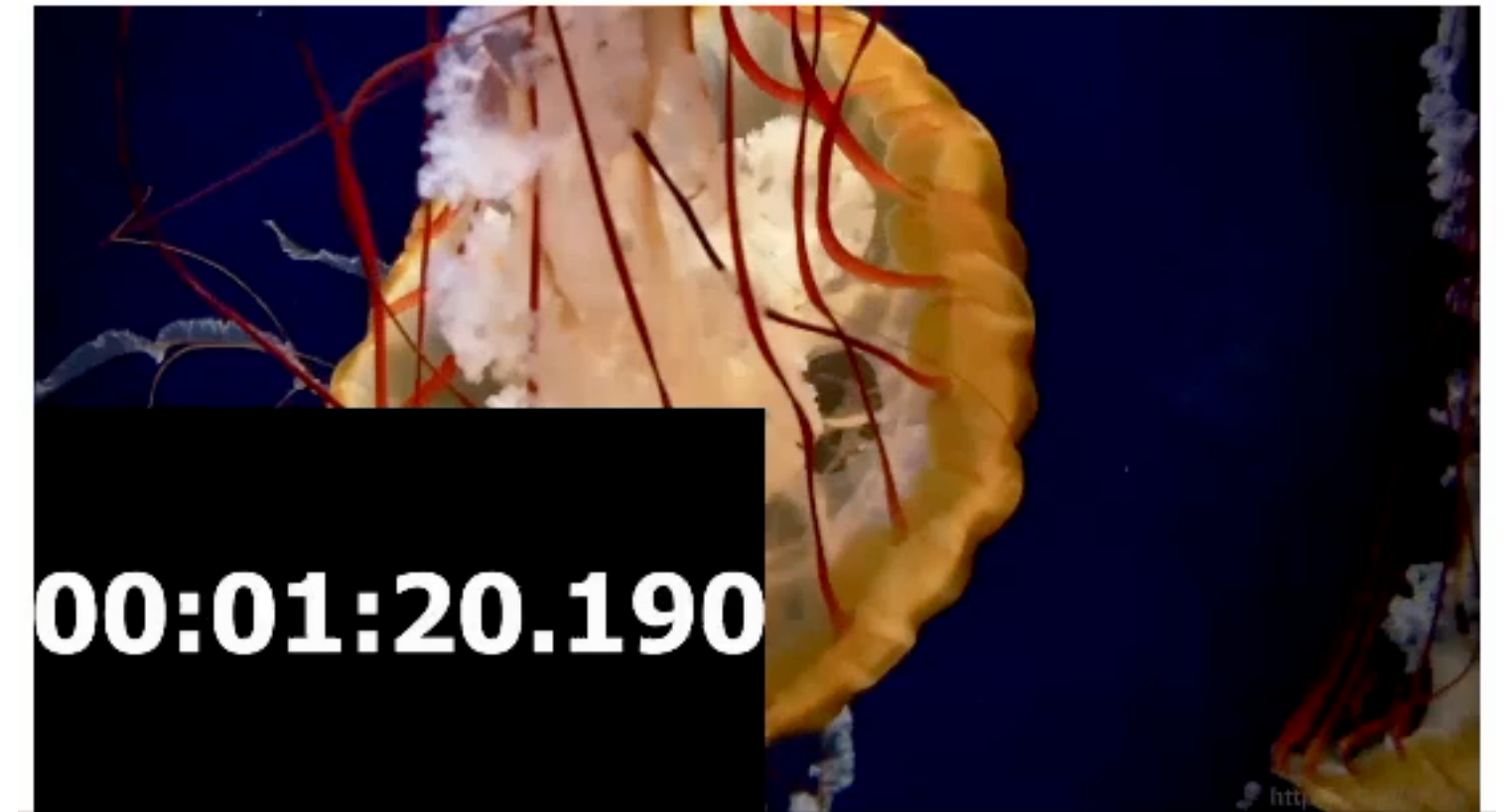
```
Network.emulateNetworkConditions(  
{  
  'offline': True,  
  'latency': -1,  
  'download_throughput': -1,  
  'upload_throughput': -1  
})
```



Network

Chrome DevTools Protocol

```
Network.emulateNetworkConditions(  
{  
  'offline': False,  
  'latency': -1,  
  'download_throughput': -1,  
  'upload_throughput': -1  
})
```



Быстрый старт LL

```
#EXTM3U
#EXT-X-VERSION:6
#EXT-X-TARGETDURATION:2
#EXT-X-INDEPENDENT-SEGMENTS
#EXT-X-MEDIA-SEQUENCE:601
#EXT-X-DISCONTINUITY-SEQUENCE:8
#EXT-X-MAP:URI="https://b-hls-11.nda.com/hls/id/id_1080p_init_bXoH3BGMGTAXqxKr.mp4"
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_601_neNYNFrQQ9aQJZBY_1726491891.mp4
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893.mp4
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895.mp4
```



Быстрый старт LL

```
#EXTM3U
#EXT-X-VERSION:6
#EXT-X-TARGETDURATION:2
#EXT-X-SERVER-CONTROL:CAN-BLOCK-RELOAD=YES,PART-HOLD-BACK=1.500
#EXT-X-PART-INF:PART-TARGET=0.500
#EXT-X-INDEPENDENT-SEGMENTS
#EXT-X-MEDIA-SEQUENCE:601
#EXT-X-DISCONTINUITY-SEQUENCE:8
#EXT-X-MAP:URI="https://b-hls-11.nda.com/hls/id/id_1080p_init_bXoH3BGMGTAXqxKr.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_601_neNYNFrQQ9aQJZBY_1726491891_part0.mp4",INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_601_neNYNFrQQ9aQJZBY_1726491891_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_601_neNYNFrQQ9aQJZBY_1726491891_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_601_neNYNFrQQ9aQJZBY_1726491891_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:51.331+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_601_neNYNFrQQ9aQJZBY_1726491891.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893_part0.mp4",INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:53.357+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895_part0.mp4",INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:55.362+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_604_FKaTYLHEHlzBAcFw_1726491897_part0.mp4",INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_604_FKaTYLHEHlzBAcFw_1726491897_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_1080p_604_FKaTYLHEHlzBAcFw_1726491897_part2.mp4"
#EXT-X-PRELOAD-HINT:TYPE=PART,URI="https://b-hls-11.nda.com/hls/id/id_1080p_604_FKaTYLHEHlzBAcFw_1726491897_part3.mp4"
```



Быстрый старт LL

```
#EXTM3U
#EXT-X-VERSION:6
#EXT-X-TARGETDURATION:2
#EXT-X-SERVER-CONTROL:CAN-BLOCK-RELOAD=YES,PART-HOLD-BACK=1.500
#EXT-X-PART-INF:PART-TARGET=0.500
#EXT-X-INDEPENDENT-SEGMENTS
#EXT-X-MEDIA-SEQUENCE:601
#EXT-X-DISCONTINUITY-SEQUENCE:8
#EXT-X-MAP:URI="https://b-hls-11.nda.com/hls/id/id_1080p_init_bXoH3BGMGTAXqxKp.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4" INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:51.331+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_601_neNYNFrQQ9aQJZBY_1726491891.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4" INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:53.357+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4" INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:55.362+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4" INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PRELOAD-HINT:TYPE=PART,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
```

INDEPENDENT=YES

INDEPENDENT=YES

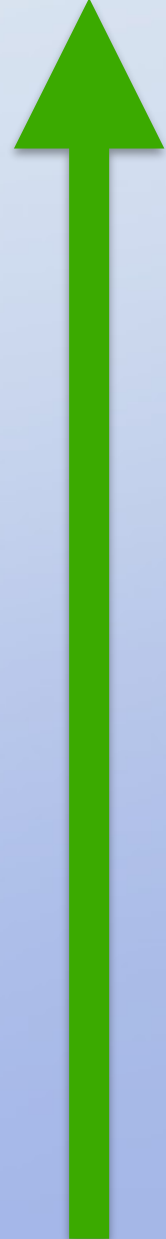
INDEPENDENT=YES

INDEPENDENT=YES



Быстрый старт LL

```
#EXTM3U
#EXT-X-VERSION:6
#EXT-X-TARGETDURATION:2
#EXT-X-SERVER-CONTROL:CAN-BLOCK-RELOAD=YES,PART-HOLD-BACK=1.500
#EXT-X-PART-INF:PART-TARGET=0.500
#EXT-X-INDEPENDENT-SEGMENTS
#EXT-X-MEDIA-SEQUENCE:601
#EXT-X-DISCONTINUITY-SEQUENCE:8
#EXT-X-MAP:URI="https://b-hls-11.nda.com/hls/id/id_1080p_init_bXoH3BGMGTAXqxKp.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4" INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:51.331+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_601_neNYNFrQQ9aQJZBY_1726491891.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4" INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:53.357+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4" INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:55.362+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4" INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PRELOAD-HINT:TYPE=PART,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
```



INDEPENDENT=YES

INDEPENDENT=YES

INDEPENDENT=YES

INDEPENDENT=YES



Быстрый старт LL

```
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_602_MJd1atWth0wvR5hj_1726491893.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4",INDEPENDENT=YES
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
#EXT-X-PROGRAM-DATE-TIME:2024-09-16T13:04:55.362+0000
#EXTINF:2.000
https://b-hls-11.nda.com/hls/id/id_1080p_603_2sffLCQYoYiWzXFz_1726491895.mp4
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4",INDEPENDENT=YES
#EXT-X-PRELOAD-HINT:TYPE=PART,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"
```



Быстрый старт LL

```
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part0.mp4",INDEPENDENT=YES  
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part1.mp4"  
#EXT-X-PART:DURATION=0.500,URI="https://b-hls-11.nda.com/hls/id/id_part2.mp4"  
#EXT-X-PRELOAD-HINT:TYPE=PART,URI="https://b-hls-11.nda.com/hls/id/id_part3.mp4"
```



HLS ABR

```
#EXTM3U
#EXT-X-VERSION:6
#EXT-X-STREAM-INF:BANDWIDTH=3000,RESOLUTION=284x160,NAME=160p
http://-player.demo/streams/live_stream/ts/{}/manifest_0.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=850000,RESOLUTION=426x240,NAME=240p
http://-player.demo/streams/live_stream/ts/{}/manifest_1.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=1500000,RESOLUTION=854x480,NAME=480p
http://-player.demo/streams/live_stream/ts/{}/manifest_2.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=3748000,RESOLUTION=1280x720,NAME=720p
http://-player.demo/streams/live_stream/ts/{}/manifest_3.m3u8
```



HLS ABR

```
#EXTM3U
#EXT-X-VERSION:6
#EXT-X-STREAM-INF BANDWIDTH=3000 RESOLUTION=284x160,NAME=160p
http://-player.demo/streams/live_stream/ts/{}/manifest_0.m3u8
#EXT-X-STREAM-INF BANDWIDTH=850000 RESOLUTION=426x240,NAME=240p
http://-player.demo/streams/live_stream/ts/{}/manifest_1.m3u8
#EXT-X-STREAM-INF BANDWIDTH=1500000 RESOLUTION=854x480,NAME=480p
http://-player.demo/streams/live_stream/ts/{}/manifest_2.m3u8
#EXT-X-STREAM-INF BANDWIDTH=3748000 RESOLUTION=1280x720,NAME=720p
http://-player.demo/streams/live_stream/ts/{}/manifest_3.m3u8
```



HLS ABR

Chrome DevTools Protocol

```
Network.emulateNetworkConditions(  
{  
  'offline': False,  
  'latency': -1,  
  'download_throughput': 2000000,  
  'upload_throughput': -1  
})
```

```
#EXTM3U  
#EXT-X-VERSION:6  
#EXT-X-STREAM-INF:BANDWIDTH=3000,RESOLUTION=28  
http://-player.demo/streams/workaround/live_st  
#EXT-X-STREAM-INF:BANDWIDTH=850000,RESOLUTION=  
http://-player.demo/streams/workaround/live_st  
#EXT-X-STREAM-INF BANDWIDTH=1500000 RESOLUTION  
http://-player.demo/streams/workaround/live_st  
#EXT-X-STREAM-INF:BANDWIDTH=3748000,RESOLUTION  
http://-player.demo/streams/workaround/live_st
```



HLS ABR

Chrome DevTools Protocol

```
Network.emulateNetworkConditions(  
{  
  'offline': False,  
  'latency': -1,  
  'download_throughput': 2000000,  
  'upload_throughput': -1  
})
```

```
#EXTM3U  
#EXT-X-VERSION:6  
#EXT-X-STREAM-INF BANDWIDTH=3000,RESOLUTION=28  
http://-player.demo/streams/workaround/live_st  
#EXT-X-STREAM-INF BANDWIDTH=850000,RESOLUTION=  
http://-player.demo/streams/workaround/live_st  
#EXT-X-STREAM-INF BANDWIDTH=1500000,RESOLUTION=  
http://-player.demo/streams/workaround/live_st  
#EXT-X-STREAM-INF:BANDWIDTH=3748000,RESOLUTION=  
http://-player.demo/streams/workaround/live_st
```



HLS ABR

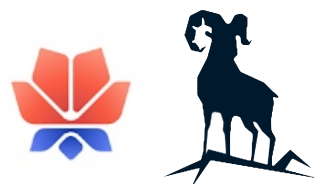
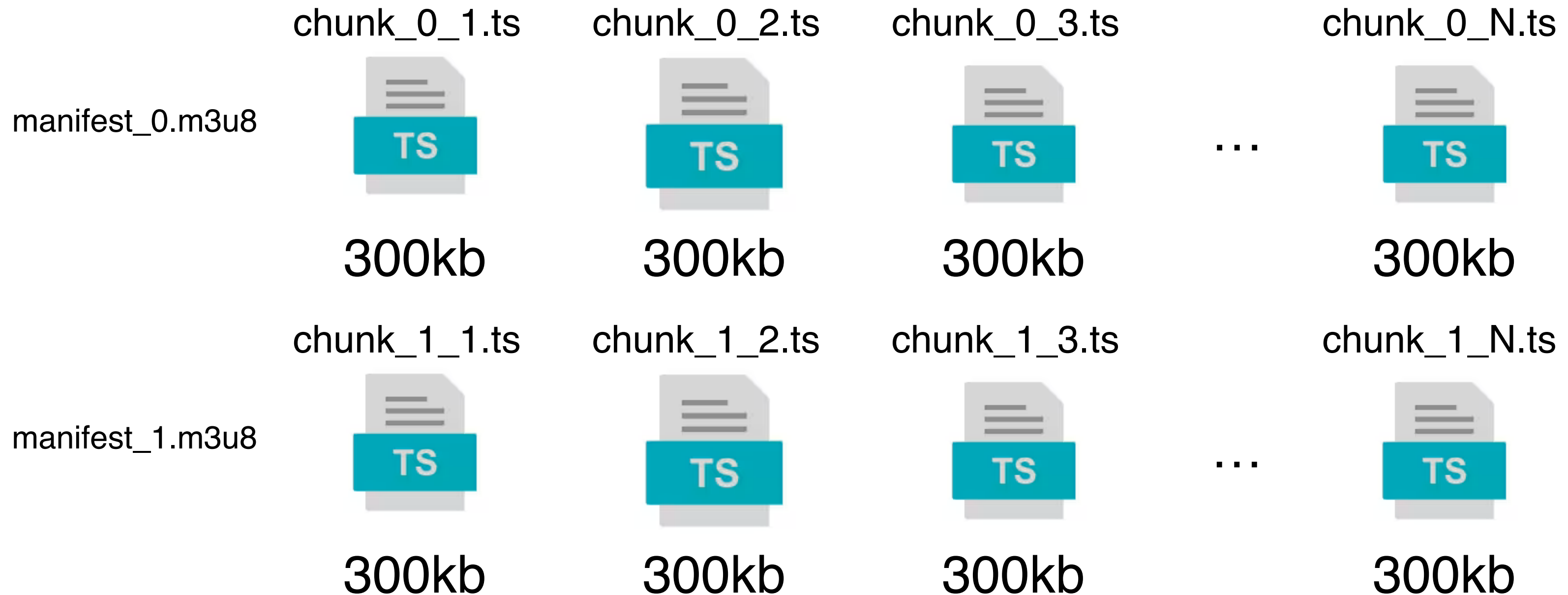
Chrome DevTools Protocol

```
Network.emulateNetworkConditions(  
{  
  'offline': False,  
  'latency': 2400,  
  'download_throughput': -1,  
  'upload_throughput': -1  
}  
)
```



HLS ABR


```
ffmpeg -re -stream_loop -1 -i "/path_to_input_file" \  
-minrate {bitrate}k -maxrate {bitrate}k -bufsize {bitrate}k
```

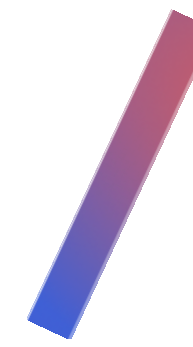


HLS ABR


Chrome DevTools Protocol

```
Network.emulateNetworkConditions(  
{  
  'offline': False,  
  'latency': 2400,  
  'download_throughput': -1,  
  'upload_throughput': -1  
})
```


300 kb

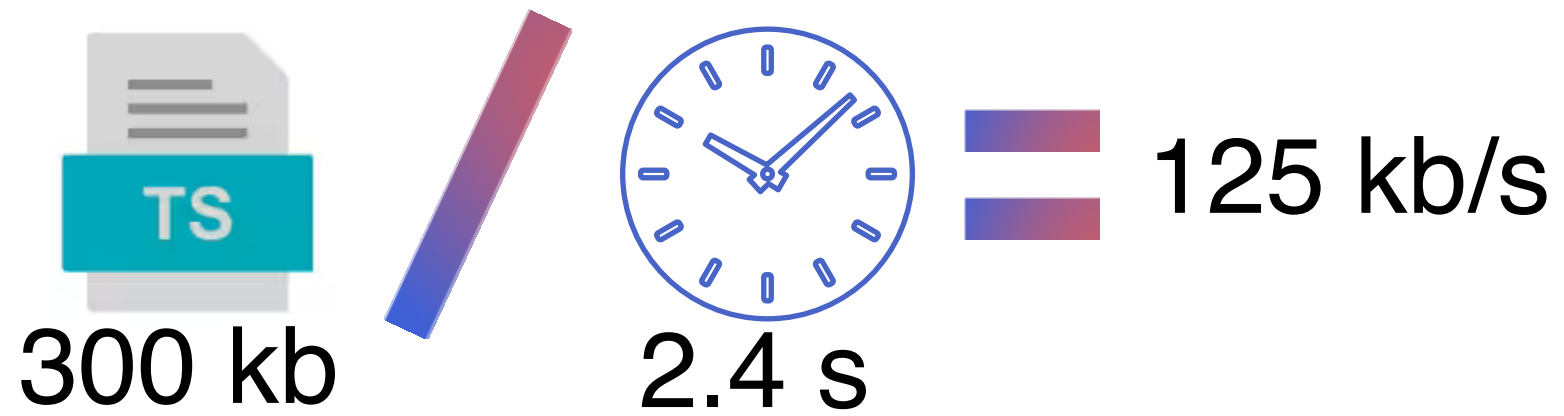



2.4 s

 125 kb/s



HLS ABR



```
#EXTM3U
#EXT-X-VERSION:6
#EXT-X-STREAM-INF:BANDWIDTH=3000,RESOLUTION=284x160,NAME=1
http://player.demo/streams/live_stream/ts/{}/manifest_0.m3
#EXT-X-STREAM-INF:BANDWIDTH=850000,RESOLUTION=426x240,NAME
http://player.demo/streams/live_stream/ts/{}/manifest_1.m3
#EXT-X-STREAM-INF:BANDWIDTH=1500000,RESOLUTION=854x480,NAM
http://player.demo/streams/live_stream/ts/{}/manifest_2.m3
#EXT-X-STREAM-INF:BANDWIDTH=3748000,RESOLUTION=1280x720,NA
http://player.demo/streams/live_stream/ts/{}/manifest_3.m3
```



1. Что такое Mouflon Media Engine
2. Стек тестирования
3. Автоматизация подачи
4. Автоматизация проверки транскодинга
5. Автоматизация проверки плейбека
6. Проверки на стадии концепта



Latency (WebRTC)

Anatomy of a WebRTC SDP

See the source post by Antón Román for more details.

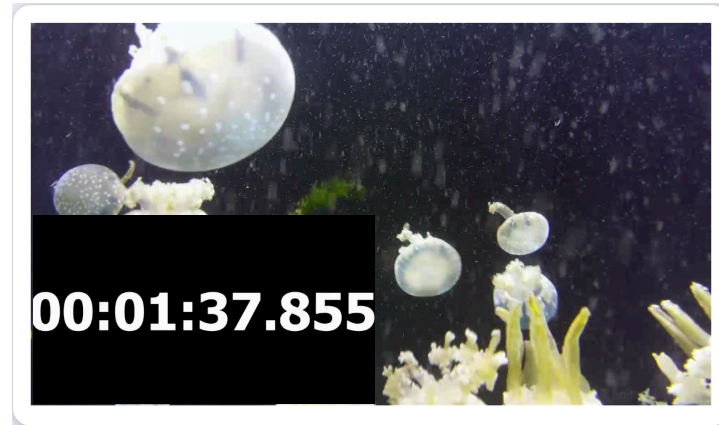
Global Lines
o=- 4611731400430051336 2 IN IP4 127.0.0.1
s=-
t=0 0
a=group:BUNDLE 0 1
a=msid-semantic: WMS lgsCFqt9kN2fVKw5wg3NKqGdATQoltEwOdMS

Audio Lines
m=audio 58779 UDP/TLS/RTP/SAVPF 111 103 104 9 0 8 106 105 13 126
c=IN IP4 217.130.243.155
a=rtpmap:51472 IN IP4 217.130.243.155

ICE Candidates
a=candidate:1467250027 1 udp 2122260223 192.168.0.196 46243 typ host generation 0
a=candidate:1467250027 2 udp 2122260222 192.168.0.196 56280 typ host generation 0
a=candidate:435653019 1 tcp 1845501695 192.168.0.196 0 typ host tcptype active generation 0



Latency (WebRTC)

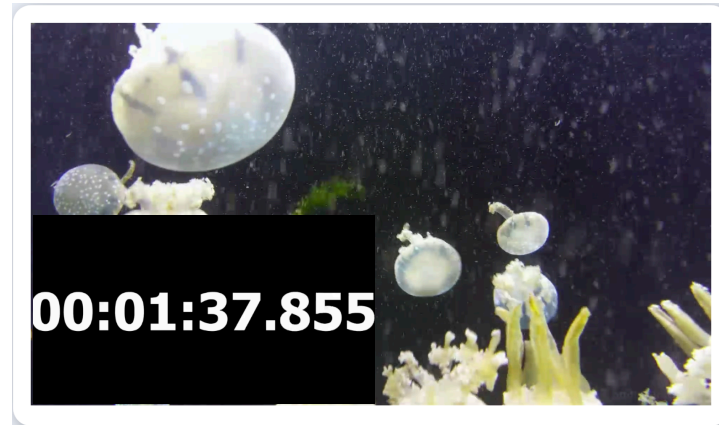


WebRTC

SDP + Added timestamp

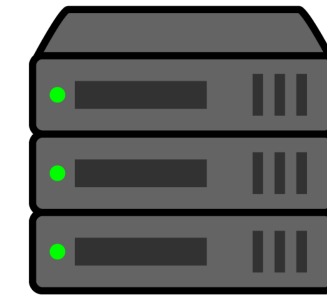


Latency (WebRTC)

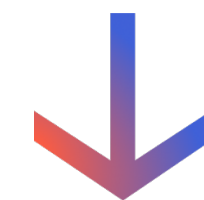
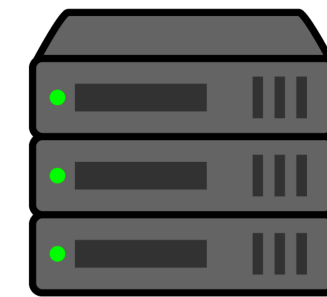


WebRTC

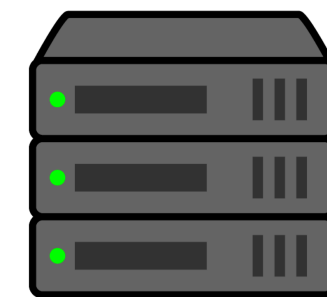
SDP + Added timestamp



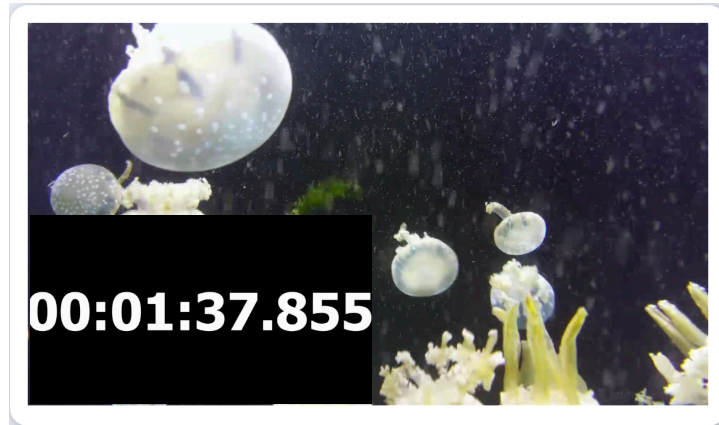
+ time



+ time

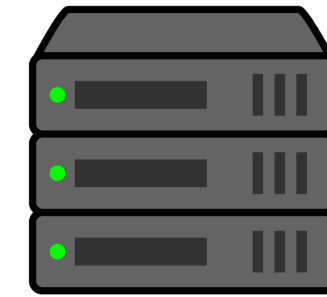


Latency (WebRTC)

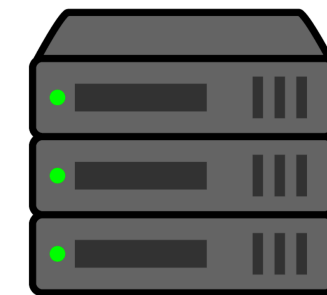


WebRTC

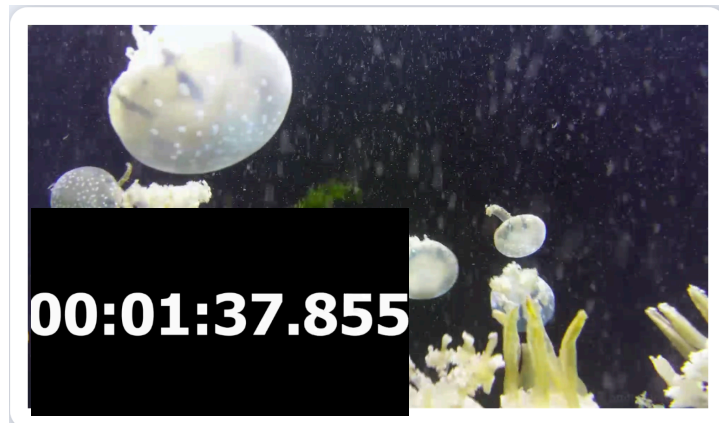
SDP + Added timestamp



+ time

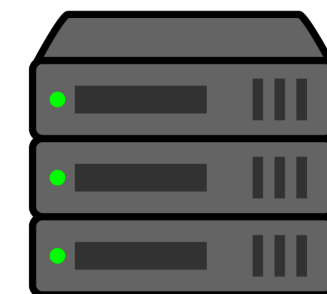


+ time



WebRTC

Changed timestamp



Lip sync

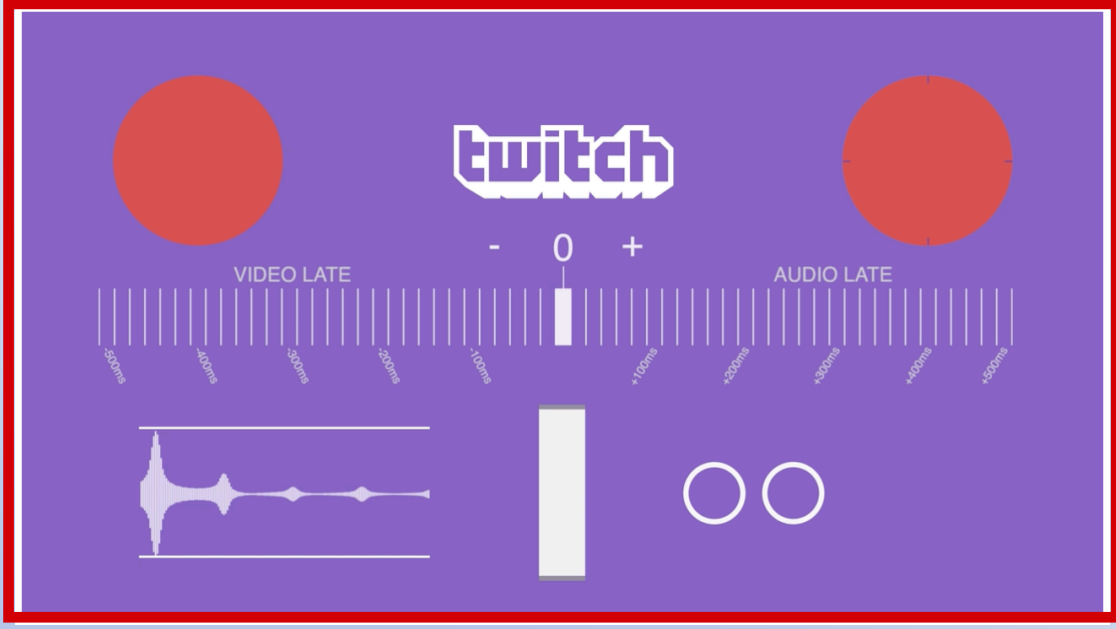


Lip sync

ffmpeg -re -stream_loop ...

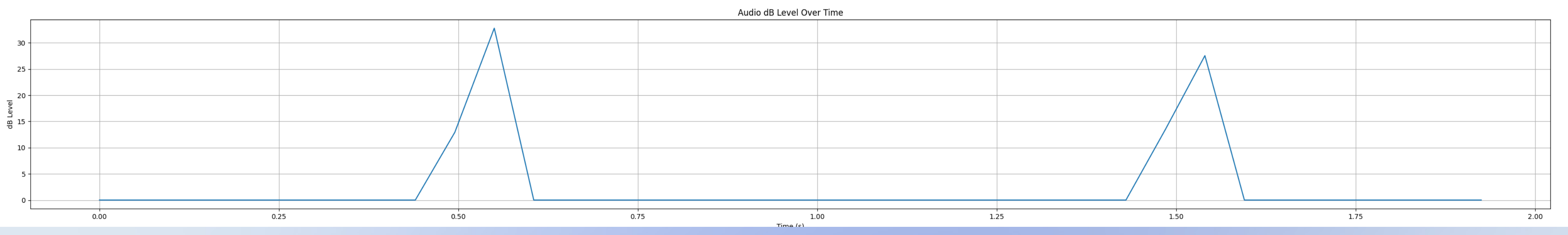


ffmpeg -f avfoundation ...



Lip sync

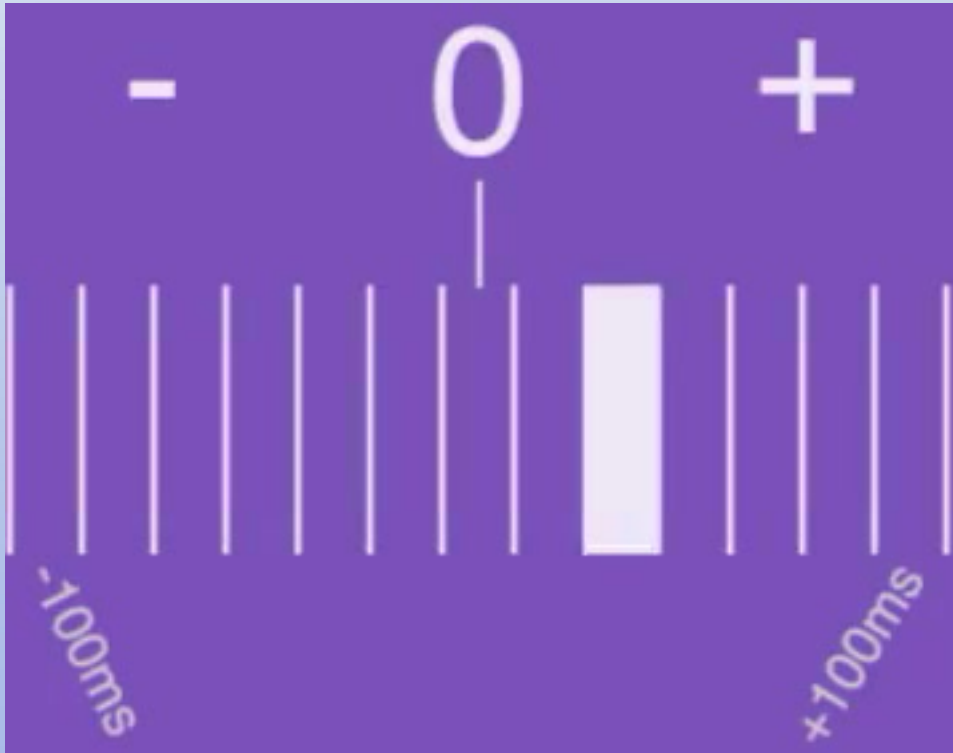
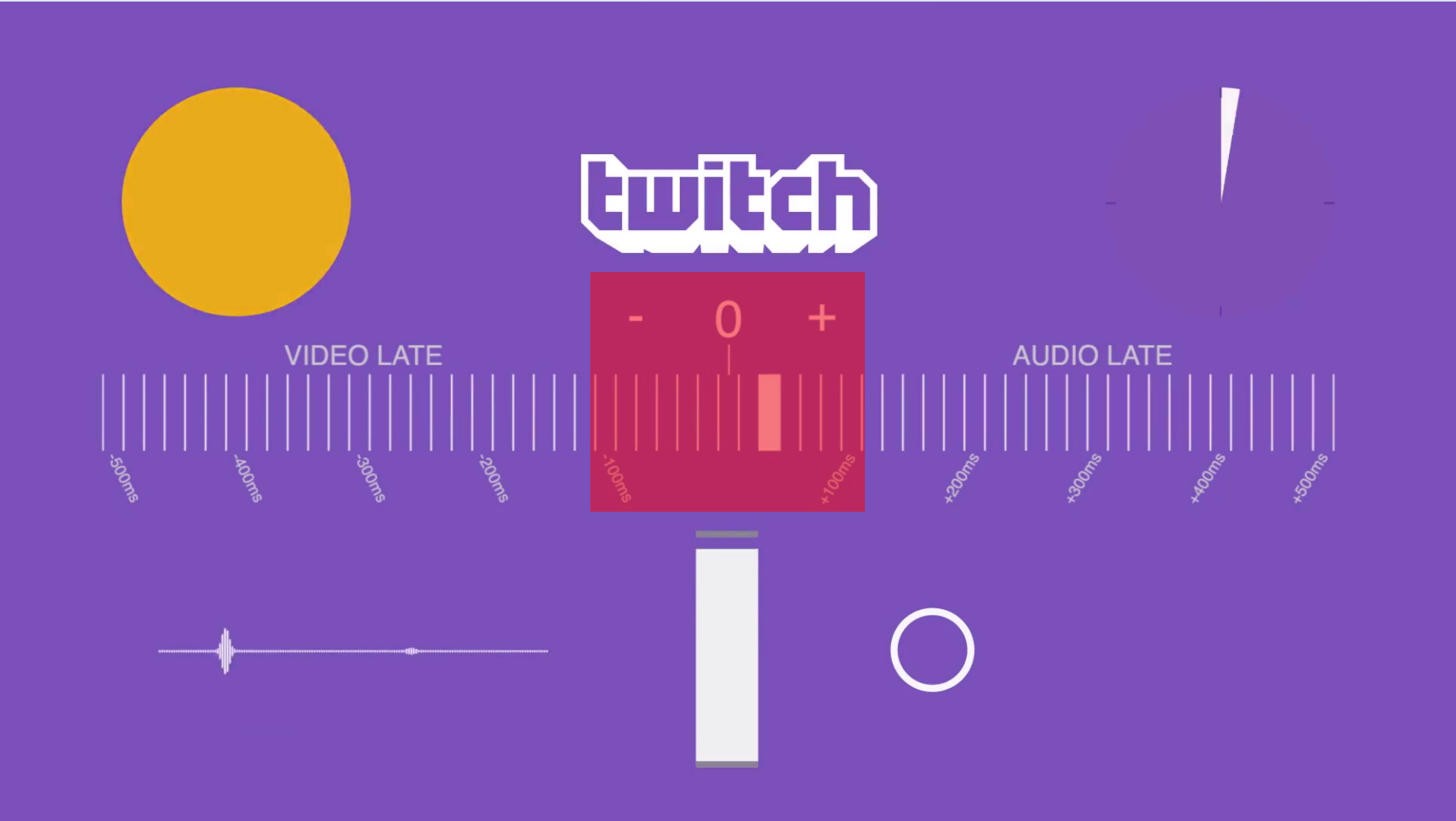
The image displays five sequential panels illustrating lip sync adjustments for the word "twitch". Each panel features a central "twitch" logo and a control interface with a slider between "VIDEO LATE" and "AUDIO LATE" markers, and a central "0" marker. Below the slider is a waveform and a visual representation of the lip shape. The panels show the lip shape changing from a simple white semi-circle to a yellow circle, then to a white semi-circle, a white quarter circle, and finally a white eighth circle, demonstrating the visual effect of audio delay.



Lip sync

Frame from 0:00:00.520

Check result on part

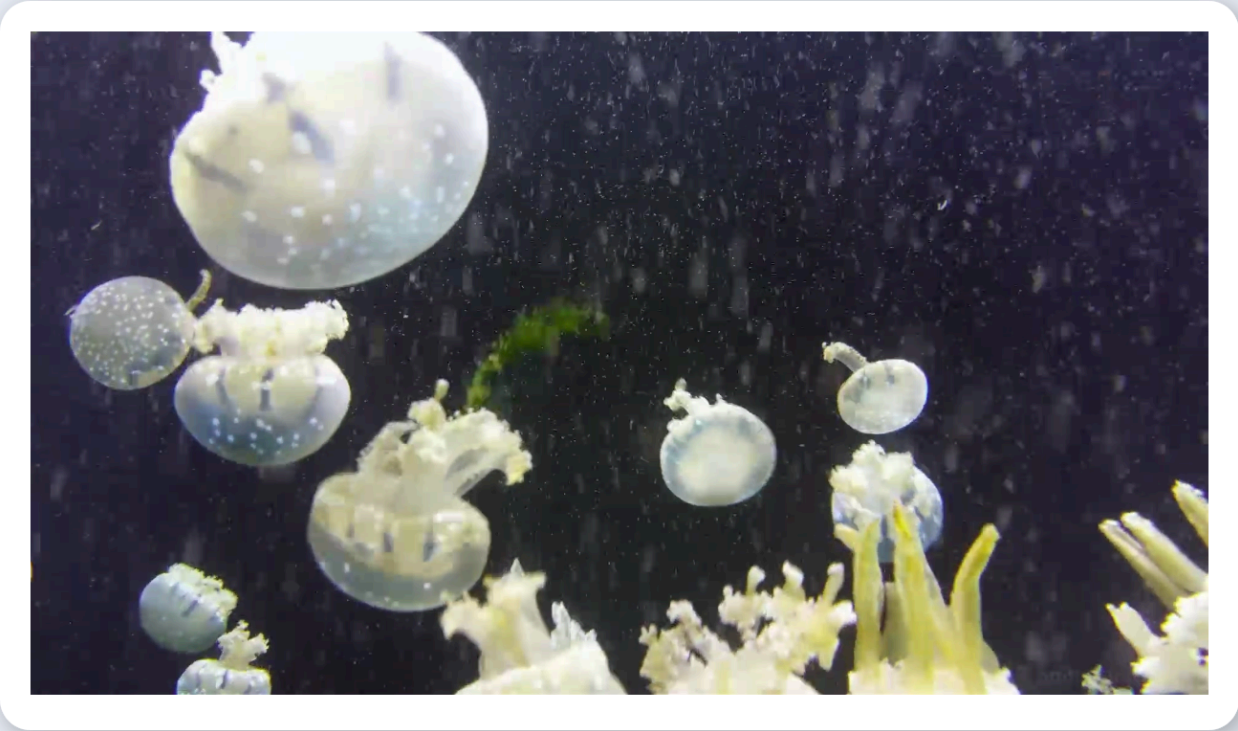


Tests concepts

AV sync

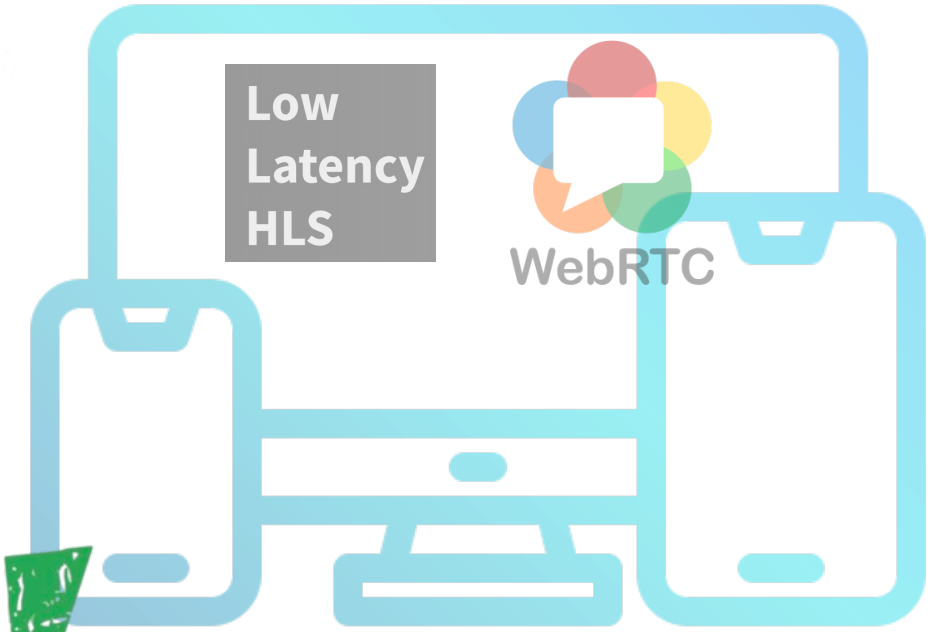
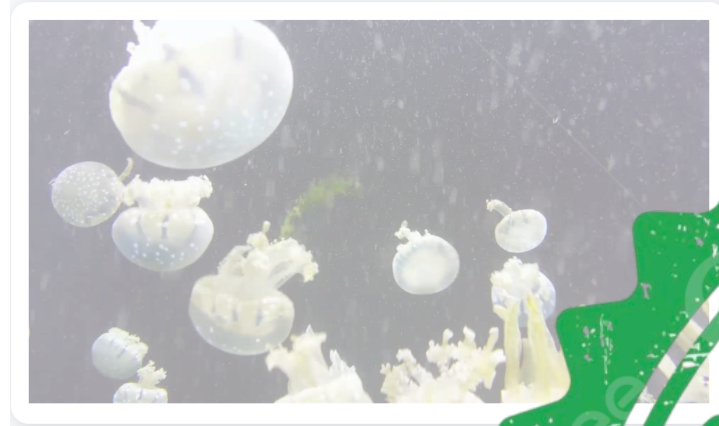
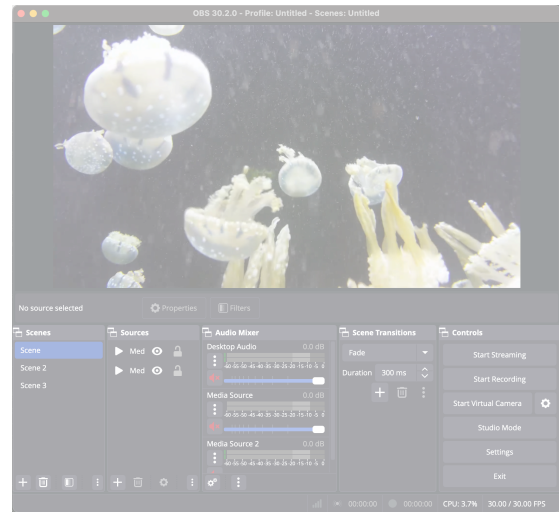


Latency (WebRTC)



SDP + Added timestamp





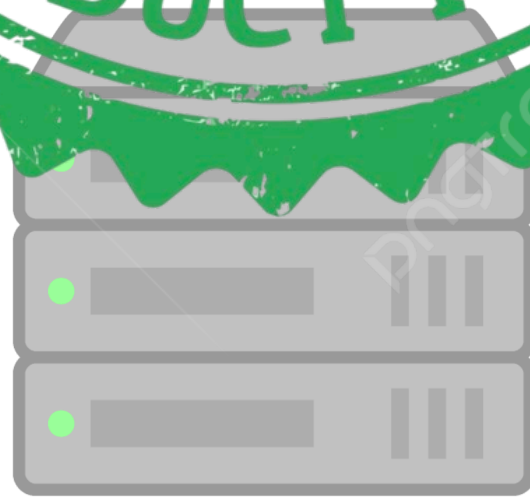
RTMP

WebRTC

TESTED

PRODUCT TESTED

PRODUCT TESTED



Origins

Transcoders

Edges



**Live streaming:
куда жать, чтобы
протестировать?**

mayflower.work



Куда жать то?

Mouflon Media Server

The screenshot displays three stages of a CI/CD pipeline for Mouflon Media Server:

- build**: Contains jobs 'cdn_dbg_', 'cdn_prd_', and 'deployment'.
- test**: Contains jobs 'run_dbg_integration_tests', 'run_prd_integration_tests', and 'run_..._regression_tests'. A green arrow points to the 'run_..._regression_tests' job, which has a 'Trigger job' button below it.
- deploy**: Contains jobs 'dev_deployment' and 'prd_deployment', both with 'Trigger job' buttons.

Mouflon Media Player

The screenshot displays three stages of a CI/CD pipeline for Mouflon Media Player:

- build**: Contains jobs 'Build demo' and 'Build package'. A green arrow points to the 'Build demo' job.
- prepare_tests**: Contains jobs 'build_image' and 'prepare_branch_name'.
- python_tests**: Contains the job 'tests_qa_python' with a 'Trigger job' button below it.





Setup

Platform ... UP
Player ... UP
Nginx ... UP

def test_1()

```
# subprocess.Popen(ffmpeg)
Broadcast().add_stream()
# subprocess.Popen(ffprobe)
Transcoding().get_tracks_from_manifest()

assert 'something'
```

def test_2()

```
driver.open('http://player.demo')
Player().open_stream('http://path_to_playlist')
Player().wait_played_frames()

assert 'somthing'
```

===== failed, passed, skipped in =====



Егор Сатурьянц



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