



WARP Draft - Update

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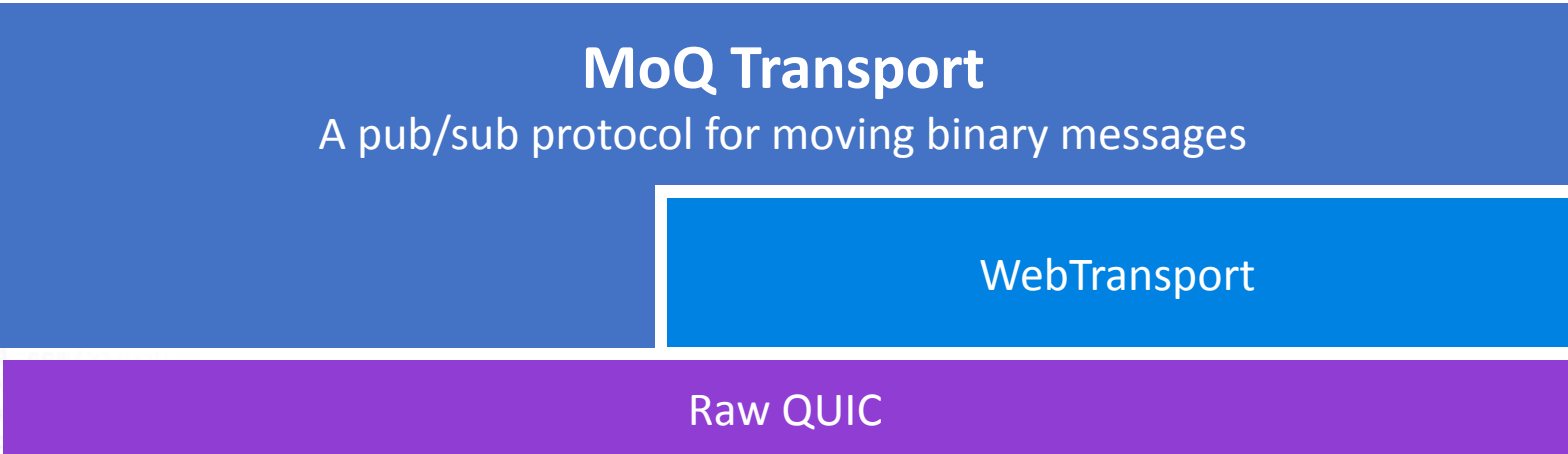
Repo: <https://github.com/moq-wg/warp-streaming-format>

Issues: <https://github.com/moq-wg/warp-streaming-format/issues>

Agenda for today

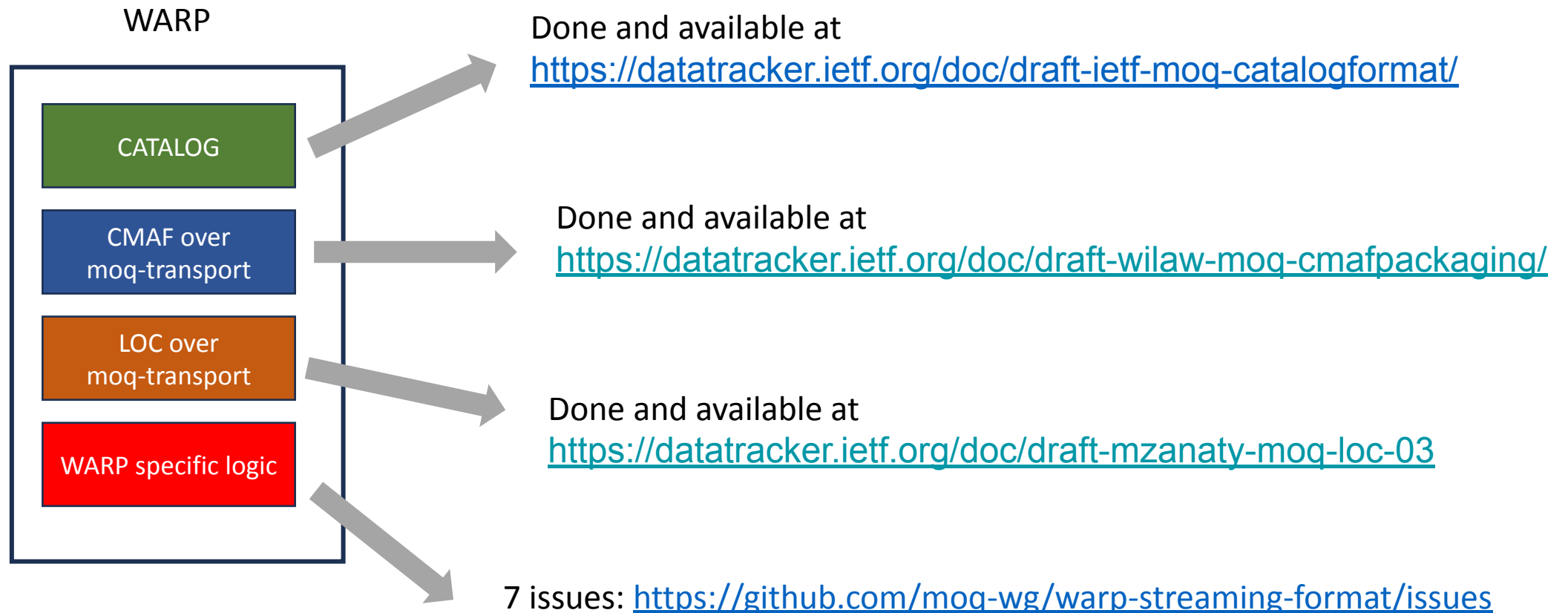
1. Brief overview of linked specifications
2. Discuss PRs
 - a. [#27](#) - Adding LOC packaging
 - b. [#26](#) - Timeline tracks
3. Core features that need development

Where does WARP fit in to the architecture?



CDN

WARP components



PR #27 - Adding LOC packaging

- Provides the ability for WARP tracks to carry either CMAF-packaged or LOC-packaged bitstreams.
- The packaging field of the catalog must use one of the following values

Packaging field value	Condition	Explanation
cmaf-frag-per-group	CMAFpackaging 4.1 is active	Each CMAF Fragment is placed in a single MOQT Object and there is one MOQT Object per MOQT Group
cmaf-chunk-per-object	CMAFpackaging 4.2 is active	Each CMAF chunk is placed in a MOQT Object and there is one MOQT Group per CMAF Fragment
loc	LOC packaging is active	Each EncodedAudioChunk or EncodedVideoChunk sample is placed in a separate MOQT Object

Example catalog with LOC and CMAF packaging

```
{
  "version": 1, "streamingFormat": 1, "streamingFormatVersion": "0.2",
  "commonTrackFields": {
    "namespace": "output.example.com/event/12345",
    "renderGroup": 1
  },
  "tracks": [
    {
      "name": "video",
      "selectionParams": {"codec": "avc1.64001f", "mimeType": "video/mp4", "width": 1280, "height": 720, "framerate": 30, "bitrate": 4952892},
      "initTrack": "init_video_720",
      "packaging": "cmaf-frag-per-group"
    },
    {
      "name": "audio",
      "selectionParams": {"codec": "opus", "samplerate": 48000, "channelConfig": "2", "bitrate": 32000},
      "packaging": "loc"
    }
  ]
}
```

PR #26 - Timeline proposal

- The timeline track provides data about the previously published groups and object and their relationship to
 - wall-clock time
 - media time
 - associated timed-metadata.
- Timeline tracks allow players to seek to precise points behind the live head in a live broadcast, or for random access in a VOD asset.
- A timeline track may also be used to insert events at media times which do not correlate with Object boundaries.
- Timeline tracks are optional. Multiple timeline tracks MAY exist inside a catalog.

Timeline track proposal

Timeline tracks are csv files. Why?

- Low overhead, easy to read & parse
- Simply concatenation using media time as the ordering key
- Easily debugged without a parser.
- CBOR in the future?

```
MEDIA_PTS,GROUP_ID,OBJECT_ID,WALLCLOCK,METADATA
0,0,0,1698351160,
2002,1,0,1698353162,
4004,2,0,1698355164,
6006,3,0,1698357166,
8008,4,0,1698359168,
10010,5,0,1698361170,
12012,6,0,1698363172,
14014,7,0,1698365174,
16016,8,0,1698367176,
18018,9,0,1698369178,
20020,10,0,1698371180,
22022,11,0,1698373182,
24024,12,0,1698375184,
...
```

A player wanting to seek to 1698363173 would FETCH from Group 6.

Example with object-aligned JSON metadata

```
MEDIA_PTS,GROUP_ID,OBJECT_ID,WALLCLOCK,METADATA
0,0,0,1698351160,"{"score":{"England":0,"Spain":0}}"
2002,1,0,1698353162,
4004,2,0,1698355164,
6006,3,0,1698357166,
8008,4,0,1698359168,
10010,5,0,1698361170,
12012,6,0,1698363172,
14014,7,0,1698365174,
15020,7,2,1698366180,"{"score":{"England":1,"Spain":0}}"
16016,8,0,1698367176,
18018,9,0,1698369178,
20020,10,0,1698371180,
22022,11,0,1698373182,
24024,12,0,1698375184,
```

Example with object-aligned XML metadata

MEDIA_PTS, GROUP_ID, OBJECT_ID, WALLCLOCK, METADATA

0,0,0,1698351160,{"score":{"England":0,"Spain":0}}

2002,1,0,1698353162,

4004,2,0,1698355164,

6006,3,0,1698357166,

8008,4,0,1698359168,

80163,,,,"<Event id='6'

presentationTime='80163'><scte35:signal><scte35:binary>/DBhAAAAAAAAA///wBQb+qM1
E7QBLAhdDVUVJSAAArX+fCAgAAAAALLXnTUCAAIXQ1VFSUgAACZ/nwglAAAAACyy15
0RAAACF0NVRUIIAAAnf58ICAAAAAAsstezEAAIhiGnw==</scte35:binary></scte35:signa
l></Event>"

10010,5,0,1698361170,

12012,6,0,1698363172,

14014,7,0,1698365174,

15020,7,2,1698366180,{"score":{"England":0,"Spain":1}}

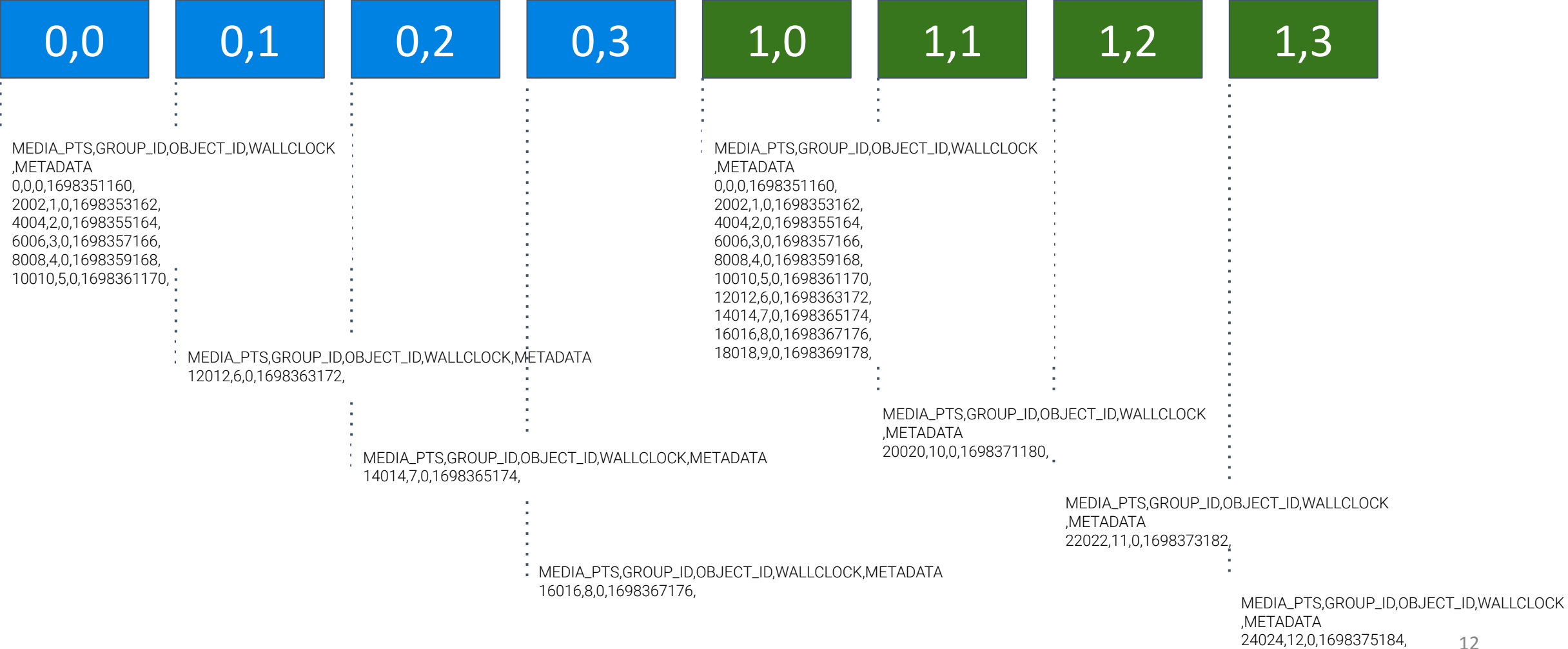
Timeline reference in a catalog

```
{
  "version": 1, "streamingFormat": 1, "streamingFormatVersion": "0.2",
  "commonTrackFields": {
    "namespace": "conference.example.com/conference123/alice", "packaging": "loc", "renderGroup": 1
  },
  "tracks": [
    {
      "name": "live-timeline",
      "type": "timeline",
      "depends": ["video", "audio"]
    },
    {
      "name": "video",
      "selectionParams": {"codec": "av01.0.08M.10.0.110.09", "width": 1920, "height": 1080, "framerate": 30, "bitrate": 1500000}
    },
    {
      "name": "audio",
      "selectionParams": {"codec": "opus", "samplerate": 48000, "channelConfig": "2", "bitrate": 32000}
    }
  ]
}
```

Timeline updates

Group ID, Object ID)

No longer than 30s between full updates



Core issues remaining

- **Finalize CMAF/LOC stream mapping** *based on Object Model to Transport Mapping* [#333](#)
- **Communicating** what groups are available over time for clipping and DVR.
- Finalize **simulcast**
- **Object prioritization** (*MOQT dependency*)
- **Bitrate adaptation** (client side and/or server side) (*MOQT dependency - Sender-side ABR* [#259](#))
- **Advertising insertion** (*MOQT dependency*) - *should also work with real-time latency*
- **DRM** – define and add Schema and pssh data to catalog as track properties. (*catalog dependency*)