WARP Draft - Update
IETF #119, Brisbane, 16-22 March 2024
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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. Reminder of what WARP is
2. Improvements since IETF #118
3. Discuss issues
   a. #22 - How does the client learn about group numbers and their relationship to media time and wallclock time?
   b. #13 Does catalog specification need to be CMAF-specific?
4. Core features that need development
Where does WARP fit in to the architecture?

MoQ Transport
A pub/sub protocol for moving binary messages

WebTransport

Raw QUIC

WARP
Streaming Format

LOC
Streaming Format

Chat Format

APP

CDN
WARP comprised of reusable components.

- Defines versioning, catalog naming, track operations, track relationships, packaging declarations.
- Specifies how to package CMAF content for carriage over a moq-transport/catalog environment.
- Specifies how to package LOC content for carriage over a moq-transport/catalog environment.
- Specifies media to MOQT bindings, MOQT behaviors, Timeline track, Content Protection, ABR, Ad insertion etc.

6 issues: https://github.com/moq-wg/warp-streaming-format/issues

Done and available at https://datatracker.ietf.org/doc/draft-wilaw-moq-catalogformat/

Done and available at https://datatracker.ietf.org/doc/draft-wilaw-moq-cmafpackaging/

Done and available at https://www.ietf.org/archive/id/draft-mzanaty-moq-loc-03.html
PR#20: CMAF Packaging for moq-transport

Removed CMAF packaging definition from WARP draft and moved it to an independent draft https://datatracker.ietf.org/doc/draft-wilaw-moq-cmafpackaging/

Defines an interoperable method of transmitting CMAF [CMAF] compliant media content over Media Over QUIC Transport (MOQT) [MoQTransport].

CMAF Track === MOQT Track
CMAF Switching Set === time-aligned MOQT Tracks

This draft maps CMAF objects to MOQT objects. The mapping of MOQT Objects to MOQT Streams is defined by the Streaming Format.
PR#19 Update WARP Streaming Format to reference an external catalog definition

- Catalog definition has been externalized to an independent draft (recently adopted)
- WARP spec mandates that the catalog track must be named “catalog”.

```json
{
  "version": 1,
  "sequence": 0,
  "streamingFormat": 1,
  "streamingFormatVersion": "0.2",
  "commonTrackFields": {
    "namespace": "output.example.com/event/12345",
    "renderGroup": 1
  },
  "tracks": [
    {
      "name": "video0",
      "selectionParams": {
        "codec": "avc1.64001f",
        "mimeType": "video/mp4",
        "width": 1280,
        "height": 720,
        "framerate": 30,
        "bitrate": 4952892
      },
      "initTrack": "init_video_720",
      "packaging": "cmaf"
    },
    {
      "name": "audio",
      "selectionParams": {
        "codec": "opus",
        "samplerate": 48000,
        "channelConfig": "2",
        "bitrate": 32000
      },
      "packaging": "loc"
    }
  ]
}
```
Timeline proposal

- A special ‘timeline’ track is produced which describes the availability of groups with respect to media time and wallclock time.
- May also carry media time events which can be used by the player in constructing a UI. “Goal”, “Penalty” - etc
- This track can be used by the player for seeking to request specific portions of a DVR window in a live stream, or to any portion of a VOD asset.
- This may be used for advertising insertion at a later date.

```c
// Group number, wall-clock time, media PTS
[
{0,1698351160362,0}
{1,1698353162362,2002}
{2,1698355164362,4004}
...
{3745,1705848650198,7497490}
]
```
Timeline proposal

Roughly at every GOP interval, the timeline track will need to be extended. This is an append-only operation, so JSON-PATCH seems like overkill. CSV as a file format would be simpler, as the update could simply include the new line.

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</table>

We may actually want two timelines tracks:

- One that always provides a complete view up to the current time
- Another that only ever provides per-Group updates.
Core issues remaining

- Finalize CMAF/LOC stream mapping based on Object Model to Transport Mapping #333
- Integrate LOC packaging
- Seeking & DVR - including timeline track.
- 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)