



Fraunhofer FOKUS Institute for Open Communication Systems

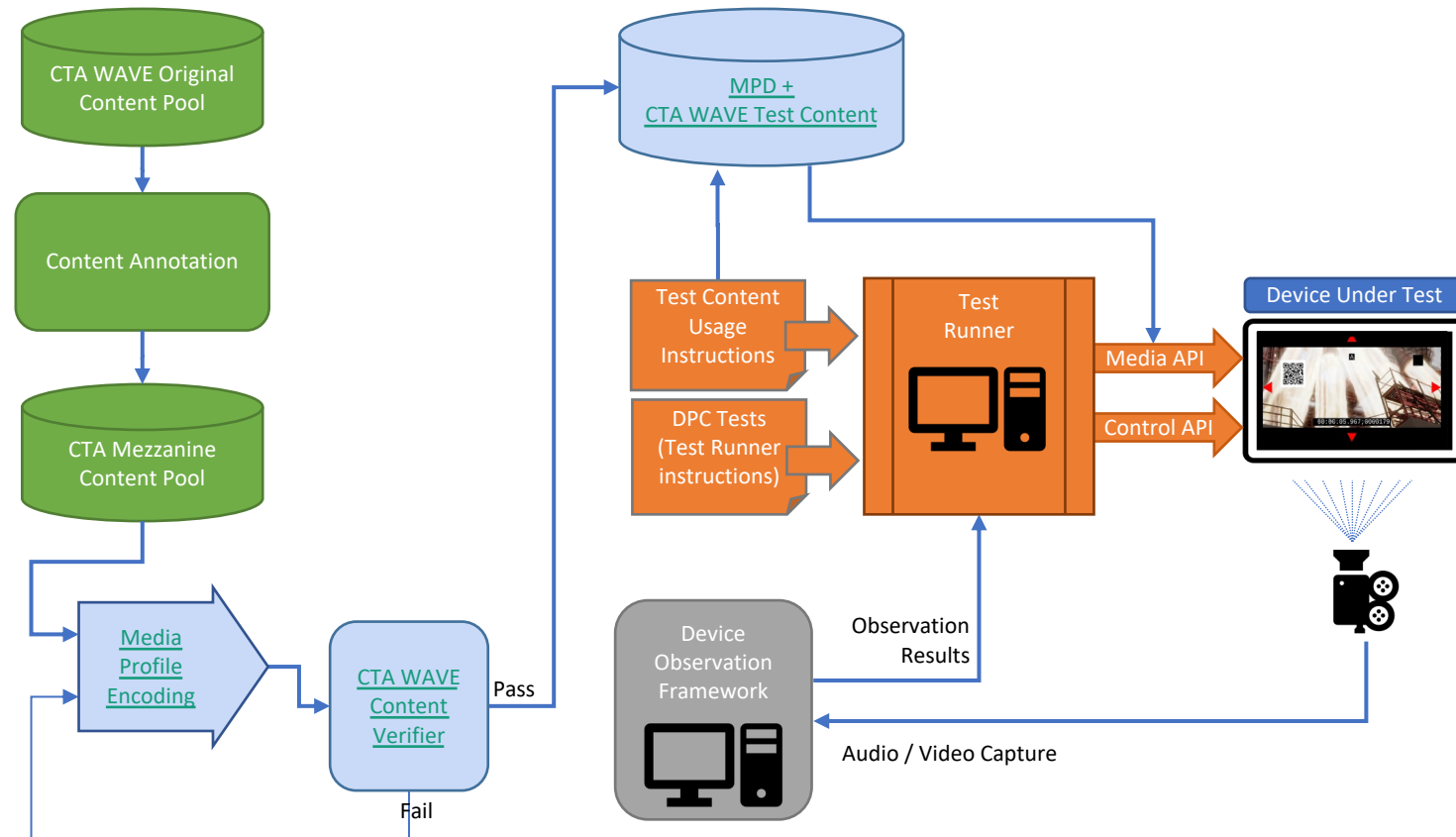
CTA WAVE Streaming Media Test Suite Media and Entertainment Meeting at TPAC 2023

Dr. Louay Bassbous | TPAC 2023 | 11.09.2023

CTA WAVE Streaming Media Test Suite

CTA WAVE Streaming Media Test Suite - Main Components

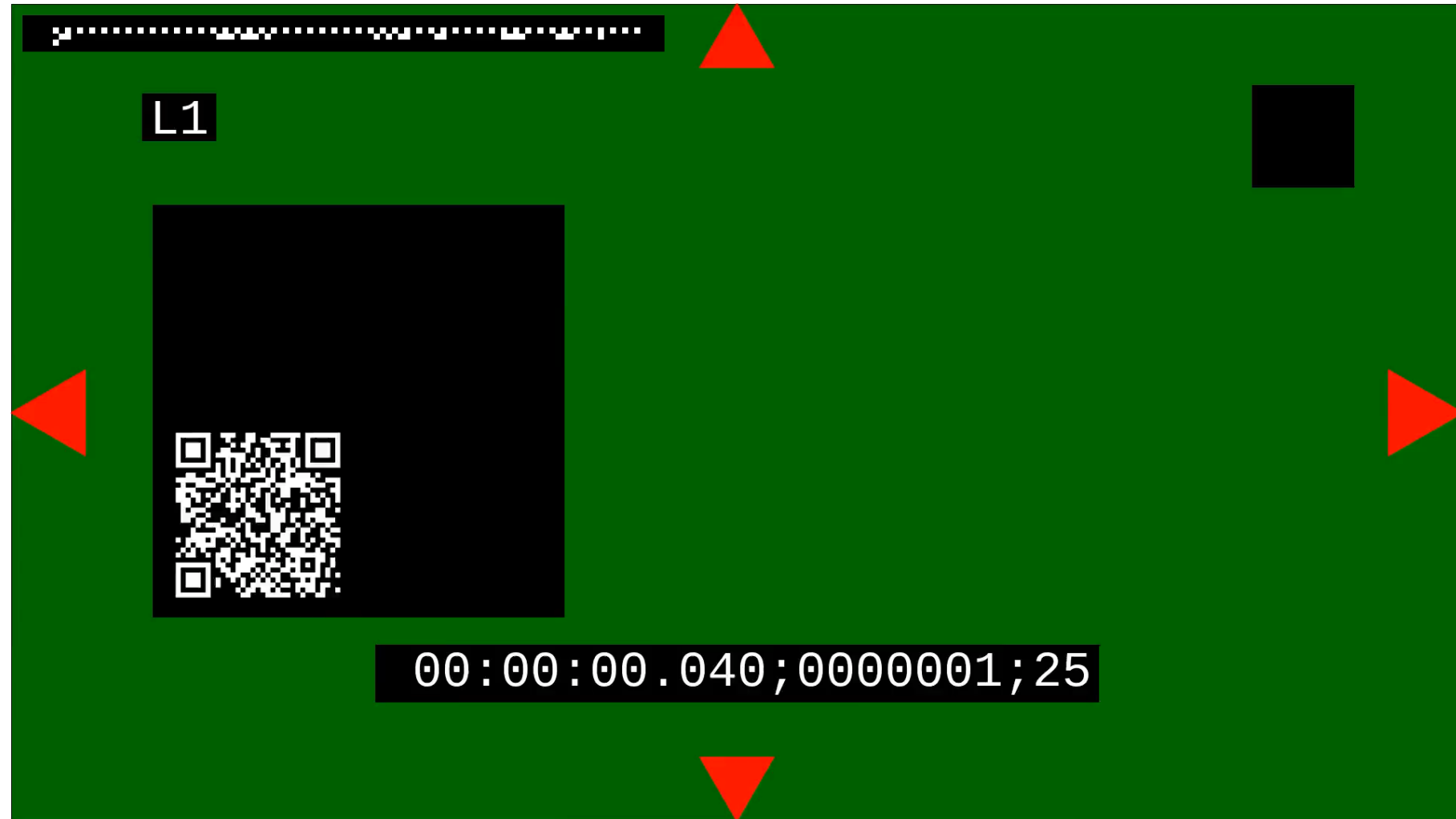
1. CTA WAVE Mezzanine Content [\[GitHub\]](#)
2. CTA WAVE Test Content [\[GitHub\]](#)
3. CTA WAVE Test Runner [\[GitHub\]](#)
4. CTA WAVE Observation Framework [\[GitHub\]](#)



1 - CTA WAVE Mezzanine Content

CTA WAVE Streaming Media Test Suite

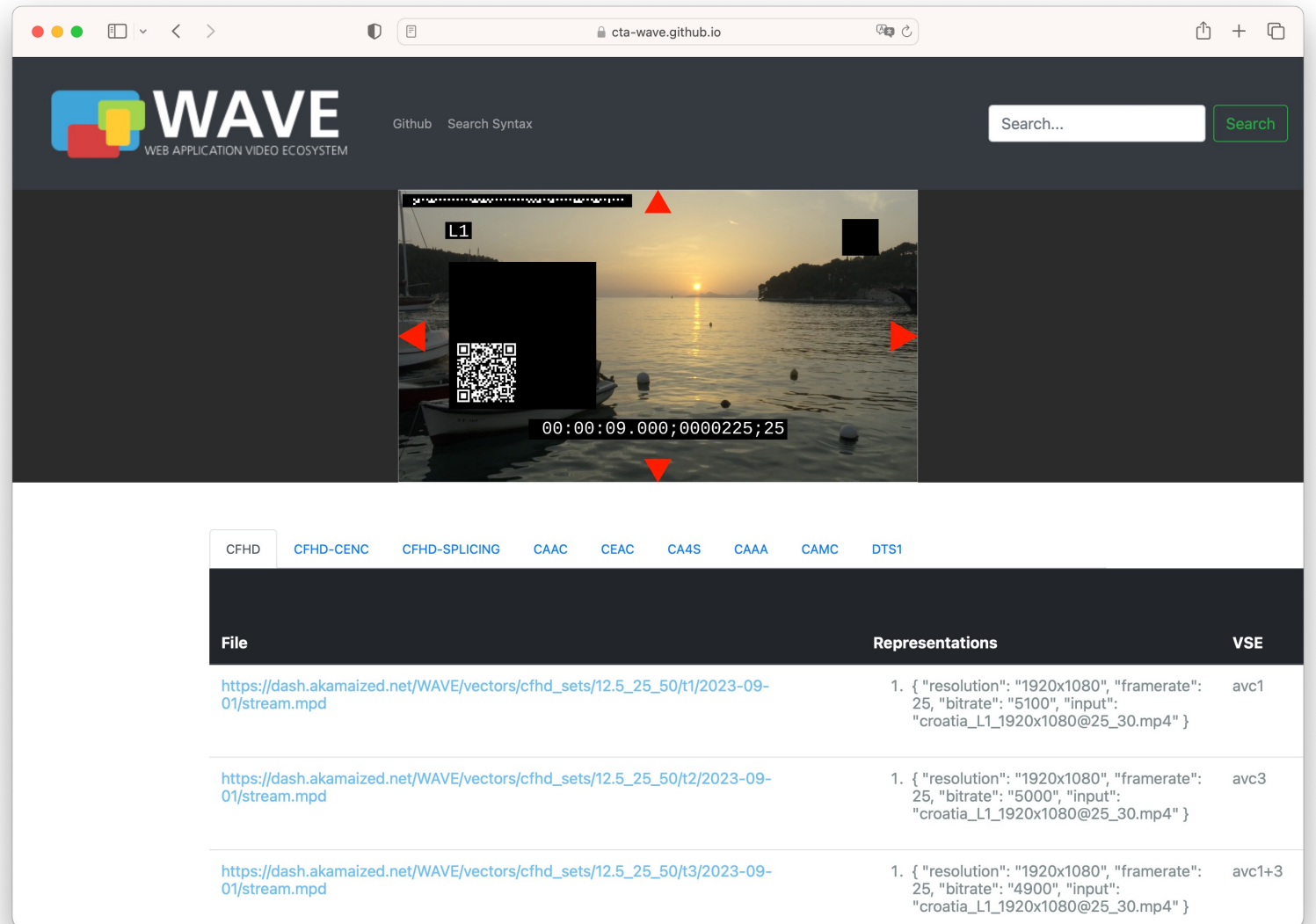
The Mezzanine GH repo contains scripts that builds annotated test content from specific source content, compatible with the WAVE device playback test suite



2 - CTA WAVE Test Content

CTA WAVE Streaming Media Test Suite

The Test Content GH Repo offers Test Content generated from the Mezzanine Content in different codecs and variations



The screenshot shows the website interface for the CTA WAVE Streaming Media Test Suite. At the top, there is a logo for WAVE (WEB APPLICATION VIDEO ECOSYSTEM) and a search bar. Below the logo is a video player displaying a sunset scene with a boat and a QR code. The video player has a progress bar and a timestamp of 00:00:09.000;0000225;25. Below the video player is a navigation menu with tabs for various codecs: CFHD, CFHD-CENC, CFHD-SPLICING, CAAC, CEAC, CA4S, CAAA, CAMC, and DTS1. Below the navigation menu is a table with three columns: File, Representations, and VSE.

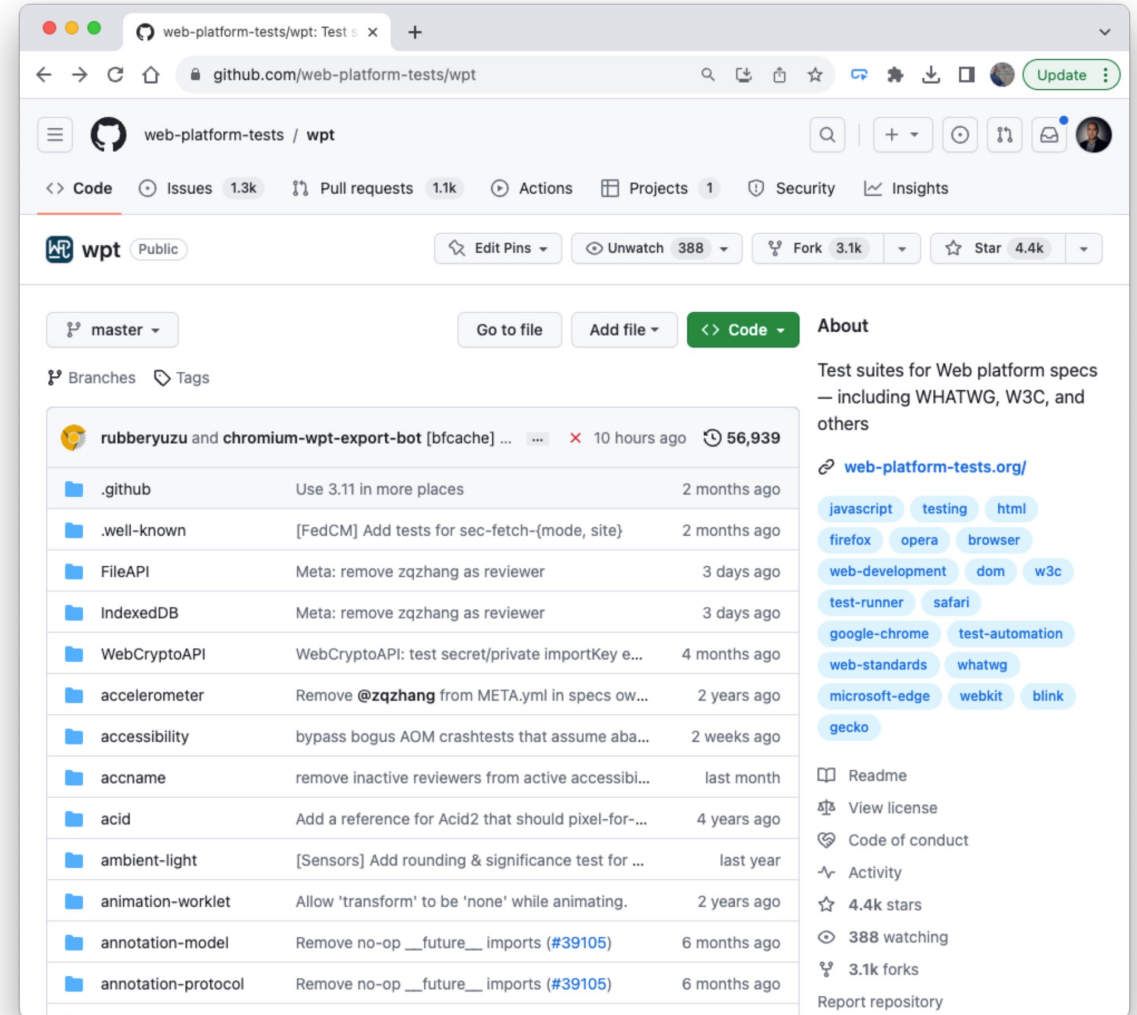
| File | Representations | VSE |
|---|---|--------|
| https://dash.akamaized.net/WAVE/vectors/cfhd_sets/12.5_25_50/t1/2023-09-01/stream.mpd | 1. { "resolution": "1920x1080", "framerate": 25, "bitrate": "5100", "input": "croatia_L1_1920x1080@25_30.mp4" } | avc1 |
| https://dash.akamaized.net/WAVE/vectors/cfhd_sets/12.5_25_50/t2/2023-09-01/stream.mpd | 1. { "resolution": "1920x1080", "framerate": 25, "bitrate": "5000", "input": "croatia_L1_1920x1080@25_30.mp4" } | avc3 |
| https://dash.akamaized.net/WAVE/vectors/cfhd_sets/12.5_25_50/t3/2023-09-01/stream.mpd | 1. { "resolution": "1920x1080", "framerate": 25, "bitrate": "4900", "input": "croatia_L1_1920x1080@25_30.mp4" } | avc1+3 |

3 - CTA WAVE Test Runner

CTA WAVE Streaming Media Test Suite

Recap: Web Platform Tests

- Cross-browser test suite for the Web-platform stack [[GitHub](#)]
- Built for desktop
 - accessible via mouse and keyboard
 - multi window
 - hosted locally, persisting results locally
 - hard to run on embedded devices



3 - CTA WAVE Test Runner

CTA WAVE Streaming Media Test Suite

- CTA WAVE Test Runner is built on top of WPT to make test runner accessible on embedded devices (TVs/STBs)
 - remote server manages test sessions and results
 - custom wrapper executes tests in single window
 - configure session using companion device by scanning QR code
 - REST API for full automation and integration into other systems and workflows



CTA WAVE Streaming Media Test Suite

[GitHub - DPCTF Specification](#)

New test session



Token: 5e125574-4e5a-11ee-a416-0242ac110003
Expires: 08/09/2023, 17:44:12
(Session start revokes expiration.)

Configure a new session on a second device by scanning the QR-Code, or click the button:

 [Configure Session](#)

The tests will start running in this window, as soon as the session is started from the configuration view.

Resume running session

Last session: 3b674e08-2fba-11ee-81e9-0242ac110003

 [Resume](#)

3 - CTA WAVE Test Runner

CTA WAVE Streaming Media Test Suite

- Companion web app to configure, run and monitor test sessions running on DUT
- Export test results as JSON or HTML
- Integration with external tools and platforms via REST API

Session Results - Web Platform

automatic: 100s

Date Started 28/06/2023, 12:17:35

Date Finished 28/06/2023, 12:36:08

Duration 00:18:32

Labels [Add](#)

Last Timed-Out Test Files (most recent first)

- No Timed-Out Tests -

API Results

| API | Pass | Fail | Timeout | Not Run | Test Files Run | Export |
|-----------------------|--------------------|------------------|---------------|---------------|---------------------|---|
| cfhd_12.5_25_50-local | 50 (98.03%) | 1 (1.96%) | 0 (0%) | 0 (0%) | 26/26 (100%) | json report |
| Total | 50 (98.03%) | 1 (1.96%) | 0 (0%) | 0 (0%) | 26/26 (100%) | |

Export

Results Download results for import into other WMAS Test Suite instances. [Download Zip](#)

All JSON Files Download JSON files containing results of completed test files. [Download Zip](#)

Session result HTML Download this sessions result as standalone HTML page, similar to this page. [Download HTML](#)

4 - CTA WAVE Observation Framework

CTA WAVE Streaming Media Test Suite

The Observation Framework determines pass or fail results, based on observations taken of tests which are run by the Test Runner



DTVP/DTG Plugfest and HbbTV Testing Event Schedule

- Location: Fraunhofer FOKUS – Berlin
- June 26th to 30th, 2023
- **DTVP / DTG Plugfest**
 - June 26th to 28th
 - Plugfest to check interoperability; or site debugging; HbbTV, UHD, DVB-I, NGA
 - Deutsche TV-Plattform & DTG UK
- **HbbTV Testing Event**
 - June 28th to 30th, 2023 (hybrid) and June 3rd to 7th (remote)
 - Tests of HbbTV Test Suite
- More Details: <https://tv-plattform.de/themen/plugfest/>



2023 DTVP / DTG Plugfest + HbbTV Testing Event, June 26 – 30

Hosted by Fraunhofer FOKUS Berlin

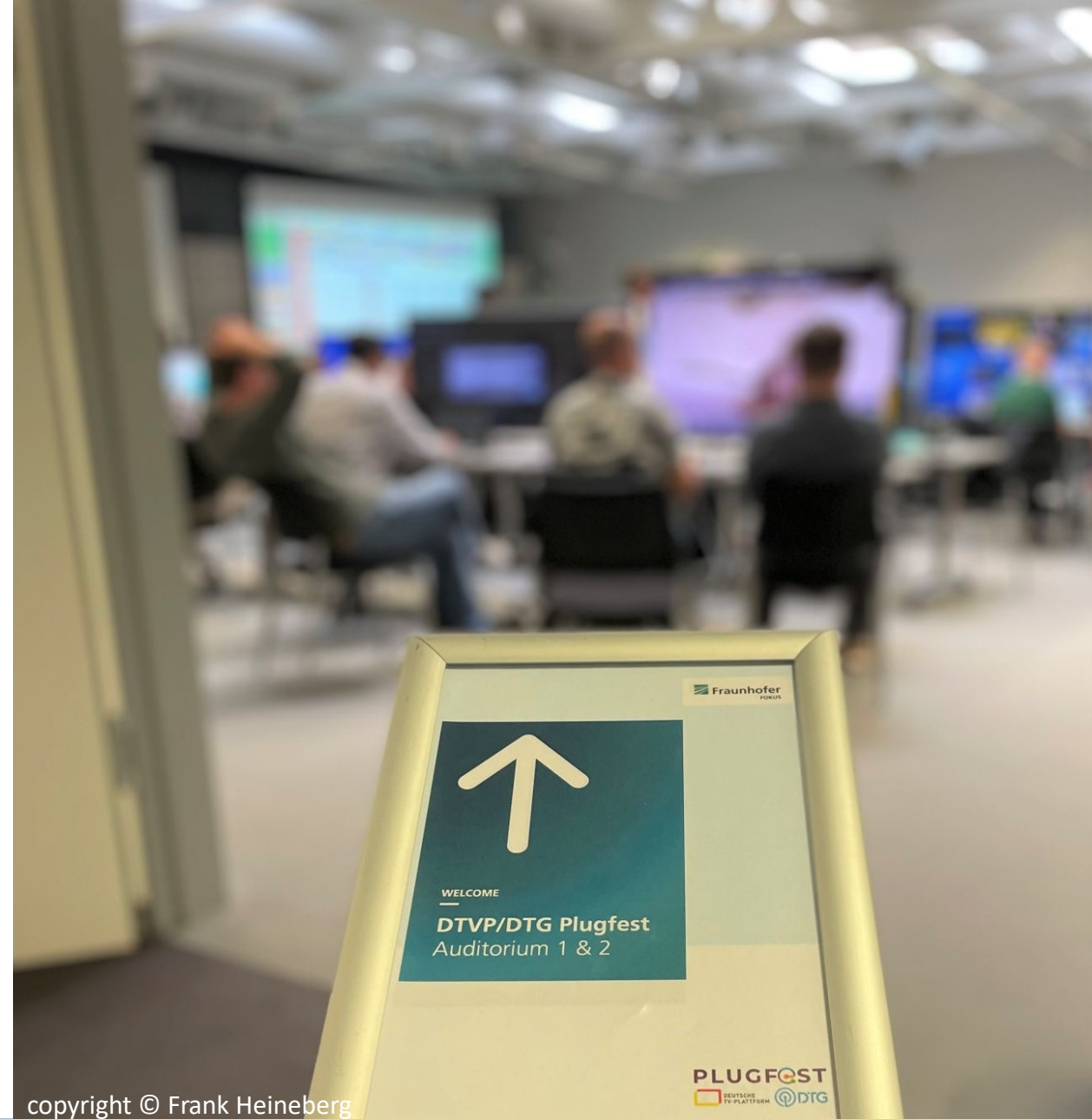
| | | |
|---------------------|--|--|
| Monday 26.06. | DTVP / DTG Plugfest* <i>HbbTV, UHD, DVB-I, NGA</i> Start time: 10:00 | |
| Tuesday 27.06. | DTVP / DTG Plugfest* <i>HbbTV, UHD, DVB-I, NGA</i> | |
| Wednesday 28.06. | DTVP / DTG Plugfest* ½ Day | HbbTV Testing Event** (in-person and remote) ½ Day |
| Thursday 29.06. | HbbTV Testing Event** (in-person and remote) | |
| | HbbTV Testing Group Meeting*** | |
| Friday 30.06. | HbbTV Testing Event** (in-person and remote) End time: 16:00 | |



- * DTVP/DTG/HbbTV members: free
Non-members: entry-fee
- ** HbbTV members only, no fee
- *** HbbTV Testing Group members only

DTVP/DTG Plugfest and HbbTV Testing Event Overview

- Participants (at Fraunhofer FOKUS)
 - DTVP/DTG Plugfest: **80**
 - HbbTV Testing Event: **20** (+Online)
- TV Manufacturers: **11**
- STBs (HDMI Interop Tests): **6**
- Content Providers (HbbTV, DVB-I, UHD, HDR, NGA): **15**



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DTVP/DTG Plugfest and HbbTV Testing Event

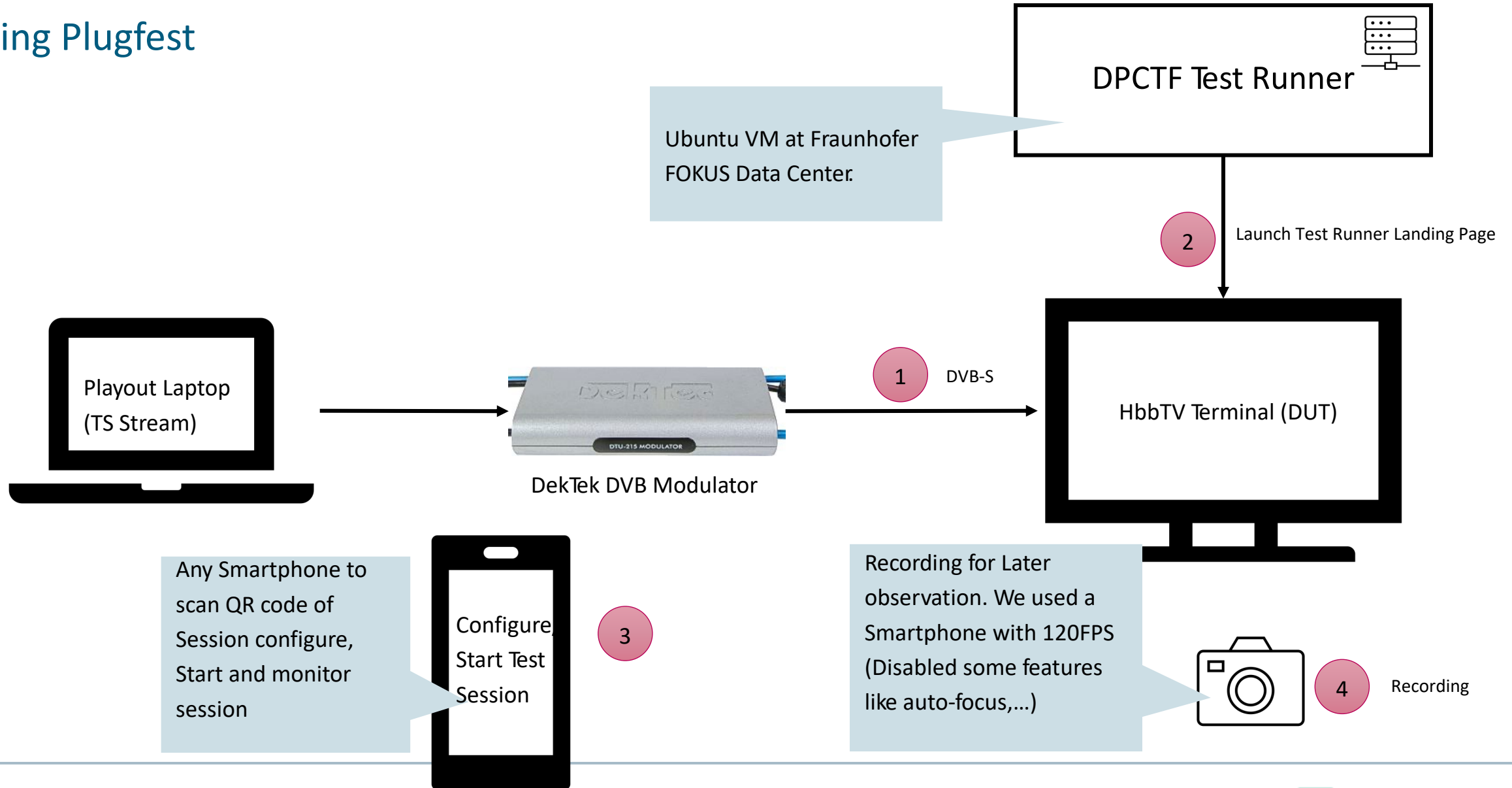
Test Plan

Test Slot: 45min

| Day X | Slot1 | Slot2 | Slot3 | ... | SlotN |
|-------|-------|-------|-------|-------|-------|
| TV1 | FOKUS | | | | |
| TV2 | | | | FOKUS | |
| TV3 | | | FOKUS | | |
| TV4 | | FOKUS | | | |
| ... | | | | | FOKUS |
| TV11 | | | | | |



CTA WAVE Streaming Media Test Suite - HbbTV Setup During Plugfest



CTA WAVE Streaming Media Test Suite - HbbTV Setup Demo



CTA WAVE Streaming Media Test Suite - HbbTV Setup

Test Summary

- The table shows the results for all tests without observation
 - PASS means video playback is started and finished properly
- Same Test Failed on all Terminals: /cfhd_12.5_25_50-local/splicing-of-wave-program-with-baseline-constraints__splice_main_splice_ad.html

| # | Status | Start | End | Duration | Test F | HbbTV Version | PASS | FAIL | TIMEOUT | NOT RUN |
|--------------------|---------------------------|-------------|-----------|----------|--------|---------------|------|------|---------|---------|
| 1 | completed | 26/06/2023, | 26/06/202 | 00:22:38 | 26/26 | HbbTV/1.6.1 | 42 | 1 | 4 | 0 |
| 2 | completed | 26/06/2023, | 26/06/202 | 00:22:39 | 26/26 | HbbTV/1.6.1 | 44 | 1 | 3 | 0 |
| 3 | completed | 26/06/2023, | 26/06/202 | 00:18:27 | 26/26 | HbbTV/1.6.1 | 50 | 1 | 0 | 0 |
| 4 | completed | 26/06/2023, | 26/06/202 | 00:20:27 | 26/26 | HbbTV/1.5.1 | 50 | 1 | 0 | 0 |
| 5 | completed | 26/06/2023, | 26/06/202 | 00:19:08 | 26/26 | HbbTV/1.6.1 | 50 | 1 | 0 | 0 |
| 6 | completed | 27/06/2023, | 27/06/202 | 00:21:19 | 26/26 | HbbTV/1.5.1 | 48 | 1 | 1 | 0 |
| 7 | crashed | 27/06/2023, | 14:42:09 | | 20/26 | HbbTV/1.6.1 | 24 | 0 | 8 | 0 |
| 8 | completed | 27/06/2023, | 27/06/202 | 00:18:50 | 26/26 | HbbTV/1.6.1 | 50 | 1 | 0 | 0 |
| 9 | completed | 28/06/2023, | 28/06/202 | 00:19:08 | 26/26 | HbbTV/1.6.1 | 50 | 1 | 0 | 0 |
| 10 | completed | 28/06/2023, | 28/06/202 | 00:18:32 | 26/26 | HbbTV/1.6.1 | 50 | 1 | 0 | 0 |
| 11 | completed | 28/06/2023, | 28/06/202 | 00:19:30 | 26/26 | HbbTV/1.6.1 | 50 | 1 | 0 | 0 |
| 12 | completed | 7/14/2023, | 7/14/2023 | 00:21:54 | 26/26 | HbbTV/1.6.1 | 52 | 0 | 0 | 0 |
| 13 | completed | 7/14/2023, | 7/14/2023 | 00:20:05 | 26/26 | HbbTV/1.6.1 | 52 | 0 | 0 | 0 |

CTA WAVE Streaming Media Test Suite - HbbTV Setup

Example Test Report without Observation

| | |
|---------------------|---|
| Test Paths | /cfhd_12.5_25_50-local |
| Excluded Test Paths | 0 <input type="button" value="show"/> |
| Total Test Files | 26 |
| Status | completed |
| Test Timeouts | manual: 100s automatic: 100s |
| Date Started | 26/06/2023, 17:32:24 |
| Date Finished | 26/06/2023, 17:52:52 |
| Duration | 00:20:27 |
| Labels | <input type="button" value="Add"/> |

Last Timed-Out Test Files (most recent first)

API Results

| API | Pass |
|-----------------------|--------------------|
| cfhd_12.5_25_50-local | 50 (98.03%) |
| Total | 50 (98.03%) |

```

{
  "results": [
    {
      "status": "OK",
      "test": "/cfhd_12.5_25_50-local/fullscreen-playback-of-switching-sets__ssl.html",
      "message": null,
      "logs": [
        "Loading test parameters ... ",
        "Hiding scrollbars from UserJS. ",
        "Setting up test ",
        "Warning: No audio mpd provided! ",
        "Checking MSE API support ",
        "Checking Codec support ",
        "Initializing WAVE service ",
        "Executing test ",
        "Creating result ... "
      ],
      "subtests": [
        {
          "status": "PASS",
          "message": null,
          "name": "Test workflow"
        },
        {
          "status": "PASS",
          "message": null,
          "name": "video ended event fired"
        }
      ]
    },
    {
      "status": "OK",
      "test": "/cfhd_12.5_25_50-local/out-of-order-loading__t1.html",
      "message": null,
      "logs": [
        "Loading test parameters ... ",
        "Hiding scrollbars from UserJS. ",
        "Setting up test ",
        "Warning: No audio mpd provided! ",
        "Checking MSE API support ",
        "Checking Codec support ",
        "Initializing WAVE service ",
        "Executing test ",
        "Creating result ... "
      ],
      "subtests": [
        {
          "status": "PASS".
    }
  ]
}

```

| Test | Show/Hide Messages | Xxx01 |
|--|--------------------|-------|
| /cfhd_12.5_25_50-local/fullscreen-playback-of-switching-sets__ssl.html | | |
| Test workflow | | PASS |
| video ended event fired | | PASS |
| /cfhd_12.5_25_50-local/out-of-order-loading__t1.html | | |
| | | PASS |
| | | PASS |
| html | | PASS |
| | | PASS |
| ent-https_t1-cenc.html | | PASS |
| | | PASS |
| s-splice-constraints__splice_main_splice_ad.html | | PASS |
| | | PASS |
| resentation__t1.html | | PASS |
| | | PASS |
| __t1.html | | PASS |
| | | PASS |
| html | | PASS |

CTA WAVE Streaming Media Test Suite - HbbTV Setup

Example Test Report after Observation

| | |
|---------------------|--|
| Test Paths | /cfhd_12.5_25_50-local |
| Excluded Test Paths | 0 show |
| Total Test Files | 26 |
| Status | completed |
| Test Timeouts | manual: 100s automatic: 100s |
| Date Started | 26/06/2023, 15:19:36 |
| Date Finished | 26/06/2023, 15:42:16 |
| Duration | 00:22:39 |
| Labels | Add |

```

{
  "results": [
    {
      "status": "OK",
      "test": "/cfhd_12.5_25_50-local/fullscreen-playback-of-switching-sets__ssl.html",
      "message": null,
      "logs": [
        "Loading test parameters ... ",
        "Not generating ApplicationLoaded event - created_app undefined target 23 ",
        "Setting up test ",
        "Warning: No audio mpd provided! ",
        "Checking MSE API support ",
        "Checking Codec support ",
        "Initializing WAVE service ",
        "Executing test ",
        "setValue 31 other keys undefined ",
        "Creating result ... "
      ],
      "subtests": [
        {
          "status": "PASS",
          "message": null,
          "name": "Test workflow"
        },
        {
          "status": "PASS",
          "message": null,
          "name": "video ended event fired"
        },
        {
          "status": "FAIL",
          "message": "First frame found is 7, expected to start from 1. First frame number tolerance is 0. Last frame found is 1498, expected to end at 1500. Last frame number tolerance is 0. Number of switches does not match. Test is configured to switch 8 times. Actual number of switches is 1. Total of missing frames is 8.",
          "name": "[OF] Every sample S[k,s] shall be rendered and the samples shall be rendered in increasing presentation time order."
        },
        {
          "status": "FAIL",
          "message": "Playback duration 59648.33ms does not match expected duration 59680.0ms +/- tolerance of 20ms. Allowed tolerance is 20ms and duration frame tolerance is 0. Starting missing frame number is 6. Starting frames to take out is 6. Ending missing frame number is 2.",
          "name": "[OF] The playback duration of the playback matches the duration of the CMAF Track, i.e. TR [k, S] = TR [k, 1] + td[k]."
        },
        {
          "status": "FAIL",
          "message": "Maximum permitted startup delay is 120ms.The presentation start up delay is 509.3333ms",
          "name": "[OF] The start-up delay should be sufficiently low, i.e., TR [k, 1] - Ti < TSMMax."
        }
      ]
    }
  ]
}

```

Last Timed-Out Test Files (most recent first)

| Test File |
|---|
| /cfhd_12.5_25_50-local/sequential-playback-of-encrypted-and-non-encrypted-baseline-cenc |
| /cfhd_12.5_25_50-local/restricted-splicing-of-encrypted-content-https__splice_main-cenc |
| /cfhd_12.5_25_50-local/playback-of-encrypted-content-https__t1-cenc.html |

API Results

| API | Pass | Fail |
|-----------------------|--------------------|--------------------|
| cfhd_12.5_25_50-local | 65 (55.08%) | 50 (42.37%) |
| Total | 65 (55.08%) | 50 (42.37%) |

| Test | Show/Hide Messages | Xx01 |
|--|--------------------|------|
| video ended event fired | | PASS |
| /cfhd_12.5_25_50-local/random-access-of-a-wave-presentation__t1.html | | |
| Test workflow | | PASS |
| [OF] The playback duration of the playback matches the duration of the CMAF Track, i.e. TR [k, S] = TR [k, 1] + td[k]. | | PASS |
| Xx01: Playback duration is 9873.33ms, expected track duration is 9880.0ms. Allowed tolerance is 20ms and duration frame tolerance is 0. Starting missing frame number is 0. Starting frames to take out is 1. Ending missing frame number is 2. | | |
| ... included in the CMAF Presentation duration shall be rendered and shall be rendered in order. | | FAIL |
| ... at 750. Last frame number tolerance is 0. Mid frame number tolerance is 10. Total of missing frames is 2. | | |
| ... earliest video sample and the audio sample that corresponds to the same presentation time. | | PASS |
| ... samples shall be rendered in increasing presentation time order. | | FAIL |
| ... at 750. Last frame number tolerance is 0. Mid frame number tolerance is 10. Total of missing frames is 2. | | |
| ... matches the duration of the CMAF Track, i.e. TR [k, S] = TR [k, 1] + td[k]. | | PASS |
| ... track duration is 9880.0ms. Allowed tolerance is 20ms and duration frame tolerance is 0. Starting missing frame number is 0. Starting missing frame number is 2. | | |
| ... rendered by the currentTime value within the tolerance of the sample duration. | | FAIL |
| ... the difference between Test Runner reported media currentTime and actual media time exceeded tolerance for following events: | | |
| ... i.e., TR [k, 1] - Ti < TSMMax. | | PASS |
| ... ns.The presentation start up delay is 106.0ms | | |
| | | PASS |

Contact



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