

Fraunhofer FOKUS Institute for Open Communication Systems

Extending the WAVE Streaming Media Test Suite: Toward Automated Subtitle Testing

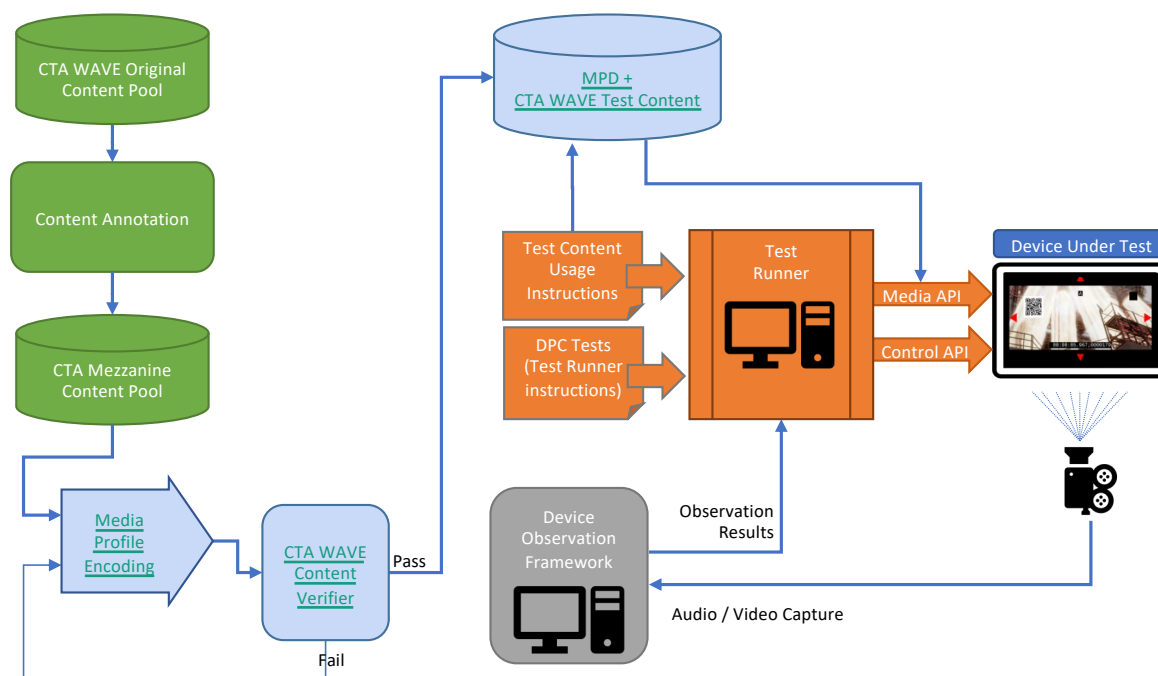
Dr. Louay Bassbouss | CCSUBS F2F@MWS | 26.06.2025

WAVE Streaming Media Test Suite Overview



Main Components

1. Mezzanine Content
[\[GitHub\]](#)
2. CMAF Test Content
[\[GitHub\]](#)
3. Test Runner (TR)
[\[GitHub\]](#)
4. HTML & JavaScript Templates
[\[GitHub\]](#)
5. Observation Framework (OF)
[\[GitHub\]](#)



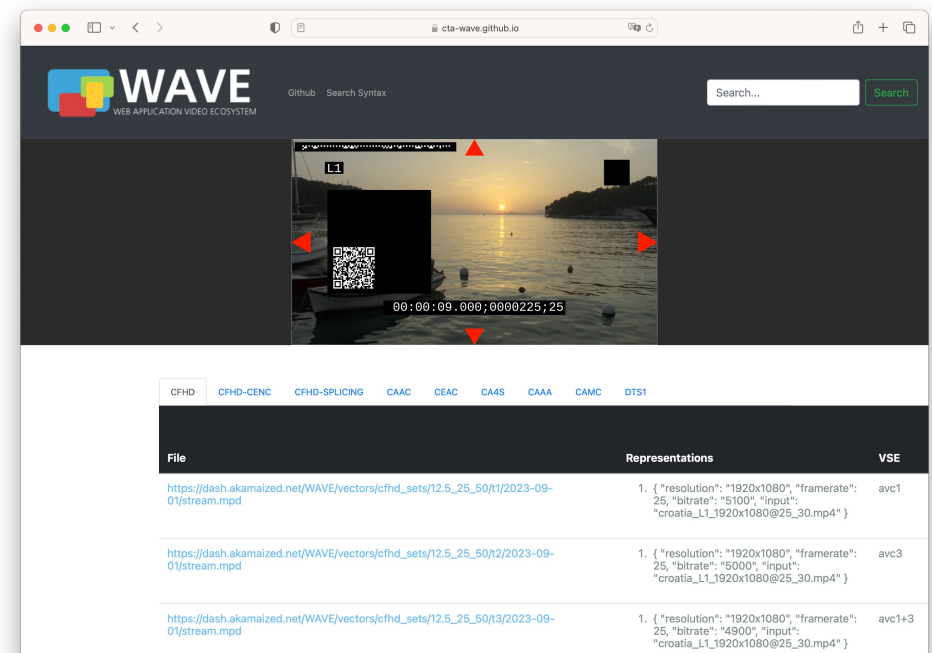
Mezzanine Content

- Annotated video content in different resolutions
 - Based on big buck bunny for 60Hz and fractional frame rates & an EBU sequence from Croatia for 50Hz.
 - Green frame on the start and red frame on the end.
- Annotations burnt into the video
 - Rotating QR code for observation framework.
 - Human-readable text for debugging.
 - Same information as in the QR code.
 - Bit pattern for TV manufacturer in-house use.
 - Flashing square with beeps for simple A/V sync testing.
 - Red triangles to check all content is visible.



CMAF Test Content

- Encoded & validated mezzanine content
 - CMAF media segments / fragments.
 - Metadata describing media segments provided in the form of a DASH MPD.
- Groups of streams encoded for each technology
 - Testing combinations of content options.
 - Testing content options individually for debugging.
 - Resolutions for testing CMAF switching sets.
 - Special content for testing splicing, encryption, ...
- Content Validation
 - DASH-IF content conformance validator checks the content is valid CMAF.



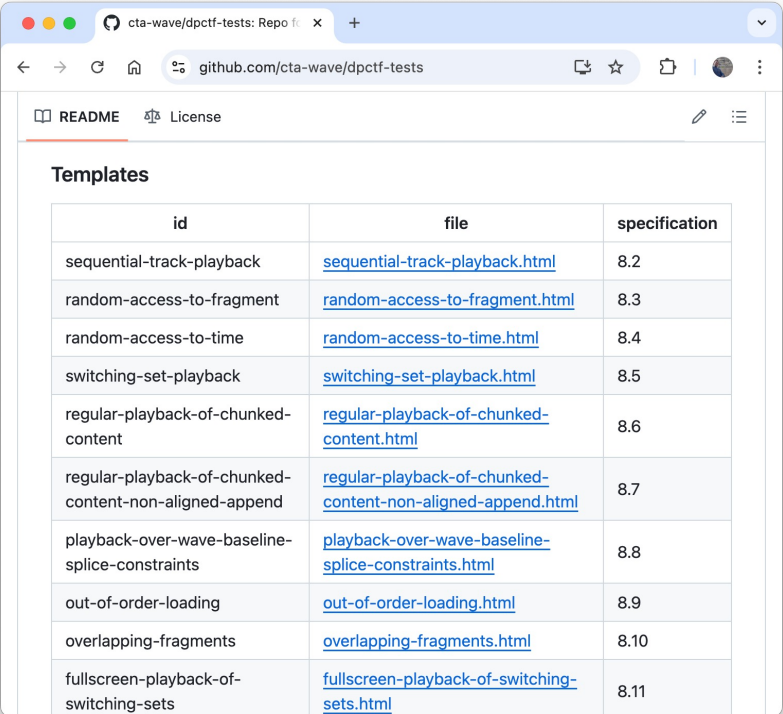
Content Conformance Validator

- Media Presentation Description (MPD) Validation
 - Ensure MPD is well formatted XML
 - MPD is properly structured according to the DASH schema
 - MPD-level signaling is correctly implemented
- Segment Validation
 - Media content validation at the container level
 - Media is properly formatted and in line with the standards
- Cross Validation
 - Cross-validation of MPD-level elements and attributes against the media content they signal
 - Ensures that the hierarchy and relationships between the content's components are correctly aligned

The screenshot shows the 'Conformance Tool' interface. At the top is a blue navigation bar with 'Conformance Tool', 'Validator', 'About', and 'FAQ' links. The main area has a 'Manifest' tab selected, with sub-tabs for 'URL', 'File Upload', and 'Text Input'. A text input field contains the URL 'https://dash.akamaized.net/akamai/bbb_30fps/bbb_30fps.mpd'. Below this is a section for 'Enabled Modules' with a list of checkboxes: 'Segment Validation' (checked), 'DASH-IF' (checked), 'CMAF', 'CTA-WAVE', 'HbbTV', 'Latest XSD', 'DVB (2018 xsd)', 'DVB (2019 xsd)', 'DASH-IF IOP Low Latency', 'DASH-IF Interoperability', 'Dolby', 'Automatically detect profiles', and 'Disable detailed segment validation output'. A blue 'Process' button is at the bottom right.

HTML & JavaScript Templates

- Media codec / technology independent
 - Exercise MSE (and EME) playback.
 - Algorithms documented in WAVE Device Playback Specification.
 - Common library that reads and plays CMAF content based on metadata in DASH MPD.
- Mixture of templates for either video or audio or for both video & audio → Examples:
 - **Sequential Track Playback:** Play a CMAF video or audio track from beginning to end.
 - **Random Access to Fragment, Random Access to Time:** Play a CMAF video or audio track from somewhere in the middle.
 - **Switching Set Playback:** Play a CMAF switching set, switching between tracks at various points.
 - **Buffer Underrun and Recovery:** Playback terminating.



id	file	specification
sequential-track-playback	sequential-track-playback.html	8.2
random-access-to-fragment	random-access-to-fragment.html	8.3
random-access-to-time	random-access-to-time.html	8.4
switching-set-playback	switching-set-playback.html	8.5
regular-playback-of-chunked-content	regular-playback-of-chunked-content.html	8.6
regular-playback-of-chunked-content-non-aligned-append	regular-playback-of-chunked-content-non-aligned-append.html	8.7
playback-over-wave-baseline-splice-constraints	playback-over-wave-baseline-splice-constraints.html	8.8
out-of-order-loading	out-of-order-loading.html	8.9
overlapping-fragments	overlapping-fragments.html	8.10
fullscreen-playback-of-switching-sets	fullscreen-playback-of-switching-sets.html	8.11

Test Runner (TR)

Expires 06/06/2024, 17:40:26

Labels

Filters

Exclude Filters

Test Groups

☐ > ca4s-local

☐ > ca4s-online

☐ > caaa_sets-local

☐ > caaa_sets-online

☐ > caac_sets-local

☐ > caac_sets-online

☐ > camc_sets-local

☐ > camc_sets-online

☐ > ceac-local

One or more beta test selected. For more information please see [the docs](#)

- The CTA WAVE Test Runner is built on top of W3C Web Platform Tests (WPT) to make tests accessible on embedded devices (TVs/STBs). Features:
 - Remote server manages test sessions and results
 - Custom wrapper executes tests in single window
 - Configure session using companion device by scanning QR code



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:

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

- REST API for full automation and integration into other systems and workflows
- Companion web app to configure, run and monitor test sessions running on DUT (Device under Test)
- Export test results as JSON or HTML

Observation Framework (OF)

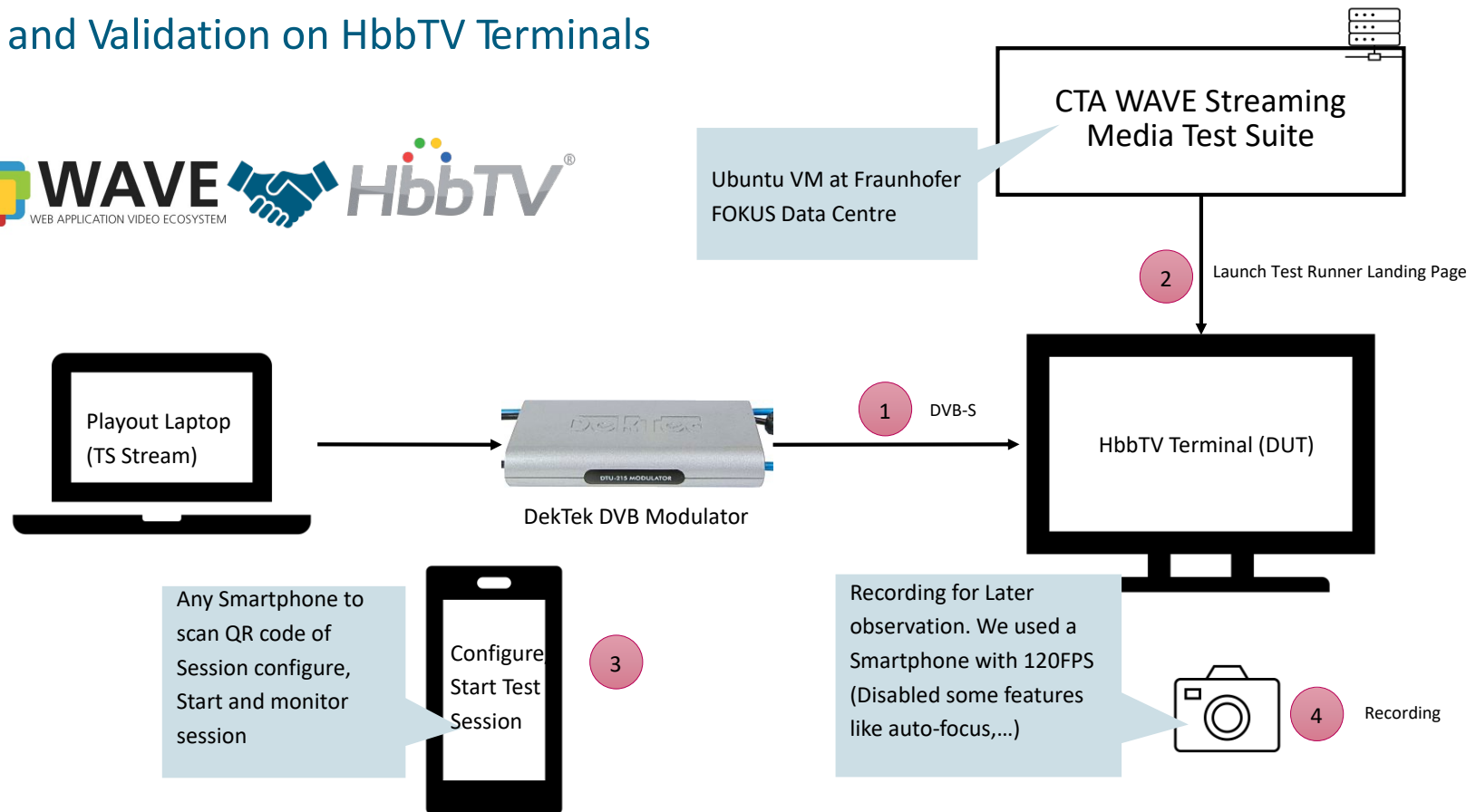
- Processes recordings from the camera and reports results to the test runner.
- Results are merged into the results from when the test was run.
- Two steps:
 - Extraction of QR codes from the recording.
 - Processing of data from QR codes against test procedures in the WAVE Device Playback Specification (CTA-5003).
- OF generates log files and debug output for developers to analyse when a device is reported as failing.



Demo of CTA WAVE Tests on HbbTV Terminal at Fraunhofer FOKUS TV Lab



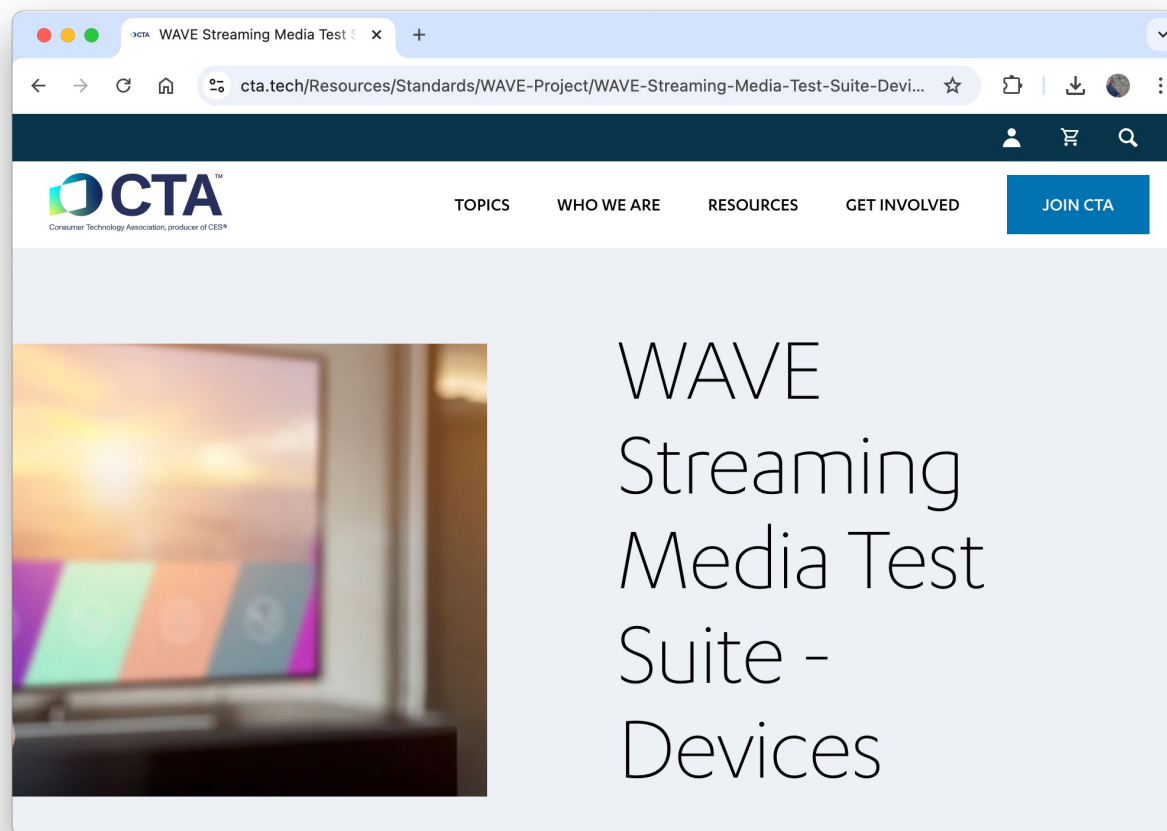
Testing and Validation on HbbTV Terminals



WAVE Streaming Media Test Suite

Where to start?

- Visit the CTA WAVE Landing Page of the Test Suite and read the description: [LINK](#)
- View and read the Test Suite Explainer carefully
- Visit the Test Suite main GitHub Repo: [dpctf-deploy](#) and follow the instructions in the README
- v3.0.0 released 3 weeks ago: [DPCTF Deploy v3.0.0](#)

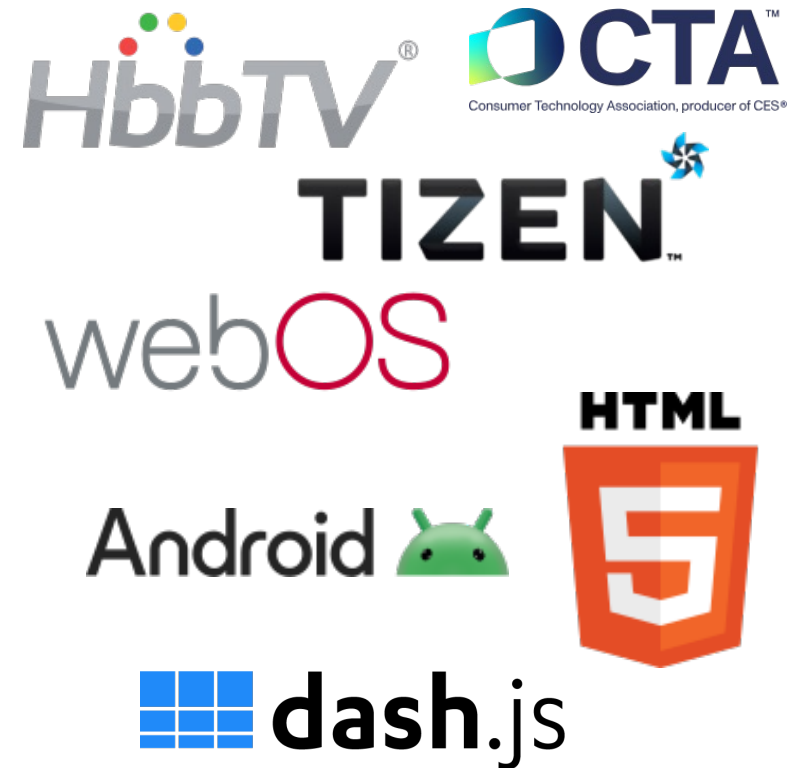


Source: <https://www.cta.tech/Resources/Standards/WAVE-Project/WAVE-Streaming-Media-Test-Suite-Devices>

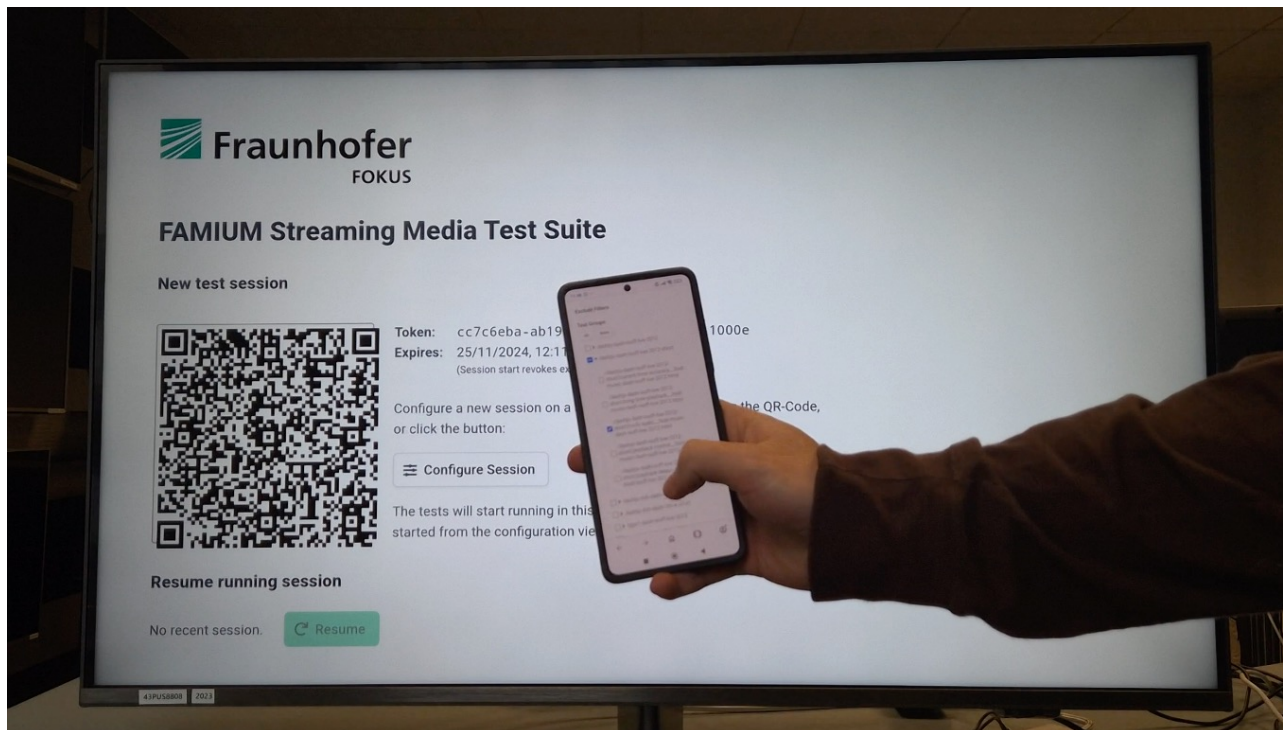
FAMIUM Streaming Media Test Suite

Supported Players and Platforms

- **Features**
 - Extension on WAVE Streaming Media Test Suite
 - Additional test cases focussing on native and 3rd party players
 - Extensive Platform / Player support
 - Integrated ABR Testbed to simulate varying network conditions
 - Metric Reporting and Playback analytics via FAMIUM SAND
 - In-Browser (using WebAssembly) DASH content validation (WIP)
- **Players**
 - Plain MSE/EME Player (according WAVE Device Playback Spec)
 - Dash.js (hls.js WIP)
 - Native DASH Players (HLS WIP): HbbTV, Tizen, WebOS, ExoPlayer
- **Platforms**
 - Web (Desktop / Mobile)
 - HbbTV
 - Samsung/Tizen
 - LG/WebOS
 - Android



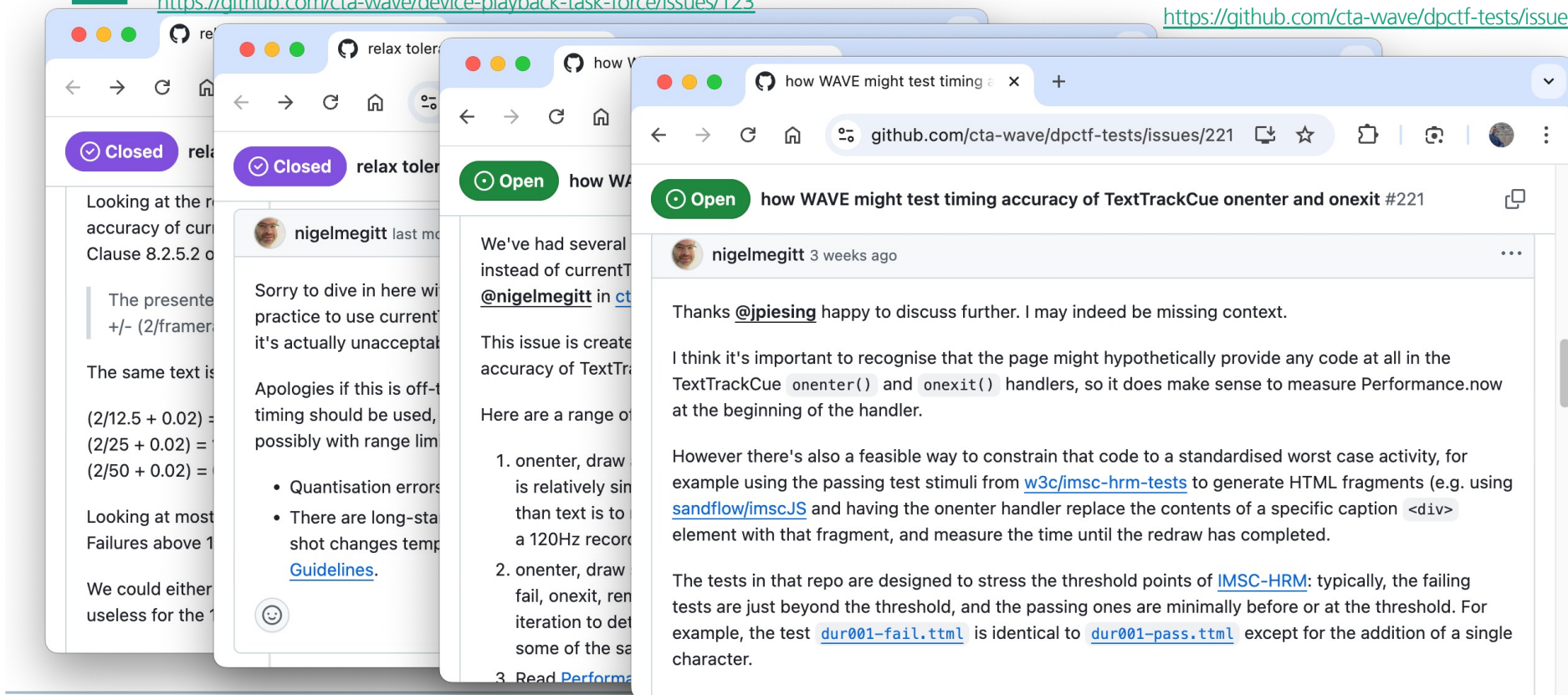
Demo in dash.js and ExoPlayer on Android TV at Fraunhofer FOKUS TV Lab



Toward Automated Subtitle Testing

<https://github.com/cta-wave/device-playback-task-force/issues/123>

<https://github.com/cta-wave/dpctf-tests/issues/221>



What are the specific aspects we aim to evaluate?

- Timing:
 - When to show/hide subtitles
- Positioning:
 - subtitles are displayed in the correct position
- Other aspects:
 - Text size, font, color,



Proposal to extend the Streaming Media Test Suite by incorporating Subtitle Testing support.

1. Use exiting Mezzanine Video Content from the Test Suite (or check if subtitle area needs to be modified)
2. Prepare (or use existing) Mezzanie Subtitles/CC content
3. Create WAVE Content (DASH/CMAF) including subtitles (which formats?)
4. Use the Test Suite (resuse existing sequential track playback test) to play video with subtitles (extend tests to show subtitles using `TextTrackCue.onenter()/onexit()`).
5. Extend Observation Framework to support subtitle observation



Contact

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<https://s.fhg.de/zkiZ>