WAVE
WEB APPLICATION VIDEO ECOSYSTEM

OSMART
OPEN-SOURCE MEDIA APPLICATION REFERENCE TOOLS
WORKSHOP #3
5 DECEMBER 2024 • 16:00–18:30 CET • ONLINE

CTA WAVE Streaming Media Test Suite - Devices

testing of web-based media playback on smart devices

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OSMART Workshop #3

December 5, 2024

CES Consumer Technology Association

Device Playback Capabilities Specification (CTA-5003-A)

5 Architecture and Device Reference Model

6 Media Playback Model

7 DRM Protected Media

8 Single-Track Media Playback Requirements

9 WAVE Content Playback Requirements

10 General CMAF Requirements and Tests

11 Video Media Profiles

12 Audio Media Profiles

13 Subtitle Media Profiles

14 Other Playback Requirements

15 Device Core Profiles

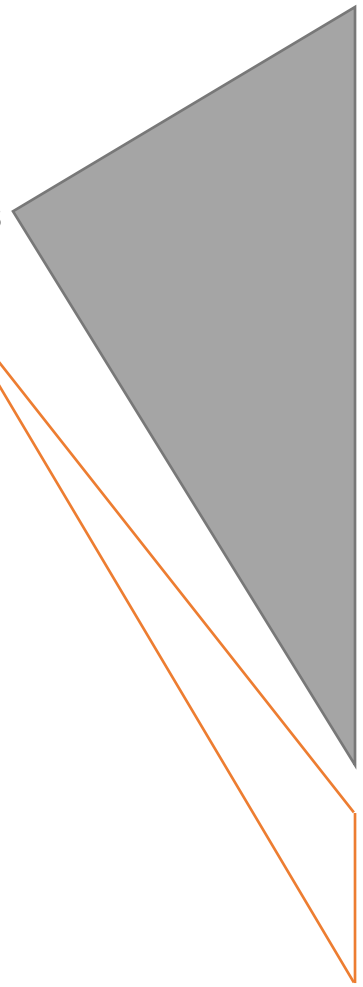
16 Device Extension Profiles

17 Configurations

Annex A Device Capability Discovery

Annex B Relevant HTML-5 APIs

Annex C Test Content Format Specification

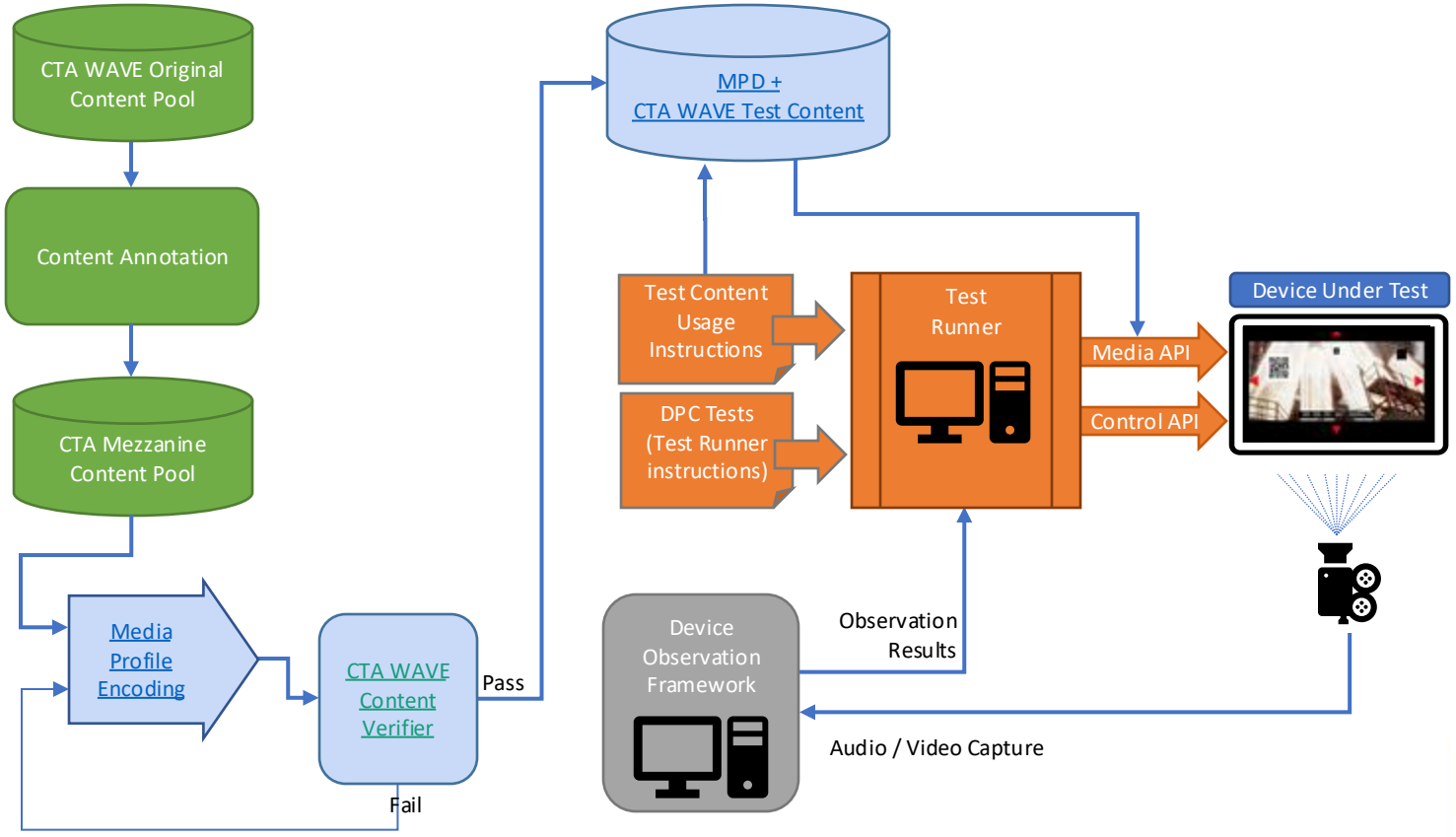


- Sequential Track Playback
- Random Access to Fragment/Time
- Switching Set Playback
- Playback of Chunked Content
- Playback over WAVE Baseline Splice Constraints
- Out-Of-Order Loading
- Overlapping Fragments
- Full Screen Playback of Switching Sets
- Playback of Encrypted Content
- Source Buffer Re-Initialization
- Buffer Underrun and recovery
- Low Latency Playback
- Regular Playback of a CMAF Presentation
- Random Access of a CMAF Presentation
- Splicing of WAVE Program with Baseline Constraints

CTA WAVE Streaming Media Test Suite - Devices

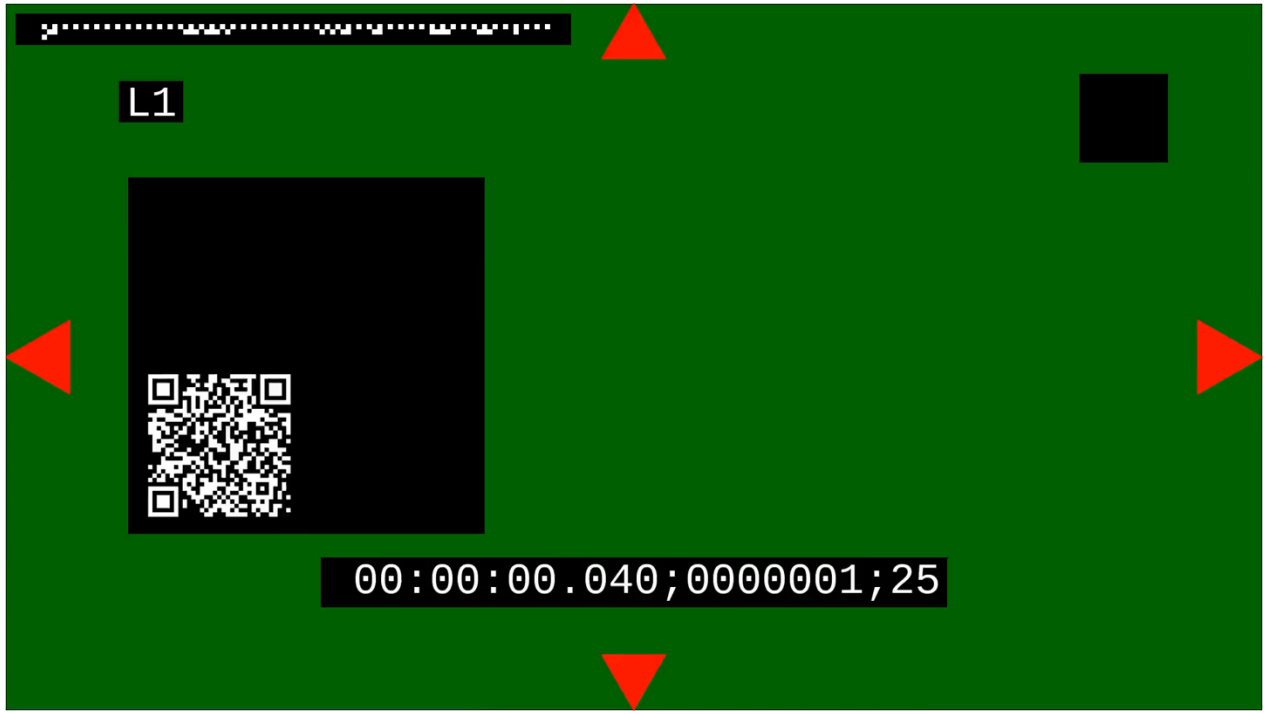
Main Components

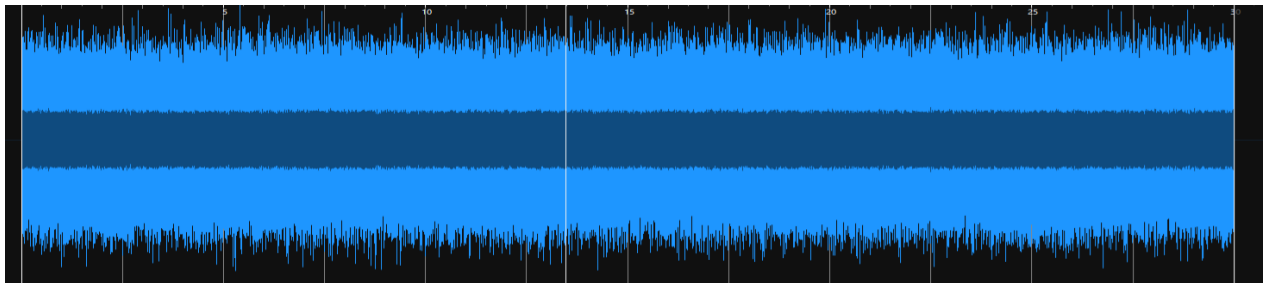
1. Mezzanine Content [GitHub]
2. CMAF Test Content [GitHub]
3. Test Runner (TR) [GitHub]
4. HTML & JavaScript Templates [GitHub]
5. Observation Framework (OF) [GitHub]



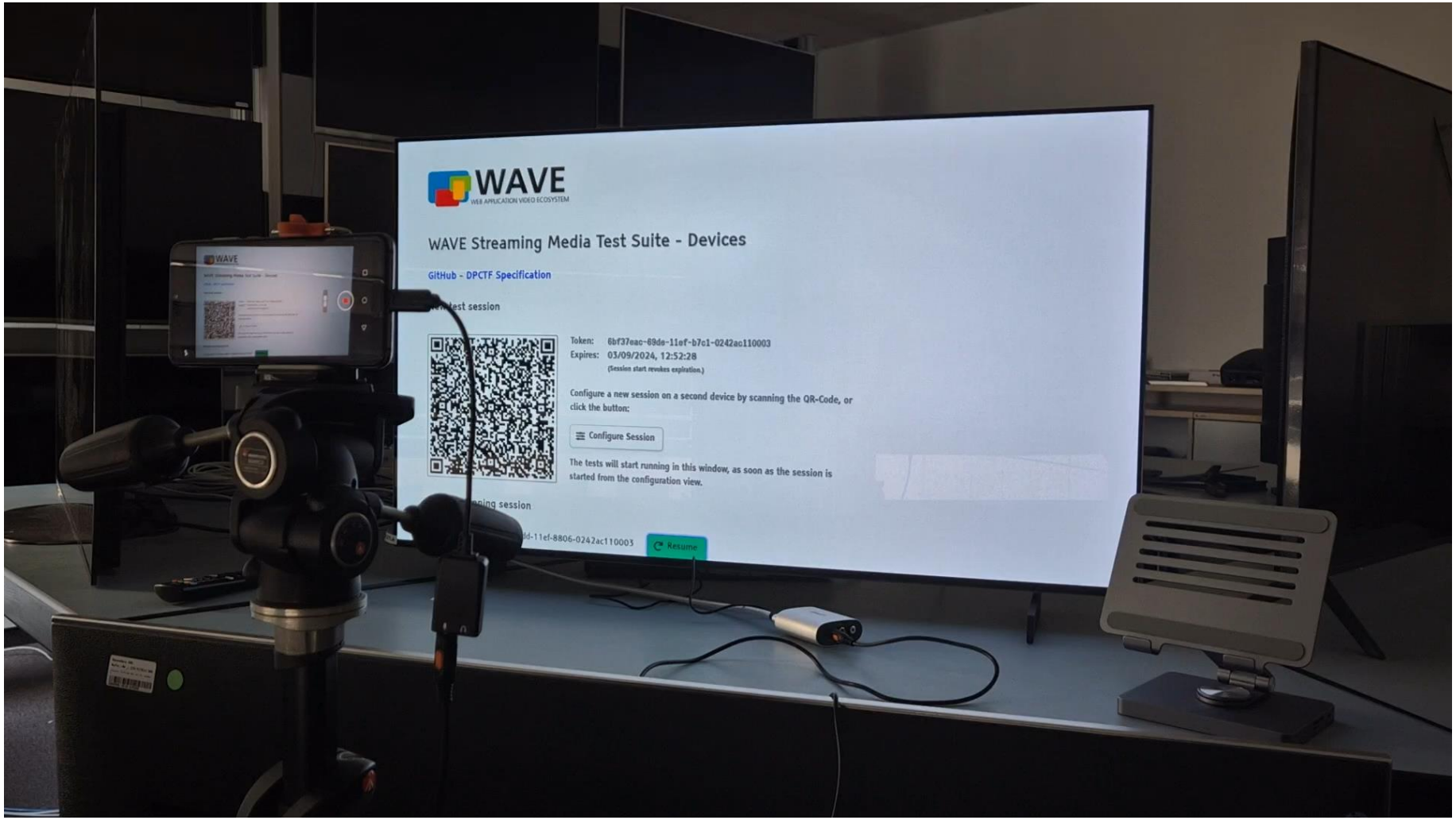
Mezzanine Content

- Annotated video content in many different resolutions and frame rates
  - Tears of Steel 60Hz group and fractional frame rates
  - An EBU sequence from Croatia for 50Hz group
  - Big buck bunny for ad insertion in splicing tests
  - 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.
- Audio content based on pseudo-random noise.
  - Observation framework can reconstruct a timeline from this



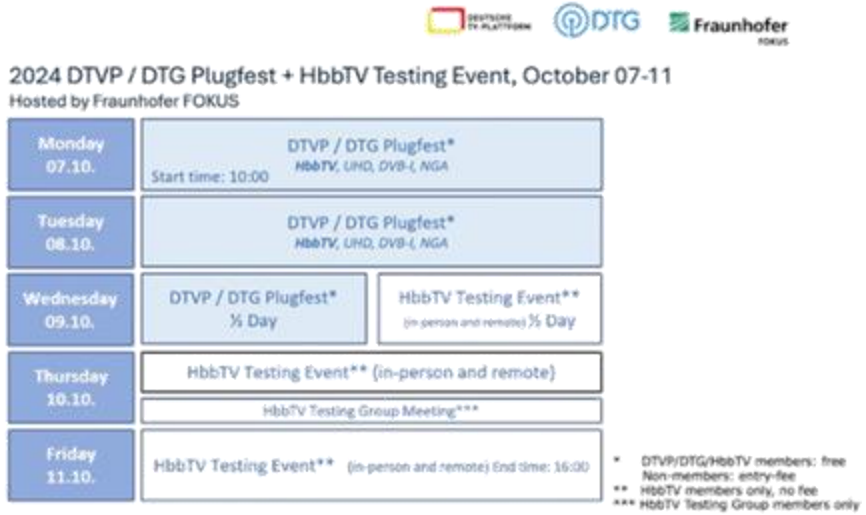


Demo at Fraunhofer FOKUS TV Lab



Validation: HbbTV Plugfests/Testing Events

- Previous HbbTV Plugfests/Testing Events
  - Feb. 2023 DTG/London
  - Jun. 2023 Fraunhofer/Berlin
  - Oct. 2023 Kineton/Naples
  - Feb. 2024 DTG/London
  - Jun. 2024 Kineton/Milan
  - Oct. 2024 Fraunhofer/Berlin
- 3 HbbTV Plugfests/Testing Events planned in 2025

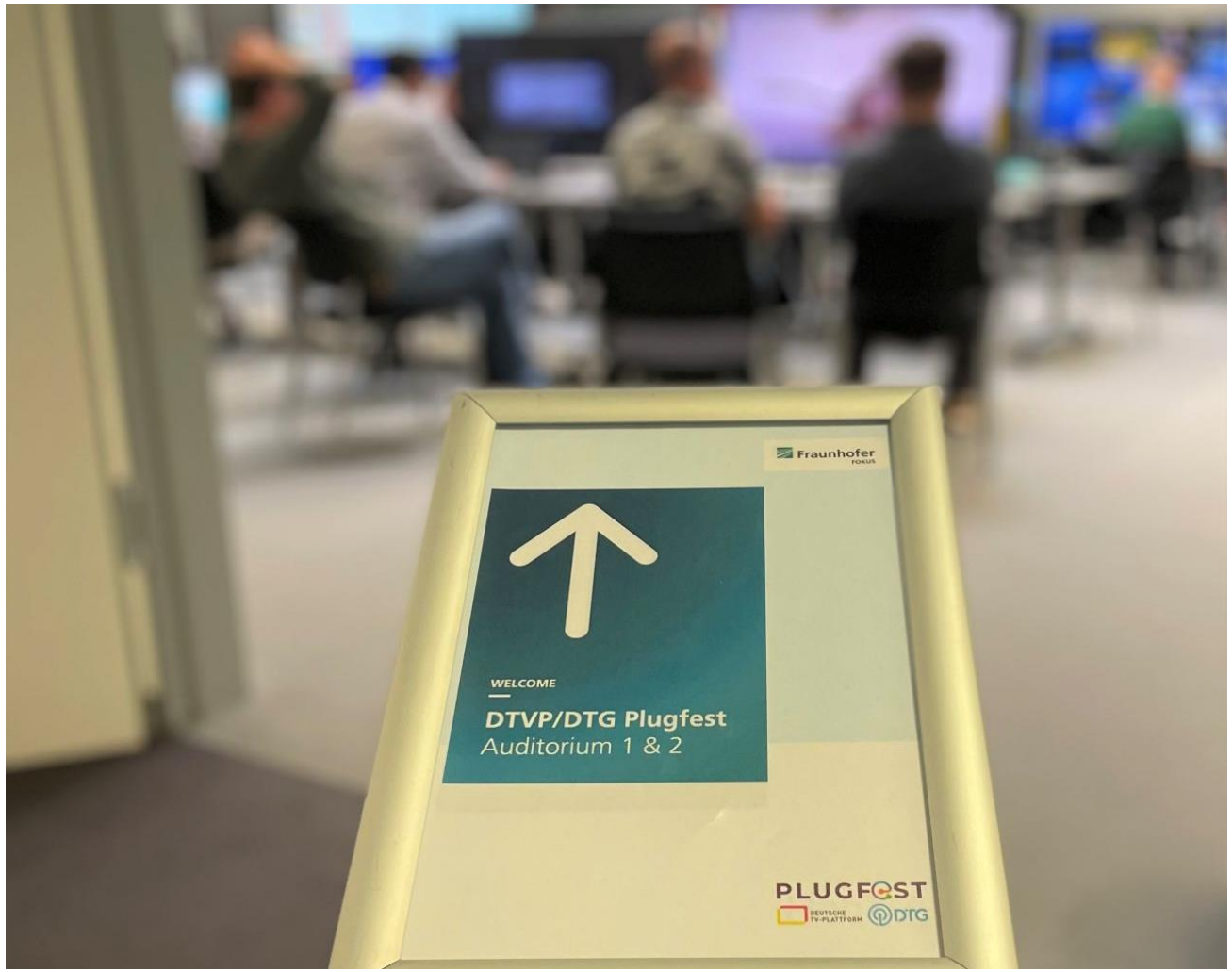


2024 DTVP / DTG Plugfest + HbbTV Testing Event, October 07-11

Hosted by Fraunhofer FOKUS

Monday 07.10.	DTVP / DTG Plugfest* HbbTV, UHD, DVB-I, NGA Start time: 10:00	
Tuesday 08.10.	DTVP / DTG Plugfest* HbbTV, UHD, DVB-I, NGA	
Wednesday 09.10.	DTVP / DTG Plugfest* ½ Day	HbbTV Testing Event** (in-person and remote) ½ Day
Thursday 10.10.	HbbTV Testing Event** (in-person and remote)	
	HbbTV Testing Group Meeting***	
Friday 11.10.	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



Example: Session Results with PASS/FAIL Observations

cfhd_12.5_25_50-local: All Results

Test files: 1; **Total subtests**: 6

Test Files

1. /cfhd_12.5_25_50-local/low-latency-playback-over-gaps__t2.html

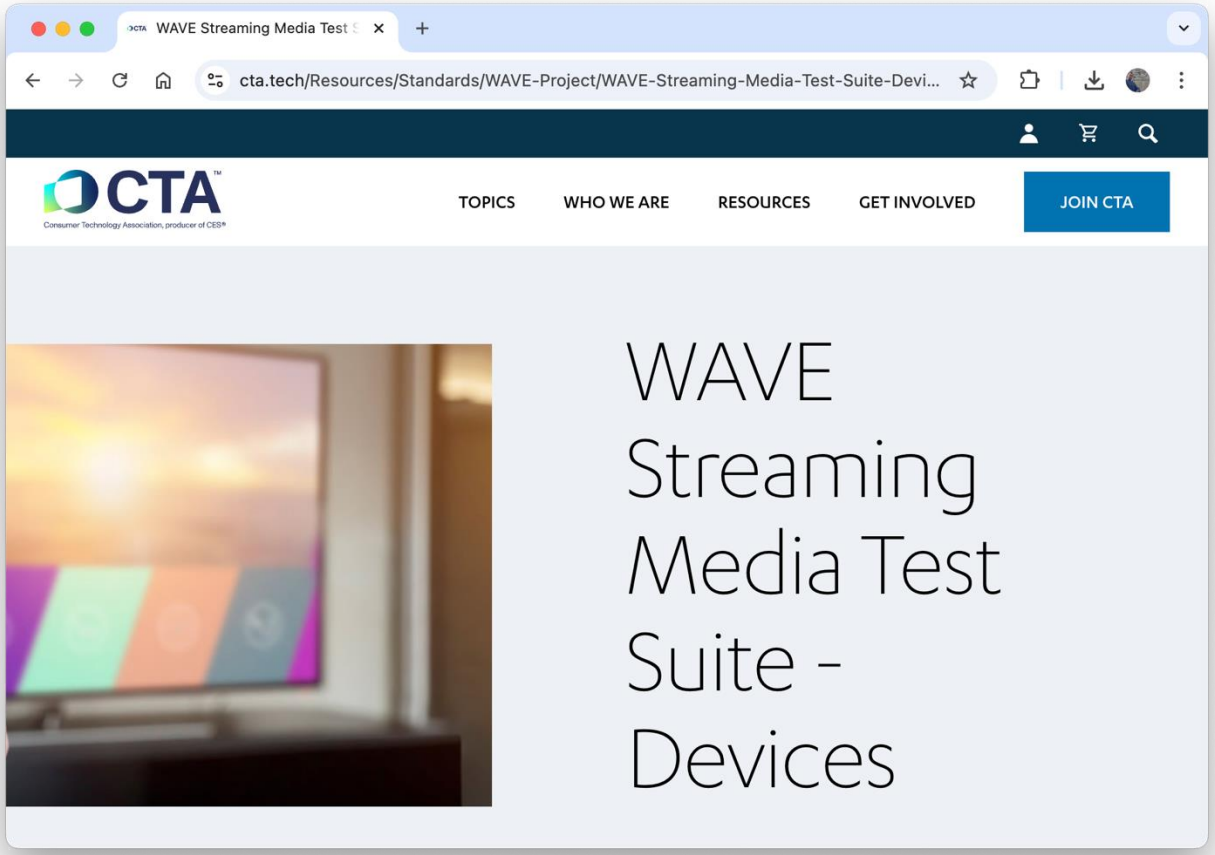
Test	Show/Hide Messages	Xx01
/cfhd_12.5_25_50-local/low-latency-playback-over-gaps__t2.html		
Test workflow		PASS
[OF] Every video frame S[k,s] shall be rendered and the video frames shall be rendered in increasing presentation time order.		FAIL
Xx01: First frame found is 8, expected to start from 1. First frame number tolerance is 0. Last frame found is 251, expected to end at 750. Last frame number tolerance is 0. Mid frame number tolerance is 10. Total of missing frame count is 506. Last frame detected before gap 115 exceeded 'stall_tolerance_margin'=7.5 frames of expected frame 125.		
[OF] Video: The playback duration shall match the duration of the CMAF Track		FAIL
Xx01: Playback duration 10089.88ms does not match expected duration 9760.0ms +/- tolerance of 50ms. Detected duration is different by 329.88ms. Allowed tolerance is 50ms and duration frame tolerance is 0. Starting missing frame number is 7. Ending missing frame number is 499.		
[OF] Video: The presented sample shall match the one reported by the currentTime value within the tolerance.		PASS
Xx01: Total failure count is 0. Tolerances: +/-(1 frame(s) + 150ms.)		
video ended event fired		PASS
video remains in waiting state until skipping over the gap		PASS

Example: Consolidated Results

Test	Subtest	#1	#2	#3	#4	#5	#6	#7	#8
/cfhd_12.5_25_50-local/mse-appendwindow__t1.html		OK	OK	OK	OK	OK	OK	OK	OK
	Test workflow	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:
	video ended event fired	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:
	[OF] Every video frame S[k,s] shall be rendered and the video frames shall be	PASS: Mid frame n	PASS: Mid frame n	FAIL: First frame fc	PASS: Mid frame n	FAIL: Last frame fo	PASS: Mid frame n	PASS: Mid frame n	FAIL: First frame fc
	[OF] Video: The playback duration shall match the duration of the CMAF Tra	FAIL: Playback dur	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui
	[OF] Video: The presented sample shall match the one reported by the curre	FAIL: Allowed tole	PASS: Allowed tol	FAIL: Allowed tole	PASS: Allowed tol	PASS: Allowed tol	FAIL: Allowed tole	PASS: Allowed tol	FAIL: Allowed tole
/cfhd_12.5_25_50-local/out-of-order-loading__t1.html		OK	OK	OK	OK	OK	OK	OK	OK
	Test workflow	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:
	video ended event fired	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:
	[OF] Every video frame S[k,s] shall be rendered and the video frames shall be	FAIL: Mid frame nu	PASS: Mid frame n	FAIL: First frame fc	PASS: Mid frame n	FAIL: Last frame fo	PASS: Mid frame n	PASS: Mid frame n	FAIL: First frame fc
	[OF] Video: The playback duration shall match the duration of the CMAF Tra	FAIL: Playback dur	PASS: Playback dui	PASS: Playback dui	FAIL: Playback dur	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui
	[OF] Video start-up delay: The start-up delay should be sufficiently low.	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe
	[OF] Video: The presented sample shall match the one reported by the curre	FAIL: Allowed tole	PASS: Allowed tol	FAIL: Allowed tole	PASS: Allowed tol	PASS: Allowed tol	FAIL: Allowed tole	PASS: Allowed tol	FAIL: Allowed tole
/cfhd_12.5_25_50-local/overlapping-fragments__ss1.html		OK	OK	OK	OK	OK	OK	OK	OK
	Test workflow	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:
	video ended event fired	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:
	[OF] Every video frame S[k,s] shall be rendered and the video frames shall be	FAIL: Last frame fo	PASS: Mid frame n	PASS: Mid frame n	FAIL: Mid frame nu	FAIL: Last frame fo	FAIL: First frame fc	PASS: Mid frame n	FAIL: Mid frame nu
	[OF] Video: The playback duration shall match the duration of the CMAF Tra	FAIL: Playback dur	FAIL: Playback dur	PASS: Playback dui	FAIL: Playback dur	FAIL: Playback dur	FAIL: Playback dur	FAIL: Playback dur	PASS: Playback dui
	[OF] Video start-up delay: The start-up delay should be sufficiently low.	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe
	[OF] Video: The presented sample shall match the one reported by the curre	FAIL: Allowed tole	FAIL: Allowed tole	FAIL: Allowed tole	FAIL: Allowed tole	FAIL: Allowed tole	FAIL: Allowed tole	FAIL: Allowed tole	FAIL: Allowed tole
/cfhd_12.5_25_50-local/playback-over-wave-baseline-splice-constraints__splice_main_splice_ad.html		OK	OK	OK	OK	OK	OK	OK	OK
	Test workflow	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:
	video ended event fired	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:	PASS:
	[OF] Every video frame S[k,s] shall be rendered and the video frames shall be	PASS: Mid frame n	PASS: Mid frame n	FAIL: First frame fc	PASS: Mid frame n	FAIL: Last frame fo	PASS: Mid frame n	PASS: Mid frame n	FAIL: First frame fc
	[OF] Video: The playback duration shall match the duration of the CMAF Tra	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui	PASS: Playback dui
	[OF] Video start-up delay: The start-up delay should be sufficiently low.	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe	PASS: Maximum pe
	[OF] Video: The presented sample shall match the one reported by the curre	FAIL: Allowed tole	PASS: Allowed tol	FAIL: Allowed tole	PASS: Allowed tol	FAIL: Allowed tole	FAIL: Allowed tole	FAIL: Allowed tole	FAIL: Allowed tole

Where to start?

- Visit the CTA WAVE Landing Page of the Test Suite: LINK
  1. Check/read the **TEST SUITE EXPLAINER**
  2. Check **TEST SUITE RELEASES AND README**
- Check recording/slides of “DASH-IF Special Session: WAVE Streaming Media Test Suite – Devices” (October 25, 2024): LINK



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

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- Romain Bouqueau (Motion Spell) with support from Qualcomm and CTA
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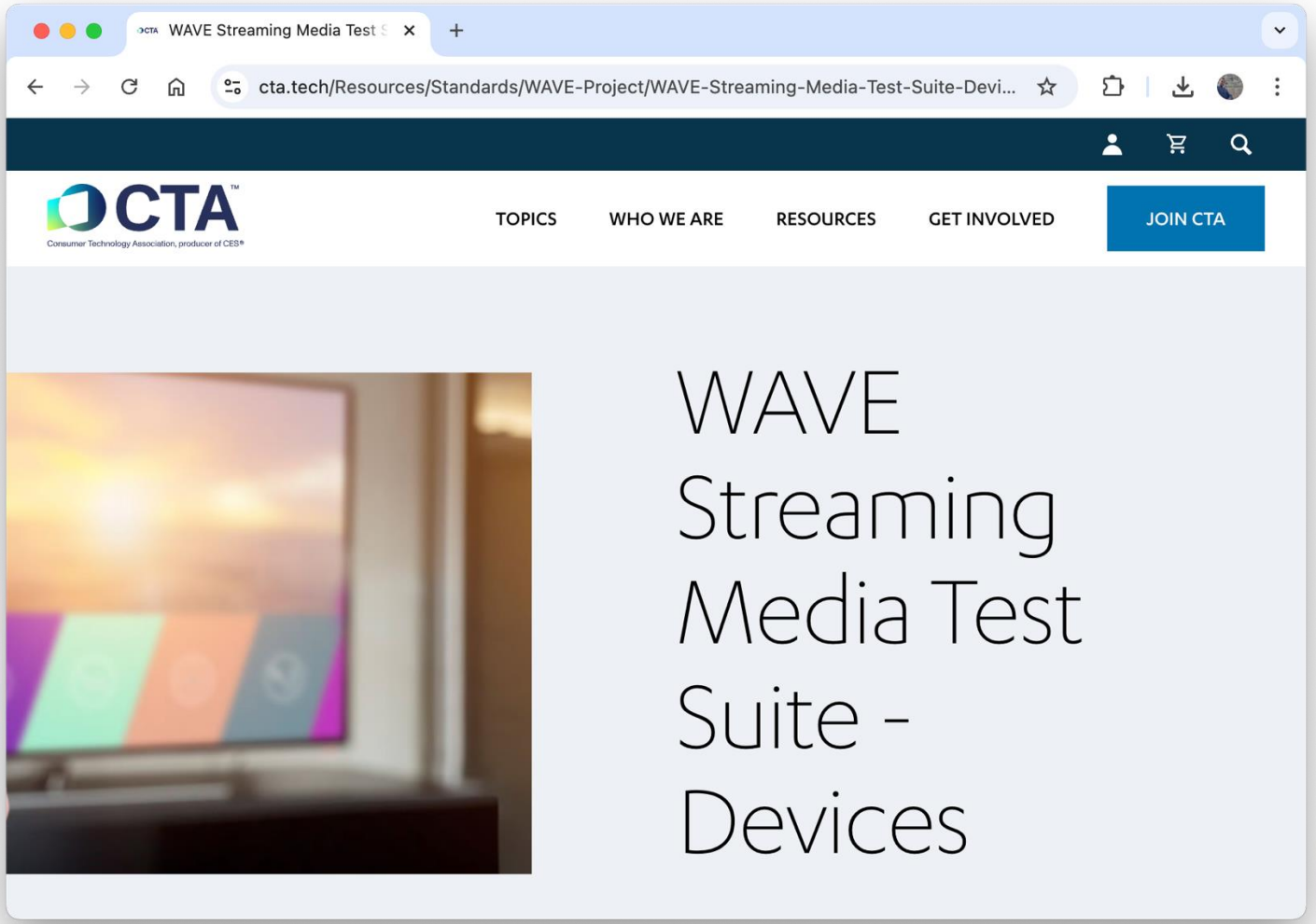
- Thomas Stockhammer (Qualcomm)
- Zachary Cava (Walt Disney Co.)
- Mike Bergman, Bill Rose, Alexandra Blasgen (CTA)

Thank You!



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