



CTA WAVE & Open Source

Presented by

Mike Bergman (Consumer Technology Association)
Louay Bassbouss (Fraunhofer FOKUS)



WAVE Overview

Vision: WAVE promotes commercial OTT interoperability by creating interoperability specifications and FOSS test suites that leverage industry “core” specifications.

CMAF

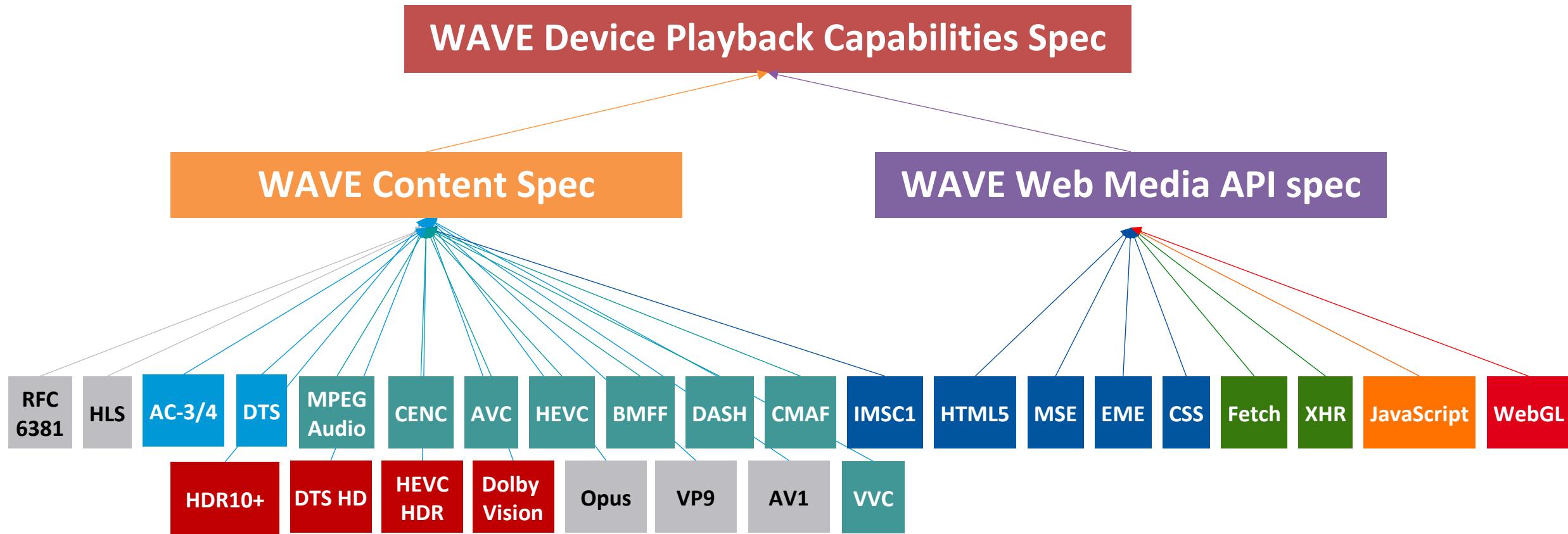
HTML5/MSE/EME

DASH

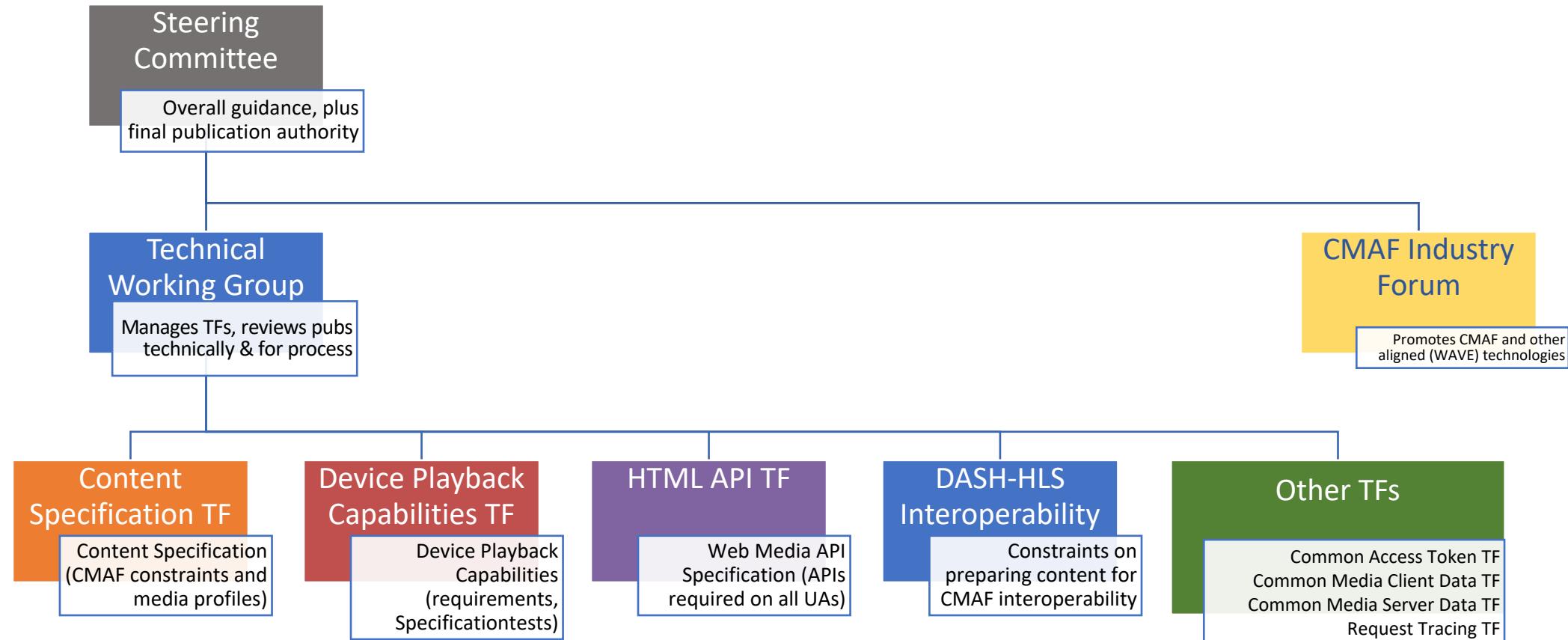
HLS

CENC

WAVE leverages existing web and media standards



WAVE Setup and Organizations



Sponsoring

- Sponsored by Consumer Technology Association (CTA)
 - Trade association, ~1800 member companies
 - Owner/producer of the annual CES trade show
 - ANSI-accredited SDO (~90 groups, ~400 active participants)

License

Category	License	Used For
Code	3-Clause BSD	Default for code
	MIT	Code based on W3C Web Platform Tests
	Apache 2.0	Code involving 3rd-party patents
Media	Creative Commons Attribution 3.0	<p>Test streams derived from</p> <ul style="list-style-type: none"> • <i>Big Buck Bunny</i>, or • <i>Tears of Steel</i>
	Creative Commons Attribution 4.0	<p>Test streams derived from</p> <ul style="list-style-type: none"> • <i>Croatia</i>, or • WAVE-original content

Numbers & Stats

Total registered companies	61
Total registered participants	163
Total working groups	11
WG and TF meeting cadence	Biweekly
Total published standards	6 (+3 in process)

Akamai	Cox Communications	Interdigital	Samsung Electronics
Amazon.com	DataZoom	John Simmons Consulting	Sony Electronics
Apple	Disney Streaming Services	LG Electronics	Streaming Video Alliance
AT&T	Dolby Laboratories	Martin Freeman Consulting	TBT
ATEME	Ericsson	Microsoft Corporation	Toshiba
BBC Research & Development	Eurofins Digital Testing	MPAA	TP Vision
BitRouter	Eyevinn	Motion Picture Laboratories	Unified Streaming
BrightCove	Facebook	Mux	Verizon
Broadpeak.tv	Fox Corporation	Nagravision	Viacom
Cable Television Labs	Fraunhofer	NBC Universal	Vizio
castLabs	Google	Netflix	Warner Media
Charter Communications	Harmonic	NHK Science & Tech Research	WJR Consulting
Cisco Systems	Hulu	P Thomsen Consulting	W3C
Comcast Cable	IneoQuest	Philips	Xperi
	Intel Corporation	Qualcomm Incorporated	

*Company names in **bold** are members of the WAVE Steering Committee.*

- Primary audience
- Secondary audience

Status of the Project (WAVE Publications)

App Devs	Content Prep	Origin & CDN	Device & UA	Title of Output (Doc # for next rev)	Date of Current Publication	Planned Update Publication
	●		○	Content Specification 2021 (CTA-5001-D*)	2021	(See Annex plan)
	●			DASH/HLS Interop Specification v2 (CTA-5005-A)	2021	tbd
●			●	Web Media API Snapshot 2022 (CTA-5000-E)	2021	2022Q4 (tent.)
●				Web Media Application Developer Guidelines (CTA-5002-A)	2018	tbd
●			●	<i>"WMAS Test Subset for HbbTV & ASTC"</i>	In process	tbd
	●		●	<i>"Video Switching Sets for Device Reach"</i> (5001-D annex)	In process	tbd
			●	Device Playback Specification 2022 (CTA-5003-A)	2018	2022Q2
			●	Common Access Token Specification (doc # tbd)	In process	2022Q2
●		○		Common Media Client Data Specification (CTA-5004-A)	In process	tbd
●		●		Common Media Server Data Specification (doc # tbd)	2020	2022Q2
		●		Media Request Tracing Specification (doc # tbd)	In process	tbd

* The Content Spec –D rev is current. The update may be an Annex only, see “Video Switching Sets” item.

Roadmap: WAVE Open Source Test Suites

Specification	Conformance Test Suite or Status	Expected date of availability
Content Specification	JCCP	Q1 2023
Web Media API Snapshot	5000-C (2020) available now; 5000-D (2021) is at RFP	-C: Now -D: Q4 2022 (tent.)
Device Playback Specification	5003-A finalizing now	Q4 2022 (tent.)
DASH/HLS Interop Specification	Planning an extension to JCCP	Late 2023
Common Media Server Data Specification	No plan at this time	
Common Access Token Specification	No plan at this time	
Common Media Client Data Specification	No plan at this time	
Request Tracing Specification	No plan at this time	

WAVE Test Suites

- Vision:
 - WAVE promotes **commercial OTT interoperability** by creating **interoperability specifications** and **FOSS test suites** that leverage **industry “core” specifications**.
- The Tools:
 - DPC: Specification + conformance tests for **device playback capability**
 - WMAS: Specification + conformance tests for **minimum UA API support**
 - Content: Specification + conformance tests for **CMAF-prepared content that meets constraints**:
 - for overall interoperability, and
 - for DASH-HLS interoperability (if desired)
 - Based on ‘core’ specifications...

CMAF

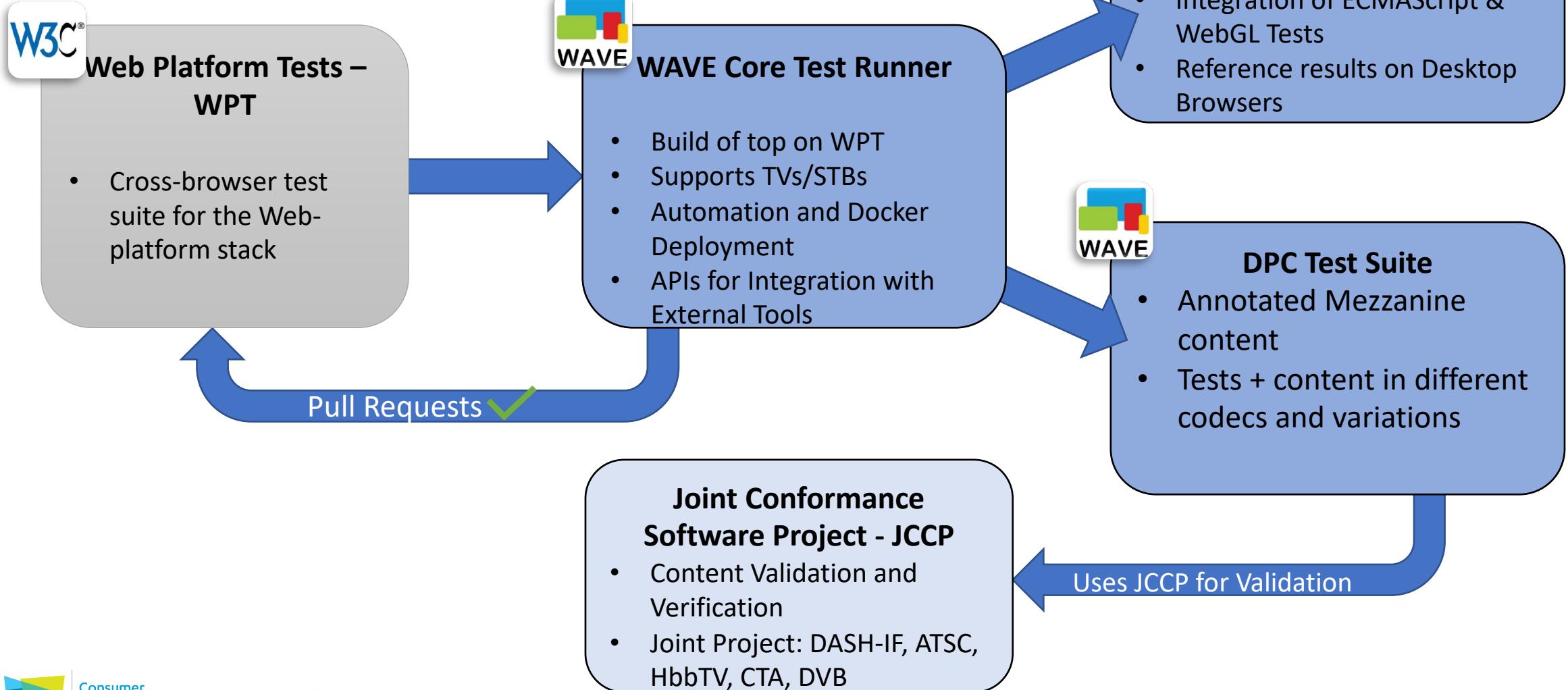
HTML5/MSE/EME

DASH

HLS

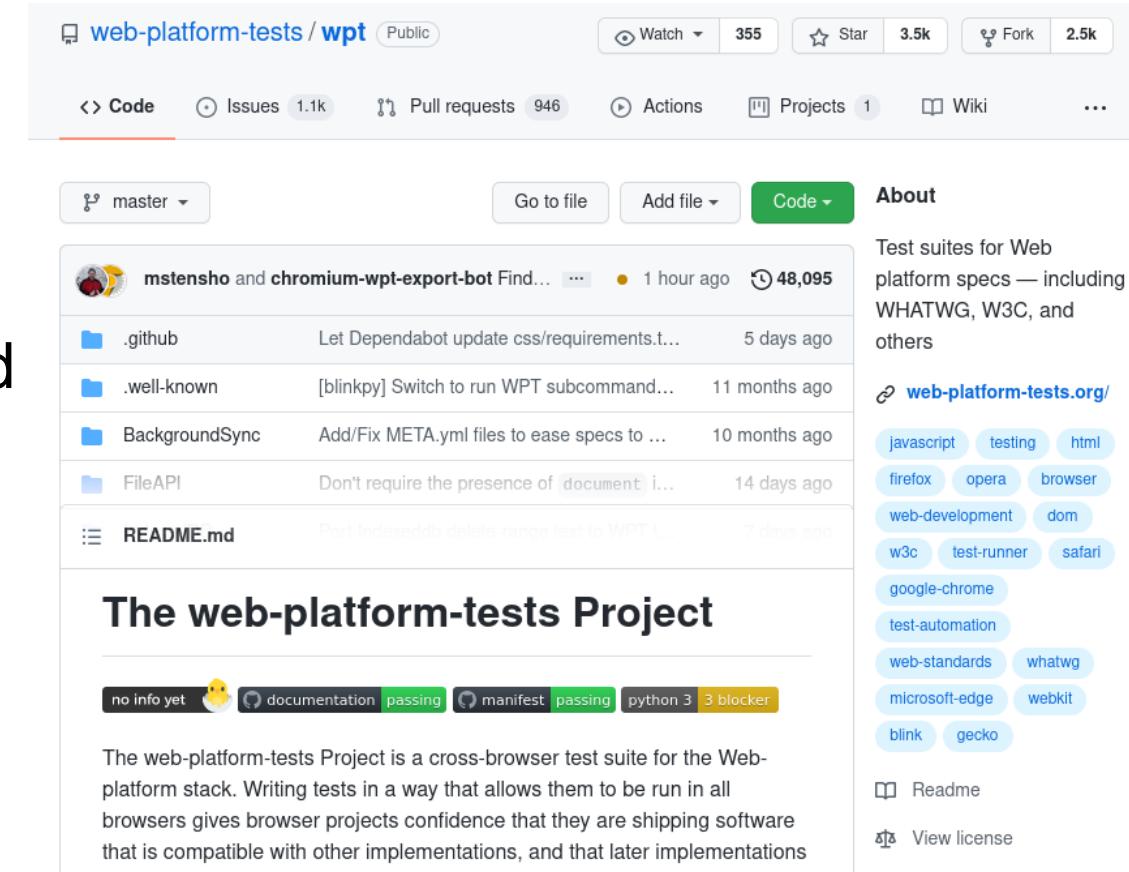
CENC

WAVE Test Suites



Web Platform Tests - WPT

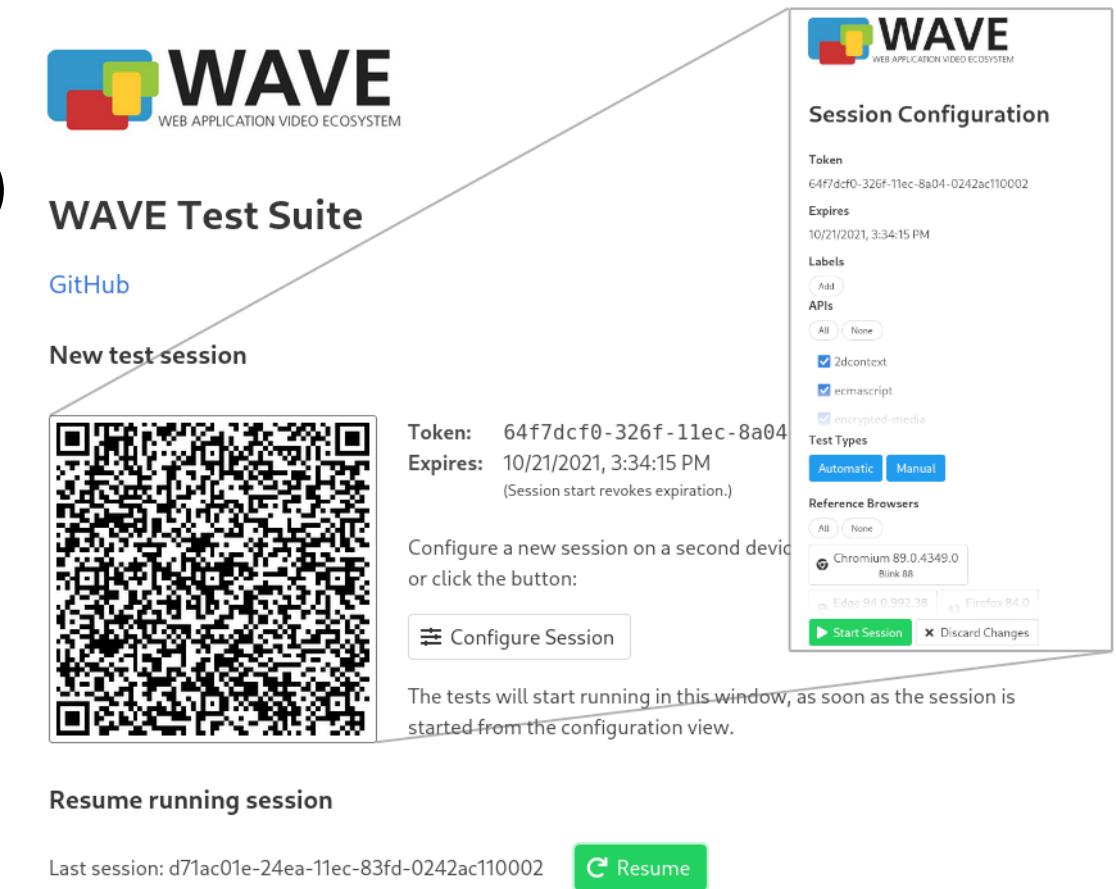
- Cross-browser test suite for the Web-platform stack [\[GitHub\]](#)
- Built for desktop
 - accessible via mouse and keyboard
 - multi window
 - hosted locally, persisting results locally
 - hard to run on embedded devices



The screenshot shows the GitHub repository page for `web-platform-tests / wpt`. The repository is public and has 355 watchers, 3.5k stars, 2.5k forks, and 946 pull requests. The code tab is selected, showing the master branch with recent commits from `mstensho` and `chromium-wpt-export-bot`. The repository description states: "Test suites for Web platform specs — including WHATWG, W3C, and others". It includes links to `web-platform-tests.org` and various tags like `javascript`, `testing`, `html`, `firefox`, `opera`, `browser`, etc. The project summary notes: "The web-platform-tests Project is a cross-browser test suite for the Web-platform stack. Writing tests in a way that allows them to be run in all browsers gives browser projects confidence that they are shipping software that is compatible with other implementations, and that later implementations".

WAVE Core Test Runner

- 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



The screenshot displays the WAVE Core Test Runner interface, which consists of two main components:

- WAVE Test Suite (Left Panel):** This panel shows a "New test session" section with a large QR code. Below the QR code, there's a button labeled "Configure Session". A note at the bottom states: "The tests will start running in this window, as soon as the session is started from the configuration view."
- Session Configuration (Right Panel):** This panel contains the following details:
 - Token:** 64f7dcf0-326f-11ec-8a04-0242ac110002
 - Expires:** 10/21/2021, 3:34:15 PM
 - Labels:** 2context, ecmascript, encrypted-media
 - Test Types:** Automatic (selected), Manual
 - Reference Browsers:** Chromium 89.0.4349.0 (selected), Blink 88, Edge 94.0.992.38, Firefox 84.0
 - Buttons:** Start Session, Discard Changes

WAVE Core Test Runner

- Share test results
 - HTML reports
 - JSON reports
 - Export/Import results between multiple instances
- Use completed sessions as reference for new sessions
 - e.g. run tests on TV that pass on Desktop Browser code bases



Result

Session details

Token	da39b02a-2503-11ec-ad8a-6c88140d17f8
User Agent	Mozilla/5.0 (X11; Linux x86_64; rv:84.0) Gecko/20100101 Firefox/84.0
Test Paths	/2dcontext, /beacon, /content-security-policy, /css, /dom, /ecmascript, /encrypted-media, /fetch, /FileAPI, /fullscreen, /hr-time, /html, /IndexedDB, /manifest, /media-source, /navigation-timing, /notifications, /page-visibility, /performance-timeline, /referrer-policy, /resource-timing, /service-workers, /subresource-integrity, /uievents, /upgrade-insecure-requests, /user-timing, /webaudio, /WebCryptoAPI, /webgl, /webmessaging, /websockets, /webstorage, /workers, /xhr
Excluded Test Paths	0 show
Total Test Files	48872
Status	running
Date Started	10/4/2021, 1:11:48 PM
Date Finished	10/13/2021, 5:31:04 PM
Duration	220:19:16

API Results

API	Pass	Fail	Timeout	Not Run	Test Files Run	Export
2dcontext	774 (87.95%)	106 (12.04%)	0 (0%)	0 (0%)	880/880 (100%)	json report
beacon	18 (85.71%)	1 (4.76%)	1 (4.76%)	1 (4.76%)	10/10 (100%)	json report
content-security-policy	2353 (62.93%)	1199 (32.06%)	139 (3.71%)	48 (1.28%)	764/764 (100%)	json report
css	26972 (67.5%)	12743 (31.89%)	86 (0.21%)	154 (0.38%)	2117/2117 (100%)	json report

Export

Results Download results for import into other WMAS Test Suite instances.

All JSON Files Download JSON files containing results of completed test files.

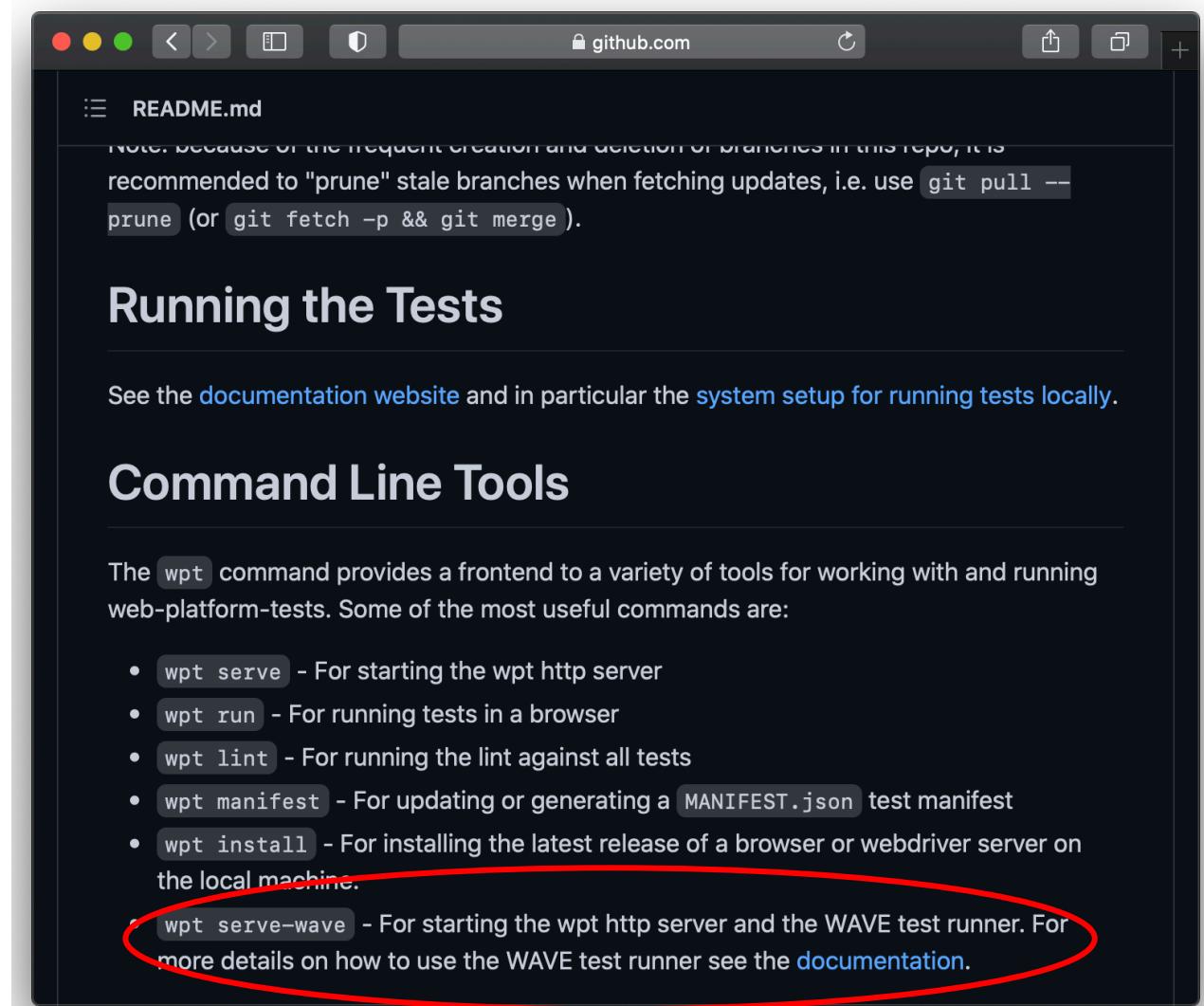
Session result HTML Download this sessions result as standalone HTML page, similar to this page.

[Download Zip](#) [Download Zip](#) [Download HTML](#)

[← Results Overview](#)

Contribution to WPT

- The WAVE WPT Extension is already contributed and merged in the WPT project.
- New Features and bug fixes are also contributed back to the WPT project



The screenshot shows a GitHub browser interface displaying the `README.md` file for the WPT repository. The page includes instructions for managing branches and notes about frequent creation and deletion. Below this, there are sections for "Running the Tests" and "Command Line Tools". A red oval highlights the final bullet point under "Command Line Tools", which describes the `wpt serve-wave` command.

Note: because of the frequent creation and deletion of branches in this repo, it is recommended to "prune" stale branches when fetching updates, i.e. use `git pull --prune` (or `git fetch -p && git merge`).

Running the Tests

See the [documentation website](#) and in particular the [system setup](#) for running tests locally.

Command Line Tools

The `wpt` command provides a frontend to a variety of tools for working with and running web-platform-tests. Some of the most useful commands are:

- `wpt serve` - For starting the wpt http server
- `wpt run` - For running tests in a browser
- `wpt lint` - For running the lint against all tests
- `wpt manifest` - For updating or generating a `MANIFEST.json` test manifest
- `wpt install` - For installing the latest release of a browser or webdriver server on the local machine.
- `wpt serve-wave` - For starting the wpt http server and the WAVE test runner. For more details on how to use the WAVE test runner see the [documentation](#).

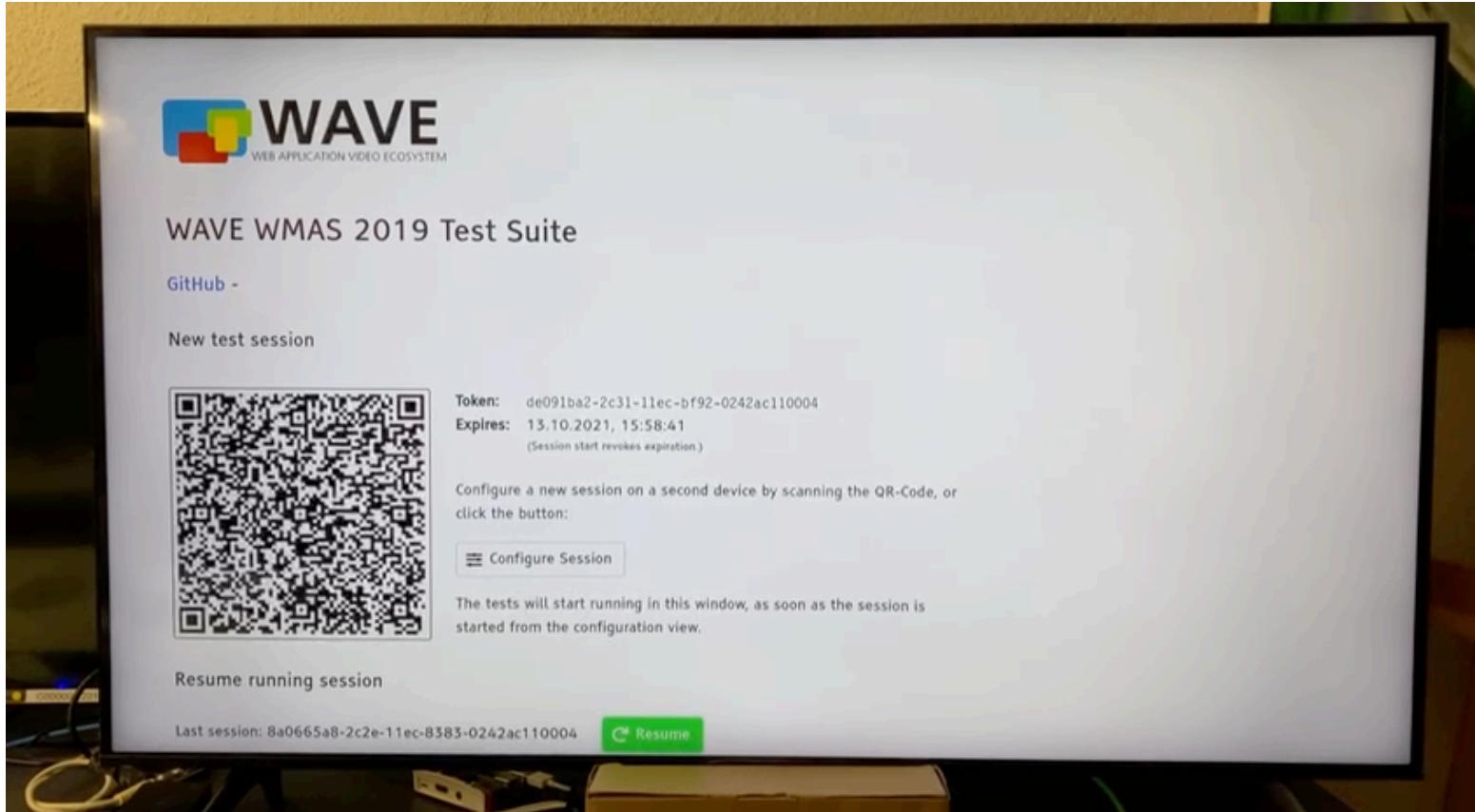
WMAS API Test Suite

- Built on top of WAVE Core Test Runner
- Defines subsets of WPT Tests according to WMAS specifications
- Integrates external test suites and convert tests to WPT compatible format: ECMAScript, WebGL
- Provides reference test results for major desktop browsers (Chrome/Chromium, Edge, Safari/WebKit, Firefox)
- Provides Docker configurations for easy deployment
- Validation on embedded devices (TV/STB, HbbTV)
- GitHub: [WMAS Test Runner](#), [Docker Deployment](#)

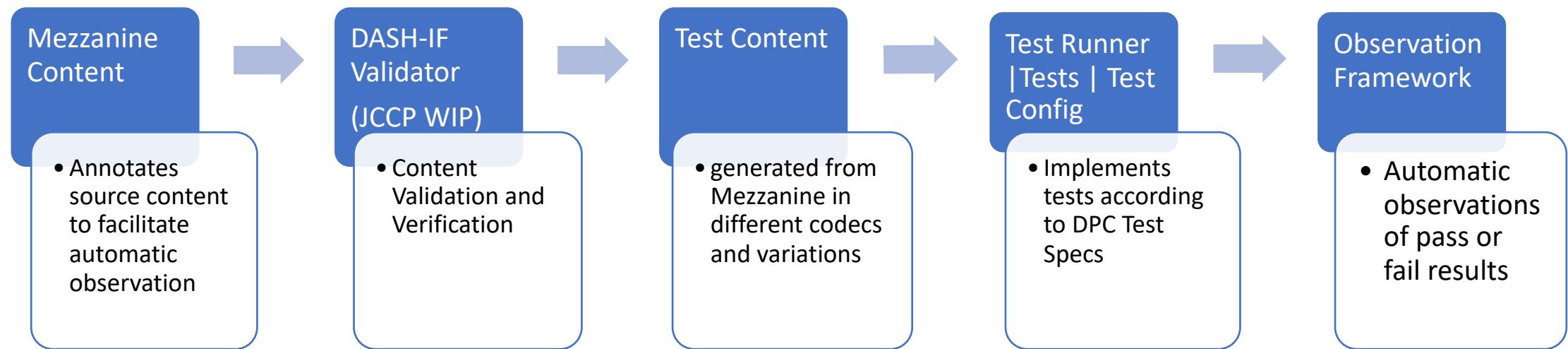
Hosted WMAS API Test Suites

- WMAS2017:
 - Spec: <https://www.w3.org/2017/12/webmediaapi.html>
 - Test Runner: <https://webapitests2017.ctawave.org/>
- WMAS2018:
 - Spec: <https://www.w3.org/2018/12/webmediaapi.html>
 - Test Runner: <https://webapitests2018.ctawave.org/wave/>
- WMAS2019:
 - Spec: <https://www.w3.org/2019/12/webmediaapi.html>
 - Test Runner: <https://webapitests2019.ctawave.org/wave/>
- WMAS2020:
 - Spec: <https://www.w3.org/2020/12/webmediaapi.html>
 - Test Runner: <https://webapitests2020.ctawave.org/wave/>

WMAS API Test Suite on HbbTV - Demo



DPC Test Suite – Building Blocks



DPC Test Suite

- Custom tests to test playback of different media under various circumstances
- Implements tests according to DPC Test Specification
- Offers tools to generate tests for different variations of Test Implementation and Test Content
- Offers docker configuration for easier deployment
- GitHub: [DPC Test Suite](#)



DPC Test Suite - Demo

