



Consumer
Technology
Association™



WAVE

WEB APPLICATION VIDEO ECOSYSTEM

WAVE Update for MEIG

October 25, 2021

Will Law – Chairman – CTA WAVE

What is WAVE again?

Web Application Video Ecosystem

For Internet-delivered commercial video (“streaming”) and web applications

- Goals:
 - Consumer Devices: To improve streaming handling
 - Content Creators: To ease distribution to devices
- Strategies:
 - **Make** standards - Interoperability specifications based on accepted industry standards (e.g., *HTML5, MSE/EME, MPEG-CMAF, DASH and HLS, well-known codecs*)
 - **Test** those standards - Interoperability tools for global compatibility
 - **Coordinate** – activities among other SDOs
- WAVE also hosts the CMAF Industry Forum (CMAF-IF), focused on promoting CMAF industry interoperability and support.
- Currently 165 participants from 64 companies. Hosted by the Consumer Technology Association (CTA[®]) since 2015.

WAVE bridges media standards & web standards

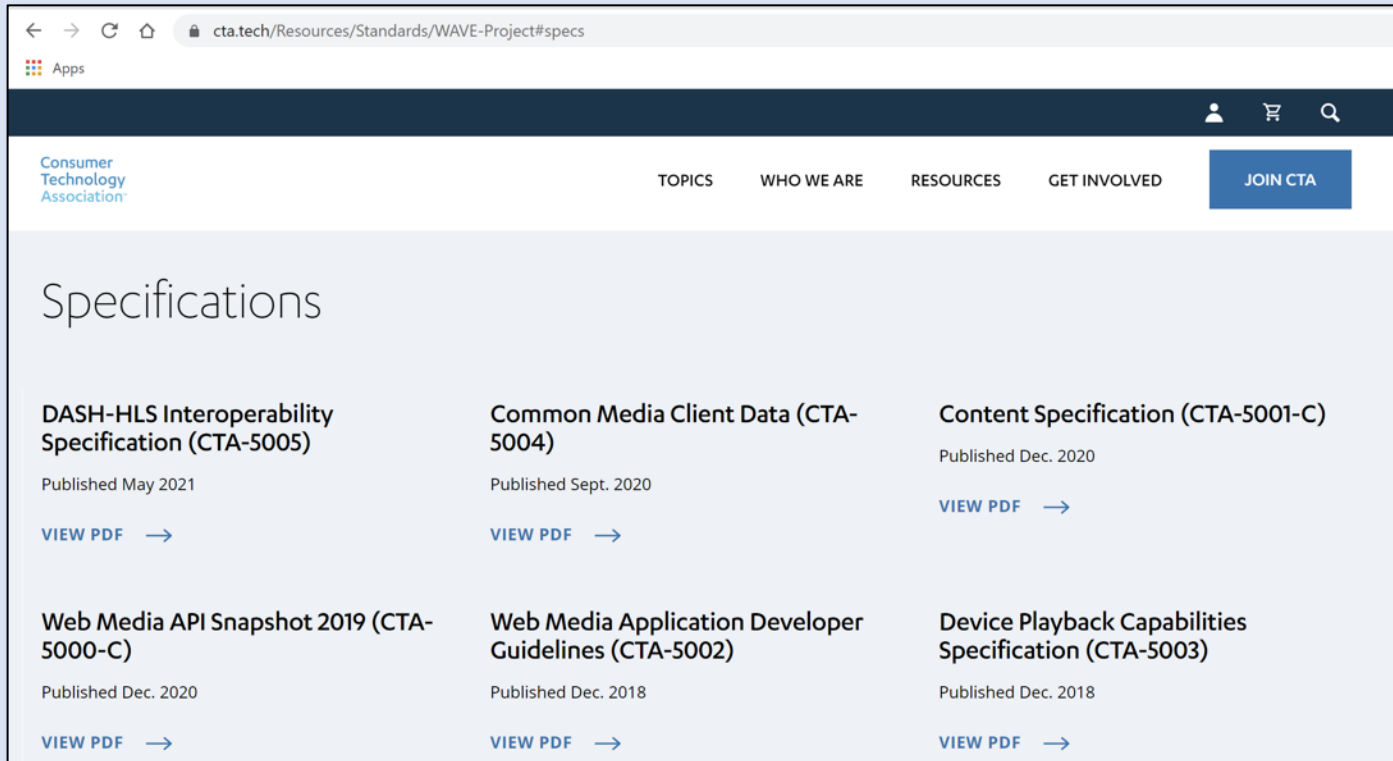
WAVE Device Playback Capabilities Spec

WAVE Content Spec

WAVE Web Media API spec

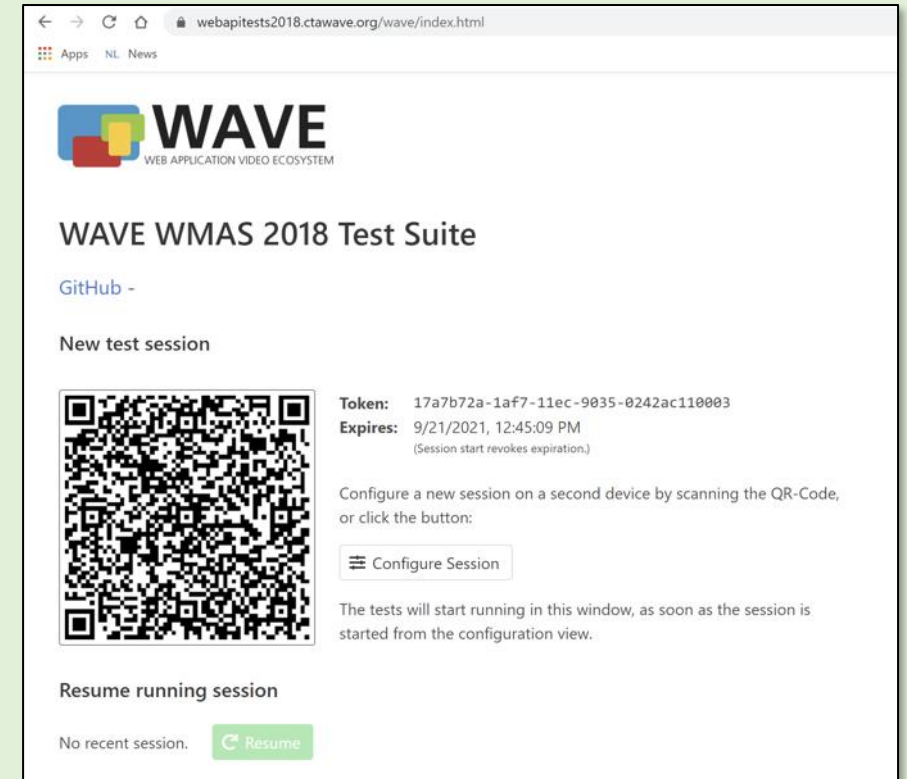


WAVE Project: What we make



Interoperability specifications for content, plus specifications for device playback and API environments

Test tools for content validation, plus device playback and API validation



All WAVE Project output is free & code is open source

WAVE Project Recent Standards Activities

Publications:

- WAVE main specifications/updates, published Q4 2021
 - Updated CTA-5003-A, *Device Playback Specification* with Media Capabilities Discovery annex
 - Updated CTA-5000-D, *Web Media Snapshot 2021* (note, this is the 2nd update to the –B version cited in A/344)
 - Updated CTA-5001-D, *Content Specification*
- Newly available:
 - [CTA-5004, Common Media Client Data](#) – info passed from client (e.g. bitrate, buffer & segment signaling, more) to allow CDNs to optimize traffic
 - [CTA-5005, DASH/HLS Interop Specification](#) (linked here and also available at CTA.tech store)
 - Conformance test will be via JCCP (Joint Content Conformance Project) with ATSC/DASH-IF/DVB/HbbTV
- Other Projects:
 - Common Media Server Data – info passed from server to client, e.g., bandwidth & bitrate, redirection, caching...
 - Common Token Format – to standardize mechanisms for structuring, naming, generating & revoking access tokens.

Test suites built under contract by

Thanks to Louay Bassbouss for
the following slide material.



Fraunhofer

FOKUS

The Big Picture for testing

Web-Platform-Tests (WPT) with WAVE Extension [\[GitHub\]](#)

Web-Platform-Tests

- Provides Test Runner Tools
- Implements Tests for Web APIs

WAVE Extension

- Supports embedded devices like TVs/STBs
- New features: REST APIs, Docker, Companion Config

Web Media APIs Snapshots (WMAS) Test Suites [\[GitHub\]](#)

WMAS2017
Test Runner

WMAS2018
Test Runner

WMAS2019
Test Runner

WMAS2020
Test Runner

Device Playback Capabilities (DPC) Test Suite [\[GitHub\]](#)

Mezzanine
Content

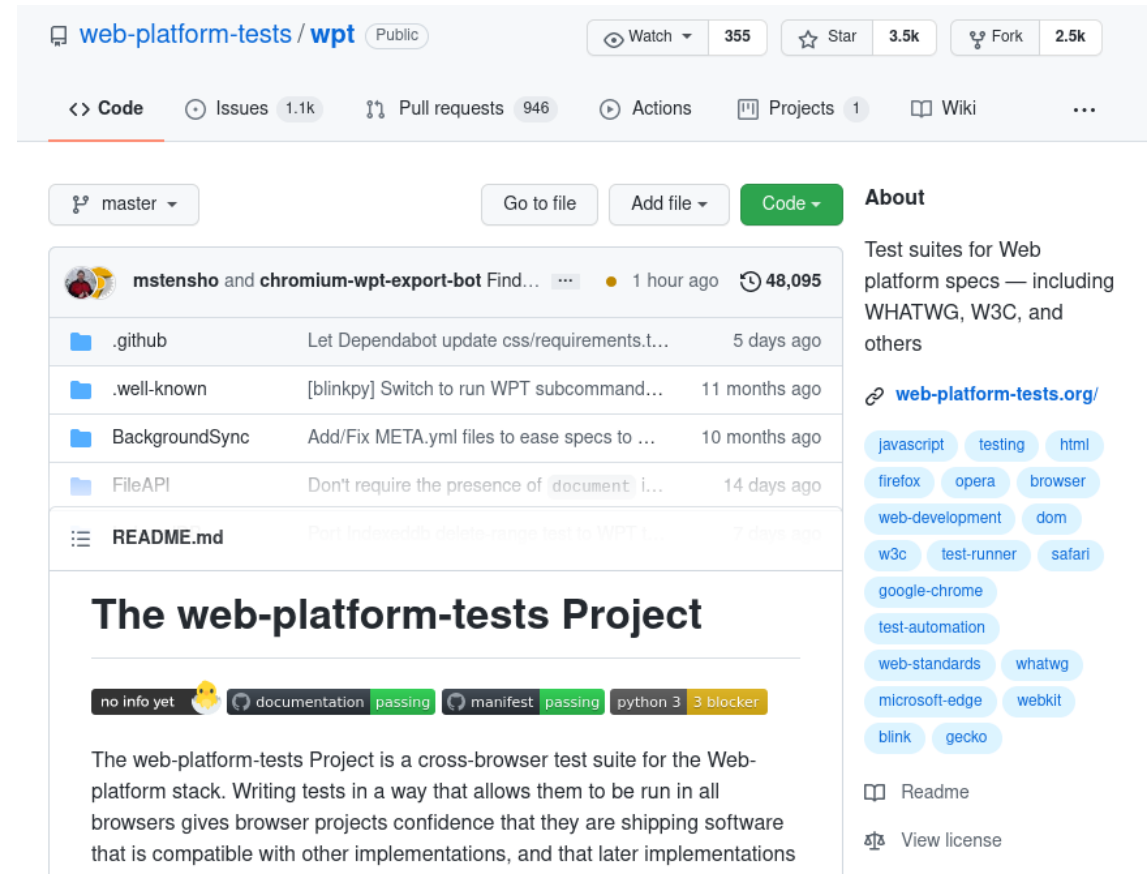
Test
Content

Test
Runner

Observation
Framework

W3C 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



The screenshot shows the GitHub repository page for `web-platform-tests / wpt`. The repository is public and has 355 watchers, 3.5k stars, and 2.5k forks. It includes 1.1k issues, 946 pull requests, 1 project, and a wiki. The current branch is `master`. The repository contains several folders: `.github`, `.well-known`, `BackgroundSync`, `FileAPI`, and `README.md`. The `README.md` file is highlighted, showing the project title "The web-platform-tests Project" and a progress bar with the following status: "no info yet", "documentation passing", "manifest passing", "python 3 3 blocker". The `About` section describes the project as "Test suites for Web platform specs — including WHATWG, W3C, and others" and provides the website `web-platform-tests.org/`. The `tags` section includes `javascript`, `testing`, `html`, `firefox`, `opera`, `browser`, `web-development`, `dom`, `w3c`, `test-runner`, `safari`, `google-chrome`, `test-automation`, `web-standards`, `whatwg`, `microsoft-edge`, `webkit`, `blink`, and `gecko`. The `Readme` and `View license` links are also visible.

WAVE Test Runner

- Extend WPT Runner 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



WAVE Test Suite

[GitHub](#)

New test session



Token: 64f7dcf0-326f-11ec-8a04-0242ac110002
Expires: 10/21/2021, 3:34:15 PM
(Session start revokes expiration.)

Configure a new session on a second device 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.

WAVE
WEB APPLICATION VIDEO ECOSYSTEM

Session Configuration

Token
64f7dcf0-326f-11ec-8a04-0242ac110002

Expires
10/21/2021, 3:34:15 PM

Labels
 Add

APIs
 All None

2dcontext
 ecmaascript
 encrypted-media

Test Types

Reference Browsers
 All None

Chromium 89.0.4349.0
Blink 88

Edge 94.0.992.38 Firefox 84.0

Resume running session

Last session: d71ac01e-24ea-11ec-83fd-0242ac110002

Resume

WAVE Test Runner (2)

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

The screenshot displays the WAVE Test Runner interface. At the top left is the WAVE logo (WEB APPLICATION VIDEO ECOSYSTEM). A navigation bar includes a 'Results Overview' link. Below the logo, there are 'Pause', 'Stop', and 'Delete' buttons. The main content area is titled 'Result' and contains 'Session details' and 'API Results' sections.

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

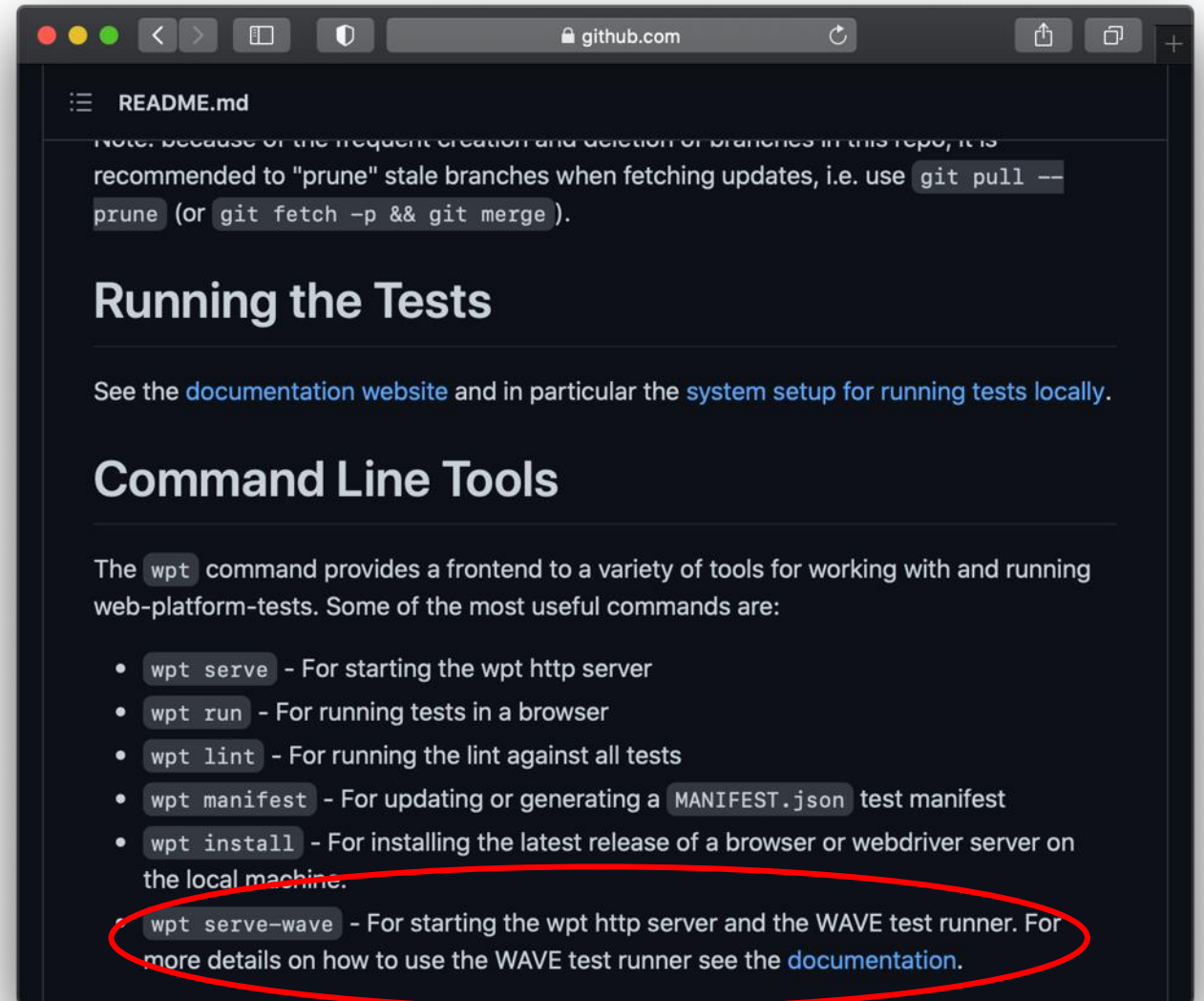
API	Pass	Fail	Timeout	Not Run	Test Files Run	Export
2dcontext	774 (87.95%)	106 (12.04%)	0 (0%)	0 (0%)	880/880 (100%)	json report
beacon	18 (85.71%)	1 (4.76%)	1 (4.76%)	1 (4.76%)	10/10 (100%)	json report
content-security-policy	2353 (62.93%)	1199 (32.06%)	139 (3.71%)	48 (1.28%)	764/764 (100%)	json report
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. [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](#)

WPT + WAVE Extension

- 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



Web Media API Snapshot (WMAS) Test Suites

- Built on top of WPT with WAVE Extension
- 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)

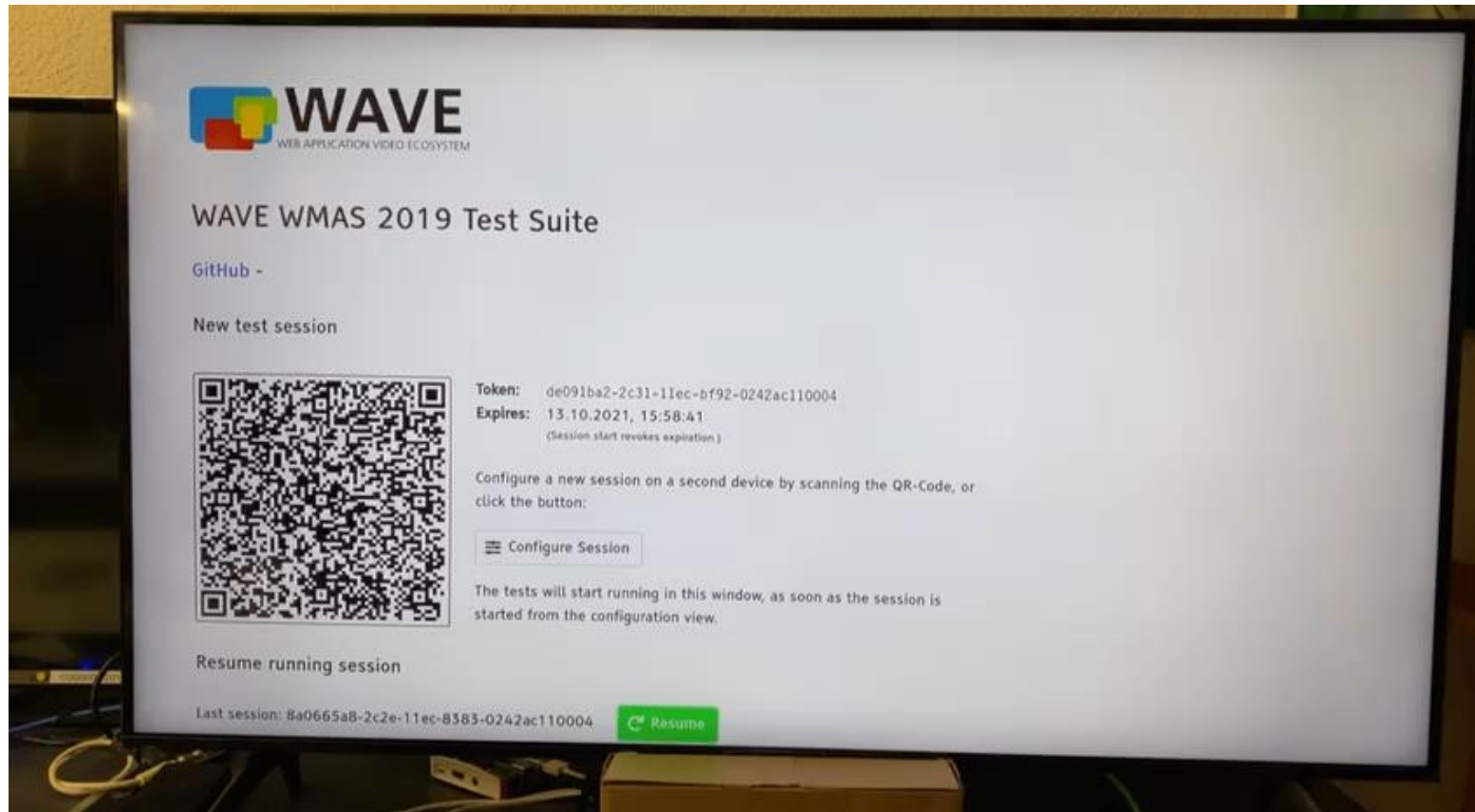
WMAS Test Suites on GitHub

- Test Runner
 - WMAS2017 to WMAS2020
 - [\[GitHub\]](#) (separate branch for each WMAS version)
- Docker Deployment
 - WMAS2018 to WMAS2020
 - [\[GitHub\]](#) (separate branch for each WMAS version)

Hosted WAMS Test Runners

- 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/>

WMAS2019 Test Runner on HbbTV



Device Playback Capabilities (DPC) Test Suite

- The DPC test suite verifies device behavior against requirements for hardware capabilities identified within the Device Playback Capabilities Task Force of the CTA WAVE project [[GitHub](#)]
- consists of four main modules:
 - **Mezzanine Content:** provides scripts to build annotated test content from specific source content, compatible with the WAVE device playback test suite [[GitHub](#)]
 - **Test Content:** offers Test Content generated from the Mezzanine Content in different codecs and variations [[GitHub](#)]
 - **Test Runner:** uses the WAVE Test Runner and Test Content. It offers an automated execution environment following the DPCTF Test Specification [[GitHub](#)]
 - **Observation Framework:** determines pass or fail results, based on observations taken of tests which are run on a device by the Test Runner [[GitHub](#)]

DPC Test Runner

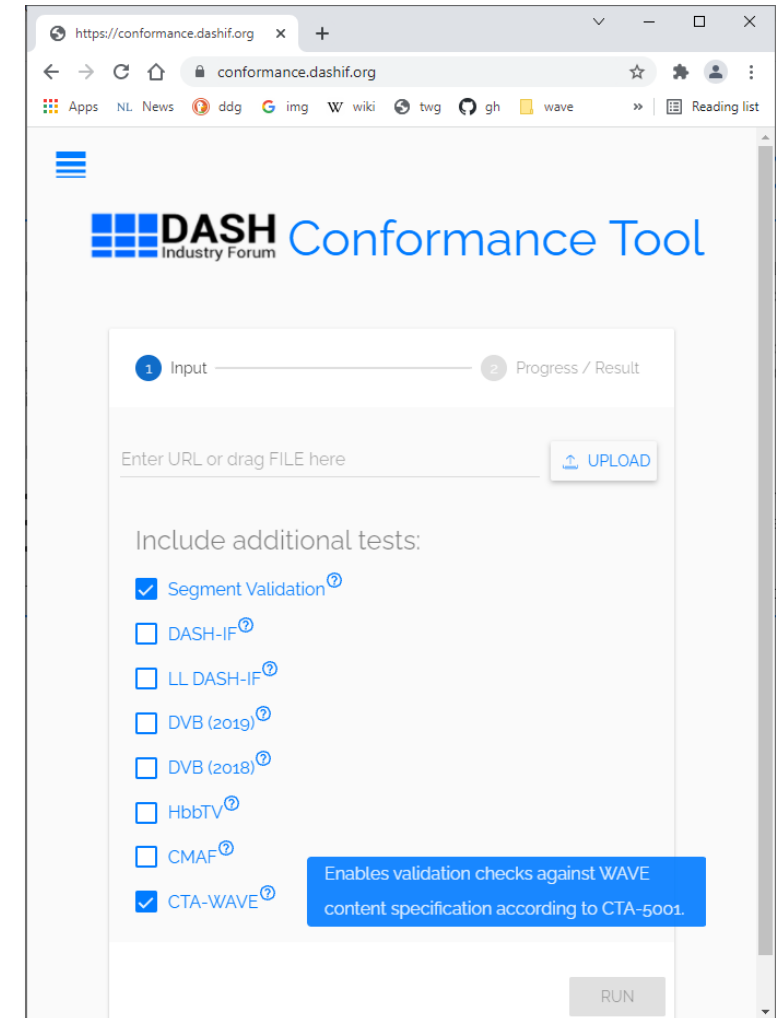
- Custom tests to test playback of different media under various circumstances
- Implements test according to DPC Test Specification
- Offers tools to generate tests for different variations of Test Implementation and Test Content
- Offers docker configuration for easier deployment in local environment



Joint Content Conformance Project

About the Joint Content Conformance Project

- DASH-IF maintains an open-source software tool at conformance.dashif.org
 - Currently used by multiple SDO's
- Tool capabilities
 - Validates the MPD vs. ISO/IEC 23009-1 DASH MPD & Segment Formats
 - Validates applicable profiles
 - (Optional) Segment Validation
 - (Optional) CTA WAVE / DASH-IF / DVB / HbbTV / MPEG-CMAF
- But
 - Code has been developed and maintained for >10 years
 - Code uses multiple languages and tools
 - It's difficult to maintain, hard to extend



Strategies and Goals

- Refactor in fewer languages/tools
- Make additional (selected) improvements
- Eliminate JVM in runtime
- Define unified API across modules
- Create distinct ISOSegmentValidator
- 12-month project, starting late 2021/early 2022

- Easier maintenance/accuracy/extensions
- Support for: CMAF, DASH, DVB, HbbTV, HLS, WAVE Content and DASH-HLS, Service Validation

Project Status

- “Conformance Partners” getting into contract
 - Letter of Intent signed by **ATSC | CTA | DASH-IF | DVB | HbbTV**
 - Cost-sharing Agreement in drafting
 - Can consider additional participants
- Phase 1, requirements & structure – Completed (*study funded by DASH-IF*)
- Phase 2
 - RFP out now (see <https://dashif.org/news/jscsp/>)
 - Anticipate a 12-month project
- SDOs potentially get:
 - ISOBMFF segment validator (shared jointly w/ other parties)
 - SDO-specific module



2021 CMAF Awareness & Adoption Survey

About Respondents

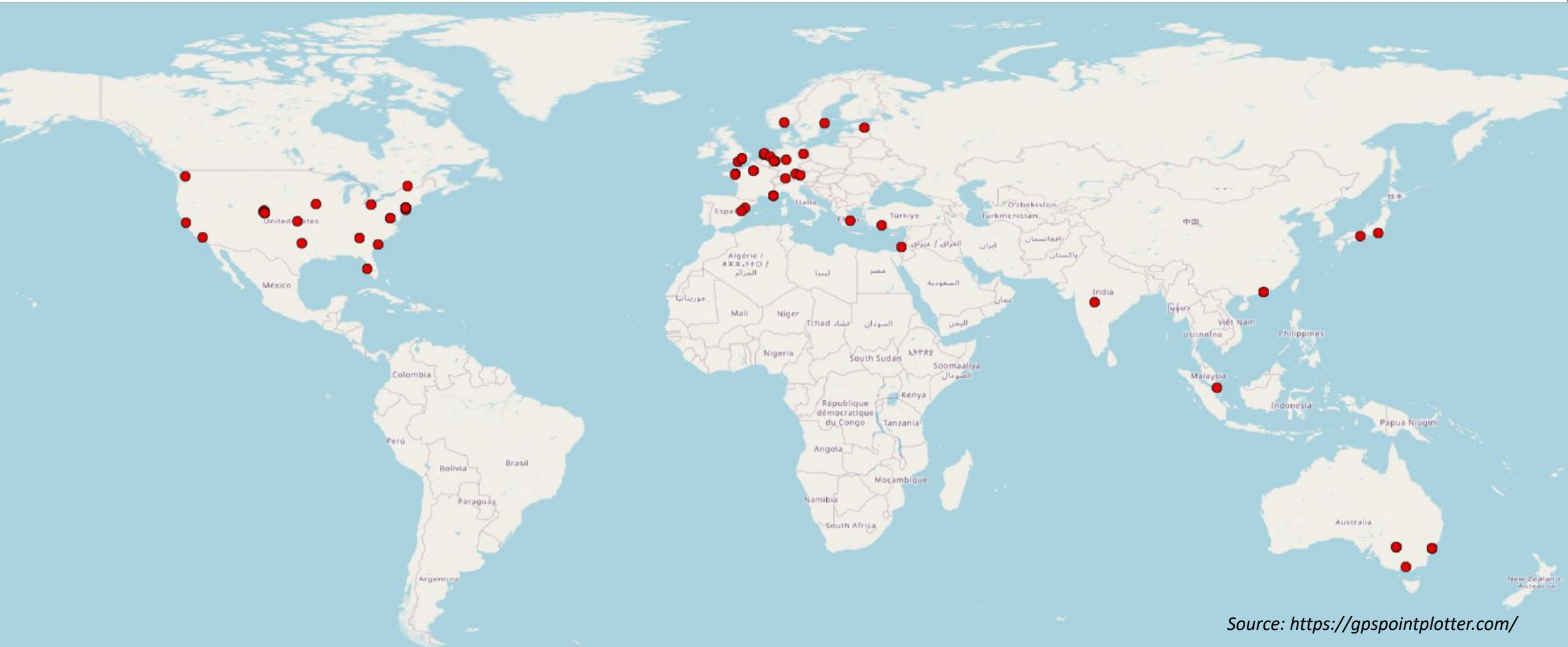
- 64 responses received
 - 37 anonymous;
 - 27 with email addresses
 - 22 Corporate affiliations
 - 8: North America
 - 13: EMEA
 - 3: ASIA
 - 1: AUS/NZ
 - 5 “friends of WAVE” (*members or frequent connections*)

Who did we engage?

139	Lumen
2MC2	Marquise Tech.
AT&T	NHK
Ateme	Optus
Axinom	Sony
BBC	Unified
Broadpeak	Streaming
CBS	VideoFlow
Fraunhofer	Vitrociset
FOKUS	Belgium
Harmonic	
Huawei	
IRT	

* “Engage” means a respondent individual new to WAVE

Respondent distribution



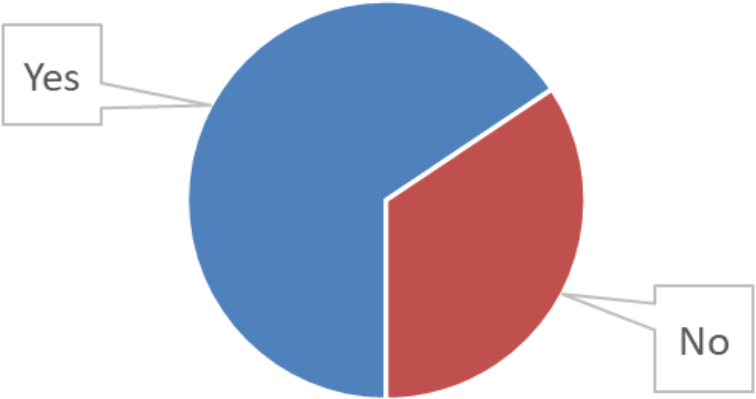
Source: <https://gpspointplotter.com/>

Questions asked

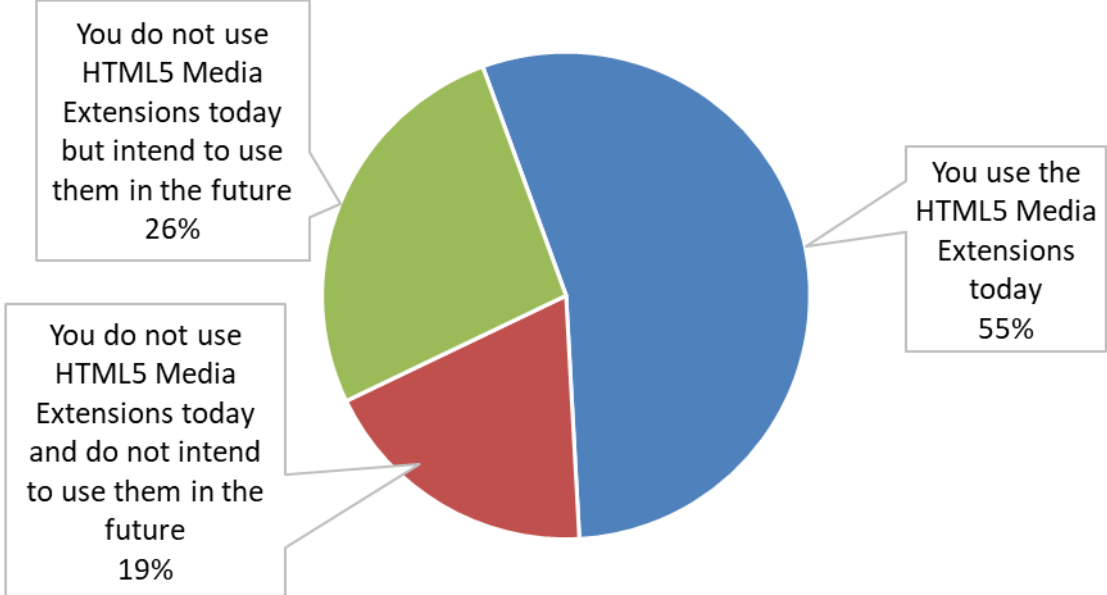
- What best describes your involvement in the Industry?
- Standards setting & industry organizations your company actively participates in?
- CMAF Usage, Plans and Transports?
- CMAF Audio/Video Profiles – Current & Future?
- Planned CODEC support and use?
- DASH-HLS Interop Issues?
- Many more ...

Awareness and Use of HTML5 Media Extensions

Are you aware of the relationship of CMAF to the W3C HTML5 Media Extensions?

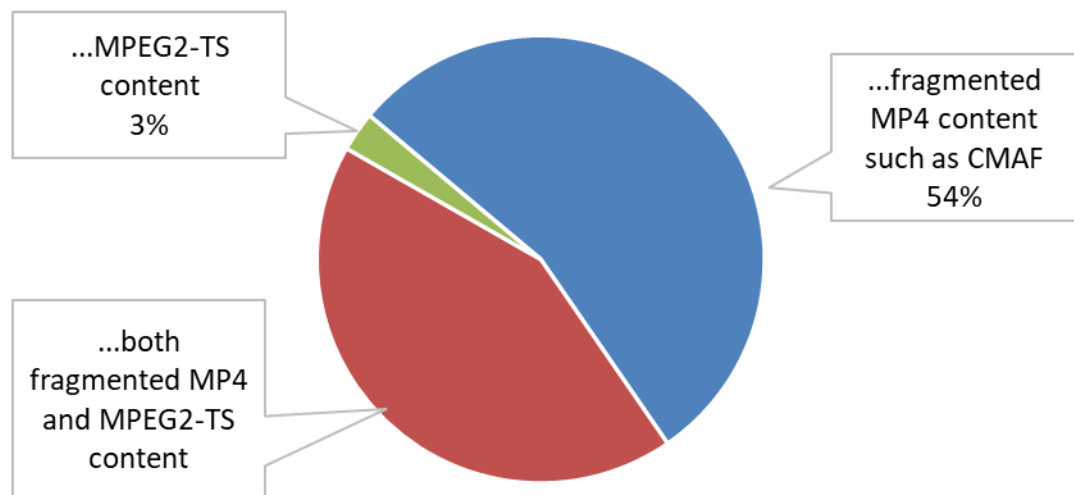


Use of HTML5 Media Extensions today and in the future

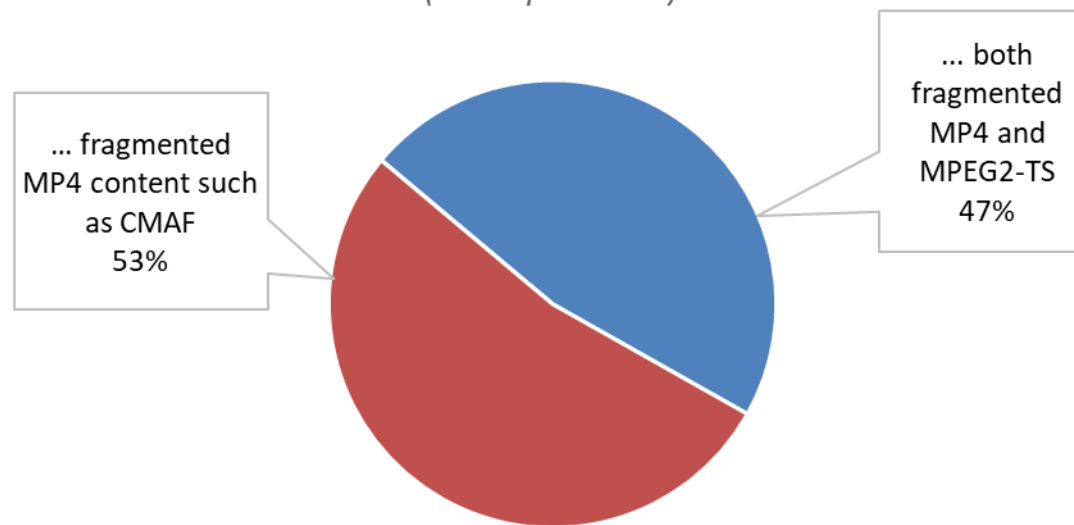


Awareness and Use of HTML5 Media Extensions (2)

Use of HTML5 Media Extensions today and in the future with... (35 respondents)



You intend to use HTML5 Media Extensions with ... (17 respondents)



What is the principal obstacle preventing you from using HTML5 Media Extensions?

- Performance, Market Direction
 - *“The majority of our consumption is CTV. HTML5 implementations are usually poor and half-baked. Premium content consumption is no longer browser based but CTV / Roku / Apple TV etc.” (CTV = connected TV)*
 - *“Unreliable playback performance.”*
- No customer demand | use case | vendor support
 - *“No need”; “Not sure we have a use case for this.”*
 - *“No obstacles, just don't have the customer need / demand to leverage these extensions at this time.”*
 - *“Not enough use cases or vendor support”*
- Out of scope for our business
 - *“I'm involved with providing a service for creating CMAF streams not necessarily playing them.”*
 - *“Not sure of the relevance of this topic to the Server Side Ad Insertion solution we provide.”*
 - *“Video player is not within our scope of activities”*
- Other
 - *“HTML 5 is just a stepping stone to the next version” ; “I am against DRM.”*

Questions?

