CTA™ Consumer Technology Association
Producer of CES®

WAVE Testing at CTA PlugFest

Frequently Asked Questions

Q. What is this testing about?
A. The WAVE Streaming Media Test Suite – Devices ("WAVE Test Suite") verifies the ability of devices to render and display modern streaming services like Disney+ and YouTube.

New this year for the CTA Plugfest, streaming media playout devices like TVs and media sticks can be tested with this open-source test suite. The WAVE Test Suite verifies that streaming audio and video are played out correctly under a variety of content scenarios.

- What it tests: That the device plays out A/V media completely and in order with no gaps in audio or video, and that audio and video are consistently in sync.
- Content scenarios: Sequential track playback, random access to fragments, chunked content, encrypted content, source buffer reinitialization, swapping codecs, changing encryption schemes, overlaps and gaps in content and more.
- Content types: AVC, HEVC, AAC, AC-3 and AC 4.

Q. Is the testing for Sources or Sinks?
A. Source and Sink are useful distinctions in HDMI. However, these terms are specifically about the HDMI interconnection. The WAVE Test Suite is aimed at the media playout process: receiving a stream, unpacking the audio/video/captions, and feeding packets to the media buffers for playout. The Test Suite works off the audio and video rendered by the device, using a camera and microphone.

So this testing is for devices that can render streaming media, either on their own screen or on a display monitor.

Q. What is the manufacturer's incentive to do this kind of testing?
A. The WAVE Device Test Suite allows a player manufacturer to:

- Improve interoperability between apps and devices for media playback using web APIs.
- Reduce the combinatorial explosion of testing between apps and devices, so manufacturers do not have to repeat the same testing across many platform/content combinations.
- Test a player once and share results with content providers and platforms, instead of revalidating separately for each partner.
- Improve the viability of web-based media apps on TVs and other devices.

Q. What kind of results does the manufacturer end up with?
A. A participating manufacturer will leave with:

- A copy of CTA-5003-C, the Device Playback test specification.
- A list of test vectors and specific tests used.
- A list of tests with pass/fail/reason information for the specific device.
- An agentic AI tool will post-process and summarize test data. The manufacturer's results can be contrasted with industry averages from prior events. Participants will have the opportunity to discuss the results with the CTA testing team.

Q. Who will have access to the results of testing?
A. The participating manufacturer will see their own results, as will CTA and their contracted engineers who are assisting with the testing. A manufacturer's results may be anonymized and aggregated with other anonymized results, but all results are confidential otherwise. All testing will be covered under the Plugfest NDA for this event.

Q. How does a device play out the WAVE content in the test suite? Specifically, what does the manufacturer's engineer need to do to run the tests?
A. For the WAVE testing, the participating engineers need only play networked test vectors on their devices, and the WAVE engineers will do the rest.

Here are the specifics:

- If there is an available TV Browser on the device:
  - Open the URL of the WAVE Test Runner (TR) landing page in the browser
  - Details on the URL are available at https://github.com/cta-wave/dpctf-deploy#phase-2-test-execution-and-recording-to-be-performed-by-tester.
- Else if the device is HbbTV-compliant:
  - The URL of the landing page is embedded in the HbbTV Playout signal (MPEG-TS) as an HbbTV Application.
  - HbbTV terminals launch the TR Landing page automatically when you switch to the corresponding channel.
- Else if the device runs a Smart TV Platform Engine (Samsung/Tizen, LG/WebOS, ...):
  - You need to install a minimal application (so-called hosted App) that immediately forwards to the TR landing page after start.
  - The app is just a minimal app that usually includes an HTML file.
  - For Android TV, WebOS, Tizen, we can provide the minimal app if required.
  - Here is a sample HTML file that would go in the minimum app; the app just needs to launch this HTML. The yellow marked line forwards to the test suite landing page (this is an example URL of test suite running on a test server provided by Fraunhofer).

```
<!DOCTYPE html>
<html>
<head>
    <link rel="stylesheet" type="text/css" href="css/style.css" />
    <title>WAVE Streaming Media Test Suite Sample Smart TV App</
title>
       <meta charset="UTF-8" />
       <meta http-equiv="refresh" content="1; URL=https://trillian.
fokus.fraunhofer.de/_wave/" />
</head>
<body>
 <p>redirecting...</p>
</body>
</html>
```

Q. What standards are involved?

A. These services use adaptive bit rate (ABR) streamed media, either HLS or MPEG-DASH ABR. The content is typically processed with AVC or HEVC video compression and one of the major (MPEG, Dolby, DTS, or other) audio compression technologies, and then bundled up for streaming with MPEG CMAF.

Q. Where can I get more technical information about WAVE (architecture, tests, specifications, etc.)?

A. See https://www.cta.tech/wave-project/wave-streaming-media-test-suite-devices/ for overviews, architecture, specifications and more.