Consumer Technology Association™

CTA Specification

Web Media API Snapshot 2023

CTA-5000-F

October 2023

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(Formulated under the cognizance of the CTA **WAVE Project**; for information please see cta.tech/WAVE.)

Published by
CONSUMER TECHNOLOGY ASSOCIATION
Technology & Standards Department
www.cta.tech

Foreword

The goal of WAVE is to improve interoperability in the commercial Over-the-Top (OTT) video ecosystem using industry-standard protocols including HTML5 with MSE Extensions [MEDIA-SOURCE] and EME [ENCRYPTED-MEDIA], MPEG-CMAF[1], MPEG-CENC[2] and adaptive bit-rate streaming protocols MPEG-DASH[3] and Apple HLS[4].

The process under which WAVE develops specifications is available online at the WAVE public home page (https://cta.tech/wave).

The *Web Media API Snapshot 2023* was co-developed between the CTA WAVE HTML5 API Task Force and the W3C Web Media API Community Group. It is jointly published between CTA (as a CTA specification, CTA-5000-F) and W3C (as a Final Community Group Report), by agreement between the two organizations.

Web Media API Snapshot 2023

CTA Status: CTA Specification CTA-5000-F, "WAVE Web Media API Snapshot 2023"

W3C Status: Final Community Group Report, 1 November 2023

Latest editor's draft:

https://w3c.github.io/webmediaapi/

Test suite:

https://webapitests2023.ctawave.org/wave/

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[1] ISO/IEC 23000-19:2020, "Information technology – Multimedia application format (MPEG-A) – Part 19: Common media application format (CMAF) for segmented media", https://www.iso.org/standard/79106.html.

[2] ISO/IEC 23001-7:2016, "Information technology – MPEG systems technologies – Part 7: Common encryption in ISO base media file format files", https://www.iso.org/standard/68042.html.

[3] ISO/IEC 23009-1:2014, "Information technology – Dynamic adaptive streaming over HTTP (DASH) – Part 1: Media presentation description and segment formats", https://www.iso.org/standard/65274.html

[4] Pantos, R., Ed., and W. May, "HTTP Live Streaming", https://tools.ietf.org/html/draft-pantos-http-live-streaming-20.

Participate:

Web Media API Specification Repository: https://github.com/w3c/webmediaapi

File a bug: https://github.com/w3c/webmediaapi/issues/

Commit history: https://github.com/w3c/webmediaapi/commits/gh-pages

Pull requests: https://github.com/w3c/webmediaapi/pulls/

Abstract

This specification lists the web APIs to support media web apps that are supported across all four of the most widely used user agent code bases at the time of publication (i.e., Chrome, Edge, Firefox, and Safari). This specification should be updated at least annually to keep pace with the evolving web platform. We encourage manufacturers to develop products that support the APIs in the most recent version of Web Media API Snapshot. This specification is comprised of references to existing specifications in W3C and other specification groups. The target devices will include any device that runs a modern HTML user agent, including televisions, game machines, set-top boxes, mobile devices and personal computers.

This specification is being developed as part of the CTA WAVE Project[5].

Status of This Document

This specification was published by the Web Media API Community Group[6]. It is not a W3C Standard nor is it on the W3C Standards Track. Please note that under the W3C Community Contributor License Agreement (CLA)[7] there is a limited opt-out and other conditions apply. Learn more about W3C Community and Business Groups[8].

GitHub Issues[9] are preferred for discussion of this specification.

[5] http://cta.tech/WAVE

[6] https://www.w3.org/community/webmediaapi/

[7] https://www.w3.org/community/about/agreements/cla/

[8] https://www.w3.org/community/

[9] https://github.com/w3c/webmediaapi/issues/

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Web Application Video Ecosystem – Web Media API Snapshot 2023

1 INTRODUCTION

This section is non-normative.

Writing portable media web apps across browsers on consumer products (e.g., smart TVs, game machines, set-top boxes) is much more difficult than writing portable media web apps across personal computer browsers. Two main reasons for this are that the browsers on consumer products are often quite out-of-date and that they often have integration issues.

1.1 Out-of-date browsers

While browsers integrated into consumer products are often built from the same major HTML user agent code bases as personal computer browsers, it is not unusual for a consumer product to be using a code base release that is three or more years old, while personal computer browsers use recent code base releases. Furthermore, browsers on consumer products are often infrequently updated, if ever. This results in very different web API support across devices.

This specification is intended to address this problem by listing key specifications used by media web apps that are all supported in common by all of the four major web user agent code bases at the time of publication (i.e., Chrome, Edge, Firefox, and Safari). The specification will then be used to generate a test suite. The versions of each of the four code bases used to generate the test suite are listed on the front page of the test suite (see test suite URL above).

The specification and test suite enable device manufacturers to specify and verify that their browsers are up-to-date with current web standards at the time of product release. The specification and tests can also be used to specify and verify updates to browsers in the field.

Note that this specification is not defining a subset or profile to be used in place of the full web platform. There are additional specifications that are included in all code bases that are not included in this specification. Furthermore, individual code bases include APIs that are not supported on all other code bases but are nonetheless widely used. Therefore, this specification and associated tests should only be used as verification of a minimum set of current APIs. There is no suggestion that APIs not included in this specification should be removed from implementations.

It is intended that this specification be updated periodically to reflect adoption of new specifications in the web platform. For example, the specification might be updated once a year for media devices being introduced onto the market in the following year.

1.2 Integration issues

There are many issues during integration of a web user agent with a hardware device that can affect the operation of web APIs. For example, if insufficient memory is allocated for cookies, they won't function as intended.

To address this issue, this specification includes a list of target values for several APIs which are known to have been impacted by integration issues. There will also be a test suite to verify these values are supported on a device. It is expected that additional integration requirements will be added in future updates.

Note that these values are not mandated by any web standards but are based on measurement of values supported by popular browsers. Supporting these values should provide better interoperability of web applications with personal computer and mobile browsers. Manufacturers may choose to exceed these values based on their expected application environments.

2 CONFORMANCE

As well as sections marked as non-normative, all authoring guidelines, diagrams, examples, and notes in this specification are non-normative. Everything else in this specification is normative.

The key words *MUST* and *SHOULD* in this document are to be interpreted as described in BCP 14 [*RFC2119*] [*RFC8174*] when, and only when, they appear in all capitals, as shown here.

3 WEB MEDIA APIS CURRENTLY SUPPORTED ON ALL PLATFORMS

3.1 Introduction

This section is non-normative.

This section lists the web APIs to support media web apps that are supported across all four of the most widely used user agent code bases at the time of publication (i.e., Chrome, Edge, Firefox, and Safari). We encourage manufacturers to develop products that support the APIs in the most recent version of this specification.

The approach taken in this draft is only to include specifications that are of particular significance to authors, but not include all the specifications cited by those included specifications. For example, HTTP is required by the HTML spec and is therefore not included here.

In addition, the specifications of the web APIs mentioned here may in turn (recursively) reference other specifications that are not supported across all four of the most widely used user agent code bases. This possibility is understood and accepted. For example, Content Security Policy Level 2 [CSP2] references the `image()` function from CSS Images Module Level 4 [CSS-IMAGES-4], but CSS Images Module Level 4 is not yet widely supported. These

unsupported referenced specifications are not explicitly cited as exceptions in this specification but, in spite of this, will not be tested as part of our tests.

3.1.1 Features with limited implementation

Parts of some web specifications are not currently implemented across all user agent code bases and may never be. Consequently, these features will not be included in our tests. Any such features are noted as exceptions under that API.

3.1.2 At-risk features

Some specifications referenced in this section may not have reached Recommendation and, as such, may contain 'at-risk' features. Since the most common reason for features being marked as at-risk is lack of implementations, such features may not be present in some implementations of this specification and will not be tested as part of our tests.

3.1.3 Hardware limitations

While this specification does not specify a minimum or maximum number of media elements that can play content simultaneously, developers should note that due to hardware limitations of available decoders, the simultaneous playback of multiple media elements in a web application may not be possible.

3.2 Client code updates

The W3C Technical Architecture Group released a finding called *The Evergreen Web* which strongly recommends that “browsers must be regularly updated, especially to fix security and interoperability bugs — ideally with an automatic, secure update mechanism” [EVERGREEN-WEB].

Devices *SHOULD* regularly update their browsers, preferably automatically.

3.3 Core web specifications

Devices *MUST* be conforming implementations of the following specifications:

- DOM [*DOM*]
- ECMAScript 2023 Language Specification [*ECMASCRIPT-2023*]
    - Exceptions:
        - The Function.prototype.toString revisions from ECMAScript 2019 are not yet widely supported.
        - RegExp Match Indices (hasIndices `/d` flag) is not yet widely supported.
- HTML [*HTML*]
    - Devices MUST support the conformance class Web browsers and other interactive user agents.

- Devices *MUST* support a mechanism to construct instances of TextTrackCue or an interface that inherits from it.
  - Note: Current user agent implementations meet this requirement either by supporting VTTCue or by supporting a constructor for TextTrackCue that is no longer included in the HTML specification [*HTML*].
- Exceptions:
  - CSS module scripts are not yet widely supported.
  - The `hidden=until-found` HTML attribute and the `beforematch` event are not yet widely supported.

3.4 CSS specifications

Devices *MUST* be conforming implementations of the following specifications, which are derived from the official Cascading Style Sheets definition from CSS Snapshot 2018 [*CSS-2018*] as well as more recent revisions to CSS specifications as appropriate:

NOTE

As part of the updates included in CSS Snapshot 2018, the CSS Profiles effort was discontinued.

- Cascading Style Sheets Level 2 Revision 1 (CSS 2.1) Specification [*CSS2*]
- Compositing and Blending Level 1 [*COMPOSITING*]
- CSS Animations [*CSS3-ANIMATIONS*]
- CSS Backgrounds and Borders Module Level 3 [*CSS3-BACKGROUND*]
- CSS Basic User Interface Module Level 3 (CSS3 UI) [*CSS-UI-3*]
- CSS Cascading and Inheritance Level 4 [*CSS-CASCADE-4*]
- CSS Color Module Level 4 [*CSS-COLOR-4*]
- CSS Conditional Rules Module Level 3 [*CSS3-CONDITIONAL*]
- CSS Containment Module Level 1 [*CSS-CONTAIN-1*]
- CSS Custom Properties For Cascading Variables Module Level 1 [*CSS-VARIABLES-1*]
- CSS Easing Functions Level 1 [*CSS-EASING-1*]
- CSS Flexible Box Layout Module Level 1 [*CSS-FLEXBOX-1*]
- CSS Font Loading Module Level 3 [*CSS-FONT-LOADING-3*]
- CSS Fonts Module Level 3 [*CSS-FONTS-3*]
- CSS Grid Layout Module Level 1 [*CSS-GRID-1*]
- CSS Image Values and Replaced Content Module Level 3 [*CSS3-IMAGES*]
- CSS Logical Properties and Values Level 1 [*CSS-LOGICAL-1*]
- CSS Multi-column Layout Module [*CSS3-MULTICOL*]
- CSS Namespaces Module Level 3 [*CSS-NAMESPACES-3*]
- CSS Scroll Snap Module Level 1 [*CSS-SCROLL-SNAP-1*]
- CSS Shapes Module Level 1 [*CSS-SHAPES-1*]
- CSS Style Attributes [*CSS-STYLE-ATTR*]
- CSS Syntax Module Level 3 [*CSS-SYNTAX-3*]
- CSS Text Decoration Module Level 3 [*CSS-TEXT-DECOR-3*]
- CSS Transforms Module Level 1 [*CSS-TRANSFORMS-1*]

    - Exception: applying CSS transform functions to `video` elements is not required to be supported. More complex requirements such as 2D rotate, 2D skew or any of the 3D transforms may not work at all or may be limited to unencrypted content and/or to HD / SD content or even to only SD content. They may also result in dropped frames.
- CSS Transitions [*CSS3-TRANSITIONS*]
- CSS Values and Units Module Level 3 [*CSS-VALUES*]
- CSS Will Change Module Level 1 [*CSS-WILL-CHANGE-1*]
- CSS Writing Modes Level 3 [*CSS-WRITING-MODES-3*]
- CSSOM View Module [*CSSOM-VIEW*]
- Filter Effects Module Level 1 [*FILTER-EFFECTS-1*]
- Media Queries [*CSS3-MEDIAQUERIES*]
- Resize Observer [*RESIZE-OBSERVER-1*]
- Selectors Level 3 [*SELECT*]
- Web Animations [*WEB-ANIMATIONS*]

3.5 Media specifications

Devices *MUST* be conforming implementations of the following specifications:

- Encrypted Media Extensions [*ENCRYPTED-MEDIA*]
- Media Capabilities [*MEDIA-CAPABILITIES*]
- Media Fragments URI 1.0 (basic) [*MEDIA-FRAGS*]
    - Note: Support is limited to video track ranges.
- Media Source Extensions [*MEDIA-SOURCE*]
- Web Audio API [*WEBAUDIO*]
- WebRTC 1.0: Real-Time Communication Between Browsers [*WEBRTC*]
    - Note: Since consumer products may not have camera and/or microphone inputs to send video and audio, WebRTC's functionality can be limited to not allow an `RTCRtpTransceiverDirection` of "`sendrecv`" or "`sendonly`" on those devices. This also implies the RTCRtpSender interface is not required to be implemented, and the Media Capture and Streams [*GETUSERMEDIA*] requirements are limited to `MediaStream`, `MediaStreamTrack`, and `MediaStreamConstraints` as defined in Media Capture and Streams and extended by WebRTC. This enables WebRTC to be leveraged for use cases such as security camera feeds, ultra low latency live streaming, and cloud gaming.

3.6 Graphics specifications

Devices *MUST* be conforming implementations of the following specifications:

- Fullscreen API Standard [*FULLSCREEN*]
- Graphics Interchange Format [*GIF*]
- HTML Canvas 2D Context [*2DCONTEXT*]
- JPEG File Interchange Format [*JPEG*]

- Portable Network Graphics (PNG) Specification (Second Edition) [*PNG2e-20031110*]
- WebGL Specification [*WEBGL-103*]

3.7 Font specifications

Devices *MUST* be conforming implementations of the following specifications:

- Open Font Format [*OPEN-FONT-FORMAT*]
- WOFF File Format 1.0 [*WOFF*]

3.8 Networking specifications

Devices *MUST* be conforming implementations of the following specifications:

- Fetch [*FETCH*]
- WebSockets [*WEBSOCKETS*]
- XMLHttpRequest [*XHR*]

3.9 Security specifications

Devices *MUST* be conforming implementations of the following specifications:

- Content Security Policy Level 2 [*CSP2*]
- Referrer Policy [*REFERRER-POLICY*]
- Subresource Integrity [*SRI*]
- Transport Layer Security (TLS) Protocol Version 1.2 [*RFC5246*]
- Transport Layer Security (TLS) Protocol Version 1.3 [*RFC8446*]
- Upgrade Insecure Requests [*UPGRADE-INSECURE-REQUESTS*]
- Web Cryptography API [*WEBCRYPTOAPI*]

Note: Along with these security standards for the user agent, all IoT devices should be designed with security in mind. An industry-developed voluntary consensus standard for a minimum security “baseline” for IoT devices can be found at https://shop.cta.tech/collections/standards/cybersecurity.

3.10 Web Performance specifications

Devices MUST be conforming implementations of the following specifications:

- Beacon [*BEACON*]
- High Resolution Time [*HR-TIME-3*]
- Navigation Timing [*NAVIGATION-TIMING*]
- Performance Timeline [*PERFORMANCE-TIMELINE*]
- Resource Timing Level 1 [*RESOURCE-TIMING-1*]

- User Timing Level 2 [*USER-TIMING-2*]

3.11 Other web specifications

Devices *MUST* be conforming implementations of the following specifications:

- Indexed Database API [*INDEXEDDB*]
- File API [*FILEAPI*]
- Notifications API [*NOTIFICATIONS*]
    - Exception: It is possible for the user agent to support the Notifications API, but the operating system and/or device platform does not support a system to display notifications. In this scenario, it is critical that the current recommendations for feature detection of the Notifications API do not cause an error when run on the device.
        - Note: Best practices regarding feature detection of Notifications API capabilities are discussed in Notifications API GitHub Issue #116 and the "Using the Notifications API" guide from MDN.
- Service Workers 1 [*SERVICE-WORKERS-1*]
- UI Events [*UIEVENTS*]
- Note: Cross-document messaging, Channel messaging, Web storage and Web workers are also required as part of the HTML specification [*HTML*].

4 USER AGENT INTEGRATION SPECIFICATIONS

4.1 Introduction

This section is non-normative.

This section contains values for integrating a web user agent with a consumer device. The values are based on de facto requirements from browsers on personal computers and mobile devices. Supporting these integration specifications will increase interoperability with media web apps on other devices.

A test suite will evaluate client support for these specifications.

4.2 Cookies

- Devices *MUST* support cookies of length at least 4096 bytes.
- Devices *MUST* support at least 20 cookies per domain.
- Devices *MUST* support at least 100 total cookies.
- Devices *MUST* support persistence of cookies between application sessions.
- Devices *MUST* support persistence of cookies across power cycles of the device.

4.3 URLs

- Devices *MUST* support URLs up to a length of 2047 bytes.

5 WEB MEDIA APIS PROPOSED TO BE SUPPORTED ON ALL PLATFORMS

This section is non-normative.

5.1 Introduction

APIs in this section are important for web media delivery but either are not yet implemented in all four code bases or not yet commonly implemented across embedded browsers in consumer products, such as WPEWebKit. We encourage the following APIs be implemented on all HTML user agents as soon as possible. It is expected that, as implementations become available, some of these specifications may be listed as supported on all platforms in a future version of this specification.

5.2 Media specifications

- Media Session Standard [*MEDIASESSION*]
- Sourcing In-band Media Resource Tracks from Media Containers into HTML [*INBANDTRACKS*]
- WebCodecs [*WEBCODECS*]

5.3 WebAssembly specifications

- WebAssembly Core Specification [*WASM-CORE-1*]
- WebAssembly JavaScript Interface [*WASM-JS-API-1*]
- WebAssembly Web API [*WASM-WEB-API-1*]

5.4 Other web specifications

- Push API [*PUSH-API*]
- Web App Manifest [*APPMANIFEST*]
- WebTransport [*WEBTRANSPORT*]

A. WMAS BINDINGS (NORMATIVE)

This annex lists Web Media API bindings assigned within the CTA namespace "`urn:cta`". These bindings may be used to signal compatibility intent or requirement for the WAVE API Snapshot identified in the binding.

See https://www.iana.org/assignments/urn-formal/cta for the CTA namespace registration in the Official IANA Registry of URN Namespaces [*IANA-URN-NAMESPACES*].

The table below is normative within this specification. For more information on these bindings contact standards@CTA.tech.

CTA Identifier	Referenced Specification
urn:cta:wave:appinformation:standardversion:cta5000:2017	Web Media API Snapshot 2017 CTA-5000 [*CTA-5000*]
urn:cta:wave:appinformation:standardversion:cta5000a:2018	Web Media API Snapshot 2018 CTA-5000-A [*CTA-5000-A*]
urn:cta:wave:appinformation:standardversion:cta5000b:2019	Web Media API Snapshot 2019 CTA-5000-B [*CTA-5000-B*]
urn:cta:wave:appinformation:standardversion:cta5000c:2020	Web Media API Snapshot 2020 CTA-5000-C [*CTA-5000-C*]
urn:cta:wave:appinformation:standardversion:cta5000d:2021	Web Media API Snapshot 2021 CTA-5000-D [*CTA-5000-D*]
urn:cta:wave:appinformation:standardversion:cta5000e:2022	Web Media API Snapshot 2022 CTA-5000-E [*CTA-5000-E*]
urn:cta:wave:appinformation:standardversion:cta5000f:2023	Web Media API Snapshot 2023 CTA-5000-F [*CTA-5000-F*]

B. REFERENCES

For WHATWG living standards, while it is recommended that devices support the living standard, they must support the referenced review draft version of each WHATWG standard or a later commit snapshot version.

B.1 Normative references

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HTML Canvas 2D Context. Rik Cabanier; Jatinder Mann; Jay Munro; Tom Wiltzius; Ian Hickson. W3C. 28 January 2021. W3C Recommendation. URL: https://www.w3.org/TR/2dcontext/

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[COMPOSITING]

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[CSS-CONTAIN-1]

CSS Containment Module Level 1. Tab Atkins Jr.; Florian Rivoal. W3C. 25 October 2022. W3C Recommendation. URL: https://www.w3.org/TR/css-contain-1/

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CSS Easing Functions Level 1. Brian Birtles; Dean Jackson; Matt Rakow. W3C. 13 February 2023. W3C Candidate Recommendation. URL: https://www.w3.org/TR/css-easing-1/.

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Consumer Technology Association Document Improvement Proposal

If in the review or use of this document a potential change is made evident for safety, health or technical reasons, please email your reason/rationale for the recommended change to standards@CTA.tech.

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