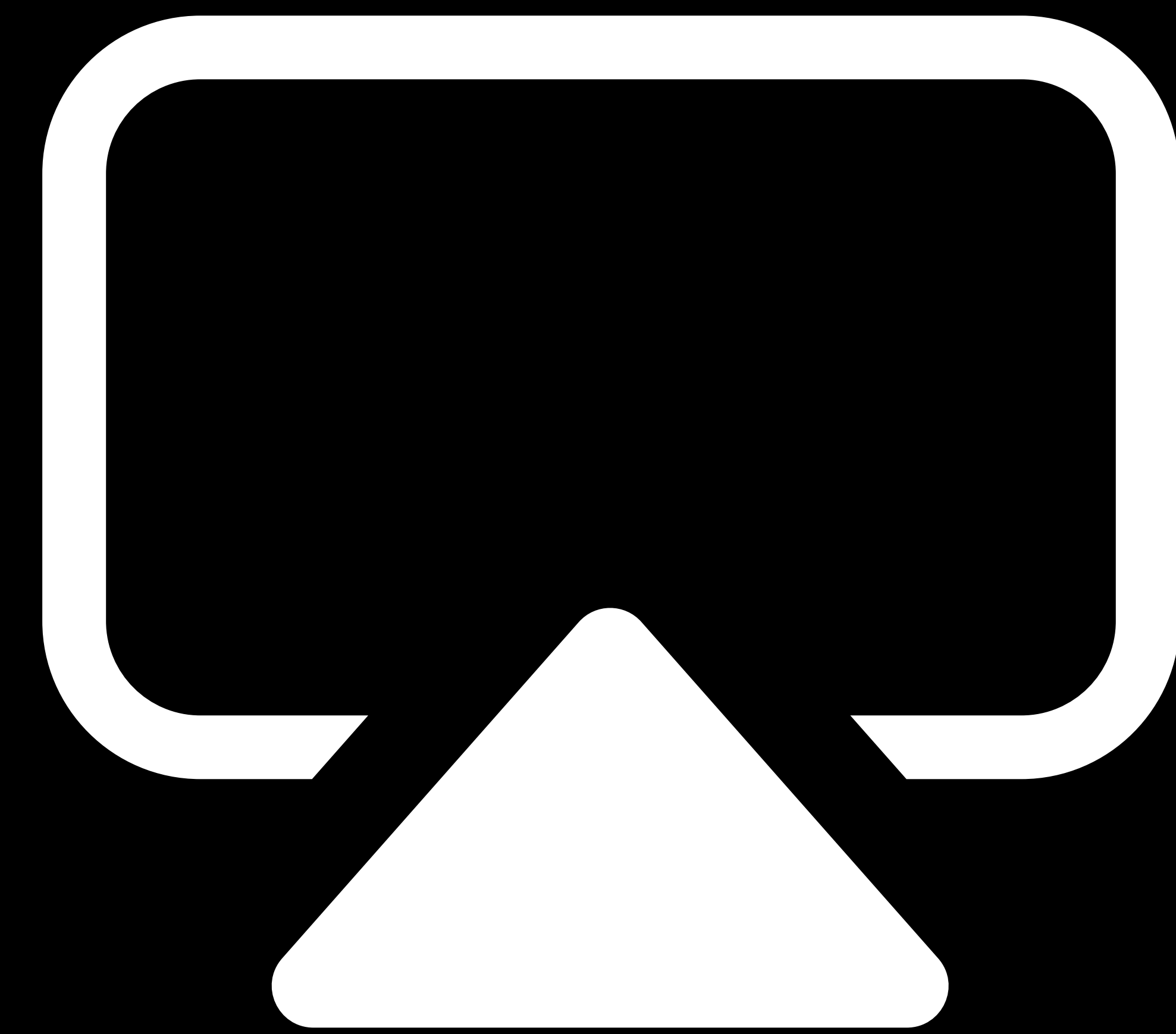


#WWDC19

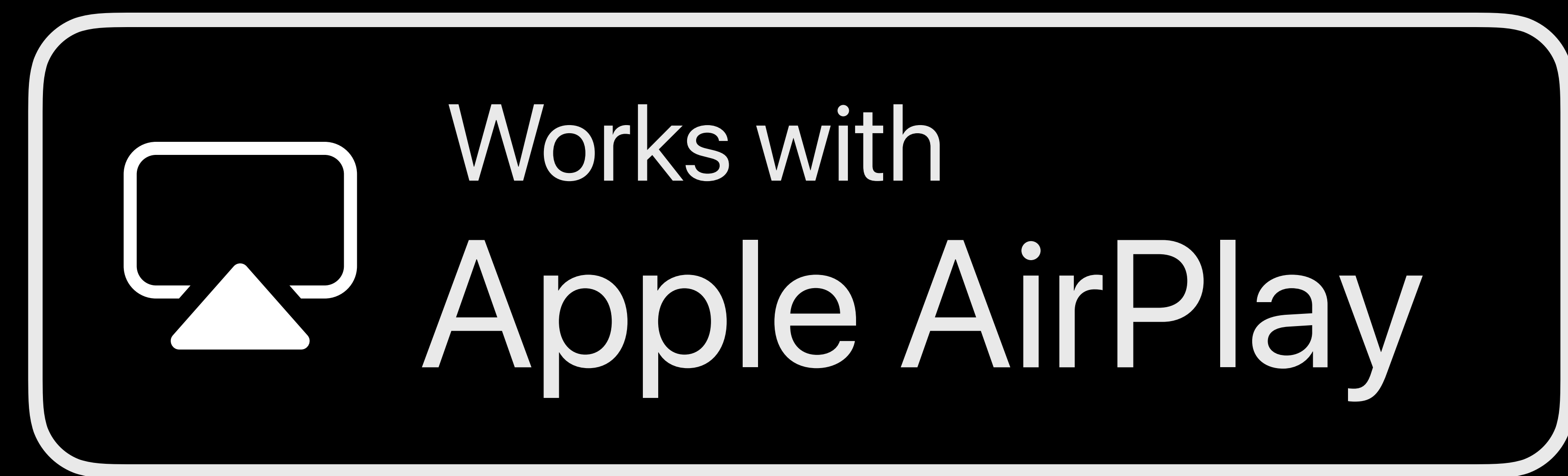
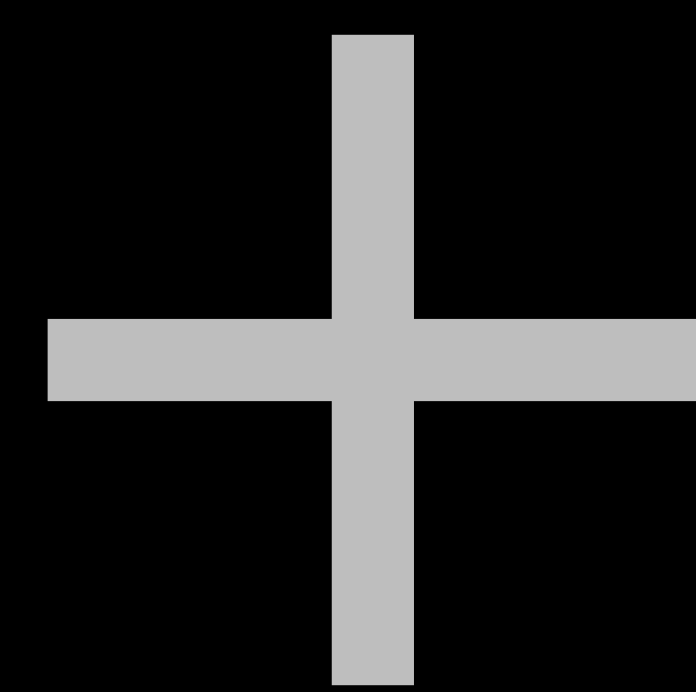
HLS Authoring for AirPlay 2 Video

Eryk Vershen, HLS Streaming Team



AirPlay 2





Agenda

AirPlay 2 requirements

Changes to validation tools

AirPlay 2 Requirements

AirPlay 2 TV Video Requirements

Synchronize variants

Avoid most changes at discontinuities

Full range of variants for each codec

10% Encryption

Provide compatible formats

Synchronize Variants

Segment boundaries at the same points in time

Timestamps match when rounded to the nearest millisecond



Synchronize Variants

Segment boundaries at the same points in time

Timestamps match when rounded to the nearest millisecond



Avoid Most Changes at Discontinuities

Don't switch codecs at discontinuities

If you switch frame rate then double or half the rate

Don't change audio channel layout

Full Range of Variants for Each Codec

A full range of variants for each codec type and frame-rate

Each codec should be a reasonable set on it's own

If you use a video codec then I-frame variants must be provided with the same video codec

10% Encryption

Common Encryption (CBCS) must use 10% partial encryption

An encrypt : skip pattern of 1:9

Encrypted fMP4 content must contain either a 'senc' box or both a 'saiz' box and 'saio' box

Provide Compatible Formats

HDR content should be in all HDR formats

Use WebVTT for subtitles

Use recommended MIME types for all content

Recommended MIME Types

Media Type	Format	Recommended MIME Type	Typical File Extension
Playlist	HLS playlist	application/vnd.apple.mpegurl	m3u8
Video	Fragmented MP4	video/mp4	mp4
Audio	Fragmented MP4	audio/mp4	mp4
Video	MPEG transport stream	video/mp2t	ts
Audio	MPEG transport stream	video/mp2t	ts
Subtitles	WebVTT	text/plain	vtt

Recommended MIME Types

Media Type	Format	Recommended MIME Type	Typical File Extension
Audio	Packed audio	audio/aac	aac
Audio	Packed audio	audio/mpeg	mp3
Audio	Packed audio	audio/ac3	ac3
Audio	Packed audio	audio/eac3	ec3
Playlist	M3U playlist	audio/mpegurl	m3u
Subtitles	IMSC1	application/mp4	mp4

HLS Validation

Two Tools for Validation

mediastreamvalidator + hlsreport.py

Two Tools for Validation

mediastreamvalidator
HLS
Specification

+

hlsreport.py
HLS Authoring
Specification

hlsreport.py

HLSreport now checks all rule-sets by default

New '--rule-set' option

Deprecating the '--os' option

Sample Output

HLS Validation Report (General, tvOS, iOS, macOS, AirPlay 2)

Example Bip-Bop Stream

Stream type: VOD

<http://example.com/bipbop/master.m3u8>

Variant Overview

Audio ID	#	Max Rate	% Diff.	Avg Rate	% Diff.	Resolution	DR	IDR Int.	Framerate	Codec	Profile	Level	Encryption
aacLC_2ch_48kHz_600s_159k_audio	1	1018	0.0%	891	0.0%	640 x 360	SDR	1.253	30.000	AVC	High	3.1	-
↳	2	1476	0.0%	1278	0.0%	768 x 432	SDR	1.253	30.000	AVC	High	3.1	-
↳	3	3611	0.0%	3184	0.0%	1280 x 720	SDR	0.342	60.000	AVC	High	3.2	-
↳	4	5422	0.0%	4682	0.0%	1920 x 1080	SDR	0.342	60.000*	AVC	High	4.2	-
ac3_6ch_48kHz_600s_384k_audio	5	1240	0.0%	1113	0.0%	640 x 360	SDR	1.253	30.000	AVC	High	3.1	-
↳	6	1698	0.0%	1500	0.0%	768 x 432	SDR	1.253	30.000	AVC	High	3.1	-
↳	7	3834	0.0%	3406	0.0%	1280 x 720	SDR	0.342	60.000	AVC	High	3.2	-
↳	8	5644	0.0%	4904	0.0%	1920 x 1080	SDR	0.342	60.000*	AVC	High	4.2	-
aacLC_2ch_48kHz_600s_159k_audio	9	902	0.0%	829	0.0%	640 x 360	SDR	2.505	30.000	HEVC	Main 10	4.1	-
											Main		

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Sample Output

Checked against *HLS Authoring Specification for Apple Devices*

General requirements

Must Fix Issues

1. Unsupported audio track codec: Unknown

- Rendition #18

Should Fix Issues

2. Master playlists SHOULD be delivered using Transport Layer Security (TLS)

- Master Playlist

3. Target durations SHOULD be 6 seconds.

- All Variants
- All Audio Renditions

4. Media playlists SHOULD be delivered using TLS

- All Variants
- All URI Renditions
- All I-Frame Variants

5. Content protection SHOULD follow the FairPlay Streaming (FPS) specification

Sample Output

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Sample Output

10. All video variants and renditions SHOULD have segment boundaries at the same points in time

- Variant #3, Mismatch at segment 1 offset 17.983 instead of 17.133
- Variant #4, Mismatch at segment 1 offset 17.983 instead of 17.133
- Variant #7, Mismatch at segment 1 offset 17.983 instead of 17.133
- Variant #8, Mismatch at segment 1 offset 17.983 instead of 17.133
- Variant #9, Mismatch at segment 1 offset 17.5 instead of 17.133
- Variant #10, Mismatch at segment 1 offset 17.5 instead of 17.133
- Variant #11, Mismatch at segment 1 offset 17.883 instead of 17.133
- Variant #12, Mismatch at segment 1 offset 17.883 instead of 17.133
- Variant #13, Mismatch at segment 1 offset 17.5 instead of 17.133
- Variant #14, Mismatch at segment 1 offset 17.5 instead of 17.133
- Variant #15, Mismatch at segment 1 offset 17.883 instead of 17.133
- Variant #16, Mismatch at segment 1 offset 17.883 instead of 17.133

Additional requirements for iOS

Must Fix Issues

11. Master playlists that are delivered over cellular networks MUST contain a variant whose peak BANDWIDTH is less than or equal to 192kb/s.

- Master Playlist

Should Fix Issues

12. For WiFi delivery, the default video variant(s) SHOULD be the 2000 kb/s variant.

Sample Output

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- Master Playlist

Should Fix Issues

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Sample Output

- Variant #8

Additional requirements for AirPlay 2

Must Fix Issues

14. All video variants and renditions **MUST** have segment boundaries at the same points in time

- Variant #3, Mismatch at segment 1 offset 17.983 instead of 17.133
- Variant #4, Mismatch at segment 1 offset 17.983 instead of 17.133
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- Variant #16, Mismatch at segment 1 offset 17.883 instead of 17.133

Report Information

MediaStreamValidator version: Version 1.x
Report generator version: 1.x
Report generation date: 05/03/19 13:10:32
JSON format version: 1.1

Sample Output

- Variant #8

Additional requirements for AirPlay 2

Must Fix Issues

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Rule-set sections (and "Must Fix" or "Should fix" subsections) are removed when no issues are found.

Report Information

MediaStreamValidator version: Version 1.x
Report generator version: 1.x
Report generation date: 05/03/19 13:10:32
JSON format version: 1.1

Summary

AirPlay 2 adds new requirements

Requirements are listed in the HLS Authoring Specification

Always use both validation tools

HLSReport now checks all rule-sets by default

More Information

<https://developer.apple.com/wwdc19/507>

