HLS Authoring for AirPlay 2 Video

Eryk Vershen, HLS Streaming Team
AirPlay 2
Works with Apple AirPlay
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 its 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

<table>
<thead>
<tr>
<th>Media Type</th>
<th>Format</th>
<th>Recommended MIME Type</th>
<th>Typical File Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playlist</td>
<td>HLS playlist</td>
<td>application/vnd.apple.mpegurl</td>
<td>m3u8</td>
</tr>
<tr>
<td>Video</td>
<td>Fragmented MP4</td>
<td>video/mp4</td>
<td>mp4</td>
</tr>
<tr>
<td>Audio</td>
<td>Fragmented MP4</td>
<td>audio/mp4</td>
<td>mp4</td>
</tr>
<tr>
<td>Video</td>
<td>MPEG transport stream</td>
<td>video/mp2t</td>
<td>ts</td>
</tr>
<tr>
<td>Audio</td>
<td>MPEG transport stream</td>
<td>video/mp2t</td>
<td>ts</td>
</tr>
<tr>
<td>Subtitles</td>
<td>WebVTT</td>
<td>text/plain</td>
<td>vtt</td>
</tr>
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<tbody>
<tr>
<td>Audio</td>
<td>Packed audio</td>
<td>audio/aac</td>
<td>aac</td>
</tr>
<tr>
<td>Audio</td>
<td>Packed audio</td>
<td>audio/mpeg</td>
<td>mp3</td>
</tr>
<tr>
<td>Audio</td>
<td>Packed audio</td>
<td>audio/ac3</td>
<td>ac3</td>
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<tr>
<td>Audio</td>
<td>Packed audio</td>
<td>audio/eac3</td>
<td>ec3</td>
</tr>
<tr>
<td>Playlist</td>
<td>M3U playlist</td>
<td>audio/mpegurl</td>
<td>m3u</td>
</tr>
<tr>
<td>Subtitles</td>
<td>IMSC1</td>
<td>application/mp4</td>
<td>mp4</td>
</tr>
</tbody>
</table>
Two Tools for Validation

mediastreamvalidator + hlsreport.py
Two Tools for Validation

mediastreamvalidator + hlsreport.py
HLS Specification + HLS Authoring Specification
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

<table>
<thead>
<tr>
<th>Audio ID</th>
<th>#</th>
<th>Max Rate</th>
<th>% Diff.</th>
<th>Avg Rate</th>
<th>% Diff</th>
<th>Resolution</th>
<th>DR</th>
<th>IDR Int.</th>
<th>Framerate</th>
<th>Codec</th>
<th>Profile</th>
<th>Level</th>
<th>Encryption</th>
</tr>
</thead>
<tbody>
<tr>
<td>aaclc_2ch_48kHz_600s_159k_audio</td>
<td>1</td>
<td>1018</td>
<td>0.0%</td>
<td>891</td>
<td>0.0%</td>
<td>640 x 360</td>
<td>SDR</td>
<td>1.253</td>
<td>30.000</td>
<td>AVC</td>
<td>High</td>
<td>3.1</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1476</td>
<td>0.0%</td>
<td>1278</td>
<td>0.0%</td>
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</tr>
<tr>
<td></td>
<td>3</td>
<td>3611</td>
<td>0.0%</td>
<td>3184</td>
<td>0.0%</td>
<td>1280 x 720</td>
<td>SDR</td>
<td>0.342</td>
<td>60.000</td>
<td>AVC</td>
<td>High</td>
<td>3.2</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5422</td>
<td>0.0%</td>
<td>4682</td>
<td>0.0%</td>
<td>1920 x 1080</td>
<td>SDR</td>
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</tr>
<tr>
<td>ac3_6ch_48kHz_600s_384k_audio</td>
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<td>1240</td>
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<td>1113</td>
<td>0.0%</td>
<td>640 x 360</td>
<td>SDR</td>
<td>1.253</td>
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</tr>
<tr>
<td></td>
<td>6</td>
<td>1698</td>
<td>0.0%</td>
<td>1500</td>
<td>0.0%</td>
<td>768 x 432</td>
<td>SDR</td>
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<tr>
<td></td>
<td>7</td>
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<td>0.0%</td>
<td>3406</td>
<td>0.0%</td>
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<td></td>
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<td>829</td>
<td>0.0%</td>
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<td>SDR</td>
<td>2.505</td>
<td>30.000</td>
<td>HEVC</td>
<td>Main</td>
<td>4.1</td>
<td>0.0%</td>
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Report generator version: 1.x

Report generation date: 05/03/19 13:10:32

JSON data timestamp: 04/30/19 14:29:39

JSON format version: 1.1
Sample Output

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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
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   - All URI Renditions
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5. Content protection SHOULD follow the FairPlay Streaming (FPS) specification
checked against HLS Authoring Specification for Apple Devices

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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
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- 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
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**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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Additional requirements for AirPlay 2

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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
Additional requirements for AirPlay 2

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**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