



Dolby Vision

Streams within the HTTP Live Streaming format

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1 Introduction to Dolby Vision streams within the HTTP Live Streaming format

This document specifies the required data formatting and signaling between a server and its clients to enable Dolby Vision to be transmitted within fragmented MPEG-4 files under HTTP Live Streaming (HLS) protocol.

- [HTTP Live Streaming](#)
- [Dolby Vision stream multiplexing in HTTP Live Streaming](#)
- [Standards and Dolby documents](#)
- [Contacting Dolby](#)

1.1 HTTP Live Streaming

HLS is a protocol developed by Apple for transferring streams of media data. HTTP Live Streaming supports both live broadcasts and prerecorded content (video on demand).

HLS uses segmented MPEG-2 transport streams or fragmented MPEG-4 files for streaming the video-only content of a multimedia presentation, and uses segmented audio elementary streams or fragmented MPEG-4 files for streaming audio-only content.

Information about the contained multimedia presentation is signalled within the master HTTP Live Streaming playlist file (.m3u8).

1.2 Dolby Vision stream multiplexing in HTTP Live Streaming

For transmission using HLS, the base-layer and reference-picture-unit substreams are combined into a single Dolby Vision stream. The Dolby Vision stream can be multiplexed into a fragmented MP4.

For detailed information about the process of combing the base layer and reference-picture-unit substreams into one single Dolby Vision stream, refer to the *Dolby Vision VES multiplexing specification*.

For Apple devices, the following requirements must be met:

- Dolby Vision streams can be delivered only via a fragmented MP4.
- Dolby Vision can be delivered only to an HEVC-compliant decoder.
- A Dolby Vision stream can be delivered only as a single-layer stream.

For more information about the requirements, refer to the *HLS Authoring Specification for Apple Devices* (https://developer.apple.com/documentation/http_live_streaming/hls_authoring_specification_for_apple_devices) and the *HTTP Live Streaming 2nd Edition*, available from <https://datatracker.ietf.org>.

1.3 Standards and Dolby documents

Standards and Dolby documents provide additional information to assist you in designing your product.

Standards

- *HTTP Live Streaming 2nd Edition*, available from <https://datatracker.ietf.org>. (Search for "HTTP Live Streaming".)
- ISO/IEC 13818-1:201X/PDAM 3, *Information Technology—Generic Coding of Moving Pictures and Associated Audio Information: Systems Amendment 3*, available from <http://www.iso.org>.
- ISO/IEC 14496-10:2014, *Information Technology—Coding of Audio-Visual objects, Part 10: Advanced Video Coding*, available from <http://www.iso.org>.
- ISO/IEC 14496-12:2015, *Information Technology—Coding of Audio-Visual Objects, Part 12: ISO Base Media File Format*, available from <http://www.iso.org>. This documentation is Part 12 of the MPEG-4 specification and describes storage of content in a media file.
- ISO/IEC 14496-15:2014, *Information Technology—Coding of Audio-Visual Objects, Part 15: Carriage of Network Abstraction Layer (NAL) Unit Structured Video in ISO Base Media File Format*, available from <http://www.iso.org>
- ISO/IEC 23008-2:2013, *Information Technology—High Efficiency Coding and Media Delivery in Heterogeneous Environments, Part 2: High Efficiency Video Coding*, available from <http://www.iso.org>.
- ISO/IEC 23001-7:2016, *Information Technology—MPEG systems technologies, part 7: Common encryption in ISO base media file format files*, available from <http://www.iso.org>.
- RFC 6381, *The 'Codecs' and 'Profiles' Parameters for "Bucket" Media Types*, August 2011, available from <http://tools.ietf.org/html>.

Dolby documents

- *Dolby Vision Video Elementary Stream Multiplexing Specification* (dovi_proenc_ves_muxing_spec.pdf), located in the documentation package of the *Dolby Vision Professional Encoder Software Integration Development Kit*.
- *Dolby Vision Streams Within the ISO Base Media File Format*, available from <https://www.dolby.com/us/en/technologies/dolby-vision/dolby-vision-for-creative-professionals.html#5>.
- *Dolby Vision Profiles and Levels*, available from <https://www.dolby.com/us/en/technologies/dolby-vision/dolby-vision-for-creative-professionals.html#5>.

1.4 Contacting Dolby

Support services are available to address any questions and to provide advice about integrating Dolby technology into your product.

For product design or testing, contact Dolby at systemsupport@dolby.com. By utilizing Dolby expertise, especially during the design process, many problems that might require design revisions before a product is approved can be prevented.

Dolby is also available to review product plans, including preliminary design information, markings, displays, and control and menu layouts, with the goal of preventing problems early in the product development cycle.

If you have comments or feedback about this document, send us an email at documentation@dolby.com.

2 Dolby Vision profiles and levels

The Dolby Vision format provides many features, not all of which apply to every application. Subsets of Dolby Vision features are stipulated in profiles and levels. Develop your application to support one or more of these profiles and levels as needed.

- [Dolby Vision profiles](#)
- [Dolby Vision levels](#)

2.1 Dolby Vision profiles

A Dolby Vision profile is a subset of Dolby Vision feature configurations predefined by Dolby.

This table only lists profiles that are supported in online streaming formats. There are more profiles applicable to other use cases. For details, refer to *Dolby Vision profiles and levels*.

Profile ID	BL codec	Dolby Vision fourCC string
5	10-bit HEVC	dvhe or dvh1
8	10-bit HEVC	dvhe or dvh1

In this table,

- **BL codec**, 10-bit HEVC, indicates H.265 main10 profile.
- **Dolby Vision FourCC string** is the codec fourCC string used within the CODEC tag.

Dolby Vision codecs use strings begin with d. As defined in *Dolby Vision Streams Within the ISO Base Media File Format*, Dolby Vision-specific configuration boxes may be used with standard codecs strings for certain profiles. Codecs other than HEVC may be supported in the future, for which additional Dolby Vision bitstream profile IDs will be added.

2.2 Dolby Vision levels

A Dolby Vision level specifies the maximum pixel rate, decoded bitstream video width, and bit rate supported by a product within a given bitstream profile.

Typically, there is a limit on the maximum number of pixels a product can process per second within a given bitstream profile; the levels defined here generally correspond to the product processing capability. Although not listed, noninteger frame rates are supported.

Table 1: Dolby Vision levels

Level ID	Maximum pixel rate (pps)	Maximum decoded bitstream video width (pixels)	Example decoded bitstream resolution @ frame rate (fps)	Maximum bit rates	
				Main tier (Mbps)	High tier (Mbps)
01	22,118,400	1280	1280 × 720 @ 24	20	50
02	27,648,000	1280	1280 × 720 @ 30	20	50
03	49,766,400	1920	1920 × 1080 @ 24	20	70
04	62,208,000	2560	1920 × 1080 @ 30	20	70
05	124,416,000	3840	1920 × 1080 @ 60	20	70

Table 1: Dolby Vision levels (continued)

Level ID	Maximum pixel rate (pps)	Maximum decoded bitstream video width (pixels)	Example decoded bitstream resolution @ frame rate (fps)	Maximum bit rates	
				Main tier (Mbps)	High tier (Mbps)
06	199,065,600	3840	3840 × 2160 @ 24	25	130
07	248,832,000	3840	3840 × 2160 @ 30 Also supports: 1920 × 1080 @ 120	25	130
08	398,131,200	3840	3840 × 2160 @ 48	40	130
09	497,664,000	3840	3840 × 2160 @ 60	40	130
10	995,328,000	3840	3840 × 2160 @ 120	60	240
11	995,328,000	7680	<ul style="list-style-type: none"> • 7680 × 4320 @ 30 • 3840 × 2160 @ 120 	60	240
12	1,990,656,000	7680	7680 × 4320 @ 60	120	480
13	3,981,312,000	7680	7680 × 4320 @ 120	240	800

The columns in this table include:

- **Maximum pixel rate (PPS):** This column lists imposed limits on arithmetic combinations of decoded bitstream resolution and frame rate (decoded bitstream resolution multiplied by frame rate: horizontal pixels × vertical pixels × frame rate). The maximum pixels per second is a constant for a given level. The decoded bitstream resolution is inversely proportional to the frame rate, meaning that the decoded bitstream resolution can be reduced for obtaining higher frame rate, and vice versa. Note that the decoded bitstream resolution here is for baseband video, irrespective of the particular video compression codec that is used.
- **Example decoded bitstream resolution @ frame rate (fps):** Baseband picture horizontal and vertical pixels followed by frame rate.
- **Maximum bit rates:** This column indicates the maximum bit rate of the encoded bitstream.
- **High tier:** Note that for Dolby Vision bitstream profile 7, Blu-ray Disc Association specifications allow a maximum high tier bit rate of 100 Mbps for each level. Similarly, there may be other Dolby Vision enabled systems that limit or require different maximum bit rates. Additionally, high tier may be required for some applications that use temporal subscale layers.

3 Dolby Vision encryption requirements

Dolby Vision is digital rights management (DRM) agnostic if the encryption follows ISO/IEC 23001-7.

To facilitate stream reformatting before decryption, it is required that at least the Network Abstraction Layer (NAL) length field and the `nal_unit_type` field (the first byte after the length field) of each NAL unit is left unencrypted, and recommended that the entire slice NAL headers remain unencrypted. In addition, it should be noted that:

- For other NAL structured video sample description stream formats (for example, `avc3`, `hvc1`, and `hev1`), only video slice data should be encrypted. The size and type headers of a video NAL slice should be unencrypted. For the other NAL types, no encryption is needed.
- There are multiple NAL units per sample, requiring multiple pieces of clear and encrypted data per sample.
- NAL units that do not contain video slice data need not be encrypted, and should not be encrypted if they contain information that must be accessed prior to decryption, such as caption information contained in SEI NAL units.

Although some of the statements about encryption are recommendations in ISO/IEC 23001-7, some DRM will make the following items as requirements moving forward:

- NAL units that do not contain any audio or video data must remain entirely unencrypted. This means that the Dolby Vision reference picture unit must remain entirely unencrypted.
- NAL units that contain audio/video data must have the slice header unencrypted.
- In the MP4 box structure, the fourCC string (for example, `dvh1` for profile 5) must be replaced with `encv`.

4 Signaling Dolby Vision in an HTTP Live Streaming playlist file

Information about the Dolby Vision streams encapsulated in an HTTP Live Streaming stream can be signaled within a playlist file.

- [HTTP Live Streaming playlist files](#)
- [HTTP Live Streaming playlist files with Dolby Vision](#)
- [HTTP Live Streaming playlist examples](#)

4.1 HTTP Live Streaming playlist files

An HLS playlist file provides information for a playback device about the available content for a multimedia presentation.

Specifically, HLS playlist files provide information about:

- The media segments that comprise the multimedia presentation
- Available content alternatives in the content selection process (for example, different languages)
- Available content variants (for example, content rendered for different bandwidths)

HLS playlist files are regular M3U8 playlists, extended by the addition of information specific to HTTP Live Streaming. This extended information is contained in lines that start with an #EXT prefix inside the playlist. A playlist contains URIs that point to media files or to other playlists.

The HLS protocol defines a specific type of playlist, known as a variant playlist, to allow a client device to select from different versions of the same piece of content. For example, these versions can be encoded at different bit rates to enable the client to switch to a lower data rate when the available delivery bandwidth is reduced, or to switch to a higher data rate to improve audio and video quality. A variant playlist may also point to alternative content for a presentation, such as an alternative language version of the content.

4.2 HTTP Live Streaming playlist files with Dolby Vision

In HTTP Live Streaming, the main way of signaling the type of video to be streamed is by using the EXT-X-STREAM-INF or EXT-X-I-FRAME-STREAM-INF tag and its associated CODECS attribute as defined in RFC 6381.

The CODEC attribute of the EXT-X-STREAM-INF parameter (or EXT-X-I-FRAME-STREAM-INF) must include a dot-separated, three-part value to signal the codec, profile, and level information of the referenced Dolby Vision stream. The codec information indicates the codec in which the Dolby Vision stream is encoded.

For a Dolby Vision stream, the video codec value is composed in this format:

```
[Dolby_Vision_fourCC].[Dovi_Profile_ID].[Dovi_Level_ID]
```

In this string,

- The [Dolby_Vision_fourCC] is a four-character value indicating the codec type as listed in the following *Sample description entry code* table. This value can be obtained from Dolby Vision sample entries in the sample description box (stsd), as described in the [Dolby Vision Streams Within the ISO Base Media File Format](#) specification.
- The [Dovi_Profile_ID] is a two-digit value representing the Dolby Vision profile ID as listed in the *Dolby Vision profiles* section. This value can be obtained from the Dolby Vision configuration box, as described in the [Dolby Vision Streams Within the ISO Base Media File Format](#) specification.
- The [Dovi_Level_ID] is a two-digit value representing the Dolby Vision level ID as listed in the *Dolby Vision levels* section. This value can be obtained from the Dolby Vision configuration box, as described in the [Dolby Vision Streams Within the ISO Base Media File Format](#) specification.

For a Dolby Vision stream that is not backward compatible, only a Dolby Vision fourCC code is referenced in the playlist; for a Dolby Vision stream that is backward compatible, both a standard High-Efficiency Video Coding (HEVC) fourCC code and a Dolby Vision fourCC code must be referenced in the playlist.

Table 2: Sample description entry code

Codec	Codec variant	SDR fourCC code	Dolby Vision fourCC code
HEVC	Parameter sets (VPS, PPS, or SPS) are stored either in the sample entries in the sample description box or as part of the samples, or in both.	hev1	dvhe
	Parameter sets (VPS, PPS, or SPS) are stored only in the sample entries in the sample description box.	hvc1	dvh1

For example:

```
#EXT-X-STREAM-INF:BANDWIDTH=2560000,CODECS="dvhe.05.07,ec-3",AUDIO="ddp" low/video.m3u8
```

In this example, the highlighted string indicates that the video element is signaled as a single-layer, non-backward-compatible Dolby Vision stream encoded as 10-bit HEVC video with a maximum resolution of 3840 × 2160 at 30 fps. This corresponds to Dolby Vision profile ID 5 and level ID 7.

For a Dolby Vision stream that is backward compatible, besides referencing the Dolby Vision codec, the playlist must also contain a reference to the backward compatible codec. The CODECS attribute uses the codec values described in ISO/IEC 14496-15.

```
[BL_compatible_codec]
```

The [BL_compatible_codec] takes a backward-compatible codec value format that begins with a fourCC code and may optionally be followed by profile and level information. For details, refer to RFC 6381.

Related information

[Dolby Vision profiles](#) on page 6

[Dolby Vision levels](#) on page 6

4.3 HTTP Live Streaming playlist examples

Examples of HTTP Live Streaming playlist files that contain Dolby Vision video elements, as well as Dolby Digital Plus audio media elements, are provided.

In addition to the Dolby Vision programs, Dolby recommends including a separate program for delivering a pure SDR version of the same content as the Dolby Vision version. This alternate variant ensures that the multimedia presentation can be decoded and played back by a device that does not support Dolby Vision.

4.3.1 Profile 5 Dolby Vision stream

This example shows a master playlist listing three Dolby Vision variants and two audio renditions (AAC and Dolby Atmos). The bit rate is the only major parameter that differs across the Dolby Vision programs. The essence of each Dolby Vision program is a single-layer stream encoded as 10-bit HEVC video with a resolution of 3840 × 2160 at 30 fps, where the base layer is not backward compatible.

```
#EXTM3U
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="aac",NAME="ENGLISH",CHANNELS="2",
DEFAULT=YES,AUTOSELECT=YES,LANGUAGE="en",URI="main/english-aac.m3u8"
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="atmos",NAME="ENGLISH",CHANNELS="16/JOC",
DEFAULT=YES,AUTOSELECT=YES,LANGUAGE="en",URI="main/english-atmos.m3u8"

#EXT-X-STREAM-INF:BANDWIDTH=5120000,VIDEO-RANGE=PQ,CODECS="dvh1.05.07,mp4a.40.29",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
low/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=7680000,VIDEO-RANGE=PQ,CODECS="dvh1.05.07,mp4a.40.29",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
mid/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=14156144,VIDEO-RANGE=PQ,CODECS="dvh1.05.07,mp4a.40.29",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
hi/video.m3u8

#EXT-X-STREAM-INF:BANDWIDTH=5120000,VIDEO-RANGE=PQ,CODECS="dvh1.05.07,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
low/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=7680000,VIDEO-RANGE=PQ,CODECS="dvh1.05.07,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
mid/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=14156144,VIDEO-RANGE=PQ,CODECS="dvh1.05.07,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
hi/video.m3u8
```

In this playlist example, the base layer is a profile 5 stream, and the Dolby Vision fourCC code is `dvh1`. In cases where the Dolby Vision fourCC code is `dvhe`, the video codec string in the `CODECS` value must be set to `dvhe.05.07`.

Related information

[HTTP Live Streaming playlist files with Dolby Vision](#) on page 9

4.3.2 Profile 8 Dolby Vision stream

This example shows a Dolby Vision profile 8.1 master playlist listing three backward-compatible Dolby Vision variants and two audio renditions (AAC and Dolby Atmos). The bit rate is the only major parameter that differs across the Dolby Vision programs. The essence of each Dolby Vision program is single-layer stream encoded as 10-bit HEVC video with a resolution of 3840 × 2160 at 30 fps, where the base layer is backward compatible with HDR10. Both a Dolby Vision codec and an HDR10 codec are used to provide backward compatibility.

```
#EXTM3U
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="aac",NAME="English",CHANNELS="2",
DEFAULT=YES,AUTOSELECT=YES,LANGUAGE="en",URI="main/english-aac.m3u8"
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="atmos",NAME="English",CHANNELS="16/10C",
DEFAULT=YES,AUTOSELECT=YES,LANGUAGE="en",URI="main/english-atmos.m3u8"

#EXT-X-STREAM-INF:BANDWIDTH=5120000,VIDEO-RANGE=PQ,CODECS="dvh1.08.07,mp4a.40.29",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
low/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=7680000,VIDEO-RANGE=PQ,CODECS="dvh1.08.07,mp4a.40.29",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
mid/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=14156144,VIDEO-RANGE=PQ,CODECS="dvh1.08.07,mp4a.40.29",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
hi/video.m3u8

#EXT-X-STREAM-INF:BANDWIDTH=5120000,VIDEO-RANGE=PQ,CODECS="hvc1.2.4.L153.b0,
mp4a.40.29",FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
low/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=7680000,VIDEO-RANGE=PQ,CODECS="hvc1.2.4.L153.b0,
mp4a.40.29",FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
mid/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=14156144,VIDEO-RANGE=PQ,CODECS="hvc1.2.4.L153.b0,
mp4a.40.29",FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="aac"
hi/video.m3u8

#EXT-X-STREAM-INF:BANDWIDTH=5120000,VIDEO-RANGE=PQ,CODECS="dvh1.08.07,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
low/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=7680000,VIDEO-RANGE=PQ,CODECS="dvh1.08.07,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
mid/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=14156144,VIDEO-RANGE=PQ,CODECS="dvh1.08.07,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
hi/video.m3u8

#EXT-X-STREAM-INF:BANDWIDTH=5120000,VIDEO-RANGE=PQ,CODECS="hvc1.2.4.L153.b0,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
low/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=7680000,VIDEO-RANGE=PQ,CODECS="hvc1.2.4.L153.b0,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
mid/video.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=14156144,VIDEO-RANGE=PQ,CODECS="hvc1.2.4.L153.b0,ec-3",
FRAME-RATE=30.000,RESOLUTION=3840x2160,AUDIO="atmos"
hi/video.m3u8
```

Glossary

AVC

Advanced Video Coding. See [H.264](#).

DRM

Digital rights management. A group of technologies that are used by hardware manufacturers, publishers, copyright holders, and individuals with the intent to control the use of digital content and devices after sale.

HDR

High dynamic range.

HEVC

High-Efficiency Video Coding. See [H.265](#).

HLS

HTTP Live Streaming. An adaptive streaming protocol for delivery of media content developed by Apple.

NAL

Network Abstraction Layer.

SDR

Standard dynamic range. A Rec. 709 signal with peak luminance of 100 cd/m².