



# **Dolby<sup>®</sup> Vision Streams Within the ISO Base Media File Format**

Version 2.0

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Issue 1

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# Introduction

This document defines the structures for the storage of Dolby® Vision video streams in a file format compliant with the ISO base media file format (ISOBMFF). Example file formats derived from the ISOBMFF include the Digital Entertainment Content Ecosystem (DECE) Common File Format (CFF), Protected Interoperable File Format (PIFF), and MP4 file format. The file format defined here is intended to be compliant with the DECE media specifications as appropriate.

## 1.1 New in this version

Changes have been made to the latest version of this document. For v2.0, the changes include:

- Introduction of an additional Dolby Vision Configuration Box, 'dvvC', for use with Profiles numbered greater than 7.
- Accompanying note to Dolby Vision Configuration Boxes that require Dolby Vision decoders to comply with ISOBMFF specification, ISO/IEC 14496, if an unrecognized Dolby Vision Configuration Box, Profile number, or Profile level ID are found in a stream. With Dolby Vision streams with Profile 8, 9 or later, this ensures that devices that support Profile 7, or earlier, play the compatible base-layer.
- A new section 1.4 which provides an overview of the Dolby Vision ISOBMFF box hierarchy.
- Addition of 'hvc1' box in certain places where missing and the only box listed was 'hev1.'
- In section 5.3 Semantics, a definition was added for 'ELConfig' where missing in version 1.4.

## 1.2 Terms, Definitions, and Abbreviated Terms

## 1.2.1 Terms and Definitions

### SDR signal

A Rec. 709 signal with peak luminance equal to 100nits.

### HDR signal

A Rec. 2020 signal with peak luminance equal to 1000nits.

### SDR or HDR Compliant Base Layer Dolby Vision track

A Dolby Vision track with the Base Layer, Enhancement Layer, and RPU combined into a single VES. The Base Layer signal in the combined VES carried in the track has a non-zero value for the BL signal compatibility ID, is compliant with ISO/IEC 14496-10, 14496-15, and ISO/IEC 23008-2 and is decodable by an AVC or HEVC compliant decoder to output an SDR or HDR signal compliant with a particular set of standards as defined in the Dolby Vision Profiles and Levels doc.

### Non-SDR and Non-HDR Compliant Base Layer Dolby Vision track

A Dolby Vision track with the Base Layer, Enhancement Layer, and RPU combined into a single VES. The Base Layer in the combined VES carried in the track has a zero value for the BL signal compatibility ID, is compliant with ISO/IEC 14496-10, 14496-15, and ISO/IEC 23008-2 and is decodable by an AVC or HEVC compliant decoder to output a non-SDR and non-HDR signal that is not compliant with any standard.

## 1.2.2 Abbreviated Terms

The following table describes the terminology and abbreviations used throughout this document.

**Table 1-1** Abbreviated Terms

Term	Definition
AVC	Advanced Video Coding.
BL	Base layer.
DECE	Digital Entertainment Content Ecosystem.
DSI	Decoder specification information.
EL	Enhancement layer.

Term	Definition
HEVC	High efficient video coding.
HDR	High Dynamic Range
NAL	Network abstraction layer.
OTT	Over the top.
PIFF	Protected interoperable file format.
PPS	Picture parameter set.
SPS	Sequence parameter set.
VES	Video elementary stream.
SDR	Standard Dynamic Range

### 1.3 Resources

The following resources supplement the information in this manual:

- ISO/IEC 14496-12:2012, *Information Technology – Coding of Audio-Visual Objects, Part 12: ISO Base Media File Format, with AMD1, AMD2, COR1 and COR2*, available from [www.iso.org](http://www.iso.org)
- ISO/IEC 14496-15:2014, *Information technology – Coding of audio-visual objects, Part 15: Carriage of NAL unit structured video in the ISO Base Media File Format*, available from [www.iso.org](http://www.iso.org)
- ISO/IEC 14496-10: 2014, *Information technology – Coding of audio-visual objects, part 10: Advanced Video Coding*, available from [www.iso.org](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 [www.iso.org](http://www.iso.org)
- *Dolby Vision Decoder Specification*, available from [Dolby Laboratories, Inc](http://DolbyLaboratories.com)
- *Dolby Vision VES Multiplexing Specification*, available from [Dolby Laboratories, Inc](http://DolbyLaboratories.com)
- *Signaling Dolby Vision Profiles and Levels*, available from [Dolby Laboratories, Inc](http://DolbyLaboratories.com)

### 1.4 Contacting Dolby

For technical questions about the system development materials, contact [dolbyonlinekits@dolby.com](mailto:dolbyonlinekits@dolby.com).

If you have questions or comments about this document, contact [documentation@dolby.com](mailto:documentation@dolby.com).

## 1.5 Box hierarchy overview

An ISO base media file that contains Dolby Vision stream is expected to be structured conforming to this documentation.

This table lists all possible boxes that can be used for signaling either a single- or dual-track Dolby Vision stream, and shows an overall view of the box encapsulation structure; indentation is used to show containment. Which boxes to be included in the sample description box (stsd) depends on the configuration of the Dolby Vision stream.

In the table, the value of the nesting level provided for each box is based on the structure of the complete ISO base media file, beginning with a nesting value of 0 for the `ftyp` and `moov` boxes.

Nesting Level

4      5      6                      7

stbl

    stsd

        One of:

- DolbyVisionAVC3SampleEntry (dvav)
- DolbyVisionAVC1SampleEntry (dva1)
- DolbyVisionHEV1SampleEntry (dvhe)
- DolbyVisionHVC1SampleEntry (dvh1)
- DolbyVisionAVCCCompatibleSampleEntry (avc1)
- DolbyVisionAVCCCompatibleSampleEntry(avc3)
- AVC2SampleEntry (avc2)

- AVC2SampleEntry (avc4)
- HEVCSampleEntry (hev1)
- HEVCSampleEntry (hvc1)

One of:

- AVC configuration box (avcC)
- HEVC configuration box (hvcC)

One of:

- Dolby Vision configuration box (dvcC)
- Dolby Vision configuration box (dvvC)

One of:

- Dolby Vision enhancement layer AVC configuration box (avcE)
- Dolby Vision enhancement layer HEVC configuration box (hvcE)

stts  
stsc  
stsz  
stz2  
stco  
co64

## Dolby Vision VES Format

For information on the storage format of Dolby Vision VES within the ISOBMFF, refer to *Dolby Vision Decoder Specification* and *Dolby Vision VES Multiplexing Specification*, see [Resources](#). This storage format extends the definition of the storage format of AVC in ISO/IEC 14496-15 and HEVC in ISO/IEC 23008-2, see [Resources](#).

## Dolby Vision Configuration Boxes and Decoder Configuration Record

The Dolby Vision decoder configuration record provides the configuration information that is required to initialize the Dolby Vision decoder.

### 3.1 Definition

The Dolby Vision Configuration Box contains the following information.

Box Type      For `dv_profile <= 7`, `'dvcC'`;  
                  for `dv_profile > 7`, `'dvvC'`

Note: Dolby Vision devices that do not recognize a particular Dolby Vision Configuration Box, or the value for an element of the decoder configuration record, such as `dv_profile` or `dv_level`, shall follow the requirements of ISO/IEC 14496 and shall ensure that they handle the stream properly based on the stream's ISO/IEC 14496 codec Configuration Box.

Container      AVC2SampleEntry('avc2' or 'avc4'),  
                  HEVCSampleEntry('hev1' or 'hvc1'),  
                  DolbyVisionAVC3SampleEntry('dvav'),  
                  DolbyVisionAVC1SampleEntry('dva1'),  
                  DolbyVisionHEV1SampleEntry('dvhe'),  
                  DolbyVisionHVC1SampleEntry('dvh1'), or  
                  DolbyVisionAVCCCompatibleSampleEntry('avc1' or 'avc3')

Mandatory    Yes

Quantity      Exactly One

### 3.2 Syntax

The syntax of the Dolby Vision Configuration Box and decoder configuration record is described below.

```
align(8) class DOVIDecoderConfigurationRecord
{
    unsigned int (8)          dv_version_major;
    unsigned int (8)          dv_version_minor;
    unsigned int (7)          dv_profile;
    unsigned int (6)          dv_level;
    bit (1)                   rpu_present_flag;
    bit (1)                   el_present_flag;
    bit (1)                   bl_present_flag;
    unsigned int (4)          dv_bl_signal_compatibility_id;
    const unsigned int (28) reserved = 0;
    const unsigned int (32)[4] reserved = 0;
}

class DOVIConfigurationBox extends Box('dvcc' or 'dvvC')
{
    DOVIDecoderConfigurationRecord() DOVIConfig;
}
```

### 3.3 Semantics

The semantics of the Dolby Vision decoder configuration record is described as follows.

`dv_version_major` - specifies the major version number of the Dolby Vision specification that the stream complies with. A stream compliant with this specification shall have the value 1.

`dv_version_minor` - specifies the minor version number of the Dolby Vision specification that the stream complies with. A stream compliant with this specification shall have the value 0.

`dv_profile` - specifies the Dolby Vision profile. Valid values are Profile IDs as defined in Table 1 column 1 of *Signaling Dolby Vision Profiles and Levels*.

`dv_level` - specifies the Dolby Vision level. Valid values are Level IDs as defined in Table 3 of *Signaling Dolby Vision Profiles and Levels*.

`rpu_present_flag` - if 1 indicates that this track contains the RPU substream.

`el_present_flag` – if 1 indicates that this track contains the EL substream. For Dolby Vision profiles for which there is no EL video, this flag shall be set to 0.

`bl_present_flag` – if 1 indicates that this track contains the BL substream.

`dv_bl_signal_compatibility_id` – specifies a particular form of a base-layer sub-stream that can be decoded to a signal compliant with a particular set of standards, if any.



## Dolby Vision EL AVC and HEVC Configuration Box

This section describes the AVC and HEVC configuration box for the Dolby Vision Enhancement Layer.

### 4.1 Definition

The Dolby Vision EL AVC and HEVC Configuration Box contain the following information.

Box Type	'avcE', 'hvcE'
Container	AVC2SampleEntry('avc2' or 'avc4'), HEVCSampleEntry('hev1' or 'hvc1'), DolbyVisionAVC3SampleEntry('dvav'), DolbyVisionAVC1SampleEntry('dva1'), DolbyVisionHEV1SampleEntry('dvhe'), DolbyVisionHVC1SampleEntry('dvh1'), or DolbyVisionAVCCCompatibleSampleEntry('avc1' or 'avc3')
Mandatory	No
Quantity	Zero or One

### 4.2 Syntax

The syntax for the Dolby Vision EL AVC and HEVC Configuration Box are described below.

```
class DolbyVisionELAVCConfigurationBox() extends Box('avcE')
{
    AVCDecoderConfigurationRecord() AVCConfig;
}

class DolbyVisionELHEVCConfigurationBox() extends Box('hvcE')
```

```
{  
    HEVCDecoderConfigurationRecord() HEVCConfig;  
}
```

## Dolby Vision Sample Entries

This section describes the Dolby Vision sample entries. It is used to describe tracks that contain substreams that cannot necessarily be decoded by AVC/HEVC compliant decoders.

### 5.1 Definition

The Dolby Vision sample entries contain the following information:

Box Type	'dvav', 'dval', 'dvhe', 'dvh1'
Container	Sample Description Box ('stsd')
Mandatory	Yes
Quantity	One or more sample entries of the same box type may be present

### 5.2 Syntax

The syntax for the Dolby Vision sample entries are described below.

```
class DolbyVisionAVC3SampleEntry() extends
    AVCSampleEntry('dvav')
{
    DOVIConfigurationBox()          config;
    DolbyVisionELAVCConfigurationBox() ELConfig; // optional
}

class DolbyVisionAVC1SampleEntry() extends
    AVCSampleEntry('dval')
{
    DOVIConfigurationBox()          config;
    DolbyVisionELAVCConfigurationBox() ELConfig; // optional
}

class DolbyVisionHEVCSampleEntry() extends
    HEVCSampleEntry('dvhe')
{
    DOVIConfigurationBox()          config;
```

```
        DolbyVisionELHEVCConfigurationBox() ELConfig; // optional
    }

class DolbyVisionHVC1SampleEntry() extends
    HEVCSampleEntry('dvh1')
{
    DOVIConfigurationBox()          config;
    DolbyVisionELHEVCConfigurationBox() ELConfig; // optional
}
```

### 5.3 Semantics

A Dolby Vision AVC/HEVC sample entry shall contain a Dolby Vision Configuration Box as defined 3.1. It also contains an optional AVC or HEVC configuration box for the Dolby Vision EL sample.

`config` - specifies the configuration information required to initialize the Dolby Vision decoder for a Dolby Vision EL track encoded in AVC/HEVC.

`ELConfig` - For a single-track Dolby Vision stream, this optional box specifies the enhancement-layer configuration information required to initialize the Dolby Vision decoder for the enhancement-layer substream. If this box is absent from the Dolby Vision single track, the downstream decoding product may extract information from the `mdat` box directly.

This box is not required for a dual-track Dolby Vision stream as the AVC or HEVC configuration box (`avcC` or `hvcC`) and Dolby Vision configuration box (`dvcC` or `dvvC`) provide the required information.

`Compressorname` in the base class `VisualSampleEntry` indicates the name of the compressor used, with the value `"\013DOVI Coding"` being recommended (`\013` is 11, the length of the string `"DOVI coding"` in bytes).

## Dolby Vision AVC-compatible Sample Entry

This section describes the Dolby Vision AVC-compatible sample entry. It is used to extend the AVC sample entry to contain a Dolby Vision Configuration Box ('dvcc' or 'dvvC').

### 6.1 Syntax

The syntax of the Dolby Vision AVC-compatible Sample Entry used for 'avc1' and 'avc3' samples is:

```
class DolbyVisionAVCCompatibleSampleEntry() extends
    AVCSampleEntry()
{
    DOVIConfigurationBox()          config;
    DolbyVisionELAVCConfigurationBox() ELConfig;
}
```

## Dolby Vision Files

The brand 'dby1' should be used in the `compatible_brands` field to indicate that the file is compliant with all Dolby Extensions as outlined in this document. The `major_brand` shall be set to the ISO-defined brand, e.g. 'iso6'.

# Dolby Vision Tracks In A Single File

A Dolby Vision video stream can be encapsulated in a single file in two ways:

- as a single-track file containing a BL, EL, and RPU packaged into one track, where the presence of EL substream is dependent on the Dolby Vision profile
- as a dual-track file containing separate BL and EL+RPU tracks

Each of these encapsulations is described in the following sections.



---

**Note:** More than one video track is forbidden in DECE CFF v2.0.

---

## 8.1 Single-track file

As a single-track file, Dolby Vision BL, EL, and RPU substreams are packaged together into a single ISOBMFF track. The presence of EL substream is dependent on the Dolby Vision profile.

The track shall meet the following constraints:

- The Dolby Vision Configuration Box ('dvcC' or 'dvvC') shall be present in the visual sample entry.
- The `rpu_present_flag` shall be set to 1.
- The `el_present_flag` shall be set to 0 or 1 according to the presence of EL for the Dolby Vision profile.
- The `bl_present_flag` shall be set to 1.

### 8.1.1 SDR or HDR Compliant BL Dolby Vision Track

When the Dolby Vision stream is encoded with SDR or HDR Compliant BL, it can be decoded and displayed with an AVC/HEVC compliant decoder.

For an HEVC-compatible stream, an HEVC Sample Entry ('hev1' or 'hvc1') shall be used. The HEVC Sample Entry Box shall contain an HEVC Configuration Box ('hvcC'), a Dolby Vision Configuration Box ('dvcC' or 'dvvC'), and a Dolby Vision EL HEVC Configuration Box ('hvce').

For an AVC-compatible stream, a DolbyVisionAVCCCompatibleSampleEntry ('avc1' or 'avc3') or AVC2SampleEntry ('avc2' or 'avc4') shall be used. Here, the DolbyVisionAVCCCompatibleSampleEntry or AVC2SampleEntry shall contain an AVC Configuration Box ('avcC'), a Dolby Vision Configuration Box ('dvcC' or 'dvvC'), and a Dolby Vision EL AVC Configuration Box ('avcE').

The track shall meet the following additional constraints:

- The dv\_profile field in the Dolby Vision Configuration Box ('dvcC' or 'dvvC') shall be set according the encoded Dolby Vision profile.
- The dv\_level field in the Dolby Vision Configuration Box ('dvcC' or 'dvvC') shall be set according the encoded Dolby Vision level.

The following tables show the box hierarchy of the single-track Dolby Vision file with SDR or HDR Compliant BL.

---

**Note:** This is not an exhaustive list of boxes.

---

**Table 8-1** Sample table box hierarchy for single-track Dolby Vision file with SDR or HDR Compliant BL

Nesting Level				Reference
4	5	6	7	
stb1				ISO/IEC 14496-12
	stsd			
		(avc1 avc2 avc3 avc4) Or (hev1 hvc1)		
			avcC or hvcC	
			dvcC or dvvC	<a href="#">Section 3.1</a>
	stts			ISO/IEC 14496-12
	stsc			
	stsz			
	stz2			
	stco			



Nesting Level				Reference
4	5	6	7	
	co64			

**Note:** If the sample entry is not set to 'avc3' or 'hev1' it will not be compliant with DECE CFF v2.0.

### 8.1.2 Non-SDR and Non-HDR Compliant BL Dolby Vision Track

When the Dolby Vision stream is encoded with Non-SDR and Non-HDR Compliant BL, the BL is not compliant with SDR and HDR. In this case, a `DolbyVisionHEVCSampleEntry ('dvhe')`, `DolbyVisionHVC1SampleEntry ('dvh1')`, `DolbyVisionAVC3SampleEntry ('dvav')` or `DolbyVisionAVC1SampleEntry ('dva1')` shall be used. The visual sample entries shall contain an AVC or HEVC Configuration Box ('avcC' or 'hvcC'), a Dolby Vision Configuration Box ('dvcC' or 'dvvC') and a Dolby Vision EL AVC or HEVC Configuration Box ('avcE' or 'hvcE').

The track shall meet the following additional constraints:

- In the handler reference box, the `handler_type` field shall be set to 'vide'.
- The media information header box shall contain a video media header box.
- The `dv_profile` field in the Dolby Vision Configuration Box ('dvcC' or 'dvvC') shall be set according the encoded Dolby Vision profile.
- The `dv_level` field in the Dolby Vision Configuration Box ('dvcC' or 'dvvC') shall be set according the encoded Dolby Vision level.

The following table shows the box hierarchy of the single-track Dolby Vision file.



**Note:** This is not an exhaustive list of boxes.

**Table 8-2** Sample table box hierarchy for single-track Dolby Vision file with Non-SDR and Non-HDR Compliant BL

Nesting Level				Reference
4	5	6	7	
stbl				ISO/IEC 14496-12

Nesting Level				Reference
4	5	6	7	
	stsd			
		dvav, dva1, dvhe or dvh1		
			avcC or hvcC	
			dvcC or dvvC	<a href="#">Section 3.1</a>
			avcE or hvcE	
	stts			ISO/IEC 14496-12
	stsc			
	stsz			
	stz2			
	stco			
	co64			

## 8.2 Dual-track file

As a dual-track file, Dolby Vision BL and EL+RPU substreams are packaged in separate video tracks. Each track has different sample descriptions.

### 8.2.1 BL Track

The BL track is SDR or HDR compliant and can be decoded and displayed with a compliant AVC/HEVC decoder.




---

**Note:** If the sample entry is not set to 'avc3' or 'hev1' it will not be compliant with DECE CFF v2.0.

---

### 8.2.2 EL Track

The EL track is not SDR and HDR compliant. In this case, a `DolbyVisionHEVCVisualSampleEntry('dvhe')`, `DolbyVisionHVC1VisualSampleEntry('dvh1')`, `DolbyVisionAVC3VisualSampleEntry('dvav')` or

DolbyVisionAVC1VisualSampleEntry ('dva1') shall be used. The visual sample entries shall contain an AVC or HEVC Configuration Box ('avcC' or 'hvcC'), and a Dolby Vision Configuration Box ('dvcC' or 'dvvC'). Notice that the Dolby Vision EL AVC or HEVC Configuration Box ('avcE' or 'hvcE') shall not be present.

The track shall meet the following constraints:

- In the handler reference box, the `handler_type` field shall be set to 'vide'.
- The media information header box shall contain a video media header box.
- The dependency between the Dolby Vision base and enhancement track shall be signaled by the 'tref' box. The `reference_type` shall be set to 'vdep'.
- The `dv_profile` field in the Dolby Vision Configuration Box ('dvcC' or 'dvvC') shall be set according the encoded Dolby Vision profile.
- The `dv_level` field in the Dolby Vision Configuration Box ('dvcC' or 'dvvC') shall be set according the encoded Dolby Vision level.
- The `rpu_present_flag` shall be set to 1.
- The `el_present_flag` shall be set to 0 or 1.
- The `bl_present_flag` shall be set to 0.

The following table shows the box hierarchy of the EL track of a dual-track Dolby Vision file.



**Note:** This is not an exhaustive list of boxes.

**Table 8-3** Sample table box hierarchy for the EL track of a dual-track Dolby Vision file

Nesting Level				Reference
4	5	6	7	
stbl				ISO/IEC 14496-12
	stsd			
		dvav, dva1, dvhe or dvh1		<a href="#">Section 4.1</a>
			avcC or hvcC	<a href="#">Section 3.1</a>
			dvcC or dvvC	
	stts			ISO/IEC 14496-12

Nesting Level				Reference
4	5	6	7	
	stsc			
	stsz			
	stz2			
	stco			
	co64			

### 8.3 Constraints on the ISO base media file format boxes

#### 8.3.1 Constraints on Movie Fragments

For a dual-track file, the movie fragments carrying the BL and EL shall meet the following constraints:

- The adjacent movie fragments (‘moof’ and ‘mdat’) for the base and enhancement track shall be interleaved with BL followed by EL. BL and EL samples shall be placed in separate Movie Fragments and that each BL Movie Fragment shall be immediately followed by an EL movie fragment containing the same number of samples with identical composition timestamps.
- The track fragment run box (‘trun’) for the base and enhancement track shall contain the same number of samples.

#### 8.3.2 Constraints on Track Fragment Random Access Box

The track fragment random access box (‘tfra’) for the base and enhancement track shall conform to the ISO/IEC 14496-12 (section 8.8.10) (see [Resources](#)) and meet the following additional constraint:

- The value of the `time` field in the track fragment random access box indicates the presentation time of a random accessible sample. This `time` value shall be identical for every corresponding random accessible sample in the base and enhancement track.