
**Information technology — Coding of
audio-visual objects —**

**Part 15:
Carriage of network abstraction layer
(NAL) unit structured video in the ISO
base media file format**

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**AMENDMENT 1: Improved support for
tiling and layering**

ISO/IEC 14496-15:2019/Amd 1:2020

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*Technologies de l'information — Codage des objets audiovisuels —
Partie 15: Transport de vidéo structurée en unités NAL sur la couche
réseau au format ISO de base pour les fichiers médias*

AMENDEMENT 1: .



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Information technology — Coding of audio-visual objects —

Part 15: Carriage of network abstraction layer (NAL) unit structured video in the ISO base media file format

AMENDMENT 1: Improved support for tiling and layering

Clause 4

At the end of Clause 4, add a new subclause as follows:

4.13 Alternative extraction source track grouping

Members of the track group with `track_group_type` equal to 'alte' are alternatives to be used as a source for 'scal' or 'sabt' track reference. The value of (`flags & 1`) shall be equal to 1 in a `TrackGroupTypeBox` of type 'alte' to indicate the uniqueness of `track_group_id` as specified in ISO/IEC 14496-12.

A 'scal' or 'sabt' track reference may refer to a `track_group_id` value of an 'alte' track group. As implied by the general semantics of a track reference to a `track_group_id` specified in ISO/IEC 14496-12, any single track of an 'alte' track group is a valid source for extraction as specified in A.3 and A.7 or for bitstream reconstruction from file tracks as specified in subclause 10.5.4.

8.3.3.1.3

Add the following sentence at the end of the semantics of `nalUnit` in paragraph 13:

When one or more SEI NAL units containing an SEI manifest SEI message and/or an SEI prefix indication SEI message are available, they should be stored as instances of `nalUnit`.

9.2

Replace the paragraph that starts with 'When the samples of a track contain', including the note, with the following text:

When the samples of a track contain temporal sub-layers of an HEVC base layer but do not contain, natively or through extraction, the temporal sub-layer with `TemporalId` equal to 0 of an HEVC base layer, an 'hvc2', or 'hev2' sample entry shall be used. When the samples of a track contain, natively or through extraction, an HEVC compatible base layer or a temporal subset of an HEVC base layer including a sub-layer with `TemporalId` equal to 0, an 'hvc1', 'hev1', 'hvc2', 'hev2', 'hvc3', or 'hev3' sample entry shall be used.

NOTE When a sample entry type 'hvc2', 'hev2', 'hvc3' or 'hev3' is used in a track containing the base layer, parsers complying only with non-layered HEVC storage specified in Clause 8 are not able to process the track.

9.5.3.1.1

In the definition, add 'hvc3' and 'hev3' to the lists in both the "Sample Entry and Box types" and "Mandatory" rows.

In the second paragraph below the definition, replace:

When the sample entry name is 'hev2'

with:

When the sample entry name is 'hev2' or 'hev3'

In the third paragraph below the definition, replace:

or when the sample entry name is 'hev1' or 'hev2'

with:

or when the sample entry name is 'hev1', 'hev2' or 'hev3'

Replace the paragraph immediately above NOTE 2 with the following:

In case two parameter sets with different content but using the same ID are present, it may not be possible to use a single sample entry of type 'hvc1', 'hvc2', 'hvc3' or 'lhv1'; file packagers should create either different sample entries of type 'hvc1', 'hvc2', 'hvc3' or 'lhv1', or use in-band parameter sets through 'hev1', 'hev2', 'hev3' or 'lhe1' sample entries.

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Replace the two paragraphs immediately below NOTE 3 with the following:

For an HEVC or L-HEVC bitstream carried in more than one track, when the sample entry name of the base track is 'hvc1', 'hvc2' or 'hvc3', the sample entry name of other tracks carrying the same bitstream shall be 'hvc2', 'hvc3' or 'lhv1', and when the sample entry name of the base track is 'hev1', 'hev2' or 'hev3', the sample entry name of other tracks carrying the same bitstream shall be 'hev2', 'hev3' or 'lhe1'.

For an L-HEVC bitstream whose base layer is an AVC bitstream, when the sample entry name of the base track is 'avc1' or 'avc2', the sample entry name of the other tracks carrying the associated L-HEVC bitstream shall be 'hvc2', 'hvc3', or 'lhv1', and when the sample entry name of the base track is 'avc3' or 'avc4', the sample entry name of the other HEVC tracks carrying the associated L-HEVC bitstream shall be 'hev2', 'hev3' or 'lhe1'.

In both NOTE 6 and the sentence immediately following NOTE 6, replace (two occurrences):

'hvc1', 'hev1', 'hvc2', or 'hev2'

with:

'hvc1', 'hev1', 'hvc2', 'hev2', 'hvc3' or 'hev3'

Replace Table 11 with the following:

Table 11 — Use of sample entries for HEVC and L-HEVC tracks

sample entry name	with configuration records	meaning
'hvc1' or 'hev1'	HEVC Configuration Only	A plain HEVC track without NAL units with nuh_layer_id greater than 0; Extractors and aggregators shall not be present.
'hvc1' or 'hev1'	HEVC and L-HEVC Configurations	An L-HEVC track with both NAL units with nuh_layer_id equal to 0 and NAL units with nuh_layer_id greater than 0; Extractors and aggregators shall not be present.
'hvc2' or 'hev2'	HEVC Configuration Only	A plain HEVC track without NAL units with nuh_layer_id greater than 0; Extractors may be present and used to reference NAL units; constructor_type shall be equal to 0 or 2 in extractors; Aggregators may be present to contain and reference NAL units.
'hvc2' or 'hev2'	HEVC and L-HEVC Configurations	An L-HEVC track with both NAL units with nuh_layer_id equal to 0 and NAL units with nuh_layer_id greater than 0; Extractors and aggregators may be present; Extractors may reference any NAL units; constructor_type shall be equal to 0 or 2 in extractors; Aggregators may both contain and reference any NAL units.
'hvc3' or 'hev3'	HEVC Configuration Only	A plain HEVC track without NAL units with nuh_layer_id greater than 0; Extractors may be present and used to reference NAL units; constructor_type shall be equal to 0, 2, 3, 4, 5 or 6 in extractors; Aggregators may be present to contain and reference NAL units.
'hvc3' or 'hev3'	HEVC and L-HEVC Configurations	An L-HEVC track with both NAL units with nuh_layer_id equal to 0 and NAL units with nuh_layer_id greater than 0; Extractors and aggregators may be present; Extractors may reference any NAL units; constructor_type shall be equal to 0, 2, 3, 4, 5 or 6 in extractors; Aggregators may both contain and reference any NAL units.
'lhv1', 'lhe1'	L-HEVC Configuration Only	An L-HEVC track with NAL units with nuh_layer_id greater than 0 and without NAL units with nuh_layer_id equal to 0; Extractors shall not be present; Aggregators may be present to contain and reference NAL units.

9.5.3.1.3

In the second sentence, replace:

When the sample entry is 'hvc2' or 'hev2'

with:

When the sample entry is 'hvc2', 'hev2', 'hvc3' or 'hev3'

9.5.4

In the second and third list items, replace:

the sample entry type is 'hvc2' or 'hev2'

with:

the sample entry type is 'hvc2', 'hev2', 'hvc3' or 'hev3'

9.5.5

In list item 3, replace:

if the sample entry type is 'hvc2' or 'hev2' and the track contains extractors,

with:

if the sample entry type is 'hvc2', 'hev2', 'hvc3' or 'hev3' and the track contains extractors,

In list item 4, replace:

Otherwise, if the sample entry type is 'hvc2' or 'hev2'

with:

Otherwise, if the sample entry type is 'hvc2', 'hev2', 'hvc3' or 'hev3'

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9.5.8

In the second sentence, replace:

When included in an 'hvc2' or 'hev2' track that is not the base track and contains extractors,

with:

When included in an 'hvc2', 'hvc3', 'hev2', or 'hev3' track that is not the base track and that contains extractors,

In the paragraph immediately after the NOTE, replace:

The presence of the 'sync', 'roll', and 'rap' sample groups in 'hvc2', 'hev2', 'lhv1', or 'lhe1' tracks

with:

The presence of the 'sync', 'roll', and 'rap' sample groups in 'hvc2', 'hvc3', 'hev2', 'hev3', 'lhv1', or 'lhe1' tracks

10.5.1

In the first paragraph, replace:

For such cases, tile tracks may be created using the HEVCTileSampleEntry or LHEVCTileSampleEntry sample description format

with:

For such cases, tile tracks may be created using the `HEVCTileSampleEntry`, `HEVCTileSSHInfoSampleEntry` or `LHEVCTileSampleEntry` sample description format

In the second paragraph, replace:

The sample entry type for an HEVC tile track is 'hvt1'

with:

The sample entry type for an HEVC tile track is 'hvt1' or 'hvt3'

Add the following paragraph at the end of subclause 10.5.1:

When a timed metadata track is linked to a tile base track with a 'cdsc' track reference, it describes the HEVC video bitstream carried by the tile base track and all the associated tile tracks, and in this case the timed metadata track shall not be linked to the associated tile tracks.

10.5.4

in the first paragraph, add the following text at the end of the first sentence:

When a 'sabt' track reference points to a track_group_id of an 'alte' track group, any single track of the 'alte' track group is a valid tile track to be used in the bitstream reconstruction.

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10.5.5

At the end of 10.5.5, add new subclauses as follows:

10.5.6 HEVC Tile Track with Slice Segment Header Info

10.5.6.1 Definition

Sample Entry Type: 'hvt3'

Container: Sample Description Box ('stsd')

Mandatory: No

Quantity: Zero or more sample entries may be present

An 'hvt3' track shall have a 'tbas' track reference to an HEVC tile base track. The specifications for HEVC tile track specified in 10.5 apply to the 'hvt3' track. The width and height of the `VisualSampleEntry` for an HEVC tile track (sample entry type 'hvt3') shall be set to the width and height of the minimum bounding box enclosing all tile regions contained in the track. The layout information in the track header (i.e. layer, matrix, width and height) of an HEVC tile track shall be ignored by file parsers. `CleanApertureBox` and `PixelAspectRatioBox` shall not be present in an 'hvt3' sample description.

For each VCL NAL unit in 'hvt3' tracks there shall be a preceding `SliceSegmentHeaderInfo` NAL-unit-like structure that documents its slice segment header length.

NOTE Even though `SliceSegmentHeaderInfo` NAL-unit-like structures are informational in nature, client implementations can rely on their presence for correct behaviour and performance reasons. Signalling a track as 'hvt3' allows such clients to check compatibility.

10.5.6.2 Syntax

```
class HEVCTileSSHInfoSampleEntry() extends VisualSampleEntry ('hvt3'){
    HEVCTileConfigurationBox config(); // optional
}
```

10.5.6.3 Semantics

The constraints and semantics of `HEVCTileSSHInfoSampleEntry` are identical to those of `HEVCTileSampleEntry` as specified in subclause 10.5.2.3.

10.6 HEVC slice segment data track

10.6.1 Overview

The general definition of sample format as provided in subclause 4.3.3 does not apply to the definition of 'hvt2' tracks.

The sample format of an 'hvt2' track consists of one and only one instance of the HEVC syntax elements `slice_segment_data()` and `rbsp_slice_segment_trailing_bits()` of an independent slice segment. No other data is present in samples of 'hvt2' tracks.

'hvt2' tracks avoid the need to have a slice segment header redundantly present for applications where the slice segment header is adjusted depending on which composition of tracks is merged to a bitstream to be decoded. Appropriate slice segment headers for an 'hvt2' track are present in extractor tracks that include samples from the 'hvt2' tracks by reference of type 'scal'. It is not possible to process an 'hvt2' track without an 'hvc2', 'hev2', 'hvc3', or 'hev3' track that contains slice segment headers natively and the respective slice segment data by reference from the 'hvt2' track through extractors.

`track_in_movie` shall be equal to 0 in the `TrackHeaderBox` of 'hvt2' tracks.

10.6.2 Sample entry name and format for HEVC slice segment data tracks

10.6.2.1 Definition

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Sample Entry Type: 'hvt2'

Container: Sample Description Box ('stsd')

Mandatory: No

Quantity: Zero or more sample entries may be present

This sample entry describes the media samples of an HEVC slice segment data track. The `width` and `height` of the `VisualSampleEntry` for an HEVC slice segment data track (sample entry type 'hvt2') shall be set to the width and height of the minimum bounding box enclosing the independent slice segments contained in the track. The layout information in the track header (i.e. `layer`, `matrix`, `width` and `height`) of an HEVC slice segment data track shall be ignored by file parsers. `CleanApertureBox` and `PixelAspectRatioBox` shall not be present in an 'hvt2' sample description.

The sample format of an 'hvt2' track shall consist of one and only one instance of the HEVC syntax elements `slice_segment_data()` and `rbsp_slice_segment_trailing_bits()` of a typically independent slice segment. No other data shall be present in samples of 'hvt2' tracks.

10.6.2.2 Syntax

```
class HEVCSliceSegmentDataSampleEntry() extends VisualSampleEntry ('hvt2'){
    HEVCTileConfigurationBox config(); // optional
}
```

10.6.2.3 Semantics

The `HEVCSliceSegmentDataSampleEntry` shall not contain any `HEVCConfigurationBox`, `LHEVCConfigurationBox` or `MPEG4ExtensionDescriptorsBox`; these boxes are found in the sample description of the track containing extractors for including the slice segment data by reference. Other optional boxes may be included.

Optionally, the `HEVCSliceSegmentDataSampleEntry` may contain one `HEVCTileConfigurationBox`, used to indicate the tier and level information in the case the slice segment data in this track is for a motion-constrained tile or tile set.

`Compressorname` in the base class `VisualSampleEntry` indicates the name of the compressor used with the value "`\025HEVC Slice Data Coding`" being recommended; the first byte is a count of the remaining bytes, here represented by `\025`, which (being octal 25) is 21 (decimal), the number of bytes in the rest of the string.

All `'hvt2'` tracks referenced by the same extractor track and the extractor track shall share the same timescale.

NOTE If an `'hvt2'` track is removed from a file, all extractor tracks that reference the `'hvt2'` track have to be removed too. If an extractor track is removed from a file, all `'hvt2'` tracks that the extractor track references ought to be removed too provided that there is no other extractor track referencing them.

A.3.1

In the final paragraph, add the following text at the end of the first sentence:

When a `'scal'` track reference points to a `track_group_id` of an `'alte'` track group, any single track of the `'alte'` track group is a valid source for extraction.

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A.7.1

Add the following items in the list in the second paragraph:

- c) A sample constructor from a track group extracts, by reference, NAL unit data (either entire NAL unit or NAL unit payload) from a sample of another track or track in a track group.
- d) A reference constructor allows referencing default constructors declared in a list in sample entry, with optional override of default constructor fields.
- e) A NAL unit start constructor marks the beginning of a reconstructed NAL unit of possibly variable size (depending on the current track selection).

In the final paragraph, add the following text at the end of the first sentence:

When a `'scal'` track reference points to a `track_group_id` of an `'alte'` track group, any single track of the `'alte'` track group is a valid source for extraction.