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Information technology — Coding of audio-visual objects —

Part 10: Advanced Video Coding

AMENDMENT 1: Constrained baseline profile, stereo high profile and frame packing arrangement SEI message

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Technologies de l'information — Codage des objets audiovisuels —
Partie 10: Codage visuel avancé

AMENDEMENT 1: Profil de niveau de référence contraint, profil haut
stéréo et message SEI d'arrangement d'emballage de cadre

Please see the administrative notes on page iii

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Foreword

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Amendment 1 to ISO/IEC 14496-10:2009 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*, in collaboration with ITU.

Amendment 1 to ISO/IEC 14496-10:2009 is technically aligned with ITU-T Rec. H.264(2009)/Amd.1 but is not published as identical text.

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Information technology — Coding of audio-visual objects —

Part 10: Advanced Video Coding

AMENDMENT 1: Constrained baseline profile, stereo high profile and frame packing arrangement SEI message

In 0.4 "Publication and versions of this specification", replace the paragraph:

ITU-T Rec. H.264 | ISO/IEC 14496-10 version 10 (the current Specification) refers to the integrated version 9 text after its amendment to specify multiview video coding in one profile (Multiview High profile).

with:

ITU-T Rec. H.264 | ISO/IEC 14496-10 version 10 refers to the integrated version 9 text after its amendment to specify a profile for multiview video coding and to define additional SEI messages.

ITU-T Rec. H.264 | ISO/IEC 14496-10 version 11 refers to the integrated version 10 text after its amendment to define a new profile (the Constrained Baseline profile) intended primarily to enable implementation of decoders supporting only the common subset of capabilities supported in various previously-specified profiles.

ITU-T Rec. H.264 | ISO/IEC 14496-10 version 12 (the current Specification) refers to the integrated version 11 text after its amendment to define a new profile (the Stereo High profile) for two-view video coding with support of interlaced coding tools and to specify an additional SEI message specified as the frame packing arrangement SEI message. The changes for versions 11 and 12 were processed as a single amendment in the ISO/IEC approval process.

In 0.7 "How to read this specification", replace the sentence:

Annex A specifies eleven profiles (Baseline, Main, Extended, High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra), each being tailored to certain application domains, and defines the so-called levels of the profiles.

with:

Annex A specifies twelve profiles (Baseline, Constrained Baseline, Main, Extended, High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra), each being tailored to certain application domains, and defines the so-called levels of the profiles.

In 0.7 "How to read this specification", replace the paragraph:

Annex H specifies multiview video coding (MVC). The reader is referred to Annex H for the entire decoding process for MVC, which is specified there with references being made to clauses 2-9 and Annexes A-E. Subclause H.10 specifies one profile for MVC (Multiview High).

with:

Annex H specifies multiview video coding (MVC). The reader is referred to Annex H for the entire decoding process for MVC, which is specified there with references being made to clauses 2-9 and Annexes A-E. Subclause H.10 specifies two profiles for MVC (Multiview High and Stereo High).

In 7.3.2.1.1, “Sequence parameter set data syntax”, replace the following rows of the syntax table:

constraint_set4_flag	0	u(1)
reserved_zero_3bits /* equal to 0 */	0	u(3)
level_idc	0	u(8)
seq_parameter_set_id	0	ue(v)
if(profile_idc == 100 profile_idc == 110 profile_idc == 122 profile_idc == 244 profile_idc == 44 profile_idc == 83 profile_idc == 86 profile_idc == 118) {		

with:

constraint_set4_flag	0	u(1)
constraint_set5_flag	0	u(1)
reserved_zero_2bits /* equal to 0 */	0	u(2)
level_idc	0	u(8)
seq_parameter_set_id	0	ue(v)
if(profile_idc == 100 profile_idc == 110 profile_idc == 122 profile_idc == 244 profile_idc == 44 profile_idc == 83 profile_idc == 86 profile_idc == 118 profile_idc == 128) {		

In 7.3.2.1.3, “Subset sequence parameter set RBSP syntax”, replace the following row of the syntax table:

} else if(profile_idc == 118) {	(standards.iteh.ai)		
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with:

} else if(profile_idc == 118 profile_idc == 128) {	ISO/IEC 14496-10:2009/FDAM 1 https://standards.iteh.ai/catalog/standards/sist/2b331d87-f361-4d2c-9c2d-68638807a500/iso-iec-14496-10-2009-fdam-1		
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In 7.4.2.1.1, “Sequence parameter set data semantics”, replace the sentence:

reserved_zero_3bits shall be equal to 0. Other values of reserved_zero_3bits may be specified in the future by ITU-T | ISO/IEC. Decoders shall ignore the value of reserved_zero_3bits.

with:

constraint_set5_flag has semantics as specified in Annex H. Decoders conforming to the profiles specified in Annex A and Annex G may ignore the value of constraint_set5_flag.

reserved_zero_2bits shall be equal to 0. Other values of reserved_zero_2bits may be specified in the future by ITU-T | ISO/IEC. Decoders shall ignore the value of reserved_zero_2bits.

In 8.7 “Deblocking filter process”, replace the sentence:

A conditional filtering process is specified in this subclause that is an integral part of the decoding process which shall be applied by decoders conforming to the Baseline, Extended, Main, High, High 10, High 4:2:2, and High 4:4:4 Predictive profiles.

with:

A conditional filtering process is specified in this subclause that is an integral part of the decoding process which shall be applied by decoders conforming to the Baseline, Main, Constrained Baseline, Extended, High, High 10, High 4:2:2, and High 4:4:4 Predictive profiles.

In 9.2.2.1 "Parsing process for level_prefix", replace the sentence:

The value of level_prefix is constrained to not exceed 15 in bitstreams conforming to the Baseline, Main, and Extended profiles, as specified in subclauses A.2.1, A.2.2, and A.2.3, respectively.

with:

The value of level_prefix is constrained to not exceed 15 in bitstreams conforming to the Baseline, Constrained Baseline, Main, and Extended profiles, as specified in subclauses A.2.1, A.2.1.1, A.2.2, and A.2.3, respectively.

Remove the following text from A.2.1 "Baseline profile":

A.2.1.1 Constrained Baseline bitstreams and decoders

A bitstream can be referred to as a Constrained Baseline bitstream when profile_idc is equal to 66 and constraint_set1_flag is equal to 1.

A decoder is referred to as a Constrained Baseline decoder when it has the capability of decoding bitstreams in which profile_idc is equal to 66 or constraint_set0_flag is equal to 1 and in which constraint_set1_flag is equal to 1.

NOTE – All decoders conforming to the Baseline, Scalable Baseline, Main, Extended, High, Scalable High, High 10, High 4:2:2, and High 4:4:4 Predictive profiles are Constrained Baseline decoders.

Add A.2.1.1 "Constrained Baseline profile" as follows:

A.2.1.1 Constrained Baseline profile

Bitstreams conforming to the Constrained Baseline profile shall obey all constraints specified in subclause A.2.1 for the Baseline profile and all constraints specified in subclause A.2.2 for the Main profile.

Conformance of a bitstream to the Constrained Baseline profile is specified by profile_idc being equal to 66 with constraint_set1_flag being equal to 1.

NOTE – This specification of the Constrained Baseline profile is technically identical to specification of the use of the Baseline profile with constraint_set1_flag equal to 1. Thus, any existing specifications (in other documents that reference this Recommendation | International Standard) that have referred to the use of the Baseline profile with constraint_set1_flag equal to 1 should thus be interpreted as continuing in force as being technically identical to referring to the use of the Constrained Baseline profile (without any need for revision of these existing specifications to instead refer explicitly to the use of the Constrained Baseline profile).

Decoders conforming to the Constrained Baseline profile at a specific level shall be capable of decoding all bitstreams in which all of the following are true:

- profile_idc is equal to 66 or constraint_set0_flag is equal to 1
- constraint_set1_flag is equal to 1
- level_idc and constraint_set3_flag represent a level less than or equal to the specified level.

Replace the title of A.3.1:

A.3.1 Level limits common to the Baseline, Main, and Extended profiles

with:

A.3.1 Level limits common to the Baseline, Constrained Baseline, Main, and Extended profiles

In A.3.1 "Level limits common to the Baseline, Constrained Baseline, Main, and Extended profiles", replace the following sentence:

Bitstreams conforming to the Baseline, Main, or Extended profiles at a specified level shall obey the following constraints:

with:

Bitstreams conforming to the Baseline, Constrained Baseline, Main, or Extended profiles at a specified level shall obey the following constraints:

In A.3.3 "Profile-specific level limits", replace the following NOTE:

NOTE 1 – direct_8x8_inference_flag is not relevant to the Baseline profile as it does not allow B slice types (specified in subclause A.2.1), and direct_8x8_inference_flag is equal to 1 for all levels of the Extended profile (specified in subclause A.2.3).

with:

NOTE 1 – direct_8x8_inference_flag is not relevant to the Baseline or Constrained Baseline profiles as these profiles do not allow B slice types (specified in subclause A.2.1), and direct_8x8_inference_flag is equal to 1 for all levels of the Extended profile (specified in subclause A.2.3).

In A.3.3 "Profile-specific level limits", replace the following NOTE:

NOTE 2 – frame_mbs_only_flag is equal to 1 for all levels of the Baseline profile (specified in subclause A.2.1).

with:

NOTE 2 – frame_mbs_only_flag is equal to 1 for all levels of the Baseline and Constrained Baseline profiles (specified in subclauses A.2.1 and A.2.1.1, respectively).

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In item f of A.3.3 "Profile-specific level limits", replace the phrase "Baseline or Extended" with "Baseline, Constrained Baseline, or Extended".

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In item f of A.3.3 "Profile-specific level limits", replace the phrase "specified in Table A-3 for the Baseline profile" with "specified in Table A-3 for the Baseline and Constrained Baseline profiles".

Replace the title of A.3.3.1:

A.3.3.1 Baseline profile level limits

with:

A.3.3.1 Baseline and Constrained Baseline profile level limits

In A.3.3.1 "Baseline and Constrained Baseline profile level limits", replace the following sentence:

Table A-3 specifies limits for each level that are specific to bitstreams conforming to the Baseline profile.

with:

Table A-3 specifies limits for each level that are specific to bitstreams conforming to the Baseline or Constrained Baseline profiles.

In A.3.3.1 "Baseline and Constrained Baseline profile level limits", replace the title of Table A-3 by replacing "Baseline profile level limits" with "Baseline and Constrained Baseline profile level limits".

In the syntax table of D.1 "SEI payload syntax", after the following rows of the table:

else if(payloadType == 44)		
base_view_temporal_hrd(payloadSize) /* specified in Annex H */	5	

insert the following additional rows:

else if(payloadType == 45)		
frame_packing_arrangement(payloadSize)	5	

Add a NOTE at the beginning of D.2.22 "Stereo video information SEI message semantics" as follows:

NOTE – The stereo video information SEI message is included in this Specification primarily for historical reasons. It is now suggested to use the frame packing arrangement SEI message rather than the stereo video information SEI message to signal stereo video information.

Add D.1.24.1 "Frame packing arrangement SEI message syntax" above D.1.25 as follows:

D.1.24.1 Frame packing arrangement SEI message syntax

frame_packing_arrangement(payloadSize) {	C	Descriptor
frame_packing_arrangement_id	5	ue(v)
frame_packing_arrangement_cancel_flag	5	u(1)
if(!frame_packing_arrangement_cancel_flag) {		
frame_packing_arrangement_type	5	u(7)
quincunx_sampling_flag	5	u(1)
content_interpretation_type	5	u(6)
spatial_flipping_flag	5	u(1)
frame0_flipped_flag	5	u(1)
field_views_flag	5	u(1)
current_frame_is_frame0_flag	5	u(1)
frame0_self_contained_flag	5	u(1)
frame1_self_contained_flag	5	u(1)
If(!quincunx_sampling_flag && frame_packing_arrangement_type != 5) {		
frame0_grid_position_x	5	u(4)
frame0_grid_position_y	5	u(4)
frame1_grid_position_x	5	u(4)
frame1_grid_position_y	5	u(4)
}		
frame_packing_arrangement_reserved_byte	5	u(8)
frame_packing_arrangement_repetition_period	5	ue(v)
}		
frame_packing_arrangement_extension_flag	5	u(1)
}		

Add D.2.24.1 "Frame packing arrangement SEI message semantics" above D.2.25 as follows:

D.2.24.1 Frame packing arrangement SEI message semantics

This SEI message informs the decoder that the output decoded picture contains samples of a frame consisting of multiple distinct spatially packed constituent frames using an indicated frame packing arrangement scheme. This information can be used by the decoder to appropriately rearrange the samples and process the samples of the constituent frames appropriately for display or other purposes (which are outside the scope of this Specification).

This SEI message may be associated with pictures that are either frames or fields. The frame packing arrangement of the samples is specified in terms of the sampling structure of a frame in order to define a frame packing arrangement structure that is invariant with respect to whether a picture is a single field of such a packed frame or is a complete packed frame.

frame_packing_arrangement_id contains an identifying number that may be used to identify the usage of the frame packing arrangement SEI message. The value of **frame_packing_arrangement_id** shall be in the range of 0 to $2^{32} - 2$, inclusive.

Values of **frame_packing_arrangement_id** from 0 to 255 and from 512 to $2^{31} - 1$ may be used as determined by the application. Values of **frame_packing_arrangement_id** from 256 to 511 and from 2^{31} to $2^{32} - 2$ are reserved for future use by ITU-T | ISO/IEC. Decoders shall ignore (remove from the bitstream and discard) all frame packing arrangement SEI messages containing a value of **frame_packing_arrangement_id** in the range of 256 to 511 or in the range of 2^{31} to $2^{32} - 2$, and bitstreams shall not contain such values.

frame_packing_arrangement_cancel_flag equal to 1 indicates that the frame packing arrangement SEI message cancels the persistence of any previous frame packing arrangement SEI message in output order. **frame_packing_arrangement_cancel_flag** equal to 0 indicates that frame packing arrangement information follows.

frame_packing_arrangement_type indicates the type of packing arrangement of the frames as specified in Table D-8.

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Table D-8 – Definition of frame_packing_arrangement_type

Value	Interpretation
0	Each component plane of the decoded frames contains a "checkerboard" based interleaving of corresponding planes of two constituent frames as illustrated in Figure D-1.
1	Each component plane of the decoded frames contains a column based interleaving of corresponding planes of two constituent frames as illustrated in Figure D-2.
2	Each component plane of the decoded frames contains a row based interleaving of corresponding planes of two constituent frames as illustrated in Figure D-3.
3	Each component plane of the decoded frames contains a side-by-side packing arrangement of corresponding planes of two constituent frames as illustrated in Figure D-4 and Figure D-6.
4	Each component plane of the decoded frames contains top-bottom packing arrangement of corresponding planes of two constituent frames as illustrated in Figure D-5.
5	The component planes of the decoded frames in output order form a temporal interleaving of alternating first and second constituent frames as illustrated in Figure D-7.

NOTE 1 – Figure D-1 to Figure D-6 provide typical examples of rearrangement and upconversion processing for various packing arrangement schemes. Actual characteristics of the constituent frames are signaled in detail by the subsequent syntax elements of the frame packing arrangement SEI message. In Figure D-1 to Figure D-6, an upconversion processing is performed on each constituent frame to produce frames having the same resolution as that of the decoded frame. An example of the upsampling method to be applied to a quincunx sampled frame as shown in Figure D-1 or Figure D-6 is to fill in missing positions with an average of the available spatially neighbouring samples (the average of the values of the available samples above, below, to the left and to the right of each sample to be generated). The actual upconversion process to be performed, if any, is outside the scope of this Specification.

NOTE 2 – Sample aspect ratio (SAR) should be signalled appropriately in VUI parameters to describe the intended horizontal distance between the columns and the intended vertical distance between the rows of the luma sample array in the decoded frame. For the typical examples in Figure D-1 to Figure D-3 with SAR of 1:1 for the upconverted color plane, signalling SAR of 1:1 is appropriate. For the typical examples in Figure D-4 and Figure D-6 with SAR of 1:1 for the upconverted color plane, signalling

SAR of 2:1 is appropriate. For the typical example in Figure D-5 with SAR of 1:1 for the upconverted color plane, signalling SAR of 1:2 is appropriate.

NOTE 3 – When the output time of the samples of constituent frame 0 differs from the output time of the samples of constituent frame 1 (i.e., when `field_views_flag` is equal to 1 or `frame_packing_arrangement_type` is equal to 5) and the display system in use presents two views simultaneously, the display time for constituent frame 0 should be delayed to coincide with the display time for constituent frame 1. (The display process is not specified in this Recommendation | International Standard.)

NOTE 4 – When `field_views_flag` is equal to 1 or `frame_packing_arrangement_type` is equal to 5, the value 0 for `fixed_frame_rate_flag` is not expected to be prevalent in industry use of this SEI message.

NOTE 5 – `frame_packing_arrangement_type` equal to 5 describes a temporal interleaving process of different views.

All other values of `frame_packing_arrangement_type` are reserved for future use by ITU-T | ISO/IEC. It is a requirement of bitstream conformance to this Specification that the bitstreams shall not contain such other values of `frame_packing_arrangement_type`.

quincunx_sampling_flag equal to 1 indicates that each color component plane of each constituent frame is quincunx sampled as illustrated in Figure D-1 or Figure D-6, and `quincunx_sampling_flag` equal to 0 indicates that the color component planes of each constituent frame are not quincunx sampled.

When `frame_packing_arrangement_type` is equal to 0, it is a requirement of bitstream conformance to this Specification that `quincunx_sampling_flag` shall be equal to 1. When `frame_packing_arrangement_type` is equal to 5, it is a requirement of bitstream conformance to this Specification that `quincunx_sampling_flag` shall be equal to 0.

NOTE 6 – For any chroma format (4:2:0, 4:2:2, or 4:4:4), the luma plane and each chroma plane is quincunx sampled as illustrated in Figure D-1 when `quincunx_sampling_flag` is equal to 1.

content_interpretation_type indicates the intended interpretation of the constituent frames as specified in Table D-9. Values of `content_interpretation_type` that do not appear in Table D-9 are reserved for future specification by ITU-T | ISO/IEC.

For each specified `frame_packing_arrangement_scheme`, there are two constituent frames that are referred to as frame 0 and frame 1.



Table D-9 – Definition of `content_interpretation_type`

Value	Interpretation
0	Unspecified relationship between the frame packed constituent frames
1	Indicates that the two constituent frames form the left and right views of a stereo view scene, with frame 0 being associated with the left view and frame 1 being associated with the right view
2	Indicates that the two constituent frames form the right and left views of a stereo view scene, with frame 0 being associated with the right view and frame 1 being associated with the left view

NOTE 7 – The value 2 for `content_interpretation_type` is not expected to be prevalent in industry use of this SEI message. However, the value was specified herein for purposes of completeness.

spatial_flipping_flag equal to 1, when `frame_packing_arrangement_type` is equal to 3 or 4, indicates that one of the two constituent frames is spatially flipped relative to its intended orientation for display or other such purposes.

When `frame_packing_arrangement_type` is equal to 3 or 4 and `spatial_flipping_flag` is equal to 1, the type of spatial flipping that is indicated is as follows:

- If `frame_packing_arrangement_type` is equal to 3, the indicated spatial flipping is horizontal flipping.
- Otherwise (`frame_packing_arrangement_type` is equal to 4), the indicated spatial flipping is vertical flipping.

When `frame_packing_arrangement_type` is not equal to 3 or 4, it is a requirement of bitstream conformance to this Specification that `spatial_flipping_flag` shall be equal to 0. When `frame_packing_arrangement_type` is not equal to 3 or 4, the value 1 for `frame_packing_arrangement_type` is reserved for future use by ITU-T | ISO/IEC. When `frame_packing_arrangement_type` is not equal to 3 or 4, decoders shall ignore the value 1 for `spatial_flipping_flag`.

frame0_flipped_flag, when `spatial_flipping_flag` is equal to 1, indicates which one of the two constituent frames is flipped.