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Information technology — High efficiency coding and media delivery in heterogeneous environments —

Part 2: High efficiency video coding

AMENDMENT 2: Main 10 still picture profile

Technologies de l'information — Codage à haute efficacité et livraison des medias dans des environnements hétérogènes —

Partie 2: Codage vidéo à haute efficacité

AMENDEMENT 2: Profil main 10 pour image fixe

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A list of all parts in the ISO/IEC 23008 series can be found on the ISO website.

Information technology — High efficiency coding and media delivery in heterogeneous environments —

Part 2:
High efficiency video coding

AMENDMENT 2: Main 10 still picture profile

Clause 3

Replace 3.56 with the following:

3.56

frequency index

one-dimensional or two-dimensional index associated with a *transform coefficient* prior to the application of a *transform* in the *decoding process*

Delete 3.70, and renumber the current 3.71 through 3.164 as 3.70 through 3.163.

Add the following as 3.164:

3.164

transform

part of the *decoding process* by which a *block* of *transform coefficients* is converted to a *block* of spatial-domain values

Replace 3.165 with the following:

3.165

transform block

rectangular MxN *block* of samples resulting from the same *transform* in the *decoding process*

Replace 3.166 with the following:

3.166

transform coefficient

scalar quantity, considered to be in a frequency domain that is associated with a particular one-dimensional or two-dimensional *frequency index* in a *transform* in the *decoding process*

Clause 7

Replace 7.3.3 with the following:

7.3.3 Profile, tier and level syntax

profile_tier_level(profilePresentFlag, maxNumSubLayersMinus1) {	**Descriptor**
if(profilePresentFlag) {	
general_profile_space	u(2)
general_tier_flag	u(1)
general_profile_idc	u(5)
for(j = 0; j < 32; j++)	
general_profile_compatibility_flag[j]	u(1)
general_progressive_source_flag	u(1)
general_interlaced_source_flag	u(1)
general_non_packed_constraint_flag	u(1)
general_frame_only_constraint_flag	u(1)

if(general_profile_idc == 4 | | general_profile_compatibility_flag[4] | |
general_profile_idc == 5 | | general_profile_compatibility_flag[5] | |
general_profile_idc == 6 | | general_profile_compatibility_flag[6] | |
general_profile_idc == 7 | | general_profile_compatibility_flag[7] | |
general_profile_idc == 8 | | general_profile_compatibility_flag[8] | |
general_profile_idc == 9 | | general_profile_compatibility_flag[9] | |
general_profile_idc == 10 | | general_profile_compatibility_flag[10]) {
/* The number of bits in this syntax structure is not affected by this condition */	

general_max_12bit_constraint_flag	u(1)
general_max_10bit_constraint_flag	u(1)
general_max_8bit_constraint_flag	u(1)
general_max_422chroma_constraint_flag	u(1)
general_max_420chroma_constraint_flag	u(1)
general_max_monochrome_constraint_flag	u(1)
general_intra_constraint_flag	u(1)
general_one_picture_only_constraint_flag	u(1)
general_lower_bit_rate_constraint_flag	u(1)

if(general_profile_idc == 5 | | general_profile_compatibility_flag[5] | |
general_profile_idc == 9 | | general_profile_compatibility_flag[9] | |
general_profile_idc == 10 | | general_profile_compatibility_flag[10]) {	

general_max_14bit_constraint_flag	u(1)
general_reserved_zero_33bits	u(33)
} else	
general_reserved_zero_34bits	u(34)
} else if(general_profile_idc == 2 | | general_profile_compatibility_flag[2]) {	
general_reserved_zero_7bits	u(7)
general_one_picture_only_constraint_flag	u(1)
general_reserved_zero_35bits	u(35)
} else	
general_reserved_zero_43bits	u(43)

if((general_profile_idc >= 1 && general_profile_idc <= 5) || general_profile_idc == 9 || general_profile_compatibility_flag[1] || general_profile_compatibility_flag[2] || general_profile_compatibility_flag[3] || general_profile_compatibility_flag[4] || general_profile_compatibility_flag[5] || general_profile_compatibility_flag[9]) /* The number of bits in this syntax structure is not affected by this condition */	
general_inbld_flag	u(1)
else	
general_reserved_zero_bit	u(1)
}	
general_level_idc	u(8)
for(i = 0; i < maxNumSubLayersMinus1; i++) {	
sub_layer_profile_present_flag[i]	u(1)
sub_layer_level_present_flag[i]	u(1)
}	
if(maxNumSubLayersMinus1 > 0)	
for(i = maxNumSubLayersMinus1; i < 8; i++)	
reserved_zero_2bits[i]	u(2)
for(i = 0; i < maxNumSubLayersMinus1; i++) {	
if(sub_layer_profile_present_flag[i]) {	
sub_layer_profile_space[i]	u(2)
sub_layer_tier_flag[i]	u(1)
sub_layer_profile_idc[i]	u(5)
for(j = 0; j < 32; j++)	
sub_layer_profile_compatibility_flag[i][j]	u(1)
sub_layer_progressive_source_flag[i]	u(1)
sub_layer_interlaced_source_flag[i]	u(1)
sub_layer_non_packed_constraint_flag[i]	u(1)
sub_layer_frame_only_constraint_flag[i]	u(1)

if(sub_layer_profile_idc[i] == 4 || sub_layer_profile_compatibility_flag[i][4] ||
sub_layer_profile_idc[i] == 5 || sub_layer_profile_compatibility_flag[i][5] ||
sub_layer_profile_idc[i] == 6 || sub_layer_profile_compatibility_flag[i][6] ||
sub_layer_profile_idc[i] == 7 || sub_layer_profile_compatibility_flag[i][7] ||
sub_layer_profile_idc[i] == 8 || sub_layer_profile_compatibility_flag[i][8] ||
sub_layer_profile_idc[i] == 9 || sub_layer_profile_compatibility_flag[i][9] ||
sub_layer_profile_idc[i] == 10 || sub_layer_profile_compatibility_flag[i][10]) {
/* The number of bits in this syntax structure is not affected by this condition */	

sub_layer_max_12bit_constraint_flag[i]	u(1)
sub_layer_max_10bit_constraint_flag[i]	u(1)
sub_layer_max_8bit_constraint_flag[i]	u(1)
sub_layer_max_422chroma_constraint_flag[i]	u(1)
sub_layer_max_420chroma_constraint_flag[i]	u(1)
sub_layer_max_monochrome_constraint_flag[i]	u(1)
sub_layer_intra_constraint_flag[i]	u(1)
sub_layer_one_picture_only_constraint_flag[i]	u(1)
sub_layer_lower_bit_rate_constraint_flag[i]	u(1)
if(sub_layer_profile_idc[i] == 5 || sub_layer_profile_compatibility_flag[i][5]) {	

sub_layer_max_14bit_constraint_flag[i]	u(1)
sub_layer_reserved_zero_33bits[i]	u(33)
} else	
sub_layer_reserved_zero_34bits[i]	u(34)
} else if(sub_layer_profile_idc[i] == 2 | | sub_layer_profile_compatibility_flag[i][2]) {	
sub_layer_reserved_zero_7bits[i]	u(7)
sub_layer_one_picture_only_constraint_flag[i]	u(1)
sub_layer_reserved_zero_35bits[i]	u(35)
} else	
sub_layer_reserved_zero_43bits[i]	u(43)
if((sub_layer_profile_idc[i] >= 1 && sub_layer_profile_idc[i] <= 5) | | sub_layer_profile_idc[i] == 9 | | sub_layer_profile_compatibility_flag[1] | | sub_layer_profile_compatibility_flag[2] | | sub_layer_profile_compatibility_flag[3] | | sub_layer_profile_compatibility_flag[4] | | sub_layer_profile_compatibility_flag[5] | | sub_layer_profile_compatibility_flag[9]) /* The number of bits in this syntax structure is not affected by this condition */	
sub_layer_inbld_flag[i]	u(1)
else	
sub_layer_reserved_zero_bit[i]	u(1)
}	
if(sub_layer_level_present_flag[i])	
sub_layer_level_idc[i]	u(8)
}	
}	

In 7.4.4, delete the two sentences:

"When profilePresentFlag is equal to 1 and one or more of these syntax elements are not present, their values are inferred to be equal to 0. When general_profile_idc is not equal to 10 and is not in the range of 4 to 7, inclusive, and general_profile_compatibility_flag[10] is not equal to 1 and general_profile_compatibility_flag[j] is not equal to 1 for any value of j in the range of 4 to 7, inclusive, the value of each of these syntax elements shall be equal to 0."

In 7.4.4, after the semantics of general_reserved_zero_34bits, add the following:

general_reserved_zero_7bits, when present, shall be equal to 0 in bitstreams conforming to this version of this Specification. Other values for general_reserved_zero_7bits are reserved for future use by ITU-T | ISO/IEC. Decoders shall ignore the value of general_reserved_zero_7bits.

general_reserved_zero_35bits, when present, shall be equal to 0 in bitstreams conforming to this version of this Specification. Other values for general_reserved_zero_35bits are reserved for future use by ITU-T | ISO/IEC. Decoders shall ignore the value of general_reserved_zero_35bits.

In 7.4.4, replace the paragraph specifying the semantics of sub_layer_profile_space[i], sub_layer_tier_flag[i], sub_layer_profile_idc[i], etc., with the following:

The semantics of the syntax elements **sub_layer_profile_space**[i], **sub_layer_tier_flag**[i], **sub_layer_profile_idc**[i], **sub_layer_profile_compatibility_flag**[i][j], **sub_layer_progressive_source_flag**[i], **sub_layer_interlaced_source_flag**[i], **sub_layer_non_packed_constraint_flag**[i], **sub_layer_frame_only_constraint_flag**[i], **sub_layer_max_12bit_constraint_flag**[i], **sub_layer_max_10bit_constraint_flag**[i], **sub_layer_max_8bit_constraint_flag**[i], **sub_layer_max_422chroma_constraint_flag**[i], **sub_layer_max_420chroma_constraint_flag**[i], **sub_layer_max_monochrome_constraint_flag**[i], **sub_layer_intra_constraint_flag**[i], **sub_layer_one_picture_only_constraint_flag**[i], **sub_layer_lower_bit_rate_constraint_flag**[i], **sub_layer_max_14bit_constraint_flag**, **sub_layer_reserved_zero_33bits**[i], **sub_layer_reserved_zero_34bits**[i], **sub_layer_reserved_zero_7bits**[i], **sub_layer_reserved_zero_35bits**[i], **sub_layer_reserved_zero_43bits**[i], **sub_layer_inbld_flag**[i], **sub_layer_reserved_zero_bit**[i], and **sub_layer_level_idc**[i] are, apart from the specification of the inference of not present values, the same as the syntax elements general_profile_space, general_tier_flag, general_profile_idc, general_profile_compatibility_flag[j], general_progressive_source_flag, general_interlaced_source_flag, general_non_packed_constraint_flag, general_frame_only_constraint_flag, general_max_12bit_constraint_flag, general_max_10bit_constraint_flag, general_max_8bit_constraint_flag, general_max_422chroma_constraint_flag, general_max_420chroma_constraint_flag, general_max_monochrome_constraint_flag, general_intra_constraint_flag, general_one_picture_only_constraint_flag, general_lower_bit_rate_constraint_flag, general_max_14bit_constraint_flag, general_reserved_zero_33bits, general_reserved_zero_34bits, **general_reserved_zero_7bits, general_reserved_zero_35bits**, general_reserved_zero_43bits, general_inbld_flag, general_reserved_zero_bit, and general_level_idc, respectively, but apply to the sub-layer representation with TemporalId equal to i.

In 7.4.3.2.2, replace the paragraph specifying the semantics of the extended_precision_processing_flag syntax element with the following:

extended_precision_processing_flag equal to 1 specifies that an extended dynamic range is used for transform coefficients and transform processing. extended_precision_processing_flag equal to 0 specifies that the extended dynamic range is not used. When not present, the value of extended_precision_processing_flag is inferred to be equal to 0.

In 7.4.2.2, replace NOTE 1 with the following:

NOTE 1 NAL unit types in the range of UNSPEC48..UNSPEC63 can be used as determined by the application. No decoding process for these values of nal_unit_type is specified in this Specification. Since different applications might use these NAL unit types for different purposes, it is expected that particular care would be exercised in the design of encoders that generate NAL units with these nal_unit_type values, and in the design of decoders that interpret the content of NAL units with these nal_unit_type values. This specification does not define any management for these values. These nal_unit_type values might only be suitable for use in contexts in which "collisions" of usage (i.e. different definitions of the meaning of the NAL unit content for the same nal_unit_type value) are unimportant, or not possible, or are managed – e.g. defined or managed in the controlling application or transport specification, or by controlling the environment in which bitstreams are distributed.

Clause 8

In 8.6.2, replace Formula (8-300) (computation of r[x][y] using the variable rotateCoeffs when cu_transquant_bypass_flag is equal to 0 and transform_skip_flag[xTbY][yTbY][cIdx] is equal to 1) with the following:

$$r[x][y] = (rotateCoeffs ? d[nTbS - x - 1][nTbS - y - 1] : d[x][y]) << tsShift \quad (8\text{-}300)$$

Annexes A, G and H

In A.3.2, A.3.4, A.3.5, A.3.6, A.3.7, G.11.1.1, H.11.1. and H.11.1.2, replace the phrase "level constraints" with "tier and level constraints".

Annex A

Replace A.3.3 with the following:

A.3.3 Main 10 and Main 10 Still Picture profiles

Bitstreams conforming to the Main 10 or Main 10 Still Picture profile shall obey the following constraints:

— In bitstreams conforming to the Main 10 Still Picture profile, the bitstream shall contain only one picture with nuh_layer_id equal to 0.

— Active VPSs shall have vps_base_layer_internal_flag and vps_base_layer_available_flag both equal to 1 only.

— Active SPSs for the base layer shall have chroma_format_idc equal to 1 only.

— Active SPSs for the base layer shall have bit_depth_luma_minus8 in the range of 0 to 2, inclusive.

— Active SPSs for the base layer shall have bit_depth_chroma_minus8 in the range of 0 to 2, inclusive.

— In bitstreams conforming to the Main 10 Still Picture profile, active SPSs for the base layer shall have sps_max_dec_pic_buffering_minus1[sps_max_sub_layers_minus1] equal to 0 only.

— Active SPSs for the base layer shall have transform_skip_rotation_enabled_flag, transform_skip_context_enabled_flag, implicit_rdpcm_enabled_flag, explicit_rdpcm_enabled_flag, extended_precision_processing_flag, intra_smoothing_disabled_flag, high_precision_offsets_enabled_flag, persistent_rice_adaptation_enabled_flag, cabac_bypass_alignment_enabled_flag, sps_curr_pic_ref_enabled_flag, palette_mode_enabled_flag, motion_vector_resolution_control_idc, and intra_boundary_filtering_disabled_flag, when present, equal to 0 only.

— CtbLog2SizeY derived according to active SPSs for the base layer shall be in the range of 4 to 6, inclusive.

— Active PPSs for the base layer shall have log2_max_transform_skip_block_size_minus2, chroma_qp_offset_list_enabled_flag, and residual_adaptive_colour_transform_enabled_flag, when present, equal to 0 only.

— When an active PPS for the base layer has tiles_enabled_flag equal to 1, it shall have entropy_coding_sync_enabled_flag equal to 0.

— When an active PPS for the base layer has tiles_enabled_flag equal to 1, ColumnWidthInLumaSamples[i] shall be greater than or equal to 256 for all values of i in the range of 0 to num_tile_columns_minus1, inclusive, and RowHeightInLumaSamples[j] shall be greater than or equal to 64 for all values of j in the range of 0 to num_tile_rows_minus1, inclusive.

— The number of times read_bits(1) is called in subclauses 9.3.4.3.3 and 9.3.4.3.4 when parsing coding_tree_unit( ) data for any coding tree unit shall be less than or equal to 5 * RawCtuBits / 3.

— In bitstreams conforming to the Main 10 profile that do not conform to the Main 10 Still Picture profile, general_level_idc and sub_layer_level_idc[i] for all values of i in active SPSs for the base layer shall not be equal to 255 (which indicates level 8.5).

— The tier and level constraints specified for the Main 10 or Main 10 Still Picture profile in Clause A.4, as applicable, shall be fulfilled.

Conformance of a bitstream to the Main 10 profile is indicated by general_profile_idc being equal to 2 or general_profile_compatibility_flag[2] being equal to 1. Conformance of a sub-layer representation with TemporalId equal to i to the Main 10 profile is indicated by sub_layer_profile_idc[i] being equal to 2 or sub_layer_profile_compatibility_flag[i][2] being equal to 1.

Conformance of a bitstream to the Main 10 Still Picture profile is indicated by general_one_picture_only_constraint_flag being equal to 1 together with general_profile_idc being equal to 2 or general_profile_compatibility_flag[2] being equal to 1. Conformance of a sub-layer representation with TemporalId equal to i to the Main 10 Still Picture profile is indicated by sub_layer_one_picture_only_constraint_flag being equal to 1 together with sub_layer_profile_idc[i] being equal to 2 or sub_layer_profile_compatibility_flag[i][2] being equal to 1.

NOTE When the conformance of a bitstream to the Main 10 Still Picture profile is indicated as specified above, and the indicated level is not level 8.5, the conditions for indication of the conformance of the bitstream to the Main 10 profile are also fulfilled.

Decoders conforming to the Main 10 profile at a specific level (identified by a specific value of general_level_idc) of a specific tier (identified by a specific value of general_tier_flag) shall be capable of decoding all bitstreams and sub-layer representations for which all of the following conditions apply:

— The bitstream or sub-layer representation is indicated to conform to the Main 10 profile, the Main profile, or the Main Still Picture profile.

— The bitstream or sub-layer representation is indicated to conform to a level that is not level 8.5 and is lower than or equal to the specified level.

— The bitstream or sub-layer representation is indicated to conform to a tier that is lower than or equal to the specified tier.

Decoders conforming to the Main 10 Still Picture profile at a specific level (identified by a specific value of general_level_idc) of a specific tier (identified by a specific value of general_tier_flag) shall be capable of decoding all bitstreams and sub-layer representations for which all of the following conditions apply:

— The bitstream or sub-layer representation is indicated to conform to the Main 10 Still Picture profile or the Main Still Picture profile.

— The bitstream or sub-layer representation is indicated to conform to a level that is not level 8.5 and is lower than or equal to the specified level.

— The bitstream or sub-layer representation is indicated to conform to a tier that is lower than or equal to the specified tier.

In A.3.4, A.3.5, A.3.6, A.3.7 replace the phrase “at a specific level (identified by a specific value of general_level_idc)” with “at a specific level (identified by a specific value of general_level_idc) of a specific tier (identified by a specific value of general_tier_flag)”.

In A.3.7 delete the following item from the list:

— The decoder conforms to the Main Intra, Main 10 Intra, Main 12 Intra, Main 4:2:2 10 Intra, Main 4:2:2 12 Intra, Main 4:4:4 Intra, Main 4:4:4 10 Intra, or Main 4:4:4 12 Intra, Main 4:4:4 16 Intra, Main 4:4:4 Still Picture, or Main 4:4:4 16 Still Picture profile, and the bitstream or sub-layer representation is indicated to conform to the Main Still Picture profile.

In A.4.2 replace the NOTE at the beginning of the subclause with the following:

NOTE The term "video profiles", as used in this clause, refers to those profiles that are not still picture profiles. The still picture profiles include the Main Still Picture, Main 10 Still Picture, Main 4:4:4 Still Picture, and Main 4:4:4 16 Still Picture profiles.

Replace Table A.8 with the following:

Table A.8 — Specification of CpbVclFactor, CpbNalFactor, FormatCapabilityFactor, and MinCrScaleFactor

Profile	CpbVclFactor	CpbNalFactor	FormatCapabilityFactor	MinCrScaleFactor
Monochrome	667	733	1.000	1.0
Monochrome 12	1000	1100	1.500	1.0
Monochrome 16	1333	1467	2.000	1.0
Main	1000	1100	1.500	1.0
Screen-Extended Main	1000	1100	1.500	1.0
Main 10	1000	1100	1.875	1.0
Screen-Extended Main 10	1000	1100	1.875	1.0
Main 12	1500	1650	2.250	1.0
Main Still Picture	1000	1100	1.500	1.0
Main 10 Still Picture	1000	1100	1.875	1.0
Main 4:2:2 10	1667	1833	2.500	0.5
Main 4:2:2 12	2000	2200	3.000	0.5
Main 4:4:4	2000	2200	3.000	0.5
High Throughput 4:4:4	2000	2200	3.000	0.5
Screen-Extended Main 4:4:4	2000	2200	3.000	0.5
Screen-Extended High Throughput 4:4:4	2000	2200	3.000	0.5
Main 4:4:4 10	2500	2750	3.750	0.5
High Throughput 4:4:4 10	2500	2750	3.750	0.5
Screen-Extended Main 4:4:4 10	2500	2750	3.750	0.5
Screen-Extended High Throughput 4:4:4 10	2500	2750	3.750	0.5
Main 4:4:4 12	3000	3300	4.500	0.5