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CODING OF MOVING PICTURES AND AUDIO

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Title: **[V3C] VPS MIV edition 2 extension**
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Abstract

This proposal requests ~~a~~ VPS and CASPS extensions for ISO/IEC 23090-12 *MPEG immersive video 2nd edition* to be added to the 3rd edition of ISO/IEC 23090-5 V3C + V-PCC. This proposal has a related WG 4 proposal.

Version 3 avoids a parsing dependency in MIV edition 2 between the VPS and the common atlas sub-bitstream.

1 Introduction

Adding new functionality to the 2nd edition of MIV requires adding at least one new flag to the VPS MIV extension and CASPS MIV extension. Unfortunately, there are no reserved flags in these ~~the VPS MIV~~ extensions. Similarly, there are no reserved flags in the V-PCC ASPS and AAPS extensions. This proposal together with a related proposal in WG 4 [m63655] addresses the MIV edition 2 ~~is~~ problem by introducing a VPS MIV edition 2 extension and CASPS MIV edition 2 extension.

2 Summary of the WG 4 contribution

The new VPS MIV edition 2 extension includes the VPS MIV extension such that only one extension needs to be signalled. The motivation for that is that MIV edition 2 is an evolution of edition 1, and the overhead for signalling another extension is more than the size of the VPS MIV extension. A bitstream conformance restriction is added to disallow signalling both VPS MIV extensions.

To prevent a similar problem when adding a flag to a hypothetical third edition of MIV, the extension proposed in the WG 4 contribution [m63655] includes reserved zero bits for future ISO/IEC use.

8.3.2.8 V3C parameter set MIV edition 2 extension syntax

vps_miv_2_extension( ) {	**Descriptor**
vps_miv_extension( )	
vme_reserved_zero_8bits	u(8)
(...)	(...)
}	

8.4.2.8 V3C parameter set MIV 2 extension semantics

vme_reserved_zero_8bits, when present, shall be equal to 0 in bitstreams conforming to this version of this document. Other values for vme_reserved_zero_8bits are reserved for future use by ISO/IEC. Decoders shall ignore the value of vme_reserved_zero_8bits.

(...)

The CASPS extension mechanism has less overhead, and the CASPS MIV edition 2 extension is meant to be used together with the CASPS MIV extension.

8.3.2.9 Common atlas sequence parameter set MIV edition 2 extension syntax

casps_miv_2_extension( ) {	Descriptor
casme_reserved_zero_8bits	u(8)
(...)	(...)
}	

3 Proposed syntax changes

8.3.4.8 VPS extension syntax

vps_extension(extension_type, extension_length) {	Descriptor
if(extension_type == VPS_EXT_PACKED)	
vps_packed_video_extension( )	
else if(extension_type == VPS_EXT_MIV)	
vps_miv_extension( ) /* Specified in ISO/IEC 23090-12~~:2022~~ */	
else if(extension_type == VPS_EXT_MIV_2)	
vps_miv_2_extension( ) /* Specified in ISO/IEC 23090-12~~:2022~~ */	
else {	
for(j = 0; j < extension_length; j++)	
vps_extension_data_byte	u(8)
}	
length_alignment( )	
}	

~~[2] Under preparation. Stage at time of publication: ISO/IEC FDIS 23090-12:2022~~

[3] Under preparation. Stage at time of publication: ISO/IEC WD 23090-12:2023

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8.3.6.13 Common atlas sequence parameter set RBSP syntax

common_atlas_sequence_parameter_set_rbsp( ) {	Descriptor
casps_common_atlas_sequence_parameter_set_id	u(4)
casps_log2_max_common_atlas_frame_order_cnt_lsb_minus4	ue(v)
casps_extension_present_flag	u(1)
if(casps_extension_present_flag) {	
casps_miv_extension_present_flag	u(1)
casps_miv_2_extension_present_flag	u(1)
casps_extension_6bits	u(6)
}	

if(casps_miv_extension_present_flag)	
casps_miv_extension( ) /* Specified in ISO/IEC 23090-12 */	
if(casps_miv_2_extension_present_flag)	
casps_miv_2_extension( ) /* Specified in ISO/IEC 23090-12 */	
if(casps_extension_6bits)	
while(more_rbsp_data( ))	
casps_extension_data_flag	u(1)
rbsp_trailing_bits( )	
}	

4 Proposed semantics changes

8.4.4.1 General V3C parameter set semantics

(...)

vps_extension_type[i] indicates the VPS extension type for the extension with index i as specified in Table 1~~Table 3~~. Values indicated as reserved are reserved for future use by ISO/IEC and shall not be present in bitstreams conforming to this version of this document. Decoders conforming to this version of this document should ignore such reserved extensions. It is a requirement that a particular vps_extension_type[i] value shall only be present once in an entire VPS, while the order of extensions does not matter.

Table 13: – VPS extension types

vps_extension_type[i]	Identifier
0	VPS_EXT_UNSPECIFIED
1	VPS_EXT_PACKED
2	VPS_EXT_MIV
3	VPS_EXT_MIV_2
4-255	Reserved

The variables VpsPackingInformationPresentFlag, VpsMivExtensionPresentFlag and VpsMiv2ExtensionPresentFlag are computed as follows:

```
VpsPackingInformationPresentFlag = 0
VpsMivExtensionPresentFlag = 0
VpsMiv2ExtensionPresentFlag = 0

for( i = 0; i < vps_extension_count; i++ ) {
    if( vps_extension_type[ i ] == VPS_EXT_PACKED )
        VpsPackingInformationPresentFlag = 1
    else if( vps_extension_type[ i ] == VPS_EXT_MIV )
        VpsMivExtensionPresentFlag = 1
    else if( vps_extension_type[ i ] == VPS_EXT_MIV_2 )
```

```
        VpsMiv2ExtensionPresentFlag = 1
}
```

It is a requirement of bitstream conformance that VpsMivExtensionPresentFlag or VpsMiv2ExtensionPresentFlag is equal to zero.

vps_extension_length[i] specifies the number of bytes used to represent the payload size of the syntax structure of the associated extension with index i. If vps_extension_length[i] is equal to 0, no extension payload is present for the extension with index i. Otherwise, the extension with index i shall have a payload size in bits in the range of 8 * (vps_extension_length[i] – 1) + 1 to 8 * vps_extension_length[i], inclusive.

(...)

8.4.6.13 Common atlas sequence parameter set RBSP semantics

casps common atlas sequence parameter set id provides an identifier for the common atlas sequence parameter set for reference by other syntax elements.

casps log2 max common atlas frame order cnt lsb minus4 plus 4 specifies the values of the variables Log2MaxCommonAtlasFrmOrderCntLsb and MaxCommonAtlasFrmOrderCntLsb that are used in the decoding process for the common atlas frame order count as follows:

```
Log2MaxCommonAtlasFrmOrderCntLsb =
        casps_log2_max_common_atlas_frame_order_cnt_lsb_minus4 + 4   (130)

MaxCommonAtlasFrmOrderCntLsb = 2Log2MaxCommonAtlasFrmOrderCntLsb   (231)
```

The value of casps log2 max common atlas frame order cnt lsb minus4 shall be in the range of 0 to 12, inclusive.

casps extension present flag equal to 1 specifies that the syntax elements casps miv extension present flag, casps miv 2 extension present flag and casps extension 6bits are present in the common atlas sequence parameter set rbsp( ) syntax structure. casps extension present flag equal to 0 specifies that the syntax elements casps miv extension present flag, casps miv 2 extension present flag and casps extension 6bits are not present.

casps miv extension present flag equal to 1 specifies that the casps miv extension( ) syntax structure is present in the common atlas sequence parameter rbsp( ) syntax structure. casps miv extension present flag equal to 0 specifies that this syntax structure is not present. When not present, the value of casps miv extension present flag is inferred to be equal to 0.

casps miv 2 extension present flag equal to 1 specifies that the casps miv 2 extension( ) syntax structure is present in the common atlas sequence parameter rbsp( ) syntax structure. casps miv 2 extension present flag equal to 0 specifies that this syntax structure is not present. When not present, the value of casps miv 2 extension present flag is inferred to be equal to 0.

casps extension 6bits equal to 0 specifies that no casps extension data flag syntax elements are present in the CASPS RBSP syntax structure. When present, casps extension 6bits shall be equal to 0 in bitstreams conforming to this version of this document. Values of casps extension 6bits not equal to 0 are reserved for future use by ISO/IEC. Decoders shall allow the value of casps extension 6bits to be not equal to 0 and shall ignore all casps extension data flag syntax elements in a CASPS NAL unit. When not present, the value of casps extension 6bits is inferred to be equal to 0.

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casps extension data flag may have any value. Its presence and value do not affect decoder conformance to profiles specified in this version of this document. Decoders conforming to this version of this document shall ignore all casps extension data flag syntax elements.

Table H-23 – Max allowed syntax element values for the V-PCC toolset profile components

	Profile name			
Syntax element	**V-PCC Basic**	**V-PCC Basic Still**	**V-PCC Extended**	**V-PCC Extended Still**
ptl_profile_toolset_idc	0	0	1	1
ptc_one_v3c_frame_only_flag	–	1	–	1
asps_eom_patch_enabled_flag	0		–	
asps_map_count_minus1	Min(1, LevelMapCount – 1)		LevelMapCount – 1	
vps_multiple_map_streams_present_flag (when vps_map_count_minus1 > 0)	when present, 1		–	
vps_atlas_count_minus1	0		0	
asps_plr_enabled_flag	0		–	
ai_attribute_dimension_minus1	2		–	
ai_attribute_dimension_partitions_minus1	0		–	
ai_attribute_partition_channels_minus1	–		2	
asps_use_eight_orientations_flag	0		–	
asps_extended_projection_enabled_flag	0		–	
vps_auxiliary_video_present_flag	–		–	
vps_occupancy_video_present_flag	1		1	
vps_geometry_video_present_flag	1		1	
vps_attribute_video_present_flag	–		–	
vps_extension_present_flag	0		0	
~~vps_packing_information_present_flag~~	~~0~~		~~0~~	
VpsPackingInformationPresentFlag	0		0	
VpsMivExtensionPresentFlag	0		0	
VpsMiv2ExtensionPresentFlag	0		0	
afps_miv_extension_present_flag	0		0	
asps_miv_extension_present_flag	0		0	
casps_extension_present_flag	0		0	
casps_miv_extension_present_flag	0		0	
casps_miv_2_extension_present_flag	0		0	
caf_extension_present_flag	0		0	

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caf_miv_extension_present_flag	0	0
vuh_unit_type	V3C_VPS, V3C_AD, V3C_OVD, V3C_GVD, or V3C_AVD	V3C_VPS, V3C_AD, V3C_OVD, V3C_GVD, or V3C_AVD

5 Conclusions

The main contributions of this proposal are as follows:

- The proposed specification change enables the development of MIV edition 2.
- The new variables make it easier to define profiles that require or restrict VPS extensions.

The proponents recommend:

- Adopt this proposal into ISO/IEC 23090-5.
- Integrate into TMIV ahead of MPEG 143 to test the proposal.