International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.222.0

Amendment 6

(05/2011)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Transmission multiplexing and synchronization

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Information technology – Generic coding of moving pictures and associated audio information: Systems

Amendment 6: Extension to AVC video descriptor and signalling of operation points for MVC

Recommendation ITU-T H.222.0 (2006) – Amendment 6

ITU International Telecommunication Union

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	**H.220–H.229**
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Supplementary services for multimedia	H.450–H.499
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
Mobility interworking procedures	H.550–H.559
Mobile multimedia collaboration inter-working procedures	H.560–H.569
BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619
Advanced multimedia services and applications	H.620–H.629
IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV	
General aspects	H.700–H.719
IPTV terminal devices	H.720–H.729
IPTV middleware	H.730–H.739
IPTV application event handling	H.740–H.749
IPTV metadata	H.750–H.759
IPTV multimedia application frameworks	H.760–H.769
IPTV service discovery up to consumption	H.770–H.779

For further details, please refer to the list of ITU-T Recommendations.

INTERNATIONAL STANDARD ISO/IEC 13818-1
RECOMMENDATION ITU-T H.222.0

Information technology – Generic coding of moving pictures and associated audio information: Systems

Amendment 6

Extension to AVC video descriptor and signalling of operation points for MVC

Summary

Amendment 6 to Recommendation ITU-T H.222.0 | ISO/IEC 13818-1 specifies additional signalling for the transport of bitstreams conforming to profiles defined in Annex H of Recommendation ITU-T H.264 (2010) | ISO/IEC 14496-10:2010 over MPEG-2 transport streams as defined in Recommendation ITU-T H.222.0 (2006) | ISO/IEC 13818-1:2007 Amendment 4 (2009). This amendment introduces the new MVC operation point descriptor and clarifies certain use cases defined in Recommendation ITU-T H.222.0 (2006) | ISO/IEC 13818-1:2007 Amendment 4 (2009).

The MVC operation point descriptor includes signalling of stream characteristics needed to support additional use cases for MVC video defined in Recommendation ITU-T H.264 (2010) | ISO/IEC 14496-10:2010.

This amendment also extends the AVC video descriptor to signal presence of frame packing SEI in the AVC video elementary stream.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.222.0	1995-07-10	15
1.1	ITU-T H.222.0 (1995) Amd. 1	1996-11-11	16
1.2	ITU-T H.222.0 (1995) Amd. 2	1996-11-11	16
1.3	ITU-T H.222.0 (1995) Technical Cor. 1	1998-02-06	16
1.4	ITU-T H.222.0 (1995) Amd. 3	1998-02-06	16
1.5	ITU-T H.222.0 (1995) Amd. 4	1998-02-06	16
1.6	ITU-T H.222.0 (1995) Amd. 5	1999-05-27	16
1.7	ITU-T H.222.0 (1995) Amd. 6	1999-05-27	16
2.0	ITU-T H.222.0	2000-02-17	16
2.1	ITU-T H.222.0 (2000) Technical Cor. 1	2001-03-01	16
2.2	ITU-T H.222.0 (2000) Technical Cor. 2	2002-03-29	16
2.3	ITU-T H.222.0 (2000) Amd. 1	2002-12-14	16
2.4	ITU-T H.222.0 (2000) Amd. 1/Cor. 1	2003-06-29	16
2.5	ITU-T H.222.0 (2000) Amd. 2	2003-06-29	16
2.6	ITU-T H.222.0 (2000) Amd. 3	2004-03-15	16
2.7	ITU-T H.222.0 (2000) Technical Cor. 3	2005-01-08	16
2.8	ITU-T H.222.0 (2000) Amd. 4	2005-01-08	16
2.9	ITU-T H.222.0 (2000) Amd. 5	2005-01-08	16
2.10	ITU-T H.222.0 (2000) Technical Cor. 4	2005-09-13	16
3.0	ITU-T H.222.0	2006-05-29	16
3.1	ITU-T H.222.0 (2006) Amd. 1	2007-01-13	16
3.2	ITU-T H.222.0 (2006) Amd. 2	2007-08-29	16

3.3	ITU-T H.222.0 (2006) Cor. 1	2008-06-13	16
3.4	ITU-T H.222.0 (2006) Cor. 2	2009-03-16	16
3.5	ITU-T H.222.0 (2006) Amd. 3	2009-03-16	16
3.6	ITU-T H.222.0 (2006) Cor. 3	2009-12-14	16
3.7	ITU-T H.222.0 (2006) Cor. 4	2009-12-14	16
3.8	ITU-T H.222.0 (2006) Amd. 4	2009-12-14	16
3.9	ITU-T H.222.0 (2006) Amd. 5	2011-05-14	16
3.10	ITU-T H.222.0 (2006) Amd. 6	2011-05-14	16

FOREWORD

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

CONTENTS

INTERNATIONAL STANDARD
RECOMMENDATION ITU-T

Information technology – Generic coding of moving pictures and associated audio information: Systems

Amendment 6

Extension to AVC video descriptor and signalling of operation points for MVC

1) Clause 1.2.2

In 1.2.2, Paired Recommendations | International Standards equivalent in technical content, replace:

– ITU-T Recommendation H.264 (2009), *Advanced video coding for generic audiovisual services*.

ISO/IEC 14496-10:2009, *Information technology – Coding of audio-visual objects – Part 10: Advanced video coding*.

with:

– Recommendation ITU-T H.264 (2010), *Advanced video coding for generic audiovisual services*.

ISO/IEC 14496-10:2010, *Information technology – Coding of audio-visual objects – Part 10: Advanced Video Coding*.

2) Clause 2.1.83

At the end of 2.1.83, add the following Note:

NOTE – An MVC video sub-bitstream or MVC base view sub-bitstream based on a specific MVC view_id subset may not include view components for all view_id values included in that MVC view_id subset. One or more view order index values may be skipped if the view associated with a missing view order index value is not required for decoding the transmitted views.

3) New clause 2.1.93

After 2.1.92, add the following:

2.1.93 MVC operation point: An MVC operation point is identified by a temporal_id value representing a target temporal level and a set of view_id values representing the target output views. One MVC operation point is associated with an AVC video stream which conforms to one or more profiles defined in Annex H of Rec. ITU-T H.264 | ISO/IEC 14496-10. The AVC video stream associated with an MVC operation point is re-assembled from a set consisting of one or more of the following items: AVC video sub-bitstream of MVC, MVC base view sub-bitstream, MVC video sub-bitstreams.

4) Clause 2.6.1

a) In 2.6.1, replace:

The following semantics apply to the descriptors defined in 2.6.2 through 2.6.34.

with:

The following semantics apply to all descriptors defined in 2.6.2 through the end of 2.6.

b) In 2.6.1, Semantic definition of fields in program and program element descriptors, replace Table 2-45 with:

Table 2-45 – Program and program element descriptors

descriptor_tag	TS	PS	Identification
0	n/a	n/a	Reserved
1	n/a	X	Forbidden
2	X	X	video_stream_descriptor
3	X	X	audio_stream_descriptor
4	X	X	hierarchy_descriptor
5	X	X	registration_descriptor
6	X	X	data_stream_alignment_descriptor
7	X	X	target_background_grid_descriptor
8	X	X	video_window_descriptor
9	X	X	CA_descriptor
10	X	X	ISO_639_language_descriptor
11	X	X	system_clock_descriptor
12	X	X	multiplex_buffer_utilization_descriptor
13	X	X	copyright_descriptor
14	X		maximum_bitrate_descriptor
15	X	X	private_data_indicator_descriptor
16	X	X	smoothing_buffer_descriptor
17	X		RECOMMENDATION_descriptor
18	X	X	IBP_descriptor
19-26	X		Defined in ISO/IEC 13818-6
27	X	X	MPEG-4_video_descriptor
28	X	X	MPEG-4_audio_descriptor
29	X	X	IOD_descriptor
30	X		SL_descriptor
31	X	X	FMC_descriptor
32	X	X	external_ES_ID_descriptor
33	X	X	MuxCode_descriptor
34	X	X	FmxBufferSize_descriptor
35	X		multiplexBuffer_descriptor
36	X	X	content_labeling_descriptor
37	X	X	metadata_pointer_descriptor
38	X	X	metadata_descriptor
39	X	X	metadata_STD_descriptor
40	X	X	AVC video descriptor
41	X	X	IPMP_descriptor (defined in ISO/IEC 13818-11, MPEG-2 IPMP)
42	X	X	AVC timing and HRD descriptor
43	X	X	MPEG-2_AAC_audio_descriptor
44	X	X	FlexMuxTiming_descriptor
45	X	X	MPEG-4_text_descriptor
46	X	X	MPEG-4_audio_extension_descriptor
47	X	X	Auxiliary_video_stream_descriptor
48	X	X	SVC extension descriptor
49	X	X	MVC extension descriptor
50	X	n/a	J2K video descriptor
51	X	X	MVC operation point descriptor
52-63	n/a	n/a	Rec. ITU-T H.222.0 | ISO/IEC 13818-1 Reserved
64-255	n/a	n/a	User Private

5) Clause 2.6.7

In 2.6.7, replace the semantics of hierarchy_embedded_layer_index from:

hierarchy_embedded_layer_index – The hierarchy_embedded_layer_index is a 6-bit field that defines the hierarchy_layer_index of the program element that needs to be accessed and be present in decoding order before decoding of the elementary stream associated with this hierarchy_descriptor. This field is undefined if the hierarchy_type value is 15 (base layer).

to:

hierarchy_embedded_layer_index – The hierarchy_embedded_layer_index is a 6-bit field that defines the hierarchy_layer_index of the program element that needs to be accessed and be present in decoding order before decoding of the elementary stream associated with this hierarchy_descriptor. This field is undefined if the hierarchy_type value is 15.

6) Clause 2.6.64

Replace 2.6.64 with:

2.6.64 AVC video descriptor

For Rec. ITU-T H.264 | ISO/IEC 14496-10 video streams, the AVC video descriptor provides basic information for identifying coding parameters of the associated AVC video stream, such as on profile and level parameters included in the SPS of an AVC video stream.

The AVC video descriptor also signals the presence of AVC still pictures, AVC 24-hour pictures as well as 3D rendering assistance SEIs such as frame packing arrangement SEI message or stereo video information SEI message in the AVC video stream. If this descriptor is not included in the PMT for an AVC video stream in a transport stream or in the PSM, if present, for an AVC video stream in a program stream, then such AVC video stream shall not contain AVC still pictures, shall not contain AVC 24-hour pictures and may or may not contain frame packing arrangement SEI message or stereo video information SEI message (see Table 2-89).

7) Table 2-89

Replace Table 2-89 with:

Table 2-89 – AVC video descriptor

Syntax	No. of bits	Mnemonic
AVC_video_descriptor() {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
profile_idc	**8**	**uimsbf**
constraint_set0_flag	**1**	**bslbf**
constraint_set1_flag	**1**	**bslbf**
constraint_set2_flag	**1**	**bslbf**
constraint_set3_flag	**1**	**bslbf**
constraint_set4_flag	**1**	**bslbf**
constraint_set5_flag	**1**	**bslbf**
AVC_compatible_flags	**2**	**bslbf**
level_idc	**8**	**uimsbf**
AVC_still_present	**1**	**bslbf**
AVC_24_hour_picture_flag	**1**	**bslbf**
Frame_Packing_SEI_not_present_flag	**1**	**bslbf**
reserved	**5**	**bslbf**
}		

8) Clause 2.6.65

a) In 2.6.65, Semantic definition of fields in AVC video descriptor, replace:

profile_idc, constraint_set0_flag, constraint_set1_flag, constraint_set2_flag, constraint_set3_flag, AVC_compatible_flags and level_idc – These fields, with the exception of AVC_compatible_flags shall be coded according to the semantics for these fields defined in ITU-T Rec. H.264 | ISO/IEC 14496-10. The semantics of AVC_compatible_flags are exactly equal to the semantics of the field(s) defined for the 4 bits between the constraint_set3 flag and the level_idc field in the Sequence Parameter Set, as defined in ITU-T Rec. H.264 | ISO/IEC 14496-10. The entire AVC video stream to which the AVC descriptor is associated shall conform to the profile, level and constraints signalled by these fields.

with:

profile_idc, constraint_set0_flag, constraint_set1_flag, constraint_set2_flag, constraint_set3_flag, constraint_set4_flag, constraint_set5_flag and AVC_compatible_flags and level_idc – These fields, with the exception of AVC_compatible_flags, shall be coded according to the semantics for these fields defined in Rec. ITU-T H.264 | ISO/IEC 14496-10. The semantics of AVC_compatible_flags are exactly equal to the semantics of the field(s) defined for the 2 bits between the *constraint_set5 flag* and the *level_idc* field in the sequence parameter set, as defined in Rec. ITU-T H.264 | ISO/IEC 14496-10. The entire AVC video stream to which the AVC descriptor is associated shall conform to the profile, level and constraints signalled by these fields.

b) In 2.6.65, add:

Frame_Packing_SEI_not_present_flag – If this flag is set to '0', then the AVC video stream shall contain either the frame packing arrangement SEI message or stereo video information SEI message. If the AVC video descriptor is present and this flag is set to '1', then the presence of either of these SEI messages is unspecified.

9) New clauses 2.6.82 and 2.6.83

Insert the following new clauses after 2.6.81:

2.6.82 MVC operation point descriptor

The MVC operation point descriptor (see Table AMD6-1) provides a method to indicate profile and level for one or more operation points each constituted by a set of one or more MVC video sub-bitstreams. If present, the MVC operation point descriptor shall be included in the group of data elements following immediately the program_info_length field in the program_map_section. If an MVC operation point descriptor is present within a program description, at least one hierarchy descriptor shall be present for each MVC video sub-bitstream present in the same program.

NOTE – In order to indicate different profiles, one MVC operation point descriptor per profile is needed.

Table AMD6-1 – MVC operation point descriptor

Syntax	No. of bits	Mnemonic
MVC_operation_point_descriptor() {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
profile_idc	**8**	**uimsbf**
constraint_set0_flag	**1**	**bslbf**
constraint_set1_flag	**1**	**bslbf**
constraint_set2_flag	**1**	**bslbf**
constraint_set3_flag	**1**	**bslbf**
constraint_set4_flag	**1**	**bslbf**
constraint_set5_flag	**1**	**bslbf**
AVC_compatible_flags	**2**	**bslbf**
level_count	**8**	**uimsbf**
for (recommendation =0; recommendation < level_count; i++) {		
level_idc	**8**	**uimsbf**

Table AMD6-1 – MVC operation point descriptor

Syntax	No. of bits	Mnemonic
operation_points_count	**8**	**uimsbf**
for (j =0; j< operation_points_count; j++) {		
reserved	**5**	**bslbf**
applicable_temporal_id	**3**	**uimsbf**
num_target_output_views	**8**	**uimsbf**
ES_count	**8**	**uimsbf**
for (k =0; k< ES_count; k++) {		
reserved	**2**	**bslbf**
ES_reference	**6**	**uimsbf**
}		
}		
}		

2.6.83 Semantic definition of fields in MVC operation point descriptor

profile_idc – This 8-bit field indicates the profile, as defined in Rec. ITU-T H.264 | ISO/IEC 14496-10, of all operation points described within this descriptor for the MVC bitstream.

constraint_set0_flag, constraint_set1_flag, constraint_set2_flag, constraint_set3_flag, constraint_set4_flag, constraint_set5_flag – These fields shall be coded according to the semantics for these fields defined in Rec. ITU-T H.264 | ISO/IEC 14496-10.

AVC_compatible_flags – The semantics of AVC_compatible_flags are exactly equal to the semantics of the field(s) defined for the 2 bits between the constraint_set2 flag and the level_idc field in the sequence parameter set, as defined in Rec. ITU-T H.264 | ISO/IEC 14496-10.

level_count – This 8-bit field indicates the number of levels for which operation points are described.

level_idc – This 8-bit field indicates the level, as defined in Rec. ITU-T H.264 | ISO/IEC 14496-10, of the MVC bitstream for the operation points described by the following groups of data elements.

operation_points_count – This 8-bit field indicates the number of operation points described by the list included in the following group of data elements.

applicable_temporal_id – This 3-bit field indicates the highest value of the temporal_id of the VCL NAL units in the re-assembled AVC video stream.

num_target_output_views – This 8-bit field indicates the value of the number of the views, targeted for output for the associated operation point.

ES_count – This 8-bit field indicates the number of ES_reference values included in the following group of data elements. The elementary streams indicated in the following group of data elements together form an operation point of the MVC video bitstream. The value 0xff is reserved.

ES_reference – This 6-bit field indicates the hierarchy layer index value present in the hierarchy descriptor which identifies a video sub-bitstream.

NOTE – The profile and level for a single operation point, e.g., the entire MVC video bitstream, can be signalled using the AVC video descriptor. Beyond that, MVC allows for decoding different view subsets which can require different profiles and/or levels. The specification of the MVC operation point descriptor supports the indication of different profiles and levels for multiple operation points.

10) Clause 2.14.1

a) In 2.14.1, replace:

Each MVC video sub-bitstream shall be associated with one or more consecutive view order index values.

with:

Each MVC video sub-bitstream shall be associated with one or more consecutive view order index values.

NOTE – According to its definition in 2.1.84, an MVC video sub-bitstream or MVC base view sub-bitstream does not necessarily include view components for all view_id values included in one MVC view_id subset if one or more views are not required for decoding the transmitted views. As an example, consider a MVC bitstream having 4 views V1, V2, V3, and V4 in ascending order of view order index, where view V1 is the base view, view V2 is depending directly on V1, V3 is depending directly on V1 and V2, and V4 is depending directly on V2. Using such encoded views, two MVC sub-bitstreams M1 and M2 may be created as follows: M1 is associated with the output views V1 and V2, and M2 with the output view V4. In this example, it is possible that only M1 and M2 are transmitted to a receiver, thus sub-bitstream for V3 is not required to be transmitted since a combination of both sub-bitstreams M1 and M2 refers to the set of views V1, V2 and V4, and can be decoded without the presence of V3.

b) Further replace:

When a Rec. ITU-T H.222.0 | ISO/IEC 13818-1 program includes more than one MVC video sub-bitstream or more than one AVC video sub-bitstream of MVC and at least one MVC video sub-bitstream, a hierarchy descriptor as defined in 2.6.6 and 2.6.7 shall be used to indicate the dependencies of the related video sub-bitstreams. The syntax element hierarchy_type shall be set to the value 9 or 15.

with:

When a Rec. ITU-T H.222.0 | ISO/IEC 13818-1 program includes more than one MVC video sub-bitstream or more than one AVC video sub-bitstream of MVC and at least one MVC video sub-bitstream, one or more hierarchy descriptors as defined in 2.6.6 and 2.6.7 shall be used to indicate the dependencies of the related video sub-bitstreams. If more than one hierarchy descriptor is present for one elementary stream, the value of the syntax element hierarchy_layer_index shall be the same within the same elementary stream. The syntax element hierarchy_type shall be set to the value 9 or 15.

NOTE – Provided an MVC video sub-bitstream B depends on video sub-bitstream A and this dependency is indicated using a hierarchy descriptor, further an MVC video sub-bitstream C depends on B and this dependency is also indicated using a second hierarchy descriptor, then this implicitly indicates a dependency of C on A and no third hierarchy descriptor is needed.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
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