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

AMENDMENT 4: Transport of multiview video over Rec. ITU-T H.222.0 | ISO/IEC 13818-1

Technologies de l'information — Codage générique des images animées et du son associé: Systèmes

AMENDEMENT 4: Transport de vidéos multivues sur Rec. UIT-T H.222.0 | ISO/CEI 13818-1

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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Amendment 4 to ISO/IEC 13818-1:2007 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-T. The identical text is published as Rec. ITU-T H.222.0 (2006)/Amd.4 (12/2009).

This corrected version of ISO/IEC 13818-1:2007/Amd.4:2009 corrects the title.

INTERNATIONAL STANDARD
RECOMMENDATION ITU-T

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

Amendment 4

Transport of multiview video over Rec. ITU-T H.222.0 | ISO/IEC 13818-1

1) Subclause 1.2.2

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

– ITU-T Recommendation H.264 (2007), *Advanced video coding for generic audiovisual services*.

ISO/IEC 14496-10:2008, *Information technology – Coding of audio-visual objects – Part 10: Advanced video coding*.

with:

– 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*.

2) Subclause 2.1

a) In 2.1.78, replace:

AVC video sub-bitstream: The video sub-bitstream that contains the base layer as defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10 and that shall additionally contain NAL units with nal_unit_type equal to 14 (prefix NAL units). The AVC video sub-bitstream contains all VCL NAL units associated with dependency_id equal to 0.

with:

AVC video sub-bitstream of SVC: The video sub-bitstream that contains the base layer as defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10 and that shall additionally contain NAL units with nal_unit_type equal to 14 (prefix NAL units) as defined for SVC in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10. The AVC video sub-bitstream of SVC contains all VCL NAL units associated with dependency_id equal to 0.

b) In 2.1.81, replace:

SVC slice (system): A byte_stream_nal_unit as defined in ITU-T Rec. H.264 | ISO/IEC 14496-10 with nal_unit_type equal to 20.

with:

SVC slice (system): A byte_stream_nal_unit as defined in ITU-T Rec. H.264 | ISO/IEC 14496-10 with nal_unit_type equal to 20 of an AVC video stream which conforms to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10.

NOTE – As specified in ITU-T Rec. H.264 | ISO/IEC 14496-10, the value of svc_extension_flag is set equal to 1 for coded video sequences conforming to one or more profiles specified in Annex G. SVC slices should not include NAL units for which nal_unit_type is equal to 20 with svc_extension_flag equal to 0.

c) After 2.1.81, add subclauses 2.1.82 – 2.1.88:

2.1.82 view order index: An index that indicates the decoding order of MVC view components in an AVC access unit as defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10. The association of view order index values to the NAL unit header syntax element view_id is indicated for an AVC video sequence in the sequence parameter set MVC extension as defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10.

2.1.83 MVC view_id subset: A set of one or more view_id values, as defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10 in the NAL unit header syntax element, associated with one set of consecutive view order index values.

2.1.84 MVC video sub-bitstream: The MVC video sub-bitstream is defined to be all VCL NAL units with nal_unit_type equal to 20 associated with the same MVC view_id subset of an AVC video stream and associated non-VCL NAL units which conform to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10.

NOTE – In contrast to a sub-bitstream as specified in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, an MVC video sub-bitstream according to this Specification is not necessarily a decodable MVC video sub-bitstream. The one exception is when an MVC video sub-bitstream is also an MVC base view sub-bitstream. Re-assembling MVC video sub-bitstreams in an increasing order of view order index, starting from the lowest value of view order index up to any value of view order index, results in a decodable AVC video stream.

2.1.85 MVC base view sub-bitstream: The MVC base view sub-bitstream is defined to contain the AVC video sub-bitstream of MVC conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10 and one additional MVC video sub-bitstream associated with an MVC view_id subset including the view order index that immediately follows the view order index associated with the base view.

NOTE – The MVC base view sub-bitstream is also an AVC video stream where no re-assembly is required before decoding.

2.1.86 MVC view-component subset: The VCL NAL units of an AVC access unit associated with the same MVC view_id subset and associated non-VCL NAL units.

NOTE – Re-assembling MVC view-component subsets ordered according to the view order index, starting from the minimum view order index up to the highest view order index present in the access unit, while reordering the non-VCL NAL units conforming to the order of NAL units within an access unit, as defined in ITU-T Rec. H.264 | ISO/IEC 14496-10, results in an AVC access unit.

2.1.87 MVC slice (system): A byte_stream_nal_unit with nal_unit_type syntax element equal to 20 of an AVC video stream which conforms to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10.

NOTE – As specified in ITU-T Rec. H.264 | ISO/IEC 14496-10, the value of svc_extension_flag is set equal to 0 for coded video sequences conforming to one or more profiles specified in Annex H. MVC slices should not include NAL units for which nal_unit_type is equal to 20 with svc_extension_flag equal to 1.

2.1.88 AVC video sub-bitstream of MVC: The video sub-bitstream that contains the base view as defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, containing all VCL NAL units associated with the minimum value of view order index present in each AVC video sequence of the AVC video stream. The AVC video sub-bitstream of MVC may additionally contain the associated NAL units with nal_unit_type syntax element equal to 14 (prefix NAL units), as defined for MVC in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10.

3) Subclause 2.4.2.8

In 2.4.2.8, T-STD extensions for carriage of ITU-T Rec. H.264 | ISO/IEC 14496-10 video, replace:

To define the decoding in the T-STD of ITU-T Rec. H.264 | ISO/IEC 14496-10 video streams carried in a Transport Stream, the T-STD model needs to be extended. The T-STD extension and T-STD parameters for decoding of AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 are defined in 2.14.3.1 and T-STD extension and T-STD parameters for decoding of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10 are defined in 2.14.3.5.

with:

To define the decoding in the T-STD of ITU-T Rec. H.264 | ISO/IEC 14496-10 video streams carried in a Transport Stream, the T-STD model needs to be extended. The T-STD extension and T-STD parameters for decoding of AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 are defined in 2.14.3.1, T-STD extension and T-STD parameters for decoding of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10 are defined in 2.14.3.5, and T-STD extension and T-STD parameters for decoding of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10 are defined in 2.14.3.7.

4) Subclause 2.4.3.5

In 2.4.3.5, Semantic definition of fields in "adaptation field", make the following modifications:

a) In the section specifying the "discontinuity_indicator", replace:

For the purpose of this clause, an elementary stream access point is defined as follows:

- ISO/IEC 11172-2 video and ITU-T Rec. H.262 | ISO/IEC 13818-2 video – The first byte of a video sequence header.
- ISO/IEC 14496-2 visual – The first byte of the visual object sequence header.

- AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 – The first byte of an AVC access unit. The SPS and PPS parameter sets referenced in this and all subsequent AVC access units in the coded video stream shall be provided after this access point in the byte stream and prior to their activation.
- Video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10 – The first byte of an SVC dependency representation is an elementary stream access point if the following conditions are met:
  - The subset sequence parameter sets and picture parameter sets referenced in this and all subsequent SVC dependency representation in the video sub-bitstream shall be provided after this access point in the byte stream and prior to their activation.
  - If this SVC video sub-bitstream access point requires the elementary stream access point of the same AVC access unit, if any, contained in the corresponding elementary stream that needs to be present in decoding order before decoding the elementary stream associated with this elementary stream access point, then the corresponding elementary stream shall also include an elementary stream access point.

    NOTE 1 – If the hierarchy descriptor is present for this SVC video sub-bitstream then the video sub-bitstream of which the hierarchy_layer_index equals the hierarchy_embedded_layer_index of this SVC sub-bitstream should have an elementary stream access point in the same access unit.
- Audio – The first byte of an audio frame.
- ISO/IEC 14496-17 text stream – The first byte of a text access unit. In case in-band sample descriptions are used, each in-band sample description shall be provided in the ISO/IEC 14496-17 stream after this access point and prior to its use by an access unit.

with:

For the purpose of this clause, an elementary stream access point is defined as follows:

- ISO/IEC 11172-2 video and ITU-T Rec. H.262 | ISO/IEC 13818-2 video – The first byte of a video sequence header.
- ISO/IEC 14496-2 visual – The first byte of the visual object sequence header.
- AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 – The first byte of an AVC access unit. The SPS and PPS parameter sets referenced in this and all subsequent AVC access units in the coded video stream shall be provided after this access point in the byte stream and prior to their activation.
- Video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10 – The first byte of an SVC dependency representation is an elementary stream access point if the following conditions are met:
  - The subset sequence parameter sets and picture parameter sets referenced in this and all subsequent SVC dependency representation in the video sub-bitstream shall be provided after this access point in the byte stream and prior to their activation.
  - If this SVC video sub-bitstream access point requires the elementary stream access point of the same AVC access unit, if any, contained in the corresponding elementary stream that needs to be present in decoding order before decoding the elementary stream associated with this elementary stream access point, then the corresponding elementary stream shall also include an elementary stream access point.

    NOTE 1 – If the hierarchy descriptor is present for this SVC video sub-bitstream then the video sub-bitstream of which the hierarchy_layer_index equals the hierarchy_embedded_layer_index of this SVC sub-bitstream should have an elementary stream access point in the same access unit.
- MVC video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10 – The first byte of an MVC view-component subset is an elementary stream access point if the following two conditions are met:
  - The subset sequence parameter sets and picture parameter sets referenced in this and all subsequent MVC view-component subsets in the MVC video sub-bitstream shall be provided after this access point in the byte stream and prior to their activation.
  - If this MVC video sub-bitstream access point requires the elementary stream access point of the same AVC access unit, if any, contained in the corresponding elementary stream that needs to be present in decoding order before decoding the elementary stream associated with this elementary stream access point, then the corresponding elementary stream shall also include an elementary stream access point.

NOTE 2 – If the hierarchy descriptor is present for this MVC video sub-bitstream, then the MVC video sub-bitstream of which the hierarchy_layer_index equals the hierarchy_embedded_layer_index of this MVC sub-bitstream should have an elementary stream access point in this same access unit.

- Audio – The first byte of an audio frame.
- ISO/IEC 14496-17 text stream – The first byte of a text access unit. In case in-band sample descriptions are used, each in-band sample description shall be provided in the ISO/IEC 14496-17 stream after this access point and prior to its use by an access unit.

b) Replace:

elementary_stream_priority_indicator – The elementary_stream_priority_indicator is a 1-bit field. It indicates, among packets with the same PID, the priority of the elementary stream data carried within the payload of this Transport Stream packet. A '1' indicates that the payload has a higher priority than the payloads of other Transport Stream packets.

In the case of ISO/IEC 11172-2 or ITU-T Rec. H.262 | ISO/IEC 13818-2 or ISO/IEC 14496-2 video, this field may be set to '1' only if the payload contains one or more bytes from an intra-coded slice.

In the case of ITU-T Rec. H.264 | ISO/IEC 14496-10 video, this field may be set to '1' only if the payload contains one or more bytes from a slice with slice_type set to 2, 4, 7, or 9.

A value of '0' indicates that the payload has the same priority as all other packets which do not have this bit set to '1'.

with:

elementary_stream_priority_indicator – The elementary_stream_priority_indicator is a 1-bit field. It indicates, among packets with the same PID, the priority of the elementary stream data carried within the payload of this Transport Stream packet. A '1' indicates that the payload has a higher priority than the payloads of other Transport Stream packets.

In the case of ISO/IEC 11172-2 or ITU-T Rec. H.262 | ISO/IEC 13818-2 or ISO/IEC 14496-2 video, this field may be set to '1' only if the payload contains one or more bytes from an intra-coded slice.

In the case of ITU-T Rec. H.264 | ISO/IEC 14496-10 video, this field may be set to '1' only if the payload contains one or more bytes from a slice with slice_type set to 2, 4, 7, or 9.

A value of '0' indicates that the payload has the same priority as all other packets which do not have this bit set to '1'.

For MVC video sub-bitstreams or MVC base view sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, this field may be set to '1' only if the payload contains one or more bytes from an anchor picture, indicated by the slice_type equal to 2, 4, 7, or 9 and the anchor_pic_flag syntax element equal to 1 for all prefix NAL units and slice extension NAL units.

5) Subclause 2.4.3.7

In 2.4.3.7, Semantic definition of fields in PES packet, make the following modifications:

a) Replace:

stream_id – In Program Streams, the stream_id specifies the type and number of the elementary stream as defined by the stream_id Table 2-22. In Transport Streams, the stream_id may be set to any valid value which correctly describes the elementary stream type as defined in Table 2-22. In Transport Streams, the elementary stream type is specified in the Program Specific Information as specified in 2.4.4.

For AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, all video sub-bitstreams of the same AVC video stream shall have the same stream_id value.

with:

stream_id – In Program Streams, the stream_id specifies the type and number of the elementary stream as defined by the stream_id Table 2-22. In Transport Streams, the stream_id may be set to any valid value which correctly describes the elementary stream type as defined in Table 2-22. In Transport Streams, the elementary stream type is specified in the Program Specific Information as specified in 2.4.4.

For AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, all video sub-bitstreams of the same AVC video stream shall have the same stream_id value.

For AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, all MVC video sub-bitstreams of the same AVC video stream shall have the same stream_id value.

b) In the section specifying the PTS (presentation time stamp), replace:

For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, if a PTS is present in the PES packet header, it shall refer to the first SVC dependency representation that commences in this PES packet. An SVC dependency representation commences in a PES packet if the first byte of the SVC dependency representation is present in the PES packet. To achieve consistency between the STD model and the HRD model defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, for each re-assembled and decoded AVC access unit, the PTS value in the STD shall, within the accuracy of their respective clocks, indicate the same instant in time as the nominal DPB output time in the HRD, defined herein as $t_{o,n,dpb}(n) = t_{r,n}(n) + t_c *$ dpb_output_delay(n), where $t_{r,n}(n)$, t_c, and dpb_output_delay(n) are defined as in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10.

with:

For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, if a PTS is present in the PES packet header, it shall refer to the first SVC dependency representation that commences in this PES packet. An SVC dependency representation commences in a PES packet if the first byte of the SVC dependency representation is present in the PES packet. To achieve consistency between the STD model and the HRD model defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, for each re-assembled and decoded AVC access unit, the PTS value in the STD shall, within the accuracy of their respective clocks, indicate the same instant in time as the nominal DPB output time in the HRD, defined herein as $t_{o,n,dpb}(n) = t_{r,n}(n) + t_c *$ dpb_output_delay(n), where $t_{r,n}(n)$, t_c, and dpb_output_delay(n) are defined as in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10.

For MVC video sub-bitstreams, MVC base view sub-bitstream or AVC video sub-bitstream of MVC of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, if a PTS is present in the PES packet header, it shall refer to the first MVC view-component subset that commences in this PES packet. An MVC view-component subset commences in a PES packet if the first byte of the MVC view-component subset is present in the PES packet. To achieve consistency between the STD model and the HRD model defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, for each re-assembled and decoded AVC access unit, the PTS value in the STD shall, within the accuracy of their respective clocks, indicate the same instant in time as the nominal DPB output time in the HRD, defined herein as $t_{o,n,dpb}(n) = t_{r,n}(n) + t_c *$ dpb_output_delay(n), where $t_{r,n}(n)$, t_c, and dpb_output_delay(n) are defined as in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10.

c) In the section specifying the DTS (decoding time stamp), replace:

For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, if a DTS is present in the PES packet header, it shall refer to the first SVC dependency representation that commences in this PES packet. An SVC dependency representation commences in a PES packet if the first byte of the SVC dependency representation is present in the PES packet. To achieve consistency between the STD model and the HRD model defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, for each re-assembled AVC access unit the DTS value in the STD shall, within the accuracy of their respective clocks, indicate the same instant in time as the nominal CPB removal time $t_{r,n}(n)$ in the HRD, as defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10.

with:

For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, if a DTS is present in the PES packet header, it shall refer to the first SVC dependency representation that commences in this PES packet. An SVC dependency representation commences in a PES packet if the first byte of the SVC dependency representation is present in the PES packet. To achieve consistency between the STD model and the HRD model defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, for each re-assembled AVC access unit the DTS value in the STD shall, within the accuracy of their respective clocks, indicate the same instant in time as the nominal CPB removal time $t_{r,n}(n)$ in the HRD, as defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10.

For MVC video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, if a DTS is present in the PES packet header, it shall refer to the first MVC view-component subset that commences in this PES packet. An MVC view-component subset commences in a PES packet if the first byte of the MVC view-component subset is present in the PES packet. To achieve consistency between the STD model and the HRD model defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, for each re-assembled AVC access unit the DTS value in the STD shall, within the accuracy of their respective clocks, indicate the same instant in time as the nominal CPB removal time $t_{r,n}(n)$ in the HRD, as defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10.

d) In the section specifying the P-STD_buffer_size, replace:

For AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10, the size BS_n shall be larger than or equal to the size of the CPB signalled by the CpbSize[cpb_cnt_minus1] specified by the NAL hrd_parameters() in the AVC video stream. If the NAL hrd_parameters() are not present in the AVC video stream, then BS_n shall be larger than or equal to the size of the NAL CPB for the byte stream format defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 as 1200 × MaxCPB for the applied level.

For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, the size BS_n shall be larger than or equal to the size of the CPB signalled by the CpbSize[cpb_cnt_minus1] specified by the NAL hrd_parameters() for the video sub-bitstream carried in elementary stream ES_n as defined in 2.14.3.6. If the NAL hrd_parameters() are not present in the video sub-bitstream, the size BS_n shall be larger than or equal to the size of the NAL CPB for the byte stream format defined in ITU-T Rec. H.264 | ISO/IEC 14496-10 as 1200 × MaxCPB for the applied level for the elementary stream ES_n.

with:

For AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10, the size BS_n shall be larger than or equal to the size of the CPB signalled by the CpbSize[cpb_cnt_minus1] specified by the NAL hrd_parameters() in the AVC video stream. If the NAL hrd_parameters() are not present in the AVC video stream, then BS_n shall be larger than or equal to the size of the NAL CPB for the byte stream format defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 as 1200 × MaxCPB for the applied level.

For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, the size BS_n shall be larger than or equal to the size of the CPB signalled by the CpbSize[cpb_cnt_minus1] specified by the NAL hrd_parameters() for the video sub-bitstream carried in elementary stream ES_n as defined in 2.14.3.6. If the NAL hrd_parameters() are not present in the video sub-bitstream, the size BS_n shall be larger than or equal to the size of the NAL CPB for the byte stream format defined in ITU-T Rec. H.264 | ISO/IEC 14496-10 as 1200 × MaxCPB for the applied level for the elementary stream ES_n.

For MVC video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, the size BS_n shall be larger than or equal to the size of the CPB signalled by the CpbSize[cpb_cnt_minus1] specified by the NAL hrd_parameters() for the MVC video sub-bitstreams carried in elementary stream ES_n, as defined in 2.14.3.6. If the NAL hrd_parameters() are not present in the MVC video sub-bitstreams, the size BS_n shall be larger than or equal to the size of the NAL CPB for the byte stream format defined in ITU-T Rec. H.264 | ISO/IEC 14496-10 as 1200 × MaxCPB for the applied level for the elementary stream ES_n.

6) Subclause 2.4.4.9

In 2.4.4.9, Semantic definition of fields in Transport Stream program map section, replace Table 2-34 with:

Table 2-34 – Stream type assignments

Value	Description
0x00	ITU-T | ISO/IEC Reserved
0x01	ISO/IEC 11172-2 Video
0x02	ITU-T Rec. H.262 | ISO/IEC 13818-2 Video or ISO/IEC 11172-2 constrained parameter video stream
0x03	ISO/IEC 11172-3 Audio
0x04	ISO/IEC 13818-3 Audio
0x05	ITU-T Rec. H.222.0 | ISO/IEC 13818-1 private_sections
0x06	ITU-T Rec. H.222.0 | ISO/IEC 13818-1 PES packets containing private data
0x07	ISO/IEC 13522 MHEG
0x08	ITU-T Rec. H.222.0 | ISO/IEC 13818-1 Annex A DSM-CC
0x09	ITU-T Rec. H.222.1
0x0A	ISO/IEC 13818-6 type A

Table 2-34 – Stream type assignments

Value	Description
0x0B	ISO/IEC 13818-6 type B
0x0C	ISO/IEC 13818-6 type C
0x0D	ISO/IEC 13818-6 type D
0x0E	ITU-T Rec. H.222.0 | ISO/IEC 13818-1 auxiliary
0x0F	ISO/IEC 13818-7 Audio with ADTS transport syntax
0x10	ISO/IEC 14496-2 Visual
0x11	ISO/IEC 14496-3 Audio with the LATM transport syntax as defined in ISO/IEC 14496-3
0x12	ISO/IEC 14496-1 SL-packetized stream or FlexMux stream carried in PES packets
0x13	ISO/IEC 14496-1 SL-packetized stream or FlexMux stream carried in ISO/IEC 14496_sections
0x14	ISO/IEC 13818-6 Synchronized Download Protocol
0x15	Metadata carried in PES packets
0x16	Metadata carried in metadata_sections
0x17	Metadata carried in ISO/IEC 13818-6 Data Carousel
0x18	Metadata carried in ISO/IEC 13818-6 Object Carousel
0x19	Metadata carried in ISO/IEC 13818-6 Synchronized Download Protocol
0x1A	IPMP stream (defined in ISO/IEC 13818-11, MPEG-2 IPMP)
0x1B	AVC video stream conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 or AVC video sub-bitstream of SVC as defined in 2.1.78 or MVC base view sub-bitstream, as defined in 2.1.85, or AVC video sub-bitstream of MVC, as defined in 2.1.88
0x1C	ISO/IEC 14496-3 Audio, without using any additional transport syntax, such as DST, ALS and SLS
0x1D	ISO/IEC 14496-17 Text
0x1E	Auxiliary video stream as defined in ISO/IEC 23002-3
0x1F	SVC video sub-bitstream of an AVC video stream conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10
0x20	MVC video sub-bitstream of an AVC video stream conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10
0x21-0x7E	ITU-T Rec. H.222.0 | ISO/IEC 13818-1 Reserved
0x7F	IPMP stream
0x80-0xFF	User Private

7) Subclause 2.5.2.7

In 2.5.2.7, P-STD extensions for carriage of ITU-T Rec. H.264 | ISO/IEC 14496-10 Video, replace:

For decoding of AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 carried in a Program Stream in the P-STD model, see 2.14.3.2 and for decoding of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10 carried in a Program Stream in the P-STD model, see 2.14.3.6

with:

For decoding of AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10 carried in a Program Stream in the P-STD model, see 2.14.3.2, for decoding of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10 carried in a Program Stream in the P-STD model, see 2.14.3.6, and for decoding of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10 carried in a Program Stream in the P-STD model, see 2.14.3.8.

8) Subclause 2.5.5

In 2.5.5, Program Stream directory, replace:

For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, directory entries may be required to reference IDR picture or pictures to be re-assembled from video sub-bitstreams and associated with a recovery point SEI message present in a video sub-bitstream. Each such directory entry shall refer to the first byte of an SVC dependency representation.

with:

For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, directory entries may be required to reference IDR picture or pictures to be re-assembled from video sub-bitstreams and associated with a recovery point SEI message present in a video sub-bitstream. Each such directory entry shall refer to the first byte of an SVC dependency representation.

For MVC video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, directory entries may be required to reference IDR picture or pictures to be re-assembled from MVC video sub-bitstreams and associated with a recovery point SEI message present in an MVC video sub-bitstream. Each such directory entry shall refer to the first byte of an MVC view-component subset.

9) Subclause 2.6.1

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		STD_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

Table 2-45 – Program and program element descriptors

descriptor_tag	TS	PS	Identification
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
50-63	n/a	n/a	ITU-T Rec. H.222.0 | ISO/IEC 13818-1 Reserved
64-255	n/a	n/a	User Private

10) Subclause 2.6.7

a) In 2.6.7, Semantic definition of fields in hierarchy descriptor, replace:

hierarchy_type – The hierarchical relation between the associated hierarchy layer and its hierarchy embedded layer is defined in Table 2-50. If scalability applies in more than one dimension, this field shall be set to the value of '8' ("Combined Scalability"), and the flags temporal_scalability_flag, spatial_scalability_flag and quality_scalability_flag shall be set accordingly.

hierarchy_layer_index – The hierarchy_layer_index is a 6-bit field that defines a unique index of the associated program element in a table of coding layer hierarchies. Indices shall be unique within a single program definition. For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, this is the program element index, which is assigned in a way that the bitstream order will be correct if associated SVC dependency representations of the video sub-bitstreams of the same access unit are re-assembled in increasing order of hierarchy_layer_index.

with:

hierarchy_type – The hierarchical relation between the associated hierarchy layer and its hierarchy embedded layer is defined in Table 2-50. If scalability applies in more than one dimension, this field shall be set to the value of '8' ("Combined Scalability"), and the flags temporal_scalability_flag, spatial_scalability_flag and quality_scalability_flag shall be set accordingly. For MVC video sub-bitstreams, this field shall be set to the value of '9' ("MVC video sub-bitstream") and the flags temporal_scalability_flag, spatial_scalability_flag and quality_scalability_flag shall be set to '1'. For MVC base view sub-bitstreams, this field shall be set to the value of '15' and the flags temporal_scalability_flag, spatial_scalability_flag and quality_scalability_flag shall be set to '1'.

hierarchy_layer_index – The hierarchy_layer_index is a 6-bit field that defines a unique index of the associated program element in a table of coding layer hierarchies. Indices shall be unique within a single program definition. For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, this is the program element index, which is assigned in a way that the bitstream order will be correct if associated SVC dependency representations of the video sub-bitstreams of the same access unit are re-assembled in increasing order of hierarchy_layer_index. For MVC video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, this is the program element index, which is assigned in a way that the bitstream order will be correct if associated MVC view-component subsets of the MVC video sub-bitstreams of the same access unit are re-assembled in increasing order of hierarchy_layer_index.

b) Replace Table 2-50 with:

Table 2-50 – Hierarchy_type field values

Value	Description
0	Reserved
1	Spatial Scalability
2	SNR Scalability
3	Temporal Scalability
4	Data partitioning
5	Extension bit-stream
6	Private Stream
7	ISO/IEC 13818-2 Multi-view Profile
8	Combined Scalability
9	MVC video sub-bitstream
10-14	Reserved
15	Base layer or MVC base view sub-bitstream or AVC video sub-bitstream of MVC

11) Subclause 2.6.11

In 2.6.11, Semantic definition of fields in data stream alignment descriptor, make the following modifications:

a) Replace:

Table 2-54 describes the alignment type for ITU-T Rec. H.264 | ISO/IEC 14496-10 video when the data_alignment_indicator in the PES packet header has a value of '1'.

In this case:

- For AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10, the first PES_packet_data_byte following the PES header shall be the first byte of an AVC access unit or the first byte of an AVC slice, as signalled by the alignment_type value.
- For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, the first PES_packet_data_byte following the PES header shall be the first byte of an SVC dependency representation or the first byte of an SVC slice, as signalled by the alignment_type value.

with:

Table 2-54 describes the alignment type for ITU-T Rec. H.264 | ISO/IEC 14496-10 video when the data_alignment_indicator in the PES packet header has a value of '1'.

In this case:

- For AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10, the first PES_packet_data_byte following the PES header shall be the first byte of an AVC access unit or the first byte of an AVC slice, as signalled by the alignment_type value.
- For video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, the first PES_packet_data_byte following the PES header shall be the first byte of an SVC dependency representation or the first byte of an SVC slice, as signalled by the alignment_type value.
- For MVC video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, the first PES_packet_data_byte following the PES header shall be the first byte of an MVC view-component subset or the first byte of an MVC slice, as signalled by the alignment_type value.

b) Replace Table 2-54 with:

Table 2-54 – AVC video stream alignment values

Alignment type	Description
00	Reserved
01	AVC slice or AVC access unit
02	AVC access unit
03	SVC slice or SVC dependency representation
04	SVC dependency representation
05	MVC slice or MVC view-component subset
06	MVC view-component subset
07-FF	Reserved

12) Subclause 2.6.64

In 2.6.64, AVC video descriptor, replace:

For AVC 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 or in the subset SPS of an SVC video sub-bitstream.

For AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10, there may be one AVC video descriptor associated to each of the video sub-bitstreams identifying coding parameters of the associated re-assembled AVC video streams.

The AVC video descriptor also signals the presence of AVC still pictures and the presence of AVC 24-hour pictures in the AVC video stream. If this descriptor is not included in the PMT for an AVC video stream or a video sub-bitstream in a transport stream or in the PSM, if present, for an AVC video stream or a video sub-bitstream in a program stream, then such AVC video stream shall not contain AVC still pictures and shall not contain AVC 24-hour pictures. (See Table 2-89.)

with:

For AVC 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 or in the subset SPS of an SVC video sub-bitstream.

For AVC video streams conforming to one or more profiles defined in Annex G or Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, there may be one AVC video descriptor associated to each of the video sub-bitstreams or MVC video subsets identifying coding parameters of the associated re-assembled AVC video streams.

The AVC video descriptor also signals the presence of AVC still pictures and the presence of AVC 24-hour pictures in the AVC video stream. If this descriptor is not included in the PMT for an AVC video stream, a video sub-bitstream or an MVC video sub-bitstream in a transport stream or in the PSM, if present, for an AVC video stream, a video sub-bitstream or an MVC video sub-bitstream in a program stream, then such AVC video stream shall not contain AVC still pictures and shall not contain AVC 24-hour pictures. (See Table 2-89.)

13) Subclause 2.6.66

In 2.6.66, AVC timing and HRD descriptor, replace:

The AVC timing and HRD descriptor provides timing and HRD parameters of the associated AVC video stream. For each AVC video stream and for each video sub-bitstream carried in an ITU-T Rec. H.222.0 | ISO/IEC 13818-1 stream, the AVC timing and HRD descriptor shall be included in the PMT or in the PSM, if PSM is present in the program stream, unless the AVC video stream or the video sub-bitstream carries VUI parameters with the timing_info_present_flag set to '1':

- for each IDR picture or re-assembled IDR picture; and
- for each picture or re-assembled picture that is associated with a recovery point SEI message.

Absence of the AVC timing and HRD descriptor in the PMT for an AVC video stream or a re-assembled AVC video stream signals usage of the leak method in the T-STD for the transfer from MB_n to EB_n as defined:

- in 2.14.3.1 for an AVC video stream conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10;
- in 2.14.3.5 for video sub-bitstreams of an AVC video stream conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10.

But such usage can also be signalled by the hrd_management_valid_flag set to '0' in the AVC timing and HRD descriptor. If the transfer rate into buffer EB_n can be determined from HRD parameters contained in an AVC video stream or an AVC video stream re-assembled from video sub-bitstreams, and if this transfer rate is used in the T-STD for the transfer between MB_n to EB_n, then the AVC timing and HRD descriptor with the hrd_management_valid_flag set to '1' shall be included in the PMT for that AVC video stream or for the re-assembled AVC video stream. (See Table 2-90.)

with:

The AVC timing and HRD descriptor provides timing and HRD parameters of the associated AVC video stream. For each AVC video stream and for each video sub-bitstream or MVC video sub-bitstream carried in an ITU-T Rec. H.222.0 | ISO/IEC 13818-1 stream, the AVC timing and HRD descriptor shall be included in the PMT or in the PSM, if PSM is present in the program stream, unless the AVC video stream, the video sub-bitstream or the MVC video sub-bitstream carries VUI parameters with the timing_info_present_flag set to '1':

- for each IDR picture or re-assembled IDR picture; and
- for each picture or re-assembled picture that is associated with a recovery point SEI message.

Absence of the AVC timing and HRD descriptor in the PMT for an AVC video stream or a re-assembled AVC video stream signals usage of the leak method in the T-STD for the transfer from MB_n to EB_n as defined:

- in 2.14.3.1 for an AVC video stream conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10;
- in 2.14.3.5 for video sub-bitstreams of an AVC video stream conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10;
- in 2.14.3.7 for MVC video sub-bitstreams of an AVC video stream conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10.

But such usage can also be signalled by the hrd_management_valid_flag set to '0' in the AVC timing and HRD descriptor. If the transfer rate into buffer EB_n can be determined from HRD parameters contained in an AVC video stream or an AVC video stream re-assembled from video sub-bitstreams or MVC video sub-bitstreams, and if this transfer rate is used in the T-STD for the transfer between MB_n to EB_n, then the AVC timing and HRD descriptor with the hrd_management_valid_flag set to '1' shall be included in the PMT for that AVC video stream or for the re-assembled AVC video stream. (See Table 2-90.)

14) Subclause 2.6.67

In 2.6.67, Semantic definition of fields in AVC timing and HRD descriptor, replace:

hrd_management_valid_flag – This 1-bit field is only defined for use in transport streams.

When the AVC timing and HRD descriptor is associated to an AVC video stream or a re-assembled AVC video stream carried in a transport stream, then the following applies. If the hrd_management_valid_flag is set to '1', then Buffering Period SEI and Picture Timing SEI messages, as defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, shall be present in the associated AVC video stream or re-assembled AVC video stream. These Buffering Period SEI messages shall carry coded initial_cpb_removal_delay and initial_cpb_removal_delay_offset values for the NAL HRD. If the hrd_management_valid_flag is set to '1', then the transfer of each byte from MB_n to EB_n in the T-STD shall be according to the delivery schedule for that byte into the CPB in the NAL HRD, as determined from the coded initial_cpb_removal_delay and initial_cpb_removal_delay_offset values for SchedSelIdx = cpb_cnt_minus1. When the hrd_management_valid_flag is set to '0', the leak method for the transfer from MB_n to EB_n in the T-STD shall be used:

- as defined in 2.14.3.1 for AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10;
- as defined in 2.14.3.5 for video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10.

When the AVC timing and HRD descriptor is associated to an AVC video stream or a re-assembled AVC video stream carried in a program stream, then the meaning of the hrd_management_valid_flag is not defined.

with:

hrd_management_valid_flag – This 1-bit field is only defined for use in transport streams.

When the AVC timing and HRD descriptor is associated to an AVC video stream or a re-assembled AVC video stream carried in a transport stream, then the following applies. If the hrd_management_valid_flag is set to '1', then Buffering Period SEI and Picture Timing SEI messages, as defined in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, shall be present in the associated AVC video stream or re-assembled AVC video stream. These Buffering Period SEI messages shall carry coded initial_cpb_removal_delay and initial_cpb_removal_delay_offset values for the NAL HRD. If the hrd_management_valid_flag is set to '1', then the transfer of each byte from MB_n to EB_n in the T-STD shall be according to the delivery schedule for that byte into the CPB in the NAL HRD, as determined from the coded initial_cpb_removal_delay and initial_cpb_removal_delay_offset values for SchedSelIdx = cpb_cnt_minus1. When the hrd_management_valid_flag is set to '0', the leak method for the transfer from MB_n to EB_n in the T-STD shall be used:

- as defined in 2.14.3.1 for AVC video streams conforming to one or more profiles defined in Annex A of ITU-T Rec. H.264 | ISO/IEC 14496-10;
- as defined in 2.14.3.5 for video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex G of ITU-T Rec. H.264 | ISO/IEC 14496-10;
- as defined in 2.14.3.7 for MVC video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10.

When the AVC timing and HRD descriptor is associated to an AVC video stream or a re-assembled AVC video stream carried in a program stream, then the meaning of the hrd_management_valid_flag is not defined.

15) New subclauses 2.6.78 to 2.6.79

After 2.6.77, Semantics of fields in SVC extension descriptor, add subclauses 2.6.78 to 2.6.79:

2.6.78 MVC extension descriptor

For MVC video sub-bitstreams of AVC video streams conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, the MVC extension descriptor provides information about the AVC video stream resulting from re-assembling (up to) the associated MVC video sub-bitstream and provides information about the contained MVC video sub-bitstream and for the re-assembly of the associated MVC video sub-bitstream. There may be one MVC extension descriptor associated to any of the MVC video sub-bitstreams (with stream_type equal to 0x20) of an AVC video stream conforming to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10. When the MVC video sub-bitstream is an MVC base view sub-bitstream, the MVC extension descriptor shall be present in the associated PMT or PSM for stream_type equal to 0x1B.

Table AMD4.1 – MVC extension descriptor

Syntax	No. of bits	Mnemonic
MVC_extension_descriptor() {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
average_bit_rate	**16**	**uimsbf**
maximum_bitrate	**16**	**uimsbf**
reserved	**4**	**bslbf**
view_order_index_min	**10**	**bslbf**
view_order_index_max	**10**	**bslbf**
temporal_id_start	**3**	**bslbf**
temporal_id_end	**3**	**bslbf**
no_sei_nal_unit_present	**1**	**bslbf**
no_prefix_nal_unit_present	**1**	**bslbf**
}		

2.6.79 Semantics of fields in MVC extension descriptor

average_bitrate – This 16-bit field indicates the average bit rate, in kbits per second, of the re-assembled AVC video stream. When set to 0, the average bit rate is not indicated.

maximum_bitrate – This 16-bit field indicates the maximum bit rate, in kbits per second, of the re-assembled AVC video stream. When set to 0, the maximum bit rate is not indicated.

view_order_index_min – This 10-bit field indicates the minimum value of the view order index of all the NAL units contained in the associated MVC video sub-bitstream.

view_order_index_max – This 10-bit field indicates the maximum value of the view order index of all the NAL units contained in the associated MVC video sub-bitstream.

temporal_id_start – This 3-bit field indicates the minimum value of the temporal_id of the NAL unit header syntax element of all the NAL units contained in the associated MVC video sub-bitstream.

temporal_id_end – This 3-bit field indicates the maximum value of the temporal_id of the NAL unit header syntax element of all the NAL units contained in the associated MVC video sub-bitstream.

no_sei_nal_unit_present – This 1-bit flag when set to '1' indicates that no SEI NAL units are present in the associated video sub–bitstream.

NOTE – In case the no_sei_nal_unit_present flag is set to '1' for all MVC video sub-bitstreams and is not set to '1' or not present for the AVC video sub-bitstream of MVC, any SEI NAL units, if present, are included in the AVC video sub-bitstream of MVC. If the MVC extension descriptor is absent for all MVC video sub-bitstreams, SEI NAL units may be present in any MVC view-component subset of an MVC video sub-bitstream, and may require re-ordering to the order of NAL units within an access unit as defined in ITU-T Rec. H.264 | ISO/IEC 14496-10 before access unit re-assembling.

no_prefix_nal_unit_present – This 1-bit flag when set to '1' indicates that no prefix NAL units are present in either the AVC video sub-bitstream of MVC or MVC video sub-bitstreams. When this bit is set to '0', it indicates that prefix NAL units are present in the AVC video sub-bitstream of MVC only.

16) Subclause 2.14

a) Replace the fourth bullet in 2.14.1 for the SVC extensions by the following:

- In each elementary stream with stream_type equal to 0x1F, exactly one VDRD_nal_unit as defined in 2.14.3.3 may precede all the NAL units of the same SVC dependency representation.

NOTE 5 – If any VDRD_nal_unit is included in any SVC dependency representation, then the HRD model should include this VDRD_nal_unit in the buffer model as additional non-VCL NAL units. The NAL unit type 24 may be used in a different way by other specifications out of scope of this Specification.

b) After the last sentence of 2.14.1 Carriage of ITU-T Rec. H.264 | ISO/IEC 14496-10 Video, add:

When an AVC video stream conforms to one or more profiles defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10, the following constraints additionally apply:

- The AVC video sub-bitstream of MVC or MVC base view sub-bitstream, as defined in 2.1.88 and 2.1.85, shall be an element of an ITU-T Rec. H.222.0 | ISO/IEC 13818-1 program and the stream_type for this elementary stream shall be equal to 0x1B.
- For each MVC video sub-bitstream, as defined in 2.1.84, that is an element of the same ITU-T Rec. H.222.0 | ISO/IEC 13818-1 program, the stream_type for this elementary stream shall be equal to 0x20.
- Each MVC video sub-bitstream shall be associated with one or more consecutive view order index values.
- Each view order index value shall be associated to exactly one MVC view_id subset.

  NOTE 8 – This restriction greatly simplifies the re-assembly of any decodable sub-bitstream.
- When an ITU-T Rec. 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.
- The subset sequence parameter sets and picture parameter sets necessary for decoding an MVC video sub-bitstream shall be present within the elementary stream carrying the MVC video sub-bitstream.

- In each elementary stream with stream type equal to 0x20 exactly one VDRD_NAL_unit, as defined in 2.14.3.3, may precede all the NAL units of the same MVC view-component subset.

  NOTE 9 – If any VDRD_nal_unit is included in any MVC view component subset, then the HRD model should include this VDRD_nal_unit in the buffer model as additional non-VCL NAL units. The NAL unit type 24 may be used in a different way by other specifications out of scope of this Specification.

- All NAL units of a re-assembled AVC access unit shall be passed to the decoder in the order of NAL units within an access unit, as defined in ITU-T Rec. H.264 | ISO/IEC 14496-10.

  NOTE 10 – If SEI NAL units are present in any MVC view-component subset of an MVC video sub-bitstream, these NAL units may require re-ordering to the order of NAL units within an access unit, as defined in ITU-T Rec. H.264 | ISO/IEC 14496-10 before access unit re-assembling.

- The profile_idc and level_idc indication in the AVC_video_descriptor, if present, and the Type II HRD parameters in the AVC_timing_and_HRD_descriptor, if present, for an AVC video stream resulting from re-assembling (up to) the MVC video sub-bitstream associated to the descriptors shall include NAL units with nal_unit_type syntax element equal to 14, if present, in the AVC video sub-bitstream of MVC or MVC base view sub-bitstream and, if present, in the MVC video sub-bitstream, NAL units with nal_unit_type syntax element equal to 20 and 24.

c) *Replace 2.14.3.3 and 2.14.3.4 by the following:*

2.14.3.3 View and dependency representation delimiter NAL unit

See Table AMD3-2.

Table AMD3-2 – View and dependency representation delimiter NAL unit

Syntax	No. of bits	Mnemonic
VDRD_nal_unit() {		
forbidden_zero_bit	**1**	**bslbf**
nal_ref_idc	**2**	**bslbf**
nal_unit_type	**5**	**bslbf**
}		

2.14.3.4 Semantics of view and dependency representation delimiter NAL unit

forbidden_zero_bit – shall be equal to 0x0

nal_ref_idc – shall be equal to 0x0

nal_unit_type – shall equal to 0x18

d) *After 2.14.3.6, P-STD extensions for SVC, add subclauses 2.14.3.7 to 2.14.3.8:*

2.14.3.7 T-STD extensions for MVC

The T-STD model described in 2.14.3.1 is applied if the received elementary stream is a video sub-bitstream of stream_type 0x1B, i.e., only the AVC video sub-bitstream of MVC or MVC base view sub-bitstream is received and decoded.

When there is a set of received video sub-bitstreams and MVC video sub-bitstreams in an ITU-T Rec. H.222.0 | ISO/IEC 13818-1 program, of which dependencies may be signalled in the hierarchy descriptor, as defined in 2.6.7, and when there is at least one of the MVC video sub-bitstreams in the set of received elementary streams having the value of stream_type equal to 0x20, the T-STD model as described in 2.14.3.1 is extended as illustrated in Figure AMD4.1 and as specified below.

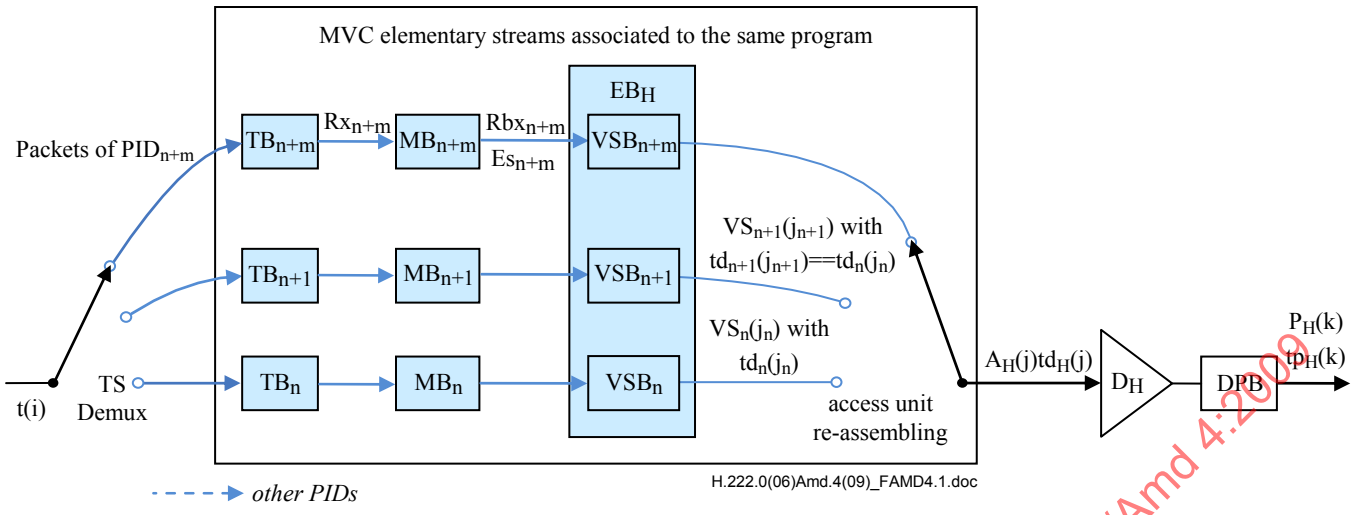

Figure AMD4.1 – T-STD model extensions for ITU-T Rec. H.264 | ISO/IEC 14496-10 Video with MVC video sub-bitstreams

The following additional notations are used to describe the T-STD extensions and are illustrated in Figure AMD4.1 above.

- ES_n is the received elementary stream associated to the n-th MVC video sub-bitstream, where n is the index to the MVC view_id subsets starting with value 0 for the MVC view_id subset containing the base view and ordered according to the minimum view order index contained in each MVC video sub-bitstream
- ES_H is the received elementary stream associated to the H-th MVC video sub-bitstream which includes the view components with the highest view order index present in all MVC video sub-bitstreams of received elementary streams
- j is an index to the re-assembled access units
- j_n is an index to the MVC view-component subsets of the elementary stream ES_n associated to the n-th MVC video sub-bitstream
- $VS_n(j_n)$ is the j_n-th MVC view-component subset of the MVC video sub-bitstream associated to ES_n
- $A_H(j)$ is the j-th access unit resulting from re-assembling (up to) the H-th MVC view-component subset associated to ES_H
- $td_n(j_n)$ is the decoding time, measured in seconds, in the system target decoder of the MVC view-component subset $VS_n(j_n)$
- $td_H(j)$ is the decoding time, measured in seconds, in the system target decoder of the j-th access unit $A_H(j)$ resulting from re-assembling (up to) the MVC view-component subset $VS_H(j_H)$
- TB_n is the transport buffer for elementary stream ES_n
- TBS_n is the size of the transport buffer TB_n, measured in bytes
- MB_n is the multiplexing buffer for elementary stream ES_n
- MBS_n is the size of the multiplexing buffer MB_n, measured in bytes
- VSB_n is the view component subset buffer for elementary stream ES_n
- $VSBS_n$ is the size of view component subset buffer VSB_n, measured in bytes
- EB_H is the elementary stream buffer for the AVC video sub-bitstream of MVC and all MVC video sub-bitstreams
- EBS_H is the size of elementary stream buffer EB_H, measured in bytes
- Rx_n transfer rate from TB_n to MB_n, as specified below
- Rbx_n transfer rate from MB_n to VSB_n, as specified below