
**Information technology — Coding of
audio-visual objects —**

**Part 10:
Advanced Video Coding**

**AMENDMENT 1: Additional profiles and
supplemental enhancement information
(SEI) messages**

Technologies de l'information — Codage des objets audiovisuels —

Partie 10: Codage visuel avancé

*AMENDEMENT 1: Profils additionnels et messages d'informations
d'amélioration supplémentaires (SEI)*



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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 1 to ISO/IEC 14496-10:2012 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

Information technology — Coding of audio-visual objects —

Part 10: Advanced Video Coding

AMENDMENT 1: Additional profiles and supplemental enhancement information (SEI) messages

At the end of 0.4, replace the following:

ITU-T Rec. H.264 | ISO/IEC 14496-10 version 15 (the current Specification) refers to the integrated version 14 text with miscellaneous corrections and clarifications as specified in a fifth technical corrigendum.

with:

ITU-T Rec. H.264 | ISO/IEC 14496-10 version 15 refers to the integrated version 14 text with miscellaneous corrections and clarifications as specified in a fifth technical corrigendum.

ITU-T Rec. H.264 | ISO/IEC 14496-10 version 16 refers to the integrated version 15 text after its amendment to define three new profiles intended primarily for communication applications (the Constrained High, Scalable Constrained Baseline, and Scalable Constrained High profiles).

ITU-T Rec. H.264 | ISO/IEC 14496-10 version 17 (the current Specification) refers to the integrated version 15 text after its amendment to define additional supplemental enhancement information (SEI) message data, including the multiview view position SEI message, the display orientation SEI message, and two additional frame packing arrangement type indication values for the frame packing arrangement SEI message (the 2D and tiled arrangement type indication values).

In 7.4.2.1.1, replace the following:

constraint_set5_flag is specified as follows:

- If `profile_idc` is equal to 118, `constraint_set5_flag` equal to 1 indicates that the coded video sequence obeys all constraints specified in subclause H.10.1.2 and `constraint_set5_flag` equal to 0 indicates that the coded video sequence may or may not obey all constraints specified in subclause H.10.1.2.
- Otherwise (`profile_idc` is not equal to 118), the value of 1 for `constraint_set5_flag` is reserved for future use by ITU-T | ISO/IEC. `constraint_set5_flag` shall be equal to 0 when `profile_idc` is not equal to 118 in bitstreams conforming to this Recommendation | International Standard. Decoders shall ignore the value of `constraint_set5_flag` when `profile_idc` is not equal to 118.

with:

constraint_set5_flag is specified as follows:

- If `profile_idc` is equal to 77, 88, or 100, `constraint_set5_flag` equal to 1 indicates that B slice types are not present in the coded video sequence. `constraint_set5_flag` equal to 0 indicates that B slice types may or may not be present in the coded video sequence.

- Otherwise, if `profile_idc` is equal to 118, `constraint_set5_flag` equal to 1 indicates that the coded video sequence obeys all constraints specified in subclause H.10.1.2 and `constraint_set5_flag` equal to 0 indicates that the coded video sequence may or may not obey all constraints specified in subclause H.10.1.2.
- Otherwise (`profile_idc` is not equal to 77, 88, 100, or 118), the value of 1 for `constraint_set5_flag` is reserved for future use by ITU-T | ISO/IEC. `constraint_set5_flag` shall be equal to 0 when `profile_idc` is not equal to 118 in bitstreams conforming to this Recommendation | International Standard. Decoders shall ignore the value of `constraint_set5_flag` when `profile_idc` is not equal to 118.

In 8.7, replace the following:

A conditional filtering process is specified in this subclause that is an integral part of the decoding process which shall be applied by decoders conforming to the Baseline, Constrained Baseline, Main, Extended, High, Progressive High, High 10, High 4:2:2, and High 4:4:4 Predictive profiles. For decoders conforming to the High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles, the filtering process specified in this subclause, or one similar to it, should be applied but is not required.

with:

A conditional filtering process is specified in this subclause that is an integral part of the decoding process which shall be applied by decoders conforming to the Baseline, Constrained Baseline, Main, Extended, High, Progressive High, Constrained High, High 10, High 4:2:2, and High 4:4:4 Predictive profiles. For decoders conforming to the High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles, the filtering process specified in this subclause, or one similar to it, should be applied but is not required.

Add A.2.4.2 "Constrained High profile" as follows:

A.2.4.2 Constrained High profile

Bitstreams conforming to the Constrained High profile shall obey all constraints specified in subclause A.2.4.1 for the Progressive High profile, and shall additionally obey the constraint that B slice types shall not be present.

Conformance of a bitstream to the Constrained High profile is indicated by `profile_idc` being equal to 100 with both `constraint_set4_flag` and `constraint_set5_flag` being equal to 1.

Decoders conforming to the Constrained High profile at a specific level shall be capable of decoding all bitstreams in which one or more of the following conditions are true:

- (`profile_idc` is equal to 66 or `constraint_set0_flag` is equal to 1), `constraint_set1_flag` is equal to 1, and the combination of `level_idc` and `constraint_set3_flag` represents a level less than or equal to the specified level.
- `profile_idc` is equal to 77, `constraint_set0_flag` is equal to 1, and the combination of `level_idc` and `constraint_set3_flag` represents a level less than or equal to the specified level.
- `profile_idc` is equal to 77, `constraint_set4_flag` is equal to 1, `constraint_set5_flag` is equal to 1, and `level_idc` represents a level less than or equal to the specified level.
- `profile_idc` is equal to 88, `constraint_set1_flag` is equal to 1, `constraint_set4_flag` is equal to 1, `constraint_set5_flag` is equal to 1, and the combination of `level_idc` and `constraint_set3_flag` represents a level less than or equal to the specified level.
- `profile_idc` is equal to 100, `constraint_set4_flag` is equal to 1, `constraint_set5_flag` is equal to 1, and `level_idc` represents a level less than or equal to the specified level.

Replace the heading of A.3.2 with the following:

A.3.2 Level limits common to the High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles

In A.3.2, replace the following:

Bitstreams conforming to the High, Progressive High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles at a specified level shall obey the following constraints:

with:

Bitstreams conforming to the High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles at a specified level shall obey the following constraints:

Also in A.3.2, replace the following:

Table A-1 specifies the limits for each level. A definition of all levels identified in the "Level number" column of Table A-1 is specified for the High, Progressive High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles. Each entry in Table A-1 indicates, for the level corresponding to the row of the table, the absence or value of a limit that is imposed by the variable corresponding to the column of the table, as follows:

with:

Table A-1 specifies the limits for each level. A definition of all levels identified in the "Level number" column of Table A-1 is specified for the High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles. Each entry in Table A-1 indicates, for the level corresponding to the row of the table, the absence or value of a limit that is imposed by the variable corresponding to the column of the table, as follows:

Replace A.3.3 and its Table A-2 with the following:

A.3.3 Profile-specific level limits

- a) In bitstreams conforming to the Main, High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles, the removal time of access unit 0 shall satisfy the constraint that the number of slices in picture 0 is less than or equal to $(\text{Max}(\text{PicSizeInMbs}, fR * \text{MaxMBPS}) + \text{MaxMBPS} * (t_r(0) - t_{r,n}(0))) \div \text{SliceRate}$, where MaxMBPS and SliceRate are the values specified in Tables A-1 and A-4, respectively, that apply to picture 0 and PicSizeInMbs is the number of macroblocks in picture 0.
- b) In bitstreams conforming to the Main, High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles, the difference between consecutive removal times of access units n and $n - 1$ with $n > 0$ shall satisfy the constraint that the number of slices in picture n is less than or equal to $\text{MaxMBPS} * (t_r(n) - t_r(n - 1)) \div \text{SliceRate}$, where MaxMBPS and SliceRate are the values specified in Tables A-1 and A-4, respectively, that apply to picture n .
- c) In bitstreams conforming to the Main, High, Progressive High, High 10, High 4:2:2, High 4:4:4 Predictive profiles, sequence parameter sets shall have `direct_8x8_inference_flag` equal to 1 for the levels specified in Table A-4.

NOTE 1 – `direct_8x8_inference_flag` is not relevant to the Baseline, Constrained Baseline, Constrained High, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles as these profiles do not allow B slice types, and `direct_8x8_inference_flag` is equal to 1 for all levels of the Extended profile.

- d) In bitstreams conforming to the Main, High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, CAVLC 4:4:4 Intra, or Extended profiles, sequence parameter sets shall have `frame_mbs_only_flag` equal to 1 for the levels specified in Table A-4 for the Main, High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles and in Table A-5 for the Extended profile.

NOTE 2 – `frame_mbs_only_flag` is equal to 1 for all levels of the Baseline, Constrained Baseline, Constrained High, and Progressive High profiles (specified in clauses A.2.1, A.2.1.1, and A.2.4.1, respectively).

- e) In bitstreams conforming to the Main, High, Progressive High, High 10, High 4:2:2, High 4:4:4 Predictive, or Extended profiles, the value of $\text{sub_mb_type}[\text{mbPartIdx}]$ with $\text{mbPartIdx} = 0..3$ in B macroblocks with mb_type equal to B_8x8 shall not be equal to B_Bi_8x4, B_Bi_4x8, or B_Bi_4x4 for the levels in which MinLumaBiPredSize is shown as 8x8 in Table A-4 for the Main, High, Progressive High, High 10, High 4:2:2, High 4:4:4 Predictive profiles and in Table A-5 for the Extended profile.
- f) In bitstreams conforming to the Baseline, Constrained Baseline, or Extended profiles, $(\text{xInt}_{\text{max}} - \text{xInt}_{\text{min}} + 6) * (\text{yInt}_{\text{max}} - \text{yInt}_{\text{min}} + 6) \leq \text{MaxSubMbRectSize}$ in macroblocks coded with mb_type equal to P_8x8, P_8x8ref0 or B_8x8 for all invocations of the process specified in clause 8.4.2.2.1 used to generate the predicted luma sample array for a single reference picture list (reference picture list 0 or reference picture list 1) for each 8x8 sub-macroblock with the macroblock partition index mbPartIdx , where $\text{NumSubMbPart}(\text{sub_mb_type}[\text{mbPartIdx}]) > 1$, where MaxSubMbRectSize is specified in Table A-3 for the Baseline and Constrained Baseline profiles and in Table A-5 for the Extended profile and the following apply:
- xInt_{min} is the minimum value of xInt_L among all luma sample predictions for the sub-macroblock
 - xInt_{max} is the maximum value of xInt_L among all luma sample predictions for the sub-macroblock
 - yInt_{min} is the minimum value of yInt_L among all luma sample predictions for the sub-macroblock
 - yInt_{max} is the maximum value of yInt_L among all luma sample predictions for the sub-macroblock
- g) In bitstreams conforming to the High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles, for the VCL HRD parameters, $\text{BitRate}[\text{SchedSelIdx}] \leq \text{cpbBrVclFactor} * \text{MaxBR}$ and $\text{CpbSize}[\text{SchedSelIdx}] \leq \text{cpbBrVclFactor} * \text{MaxCPB}$ for at least one value of SchedSelIdx, where cpbBrVclFactor is specified in Table A-2 and $\text{BitRate}[\text{SchedSelIdx}]$ and $\text{CpbSize}[\text{SchedSelIdx}]$ are given as follows:
- If $\text{vcl_hrd_parameters_present_flag}$ is equal to 1, $\text{BitRate}[\text{SchedSelIdx}]$ and $\text{CpbSize}[\text{SchedSelIdx}]$ are given by Equations E-37 and E-38, respectively, using the syntax elements of the $\text{hrd_parameters}()$ syntax structure that immediately follows $\text{vcl_hrd_parameters_present_flag}$.
 - Otherwise ($\text{vcl_hrd_parameters_present_flag}$ is equal to 0), $\text{BitRate}[\text{SchedSelIdx}]$ and $\text{CpbSize}[\text{SchedSelIdx}]$ are inferred as specified in clause E.2.2 for VCL HRD parameters.
- MaxBR and MaxCPB are specified in Table A-1 in units of cpbBrVclFactor bits/s and cpbBrVclFactor bits, respectively. The bitstream shall satisfy these conditions for at least one value of SchedSelIdx in the range 0 to cpb_cnt_minus1 , inclusive.
- h) In bitstreams conforming to the High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles, for the NAL HRD parameters, $\text{BitRate}[\text{SchedSelIdx}] \leq \text{cpbBrNalFactor} * \text{MaxBR}$ and $\text{CpbSize}[\text{SchedSelIdx}] \leq \text{cpbBrNalFactor} * \text{MaxCPB}$ for at least one value of SchedSelIdx, where cpbBrNalFactor is specified in Table A-2 and $\text{BitRate}[\text{SchedSelIdx}]$ and $\text{CpbSize}[\text{SchedSelIdx}]$ are given as follows:
- If $\text{nal_hrd_parameters_present_flag}$ is equal to 1, $\text{BitRate}[\text{SchedSelIdx}]$ and $\text{CpbSize}[\text{SchedSelIdx}]$ are given by Equations E-37 and E-38, respectively, using the syntax elements of the $\text{hrd_parameters}()$ syntax structure that immediately follows $\text{nal_hrd_parameters_present_flag}$.
 - Otherwise ($\text{nal_hrd_parameters_present_flag}$ is equal to 0), $\text{BitRate}[\text{SchedSelIdx}]$ and $\text{CpbSize}[\text{SchedSelIdx}]$ are inferred as specified in clause E.2.2 for NAL HRD parameters.
- MaxBR and MaxCPB are specified in Table A-1 in units of cpbBrNalFactor bits/s and cpbBrNalFactor bits, respectively. The bitstream shall satisfy these conditions for at least one value of SchedSelIdx in the range 0 to cpb_cnt_minus1 , inclusive.
- i) In bitstreams conforming to the High, Progressive High, or Constrained High profiles, the sum of the NumBytesInNALunit variables for access unit 0 is less than or equal to $384 * (\text{Max}(\text{PicSizeInMbs}, \text{fR} * \text{MaxMBPS}) + \text{MaxMBPS} * (\text{t}_r(0) - \text{t}_{r,n}(0))) \div \text{MinCR}$, where MaxMBPS and MinCR are the values specified in Table A-1 that apply to picture 0 and PicSizeInMbs is the number of macroblocks in picture 0.

NOTE 3 – Such a limit involving MinCR is not imposed for bitstream conformance to the High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles.

- j) In bitstreams conforming to the High, Progressive High, or Constrained High profiles, the sum of the NumBytesInNALunit variables for access unit n with $n > 0$ is less than or equal to $384 * \text{MaxMBPS} * (t_r(n) - t_r(n-1)) \div \text{MinCR}$, where MaxMBPS and MinCR are the values specified in Table A-1 that apply to picture n .

NOTE 4 – Such a limit involving MinCR is not imposed for bitstream conformance to the High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles.

- k) In bitstreams conforming to the High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles, when PicSizeInMbs is greater than 1620, the number of macroblocks in any coded slice shall not exceed $\text{MaxFS} / 4$, where MaxFS is specified in Table A-1.

Table A-2 – Specification of cpbBrVclFactor and cpbBrNalFactor

Profile	cpbBrVclFactor	cpbBrNalFactor
High Progressive High Constrained High	1 250	1 500
High 10 High 10 Intra	3 000	3 600
High 4:2:2 High 4:2:2 Intra	4 000	4 800
High 4:4:4 Predictive High 4:4:4 Intra CAVLC 4:4:4 Intra	4 000	4 800

Replace A.3.3.2 and its Table A-4 with the following:

A.3.3.2 Level limits of the Main, High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profile

Table A-4 specifies limits for each level that are specific to bitstreams conforming to the Main, High, Progressive High, Constrained High, High 10, High 4:2:2, High 4:4:4 Predictive, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, or CAVLC 4:4:4 Intra profiles. Each entry in Table A-4 indicates, for the level corresponding to the row of the table, the absence or value of a limit that is imposed by the variable corresponding to the column of the table, as follows:

- If the table entry is marked as "-", no limit is imposed by the value of the variable as a requirement of bitstream conformance to the profile at the specified level.
- Otherwise, the table entry specifies the value of the variable for the associated limit that is imposed as a requirement of bitstream conformance to the profile at the specified level.

NOTE – The constraints for MinLumaBiPredSize and direct_8x8_inference_flag are not relevant to the Constrained High, High 10 Intra, High 4:2:2 Intra, High 4:4:4 Intra, and CAVLC 4:4:4 Intra profiles, as these profiles do not support B slices.