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| *Title:* | **SPS level control over the number of merge candidates** | | |
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| *Purpose:* | Proposal | | |
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# Abstract

This document describes the decision make in Sunday plenary to have four different maximum number of merge candidates signaled in SPS level. In addition, spec text is provided to reflect the decision.

# Introduction

During Sunday plenary it was decided to have four different maximum number of merge candidates signaled in SPS level. Below are the related meeting notes.

* + *This involves four syntax elements –for regular mode, for triangle (geometry), for IBC and for subblock. They should be handled consistently, at the same syntax level. It was agreed (Saturday in Track A CE4 related discussion) that as far as the triangle/geometry control perspective is concerned, SPS level control over the number of merge candidates seemed sufficient. As far as Track A was concerned, establishing the max number of merge candidates for all of these at the SPS level without lower-level control seemed sufficient.*

*In the plenary, it was agreed to move all this control to the SPS level. Suggestion of flag and conditional send number minus 1 (except for geometry mode, which is to be signalled as a delta similar to VVC draft 7). Revisit in Track A for review of candidate text to be provided by Ling Li, Y.-J. Chang and S. Esenlik.*

In the follow-up discussion in Track A on Thursday morning, following aspects are pointed out.

* Option 2 is preferred
* Picture level TMVP flag is required

Accordingly, revision of option 2 is provided in JVET-Q0798-v4.zip

# Changes in Specification Text

The specification texts are written on top of JVET-P0041-v2 and provided together with this document. Yellow highlight indicates added spec texts.

Two options are provided, and both options include following aspects:

* Move four picture level number of merge lists to SPS
* The signaling condition for the number of geo merge list is changed as proposed in JVET-Q0336 aspect 2 and JVET-Q0422 aspect 1

## SPS changes in option 1

|  |  |
| --- | --- |
| seq\_parameter\_set\_rbsp( ) { | Descriptor |
| … |  |
| **six\_minus\_max\_num\_merge\_cand** | ue(v) |
| … |  |
| **sps\_affine\_enabled\_flag** | u(1) |
| if( sps\_affine\_enabled\_flag ) { |  |
| **five\_minus\_max\_num\_subblock\_merge\_cand** | ue(v) |
| … |  |
| } |  |
| … |  |
| **sps\_ibc\_enabled\_flag** | u(1) |
| if ( sps\_ibc\_enabled\_flag ) |  |
| **six\_minus\_max\_num\_ibc\_merge\_cand** | ue(v) |
| … |  |
| **sps\_geo\_enabled\_flag** | u(1) |
| if ( sps\_geo\_enabled\_flag && MaxNumMergeCand >= 3 ) |  |
| **max\_num\_merge\_cand\_minus\_max\_num\_geo\_cand** | ue(v) |
| … |  |
| **}** |  |

**six\_minus\_max\_num\_merge\_cand** specifies the maximum number of merging motion vector prediction (MVP) candidates supported in the SPS subtracted from 6. The maximum number of merging MVP candidates, MaxNumMergeCand is derived as follows:

MaxNumMergeCand = 6 − six\_minus\_max\_num\_merge\_cand

The value of MaxNumMergeCand shall be in the range of 1 to 6, inclusive.

**five\_minus\_max\_num\_subblock\_merge\_cand** specifies the maximum number of subblock-based merging motion vector prediction (MVP) candidates supported in the SPS subtracted from 5.

**six\_minus\_max\_num\_ibc\_merge\_cand** specifies the maximum number of IBC merging block vector prediction (BVP) candidates supported in the SPS subtracted from 6.

* If sps\_ibc\_enabled\_flag is equal to 1, the maximum number of IBC merging BVP candidates, MaxNumIbcMergeCand is derived as follows:

MaxNumIbcMergeCand = 6 − six\_minus\_max\_num\_ibc\_merge\_cand

The value of MaxNumIbcMergeCand shall be in the range of 1 to 6, inclusive.

* Otherwise, MaxNumIbcMergeCand shall be equal to 0.

**max\_num\_merge\_cand\_minus\_max\_num\_geo\_cand** specifies the maximum number of GEO merge mode candidates supported in the SPS subtracted from MaxNumMergeCand.

* If sps\_geo\_enabled\_flag is equal to 1 and MaxNumMergeCand is greater than or equal to 3, the maximum number of GEO merge mode candidates, MaxNumGeoMergeCand is derived as follows:

MaxNumGeoMergeCand =   
 MaxNumMergeCand − max\_num\_merge\_cand\_minus\_max\_num\_geo\_cand

The value of MaxNumGeoMergeCand shall be in the range of 2 to MaxNumMergeCand, inclusive.

* Otherwise, when sps\_geo\_enabled\_flag is equal to 1 and MaxNumMergeCand is equal to 2, MaxNumGeoMergeCand is set equal to 2.
* Otherwise, MaxNumGeoMergeCand is set equal to 0.

**pic\_temporal\_mvp\_enabled\_flag** specifies whether temporal motion vector predictors can be used for inter prediction for slices associated with the PH. If pic\_temporal\_mvp\_enabled\_flag is equal to 0, the syntax elements of the slices associated with the PH shall be constrained such that no temporal motion vector predictor is used in decoding of the slices. Otherwise (pic\_temporal\_mvp\_enabled\_flag is equal to 1), temporal motion vector predictors may be used in decoding of the slices associated with the PH. When not present, the value of pic\_temporal\_mvp\_enabled\_flag is inferred to be equal to 0. When no reference picture in the DPB has the same spatial resolution as the current picture, the value of pic\_temporal\_mvp\_enabled\_flag shall be equal to 0.

When sps\_affine\_enabled\_flag is equal to 0, the value of five\_minus\_max\_num\_subblock\_merge\_cand is inferred to be equal to 5 – ( sps\_sbtmvp\_enabled\_flag && pic\_temporal\_mvp\_enable\_flag ).

The maximum number of subblock-based merging MVP candidates, MaxNumSubblockMergeCand is derived as follows:

MaxNumSubblockMergeCand = 5 − five\_minus\_max\_num\_subblock\_merge\_cand (xx)

The value of MaxNumSubblockMergeCand shall be in the range of 0 to 5, inclusive.

## SPS changes in option 2

|  |  |
| --- | --- |
| seq\_parameter\_set\_rbsp( ) { | Descriptor |
| … |  |
| **six\_minus\_max\_num\_merge\_cand** | ue(v) |
| … |  |
| **sps\_affine\_enabled\_flag** | u(1) |
| if( sps\_affine\_enabled\_flag ) { |  |
| **five\_minus\_max\_num\_subblock\_merge\_cand** | ue(v) |
| … |  |
| } |  |
| … |  |
| **sps\_ibc\_enabled\_flag** | u(1) |
| if ( sps\_ibc\_enabled\_flag ) |  |
| **six\_minus\_max\_num\_ibc\_merge\_cand** | ue(v) |
| … |  |
| if (MaxNumMergeCand >= 2) |  |
| **sps\_geo\_enabled\_flag** | u(1) |
| if ( sps\_geo\_enabled\_flag && MaxNumMergeCand >= 3 ) |  |
| **max\_num\_merge\_cand\_minus\_max\_num\_geo\_cand** | ue(v) |
| … |  |
| **}** |  |

**six\_minus\_max\_num\_merge\_cand** specifies the maximum number of merging motion vector prediction (MVP) candidates supported in the SPS subtracted from 6. The maximum number of merging MVP candidates, MaxNumMergeCand is derived as follows:

MaxNumMergeCand = 6 − six\_minus\_max\_num\_merge\_cand

The value of MaxNumMergeCand shall be in the range of 1 to 6, inclusive.

**five\_minus\_max\_num\_subblock\_merge\_cand** specifies the maximum number of subblock-based merging motion vector prediction (MVP) candidates supported in the SPS subtracted from 5.

**six\_minus\_max\_num\_ibc\_merge\_cand** specifies the maximum number of IBC merging block vector prediction (BVP) candidates supported in the SPS subtracted from 6.

* If sps\_ibc\_enabled\_flag is equal to 1, the maximum number of IBC merging BVP candidates, MaxNumIbcMergeCand is derived as follows:

MaxNumIbcMergeCand = 6 − six\_minus\_max\_num\_ibc\_merge\_cand

The value of MaxNumIbcMergeCand shall be in the range of 1 to 6, inclusive.

* Otherwise, MaxNumIbcMergeCand shall be equal to 0.

**max\_num\_merge\_cand\_minus\_max\_num\_geo\_cand** specifies the maximum number of GEO merge mode candidates supported in the SPS subtracted from MaxNumMergeCand.

* If sps\_geo\_enabled\_flag is equal to 1 and MaxNumMergeCand is greater than or equal to 3, the maximum number of GEO merge mode candidates, MaxNumGeoMergeCand is derived as follows:

MaxNumGeoMergeCand =   
 MaxNumMergeCand − max\_num\_merge\_cand\_minus\_max\_num\_geo\_cand

The value of MaxNumGeoMergeCand shall be in the range of 2 to MaxNumMergeCand, inclusive.

* Otherwise, when sps\_geo\_enabled\_flag is equal to 1 and MaxNumMergeCand is equal to 2, MaxNumGeoMergeCand is set equal to 2.
* Otherwise, MaxNumGeoMergeCand is set equal to 0.

**pic\_temporal\_mvp\_enabled\_flag** specifies whether temporal motion vector predictors can be used for inter prediction for slices associated with the PH. If pic\_temporal\_mvp\_enabled\_flag is equal to 0, the syntax elements of the slices associated with the PH shall be constrained such that no temporal motion vector predictor is used in decoding of the slices. Otherwise (pic\_temporal\_mvp\_enabled\_flag is equal to 1), temporal motion vector predictors may be used in decoding of the slices associated with the PH. When not present, the value of pic\_temporal\_mvp\_enabled\_flag is inferred to be equal to 0. When no reference picture in the DPB has the same spatial resolution as the current picture, the value of pic\_temporal\_mvp\_enabled\_flag shall be equal to 0.

When sps\_affine\_enabled\_flag is equal to 0, the value of five\_minus\_max\_num\_subblock\_merge\_cand is inferred to be equal to 5 – ( sps\_sbtmvp\_enabled\_flag && pic\_temporal\_mvp\_enable\_flag ).

The maximum number of subblock-based merging MVP candidates, MaxNumSubblockMergeCand is derived as follows:

MaxNumSubblockMergeCand = 5 − five\_minus\_max\_num\_subblock\_merge\_cand (xx)

The value of MaxNumSubblockMergeCand shall be in the range of 0 to 5, inclusive.

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**Tencent may have current or pending patent rights relating to the technology described in this contribution and, conditioned on reciprocity, is prepared to grant licenses under reasonable and non-discriminatory terms as necessary for implementation of the resulting ITU-T Recommendation | ISO/IEC International Standard (per box 2 of the ITU-T/ITU-R/ISO/IEC patent statement and licensing declaration form).**

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