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CE4-related: Interaction between symmetric MVD and mvd_l1_zero_flag

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Overall Summary

- 3 methods are proposed to handle the interaction of SMVD and mvd_l1_zero_flag
- Method 1: align VTM5.0 with VVC Draft 5
- Method 2: sym_mvd_flag cannot be signalled and is inferred to be 0 when mvd_l1_zero_flag is 1 (VTM-4.0)
- Method 3: mvd_l1_zero_flag is signalled but shall not be applied when the enabling condition of SMVD is satisfied

Introduction to SMVD and mvd_l1_zero_flag in VVC Draft 5 and VTM5.0

- In VVC Draft 5,

	mvd_l1_zero_flag	sym_mvd_flag	behavior
Case 1	0	0	No SMVD
Case 2	1	0	No SMVD
Case 3	0	1	SMVD
Case 4	1	1	**No SMVD**

In case 4, there is signalling redundancy for SMVD

- In VTM5.0,

	mvd_l1_zero_flag	sym_mvd_flag	behavior
Case 1	0	0	No SMVD
Case 2	1	0	No SMVD
Case 3	0	1	SMVD
Case 4	1	1	**SMVD**

In case 4, mvd_l1_zero_flag defines the rule of MVD for L1 at slice level.
However, SMVD re-writes the rule in a lower processing level.

Proposed Method 1

- Align VTM5.0 with VVC Draft 5 so that when mvd_l1_zero_flag is 1, MVD for L1 is set to be 0 even if sym_mvd_flag is 1

	mvd_l1_zero_flag	sym_mvd_flag	behavior
Case 1	0	0	No SMVD
Case 2	1	0	No SMVD
Case 3	0	1	SMVD
Case 4	1	1	**No SMVD**

Proposed Method 2

- As in VTM4.0, sym_mvd_flag cannot be signalled and is inferred to be 0 when mvd_l1_zero_flag is 1

	mvd_l1_zero_flag	sym_mvd_flag	behavior
Case 1	0	0	No SMVD
Case 2	1	0	No SMVD
Case 3	0	1	SMVD
Case 4	1	Disallowed	No SMVD

Proposed Method 3

- mvd_l1_zero_flag is signalled but shall not be applied when the enabling condition of SMVD is satisfied
- If mvd_l1_zero_flag is applied when the enabling condition of SMVD is satisfied, it causes 1.28% luma BD-rate loss

	Random access Main10				
	Over VTM-5.0				
	Y	U	V	EncT	DecT
Class A1	1.08%	1.31%	1.42%	97%	99%
Class A2	2.12%	2.40%	2.18%	97%	102%
Class B	1.25%	1.65%	1.63%	97%	98%
Class C	0.86%	1.00%	1.05%	96%	98%
Class E					
Overall	1.28%	1.56%	1.54%	97%	99%
Class D	0.74%	0.75%	0.81%	96%	100%
Class F	1.08%	1.19%	1.19%	98%	97%

Proposed Method 3

- mvd_l1_zero_flag is signalled but shall not be applied when the enabling condition of SMVD is satisfied
- Method 3.1: mvd_l1_zero_flag is signalled but shall be 0 when the enabling condition of SMVD is satisfied

mvd_l1_zero_flag equal to 1 indicates that the mvd_coding(x0, y0, 1) syntax structure is not parsed and MvdL1[x0][y0][compIdx] is set equal to 0 for compIdx = 0..1. mvd_l1_zero_flag equal to 0 indicates that the mvd_coding(x0, y0, 1) syntax structure is parsed.

EnableFlag is initilized with true.

Enabling condition of SMVD satisfied means (1) “at least one forward reference picture in list 0 (L0) and at least one backward reference picture in L1” or (2) “at least one backward reference picture in L1 and at least one forward reference picture in L0” are found

If the enabling condition of SMVD is satisfied, EnableFlag is set to be false.

It is a requirement of bitstream conformance that when EnableFlag is false, mvd_l1_zero_flag shall be 0.

Proposed Method 3

- Method 3.2: mvd_l1_zero_flag is signalled but has no effect on MVD for L1 when the enabling condition of SMVD is satisfied

In case 4, only 1 redundant bin for mvd_l1_zero_flag

```
        if( mvd_l1_zero_flag  &&
inter_pred_idc[ x0 ][ y0 ]  = =  PRED_BI &&
(RefIdxSymL0 == −1  ||  RefIdxSymL1 == −1)) {
          MvdL1[ x0 ][ y0 ][ 0 ] = 0
          MvdL1[ x0 ][ y0 ][ 1 ] = 0
          MvdCpL1[ x0 ][ y0 ][ 0 ][ 0 ] = 0
          MvdCpL1[ x0 ][ y0 ][ 0 ][ 1 ] = 0
          MvdCpL1[ x0 ][ y0 ][ 1 ][ 0 ] = 0
          MvdCpL1[ x0 ][ y0 ][ 1 ][ 1 ] = 0
          MvdCpL1[ x0 ][ y0 ][ 2 ][ 0 ] = 0
          MvdCpL1[ x0 ][ y0 ][ 2 ][ 1 ] = 0
        } else {
          if( sym_mvd_flag[ x0 ][ y0 ] ) {
            MvdL1[ x0 ][ y0 ][ 0 ] =
−MvdL0[ x0 ][ y0 ][ 0 ]
            MvdL1[ x0 ][ y0 ][ 1 ] =
−MvdL0[ x0 ][ y0 ][ 1 ]
          } else
```

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Conclusions

- This contribution proposes 3 methods to clearly define the interaction for SMVD and mvd_l1_zero_flag
- Method 3 can handle SMVD and mvd_l1_zero_flag with less signalling redundancy
  - Less BD-rate impact on non-CTC
- It is suggested to consider method 3 into VVC