

# **Default value for skip/merge and AMVP**

**JCTVC-I0314**

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# 1. Overview

# Overview

- Proposal 1: No invalid merge/MVP candidates
  - Algorithm: Duplicate zero merge candidates are added to the last of merge candidate list
  - Related proposal: JCTVC-I0134 by Panasonic, JVCTVC-I0181 by MediaTek
- Proposal 2: Default merge candidate for MaxNumMergeCand = 0
  - Algorithm: skip and merge mode can be enabled without constructing merge candidate list when MaxNumMergeCand is equal to 0.
  - Related proposal: JCTVC-I0256 by I2R



# 2. Proposal 1

# Motivation of Proposal 1:

## Merge & MVP candidate lists in HM6.0

Merge Candidate List: B-slice

0	Spatial merge candidate: PredMode=Pred_BI, refIdxL0 = 0, refIdxL1 = 0, mvL0 = (1, 2), mvL1 = (3, 4)
1	Zero merge candidate: PredMode=Pred_BI, refIdxL0 = 0, refIdxL1 = 0, mvL0 = (0, 0), mvL1 = (0, 0)
2	Not available
3	Not available
4	Not available

Merge Candidate List: P-slice

0	Spatial merge candidate: PredMode=Pred_L0, refIdxL0 = 0, refIdxL1 = -1, mvL0 = (1, 2), mvL1 = (0, 0)
1	Zero merge candidate: PredMode=Pred_L0, refIdxL0 = 0, refIdxL1 = -1, mvL0 = (0, 0), mvL1 = (0, 0)
2	Not available
3	Not available
4	Not available

MVP Candidate List

0	Zero merge candidate: mvLX = (0, 0)
1	Not available

# Proposal 1: Default inter prediction values

## Merge mode

	B-slice	P-slice
PredMode	PRED_BI	PRED_L0
RefIdxL0	0	0
RefIdxL1	0	-1
mvL0	(0, 0)	(0, 0)
mvL1	(0, 0)	(0, 0)

## AMVP

mvLX	(0, 0)
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# Proposal 1: Merge & MVP candidate lists in HM6.0

Merge Candidate List: B-slice

0	Spatial merge candidate: PredMode=Pred_BI, refIdxL0 = 0, refIdxL1 = 0, mvL0 = (1, 2), mvL1 = (3, 4)
1	Zero merge candidate: PredMode=Pred_BI, refIdxL0 = 0, refIdxL1 = 0, mvL0 = (0, 0), mvL1 = (0, 0)
2	Zero merge candidate: PredMode=Pred_BI, refIdxL0 = 0, refIdxL1 = 0, mvL0 = (0, 0), mvL1 = (0, 0)
3	Zero merge candidate: PredMode=Pred_BI, refIdxL0 = 0, refIdxL1 = 0, mvL0 = (0, 0), mvL1 = (0, 0)
4	Zero merge candidate: PredMode=Pred_BI, refIdxL0 = 0, refIdxL1 = 0, mvL0 = (0, 0), mvL1 = (0, 0)

Merge Candidate List: P-slice

0	Spatial merge candidate: PredMode=Pred_L0, refIdxL0 = 0, refIdxL1 = -1, mvL0 = (1, 2), mvL1 = (0, 0)
1	Zero merge candidate: PredMode=Pred_L0, refIdxL0 = 0, refIdxL1 = -1, mvL0 = (0, 0), mvL1 = (0, 0)
2	Zero merge candidate: PredMode=Pred_L0, refIdxL0 = 0, refIdxL1 = -1, mvL0 = (0, 0), mvL1 = (0, 0)
3	Zero merge candidate: PredMode=Pred_L0, refIdxL0 = 0, refIdxL1 = -1, mvL0 = (0, 0), mvL1 = (0, 0)
4	Zero merge candidate: PredMode=Pred_L0, refIdxL0 = 0, refIdxL1 = -1, mvL0 = (0, 0), mvL1 = (0, 0)

MVP Candidate List

0	Zero merge candidate: mvLX = (0, 0)
1	Zero merge candidate: mvLX = (0, 0)

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## 3. Proposal 2

## Motivation of Proposal 2

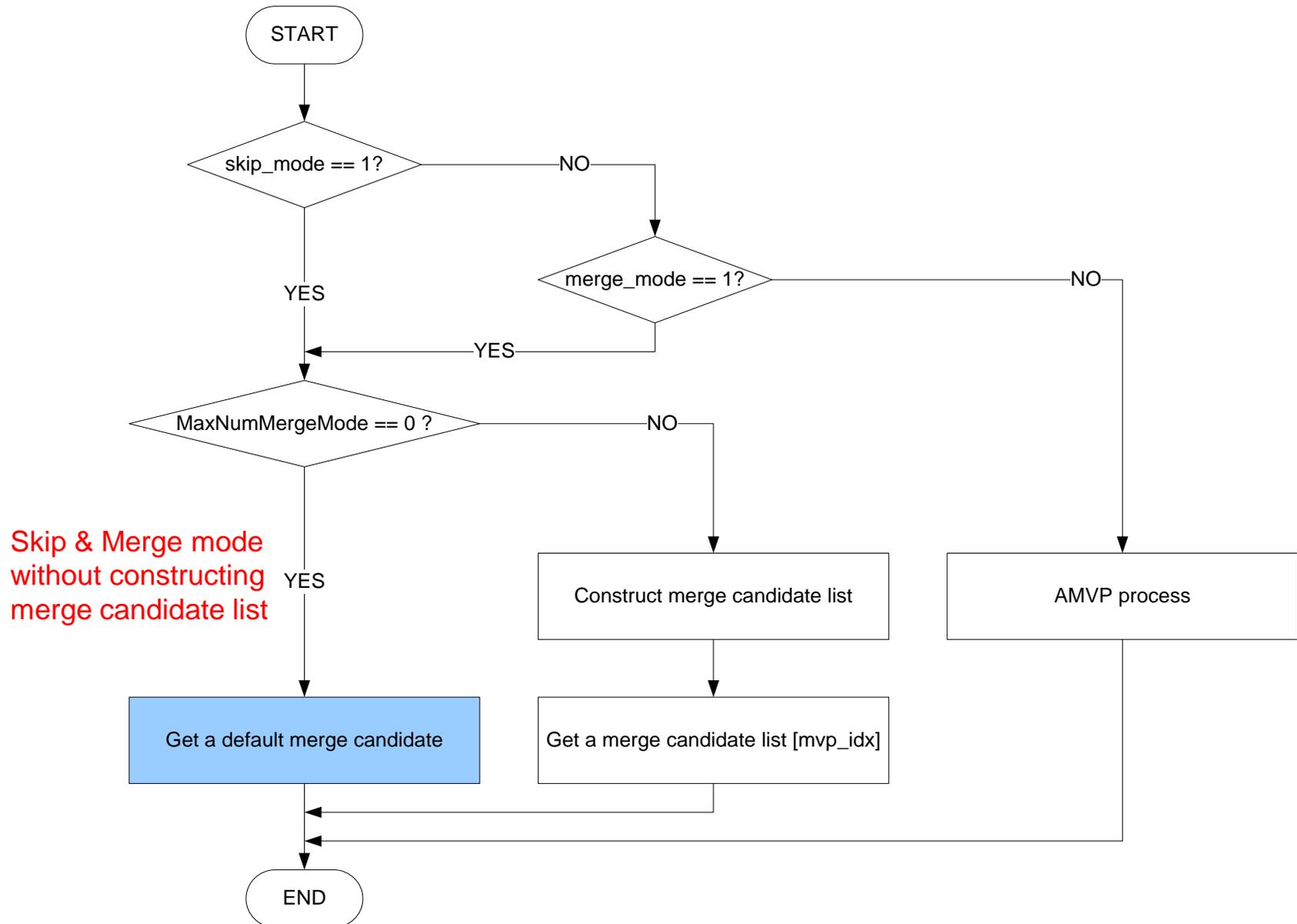
- In the CD description,  
**five\_minus\_max\_num\_merge\_cand** specifies the maximum number of merging MVP candidates supported ....., **MaxNumMergeCand** is computed as
$$\text{MaxNumMergeCand} = 5 - \text{five\_minus\_max\_num\_merge\_cand}$$
The value of **five\_minus\_max\_num\_merge\_cand** shall be limited such that **MaxNumMergeCand is in the range of 0 to 5, inclusive.**
- In the HM6.0 software,  
when **MaxNumMergeCand** is set equal to 0, **skip\_flag** and **merge\_flag** are always set equal to 0 in inter prediction mode.
- This restriction can be enabled by encoder setting instead of the value of the maximum number of merge candidates.

## Proposal 2: Default merge candidates

- Skip & merge mode without constructing merge candidate list when  $\text{MaxNumMergeCand} = 0$
- Default merge candidates

	B-slice	P-slice
PredMode	PRED_BI	PRED_L0
RefIdxL0	0	0
RefIdxL1	0	-1
mvL0	(0, 0)	(0, 0)
mvL1	(0, 0)	(0, 0)

# Flowchart of Proposal 2



# 4. Experiments

# Results: HM-6.0 ancor vs Proposal 1

- Comparison with HM6.0 anchor
- Crosscheck: JCTVC-I0437 by Panasonic

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E						
<b>Overall</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]		101%			101%	
Dec Time[%]		98%			101%	

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Overall</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]		100%			100%	
Dec Time[%]		99%			100%	

# Results: HM-6.0 ancor vs Proposal 2

- Comparison with HM6.0 anchor (MaxNumMergeCand=5)
- Crosscheck: JCTVC-I0437 by Panasonic

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	7.4%	8.2%	8.1%	6.1%	6.9%	7.4%
Class B	9.9%	9.4%	9.2%	8.9%	8.6%	8.2%
Class C	7.1%	8.1%	8.4%	6.4%	7.1%	7.3%
Class D	6.6%	6.9%	7.5%	6.1%	6.2%	6.5%
Class E						
<b>Overall</b>	7.9%	8.2%	8.3%	7.0%	7.3%	7.4%
	7.9%	8.3%	8.4%	7.0%	7.4%	7.4%
Class F	3.6%	4.3%	4.3%	3.4%	3.9%	4.0%
Enc Time[%]		88%			106%	
Dec Time[%]		94%			97%	

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	9.5%	7.9%	7.7%	8.0%	7.0%	6.7%
Class C	6.5%	7.0%	7.3%	5.6%	6.0%	6.6%
Class D	5.6%	5.4%	5.7%	4.9%	4.5%	4.4%
Class E	8.7%	9.7%	8.8%	8.1%	9.4%	8.7%
<b>Overall</b>	7.6%	7.4%	7.3%	6.7%	6.6%	6.5%
	7.6%	7.4%	7.4%	6.6%	6.6%	6.5%
Class F	4.1%	5.3%	5.3%	3.6%	4.6%	5.5%
Enc Time[%]		90%			107%	
Dec Time[%]		95%			96%	

# Results: no skip and merge mode setting vs Proposal 2

- Comparison with MaxNumMergeCand=0:  
no skip and merge mode

	Random Access Main			Low delay B Main		
	Y	U	V	Y	U	V
Class A	-1.3%	-1.4%	-1.3%			
Class B	-2.0%	-2.2%	-2.0%	-1.0%	-1.1%	-1.1%
Class C	-1.2%	-1.3%	-1.4%	-0.8%	-1.1%	-1.3%
Class D	-1.5%	-1.8%	-1.8%	-0.4%	-0.1%	-1.1%
Class E				-10.1%	-10.4%	-11.4%
Class F	-2.3%	-2.7%	-2.5%	-3.6%	-4.2%	-3.2%
<b>Overall</b>	-1.7%	-1.9%	-1.8%	-2.7%	-2.9%	-3.1%
	-1.7%	-1.9%	-1.9%	-2.7%	-2.9%	-3.1%
Enc Time[%]		105%			103%	
Dec Time[%]		96%			96%	

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## 5. Conclusion

# Recommendations

- We recommend Proposal 1 and 2 are adopted to DIS and HM
- Proposal 1:
  - Invalid values are replaced by the default inter prediction values in merge and mvp candidate list to avoid decoding error in terms of conformance.
- Proposal 2:
  - Skip and merge mode can be enabled by default merge mode which has default inter prediction values without constructing merge candidate list when MaxNumMergeCand is equal to 0 as one of encoding options.
  - Otherwise, DIS description should be revised as follows:  
MaxNumMergeCand is in the range of 1 to 5, inclusive.

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