



# CE9: Results of Experiment ROB03

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# Overall Summary

- To evaluate the trade-off between **coding efficiency** and **parsing robustness** by **disabling temporal MVPs** according to control flags
- 3 new syntax elements: 2 in the sequence parameter set (SPS) and 1 in the slice header
- The proposed syntax provides multiple trade-off points
  - A flag in SPS to disable all TMVPs
  - A flag in SPS to disable TMVPs for all reference pictures
  - A flag in the slice header to disable TMVPs for a current slice
- The bit rate increases could be reduced to only 0.2% and 0.3% while the parsing error propagation was constrained within 16 and 8 pictures, respectively.

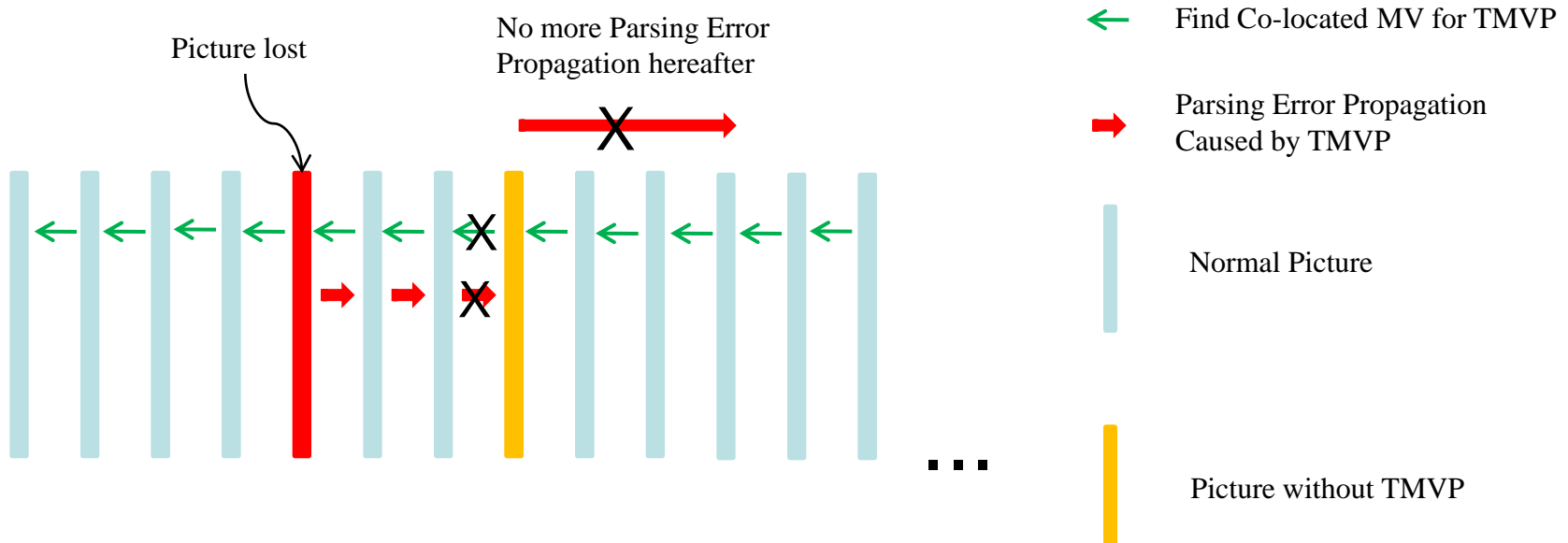
# Outline

- Problem definition
- Proposed syntax
- Experimental results
- Conclusions

# Problem Definition

- Due to the usage of temporal MVPs and removal of redundant MVPs, when an MV in a previous picture cannot be decoded correctly, a **mismatch** between the candidate set on the encoder side and that on the decoder side occurs, which may result in a **parsing error** of an MVP index.
- The rest of the current picture and following pictures can not be parsed correctly.
- One small decoding error of an MV causes **parsing error propagation** of many subsequent pictures.

# Concept of Parsing Error Control



# Proposed Syntax in SPS

- When **disable\_temporal\_mvps\_in\_seq** = 1
  - No temporal MVP is allowed. and no parsing error propagation will occur
  - The coding efficiency may be significantly decreased.
- When **disable\_temporal\_mvps\_in\_ref\_pic** = 1
  - The parsing error may occur in non-reference pictures.
  - Parsing error propagation will be terminated by the next reference picture.
  - Better coding efficiency
  - Can not be used in the LD conditions

seq_parameter_set_rbsp( ) {	C	Descriptor
...		
<b>disable_temporal_mvps_in_seq</b>	1	u(1)
<b>if(!disable_temporal_mvps_in_seq)</b>		
<b>  disable_temporal_mvps_in_ref_pic</b>	1	u(1)
...		
}		

# Proposed Syntax in Slice Header (1/2)

- When **disable\_temporal\_mvps\_in\_slice** = 1
  - The **parsing error propagation** caused from any prior slice will be **terminated by the current slice**.
  - Can be used for the LD conditions.
  - Most flexible in trading off between coding efficiency and parsing robustness
  - Picture order counts (POCs) of all reference pictures are also transmitted prevent the spatial MVP scaling from causing parsing errors when a POC of a reference picture is not correctly decoded.

# Proposed Syntax in Slice Header (2/2)

slice_header( ) {	C	Descriptor
...		
if(!disable_temporal_mvps_in_seq&& (!disable_temporal_mvps_in_ref_pic  !nal_ref_idc)) {		
<b>disable_temporal_mvps_in_slice</b>	2	u(1)
if(disable_temporal_mvps_in_slice&&nal_ref_idc) {		
for(i=0;i<num_ref_idx_l0_default_active_minus1;i++)		
<b>diff_pic_num_minus1</b>		se(v)
if( slice_type==B_SLICE){		
for(i=0;i<num_ref_idx_l1_default_active_minus1;i++)		
<b>diff_pic_num_minus1</b>		se(v)
}		
}		
}		
...		
}		



# Experiments

- Anchor: HM-3.0 with a fix of bug #146
- Test: Disabling TMVPs according to control flags
- Different levels of trade-off points between coding efficiency and parsing robustness
  - Disable TMVP for all pictures
  - Disable TMVP for all reference pictures
  - Disable TMVP for every 8 pictures
  - Disable TMVP for every 16 pictures
- Thank Canon for crosscheck (JCTVC-F476)

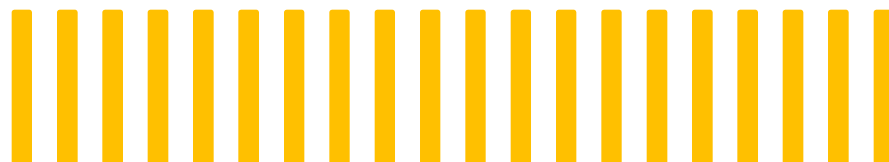
# Experiment #1

- TMVPs not allowed in all pictures

	HE-RA			LC-RA		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	3.1	2.6	2.8	3.3	2.8	2.8
Class B	2.0	1.4	1.4	1.7	1.1	1.1
Class C	2.1	2.1	2.2	2.0	2.0	2.1
Class D	2.1	2.0	2.0	2.0	1.8	1.8
Class E						
All	2.3	2.0	2.0	2.2	1.9	1.9
Enc Time[%]	92%			93%		
Dec Time[%]	97%			96%		

	HE-LD			LC-LD		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	2.1	1.8	1.2	2.3	1.6	1.5
Class C	2.5	2.6	2.7	2.6	2.4	2.4
Class D	2.2	1.8	2.1	2.2	1.2	1.3
Class E	2.9	2.7	2.1	2.6	1.4	2.0
All	2.4	2.2	2.0	2.4	1.7	1.8
Enc Time[%]	93%			93%		
Dec Time[%]	98%			94%		

## Random Access



Normal Picture

Picture without TMVP

## Low Delay

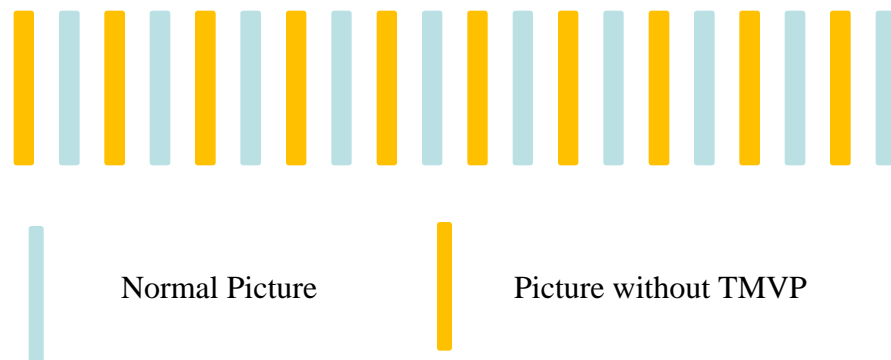


# Experiment #2

- TMVPs not allowed in all reference pictures

	HE-RA			LC-RA		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	1.5	1.4	1.6	1.8	1.7	1.6
Class B	0.9	0.7	0.7	0.7	0.6	0.6
Class C	0.8	0.7	0.8	0.7	0.7	0.8
Class D	1.0	1.0	0.9	1.0	0.7	0.7
Class E						
All	1.0	1.0	1.0	1.0	0.9	0.9
Enc Time[%]	96%			96%		
Dec Time[%]	100%			99%		

## Random Access



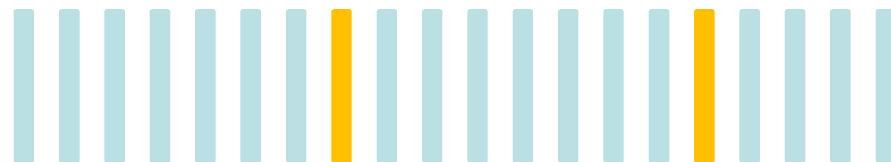
# Experiment #3

- TMVPs not allowed in every 8 pictures

	HE-RA			LC-RA		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.8	0.6	0.8	0.8	0.5	0.6
Class B	0.1	0.1	0.2	0.1	0.1	0.2
Class C	0.1	0.1	0.2	0.1	0.1	0.2
Class D	0.3	0.3	0.2	0.3	0.1	0.2
Class E						
All	0.3	0.3	0.3	0.3	0.2	0.3
Enc Time[%]	99%			99%		
Dec Time[%]	99%			99%		

	HE-LD			LC-LD		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.3	0.0	-0.5	0.4	0.1	0.2
Class C	0.4	0.3	0.3	0.4	0.3	0.2
Class D	0.3	0.0	0.8	0.4	0.0	0.0
Class E	0.5	0.3	0.4	0.4	-0.2	0.6
All	0.4	0.1	0.2	0.4	0.0	0.3
Enc Time[%]	99%			99%		
Dec Time[%]	95%			99%		

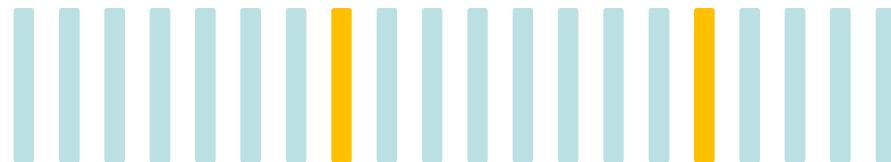
## Random Access



Normal Picture

Picture without TMVP

## Low Delay



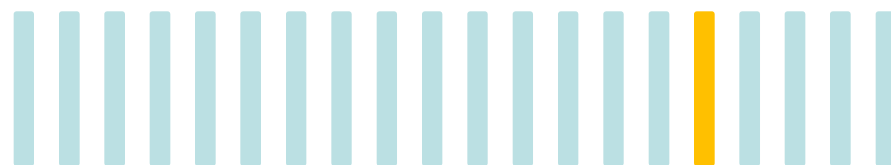
# Experiment #4

- TMVPs not allowed in every 16 pictures

	HE-RA			LC-RA		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.6	0.3	0.6	0.6	0.4	0.4
Class B	0.1	0.0	0.1	0.1	0.1	0.1
Class C	0.0	0.1	0.1	0.1	0.0	0.2
Class D	0.2	0.2	0.1	0.1	0.0	0.0
Class E						
All	0.2	0.1	0.2	0.2	0.1	0.2
Enc Time[%]	99%			100%		
Dec Time[%]	100%			101%		

	HE-LD			LC-LD		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.2	0.0	-0.1	0.2	0.2	0.0
Class C	0.2	0.2	0.1	0.2	0.1	0.0
Class D	0.2	0.0	0.2	0.2	-0.4	0.0
Class E	0.3	0.7	0.4	0.2	0.1	0.7
All	0.2	0.2	0.1	0.2	0.0	0.1
Enc Time[%]	100%			100%		
Dec Time[%]	92%			99%		

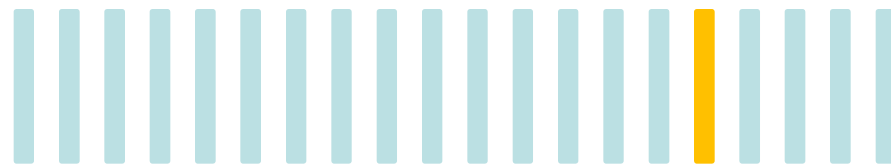
## Random Access



Normal Picture

Picture without TMVP

## Low Delay



# Conclusions

- Proposed two SPS-level flags in one slice-level flag to disable temporal MVPs
- Allow flexible trade-off points between coding efficiency and parsing robustness