



## JCTVC-E050

# AhG Parsing Robustness: Constrained Usage of Temporal MV and MVP Candidates

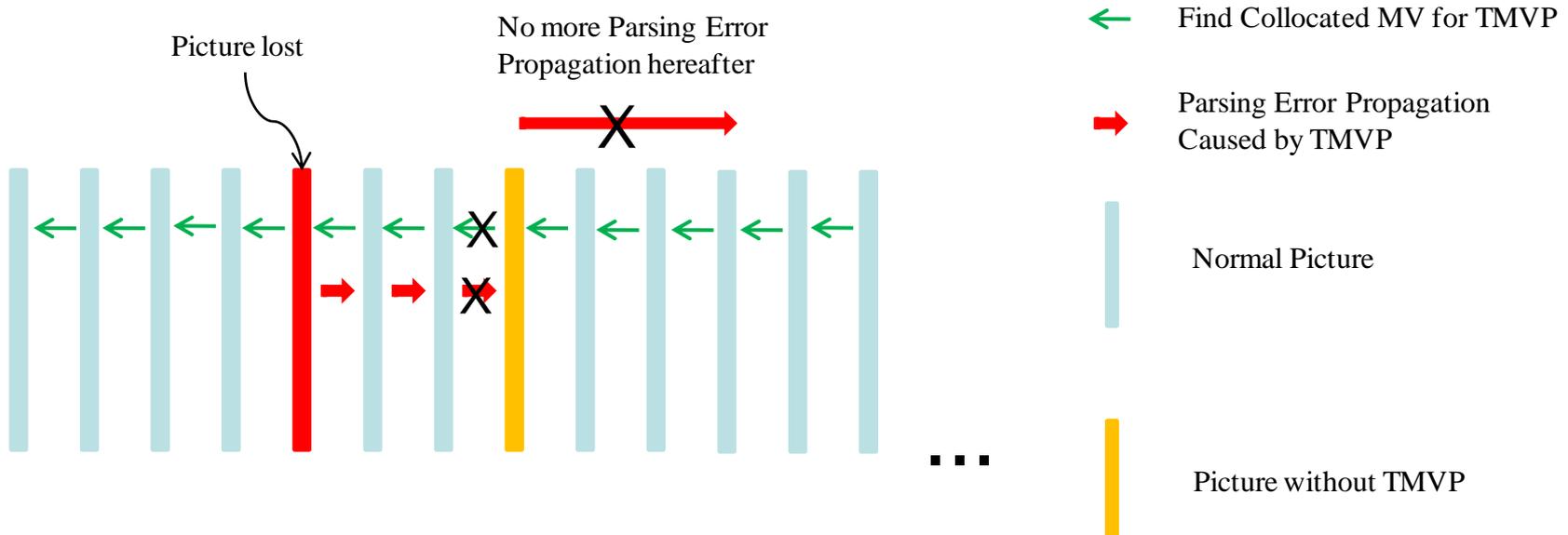
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# Problem

- When a temporal motion vector from a previous picture cannot be decoded correctly
- A **mismatch** between the candidate set on the encoder side and that on the decoder side occurs
- Result in **parsing error** of the index of the best MV or MVP candidate
- 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



# Overview

- In order to control this parsing error propagation, the use of the **temporal MV or MVP (TMVP)** needs to be constrained
- 3 new syntax elements: 2 in the sequence parameter set (SPS) and 1 in the slice header
- The parsing error can thus be **controlled** within a few pictures instead of uncontrolled propagation to many pictures
- The proposed syntax design provides multiple trade-off points between parsing error resilience and coding efficiency

# Tradeoff Points

	Coding Efficiency	Parsing Error Resilience
Temporal not used	Worst	Best
Temporal not used in reference pic.	Medium	Medium
Temporal not used in some slices	Best	Worst

# Proposed Syntax Description in SPS level

- When **temporal\_candidate\_not\_used** = 1
  - no temporal candidate is allowed and no parsing error propagation due to AMVP will occur
  - but the coding efficiency may be significantly decreased.
- When **temporal\_candidates\_not\_used\_in\_ref\_pic** = 1
  - the parsing error may occurs in a non-reference picture
  - parsing error propagation will be terminated by the next reference picture
  - better coding efficiency
  - can not be used in the LD configuration

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

# Proposed Syntax Description in Slice level

- When **temporal\_candidate\_not\_used\_in\_slice = 1**
  - the **parsing error propagation** caused from any prior slice will be **terminated by the current slice**.
  - most flexible and can be used for the LD configuration
  - Different frequency of setting this flag provides full flexibility of trade-off points between the parsing error resilience and the coding efficiency

slice_header() {	C	Descriptor
...		
<b>if( !temporal_candidate_not_used &amp;&amp; (!temporal_candidate_not_used_in_ref_pic    !nal_ref_idc ) )</b>		
<b>temporal_mvp_candidates_not_used_in_slice</b>	2	u(1)
...		
}		

# Experiments

- Anchor: HM 2.0
- Test: HM 2.0 with Parsing Error Control Mechanism
- Different levels of trade-off points between performance and parsing error resilience ability
  - Disable TMVP for all pictures (SPS syntax)
  - Disable TMVP for all reference pictures (SPS syntax)
  - Disable TMVP for every 4 pictures (slice syntax)
  - Disable TMVP for every 8 pictures (slice syntax)
  - Disable TMVP for every 16 pictures (slice syntax)
- Results were cross-checked by Qualcomm (E452)

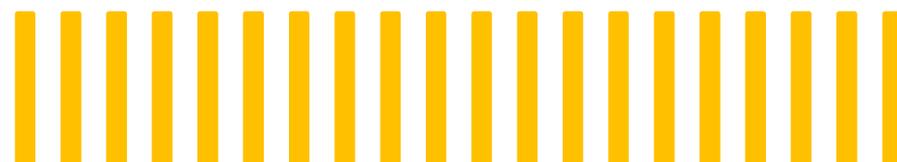
# Experiment #1

- TMVP is not allowed in all pictures

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	3.1	2.6	2.3	3.4	2.8	3.0
Class B	2.2	1.3	1.3	1.8	0.7	0.7
Class C	1.9	1.6	1.7	1.9	1.5	1.6
Class D	2.1	1.5	1.6	2.0	1.1	1.3
Class E						
All	2.3	1.7	1.7	2.2	1.5	1.6
Enc Time[%]	96%			97%		
Dec Time[%]	99%			96%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	2.1	1.5	1.4	3.0	1.5	1.7
Class C	1.8	2.0	1.9	2.7	1.9	1.8
Class D	1.4	0.9	0.8	1.9	1.0	0.8
Class E	1.3	1.2	1.8	2.0	0.4	1.5
All	1.7	1.4	1.4	2.4	1.3	1.4
Enc Time[%]	98%			100%		
Dec Time[%]	95%			93%		

## Random Access



Normal Picture

Picture without TMVP

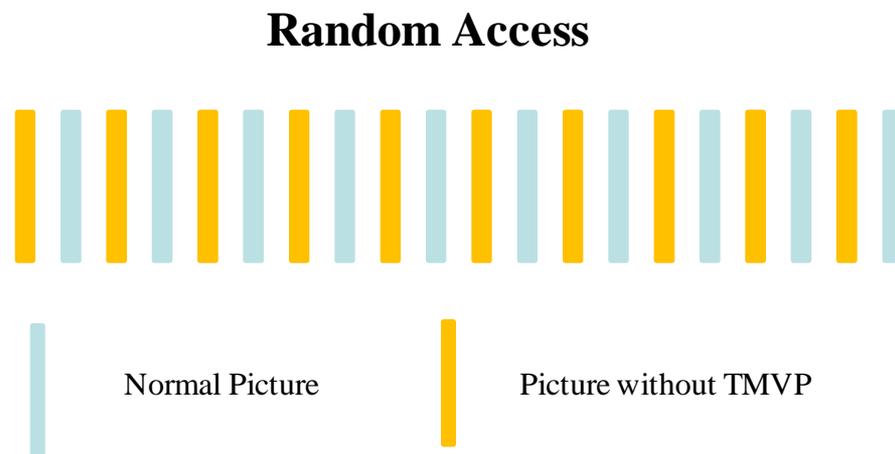
## Low Delay



# Experiment #2

- TMVP is not allowed in all reference pictures for random access

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	1.6	1.6	1.3	1.7	1.8	2.0
Class B	1.0	0.6	0.6	0.8	0.4	0.4
Class C	0.8	0.7	0.7	0.7	0.6	0.6
Class D	1.2	0.8	0.8	1.0	0.4	0.5
Class E						
All	1.1	0.9	0.8	1.0	0.8	0.9
Enc Time[%]	97%			98%		
Dec Time[%]	99%			98%		



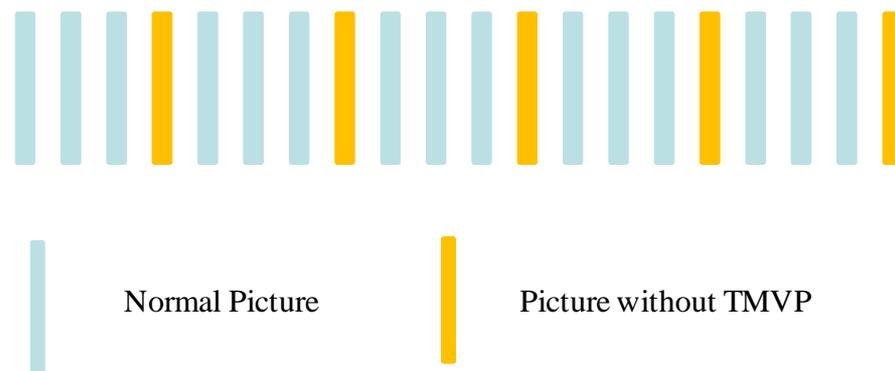
# Experiment #3

- TMVP is not allowed in every 4 pictures

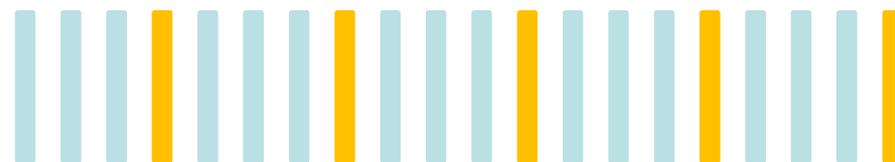
	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.9	0.9	0.6	0.8	1.0	1.1
Class B	0.5	0.3	0.2	0.4	0.3	0.3
Class C	0.4	0.3	0.3	0.3	0.3	0.3
Class D	0.9	0.5	0.5	0.7	0.3	0.3
Class E						
All	0.7	0.5	0.4	0.6	0.4	0.5
Enc Time[%]	99%			99%		
Dec Time[%]	98%			98%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.8	0.4	0.2	0.7	0.2	0.5
Class C	0.6	0.5	0.6	0.7	0.3	0.2
Class D	0.7	0.4	0.1	0.7	0.2	0.2
Class E	0.3	-0.1	0.4	0.2	-0.7	0.1
All	0.6	0.3	0.3	0.6	0.1	0.2
Enc Time[%]	99%			100%		
Dec Time[%]	98%			98%		

## Random Access



## Low Delay



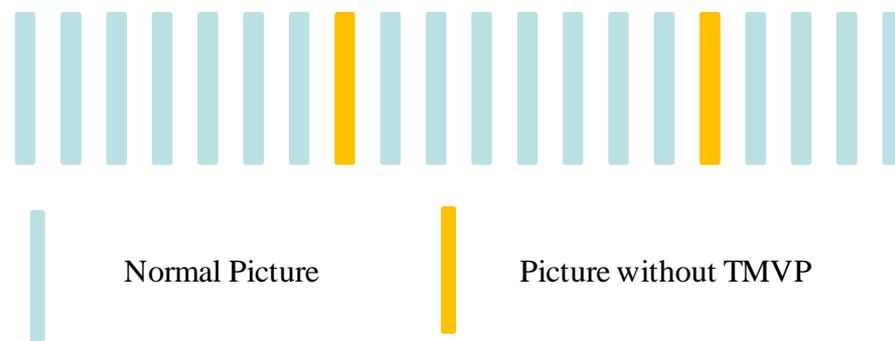
# Experiment #4

- TMVP is not allowed in every 8 pictures

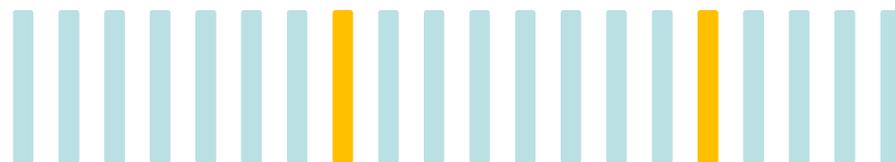
	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.8	0.7	0.6	0.7	0.7	0.8
Class B	0.3	0.1	0.1	0.2	0.1	0.2
Class C	0.3	0.2	0.2	0.2	0.1	0.2
Class D	0.7	0.3	0.4	0.5	0.2	0.1
Class E						
All	0.5	0.3	0.3	0.4	0.3	0.3
Enc Time[%]	100%			100%		
Dec Time[%]	99%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.4	0.2	0.2	0.3	0.0	0.1
Class C	0.4	0.4	0.2	0.3	0.0	-0.1
Class D	0.3	0.0	0.2	0.3	0.1	0.2
Class E	0.1	0.2	0.6	0.0	-0.2	-0.1
All	0.3	0.2	0.3	0.3	0.0	0.1
Enc Time[%]	100%			100%		
Dec Time[%]	99%			98%		

## Random Access



## Low Delay



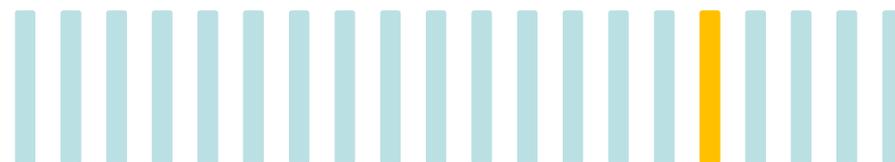
# Experiment #5

- TMVP is not allowed in every 16 pictures

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.6	0.7	0.3	0.5	0.5	0.5
Class B	0.1	0.1	0.0	0.1	0.1	0.1
Class C	0.1	0.1	0.1	0.1	0.1	0.1
Class D	0.3	0.1	0.1	0.3	0.0	0.1
Class E						
All	0.3	0.2	0.1	0.2	0.1	0.2
Enc Time[%]	100%			100%		
Dec Time[%]	99%			99%		

	Low delay			Low delay LoCo		
	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	0.0	0.1	0.0	0.3
Class C	0.2	0.4	0.3	0.2	0.1	-0.2
Class D	0.1	-0.1	0.0	0.2	0.0	0.1
Class E	-0.1	-0.4	0.0	-0.2	-0.2	0.3
All	0.1	0.0	0.1	0.1	0.0	0.2
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		

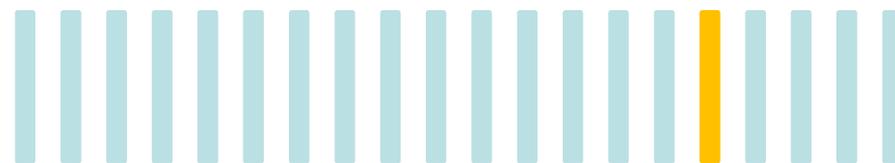
## Random Access



Normal Picture

Picture without TMVP

## Low Delay



# Conclusion

- Propose two flags in SPS and one in slice header
  - Temporal\_candidate\_not\_used
  - Temporal\_candidate\_not\_used\_in\_ref\_pic
  - Temporal\_candidate\_not\_used\_in\_slic
- Allow flexible trade-off points between parsing error resilience and coding efficiency

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