

# JVET-N0084

## CE4-related: Motion compression for HMVP buffers and MV line buffer

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# Overall Summary

- Reduce the number of bits for MV storage
  - Utilize the same mantissa-exponent representation for temporal motion vector predictors (TMVPs)
    - 10 bits instead of 18 bits for one MV in JVET-M0512
  - Compress history motion vector predictor (HMVP) buffers
  - Compress motion vector (MV) line buffer

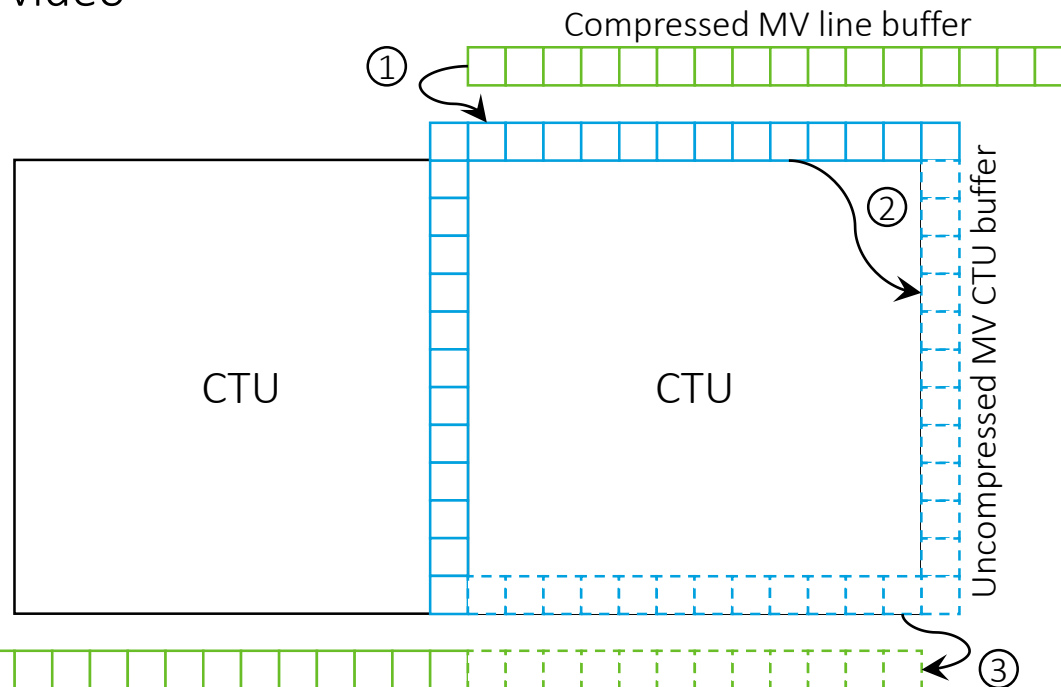
Over VTM-4.0 (%)		Y	U	V	EncT	DecT
1	Motion compression for HMVP buffers	AI	0.00	0.00	100%	100%
		RA	-0.03	-0.02	100%	100%
		LB	0.05	0.04	100%	99%
2	Motion compression for MV line buffer	AI	0.00	0.00	100%	100%
		RA	0.01	0.00	100%	100%
		LB	-0.07	-0.13	100%	100%

# Proposed Methods (1/2)

- Motion compression for HMVP buffers
  - Apply mantissa-exponent representation to the MVs in the two HMVP buffers, including regular merge HMVP buffer and IBC HMVP buffer
  - 320 bits for HMVP buffers are reduced
  - $(2 \text{ lists} \times 2 \text{ comps} \times (18-10) \times 5 \text{ entries} \times 2 \text{ buffers})$

# Proposed Methods (2/2)

- Motion compression for MV line buffer
  - Apply mantissa-exponent representation to MV line buffer
  - Fetch compressed MVs when fetching crossing CTU row boundary
  - 32 bits are reduced per 4x4 luma block, and 30720 bits are reduced in case of 4K video



# Simulation Results (1/2)

## Motion compression for HMVP buffers

	All Intra Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.00%	0.00%	0.00%	99%	97%
Class A2	0.00%	0.00%	0.00%	100%	97%
Class B	0.00%	0.00%	0.00%	100%	102%
Class C	0.00%	0.00%	0.00%	100%	101%
Class E	0.00%	0.00%	0.00%	100%	101%
<b>Overall</b>	0.00%	0.00%	0.00%	100%	100%
Class D	0.00%	0.00%	0.00%	100%	102%
Class F	0.00%	0.12%	-0.01%	101%	100%

	Random access Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.01%	-0.07%	-0.02%	100%	99%
Class A2	-0.01%	0.05%	0.03%	100%	101%
Class B	0.03%	-0.10%	0.05%	100%	100%
Class C	0.02%	0.02%	-0.14%	99%	100%
Class E					
<b>Overall</b>	0.02%	-0.03%	-0.02%	100%	100%
Class D	0.00%	-0.04%	-0.02%	100%	99%
Class F	-0.02%	0.11%	-0.15%	100%	99%

	Low delay B Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.02%	0.03%	0.16%	100%	99%
Class C	0.01%	0.07%	-0.01%	100%	100%
Class E	-0.01%	0.06%	-0.11%	100%	96%
<b>Overall</b>	0.01%	0.05%	0.04%	100%	99%
Class D	-0.01%	-0.08%	-0.81%	100%	100%
Class F	-0.02%	0.02%	-0.08%	101%	100%

# Simulation Results (2/2)

## Motion compression for MV line buffer

	All Intra Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.00%	0.00%	0.00%	99%	99%
Class A2	0.00%	0.00%	0.00%	99%	97%
Class B	0.00%	0.00%	0.00%	100%	100%
Class C	0.00%	0.00%	0.00%	100%	101%
Class E	0.00%	0.00%	0.00%	100%	101%
<b>Overall</b>	0.00%	0.00%	0.00%	100%	100%
Class D	0.00%	0.00%	0.00%	100%	102%
Class F	0.00%	-0.02%	-0.02%	100%	102%

	Random access Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.14%	0.05%	0.16%	100%	101%
Class A2	0.06%	-0.04%	0.00%	100%	100%
Class B	0.10%	-0.01%	0.04%	100%	100%
Class C	0.05%	0.03%	-0.15%	100%	100%
Class E					
<b>Overall</b>	0.09%	0.01%	0.00%	100%	100%
Class D	-0.01%	0.02%	-0.14%	100%	100%
Class F	0.03%	0.02%	-0.04%	100%	99%

	Low delay B Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.03%	-0.17%	0.00%	100%	102%
Class C	-0.01%	0.13%	-0.16%	100%	100%
Class E	0.04%	-0.16%	-0.32%	100%	96%
<b>Overall</b>	0.02%	-0.07%	-0.13%	100%	100%
Class D	-0.04%	0.06%	-0.42%	101%	101%
Class F	-0.17%	-0.26%	0.05%	100%	101%

# Conclusions

- Proposed to compress motion for HMVP buffers and MV line buffer
- Coding efficiency impact is minor
- MV storage can be reduced to 56% (10/18)
- Thanks Sharp for cross-checking