JCTVC-J0279
# CU skip and split CABAC context modification for flexible wavefront parallel parsing

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Motivation

- CU-split and CU-skip CABAC contexts are the only syntax elements that use neighboring information from CTB row above.

- Dependency on the above CTB row for CU-split and CU-skip contexts require the Wavefront Parallel Processing (WPP) parser to sync parallel running parsers every CTB.

- Parser load balance between CTBs is not uniform

  - Desirable to smooth out the variations in CABAC parsing

  - Synchronize between parallel running parsers every CTB row instead of every CTB

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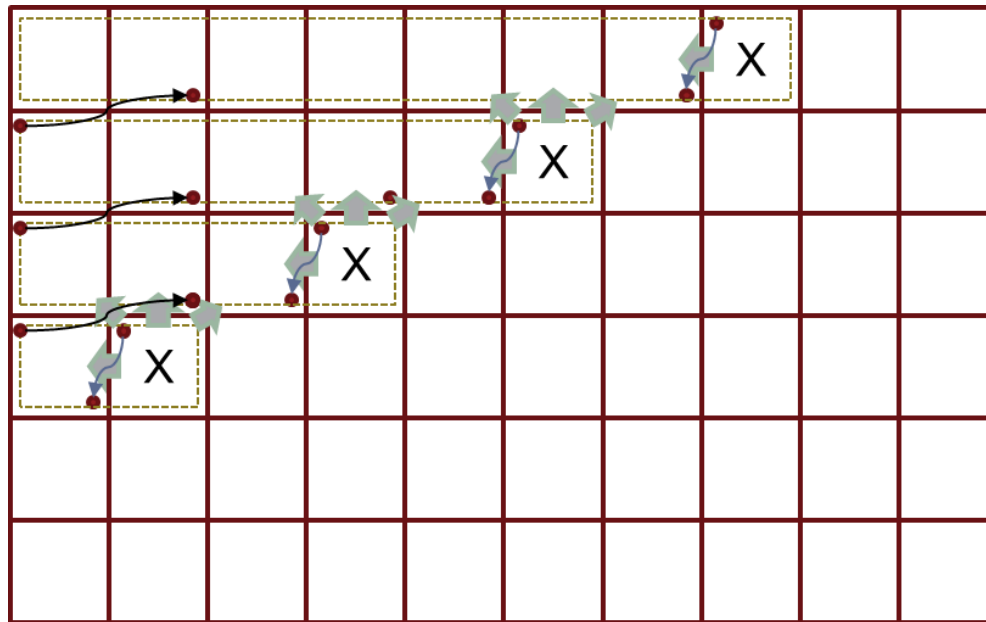
Proposed solution

- Remove the dependency of CU-split and CU-skip contexts on the CTB row above.

- Remove line buffers for CU-split and CU-skip.

- CU-skip context

$$ctxIdx = isSkip(L) + ((is\ the\ upper\ CU\ in\ the\ upper\ CTB)\ ?\ isSkip(L) : isSkip(A))$$

- CU-split context

$$ctxIdx = isSplit(L) + ((CU\_depth >> 1) << 1)$$

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Results: BD-Rate (JCTVC-I1100)

	Y	U	V
AI-Main	0.02%	-0.01%	-0.02%
AI-HE10	0.02%	-0.03%	-0.03%
RA-Main	0.05%	-0.07%	-0.07%
RA-HE10	0.06%	-0.02%	-0.14%
LB-Main	0.09%	0.08%	-0.16%
LB-HE10	0.14%	0.02%	0.22%

HM7.0 Common test conditions

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Results: BD-Rate (JCTVC-I1100 with16x16 CTB)

- Proposal:

	Y	U	V
AI-Main	0.06%	0.02%	0.03%
AI-HE10	0.05%	-0.01%	0.01%
RA-Main	0.21%	0.44%	0.21%
RA-HE10	0.19%	0.22%	-0.12%
LB-Main	0.33%	0.50%	0.45%
LB-HE10	0.34%	0.21%	1.21%

- Performance of HM7.0 vs HM7.0 (16x16 CTB)

	Y	U	V
AI-Main	3.3%	9.9%	11.8%
AI-HE10	5.3%	11.9%	12.9%
RA-Main	13.9%	19.2%	19.6%
RA-HE10	16.9%	22.6%	24.8%
LB-Main	15.8%	24.7%	28.6%
LB-HE10	19.0%	26.4%	26.2%

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Conclusion

- Recommend adoption of removing of CU-skip, CU-split context dependencies on CTB row above

- Alternatively, recommend adoption this proposal only for WPP case.

Results: BD-Rate (JCTVC-I1100)

	All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V
Class A	0.0%	0.0%	-0.1%	0.0%	-0.1%	-0.1%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
Class C	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%
Overall	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%	-0.2%	0.1%
Enc Time[%]	101%			101%		
Dec Time[%]	105%			109%		

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	-0.1%	-0.4%	-0.2%	0.0%	0.1%	-0.1%
Class B	0.1%	0.0%	-0.1%	0.1%	0.0%	0.0%
Class C	0.1%	0.1%	0.0%	0.1%	0.0%	-0.2%
Class D	0.1%	0.1%	0.1%	0.1%	-0.1%	-0.3%
Class E						
Overall	0.1%	-0.1%	-0.1%	0.1%	0.0%	-0.1%
	0.1%	-0.1%	-0.1%	0.1%	-0.1%	-0.2%
Class F	0.1%	0.2%	0.1%	0.0%	0.2%	-0.1%
Enc Time[%]	98%			98%		
Dec Time[%]	97%			104%		

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	0.1%	0.0%	-0.1%	0.1%	0.2%	-0.1%
Class C	0.1%	0.0%	0.1%	0.1%	-0.2%	0.1%
Class D	0.1%	0.3%	-0.1%	0.1%	0.6%	0.2%
Class E	0.1%	0.0%	-0.7%	0.4%	-1.0%	0.8%
Overall	0.1%	0.1%	-0.2%	0.1%	0.0%	0.2%
	0.1%	0.0%	-0.1%	0.1%	0.1%	0.2%
Class F	0.0%	0.0%	0.3%	0.2%	0.4%	1.4%
Enc Time[%]	101%			100%		
Dec Time[%]	99%			103%		

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Results: BD-Rate (JCTVC-I1100 with16x16 CTB)

	All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.1%	0.0%	-0.1%	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	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%
Overall	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
Class F	0.0%	0.1%	0.1%	0.0%	0.2%	0.2%
Enc Time[%]	100%			100%		
Dec Time[%]	105%			109%		

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.0%	1.0%	-0.3%	0.0%	0.2%	-0.7%
Class B	0.3%	0.3%	0.4%	0.3%	0.2%	0.1%
Class C	0.3%	0.3%	0.3%	0.3%	0.3%	0.1%
Class D	0.2%	0.2%	0.4%	0.2%	0.2%	0.0%
Class E						
Overall	0.2%	0.4%	0.2%	0.2%	0.2%	-0.1%
	0.2%	0.4%	0.2%	0.2%	0.2%	-0.2%
Class F	0.1%	0.1%	0.1%	0.2%	0.0%	0.6%
Enc Time[%]	99%			100%		
Dec Time[%]	97%			104%		

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	0.4%	0.7%	0.4%	0.5%	0.0%	2.6%
Class C	0.4%	0.4%	0.2%	0.4%	0.3%	0.6%
Class D	0.2%	0.7%	0.3%	0.2%	0.0%	-0.5%
Class E	0.4%	-0.1%	1.2%	0.3%	0.7%	1.9%
Overall	0.3%	0.5%	0.5%	0.3%	0.2%	1.2%
	0.3%	0.4%	0.5%	0.3%	0.2%	1.0%
Class F	0.0%	-0.2%	0.1%	-0.1%	0.2%	-0.4%
Enc Time[%]	99%			100%		
Dec Time[%]	99%			103%		

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