



# CE1.A.3: Reducing line buffers for CABAC

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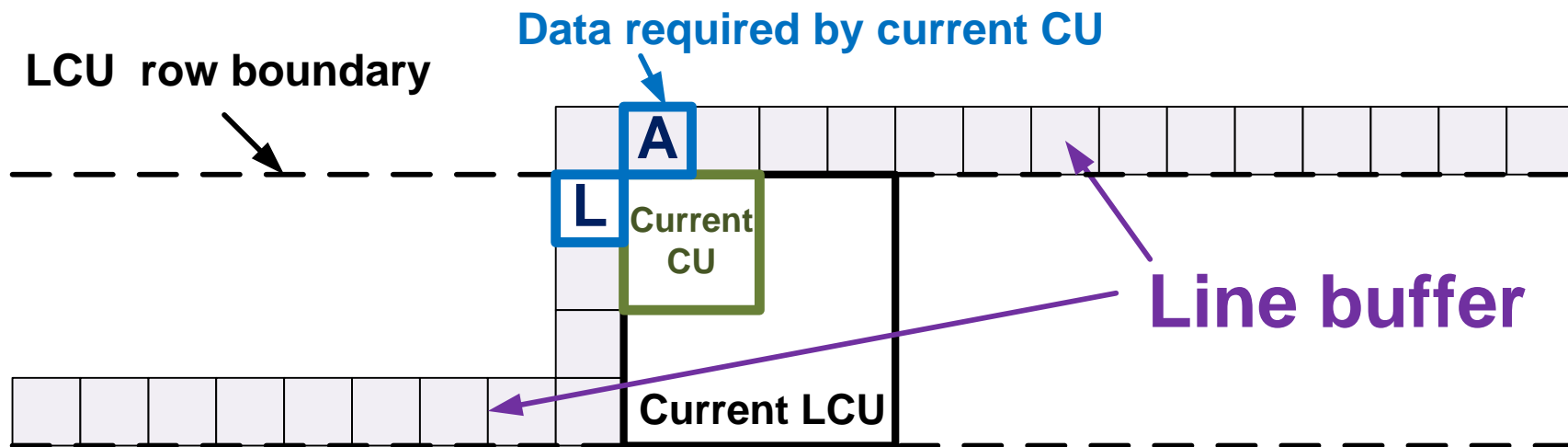
# Overall Summary

- Modifications of context modeling of split\_flag and skip\_flag to remove all the line buffers in CABAC
  - Split\_flag and skip\_flag are the only two syntax elements that still have dependency on upper LCUs and need line buffers in CABAC
  - Only the data in current LCU row are used for the context modeling for split\_flag and skip\_flag
- Bit rate increase is less than 0.07%

	HE-AI	HE-RA	HE-LDB
Avg. bit rate	0.00%	0.05%	0.07%

# Line Buffers for CABAC

- The context formations of split\_flag and skip\_flag need the data of left block and upper block
  - Need to store the data of CU\_depth and skip\_flag in line buffers
- Context formations in HM-4.0:
  - $\text{Split\_ctxIdx} = \text{isSplit}(A) + \text{isSplit}(L)$
  - $\text{Skip\_ctxIdx} = \text{isSkip}(A) + \text{isSkip}(L)$



# Proposed Context Modeling

- Only the data in current LCU row are used for the context modeling
- Split\_flag
  - Use the depth of left block and current block
  - $\text{ctxIdx} = \text{isSplit}(L) + (\min(2, \text{current\_depth}) \ll 1)$
- Skip\_flag
  - Use the data of the left block if the upper block belongs to the upper LCU
  - $\text{ctxIdx} = (\text{is blk\_idx\_y} == 0) ? \text{isSkip}(L) \ll 1 : \text{isSkip}(L) + \text{isSkip}(A)$
- Line buffer-free CABAC is achieved

# Results – Combined Split\_fag and Skip\_flag

- 0.00/0.05/0.07% loss in HE-AI, HE-RA and HE-LD

	All Intra HE			Random Access HE			Low delay B HE		
	Y	U	V	Y	U	V	Y	U	V
Class A	-0.03%	-0.10%	-0.08%	0.01%	-0.15%	0.16%			
Class B	0.00%	-0.09%	-0.11%	0.04%	0.06%	-0.19%	0.05%	0.02%	-0.27%
Class C	0.00%	-0.05%	-0.07%	0.06%	0.01%	0.10%	0.07%	0.12%	0.02%
Class D	0.02%	-0.02%	-0.05%	0.08%	0.17%	0.11%	0.08%	0.01%	-0.33%
Class E	0.04%	-0.10%	-0.07%				0.07%	-0.33%	-0.14%
<b>Overall</b>	0.00%	-0.07%	-0.08%	0.05%	0.02%	0.03%	0.07%	-0.02%	-0.19%
	0.00%	-0.07%	-0.09%	0.05%	0.01%	0.04%	0.07%	-0.05%	-0.21%
Enc Time[%]		100%			100%			100%	
Dec Time[%]		100%			100%			101%	

# Cross Verification

- We thank Panasonic for crosschecking our proposal
  - JCTVC-G298
- BD-rates and run times are confirmed

# Conclusions

- Propose two modifications of context modeling of split\_flag and split\_flag
  - Only the data in current LCU row are used for the context modeling
  - Line buffer-free CABAC
- Bit rate loss is less than 0.07%