Proposed fix on cbf flag signaling

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Overall Summary

- Propose a fix on condition for cbf flag to be inferred
  - Modify the condition of inferred cbf_luma flag decision in HM-4 for HE(CABAC) configurations
    - Increase the number of times CABAC can be skipped for cbf_luma
  - Almost the same coding performance compared to HM-4

- Crosscheck
  - JCTVC-G760 (Panasonic)
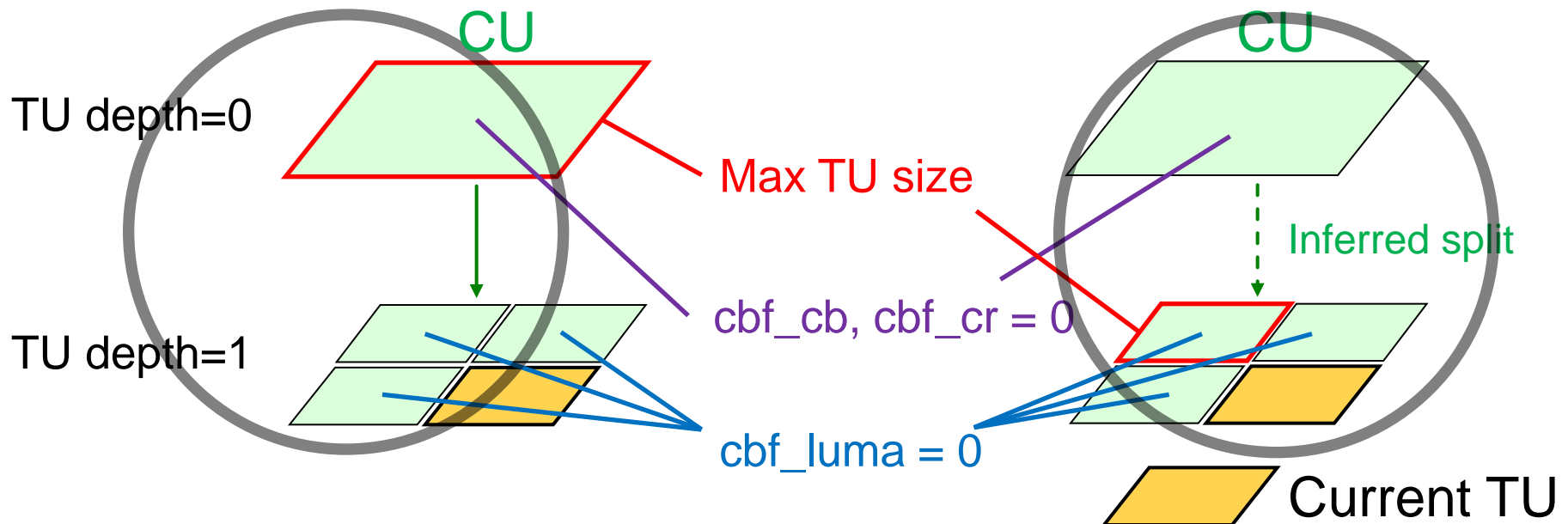
- Propose the fix to be adopted to HM-5 and WD-5

Current inferred cbf condition

- cbf_luma in current TU is inferred to 1 when following conditions are satisfied
  - Root cbf = 1 → Current CU is "inter" and has at least one coefficient
  - First three cbf_luma in current TU depth and cbf_cb and cbf_cr upper TU depth are equal to 0
  - Current TU size < Max TU size

CU

TU depth=0

Max TU size

cbf_cb, cbf_cr = 0

TU depth=1

cbf_luma = 0

CU

Inferred split
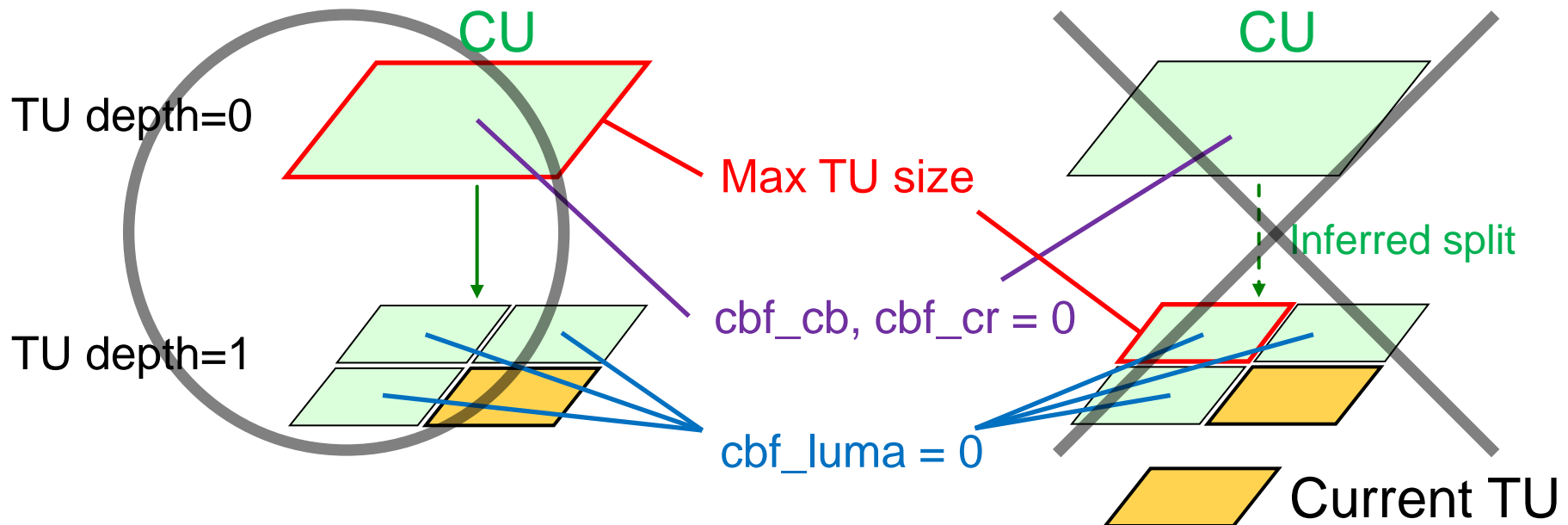
Current TU

Modified inferred cbf condition

- cbf_luma in current TU is inferred to 1 when following conditions are satisfied
  - Root cbf = 1
  - First three cbf_luma in current TU depth and cbf_cb and cbf_cr upper TU depth are equal to 0
  - Current TU size < Max TU size ← Delete!!

CU

TU depth=0

Max TU size

cbf_cb, cbf_cr = 0

TU depth=1

cbf_luma = 0

CU

Inferred split

Current TU

Non-common test condition cases

- Should consider about non-common test condition
  - For instanse: 64x64CU with max TU size=16x16 and max transform hierarchy depth=4

- Finally, inferred cbf_luma condition is following
  - Root cbf = 1
  - First three cbf_luma in current TU depth and cbf_cb and cbf_cr upper TU depth are equal to 0
  - Current TU size < Max TU size
    or Current CU size <= Max TU size + 1

Simulation Results

- Anchor: HM4.0 default condition
- Tested: Proposed scheme implemented on HM4.0

	Random Access HE			Low delay B HE		
	Y	U	V	Y	U	V
Class A	0.0%	-0.2%	0.0%			
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
Class C	0.1%	0.1%	0.1%	0.0%	-0.1%	-0.1%
Class D	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
Class E				0.1%	0.0%	0.8%
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Enc Time[%]	100%			100%		
Dec Time[%]	98%			100%		

Almost the same BD-rate performance

Conclusions

- WD refinement on inferred cbf process has been proposed
  - Increase the number of times CABAC can be skipped for cbf_luma
  - Almost the same coding performance with HM-4.0 anchor

- Propose the scheme to be adopted to HM-5

Supplemental slides

Non-common test condition cases

- Should consider in the following case
  - For instanse: 64x64CU with max TU size=16x16 and max_transform_hierarchy_depth_inter=4

TU depth=0

Inferred split

Inferred split

TU depth=1

Max TU size

Inferred split

Inferred split

TU depth=2

Cannot be inferred

TU depth=3

Can be inferred

Current TU