JVET-K0320
CE1-related: Zero-Unit for Picture Boundary Handling

Kai Zhang, Li Zhang, Hongbin Liu, Yue Wang, Pengwei Zhao, Dingkun Hong

Bytedance Inc. San Diego, U.S.

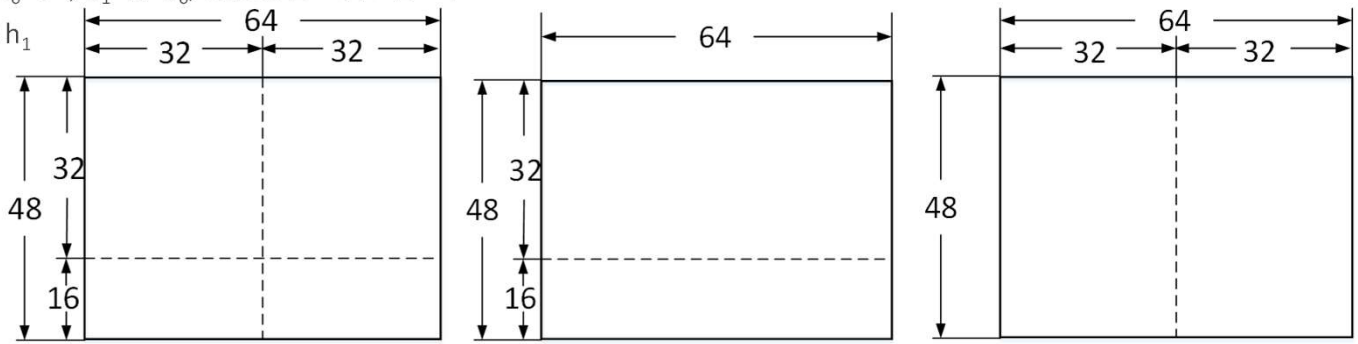
ByteDance

Problems of Boundary handling in VTM

- VTM applies a forced QT strategy to handle picture boundaries
  - For a CTU at picture boundaries, it is forced to recursively take quarter-split, until there is no CU across the boundary.
- This strategy sacrifices the partitioning flexibility of regions close to picture boundaries
  - A region close to the picture boundary may be partitioned into unnecessary small blocks with a lot of overhead bits for signaling modes and other coded information.

Proposed

- The width or height of a CU is allowed not be a 2-power number
  - Such a special CU is called a Zero-Unit (ZU). A ZU is coded as a normal CU, except that it has no residues, i.e. cbf_flag is not signaled and inferred to be zero.
  - A CTU at the picture boundary may be a ZU
- A ZU can also be binary-split or quarter-split into sub-blocks, which can be a ZU or a normal CU
  - The portioning process and signaling is the same for a ZU and a CU, except ZU does not allow TT
  - The size of a CU (or a ZU) is W×H, then $\{w_0, w_1, h_0, h_1\}$ are calculated as:
    - $w_0=2^N$, $w_1=W- w_0$; where $2^N < W <= 2^{N+1}$; $h_0=2^M$, $h_1=H- h_0$; where $2^M < H <= 2^{M+1}$.
    - QT Split: $w_0 \times h_0$, $w_1 \times h_0$, $w_0 \times h_1$ and $w_1 \times h_1$
    - Vertical BT: $w_0 \times H$ and $w_1 \times H$,
    - horizontal BT: $W \times h_0$ and $W \times h_1$



Experimental Results

Anchor: VTM-1.1

	Y	U	V	Enc	Dec
AI	0.01%	-0.04%	-0.04%	100%	104%
RA	-0.33%	-0.40%	-0.37%	101%	102%
LB	-0.57%	-0.64%	-0.65%	124%*	125%*

* Running time is not reliable

Summary

- CTU with width or height not equal to 2^N is allowed
  - CTUs at picture boundaries are handled in a unified way with CTUs inside the picture
  - No special inferring rules are needed for boundary.
- 0.33%/0.57% coding gain for RA/LB
- Suggest to be adopted into VTM