

The background is a solid green color with a repeating pattern of white line-art icons. These icons include various nautical items like anchors, lifebuoys, and compasses, as well as outdoor items like a bird, a lightning bolt, a seashell, and a jellyfish. There are also some geometric shapes like triangles and circles.

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# **JVET-N0112**

## **Simplification of context modeling for coding CU split decisions**

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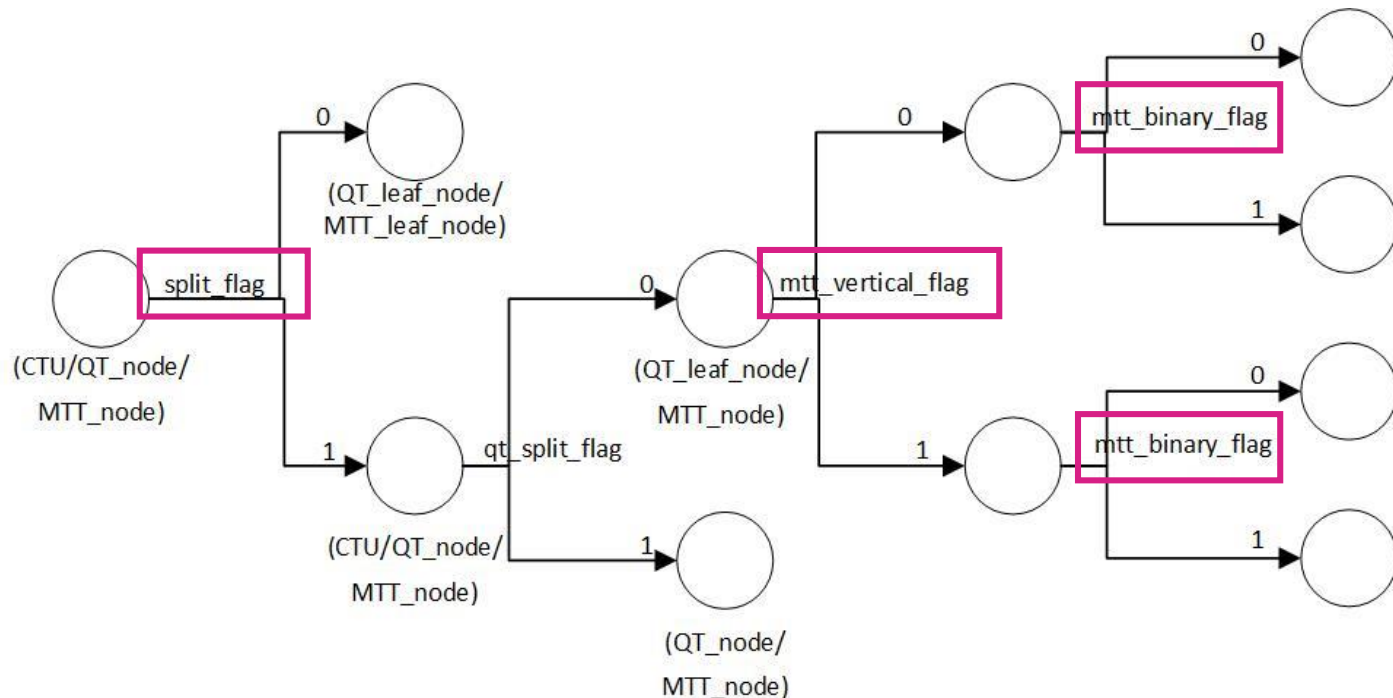
# Overall Summary

- A split-first signaling scheme for coding CU partitioning decisions was adopted into VVC Draft 4 (JVET-M0421)
- Propose the simplified context modeling schemes for split flags
  - split\_cu\_flag, mtt\_split\_cu\_vertical\_flag and mtt\_split\_cu\_binary\_flag
  - Simplify the context modeling process
  - Reduce 5 context variables

	AI	RA	LB
	Y	Y	Y
1. split_cu_flag	-0.01%	-0.01%	-0.04%
2. mtt_split_cu_vertical_flag	0.02%	0.02%	0.02%
3. mtt_split_cu_binary_flag	0.01%	0.01%	0.01%
1. + 2. + 3.	0.02%	0.03%	-0.01%

# Context Modeling for Split-First Signaling

- qt\_split\_flag: same as the previous method in VVC Draft 4
- Simplify the context modeling schemes for split\_cu\_flag, mtt\_split\_cu\_vertical\_flag, and mtt\_split\_cu\_binary\_flag



# split\_cu\_flag

- Method in VVC Draft 4
  - $\text{ctxInc} = ((\text{widthC} > \text{widthA})? 1 : 0) + ((\text{heightC} > \text{heightL})? 1 : 0) + 3 * ( ( 2A_{QT} + A_{BH} + A_{BV} + A_{TH} + A_{TV} - 1 ) / 3 )$
  - 9 context variables
  - Two neighbouring CUs' width and height
  - The split availability (five split types) of the current CU
- Proposed method
  - $\text{ctxInc} = ((\text{widthC} > \text{widthA})? 1 : 0) + ((\text{heightC} > \text{heightL})? 1 : 0) + 3 * ( (\text{btDepthC} < 2)? \text{btDepthC} : 2 )$
  - 9 context variables
  - Two neighbouring CUs' width and height
  - The btDepth of the current CU

# Results – simplified split\_cu\_flag

\* Thank Technicolor for  
cross-checking

All Intra Main10					
Over VTM-4.0					
	Y	U	V	EncT	DecT
Class A1	-0.01%	-0.08%	-0.14%	96%	100%
Class A2	-0.03%	0.12%	-0.03%	101%	100%
Class B	-0.01%	-0.05%	0.02%	101%	101%
Class C	0.01%	0.01%	0.14%	102%	99%
Class E	0.02%	-0.01%	-0.06%	99%	98%
<b>Overall</b>	<b>-0.01%</b>	<b>-0.01%</b>	<b>0.00%</b>	<b>100%</b>	<b>100%</b>
Class D	0.02%	0.12%	-0.02%	102%	101%
Class F	-0.02%	0.02%	0.02%	103%	105%
Random access Main10					
Over VTM-4.0					
	Y	U	V	EncT	DecT
Class A1	-0.03%	-0.06%	-0.05%	101%	100%
Class A2	-0.03%	0.08%	0.01%	102%	102%
Class B	0.00%	0.11%	-0.16%	103%	97%
Class C	0.00%	-0.07%	-0.04%	99%	100%
<b>Overall</b>	<b>-0.01%</b>	<b>0.02%</b>	<b>-0.07%</b>	<b>101%</b>	<b>99%</b>
Class D	-0.04%	-0.02%	0.00%	99%	99%
Class F	0.00%	-0.05%	0.16%	100%	98%
Low delay B Main10					
Over VTM-4.0					
	Y	U	V	EncT	DecT
Class B	-0.04%	-0.22%	-0.23%	104%	103%
Class C	-0.05%	0.28%	0.01%	98%	100%
Class E	-0.04%	0.63%	1.72%	99%	101%
<b>Overall</b>	<b>-0.04%</b>	<b>0.16%</b>	<b>0.34%</b>	<b>100%</b>	<b>101%</b>
Class D	-0.06%	0.15%	0.05%	100%	103%
Class F	-0.18%	0.16%	-0.37%	96%	99%

# mtt\_split\_cu\_vertical\_flag

- Method in VVC Draft 4

- $d_W = \text{widthC} / \text{widthA}$   
 $d_H = \text{heightC} / \text{heightL}$   
 $d = d_W == d_H ? 0 : (d_W < d_H ? 1 : 2)$   
 $\text{ctxInc} = A_{BH} + A_{TH} == A_{BV} + A_{TV} ? d : (A_{BH} + A_{TH} < A_{BV} + A_{TV} ? 3 : 4)$
- 5 context variables
- Two neighbouring CUs' width or height

- Proposed method

- $\text{ctxInc} = (\text{widthC} == \text{heightC}) ? 0 : ((\text{widthC} > \text{heightC}) ? 1 : 2)$
- 3 context variables
- The same as the previous method in VVC Draft 3

# Results - simplified mtt\_split\_cu\_vertical\_flag

\* Thank Panasonic  
for cross-checking

	All Intra Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.01%	0.15%	0.05%	102%	105%
Class A2	0.01%	0.12%	0.01%	103%	105%
Class B	0.02%	0.07%	0.08%	102%	103%
Class C	0.03%	-0.01%	0.02%	102%	100%
Class E	0.03%	0.08%	0.02%	102%	100%
<b>Overall</b>	<b>0.02%</b>	<b>0.08%</b>	<b>0.04%</b>	<b>102%</b>	<b>103%</b>
Class D	0.01%	0.07%	-0.09%	103%	99%
Class F	0.02%	-0.09%	-0.29%	100%	99%
	Random access Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.03%	0.03%	0.12%	102%	99%
Class A2	0.02%	-0.09%	-0.01%	101%	102%
Class B	0.00%	0.07%	-0.04%	101%	99%
Class C	0.05%	-0.02%	-0.11%	100%	100%
<b>Overall</b>	<b>0.02%</b>	<b>0.01%</b>	<b>-0.02%</b>	<b>101%</b>	<b>100%</b>
Class D	0.03%	-0.28%	-0.07%	98%	100%
Class F	0.05%	-0.12%	-0.14%	97%	99%
	Low delay B Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class B	0.00%	0.00%	0.01%	96%	101%
Class C	0.06%	0.27%	-0.18%	94%	93%
Class E	-0.01%	0.33%	0.39%	97%	97%
<b>Overall</b>	<b>0.02%</b>	<b>0.17%</b>	<b>0.04%</b>	<b>96%</b>	<b>97%</b>
Class D	-0.06%	0.04%	0.27%	99%	98%
Class F	-0.07%	0.00%	-0.01%	97%	98%

# mtt\_split\_cu\_binary\_flag

- Method in VVC Draft 4
  - $\text{ctxInc} = ( \text{mtt\_split\_cu\_vertical\_flag} ? 1 : 0 ) + ( \text{btDepthC} < 2 ? 1 : 0 )$
  - 4 context variables
- Proposed method
  - $\text{ctxInc} = 0$
  - 1 context variable
  - The same as the previous method in VVC Draft 3



# Results - simplified mtt\_split\_cu\_binary\_flag

\* Thank Panasonic  
for cross-checking

All Intra Main10					
Over VTM-4.0					
	Y	U	V	EncT	DecT
Class A1	0.02%	-0.01%	-0.03%	98%	100%
Class A2	0.01%	0.12%	-0.02%	100%	100%
Class B	0.01%	0.02%	0.00%	100%	105%
Class C	0.03%	-0.08%	-0.07%	99%	102%
Class E	0.01%	-0.02%	-0.01%	100%	101%
<b>Overall</b>	<b>0.01%</b>	<b>0.00%</b>	<b>-0.03%</b>	<b>99%</b>	<b>102%</b>
Class D	0.04%	-0.08%	-0.19%	100%	101%
Class F	0.04%	0.05%	-0.14%	99%	101%
Random access Main10					
Over VTM-4.0					
	Y	U	V	EncT	DecT
Class A1	0.00%	0.05%	-0.02%	99%	102%
Class A2	0.00%	0.12%	0.00%	100%	102%
Class B	0.00%	-0.09%	-0.11%	100%	101%
Class C	0.03%	0.19%	-0.13%	99%	98%
<b>Overall</b>	<b>0.01%</b>	<b>0.06%</b>	<b>-0.08%</b>	<b>99%</b>	<b>100%</b>
Class D	0.04%	-0.20%	-0.30%	100%	99%
Class F	-0.02%	-0.04%	-0.07%	100%	101%
Low delay B Main10					
Over VTM-4.0					
	Y	U	V	EncT	DecT
Class B	0.00%	-0.05%	-0.17%	99%	101%
Class C	-0.01%	0.22%	-0.05%	99%	101%
Class E	0.07%	0.72%	0.94%	99%	95%
<b>Overall</b>	<b>0.01%</b>	<b>0.23%</b>	<b>0.15%</b>	<b>99%</b>	<b>100%</b>
Class D	0.04%	0.48%	0.01%	100%	100%
Class F	-0.09%	-0.10%	-0.30%	100%	99%

# Combined results

	All Intra Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.00%	0.01%	-0.01%	95%	100%
Class A2	0.01%	0.14%	-0.03%	102%	105%
Class B	0.02%	-0.06%	0.06%	101%	101%
Class C	0.04%	0.10%	0.15%	102%	98%
Class E	0.03%	0.10%	0.08%	99%	97%
<b>Overall</b>	<b>0.02%</b>	<b>0.05%</b>	<b>0.06%</b>	<b>100%</b>	<b>100%</b>
Class D	0.01%	-0.01%	0.00%	101%	99%
Class F	0.06%	0.06%	-0.06%	101%	102%
	Random Access Main 10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.01%	0.13%	0.06%	102%	102%
Class A2	0.05%	0.08%	0.13%	102%	104%
Class B	0.03%	0.03%	-0.16%	103%	99%
Class C	0.05%	0.15%	-0.06%	98%	101%
<b>Overall</b>	<b>0.03%</b>	<b>0.09%</b>	<b>-0.03%</b>	<b>101%</b>	<b>101%</b>
Class D	0.01%	-0.17%	0.12%	99%	98%
Class F	-0.01%	-0.09%	0.01%	99%	105%
	Low delay B Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class B	0.01%	-0.21%	-0.44%	103%	103%
Class C	-0.02%	0.57%	0.04%	103%	106%
Class E	-0.04%	0.98%	0.99%	97%	98%
<b>Overall</b>	<b>-0.01%</b>	<b>0.35%</b>	<b>0.07%</b>	<b>101%</b>	<b>103%</b>
Class D	-0.05%	-0.58%	-0.29%	99%	101%
Class F	-0.18%	0.58%	-0.88%	97%	100%

# Conclusions

- Propose to simplify the context modeling for split flags
- `split_cu_flag`
  - Use the current CU's BT depth for context modeling
  - Simplify the context variable derivation
- `mtt_split_cu_vertical_flag` and `mtt_split_cu_binary_flag`,
  - Use the previous context modeling schemes in VVC Draft 3
  - Simplify the context variable derivation and reduce 5 context variables

	AI	RA	LB
	Y	Y	Y
1. <code>split_cu_flag</code>	-0.01%	-0.01%	-0.04%
2. <code>mtt_split_cu_vertical_flag</code>	0.02%	0.02%	0.02%
3. <code>mtt_split_cu_binary_flag</code>	0.01%	0.01%	0.01%
1. + 2. + 3.	0.02%	0.03%	-0.01%

The background is a solid light blue color with a repeating pattern of white line-art icons. These icons include various nautical items like anchors, lifebuoys, seashells, and fish, as well as outdoor and travel-related items like a compass, a map, a tent, a backpack, and a camera. The icons are scattered across the entire page.

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**Thank you!**