



# CE4 Subset3: Slice Common Information Sharing

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# Overall Summary

- In HM, ALF is adapted at picture-level but always signaled in the first slice header of a picture
  - Harmful for parallel slice decoding
  - Long decoding delay when out-of-order slices are received
- Slice common information sent in each slice header
  - Redundancy
- For multi-slice pictures, it is proposed to
  - Send ALF coefficients in PPS
  - Send slice common information in PPS
  - Distribute ALF CU on/off flags in slice headers
- Compared with HM, the proposed method achieves
  - 0.1% bit rate increase for HE and 0.1% bit rate decrease for LC
  - Parallel slice decoding
  - Shorter decoding delay



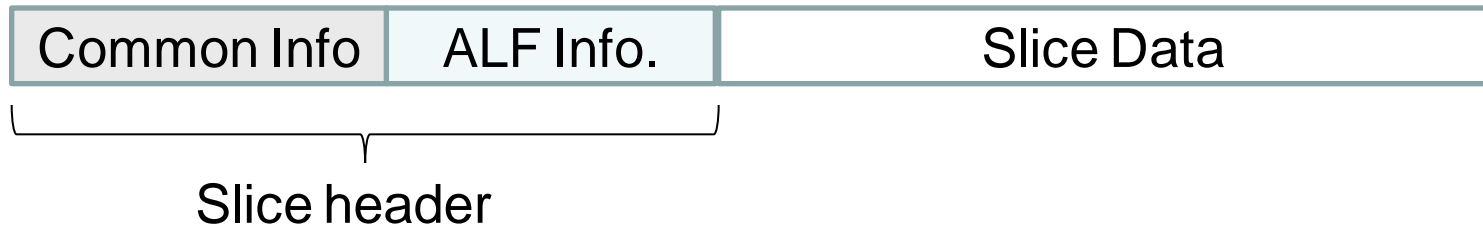
# Outlines

- Introduction
- Proposed bitstream structure
- Simulation results
- Conclusions



# HM: One Slice in a Picture

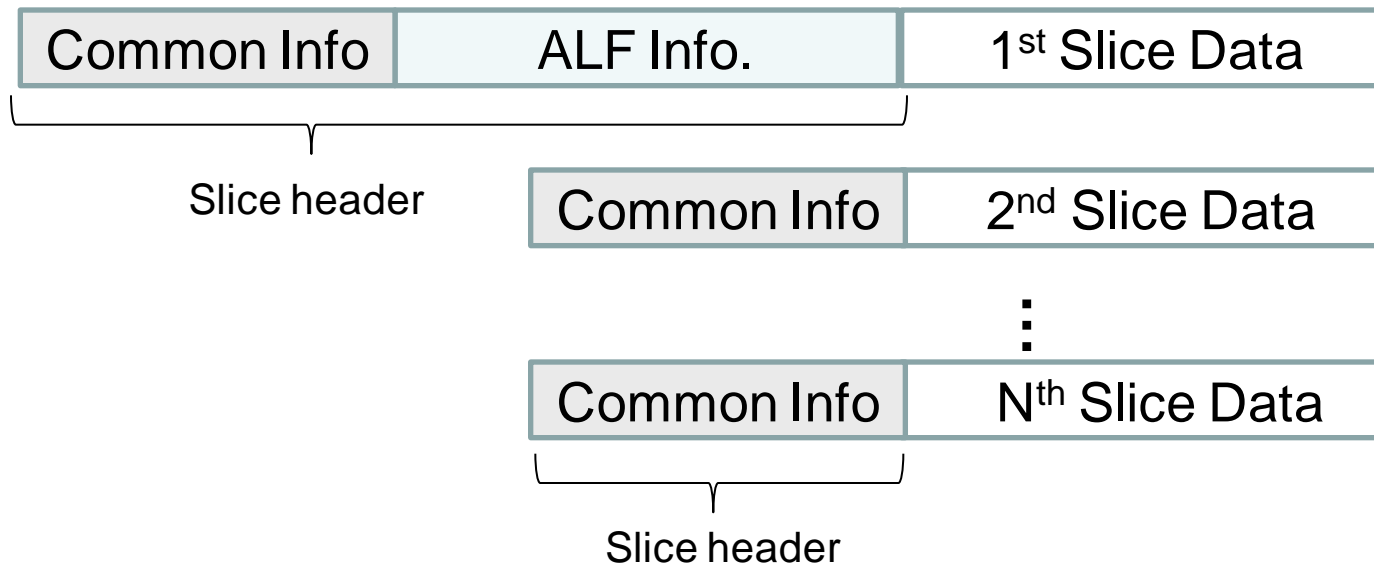
- ALF information sent in the slice header





# HM: Multiple Slices in a Picture

- ALF information sent in the first slice header





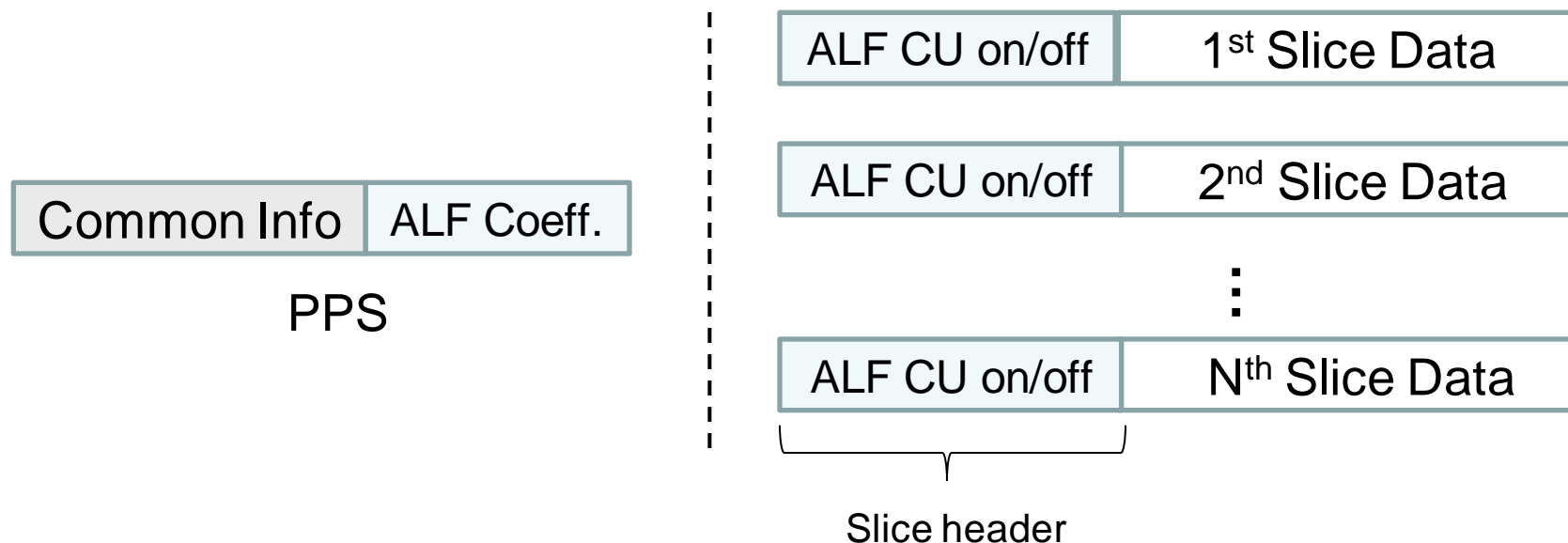
# Problems

- ALF information is at the first slice header
  - Harmful for parallel decoding
  - Long decoding delay when out-of-order slices are received
- Slice common information sent in each slice header
  - Redundancy



# Proposed Solution

- Send ALF coefficients and common slice information in the picture parameter set (PPS)
  - One PPS for one picture
  - All slices in the same picture can share the PPS information
  - One new flag in PPS to indicate sharing-on or sharing-off
- Distribute ALF CU on/off flags at slice headers





# Experiment Settings

- Anchor:
  - JCTVC-D600
- Slice settings
  - LCU-aligned slices
  - 1500 bytes per slice
- Case 1: Sharing-off
  - HM bitstream structure
  - ALF information in the first slice header
- Case 2: Sharing-on
  - Proposed bitstream structure
  - ALF coefficient and slice common information in PPS
  - ALF CU on/off flags in slice headers



## Case 1: Sharing-Off

	HE-AI			LC-AI		
	Y	U	V	Y	U	V
Class A	4.0	3.6	4.3	4.9	4.9	5.1
Class B	4.9	4.1	4.6	5.5	5.4	5.4
Class C	5.3	4.6	4.6	5.8	5.7	5.5
Class D	3.7	3.4	3.5	4.0	3.4	3.6
Class E	7.4	7.7	6.5	7.7	10.4	9.6
All	<b>4.9</b>	<b>4.5</b>	<b>4.6</b>	<b>5.5</b>	<b>5.7</b>	<b>5.7</b>

	HE-RA			LC-RA		
	Y	U	V	Y	U	V
Class A	5.8	9.7	9.0	5.4	5.9	6.7
Class B	4.8	5.8	5.5	4.8	5.0	4.7
Class C	4.2	4.9	4.9	4.2	4.2	4.1
Class D	2.6	2.9	3.0	2.5	2.2	2.5
Class E						
All	<b>4.4</b>	<b>5.8</b>	<b>5.6</b>	<b>4.3</b>	<b>4.3</b>	<b>4.5</b>

	HE-LD			LC-LD		
	Y	U	V	Y	U	V
Class A						
Class B	3.6	7.2	5.5	3.6	3.7	3.5
Class C	2.8	5.0	5.0	2.8	2.6	2.3
Class D	1.7	2.5	2.4	1.8	1.6	2.0
Class E	1.7	2.5	1.5	1.2	3.1	3.0
All	<b>2.6</b>	<b>4.6</b>	<b>3.9</b>	<b>2.5</b>	<b>2.8</b>	<b>2.7</b>

## Case 2: Sharing-On 3-E045

	HE-AI			LC-AI		
	Y	U	V	Y	U	V
Class A	3.9	3.4	4.2	4.8	4.7	5.0
Class B	4.8	3.9	4.4	5.4	5.3	5.3
Class C	5.2	4.5	4.5	5.7	5.5	5.4
Class D	3.6	3.3	3.4	3.9	3.3	3.5
Class E	7.3	7.5	6.4	7.5	10.3	9.5
All	<b>4.8</b>	<b>4.3</b>	<b>4.5</b>	<b>5.3</b>	<b>5.6</b>	<b>5.5</b>

	HE-RA			LC-RA		
	Y	U	V	Y	U	V
Class A	5.9	9.6	8.7	5.1	5.6	6.5
Class B	4.9	5.9	5.5	4.7	4.8	4.5
Class C	4.3	5.0	5.1	4.2	4.2	4.0
Class D	3.1	3.3	3.5	2.9	2.5	2.8
Class E						
All	<b>4.6</b>	<b>5.9</b>	<b>5.7</b>	<b>4.2</b>	<b>4.3</b>	<b>4.5</b>

	HE-LD			LC-LD		
	Y	U	V	Y	U	V
Class A						
Class B	3.7	7.1	5.5	3.4	3.5	3.2
Class C	3.1	5.1	5.1	2.7	2.5	2.2
Class D	2.3	2.8	2.6	2.1	1.9	2.3
Class E	2.3	2.8	2.4	1.6	3.5	3.4
All	<b>2.9</b>	<b>4.7</b>	<b>4.1</b>	<b>2.6</b>	<b>2.9</b>	<b>2.8</b>

**Average 0.1% increase in HE, and 0.1% decrease in LC**



# Conclusions

- Proposed to add an option of sending ALF coefficients and slice common information in the PPS and distributing ALF CU on/off flags in slice headers
  - Parallel decoding of multiple slices in a picture
  - Shorter decoding latency when out-of-order slices are received
- Minor impact on coding efficiency
  - LCU-aligned 1500-byte slices
  - 0.1% bit rate increase for HE
  - 0.1% bit rate decrease for LC





**Thank you**

