



JCTVC-G153

Non-CE6 : On intra prediction mode coding

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Summary (1)

- mpm_idx context removal in CABAC
 - Also proposed in G707, G767
- Coding results (AI-HE)
 - Cross-checked by Canon in G254

Test	Y (%)	U (%)	V (%)	Enc (%)	Dec (%)
HM4	0.0	0.0	0.0	100	99
CE6b unified	0.0	0.0	0.0	100	99
CE6b unified +LM bf	0.0	0.0	0.0	100	99

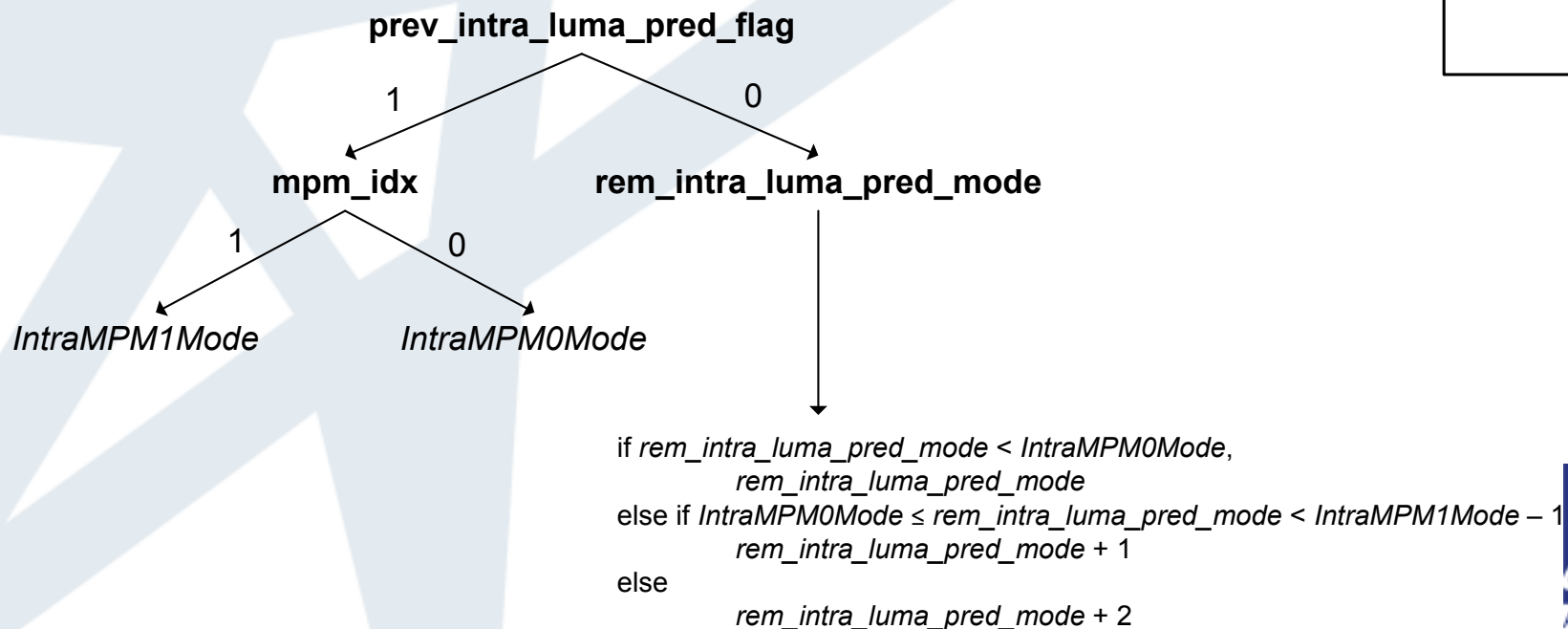
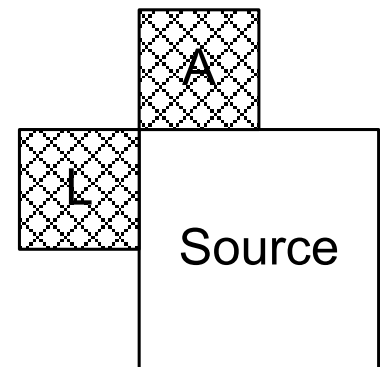
Summary (2)

- Simplification of remainder mode coding
 - Bin + FLC in CABAC (no escape codes)
 - Unary + FLC in CAVLC (no VLC tables, no mode ranking)
 - 19 intra prediction modes for 4x4
- Results (vs HM4)
 - Cross-checked by Samsung in G106

Test	Y (%)	U (%)	V (%)	Enc (%)	Dec (%)
AI-HE	-0.2	0.0	0.0	99	98
AI-LC	-0.1	0.0	0.0	100	98

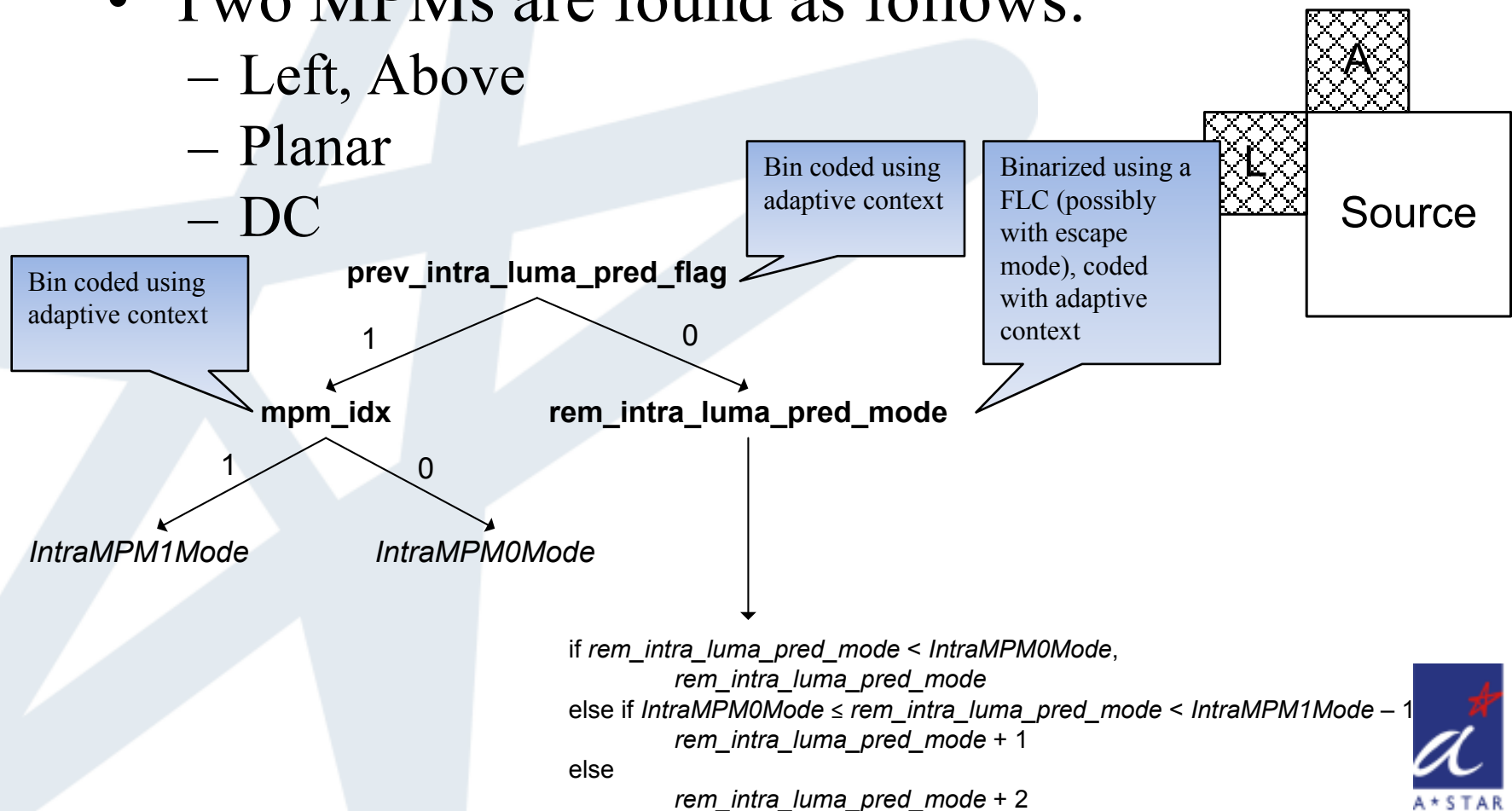
Coding of Intra Prediction mode in HM4

- Two MPMs are found as follows:
 - Left, Above
 - Planar
 - DC



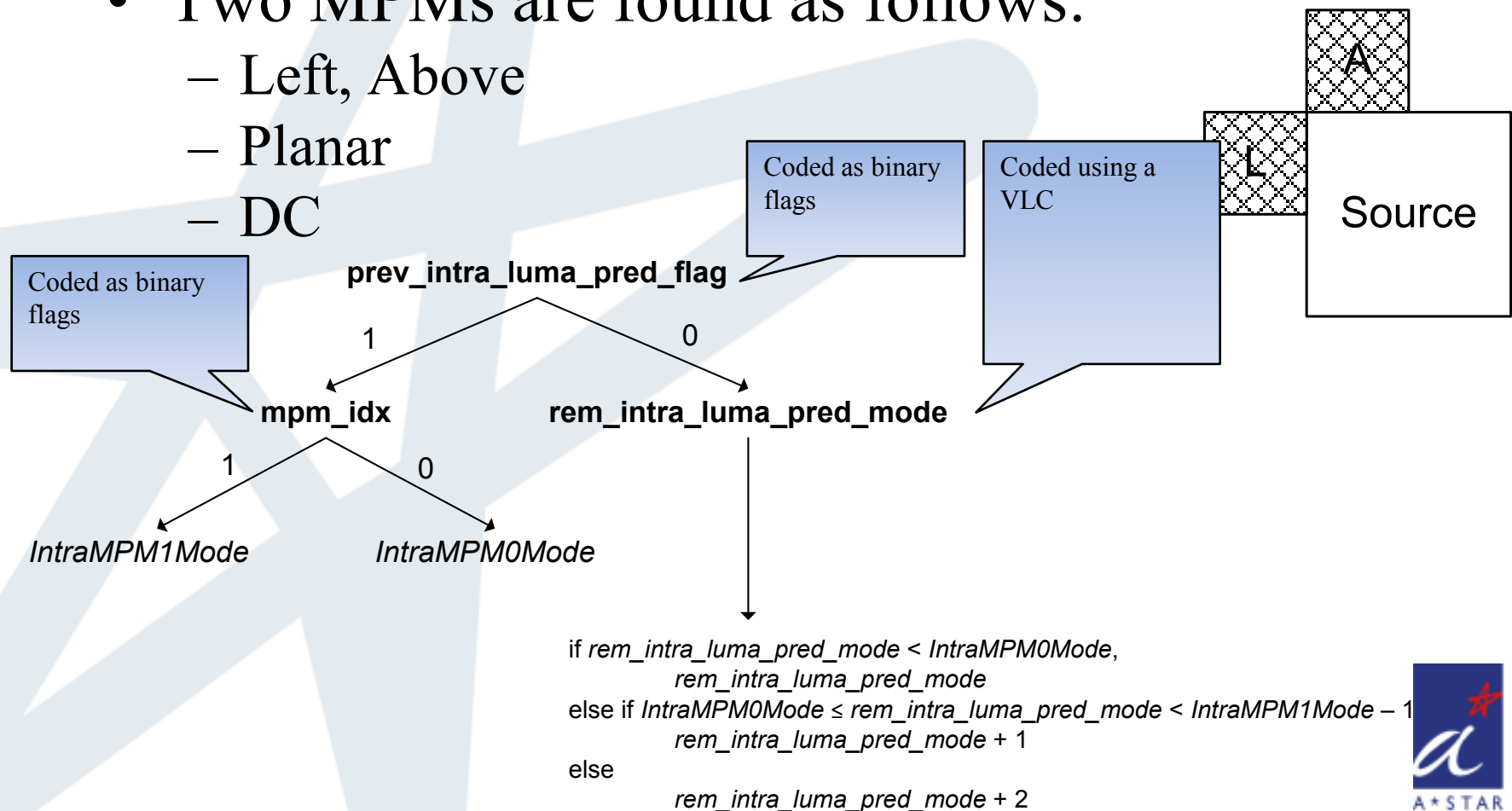
Coding of Intra Prediction mode in HM4 - CABAC

- Two MPMs are found as follows:
 - Left, Above
 - Planar
 - DC



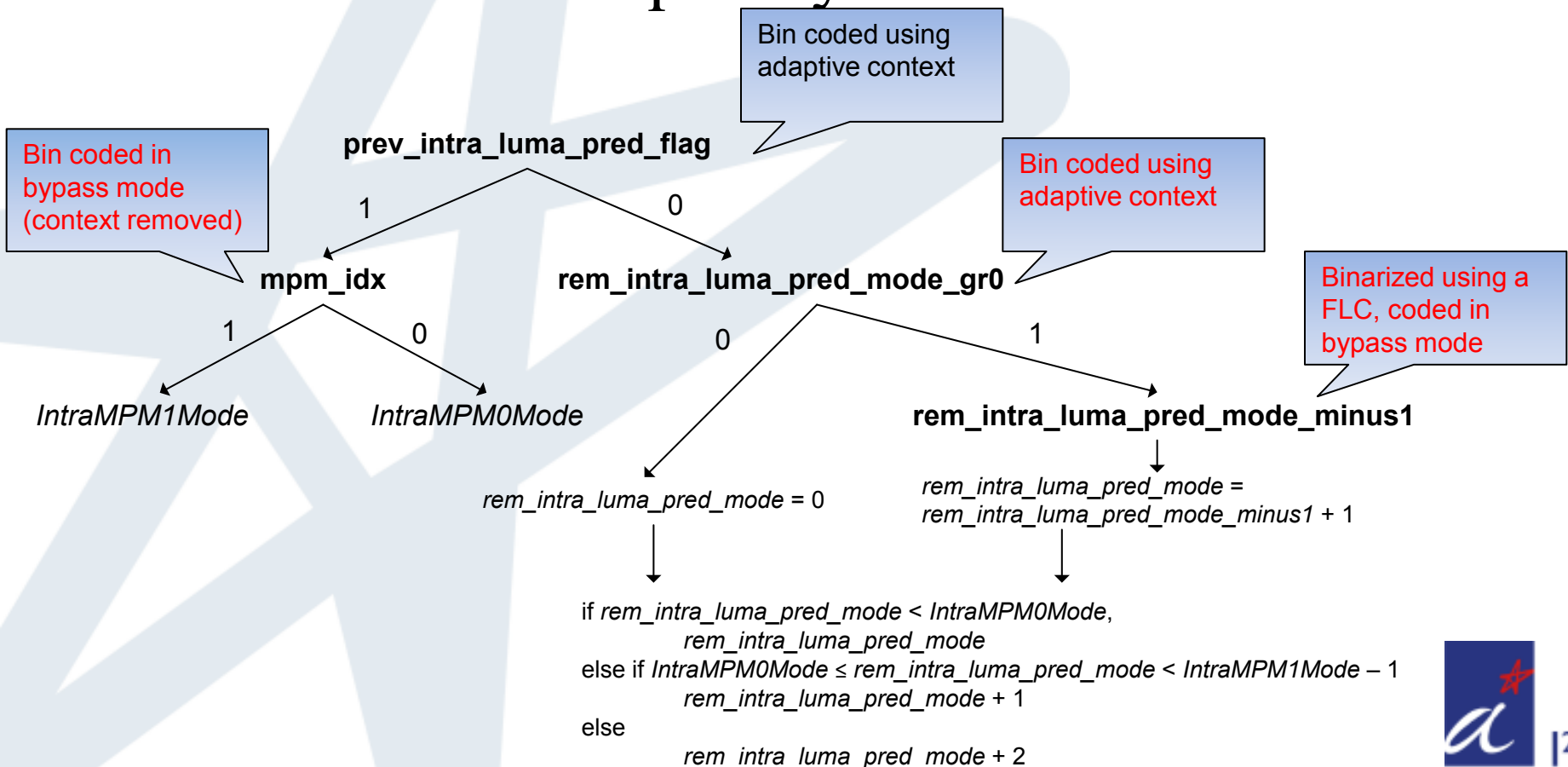
Coding of Intra Prediction mode in HM4 - CAVLC

- Two MPMs are found as follows:
 - Left, Above
 - Planar
 - DC

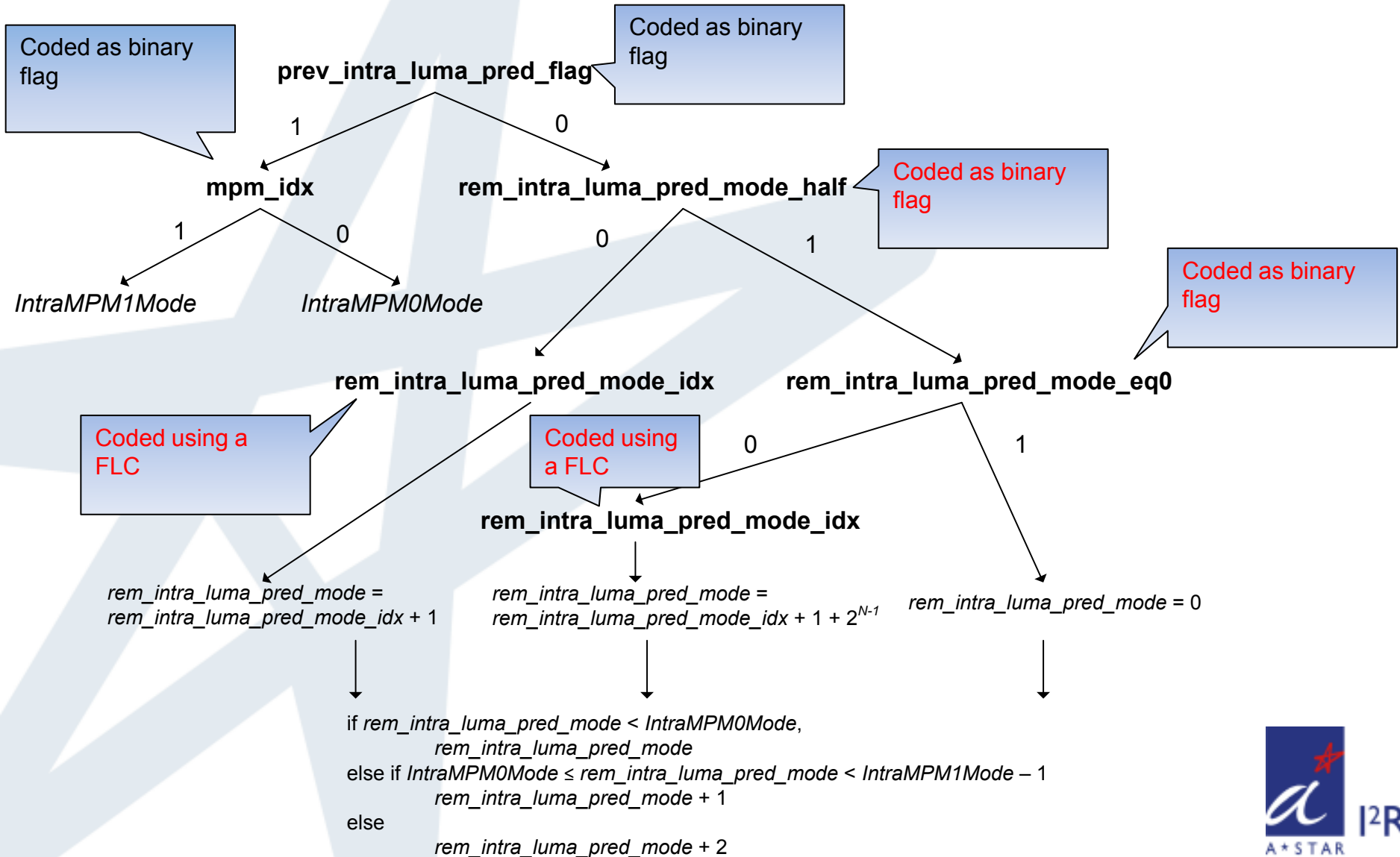


Proposed approach - CABAC

- Motivation: `rem_intra_luma_pred_mode=0` much more frequently



Proposed approach - CAVLC



Available modes in proposed approach

PU size	Number of modes	Description of modes	Bins/Bits for rem_intra_luma_pred_mode_minus1
4x4	19	Planar, DC, Ver+2x ($-4 \leq x \leq 4$), Hor+2x ($-3 \leq x \leq 4$)	4
8x8	35	All	5
16x16	35	All	5
32x32	35	All	5
64x64	4	Planar, DC, Ver, Hor	0

Advantages of proposed approach

- An elegant way to code Intra prediction modes
 - HOR+6 is now allowed for 4x4 PUs
- CABAC
 - Eliminate 1 context (2 contexts left)
 - No escape mode handling needed for 8x8 – 32x32 PUs
 - At most 2 bins coded using contexts (vs up to 7 in HM4)
- CAVLC
 - No VLC tables required
 - No mode re-ranking is done

Experimental Setup

- Implemented in HM4 reference software
- Follow common conditions for AI-HE/LC
- For remaining mode coding, encoder is modified according to CE6b unified proposal (G243)

Results – mpm_idx context removal in CABAC

	All Intra HE		
	Y	U	V
Class A	0.0%	-0.1%	0.0%
Class B	0.1%	0.1%	0.1%
Class C	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%
Class E	0.0%	0.0%	0.1%
Overall	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%
Enc Time[%]	100%		
Dec Time[%]	99%		

On HM4

	All Intra HE		
	Y	U	V
Class A	0.0%	-0.1%	-0.1%
Class B	0.1%	0.0%	0.1%
Class C	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%
Class E	0.0%	0.0%	0.0%
Overall	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%
Enc Time[%]	100%		
Dec Time[%]	99%		

On HM4+CE6b unified
(G243)

	All Intra HE		
	Y	U	V
Class A	0.0%	-0.1%	0.0%
Class B	0.1%	0.1%	0.1%
Class C	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%
Class E	0.0%	0.1%	0.1%
Overall	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%
Enc Time[%]	100%		
Dec Time[%]	99%		

On HM4+CE6b unified
+LM bf (G243)

Results – Remaining mode simplification

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A	-0.2%	0.0%	0.0%	0.0%	0.1%	0.1%
Class B	-0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
Class C	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
Class E	-0.3%	-0.1%	-0.1%	-0.1%	0.1%	0.2%
Overall	-0.2%	0.0%	0.0%	-0.1%	0.0%	0.0%
	-0.2%	0.0%	0.0%	-0.1%	0.0%	0.0%
Enc Time[%]	99%			100%		
Dec Time[%]	98%			98%		

Conclusions

- mpm_idx context removal
 - 0.0% Luma BD-Rate in AI-HE
 - Also proposed in G707, G767
- Remaining mode coding simplification
 - -0.2%/-0.1% Luma BD-Rate in AI-HE/LC
- Recommend both modifications for adoption