Reduction in contexts used for significant_coeff_flag and coefficient level
(JCTVC-F132)

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Contexts in HM-3.0 for significant_coeff_flag and coefficient level

- Number of contexts impact memory requirements and context selection logic

- significant_coeff_flag
  - All contexts between 16x16 and 32x32 transforms are shared except for at positions x<=1 and y<=1

- coeff_abs_level_greater1_flag
  - 6 sets of 5 contexts (x2 luma or chroma) = 60 contexts
  - c1 is accumulated based on the trailing ones to a maximum of 4. Select one of 5 contexts.

- coeff_abs_level_greater2_flag
  - 6 sets of 5 contexts (x2 luma or chroma) = 60 contexts
  - c2 is accumulated based on number of coeff_abs_level_greater2_flag to a maximum of 4. Select one of 5 contexts.

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Proposed context reduction

- significant_coeff_flag
  - Share all contexts between 16x16 and 32x32 transforms (remove 4 contexts)

- coeff_abs_level_greater1_flag
  - c_1 is accumulated based on the trailing ones to a maximum of 3. (remove 6 contexts)

- coeff_abs_level_greater2_flag
  - c_2 is accumulated based on number of coeff_abs_level_greater2_flag to a maximum of 2. (remove 12 contexts)

- Reduce number of contexts by 22

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Experiment Results

- HM-3.0 under common conditions

- Simulation platform is LSF equipped with Intel(R) Xeon(R) CPU X5570@2.93GHz 64 bits Linux machines

- Results cross-checked by NTTDoCoMo (Fxxx)

Coding efficiency impact

	Intra	Random Access	Low Delay
share 16x16 and 32x32 for SCF	0.0	0.0	0.0

	Intra	Random Access	Low Delay
c1 <3	0.0		
c2 <2	0.0		

	Intra	Random Access	Low Delay
Remove 22 context	0.1	0.0	-0.1

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Additional Info on c1 and c2 for coefficient level

Measurement of coding penalty for different maximums in coeff_abs_level_greater1_flag.

Maximum	All Intra HE			Random Access HE			Low Delay HE		
3	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.1
2	0.1	0.1	0.1	0.2	0.0	0.2	0.0	0.0	0.1
1	0.3	0.3	0.3	0.3	0.3	0.3	0.1	-0.1	0.0

Measurement of coding penalty for different maximums in coeff_abs_level_greater2_flag.

Maximum	All Intra HE			Random Access HE			Low Delay HE		
3	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.3	-0.3
2	0.0	0.1	0.0	0.0	0.0	0.1	0.0	-0.2	0.0
1	0.1	0.1	0.1	0.0	0.1	0.2	0.0	0.1	0.0
0	0.3	0.3	0.3	0.2	0.2	0.5	0.1	0.0	0.0

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Conclusions

- Remove 22 contexts to reduce memory storage and context selection logic

- Negligible impact on coding efficiency (up to 0.1%)

- Recommend for adoption into HEVC test model
  - Draft text available in contribution

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