JCTVC-N0167
Transform skip based on minimum TU size

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Summary

- This contribution proposes that the transform skip (TS) can be enabled when the current TU size is equal to the minimum TU size.
- Goal:
  - Allow the same flexibility of block structure for TS usages also to screen content (where TS is effective)
  - Allow low complexity encoding option with less compression loss
  - Ex: If MinTrafoSize =8x8 (i.e., MinCbSizeY=16x16), it can avoid small MC blocks & intra predictions in encoder & decoder.
- Performance: when MinCbSizeY=16x16 with MinTrafoSize=8x8
  - BD-bitrate gain of (-2.8%, -3.3%, -3.4%) respectively for (all intra, random access, LD B main) compared to HM11.0.
  - Especially in screen content coding, (-15.1%, -14.6%, -13.3%).
- Recommend to consider this method in the context of screen content coding & range extension.
- Verification by JCTVC-N0289 (Microsoft)
  - Thank you !!!

Introduction - Current HEVC

- Two syntax elements related to the transform skip method exist.

pic_parameter_set_rbsp( ) {	Descriptor
……	
transform_skip_enabled_flag	u(1)
……	

residual_coding(x0, y0, log2TrafoSize, cIdx) {	Descriptor
if(transform_skip_enabled_flag && !cu_transquant_bypass_flag && (log2TrafoSize == 2))	
transform_skip_flag[x0][y0][cIdx]	ae(v)
……	

- The *transform_skip_enabled_flag* informs a decoder of enabling transform skip method or not.
- The *transform_skip_flag* informs a decoder whether to skip transform or not for **4x4 TU size**.
  - Note the comparison of TU size with a fixed size of 4x4.

Transform skip based on min. TU size

- Main idea: **The transform skip can be enabled when the current TU size is equal to the minimum TU size.**

residual_coding(x0, y0, log2TrafoSize, cIdx) {	Descriptor
if(transform_skip_enabled_flag && !cu_transquant_bypass_flag && (log2TrafoSize == log2_skipTrafoSize_min))	
transform_skip_flag[x0][y0][cIdx]	ae(v)
……	

- Where,

log2_skipTrafoSize_min
- = log2_min_transform_block_size_minus2 + 2 if min_transformblock_size_based_transform_skip_flag = 1
- = 2 (if min_transformblock_size_based_transform_skip_flag = 0)

pic_parameter_set_rbsp( ) {	Descriptor
……	
transform_skip_enabled_flag	u(1)
if (transform_skip_enabled_flag)	
min_transform_block_size_based_transform_skip_flag	u(1)
……	

Experimental Conditions

- Implemented on HM11.0 software

Condition 1	CTC modified by Min TU size 8x8 (& Min CU size 16x16) (max transform depth = 3)	
Condition 2	CTC modified by Min TU size 16x16 (& Min CU size 32x32) (max transform depth = 2)	
Condition 3	CTC modified by Min TU size 32x32 (& Min CU size 64x64) (max transform depth = 1)	
Performance comparison of HM11.0 (anchor) vs. the proposed		1. Under condition 1 2. Under condition 2 3. Under condition 3

CTC: Common test condition; *Min CU size = MinCbSizeY;* *Min TU size = MinTrafoSize*

- Additional coding option
  -ConformanceMode=1 (Automatic padding to the next minimum CU size)

MinTrafoSize=8x8 (MinCbSizeY=16x16)

Anchor: minTU=4x4
Test: minTU=8x8 (noTS)

Anchor: minTU=8x8 (noTS)
Test: Proposed-minTU=8x8 (with TS)

Anchor: minTU=4x4
Test: Proposed-minTU=8x8 (with TS)

Reference:	HM 11.0 Min TU = 4x4						HM11.0 MinTu=8x8(noTS)						HM11.0 MinTU=4x4					
Tested:	Reference (HM 11.0 Min TU = 8x8)						Proposed						Proposed					
	All Intra Main			All Intra HE10			All Intra Main			All Intra HE10			All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A	2.5%	0.0%	-0.4%	2.5%	-0.2%	-0.6%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	2.5%	0.1%	-0.3%	2.5%	-0.1%	-0.6%
Class B	4.2%	0.8%	0.9%	4.2%	0.6%	0.6%	-0.1%	0.0%	0.1%	-0.1%	0.0%	0.0%	4.1%	0.8%	0.9%	4.2%	0.7%	0.7%
Class C	9.3%	5.5%	5.6%	9.4%	5.4%	5.5%	-0.6%	-0.1%	0.0%	-0.6%	-0.1%	-0.1%	8.7%	5.5%	5.6%	8.7%	5.3%	5.4%
Class D	10.7%	6.4%	6.7%	10.8%	6.3%	6.5%	-0.8%	-0.4%	-0.3%	-0.9%	-0.4%	-0.3%	9.8%	6.0%	6.4%	9.8%	5.9%	6.2%
Class E	8.1%	2.9%	3.1%	8.2%	2.5%	2.4%	-0.2%	0.0%	0.0%	-0.2%	0.0%	0.0%	7.9%	2.9%	3.1%	8.0%	2.6%	2.4%
Class F	37.5%	28.9%	29.9%	37.5%	28.8%	29.9%	-15.1%	-11.6%	-11.4%	-15.1%	-11.4%	-11.4%	15.3%	12.9%	14.0%	15.2%	13.1%	14.0%
Overall	11.9%	7.3%	7.5%	12.0%	7.2%	7.3%	-2.8%	-2.0%	-1.9%	-2.8%	-1.9%	-1.9%	7.9%	4.6%	4.9%	7.9%	4.5%	4.6%
	11.9%	7.2%	7.5%	11.9%	7.1%	7.2%	-2.8%	-1.9%	-1.9%	-2.8%	-1.9%	-1.9%	7.9%	4.6%	4.8%	7.9%	4.5%	4.6%
Enc Time[%]	0%			0%			121%			120%			65%			63%		
Dec Time[%]	0%			0%			98%			99%			103%			103%		

	Random Access Main			Random Access HE10			Random Access Main			Random Access HE10			Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A	2.4%	1.8%	1.4%	2.5%	1.6%	1.2%	0.0%	0.2%	0.2%	-0.1%	0.4%	0.7%	2.4%	2.0%	1.6%	2.4%	2.0%	1.8%
Class B	4.2%	1.4%	1.5%	4.3%	1.5%	1.5%	-0.1%	0.7%	0.7%	-0.2%	0.4%	0.6%	4.1%	2.1%	2.2%	4.1%	1.9%	2.1%
Class C	9.5%	7.2%	7.8%	9.5%	7.4%	8.0%	-1.0%	0.8%	0.7%	-1.0%	0.7%	0.6%	8.3%	8.0%	8.5%	8.4%	8.1%	8.6%
Class D	11.7%	8.6%	9.1%	11.8%	8.4%	9.3%	-1.7%	0.7%	1.0%	-1.7%	0.3%	0.7%	9.8%	9.4%	10.2%	9.9%	8.7%	10.1%
Class E																		
Class F	34.6%	26.8%	28.0%	35.1%	27.0%	28.1%	-14.6%	-8.9%	-8.6%	-14.9%	-9.3%	-8.8%	13.5%	14.3%	15.6%	13.5%	14.0%	15.4%
Overall	12.1%	8.8%	9.2%	12.2%	8.8%	9.2%	-3.3%	-1.2%	-1.1%	-3.4%	-1.4%	-1.2%	7.5%	6.9%	7.4%	7.5%	6.7%	7.4%
	12.1%	8.7%	9.1%	12.2%	8.7%	9.1%	-3.3%	-1.2%	-1.1%	-3.4%	-1.4%	-1.1%	7.5%	6.9%	7.3%	7.5%	6.6%	7.3%
Enc Time[%]	0%			0%			104%			104%			70%			69%		
Dec Time[%]	0%			0%			100%			99%			84%			96%		

	Low delay B Main			Low delay B HE10			Low delay B Main			Low delay B HE10			Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A																		
Class B	3.7%	1.1%	0.9%	3.8%	0.8%	0.7%	-0.2%	0.6%	0.7%	-0.2%	0.6%	0.9%	3.6%	1.7%	1.6%	3.6%	1.4%	1.6%
Class C	8.4%	5.7%	6.6%	8.4%	5.7%	6.7%	-1.2%	0.6%	0.7%	-1.3%	0.8%	0.5%	7.1%	6.4%	7.3%	7.0%	6.5%	7.2%
Class D	11.1%	7.6%	7.8%	11.1%	7.8%	8.1%	-2.3%	0.1%	0.8%	-2.3%	0.0%	0.3%	8.5%	7.8%	8.6%	8.6%	7.7%	8.5%
Class E	3.6%	0.6%	-0.7%	3.7%	0.9%	0.3%	0.1%	-0.3%	0.4%	-0.2%	-0.9%	0.1%	3.6%	0.3%	-0.2%	3.6%	0.0%	0.3%
Class F	30.5%	22.6%	23.2%	30.9%	24.0%	23.8%	-13.3%	-7.3%	-6.6%	-13.3%	-7.7%	-7.3%	12.0%	12.6%	13.9%	12.3%	13.4%	13.7%
Overall	11.5%	7.6%	7.6%	11.6%	7.8%	7.9%	-3.4%	-1.2%	-0.8%	-3.5%	-1.4%	-1.1%	6.9%	5.8%	6.3%	7.0%	5.9%	6.3%
	11.5%	7.4%	7.7%	11.6%	7.8%	7.9%	-3.4%	-1.1%	-0.9%	-3.5%	-1.3%	-0.9%	6.9%	5.8%	6.3%	7.0%	5.9%	6.4%
Enc Time[%]	0%			0%			103%			103%			56%			56%		
Dec Time[%]	0%			0%			100%			100%			69%			78%		

MinCbSizeY =16x16

&

MinTrafoSize =8x8

Anchor:
HM11.0 (no TS)

Test:
TS on 8x8

	All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V
Class A	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%
Class B	-0.1%	0.0%	0.1%	-0.1%	0.0%	0.0%
Class C	-0.6%	-0.1%	0.0%	-0.6%	-0.1%	-0.1%
Class D	-0.8%	-0.4%	-0.3%	-0.9%	-0.4%	-0.3%
Class E	-0.2%	0.0%	0.0%	-0.2%	0.0%	0.0%
Class F	**-15.1%**	**-11.6%**	**-11.4%**	**-15.1%**	**-11.4%**	**-11.4%**
Overall	-2.8%	-2.0%	-1.9%	-2.8%	-1.9%	-1.9%
	-2.8%	-1.9%	-1.9%	-2.8%	-1.9%	-1.9%
Enc Time[%]		121%			120%	
Dec Time[%]		98%			99%	

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.0%	0.2%	0.2%	-0.1%	0.4%	0.7%
Class B	-0.1%	0.7%	0.7%	-0.2%	0.4%	0.6%
Class C	-1.0%	0.8%	0.7%	-1.0%	0.7%	0.6%
Class D	-1.7%	0.7%	1.0%	-1.7%	0.3%	0.7%
Class E						
Class F	-14.6%	-8.9%	-8.6%	-14.9%	-9.3%	-8.9%
Overall	-3.3%	-1.2%	-1.1%	-3.4%	-1.4%	-1.2%
	-3.3%	-1.2%	-1.1%	-3.4%	-1.4%	-1.1%
Enc Time[%]		104%			104%	
Dec Time[%]		100%			100%	

	Low Delay B Main			Low Delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	-0.2%	0.6%	0.7%	-0.2%	0.6%	0.9%
Class C	-1.2%	0.6%	0.7%	-1.3%	0.8%	0.5%
Class D	-2.3%	0.1%	0.8%	-2.3%	0.0%	0.3%
Class E	0.1%	-0.3%	0.4%	-0.2%	-0.9%	0.1%
Class F	-13.3%	-7.3%	-6.6%	-13.3%	-7.7%	-7.3%
Overall	-3.4%	-1.2%	-0.8%	-3.5%	-1.4%	-1.1%
	-3.4%	-1.1%	-0.9%	-3.5%	-1.3%	-0.9%
Enc Time[%]		103%			103%	
Dec Time[%]		100%			100%	

MinTrafoSize=16x16(MinCbSizeY=32x32)

Anchor: minTU=4x4
Test: minTU=16x16(noTS)

Anchor: minTU=16x16 (noTS)
Test: Proposed-minTU=16x16(with TS)

Anchor: minTU=4x4
Test: Proposed-minTU=16x16 (with TS)

Reference:	HM 11.0 Min TU = 4x4						HM1 (minTU=16x16 noTS)						HM11.0(minTU=4x4)					
Tested:	HM 11.0 Min TU =16x16, noTS						proposed						Proposed(minTU=16x16)					
	All Intra Main			All Intra HE10			All Intra Main			All Intra HE10			All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A	8.0%	3.5%	2.5%	8.1%	3.0%	2.1%	-0.1%	0.0%	0.0%	-0.1%	0.1%	0.0%	7.9%	3.5%	2.6%	7.9%	3.2%	2.1%
Class B	13.7%	5.4%	5.6%	13.7%	4.8%	4.9%	-0.3%	-0.1%	-0.1%	-0.3%	-0.1%	-0.1%	13.2%	5.3%	5.5%	13.3%	4.7%	4.8%
Class C	24.5%	17.3%	17.5%	24.7%	16.8%	16.9%	-0.7%	-0.4%	-0.4%	-0.7%	-0.4%	-0.4%	23.6%	16.9%	17.1%	23.8%	16.3%	16.5%
Class D	29.3%	21.4%	23.0%	29.4%	20.8%	22.4%	-1.4%	-1.1%	-1.0%	-1.4%	-1.1%	-1.0%	27.4%	20.0%	21.7%	27.5%	19.5%	21.1%
Class E	25.1%	11.8%	10.7%	25.4%	11.0%	9.6%	-0.8%	-0.2%	-0.1%	-0.8%	-0.3%	-0.2%	24.1%	11.6%	10.6%	24.4%	10.7%	9.4%
Class F	82.0%	64.5%	66.4%	82.2%	64.2%	66.1%	-19.7%	-15.3%	-15.1%	-19.8%	-15.3%	-15.2%	42.6%	36.7%	38.6%	42.7%	36.5%	38.4%
Overall	30.0%	20.4%	20.7%	30.1%	19.9%	20.1%	-3.8%	-2.8%	-2.8%	-3.8%	-2.8%	-2.8%	22.7%	15.4%	15.8%	22.8%	14.9%	15.2%
	29.9%	20.0%	20.5%	30.0%	19.5%	19.9%	-3.8%	-2.8%	-2.8%	-3.8%	-2.8%	-2.8%	22.6%	15.2%	15.6%	22.7%	14.7%	15.0%
Enc Time[%]	0%			0%			117%			117%			39%			37%		
Dec Time[%]	0%			0%			97%			98%			94%			95%		
	Random Access Main			Random Access HE10			Random Access Main			Random Access HE10			Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A	13.4%	15.3%	13.4%	13.6%	14.5%	12.7%	0.0%	-0.6%	-0.6%	-0.1%	0.0%	-0.1%	13.4%	14.6%	12.8%	13.4%	14.4%	12.5%
Class B	16.9%	14.7%	14.7%	17.2%	14.2%	14.2%	-0.7%	0.4%	0.5%	-0.7%	0.6%	0.5%	16.1%	15.1%	15.3%	16.4%	14.8%	14.7%
Class C	34.7%	35.9%	38.0%	35.1%	36.1%	37.9%	-2.4%	0.0%	0.0%	-2.4%	-0.1%	0.0%	31.4%	35.8%	37.8%	31.7%	35.9%	37.8%
Class D	48.8%	50.5%	54.9%	49.2%	49.9%	54.5%	-4.7%	-0.8%	-0.9%	-4.7%	-1.0%	-1.2%	41.1%	49.2%	53.1%	41.5%	48.3%	52.5%
Class E																		
Class F	83.6%	71.1%	74.0%	84.8%	71.2%	73.6%	-21.1%	-13.6%	-13.5%	-21.3%	-13.7%	-13.6%	40.8%	44.8%	47.1%	41.3%	44.8%	46.6%
Overall	38.4%	36.4%	37.8%	38.9%	36.1%	37.4%	-5.5%	-2.8%	-2.7%	-5.6%	-2.7%	-2.7%	28.0%	31.1%	32.4%	28.3%	30.8%	32.0%
	38.4%	35.9%	37.5%	38.9%	35.6%	37.0%	-5.5%	-2.8%	-2.8%	-5.6%	-2.7%	-2.7%	27.9%	30.7%	32.0%	28.2%	30.4%	31.6%
Enc Time[%]	0%			0%			106%			106%			39%			38%		
Dec Time[%]	0%			0%			100%			99%			82%			93%		
	Low delay B Main			Low delay B HE10			Low delay B Main			Low delay B HE10			Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A																		
Class B	16.7%	15.9%	16.9%	16.9%	15.5%	16.8%	-1.0%	0.3%	0.4%	-1.0%	0.6%	0.5%	15.5%	16.2%	17.3%	15.6%	16.1%	17.4%
Class C	33.8%	35.7%	39.4%	34.1%	36.3%	39.5%	-3.5%	-0.7%	-0.7%	-3.5%	-0.5%	-0.4%	29.0%	34.7%	38.3%	29.2%	35.6%	38.7%
Class D	52.0%	56.5%	59.0%	52.2%	55.4%	59.2%	-6.3%	-1.1%	-1.6%	-6.3%	-1.4%	-1.7%	41.6%	54.5%	56.1%	41.9%	53.0%	56.1%
Class E	22.7%	14.5%	13.1%	23.3%	15.7%	14.5%	-0.8%	0.5%	1.3%	-1.0%	0.7%	1.1%	21.8%	15.0%	14.5%	22.1%	16.5%	15.8%
Class F	83.1%	73.1%	75.3%	83.9%	74.5%	76.2%	-21.9%	-14.0%	-13.7%	-21.8%	-14.3%	-14.6%	39.1%	45.3%	47.4%	39.8%	45.9%	46.2%
Overall	41.3%	39.2%	40.9%	41.7%	39.5%	41.3%	-6.7%	-3.0%	-2.9%	-6.7%	-3.0%	-3.1%	29.1%	33.2%	34.9%	29.4%	33.4%	34.9%
	41.3%	38.6%	40.7%	41.7%	38.9%	40.9%	-6.7%	-2.9%	-3.0%	-6.7%	-3.0%	-3.0%	29.0%	32.9%	34.6%	29.3%	33.0%	34.7%
Enc Time[%]	0%			0%			105%			105%			31%			31%		
Dec Time[%]	0%			0%			100%			100%			68%			77%		

MinCbSizeY =32x32

&

MinTrafoSize =16x16

Anchor:
HM11.0 (no TS)

Test:
TS on 16x16

	All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V
Class A	-0.1%	0.0%	0.0%	-0.1%	0.1%	0.0%
Class B	-0.3%	-0.1%	-0.1%	-0.3%	-0.1%	-0.1%
Class C	-0.7%	-0.4%	-0.4%	-0.7%	-0.4%	-0.4%
Class D	-1.4%	-1.1%	-1.0%	-1.4%	-1.1%	-1.0%
Class E	-0.8%	-0.2%	-0.1%	-0.8%	-0.3%	-0.2%
Class F	-19.7%	-15.3%	-15.1%	-19.8%	-15.3%	-15.2%
Overall	-3.8%	-2.8%	-2.8%	-3.8%	-2.8%	-2.8%
	-3.8%	-2.8%	-2.8%	-3.8%	-2.8%	-2.8%
Enc Time[%]	117%			117%		
Dec Time[%]	97%			98%		

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.0%	-0.6%	-0.6%	-0.1%	0.0%	-0.1%
Class B	-0.7%	0.4%	0.5%	-0.7%	0.6%	0.5%
Class C	-2.4%	0.0%	0.0%	-2.4%	-0.1%	0.0%
Class D	-4.7%	-0.8%	-0.9%	-4.7%	-1.0%	-1.2%
Class E						
Class F	-21.1%	-13.6%	-13.5%	-21.3%	-13.7%	-13.6%
Overall	-5.5%	-2.8%	-2.7%	-5.6%	-2.7%	-2.7%
	-5.5%	-2.8%	-2.8%	-5.6%	-2.7%	-2.7%
Enc Time[%]	106%			106%		
Dec Time[%]	100%			99%		

	Low Delay B Main			Low Delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	-1.0%	0.3%	0.4%	-1.0%	0.6%	0.5%
Class C	-3.5%	-0.7%	-0.7%	-3.5%	-0.5%	-0.4%
Class D	-6.3%	-1.1%	-1.6%	-6.3%	-1.4%	-1.7%
Class E	-0.8%	0.5%	1.3%	-1.0%	0.7%	1.1%
Class F	-21.9%	-14.0%	-13.7%	-21.8%	-14.3%	-14.6%
Overall	-6.7%	-3.0%	-2.9%	-6.7%	-3.0%	-3.1%
	-6.7%	-2.9%	-3.0%	-6.7%	-3.0%	-3.0%
Enc Time[%]	105%			105%		
Dec Time[%]	100%			100%		

MinCbSizeY =64x64

&

MinTrafoSize =32x32

Anchor:
HM11.0 (no TS)

Tetsed:
TS on 32x32

	All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V
Class A	-0.1%	0.0%	0.0%	-0.1%	0.0%	0.0%
Class B	-0.4%	-0.3%	-0.3%	-0.4%	-0.3%	-0.3%
Class C	-0.5%	-0.4%	-0.4%	-0.5%	-0.4%	-0.4%
Class D	-1.3%	-1.1%	-1.1%	-1.3%	-1.0%	-1.0%
Class E	-0.8%	-0.4%	-0.4%	-0.8%	-0.4%	-0.4%
Class F	-21.2%	-16.9%	-16.7%	-21.2%	-16.9%	-16.7%
Overall	-4.0%	-3.2%	-3.1%	-4.0%	-3.2%	-3.1%
	-4.0%	-3.1%	-3.1%	-4.0%	-3.1%	-3.1%
Enc Time[%]	127%			127%		
Dec Time[%]	97%			98%		

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	-0.4%	0.1%	0.0%	-0.3%	0.3%	0.1%
Class B	-1.8%	0.2%	0.2%	-1.9%	0.2%	0.1%
Class C	-4.8%	-0.6%	-0.6%	-4.7%	-0.6%	-0.6%
Class D	-8.8%	-2.7%	-2.5%	-8.8%	-2.7%	-2.7%
Class E						
Class F	-25.5%	-15.6%	-15.3%	-25.6%	-15.9%	-15.5%
Overall	-8.0%	-3.6%	-3.5%	-8.0%	-3.6%	-3.6%
	-8.0%	-3.5%	-3.4%	-8.0%	-3.5%	-3.5%
Enc Time[%]	110%			110%		
Dec Time[%]	99%			99%		

	Low Delay B Main			Low Delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	-2.6%	-0.2%	0.0%	-2.7%	-0.4%	-0.2%
Class C	-7.0%	-2.0%	-1.9%	-7.0%	-1.9%	-2.0%
Class D	-11.4%	-4.5%	-4.5%	-11.4%	-4.8%	-4.2%
Class E	-4.0%	-0.2%	0.4%	-3.9%	-0.5%	0.1%
Class F	-28.5%	-17.0%	-16.6%	-28.5%	-17.2%	-16.6%
Overall	-10.7%	-4.7%	-4.6%	-10.6%	-5.0%	-4.6%
	-10.6%	-4.7%	-4.5%	-10.6%	-5.0%	-4.7%
Enc Time[%]	108%			108%		
Dec Time[%]	98%			99%		

End