



CE9: 4.4 Evaluation of Partial (CU) Merge

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CE9: 4.4 Evaluation of Partial Merge

Test	Which PU is restricted	CU level	Inferred / Encoder-only
Anchor	1st 2NxN PU, 1st Nx2N PU	16x16 and larger CU sizes	Inferred
PART01	1 st 2NxN PU, 1 st Nx2N PU	All CU sizes	Inferred
PART02	1 st 2NxN PU, 1 st Nx2N PU	16x16 and larger CU sizes	Encoder-only
PART03	1 st 2NxN PU, 1 st Nx2N PU	All CU sizes	Encoder-only
PART04	Both two 2NxN PUs, both two Nx2N PUs	16x16 and larger CU sizes	Inferred
PART05	Both two 2NxN PUs, both two Nx2N PUs	All CU sizes	Inferred
PART06	Both two 2NxN PUs, both two Nx2N PUs	16x16 and larger CU sizes	Encoder-only
PART07 (withdrawn)	Both two 2NxN PUs, both two Nx2N PUs	All CU sizes	Encoder-only
PART08 (withdrawn)	2 nd 2NxN PU, 2 nd Nx2N PU	16x16 and larger CU sizes	Inferred
PART09 (withdrawn)	2 nd 2NxN PU, 2 nd Nx2N PU	All CU sizes	Inferred
PART10 (withdrawn)	2 nd 2NxN PU, 2 nd Nx2N PU	16x16 and larger CU sizes	Encoder-only
PART11 (withdrawn)	2 nd 2NxN PU, 2 nd Nx2N PU	All CU sizes	Encoder-only
PART12	None (PU merge)	N/A	N/A
PART13	1 st 2NxN PU, 1 st Nx2N PU	16x16 and larger CU sizes	Encoder-only (RCME)
PART14	1 st 2NxN PU, 1 st Nx2N PU	16x16 and larger CU sizes	Inferred
	All four NxN PUs	8x8	
PART15	1 st 2NxN PU, 1 st Nx2N PU	16x16 and larger CU sizes	Encoder-only
	All four NxN PUs	8x8	
PART16	All four NxN PUs	8x8 for NxN	Inferred
PART17	1 st 2NxN PU, 1 st Nx2N PU	All CU sizes	Inferred
	All four NxN PUs	8x8	
PART18	Disable partial merge and NxN inter predictions		Inferred

CE9: 4.4 Summary of Test Results

Test	Avg. BD-rate	Avg. Enc. Time
<i>Anchor: Force merge 1st 2NxN PU, 1st Nx2N PU, Inferred, 16x16 and larger CU sizes</i>	0.000%	100%
PART01: Force merge 1 st 2NxN PU, 1 st Nx2N PU, Inferred, all CU sizes	0.105%	92.5%
PART02: Encoder-only of Anchor	0.260%	100%
PART03: Encoder-only of PART01	0.602%	92.3%
PART04: Force merge both 2NxN and Nx2N PUs, Inferred, 16x16 and larger CU sizes	0.457%	86.5%
PART05: Force merge both 2NxN and Nx2N PUs, Inferred, all CU sizes	0.847%	70.2%
PART06: Encoder-only of PART04	0.755%	92.3%
PART12: No PU merge	-0.417%	114.2%
PART13: Anchor + RCME, Encoder-only	-0.127%	106.5%
PART14: Anchor + Force merge all four NxN PUs, Inferred	0.030%	89.2%
PART15: Encoder-only of PART14	0.400%	89.8%
PART16: PART12 + Force merge all four NxN PUs, Inferred	-0.380%	102.7%
PART17: PART01 + Force merge all four NxN PUs, Inferred	0.317%	81.2%
PART18: Anchor – Part_mrg – NxN inter predictions	-0.239%	101.6%

Results – PART01

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.09	0.16	0.16	0.03	0.21	-0.04
Class B	0.03	0.02	-0.02	0.08	0.08	0.07
Class C	0.21	0.19	0.27	0.30	0.28	0.35
Class D	0.49	0.49	0.46	0.44	0.33	0.26
Class E						
All	0.15	0.20	0.20	0.20	0.22	0.15
Enc Time[%]	93%			92%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.03	0.12	-0.34	-0.02	-0.08	-0.08
Class C	0.14	0.27	0.25	0.12	0.05	-0.01
Class D	0.16	-0.10	0.35	0.27	-0.03	-0.01
Class E	-0.25	-0.65	-0.04	-0.23	-0.09	0.18
All	0.02	-0.04	0.04	0.05	-0.04	0.00
Enc Time[%]	93%			91%		
Dec Time[%]	100%			101%		

Results – PART02

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.20	0.31	0.18	0.29	0.21	0.18
Class B	0.18	0.19	0.11	0.25	0.19	0.17
Class C	0.22	0.25	0.32	0.22	0.16	0.23
Class D	0.27	0.20	0.16	0.18	0.06	0.08
Class E						
All	0.22	0.23	0.19	0.24	0.16	0.17
Enc Time[%]	99%			100%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.25	0.38	0.19	0.34	0.24	0.29
Class C	0.25	0.26	0.31	0.18	0.28	0.10
Class D	0.13	0.42	0.75	0.20	0.06	0.34
Class E	0.50	0.53	0.68	0.58	0.40	1.12
All	0.27	0.39	0.45	0.31	0.23	0.41
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		

Results – PART03

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.37	0.57	0.42	0.46	0.36	0.28
Class B	0.37	0.36	0.35	0.43	0.31	0.32
Class C	0.68	0.69	0.81	0.69	0.59	0.66
Class D	0.99	0.95	0.94	0.84	0.63	0.63
Class E						
All	0.59	0.63	0.61	0.59	0.46	0.46
Enc Time[%]	94%			92%		
Dec Time[%]	101%			101%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.35	0.54	0.35	0.52	0.40	0.41
Class C	0.61	0.65	0.65	0.58	0.47	0.38
Class D	0.78	0.66	1.33	0.87	0.76	0.48
Class E	0.55	0.51	0.92	0.76	0.15	0.69
All	0.56	0.59	0.77	0.67	0.46	0.48
Enc Time[%]	93%			91%		
Dec Time[%]	100%			100%		

Results – PART04

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.39	0.65	0.47	0.51	0.48	0.35
Class B	0.46	0.44	0.44	0.55	0.44	0.45
Class C	0.51	0.59	0.65	0.57	0.54	0.55
Class D	0.47	0.50	0.41	0.41	0.22	0.19
Class E						
All	0.45	0.54	0.49	0.51	0.42	0.39
Enc Time[%]	89%			85%		
Dec Time[%]	100%			101%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.33	0.40	0.22	0.49	0.36	0.33
Class C	0.43	0.46	0.56	0.46	0.32	0.25
Class D	0.35	0.75	0.88	0.46	0.16	0.30
Class E	0.44	1.04	0.68	0.56	0.32	0.70
All	0.38	0.62	0.56	0.49	0.29	0.37
Enc Time[%]	88%			84%		
Dec Time[%]	100%			101%		

Results – PART05

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.51	1.16	0.87	0.69	0.82	0.54
Class B	0.64	0.61	0.57	0.78	0.66	0.75
Class C	1.13	1.24	1.39	1.26	1.19	1.39
Class D	1.48	1.54	1.70	1.45	1.29	1.33
Class E						
All	0.92	1.11	1.10	1.03	0.97	0.99
Enc Time[%]	76%			68%		
Dec Time[%]	100%			101%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.40	0.53	0.42	0.62	0.32	0.40
Class C	0.87	0.89	1.07	0.95	0.80	0.79
Class D	1.06	1.08	1.64	1.19	1.18	0.73
Class E	0.21	0.40	0.26	0.33	0.35	0.32
All	0.65	0.73	0.86	0.79	0.66	0.57
Enc Time[%]	73%			64%		
Dec Time[%]	100%			101%		

Results – PART06

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.57	0.87	0.70	0.79	0.71	0.56
Class B	0.61	0.62	0.63	0.84	0.66	0.65
Class C	0.68	0.76	0.80	0.81	0.66	0.86
Class D	0.67	0.69	0.56	0.59	0.44	0.52
Class E						
All	0.63	0.73	0.67	0.76	0.62	0.65
Enc Time[%]	89%			85%		
Dec Time[%]	101%			101%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.59	0.90	1.06	0.97	0.56	0.61
Class C	0.65	1.02	0.93	0.72	0.49	0.55
Class D	0.57	0.42	1.27	0.67	0.64	0.51
Class E	0.99	1.93	1.29	1.57	1.20	1.60
All	0.68	1.00	1.12	0.95	0.68	0.75
Enc Time[%]	87%			84%		
Dec Time[%]	100%			101%		

Results – PART12

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.61	-1.11	-0.98	-0.69	-0.74	-0.66
Class B	-0.40	-0.50	-0.49	-0.44	-0.32	-0.30
Class C	-0.62	-0.64	-0.76	-0.65	-0.62	-0.63
Class D	-0.48	-0.46	-0.51	-0.53	-0.62	-0.61
Class E						
All	-0.52	-0.67	-0.67	-0.57	-0.56	-0.54
Enc Time[%]	110%			116%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.19	-0.31	-0.56	-0.26	-0.17	-0.18
Class C	-0.35	-0.43	-0.58	-0.49	-0.26	-0.41
Class D	-0.39	-0.44	0.22	-0.31	-0.18	-0.25
Class E	-0.10	0.22	-0.06	-0.15	0.48	0.41
All	-0.27	-0.28	-0.27	-0.31	-0.07	-0.14
Enc Time[%]	112%			116%		
Dec Time[%]	100%			100%		

Results – PART13

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.17	-0.21	-0.09	-0.10	0.17	0.12
Class B	-0.08	-0.12	-0.08	-0.07	0.05	0.06
Class C	-0.19	-0.17	-0.18	-0.20	-0.06	-0.13
Class D	-0.14	-0.14	-0.14	-0.20	-0.32	-0.31
Class E						
All	-0.14	-0.16	-0.12	-0.14	-0.03	-0.06
Enc Time[%]	105%			108%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.02	0.02	-0.06	-0.03	-0.02	0.20
Class C	-0.15	0.14	-0.21	-0.23	-0.14	-0.13
Class D	-0.17	-0.29	0.62	-0.19	-0.38	-0.33
Class E	-0.11	-0.44	-0.17	-0.02	0.60	0.56
All	-0.11	-0.11	0.05	-0.12	-0.02	0.05
Enc Time[%]	105%			108%		
Dec Time[%]	99%			100%		

CE9: 4.4 PART14 Results

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.00	-0.03	0.02	0.04	0.15	-0.01
Class B	-0.01	-0.08	-0.12	0.02	0.01	0.02
Class C	0.00	0.07	0.04	0.12	0.15	0.31
Class D	0.17	0.25	0.16	0.20	0.25	0.25
Class E						
All	0.04	0.04	0.02	0.09	0.13	0.14
Enc Time[%]	91%			89%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.03	0.00	-0.11	-0.04	-0.18	-0.21
Class C	-0.02	0.08	0.03	0.03	-0.03	-0.07
Class D	0.00	-0.13	0.72	0.13	0.07	0.03
Class E	0.05	0.18	0.17	-0.17	-0.26	0.57
All	-0.01	0.02	0.18	0.00	-0.09	0.03
Enc Time[%]	90%			87%		
Dec Time[%]	100%			100%		

CE9: 4.4 PART15 Results

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.21	0.30	0.06	0.28	0.21	0.04
Class B	0.22	0.22	0.15	0.32	0.24	0.28
Class C	0.34	0.41	0.48	0.46	0.41	0.50
Class D	0.49	0.40	0.41	0.51	0.45	0.44
Class E						
All	0.31	0.33	0.27	0.39	0.32	0.31
Enc Time[%]	91%			89%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.26	0.40	0.02	0.40	0.29	0.47
Class C	0.34	0.51	0.37	0.43	0.44	0.33
Class D	0.42	0.46	1.17	0.57	0.69	0.79
Class E	0.71	1.29	0.43	0.67	0.59	1.09
All	0.40	0.61	0.47	0.50	0.48	0.63
Enc Time[%]	91%			88%		
Dec Time[%]	100%			100%		

CE9: 4.4 PART16 Results

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.58	-0.84	-0.99	-0.71	-0.68	-0.67
Class B	-0.39	-0.48	-0.50	-0.44	-0.35	-0.29
Class C	-0.61	-0.56	-0.63	-0.54	-0.39	-0.34
Class D	-0.38	-0.43	-0.36	-0.32	-0.23	-0.49
Class E						
All	-0.48	-0.57	-0.61	-0.50	-0.41	-0.44
Enc Time[%]	102%			104%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.19	-0.46	-0.38	-0.29	-0.24	-0.10
Class C	-0.31	-0.39	-0.40	-0.47	-0.41	-0.37
Class D	-0.34	-0.31	0.26	-0.19	-0.13	-0.20
Class E	-0.05	0.24	-0.39	-0.28	0.25	0.37
All	-0.23	-0.27	-0.23	-0.31	-0.16	-0.10
Enc Time[%]	102%			103%		
Dec Time[%]	100%			100%		

CE9: 4.4 PART17 Results

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.04	0.39	0.18	0.12	0.37	0.16
Class B	0.10	0.10	0.10	0.18	0.19	0.23
Class C	0.45	0.46	0.65	0.67	0.73	0.93
Class D	0.87	1.10	1.17	1.08	1.23	1.25
Class E						
All	0.35	0.49	0.50	0.49	0.60	0.62
Enc Time[%]	85%			80%		
Dec Time[%]	100%			100%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.03	0.03	-0.09	0.02	-0.08	-0.17
Class C	0.33	0.30	0.34	0.43	0.39	0.36
Class D	0.53	0.82	1.13	0.79	0.56	0.57
Class E	-0.22	-0.21	0.02	-0.22	-0.34	0.25
All	0.16	0.25	0.34	0.27	0.15	0.23
Enc Time[%]	83%			77%		
Dec Time[%]	100%			100%		

Results – PART18

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.54	-0.83	-0.94	-0.61	-0.54	-0.61
Class B	-0.35	-0.46	-0.48	-0.38	-0.29	-0.26
Class C	-0.49	-0.37	-0.48	-0.37	-0.21	-0.21
Class D	-0.22	-0.17	-0.14	-0.08	-0.08	-0.11
Class E						
All	-0.40	-0.46	-0.51	-0.36	-0.28	-0.30
Enc Time[%]	101%			102%		
Dec Time[%]	101%			99%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.11	-0.16	-0.55	-0.20	-0.09	-0.14
Class C	-0.15	-0.02	-0.25	-0.16	-0.04	-0.06
Class D	0.00	0.14	0.55	0.12	0.27	-0.06
Class E	-0.13	-0.41	-0.16	-0.16	0.18	0.27
All	-0.10	-0.10	-0.13	-0.10	0.06	-0.02
Enc Time[%]	101%			102%		
Dec Time[%]	99%			99%		

CE9: 4.4 PART 14, 16, 18 Results

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
All – PART14	0.04	0.04	0.02	0.09	0.13	0.14
Enc Time[%]	91%			89%		
All – PART16	-0.48	-0.57	-0.61	-0.50	-0.41	-0.44
Enc Time[%]	102%			104%		
All – PART18	-0.40	-0.46	-0.51	-0.36	-0.28	-0.30
Enc Time[%]	101%			102%		

	Low delay			Low delay LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
All – PART14	-0.01	0.02	0.18	0.00	-0.09	0.03
Enc Time[%]	90%			87%		
All – PART16	-0.23	-0.27	-0.23	-0.31	-0.16	-0.10
Enc Time[%]	102%			103%		
All – PART18	-0.10	-0.10	-0.13	-0.10	0.06	-0.02
Enc Time[%]	101%			102%		