

Benchmark details

```
[('paa-union-baseline-oss-393-S-09ae0b9e41-hive_sf1000_orc_part-r488',
  'baseline',
  'r'),
 ('paa-union-oss-393-S-5f5bf3f7c9-hive_sf1000_orc_part-r486',
  'paa union',
  'y'),
 ('paa-union-push-pa-thr-join-oss-393-S-5f5bf3f7c9-hive_sf1000_orc_part-r487',
  'ppa union + push pa through join',
  'g')]
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Overall Times

	label	TPCH wall time	TPC-DS wall time	TPCH CPU time	TPC-DS CPU time	TPCH Network	TPC-DS Network	TPCH peak mem	TPC-DS peak mem	TPCH physical input	TPC-DS physical input	TPCH wall time % change	TPC-DS wall time % change	TPCH CPU time % change	TPC-DS CPU time % change	TPCH Network % change	TPC-DS Network % change	TPCH peak mem % change	TPC-DS peak mem % change	TPCH physical input % change	TPC-DS physical input % change
0	baseline	560	955	61,823	103,888	2.070 PiB	1.717 PiB	1.165 TiB	0.935 TiB	833.238 GiB	1.011 TiB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	paa union	526	955	59,081	105,007	1.793 PiB	1.659 PiB	1.169 TiB	0.940 TiB	833.230 GiB	1.011 TiB	-5.97	0.02	-4.44	1.08	-13.38	-3.34	0.36	0.53	-0.00	-0.05
2	ppa union + push pa through join	519	946	57,463	103,185	1.793 PiB	1.654 PiB	1.185 TiB	0.940 TiB	833.211 GiB	1.011 TiB	-7.21	-0.95	-7.05	-0.68	-13.38	-3.63	1.71	0.46	-0.00	-0.01

FAILED QUERIES

baseline

benchmark	query	mean_duration	std_dev
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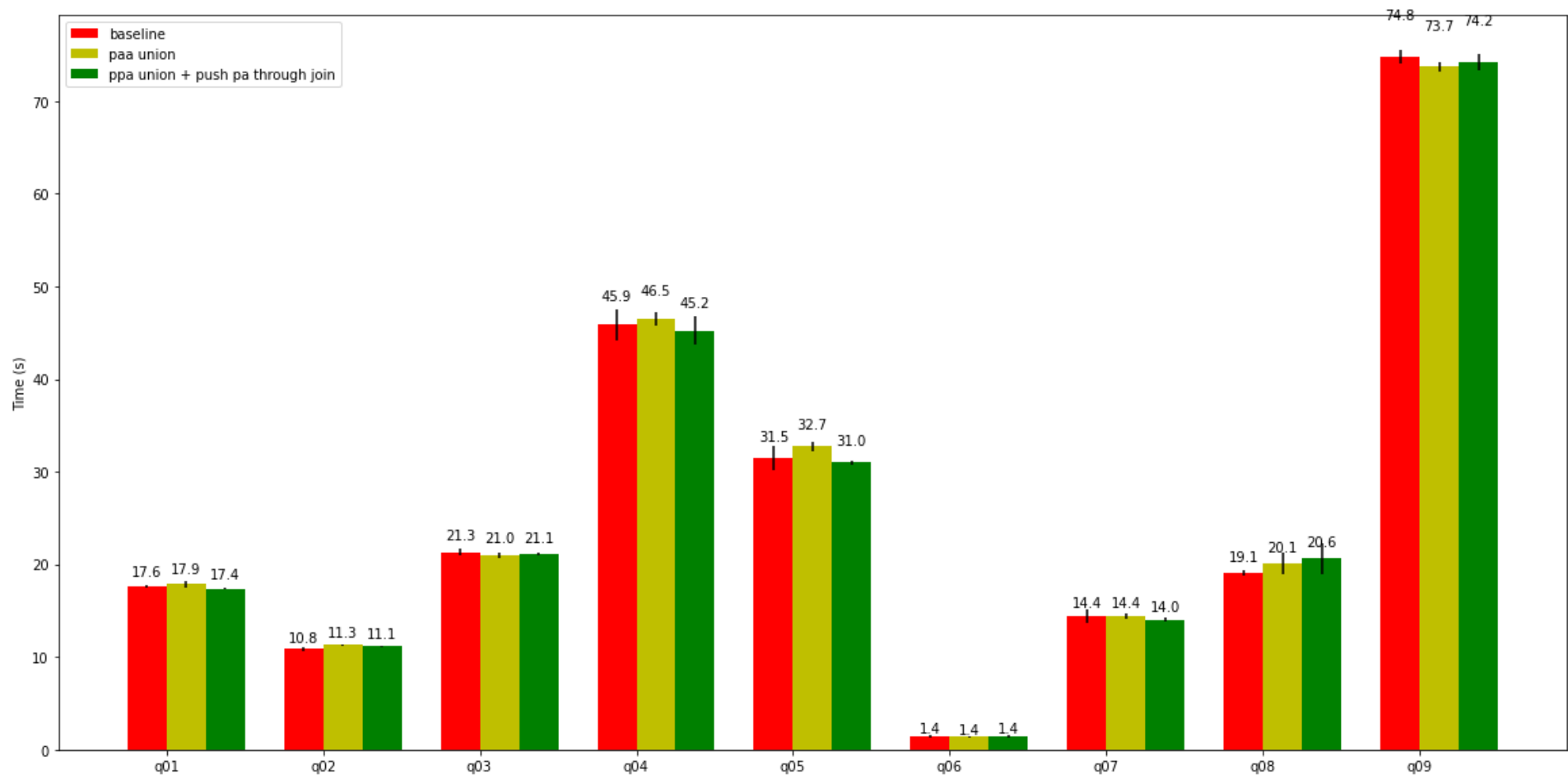
paa union

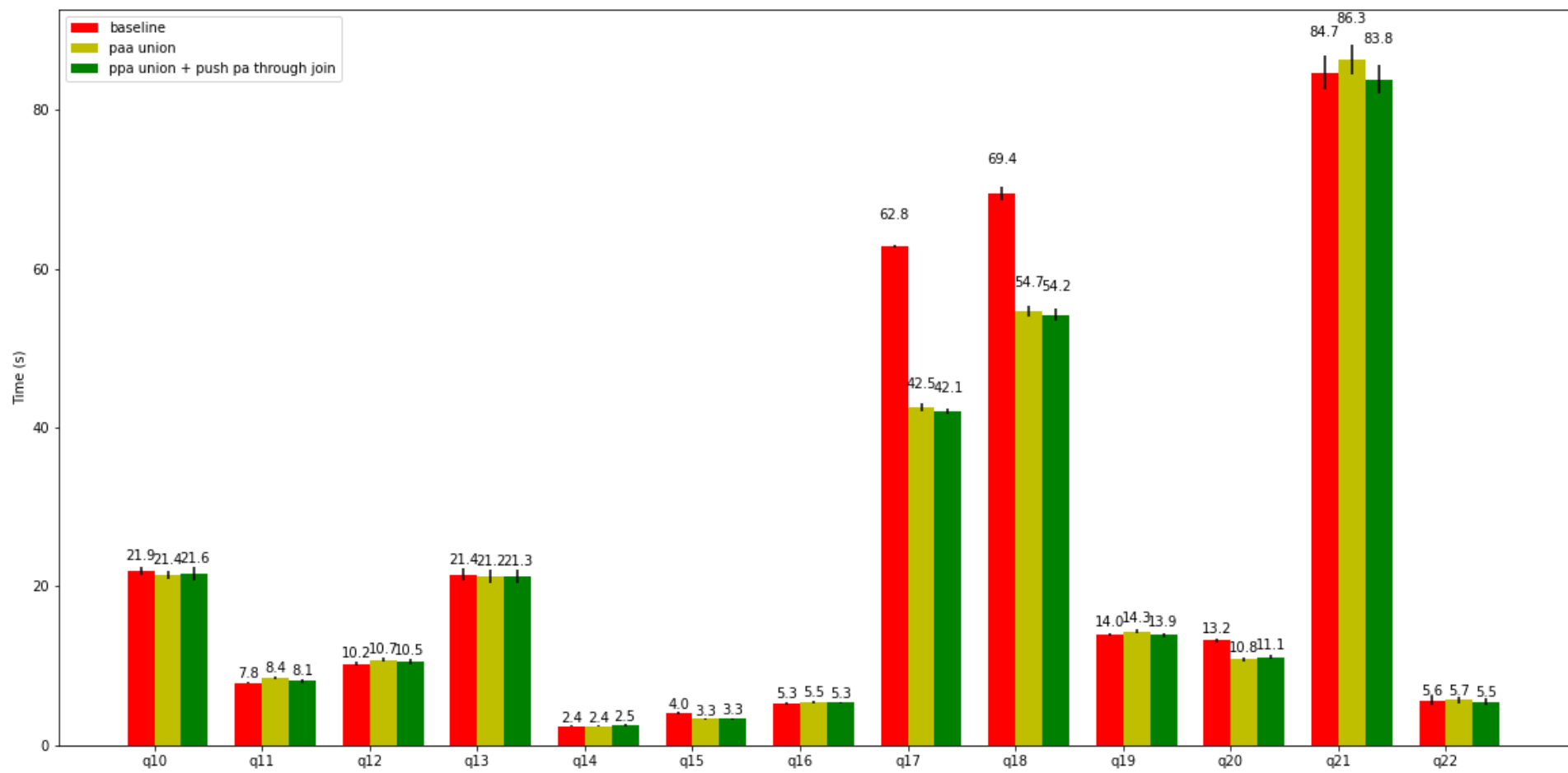
benchmark	query	mean_duration	std_dev
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ppa union + push pa through join

benchmark	query	mean_duration	std_dev
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TPC-H Comparison (DURATION)

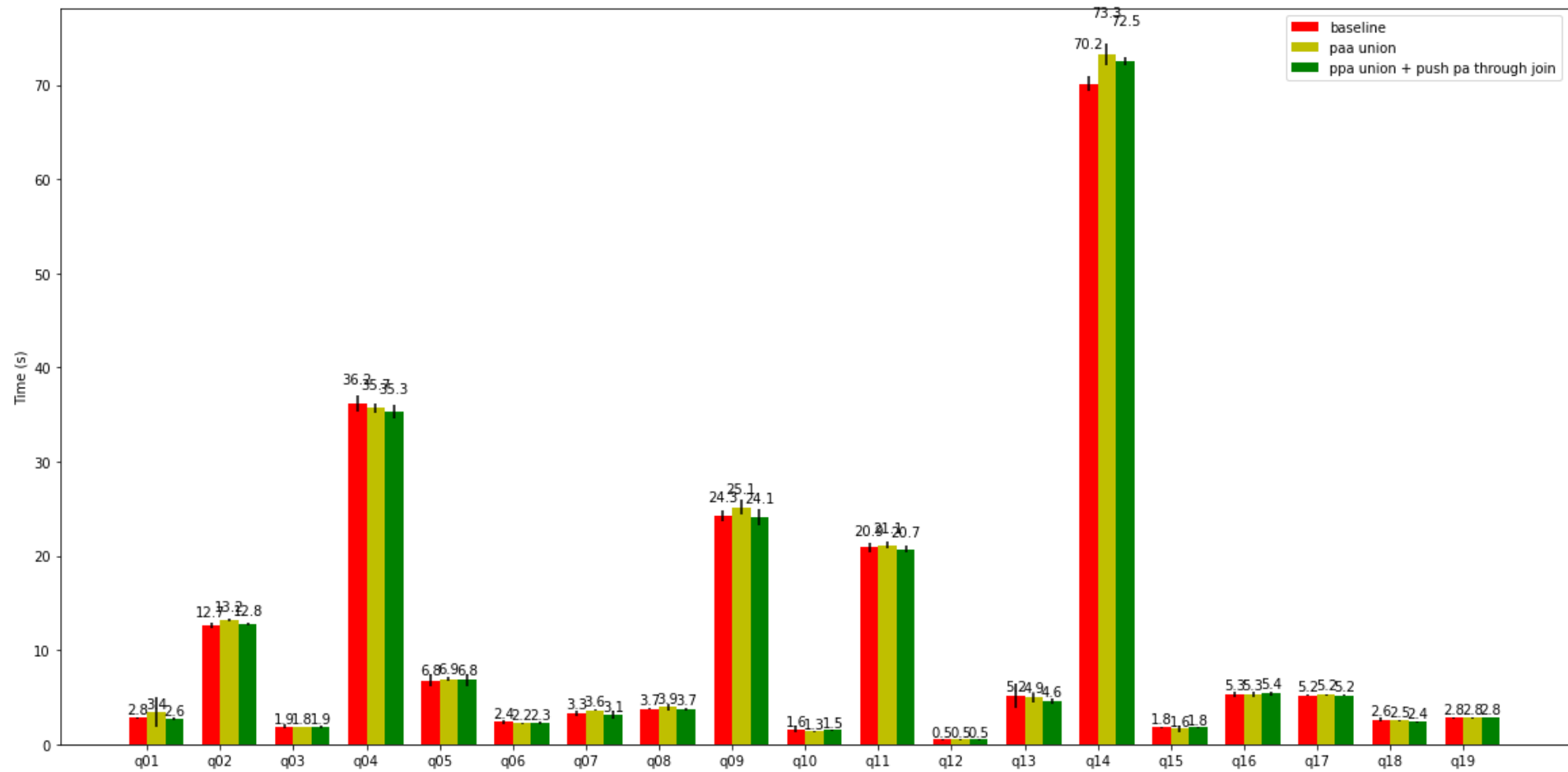


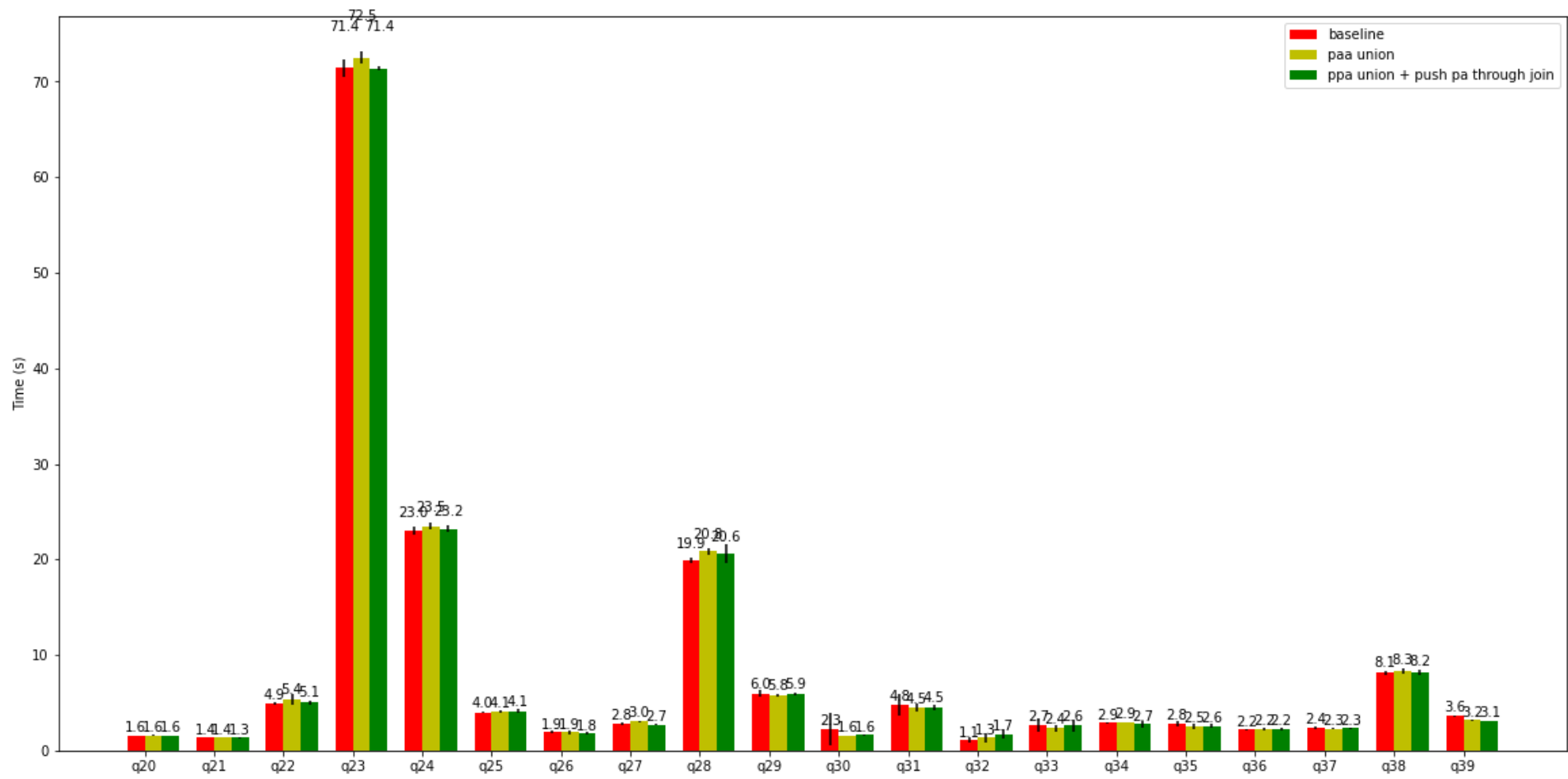


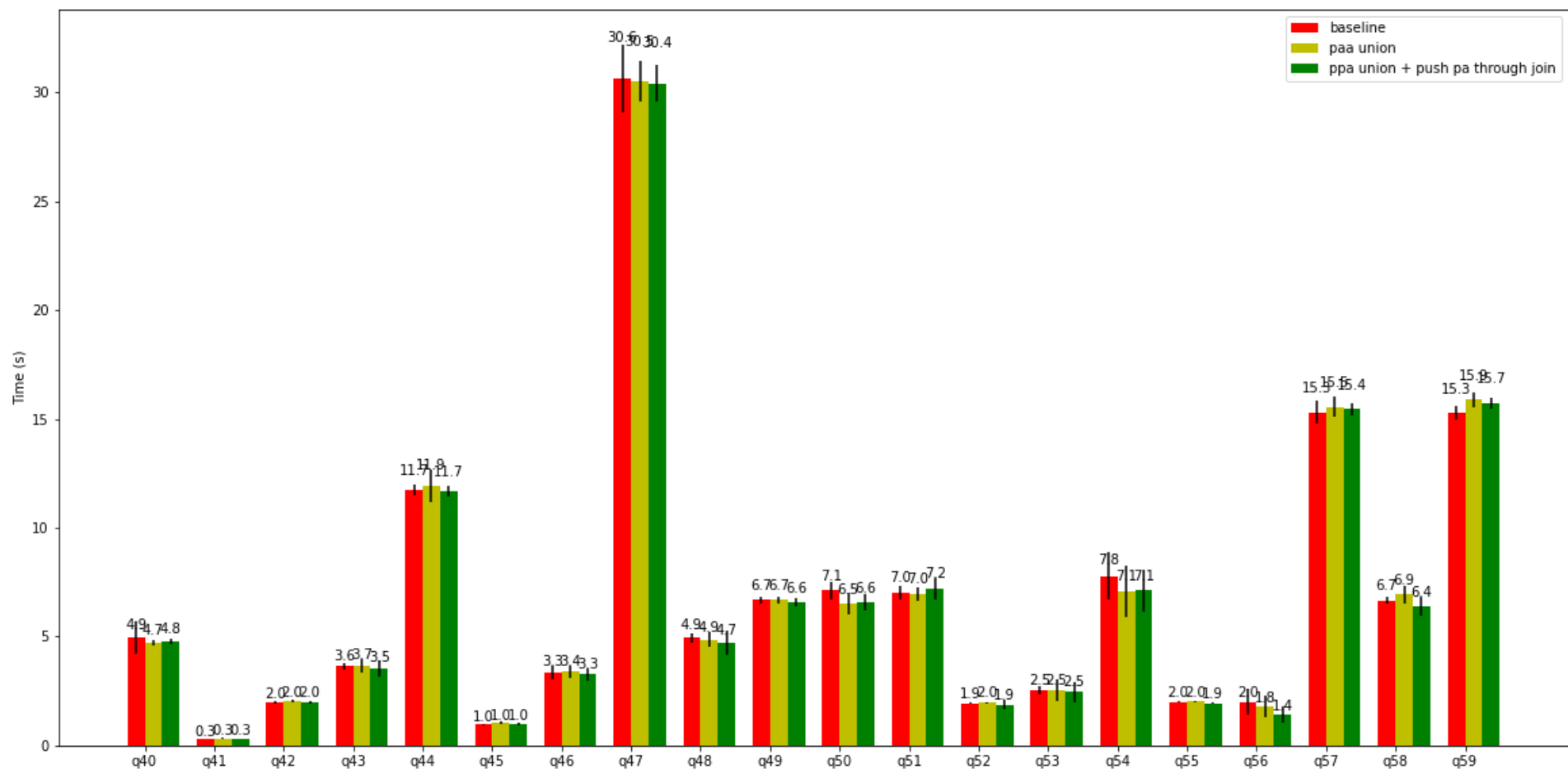
	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
16	presto/tpch: q17	62.79	0.21	42.51	0.47	42.06	0.36	-32.30	-20.28	-33.02	0.33	1.10	0.86	0.00000
17	presto/tpch: q18	69.45	0.86	54.66	0.69	54.20	0.78	-21.29	-14.79	-21.96	1.24	1.27	1.44	0.00000
19	presto/tpch: q20	13.18	0.26	10.79	0.20	11.12	0.32	-18.15	-2.39	-15.64	1.94	1.87	2.91	0.00000
8	presto/tpch: q09	74.79	0.72	73.70	0.51	74.21	0.93	-1.46	-1.09	-0.78	0.96	0.69	1.25	0.01281
14	presto/tpch: q15	4.05	0.20	3.29	0.10	3.31	0.07	-18.75	-0.76	-18.11	4.89	3.16	2.10	0.00001
9	presto/tpch: q10	21.88	0.52	21.45	0.46	21.59	0.83	-1.96	-0.43	-1.30	2.37	2.13	3.84	0.15856
2	presto/tpch: q03	21.32	0.33	21.02	0.26	21.11	0.18	-1.42	-0.30	-0.97	1.57	1.26	0.86	0.11154

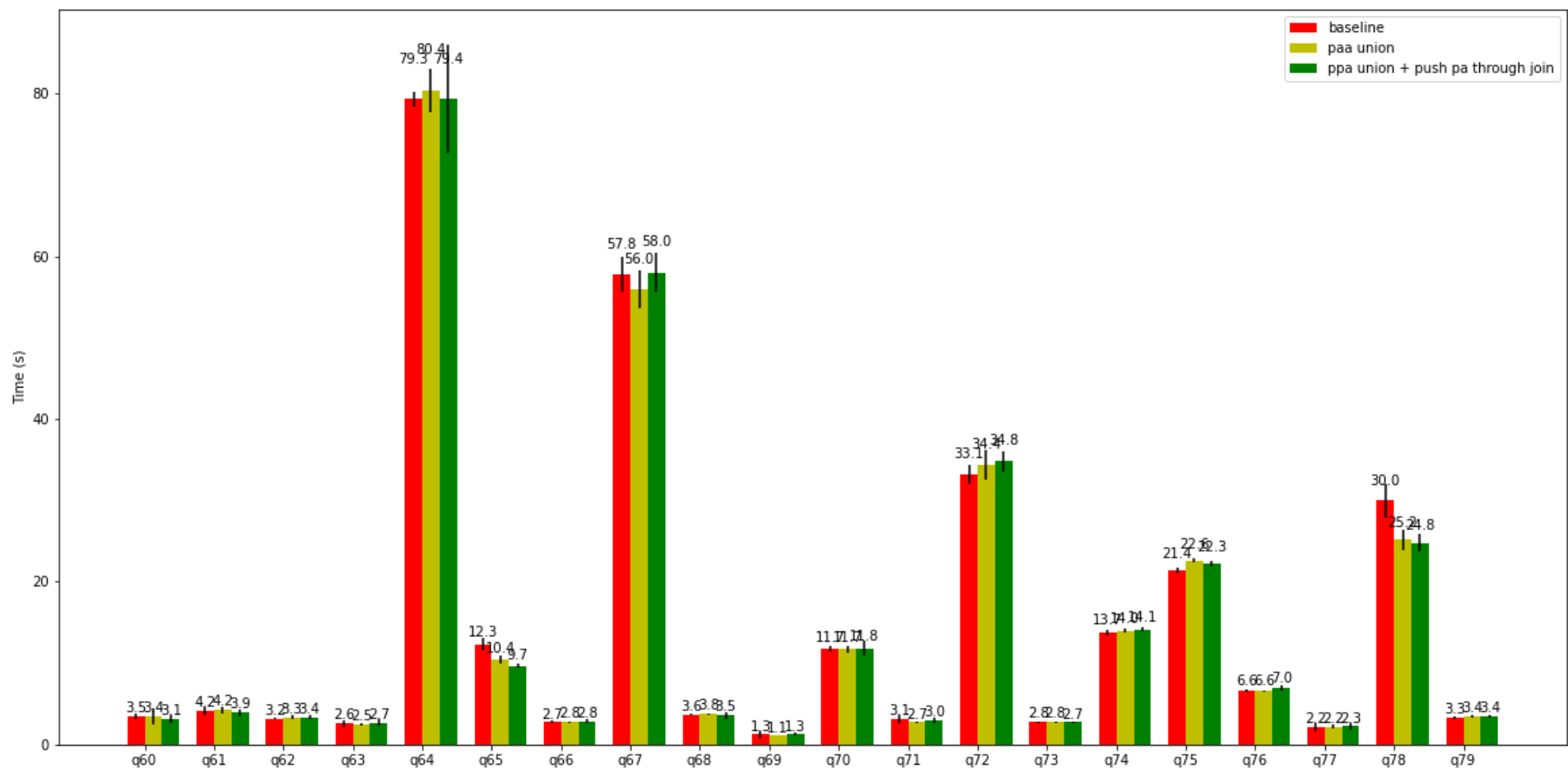
max 8
Name: % change base -> ppa union + push pa through join, dtype: float64

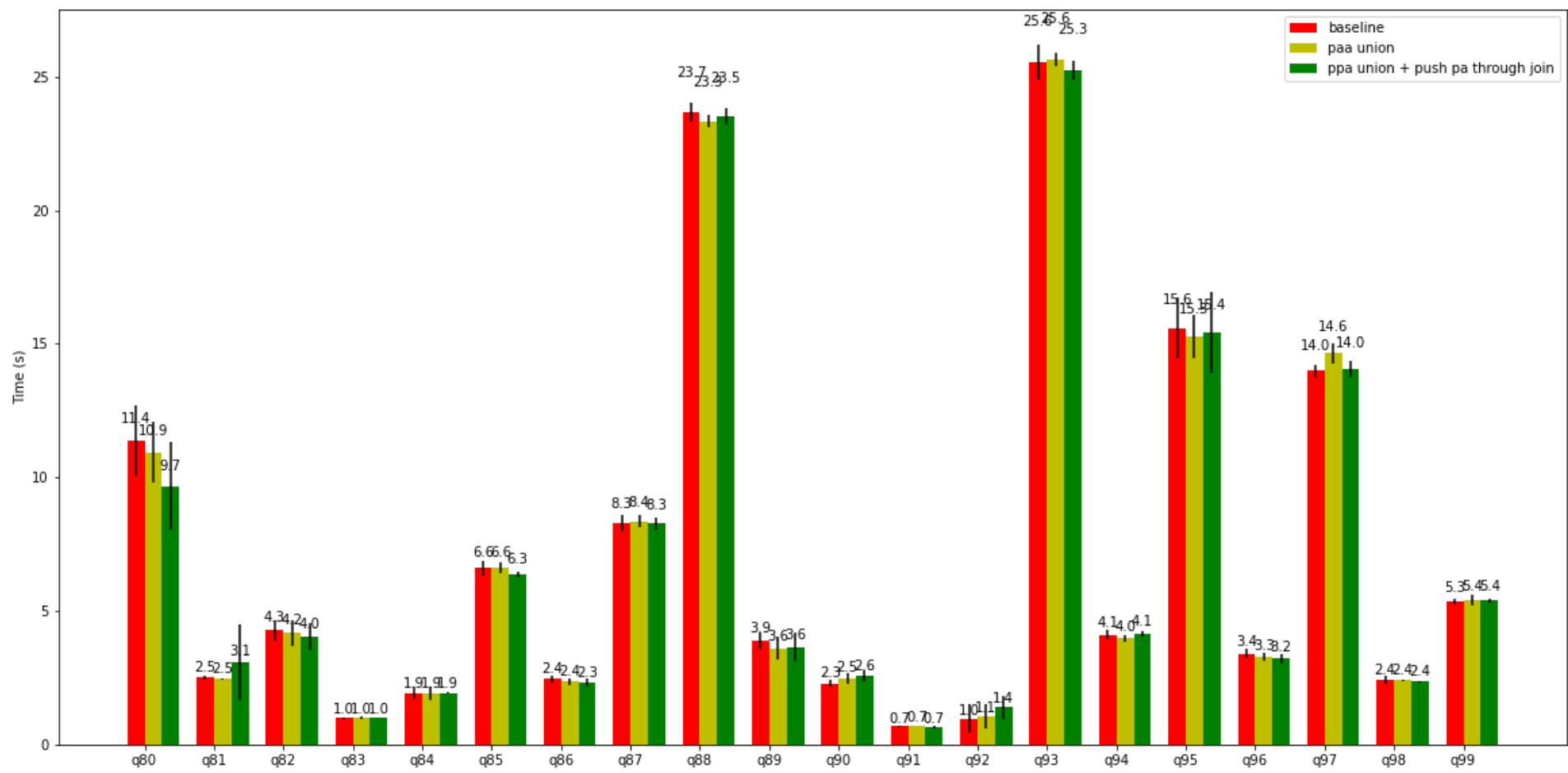
TPC-DS Comparison (DURATION)

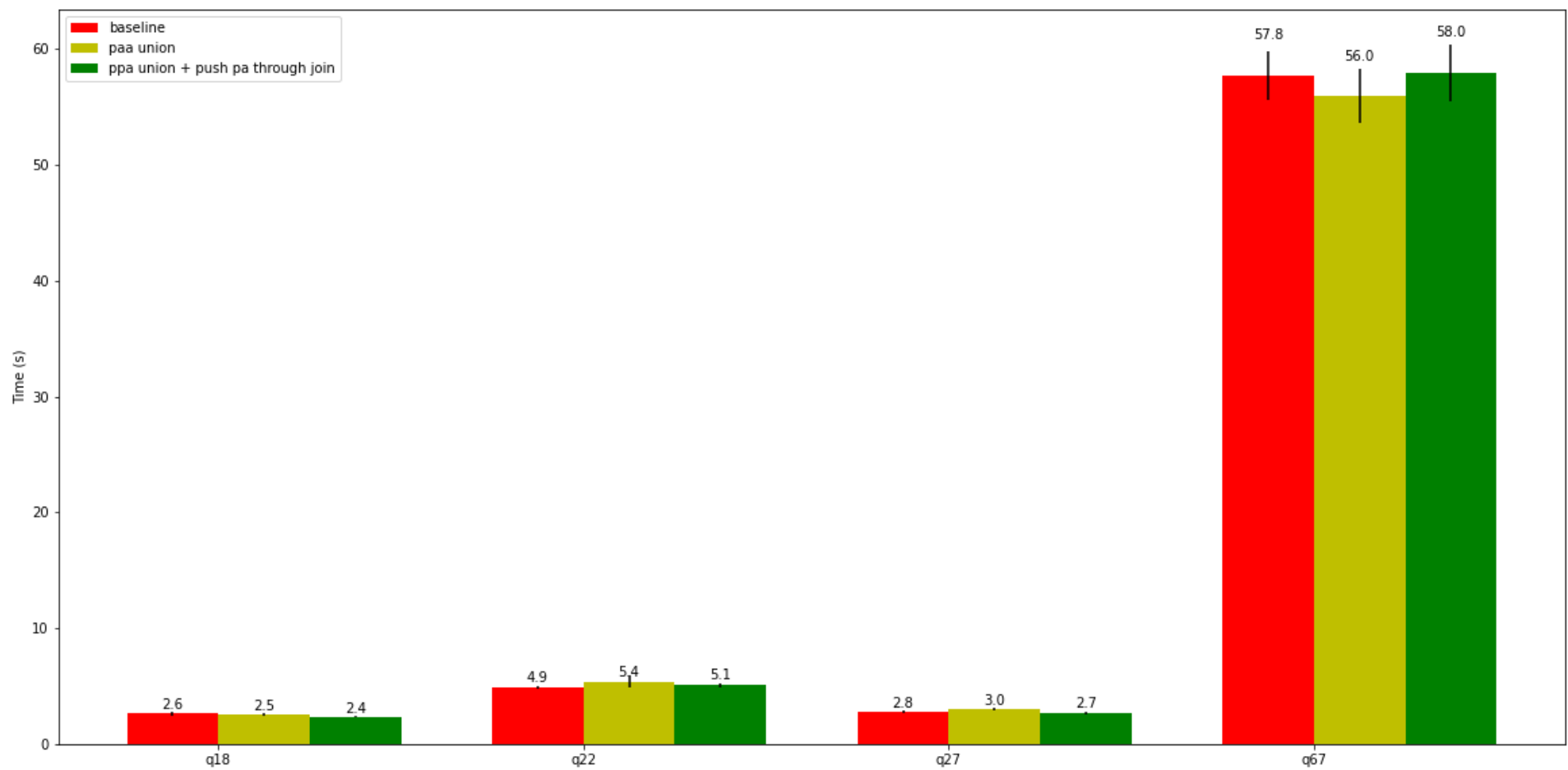












	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
77	presto/tpcds: q78	29.96	2.07	25.16	1.26	24.75	1.08	-16.00	-4.79	-17.37	6.90	5.01	4.35	0.00068
64	presto/tpcds: q65	12.33	0.73	10.39	0.48	9.67	0.28	-15.67	-1.93	-21.58	5.90	4.60	2.90	0.00029
66	presto/tpcds: q67	57.76	2.11	55.97	2.33	57.97	2.43	-3.10	-1.79	0.36	3.65	4.16	4.19	0.19292
53	presto/tpcds: q54	7.78	1.09	7.09	1.17	7.12	0.97	-8.86	-0.69	-8.51	14.00	16.48	13.61	0.31564
29	presto/tpcds: q30	2.26	1.69	1.57	0.02	1.61	0.03	-30.43	-0.69	-28.94	74.94	1.15	1.81	0.34346
49	presto/tpcds: q50	7.11	0.40	6.52	0.48	6.58	0.36	-8.31	-0.59	-7.40	5.69	7.44	5.44	0.04488
3	presto/tpcds: q04	36.19	0.85	35.71	0.53	35.31	0.71	-1.35	-0.49	-2.44	2.34	1.49	2.00	0.25983

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
38	presto/tpcds:q39	3.59	0.05	3.16	0.06	3.11	0.03	-12.03	-0.43	-13.38	1.39	1.88	1.01	0.00000
79	presto/tpcds:q80	11.36	1.31	10.94	1.14	9.67	1.63	-3.72	-0.42	-14.89	11.51	10.44	16.89	0.56458
32	presto/tpcds:q33	2.71	0.70	2.36	0.34	2.63	0.66	-12.89	-0.35	-2.95	25.97	14.61	25.20	0.30046
70	presto/tpcds:q71	3.08	0.47	2.73	0.12	2.98	0.29	-11.22	-0.35	-3.21	15.41	4.54	9.58	0.11530
87	presto/tpcds:q88	23.68	0.36	23.34	0.25	23.51	0.32	-1.45	-0.34	-0.71	1.54	1.06	1.34	0.08572
94	presto/tpcds:q95	15.59	1.15	15.28	0.81	15.42	1.51	-1.98	-0.31	-1.09	7.35	5.28	9.82	0.60115
88	presto/tpcds:q89	3.90	0.30	3.60	0.42	3.65	0.52	-7.73	-0.30	-6.52	7.67	11.68	14.27	0.18266
30	presto/tpcds:q31	4.76	1.15	4.46	0.43	4.52	0.30	-6.25	-0.30	-4.94	24.23	9.56	6.69	0.56648
34	presto/tpcds:q35	2.80	0.30	2.51	0.34	2.56	0.21	-10.57	-0.30	-8.87	10.83	13.39	8.23	0.13972
9	presto/tpcds:q10	1.60	0.32	1.35	0.13	1.48	0.13	-16.15	-0.26	-7.55	20.22	9.78	8.83	0.09995
55	presto/tpcds:q56	2.00	0.59	1.77	0.50	1.41	0.37	-11.51	-0.23	-29.44	29.48	28.11	26.07	0.48169
39	presto/tpcds:q40	4.94	0.75	4.72	0.13	4.76	0.11	-4.56	-0.23	-3.65	15.16	2.84	2.39	0.48513
12	presto/tpcds:q13	5.15	1.35	4.94	0.55	4.56	0.27	-4.18	-0.22	-11.44	26.23	11.11	5.96	0.72526
28	presto/tpcds:q29	5.97	0.31	5.77	0.15	5.93	0.14	-3.36	-0.20	-0.67	5.14	2.68	2.34	0.18333
68	presto/tpcds:q69	1.27	0.41	1.10	0.04	1.26	0.18	-12.95	-0.16	-0.41	32.69	3.28	14.33	0.35651
62	presto/tpcds:q63	2.62	0.41	2.46	0.17	2.67	0.41	-6.09	-0.16	2.04	15.84	6.76	15.25	0.40265
5	presto/tpcds:q06	2.39	0.23	2.24	0.04	2.28	0.10	-6.59	-0.16	-4.65	9.46	1.83	4.25	0.12378
14	presto/tpcds:q15	1.79	0.05	1.63	0.30	1.78	0.06	-8.49	-0.15	-0.28	3.05	18.46	3.29	0.25348
93	presto/tpcds:q94	4.11	0.19	3.96	0.13	4.14	0.12	-3.46	-0.14	0.93	4.66	3.39	2.83	0.16748
46	presto/tpcds:q47	30.63	1.55	30.50	0.93	30.41	0.82	-0.44	-0.14	-0.71	5.07	3.04	2.69	0.85824
95	presto/tpcds:q96	3.41	0.19	3.29	0.15	3.22	0.18	-3.36	-0.11	-5.40	5.45	4.65	5.63	0.27151

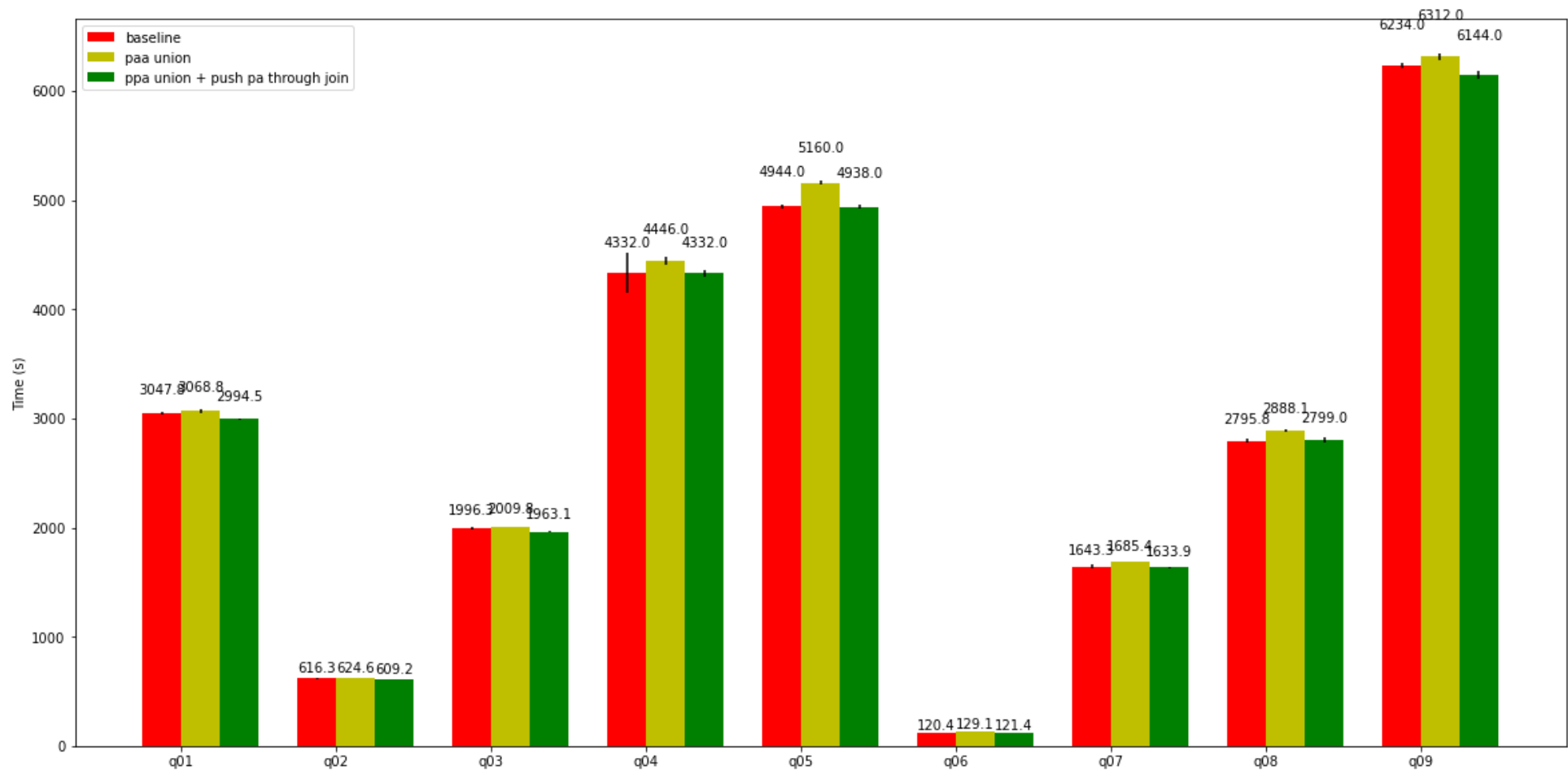
	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
17	presto/tpcds:q18	2.61	0.20	2.51	0.12	2.36	0.06	-3.71	-0.10	-9.31	7.59	4.63	2.51	0.32583
81	presto/tpcds:q82	4.28	0.39	4.18	0.48	4.04	0.49	-2.20	-0.09	-5.57	9.06	11.47	12.20	0.71677
36	presto/tpcds:q37	2.37	0.11	2.29	0.06	2.34	0.06	-3.62	-0.09	-1.41	4.69	2.64	2.43	0.12731
85	presto/tpcds:q86	2.44	0.13	2.36	0.13	2.32	0.16	-3.50	-0.09	-4.97	5.39	5.67	6.74	0.29107
47	presto/tpcds:q48	4.94	0.23	4.86	0.36	4.72	0.57	-1.66	-0.08	-4.46	4.59	7.34	12.16	0.64509
50	presto/tpcds:q51	7.02	0.30	6.97	0.31	7.22	0.50	-0.78	-0.05	2.78	4.22	4.46	6.86	0.76163
80	presto/tpcds:q81	2.50	0.06	2.46	0.04	3.08	1.42	-1.73	-0.04	23.47	2.31	1.49	46.14	0.15196
2	presto/tpcds:q03	1.88	0.22	1.84	0.03	1.85	0.14	-2.08	-0.04	-1.40	11.77	1.63	7.62	0.67650
69	presto/tpcds:q70	11.72	0.38	11.69	0.35	11.84	0.90	-0.29	-0.03	0.99	3.21	2.99	7.62	0.87399
83	presto/tpcds:q84	1.93	0.22	1.91	0.25	1.92	0.04	-1.36	-0.03	-0.53	11.53	13.06	1.84	0.85084
59	presto/tpcds:q60	3.46	0.38	3.44	0.98	3.13	0.55	-0.42	-0.01	-9.37	10.89	28.43	17.55	0.97333
75	presto/tpcds:q76	6.61	0.16	6.60	0.09	6.99	0.33	-0.16	-0.01	5.72	2.48	1.35	4.76	0.89466
97	presto/tpcds:q98	2.42	0.15	2.41	0.03	2.36	0.03	-0.34	-0.01	-2.54	6.20	1.07	1.19	0.89589
15	presto/tpcds:q16	5.28	0.24	5.27	0.27	5.37	0.26	-0.12	-0.01	1.68	4.64	5.19	4.82	0.96800
20	presto/tpcds:q21	1.39	0.05	1.38	0.03	1.34	0.03	-0.41	-0.01	-3.53	3.95	2.17	2.36	0.82867
52	presto/tpcds:q53	2.54	0.18	2.54	0.52	2.45	0.47	0.11	0.00	-3.30	7.29	20.65	19.35	0.99028
25	presto/tpcds:q26	1.91	0.14	1.91	0.24	1.81	0.16	0.24	0.00	-5.09	7.14	12.62	8.95	0.96910
84	presto/tpcds:q85	6.60	0.28	6.60	0.21	6.35	0.11	0.09	0.01	-3.76	4.24	3.19	1.70	0.96640
18	presto/tpcds:q19	2.79	0.05	2.80	0.09	2.81	0.03	0.34	0.01	0.51	1.85	3.22	1.08	0.82744
48	presto/tpcds:q49	6.67	0.17	6.69	0.15	6.55	0.18	0.17	0.01	-1.79	2.53	2.26	2.78	0.90354
72	presto/tpcds:q73	2.76	0.05	2.77	0.06	2.72	0.05	0.45	0.01	-1.28	1.96	2.29	1.85	0.72430

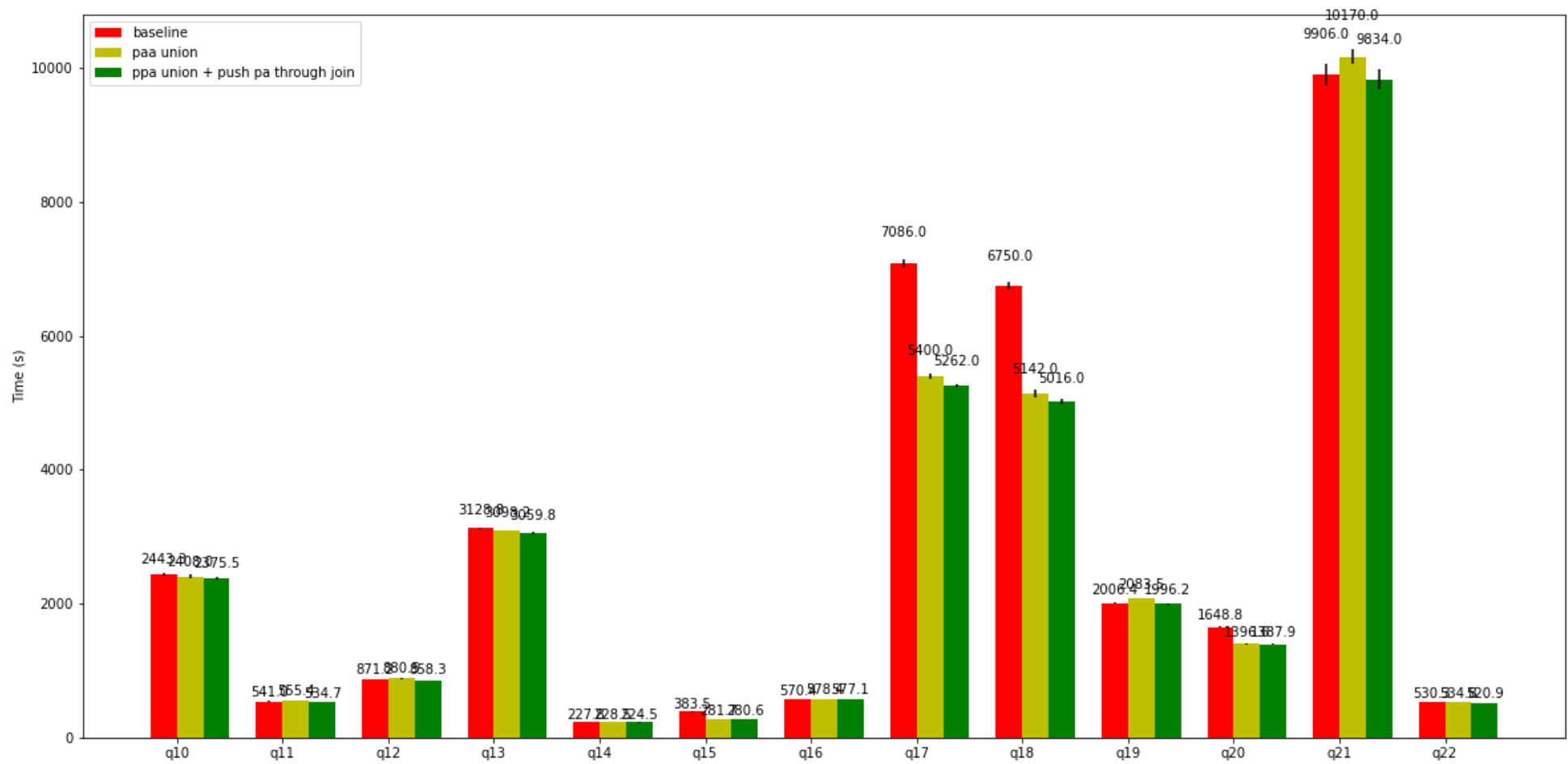
	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
40	presto/tpcds:q41	0.30	0.01	0.32	0.02	0.31	0.01	5.20	0.02	3.34	4.74	5.63	4.52	0.12414
90	presto/tpcds:q91	0.67	0.04	0.69	0.01	0.67	0.05	2.42	0.02	-1.21	6.44	1.61	7.91	0.39314
82	presto/tpcds:q83	0.98	0.03	1.00	0.04	1.00	0.02	2.02	0.02	1.85	3.38	3.69	1.66	0.35051
19	presto/tpcds:q20	1.57	0.02	1.59	0.03	1.57	0.01	1.51	0.02	-0.15	1.21	1.74	0.85	0.11502
65	presto/tpcds:q66	2.72	0.15	2.76	0.11	2.84	0.23	1.17	0.03	4.29	5.61	3.89	8.13	0.68479
54	presto/tpcds:q55	1.99	0.03	2.02	0.04	1.94	0.01	1.66	0.03	-2.63	1.49	1.76	0.73	0.11139
76	presto/tpcds:q77	2.15	0.46	2.19	0.19	2.26	0.45	1.78	0.04	4.79	21.22	8.62	19.76	0.85321
41	presto/tpcds:q42	1.97	0.04	2.01	0.06	1.97	0.05	2.18	0.04	0.05	2.14	2.81	2.38	0.16662
45	presto/tpcds:q46	3.34	0.31	3.38	0.30	3.26	0.28	1.33	0.04	-2.37	9.23	8.82	8.53	0.80510
42	presto/tpcds:q43	3.63	0.14	3.68	0.30	3.54	0.39	1.29	0.05	-2.36	3.75	8.28	10.95	0.73860
86	presto/tpcds:q87	8.30	0.31	8.35	0.23	8.27	0.21	0.60	0.05	-0.46	3.69	2.81	2.52	0.75917
35	presto/tpcds:q36	2.19	0.08	2.24	0.12	2.22	0.15	2.34	0.05	1.47	3.44	5.47	6.68	0.40404
33	presto/tpcds:q34	2.89	0.08	2.94	0.07	2.74	0.31	1.86	0.05	-5.03	2.70	2.29	11.23	0.22962
51	presto/tpcds:q52	1.92	0.04	1.98	0.03	1.88	0.22	2.82	0.05	-2.03	2.00	1.58	11.42	0.02333
11	presto/tpcds:q12	0.48	0.02	0.53	0.08	0.51	0.04	11.37	0.05	6.33	3.42	14.16	8.45	0.11516
16	presto/tpcds:q17	5.18	0.08	5.24	0.04	5.20	0.10	1.10	0.06	0.40	1.50	0.82	1.89	0.14625
44	presto/tpcds:q45	0.96	0.05	1.01	0.06	0.99	0.05	6.09	0.06	3.38	5.73	6.13	4.69	0.11621
78	presto/tpcds:q79	3.33	0.18	3.39	0.18	3.42	0.15	1.85	0.06	2.59	5.31	5.35	4.28	0.56558
98	presto/tpcds:q99	5.34	0.11	5.40	0.21	5.38	0.08	1.20	0.06	0.83	2.03	3.89	1.53	0.52295
60	presto/tpcds:q61	4.16	0.47	4.23	0.47	3.92	0.43	1.65	0.07	-5.78	11.30	11.17	10.88	0.80570
91	presto/tpcds:q92	0.98	0.54	1.05	0.46	1.39	0.43	7.80	0.08	42.06	55.68	43.54	30.99	0.79827

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
92	presto/tpcds:q93	25.55	0.64	25.65	0.25	25.26	0.35	0.38	0.10	-1.14	2.52	0.99	1.40	0.73954
24	presto/tpcds:q25	3.99	0.06	4.09	0.16	4.13	0.26	2.43	0.10	3.43	1.50	3.83	6.31	0.18751
67	presto/tpcds:q68	3.65	0.06	3.75	0.07	3.54	0.35	2.85	0.10	-2.98	1.64	1.99	9.87	0.02402
4	presto/tpcds:q05	6.76	0.65	6.90	0.20	6.85	0.66	2.08	0.14	1.25	9.65	2.95	9.58	0.62513
61	presto/tpcds:q62	3.17	0.11	3.33	0.29	3.36	0.25	5.17	0.16	5.85	3.31	8.57	7.41	0.21644
37	presto/tpcds:q38	8.11	0.16	8.31	0.26	8.16	0.25	2.37	0.19	0.53	2.02	3.15	3.07	0.15835
7	presto/tpcds:q08	3.74	0.05	3.93	0.30	3.73	0.12	5.28	0.20	-0.16	1.30	7.69	3.12	0.14620
89	presto/tpcds:q90	2.29	0.13	2.49	0.20	2.57	0.19	8.80	0.20	12.22	5.79	8.05	7.25	0.06732
43	presto/tpcds:q44	11.72	0.25	11.94	0.75	11.67	0.23	1.91	0.22	-0.41	2.12	6.26	1.97	0.50226
73	presto/tpcds:q74	13.74	0.40	13.96	0.22	14.12	0.22	1.65	0.23	2.75	2.92	1.61	1.58	0.25614
10	presto/tpcds:q11	20.92	0.53	21.15	0.40	20.73	0.40	1.08	0.23	-0.92	2.53	1.90	1.94	0.42460
31	presto/tpcds:q32	1.09	0.30	1.33	0.46	1.70	0.51	21.39	0.23	55.00	27.47	34.30	30.24	0.31835
56	presto/tpcds:q57	15.30	0.52	15.53	0.47	15.44	0.29	1.54	0.24	0.93	3.41	3.01	1.87	0.42956
26	presto/tpcds:q27	2.78	0.16	3.03	0.10	2.70	0.11	8.89	0.25	-2.83	5.74	3.38	4.18	0.00961
57	presto/tpcds:q58	6.66	0.16	6.92	0.41	6.39	0.44	3.88	0.26	-4.07	2.40	5.89	6.88	0.17884
6	presto/tpcds:q07	3.32	0.29	3.61	0.08	3.12	0.39	8.46	0.28	-6.14	8.70	2.25	12.63	0.04486
21	presto/tpcds:q22	4.89	0.11	5.36	0.52	5.06	0.21	9.71	0.47	3.50	2.31	9.72	4.19	0.05427
23	presto/tpcds:q24	22.98	0.45	23.50	0.41	23.19	0.35	2.26	0.52	0.92	1.96	1.76	1.51	0.06365
1	presto/tpcds:q02	12.65	0.31	13.21	0.19	12.75	0.11	4.38	0.55	0.79	2.44	1.47	0.85	0.00394
58	presto/tpcds:q59	15.26	0.31	15.88	0.34	15.73	0.24	4.12	0.63	3.13	2.05	2.16	1.52	0.00781
0	presto/tpcds:q01	2.78	0.09	3.41	1.56	2.65	0.14	22.65	0.63	-4.79	3.18	45.73	5.19	0.34664

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
96	presto/tpcds:q97	13.99	0.23	14.64	0.38	14.05	0.31	4.68	0.65	0.42	1.63	2.63	2.22	0.00498
8	presto/tpcds:q09	24.31	0.56	25.14	0.81	24.14	0.89	3.40	0.83	-0.72	2.32	3.21	3.69	0.06683
27	presto/tpcds:q28	19.88	0.26	20.84	0.37	20.61	0.94	4.82	0.96	3.66	1.31	1.77	4.55	0.00040
22	presto/tpcds:q23	71.42	0.91	72.52	0.65	71.40	0.24	1.53	1.10	-0.03	1.27	0.89	0.33	0.03684
63	presto/tpcds:q64	79.29	0.93	80.40	2.64	79.38	6.60	1.40	1.11	0.12	1.18	3.29	8.31	0.35554
74	presto/tpcds:q75	21.43	0.36	22.63	0.26	22.26	0.29	5.57	1.19	3.85	1.67	1.16	1.31	0.00006
71	presto/tpcds:q72	33.14	1.16	34.37	1.83	34.82	1.25	3.71	1.23	5.08	3.51	5.32	3.58	0.19559
13	presto/tpcds:q14	70.16	0.80	73.27	1.13	72.54	0.46	4.43	3.11	3.39	1.14	1.54	0.63	0.00026
count	99													
mean	-0													
std	7													
min	-30													
25%	-3													
50%	0													
75%	2													
max	23													
Name:	% change, dtype: float64													
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mean	-1													
std	10													
min	-29													
25%	-4													
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75%	1													
max	55													
Name:	% change base -> ppa union + push pa through join, dtype: float64													

TPC-H Comparison (CPU)

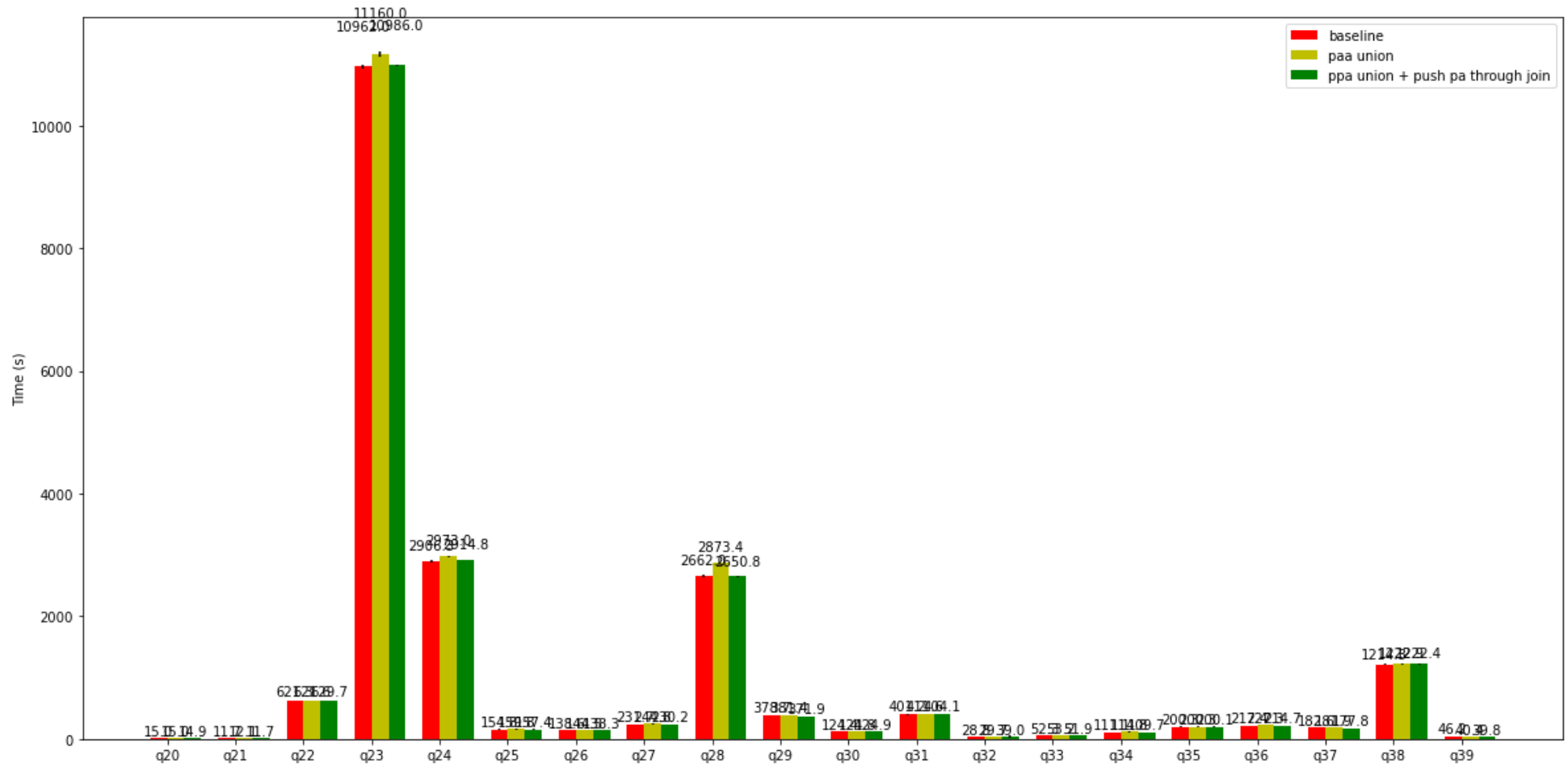


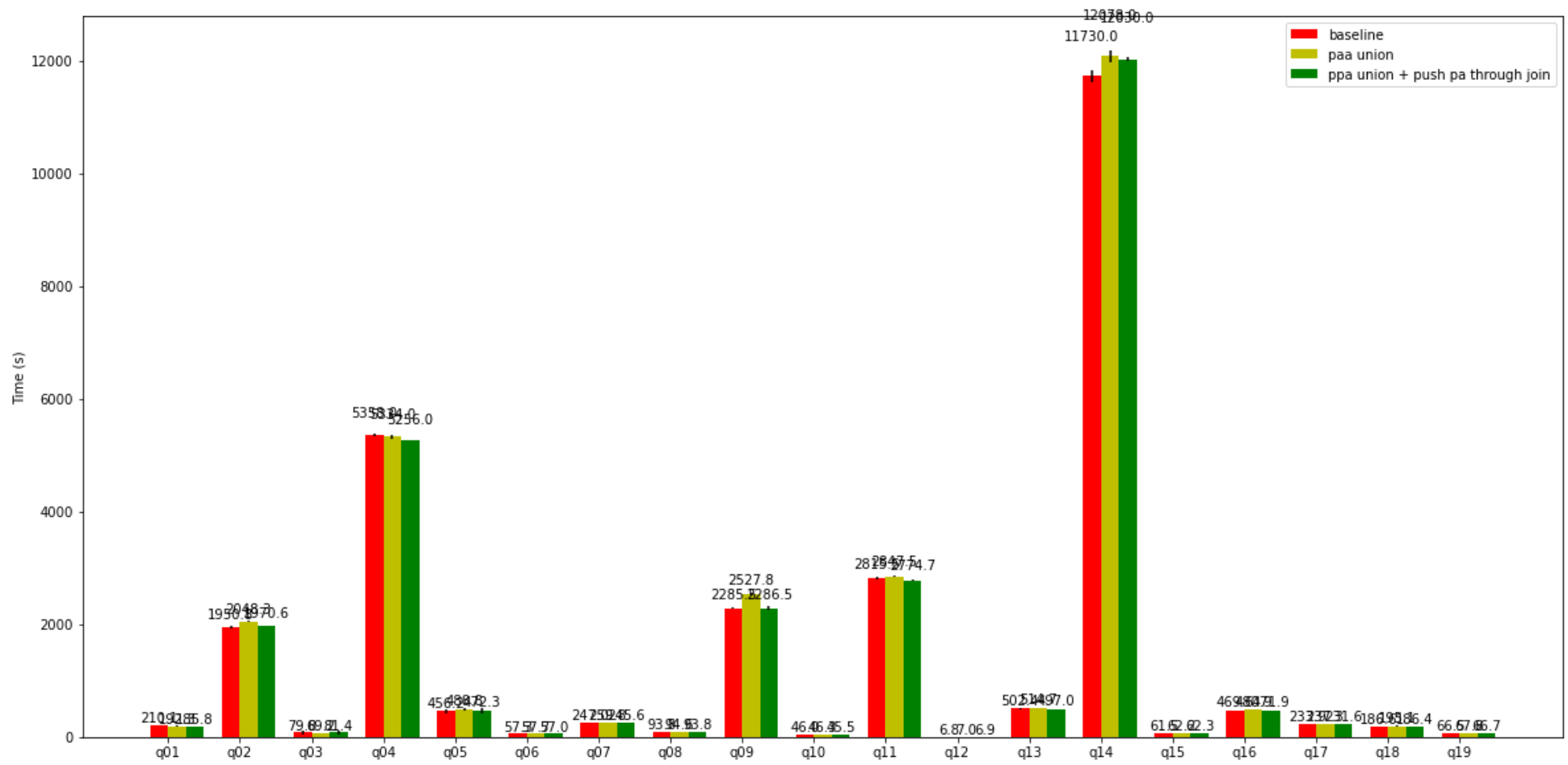


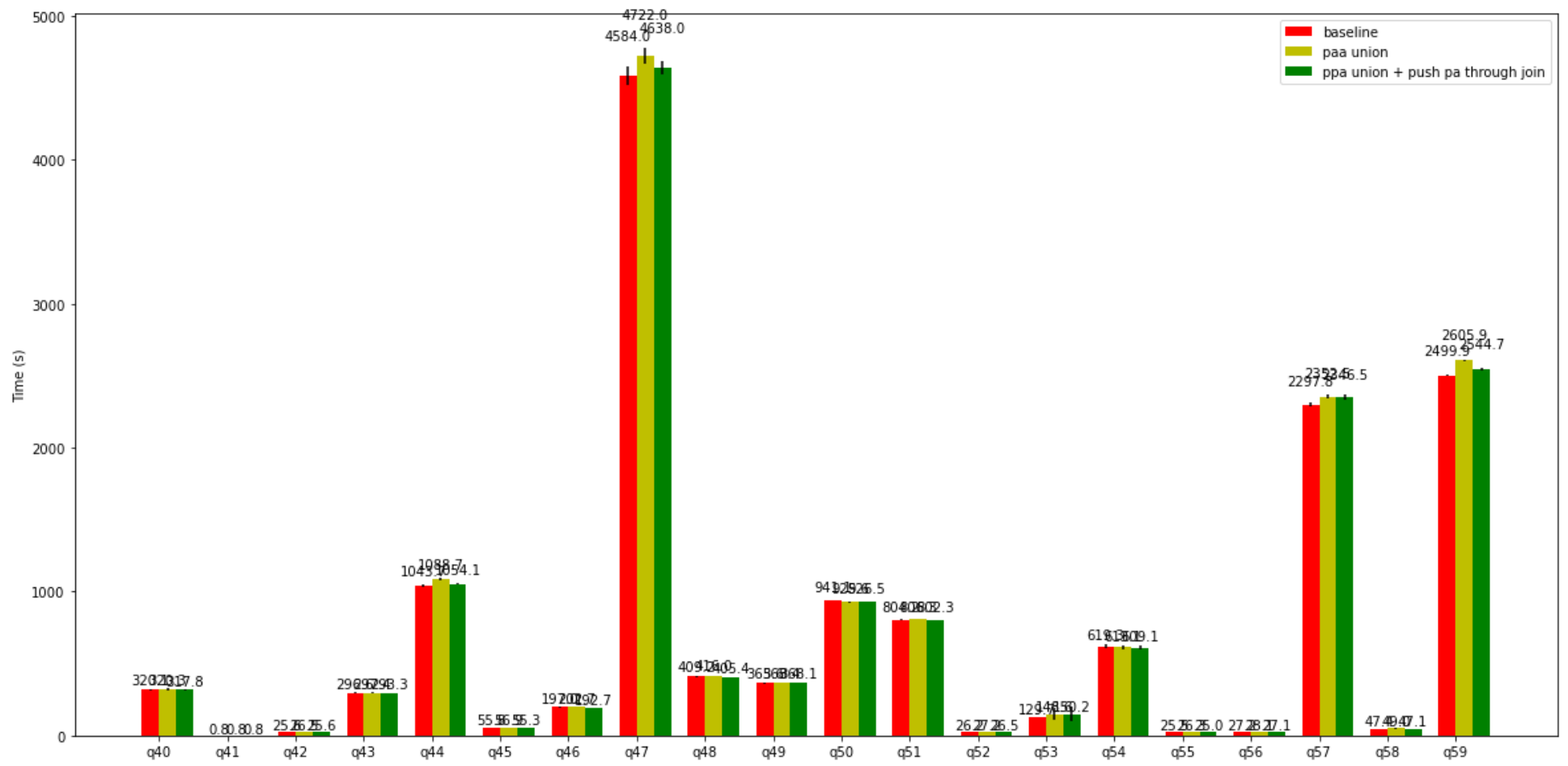
query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
14 presto/tpch: q15	383.50	2.13	281.70	0.83	280.60	1.12	-26.54	-101.80	-26.83	0.55	0.29	0.40	0.00000
17 presto/tpch: q18	6750.00	59.15	5142.00	52.99	5016.00	43.60	-23.82	-1608.00	-25.69	0.88	1.03	0.87	0.00000
16 presto/tpch: q17	7086.00	52.99	5400.00	39.44	5262.00	14.70	-23.79	-1686.00	-25.74	0.75	0.73	0.28	0.00000
19 presto/tpch: q20	1648.80	11.56	1396.60	16.29	1387.90	8.76	-15.30	-252.20	-15.82	0.70	1.17	0.63	0.00000
9 presto/tpch: q10	2443.30	21.63	2408.00	24.32	2375.50	16.93	-1.44	-35.30	-2.77	0.89	1.01	0.71	0.02403
12 presto/tpch: q13	3128.80	8.75	3098.20	5.89	3059.80	23.28	-0.98	-30.60	-2.21	0.28	0.19	0.76	0.00003
13 presto/tpch: q14	227.80	1.35	228.50	2.09	224.50	1.99	0.31	0.70	-1.45	0.59	0.92	0.89	0.50686

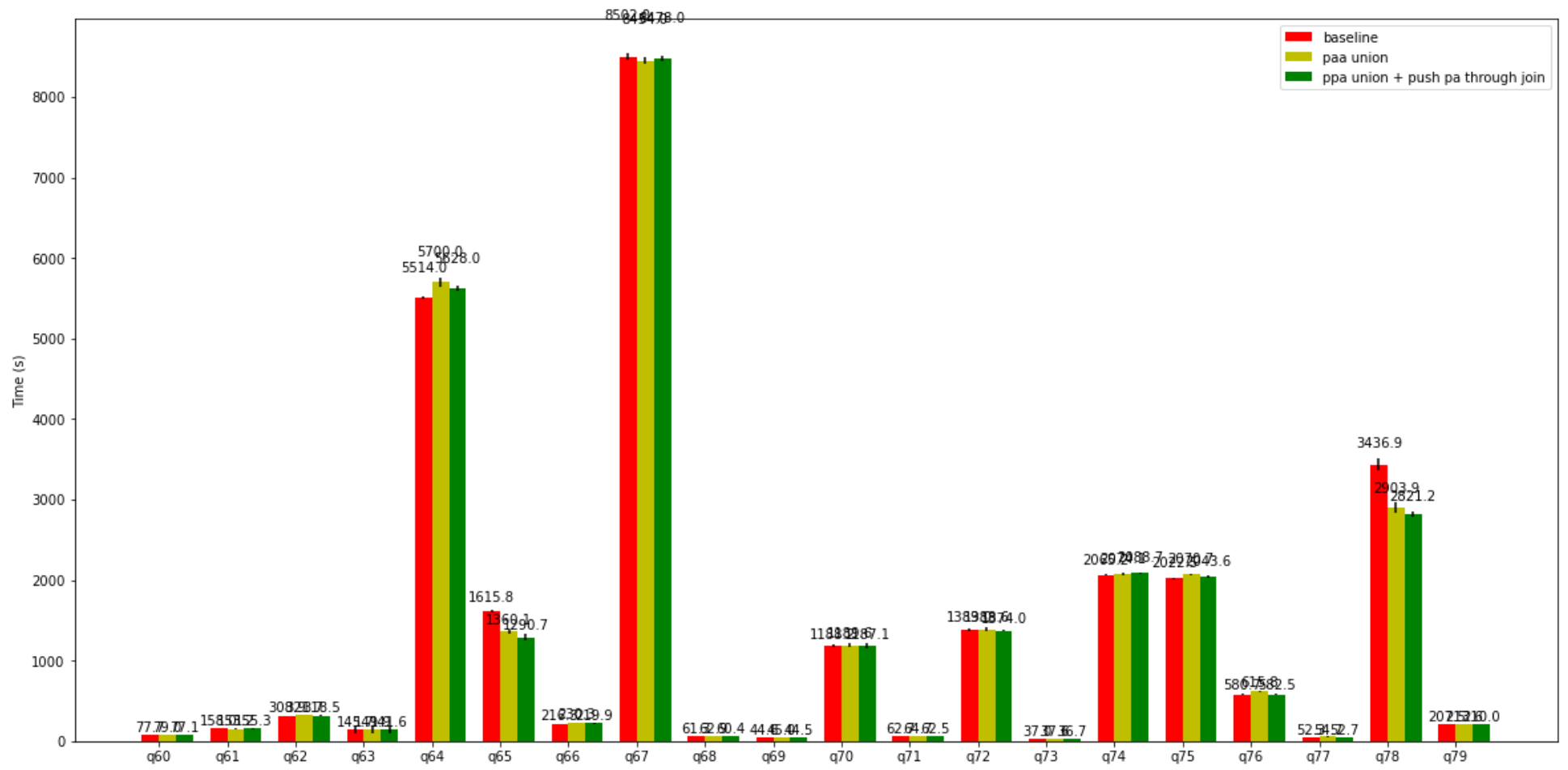
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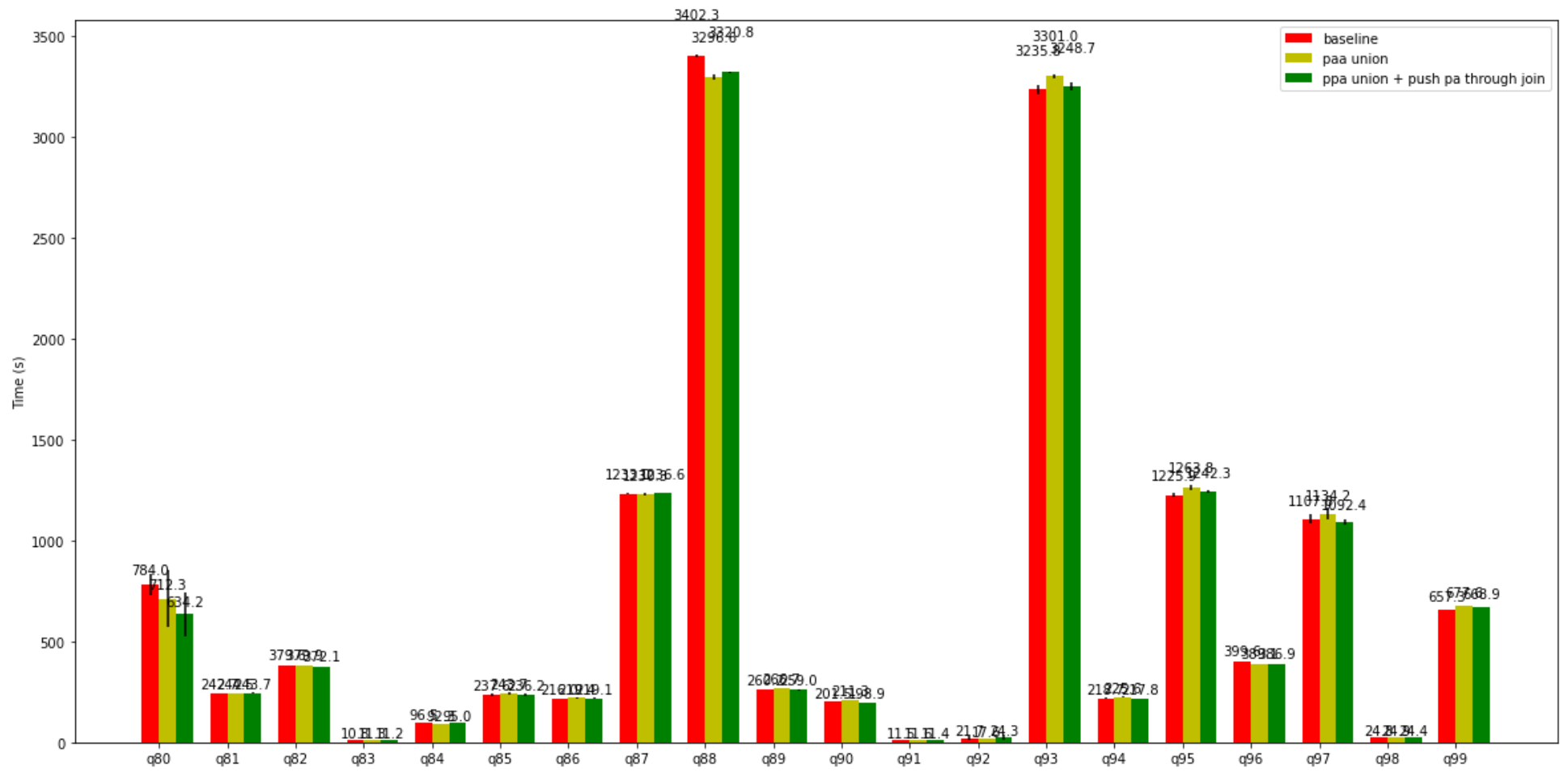
TPC-DS Comparison (CPU)

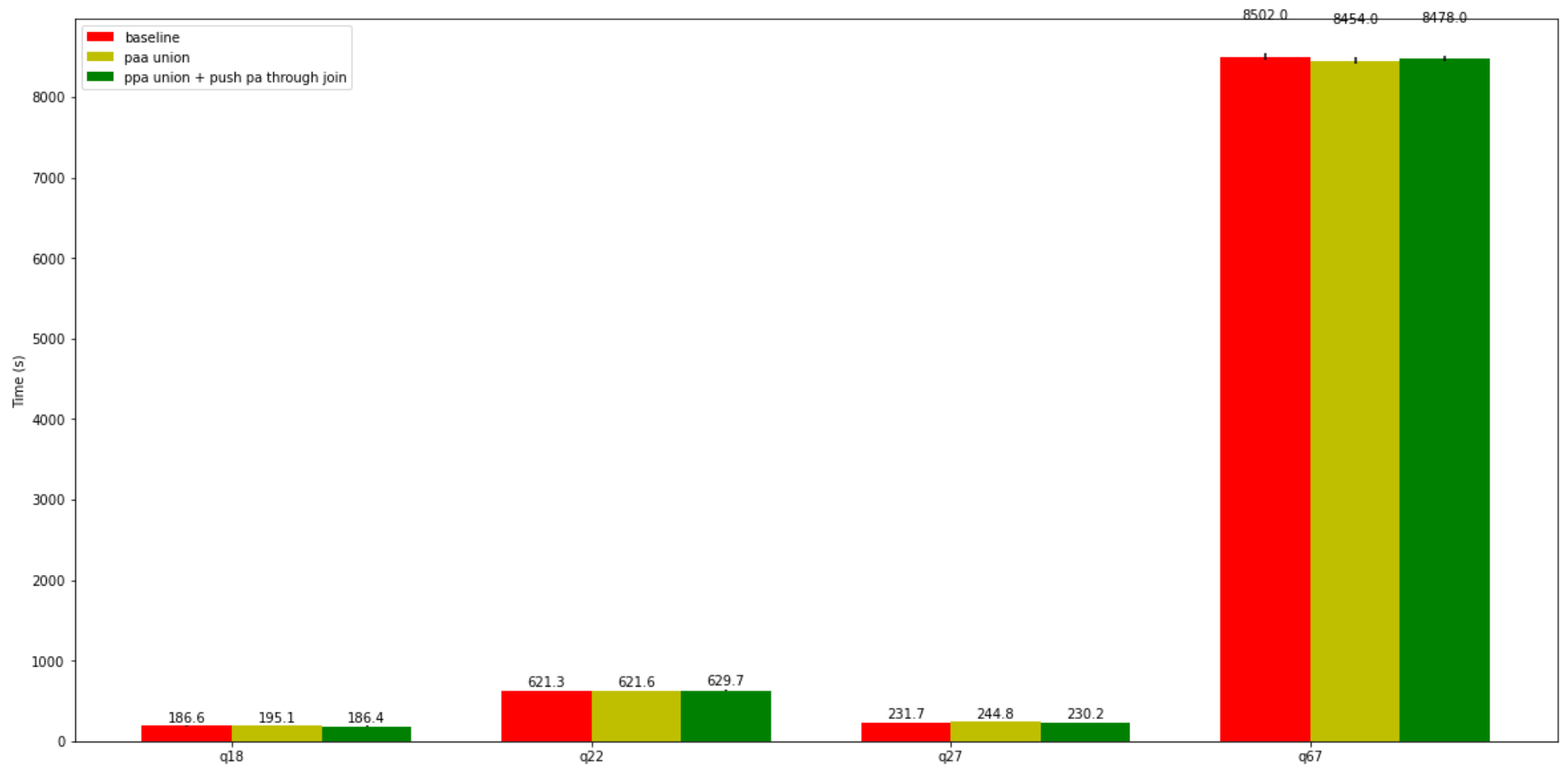












query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
91 presto/tpcds: q92	21.68	11.61	17.56	0.14	24.26	13.20	-19.02	-4.12	11.88	53.56	0.78	54.44	0.40480
64 presto/tpcds: q65	1615.80	19.05	1360.10	29.87	1290.70	39.01	-15.82	-255.70	-20.12	1.18	2.20	3.02	0.00000
77 presto/tpcds: q78	3436.90	71.07	2903.90	64.59	2821.20	37.56	-15.51	-533.00	-17.91	2.07	2.22	1.33	0.00000
2 presto/tpcds: q03	79.80	29.39	69.20	0.31	81.40	36.25	-13.28	-10.60	2.01	36.83	0.45	44.54	0.39782
38 presto/tpcds: q39	46.19	0.12	40.36	0.97	39.79	0.24	-12.62	-5.83	-13.85	0.27	2.41	0.61	0.00000
79 presto/tpcds: q80	784.00	53.17	712.30	139.34	634.20	109.75	-9.15	-71.70	-19.11	6.78	19.56	17.31	0.26624

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
0	presto/tpcds:q01	210.10	1.22	192.30	3.08	185.80	2.67	-8.47	-17.80	-11.57	0.58	1.60	1.44	0.00000
83	presto/tpcds:q84	96.50	0.45	92.30	1.34	95.00	0.49	-4.35	-4.20	-1.55	0.47	1.45	0.52	0.00003
87	presto/tpcds:q88	3402.30	6.48	3296.60	12.34	3320.80	5.84	-3.11	-105.70	-2.40	0.19	0.37	0.18	0.00000
60	presto/tpcds:q61	158.00	1.73	153.20	13.02	155.30	5.98	-3.04	-4.80	-1.71	1.09	8.50	3.85	0.39180
95	presto/tpcds:q96	399.60	0.00	389.10	1.18	386.90	0.59	-2.63	-10.50	-3.18	0.00	0.30	0.15	0.00000
49	presto/tpcds:q50	941.10	1.12	925.60	1.64	926.50	0.45	-1.65	-15.50	-1.55	0.12	0.18	0.05	0.00000
53	presto/tpcds:q54	619.30	15.03	613.10	15.48	609.10	13.57	-1.00	-6.20	-1.65	2.43	2.52	2.23	0.49757
66	presto/tpcds:q67	8502.00	42.09	8454.00	42.09	8478.00	37.76	-0.56	-48.00	-0.28	0.50	0.50	0.45	0.07645
3	presto/tpcds:q04	5358.00	27.10	5334.00	35.39	5256.00	0.00	-0.45	-24.00	-1.90	0.51	0.66	0.00	0.21665
36	presto/tpcds:q37	182.60	0.73	181.90	0.24	177.80	0.62	-0.38	-0.70	-2.63	0.40	0.13	0.35	0.04933
86	presto/tpcds:q87	1233.00	4.00	1230.30	4.34	1236.60	2.99	-0.22	-2.70	0.29	0.32	0.35	0.24	0.28852
71	presto/tpcds:q72	1389.00	17.80	1388.60	20.17	1374.00	15.51	-0.03	-0.40	-1.08	1.28	1.45	1.13	0.97166
34	presto/tpcds:q35	200.30	1.39	200.30	3.12	200.10	2.27	0.00	0.00	-0.10	0.69	1.56	1.13	1.00000
21	presto/tpcds:q22	621.30	2.10	621.60	1.56	629.70	2.86	0.05	0.30	1.35	0.34	0.25	0.45	0.78501
39	presto/tpcds:q40	320.10	4.78	320.30	5.82	317.80	5.51	0.06	0.20	-0.72	1.49	1.82	1.73	0.94944
81	presto/tpcds:q82	379.60	0.90	379.90	0.70	372.10	0.59	0.08	0.30	-1.98	0.24	0.18	0.16	0.53498
69	presto/tpcds:q70	1188.20	19.96	1189.60	23.01	1187.10	32.93	0.12	1.40	-0.09	1.68	1.93	2.77	0.91258
90	presto/tpcds:q91	11.54	0.42	11.56	0.46	11.43	0.58	0.14	0.02	-0.94	3.66	3.95	5.03	0.94895
19	presto/tpcds:q20	15.02	0.08	15.04	0.07	14.94	0.09	0.19	0.03	-0.52	0.51	0.47	0.58	0.52341
50	presto/tpcds:q51	804.20	5.34	806.30	0.88	802.30	1.71	0.26	2.10	-0.24	0.66	0.11	0.21	0.36392
42	presto/tpcds:q43	296.60	1.50	297.40	1.50	293.30	1.34	0.27	0.80	-1.11	0.51	0.51	0.46	0.37797

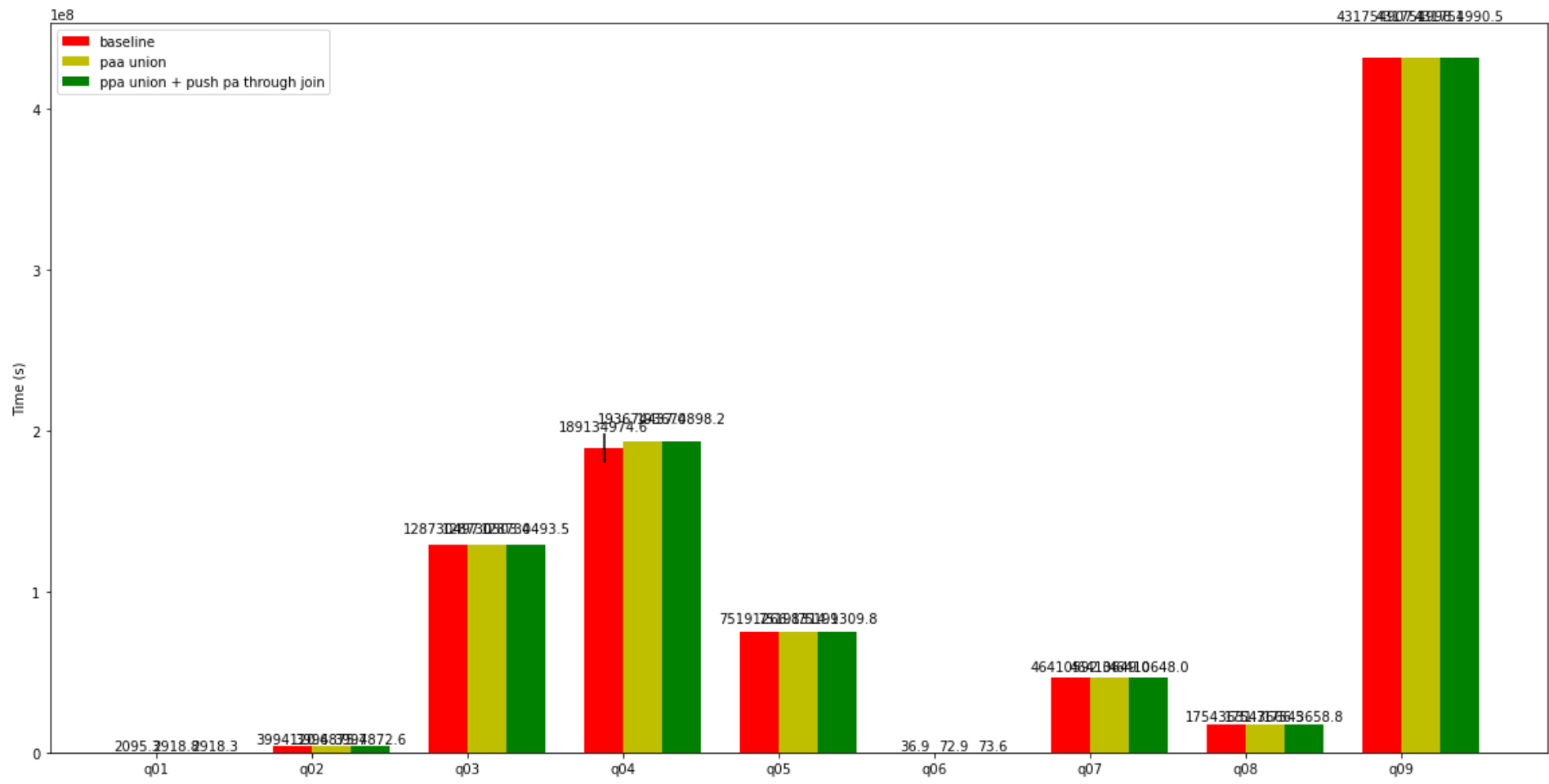
	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
29	presto/tpcds:q30	124.40	0.31	124.80	0.38	124.90	0.96	0.32	0.40	0.40	0.25	0.30	0.77	0.07339
73	presto/tpcds:q74	2065.20	8.68	2074.10	11.75	2088.70	9.71	0.43	8.90	1.14	0.42	0.57	0.46	0.16640
9	presto/tpcds:q10	46.05	0.22	46.29	0.45	45.55	0.26	0.52	0.24	-1.08	0.48	0.98	0.58	0.27160
97	presto/tpcds:q98	24.77	0.21	24.95	0.22	24.39	0.13	0.70	0.17	-1.54	0.85	0.89	0.54	0.19554
37	presto/tpcds:q38	1214.30	7.73	1222.90	7.33	1222.40	6.08	0.71	8.60	0.67	0.64	0.60	0.50	0.07631
28	presto/tpcds:q29	378.70	0.45	381.40	0.31	371.90	0.88	0.71	2.70	-1.80	0.12	0.08	0.24	0.00000
5	presto/tpcds:q06	57.27	0.48	57.69	0.25	57.01	0.18	0.73	0.42	-0.46	0.84	0.43	0.31	0.08726
80	presto/tpcds:q81	242.70	1.24	244.50	0.63	243.70	2.13	0.74	1.80	0.41	0.51	0.26	0.87	0.01012
48	presto/tpcds:q49	365.60	3.75	368.40	2.40	368.10	2.76	0.77	2.80	0.68	1.03	0.65	0.75	0.15448
7	presto/tpcds:q08	93.80	0.31	94.60	0.49	93.80	0.31	0.85	0.80	0.00	0.33	0.52	0.33	0.00700
68	presto/tpcds:q69	44.59	0.18	45.02	0.25	44.48	0.75	0.96	0.43	-0.25	0.41	0.55	1.68	0.00687
10	presto/tpcds:q11	2815.50	16.44	2847.50	9.24	2774.70	9.61	1.14	32.00	-1.45	0.58	0.32	0.35	0.00196
14	presto/tpcds:q15	61.50	0.83	62.20	1.05	62.30	1.54	1.14	0.70	1.30	1.34	1.69	2.47	0.22866
16	presto/tpcds:q17	233.90	6.09	237.30	3.10	231.60	2.52	1.45	3.40	-0.98	2.60	1.31	1.09	0.25083
85	presto/tpcds:q86	216.00	0.38	219.40	0.49	219.10	0.45	1.57	3.40	1.44	0.18	0.22	0.21	0.00000
72	presto/tpcds:q73	37.02	0.11	37.62	0.15	36.74	0.06	1.61	0.60	-0.77	0.29	0.39	0.18	0.00001
47	presto/tpcds:q48	409.20	1.00	416.00	0.49	405.40	0.73	1.66	6.80	-0.93	0.25	0.12	0.18	0.00000
59	presto/tpcds:q60	77.70	0.63	79.00	0.73	77.10	0.91	1.67	1.30	-0.77	0.81	0.92	1.18	0.00784
22	presto/tpcds:q23	10962.00	37.76	11160.00	45.54	10986.00	14.70	1.81	198.00	0.22	0.34	0.41	0.13	0.00001
32	presto/tpcds:q33	52.25	0.74	53.24	0.34	51.89	0.75	1.89	0.99	-0.70	1.42	0.63	1.44	0.01404
18	presto/tpcds:q19	66.50	0.24	67.80	0.66	66.70	0.45	1.95	1.30	0.30	0.37	0.97	0.68	0.00108

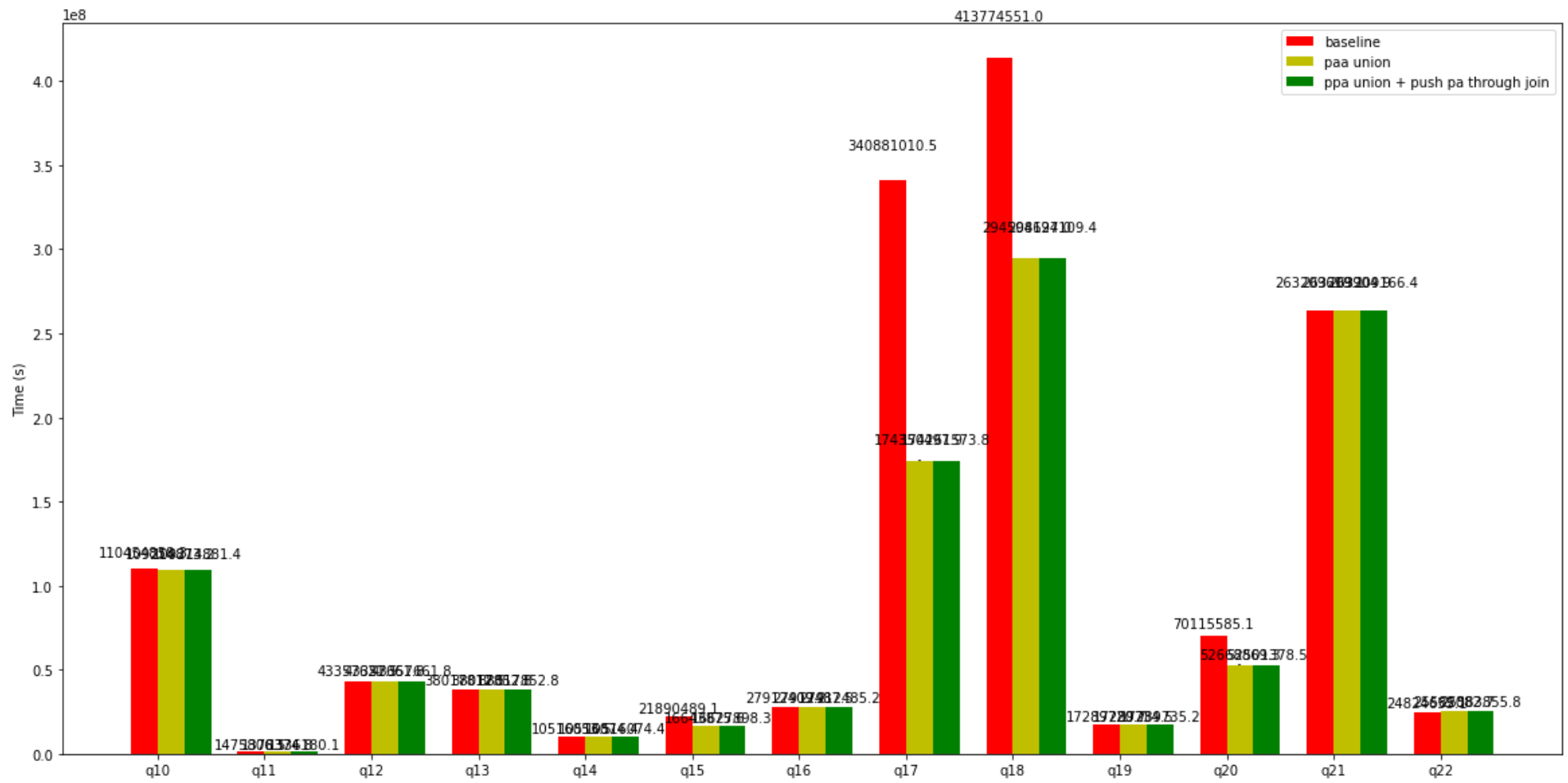
	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
92	presto/tpcds:q93	3235.80	22.49	3301.00	11.34	3248.70	20.27	2.01	65.20	0.40	0.69	0.34	0.62	0.00008
44	presto/tpcds:q45	55.78	0.34	56.92	0.43	55.26	0.57	2.05	1.15	-0.93	0.62	0.76	1.02	0.00047
23	presto/tpcds:q24	2906.30	21.62	2973.00	13.83	2914.80	6.67	2.30	66.70	0.29	0.74	0.47	0.23	0.00008
56	presto/tpcds:q57	2297.80	11.82	2352.50	14.23	2346.50	19.12	2.38	54.70	2.12	0.51	0.60	0.81	0.00003
96	presto/tpcds:q97	1107.80	25.42	1134.20	27.36	1092.40	14.50	2.38	26.40	-1.39	2.29	2.41	1.33	0.11407
74	presto/tpcds:q75	2022.50	7.68	2070.70	3.61	2043.60	10.02	2.38	48.20	1.04	0.38	0.17	0.49	0.00000
15	presto/tpcds:q16	469.60	3.88	480.90	2.10	471.90	3.21	2.41	11.30	0.49	0.83	0.44	0.68	0.00009
12	presto/tpcds:q13	502.40	5.18	514.70	6.12	497.00	1.35	2.45	12.30	-1.07	1.03	1.19	0.27	0.00375
88	presto/tpcds:q89	260.20	0.90	266.70	0.73	259.00	0.90	2.50	6.50	-0.46	0.35	0.28	0.35	0.00000
84	presto/tpcds:q85	237.60	5.83	243.70	5.17	236.20	5.76	2.57	6.10	-0.59	2.45	2.12	2.44	0.08407
30	presto/tpcds:q31	401.20	5.40	411.60	3.70	404.10	7.52	2.59	10.40	0.72	1.35	0.90	1.86	0.00300
67	presto/tpcds:q68	61.30	0.45	62.90	0.24	60.38	0.51	2.61	1.60	-1.51	0.74	0.39	0.85	0.00002
62	presto/tpcds:q63	145.70	44.73	149.90	48.85	141.60	41.15	2.88	4.20	-2.81	30.70	32.59	29.06	0.87966
45	presto/tpcds:q46	197.00	0.90	202.70	1.03	192.70	1.44	2.89	5.70	-2.18	0.46	0.51	0.75	0.00000
78	presto/tpcds:q79	207.50	0.59	213.60	0.54	210.00	0.76	2.94	6.10	1.20	0.28	0.25	0.36	0.00000
11	presto/tpcds:q12	6.78	0.02	6.98	0.02	6.86	0.02	2.95	0.20	1.11	0.34	0.25	0.31	0.00000
13	presto/tpcds:q14	11730.00	102.88	12078.00	103.71	12030.00	42.09	2.97	348.00	2.56	0.88	0.86	0.35	0.00016
46	presto/tpcds:q47	4584.00	63.04	4722.00	52.99	4638.00	47.85	3.01	138.00	1.18	1.38	1.12	1.03	0.00213
98	presto/tpcds:q99	657.30	1.96	677.60	0.49	668.90	1.03	3.09	20.30	1.76	0.30	0.07	0.15	0.00000
94	presto/tpcds:q95	1225.90	7.66	1263.80	13.86	1242.30	7.00	3.09	37.90	1.34	0.62	1.10	0.56	0.00016
93	presto/tpcds:q94	218.70	1.30	225.60	1.20	217.80	1.26	3.16	6.90	-0.41	0.59	0.53	0.58	0.00000

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
70	presto/tpcds:q71	62.70	1.96	64.70	1.67	62.50	0.96	3.19	2.00	-0.32	3.13	2.58	1.54	0.08662
31	presto/tpcds:q32	28.75	0.38	29.68	0.79	38.96	21.70	3.23	0.93	35.48	1.32	2.68	55.70	0.02740
24	presto/tpcds:q25	154.80	4.17	159.80	12.87	157.40	9.67	3.23	5.00	1.68	2.70	8.06	6.14	0.38672
57	presto/tpcds:q58	47.43	0.50	48.97	0.22	47.13	0.41	3.25	1.54	-0.61	1.06	0.44	0.88	0.00004
54	presto/tpcds:q55	25.45	0.11	26.29	0.09	25.05	0.07	3.28	0.84	-1.60	0.42	0.35	0.26	0.00000
33	presto/tpcds:q34	111.10	0.24	114.80	0.31	109.70	0.96	3.33	3.70	-1.26	0.22	0.27	0.88	0.00000
63	presto/tpcds:q64	5514.00	14.70	5700.00	54.20	5628.00	29.39	3.37	186.00	2.07	0.27	0.95	0.52	0.00001
20	presto/tpcds:q21	11.70	0.22	12.10	0.12	11.72	0.10	3.43	0.40	0.21	1.90	0.97	0.82	0.00291
40	presto/tpcds:q41	0.76	0.01	0.79	0.01	0.78	0.01	3.45	0.03	2.40	1.34	1.88	1.89	0.00503
55	presto/tpcds:q56	27.17	0.14	28.12	0.19	27.15	0.17	3.50	0.95	-0.07	0.53	0.69	0.61	0.00000
41	presto/tpcds:q42	25.58	0.10	26.49	0.07	25.63	0.07	3.57	0.91	0.20	0.39	0.27	0.28	0.00000
51	presto/tpcds:q52	26.21	0.08	27.18	0.20	26.54	0.53	3.71	0.97	1.27	0.31	0.75	2.00	0.00000
61	presto/tpcds:q62	308.90	1.22	321.70	0.70	318.50	3.16	4.14	12.80	3.11	0.40	0.22	0.99	0.00000
58	presto/tpcds:q59	2499.90	6.04	2605.90	5.00	2544.70	8.89	4.24	106.00	1.79	0.24	0.19	0.35	0.00000
25	presto/tpcds:q26	138.60	0.54	144.50	0.70	138.30	0.83	4.26	5.90	-0.22	0.39	0.49	0.60	0.00000
43	presto/tpcds:q44	1043.70	8.60	1088.70	8.86	1054.10	6.91	4.31	45.00	1.00	0.82	0.81	0.66	0.00000
35	presto/tpcds:q36	217.40	0.31	227.30	0.24	214.70	0.45	4.55	9.90	-1.24	0.14	0.11	0.21	0.00000
17	presto/tpcds:q18	186.60	0.38	195.10	0.80	186.40	0.49	4.56	8.50	-0.11	0.20	0.41	0.26	0.00000
76	presto/tpcds:q77	52.26	0.44	54.68	0.54	52.69	0.41	4.64	2.42	0.82	0.85	0.98	0.78	0.00001
82	presto/tpcds:q83	10.78	0.12	11.29	0.21	11.21	0.24	4.73	0.51	3.94	1.07	1.82	2.19	0.00034
89	presto/tpcds:q90	201.50	0.59	211.30	0.24	198.90	0.33	4.86	9.80	-1.29	0.29	0.12	0.17	0.00000

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
1	presto/tpcds:q02	1950.80	22.75	2048.30	15.99	1970.60	9.56	5.00	97.50	1.01	1.17	0.78	0.49	0.00001
6	presto/tpcds:q07	247.00	0.49	259.80	0.38	245.60	0.62	5.18	12.80	-0.57	0.20	0.15	0.25	0.00000
26	presto/tpcds:q27	231.70	0.88	244.80	0.38	230.20	0.31	5.65	13.10	-0.65	0.38	0.16	0.13	0.00000
75	presto/tpcds:q76	580.70	2.69	615.80	7.39	582.50	0.70	6.04	35.10	0.31	0.46	1.20	0.12	0.00000
65	presto/tpcds:q66	216.30	0.83	230.30	0.45	219.90	0.73	6.47	14.00	1.66	0.38	0.20	0.33	0.00000
4	presto/tpcds:q05	456.20	38.93	488.80	30.31	472.30	50.19	7.15	32.60	3.53	8.53	6.20	10.63	0.13659
27	presto/tpcds:q28	2662.00	16.33	2873.40	7.09	2650.80	8.40	7.94	211.40	-0.42	0.61	0.25	0.32	0.00000
8	presto/tpcds:q09	2285.50	10.88	2527.80	15.44	2286.50	28.33	10.60	242.30	0.04	0.48	0.61	1.24	0.00000
52	presto/tpcds:q53	129.70	0.59	148.60	40.67	150.20	52.54	14.57	18.90	15.81	0.45	27.37	34.98	0.28154
count	99													
mean	1													
std	5													
min	-19													
25%	0													
50%	2													
75%	3													
max	15													
Name:	% change, dtype: float64													
count	99													
mean	-0													
std	6													
min	-20													
25%	-1													
50%	-0													
75%	1													
max	35													
Name:	% change base -> ppa union + push pa through join, dtype: float64													

TPC-H Comparison (Network)





query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
16 presto/tpch: q17	340881010.54	123.15	174350497.94	241754.41	174261573.83	107898.20	-48.85	-166530512.60	-48.88	0.00	0.14	0.06	0.00000
17 presto/tpch: q18	413774551.0	3879.59	294508126.98	117480.26	294694109.36	312514.93	-28.82	-119266424.00	-28.78	0.00	0.04	0.11	0.00000
19 presto/tpch: q20	70115585.07	94.88	52668869.33	324343.91	52501378.52	115600.56	-24.88	-17446715.74	-25.12	0.00	0.62	0.22	0.00000
14 presto/tpch: q15	21890489.13	108.46	16643875.55	2857.85	16627898.32	10271.56	-23.97	-5246613.58	-24.04	0.00	0.02	0.06	0.00000
10 presto/tpch: q11	1475806.52	10272.20	1378374.76	21240.14	1336180.11	41192.85	-6.60	-97431.76	-9.46	0.70	1.54	3.08	0.00000
9 presto/tpch: q10	110454858.26	1127.00	109214873.24	1162.10	109214881.41	479.96	-1.12	-1239985.01	-1.12	0.00	0.00	0.00	0.00000

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
2	presto/tpch: q03	128730497.04	16.33	128730503.40	9.27	128730493.48	18.15	0.00	6.37	-0.00	0.00	0.00	0.00	0.42560
8	presto/tpch: q09	431754907.11	5.75	431754998.13	3.97	431754990.48	6.42	0.00	91.02	0.00	0.00	0.00	0.00	0.00000
4	presto/tpch: q05	75191266.77	13.62	75191314.88	10.20	75191309.78	10.27	0.00	48.11	0.00	0.00	0.00	0.00	0.00004
18	presto/tpch: q19	17289720.66	0.00	17289734.48	0.00	17289735.15	1.65	0.00	13.82	0.00	0.00	0.00	0.00	0.00000
11	presto/tpch: q12	43357621.51	0.00	43357661.83	0.00	43357661.83	0.00	0.00	40.32	0.00	0.00	0.00	0.00	0.00000
12	presto/tpch: q13	38017812.50	0.00	38017852.82	0.00	38017852.82	0.00	0.00	40.32	0.00	0.00	0.00	0.00	0.00000
20	presto/tpch: q21	263209619.09	338.32	263209904.87	566.50	263209166.35	216.61	0.00	285.78	-0.00	0.00	0.00	0.00	0.31369
6	presto/tpch: q07	46410592.34	3.78	46410648.98	5.65	46410648.03	3.56	0.00	56.64	0.00	0.00	0.00	0.00	0.00000
7	presto/tpch: q08	17543631.74	18.38	17543666.49	28.41	17543658.80	27.35	0.00	34.75	0.00	0.00	0.00	0.00	0.03063
13	presto/tpch: q14	10516053.48	0.00	10516074.41	0.00	10516074.41	0.00	0.00	20.93	0.00	0.00	0.00	0.00	0.00000
15	presto/tpch: q16	27912409.24	4.91	27912487.53	4.76	27912485.21	5.17	0.00	78.29	0.00	0.00	0.00	0.00	0.00000
1	presto/tpch: q02	3994120.57	3.21	3994875.72	2.81	3994872.60	6.05	0.02	755.15	0.02	0.00	0.00	0.00	0.00000
3	presto/tpch: q04	189134974.63	8988784.63	193674437.01	1562.17	193674898.23	1344.13	2.40	4539462.38	2.40	4.75	0.00	0.00	0.24434
21	presto/tpch: q22	24824655.12	0.00	25582082.66	1055.84	25583855.79	1023.47	3.05	757427.53	3.06	0.00	0.00	0.00	0.00000
0	presto/tpch: q01	2095.27	0.96	2918.77	0.62	2918.26	5.49	39.30	823.49	39.28	0.05	0.02	0.19	0.00000
5	presto/tpch: q06	36.91	0.14	72.93	2.29	73.60	0.29	97.59	36.02	99.41	0.37	3.14	0.39	0.00000

```

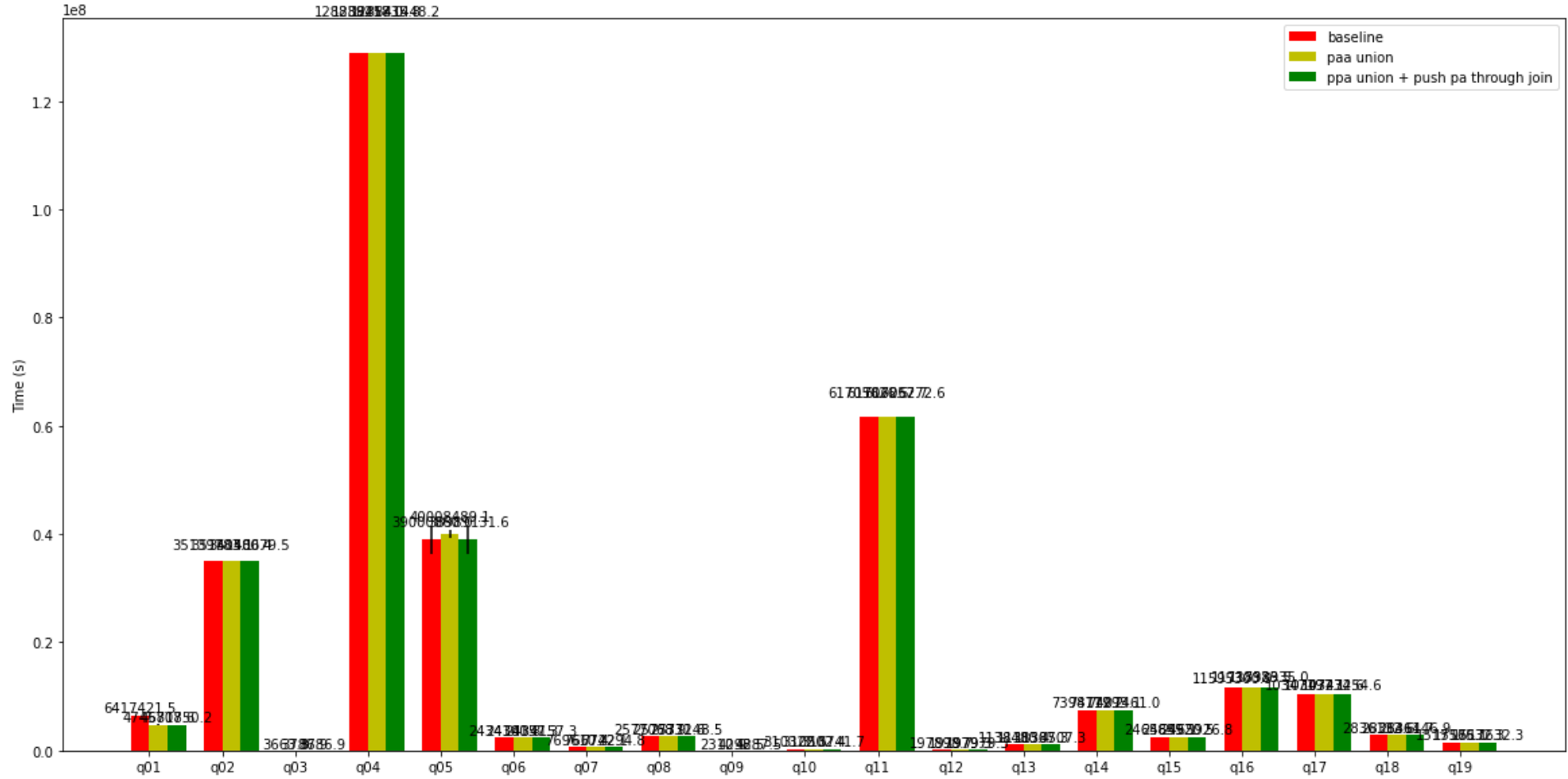
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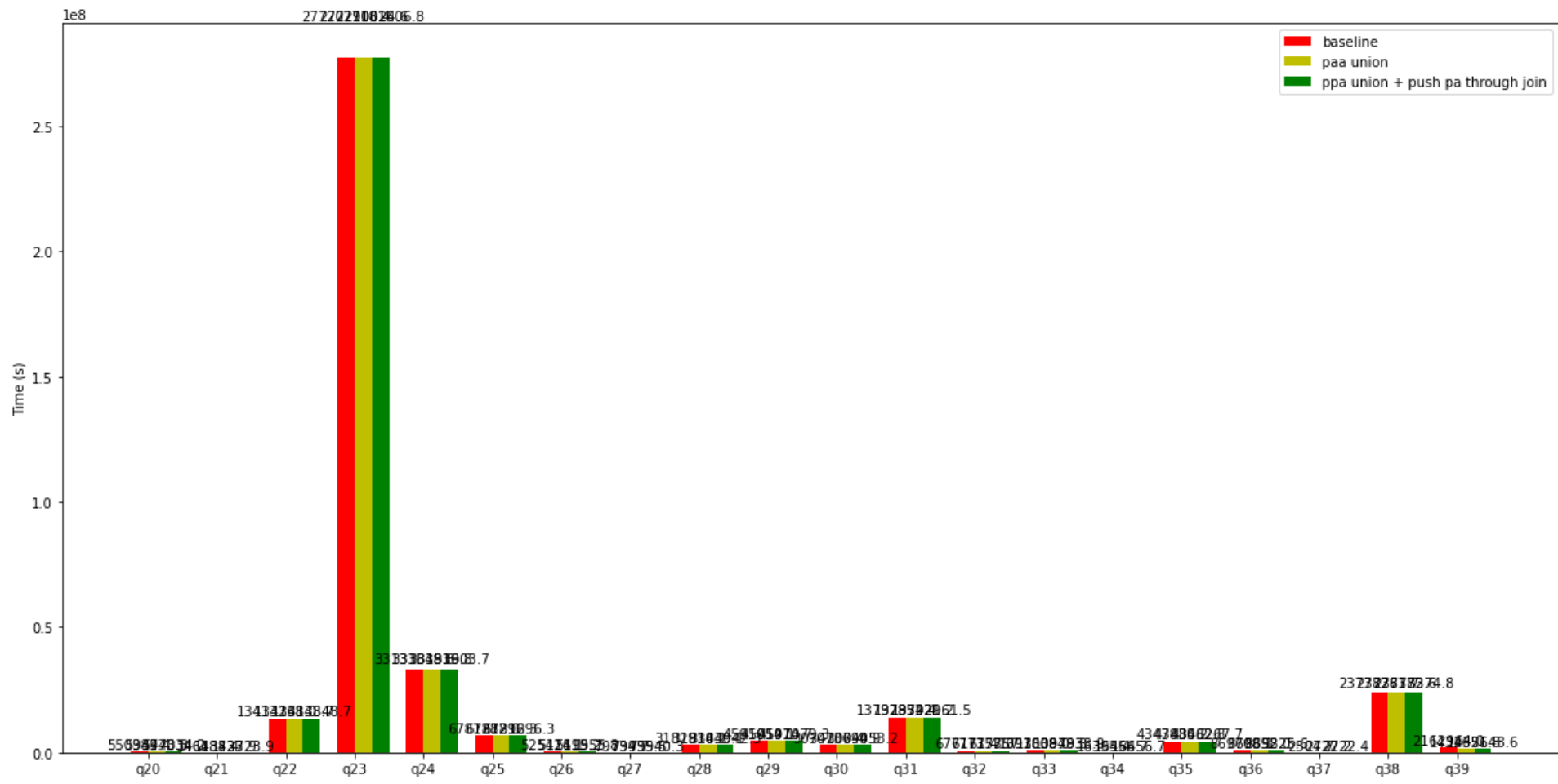
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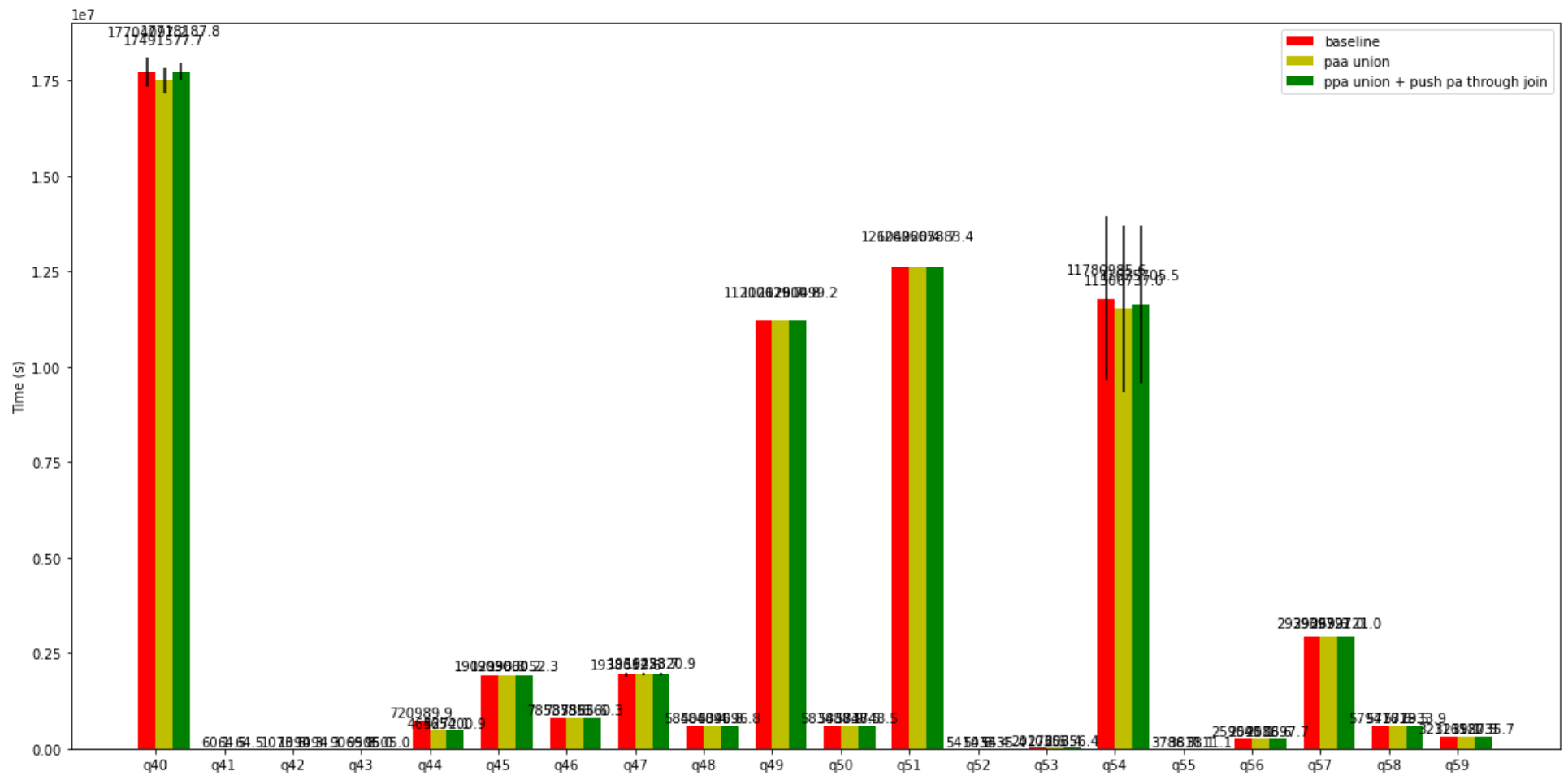

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 75% 0
 max 99

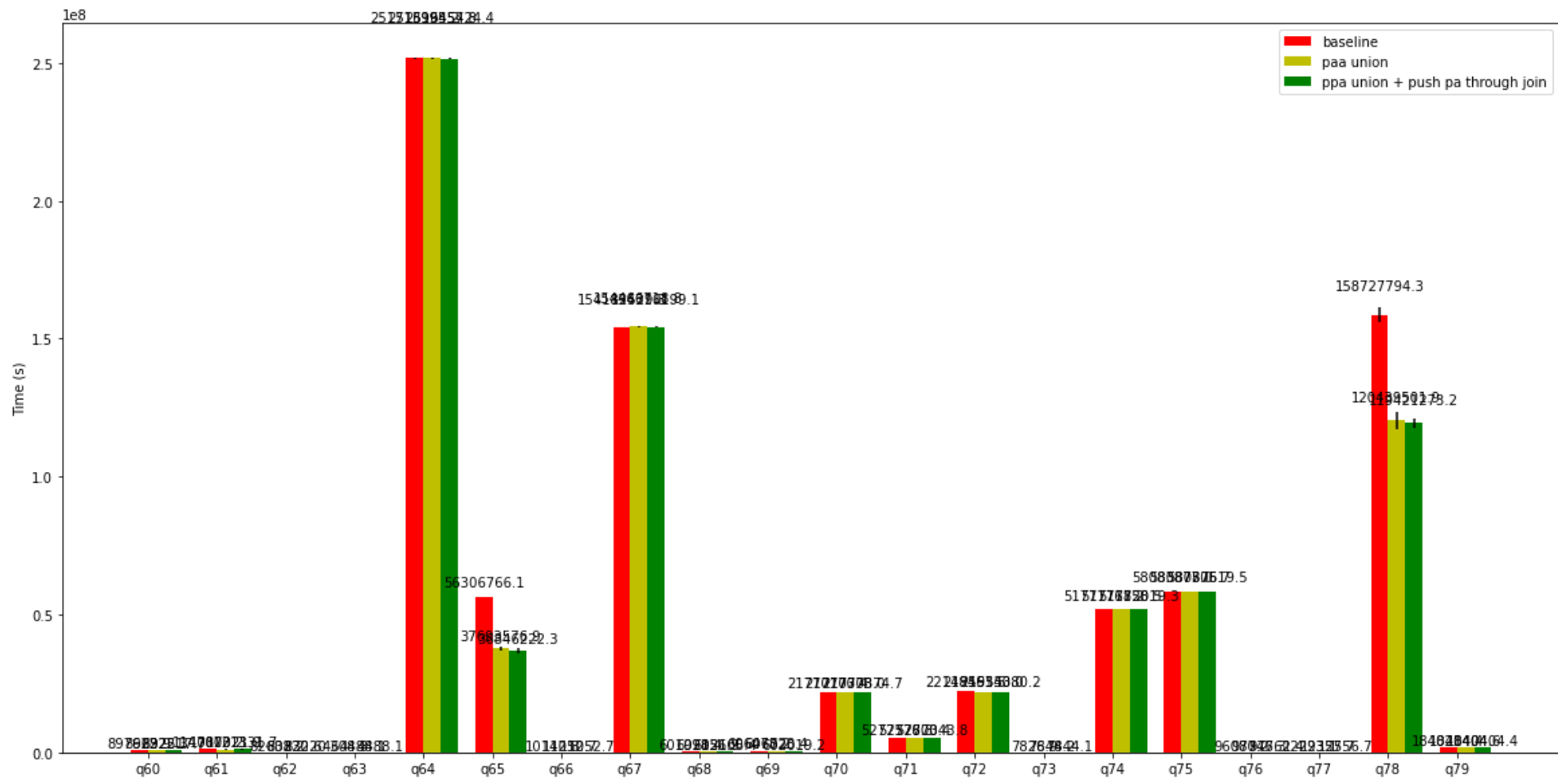
Name: % change base -> ppa union + push pa through join, dtype: float64

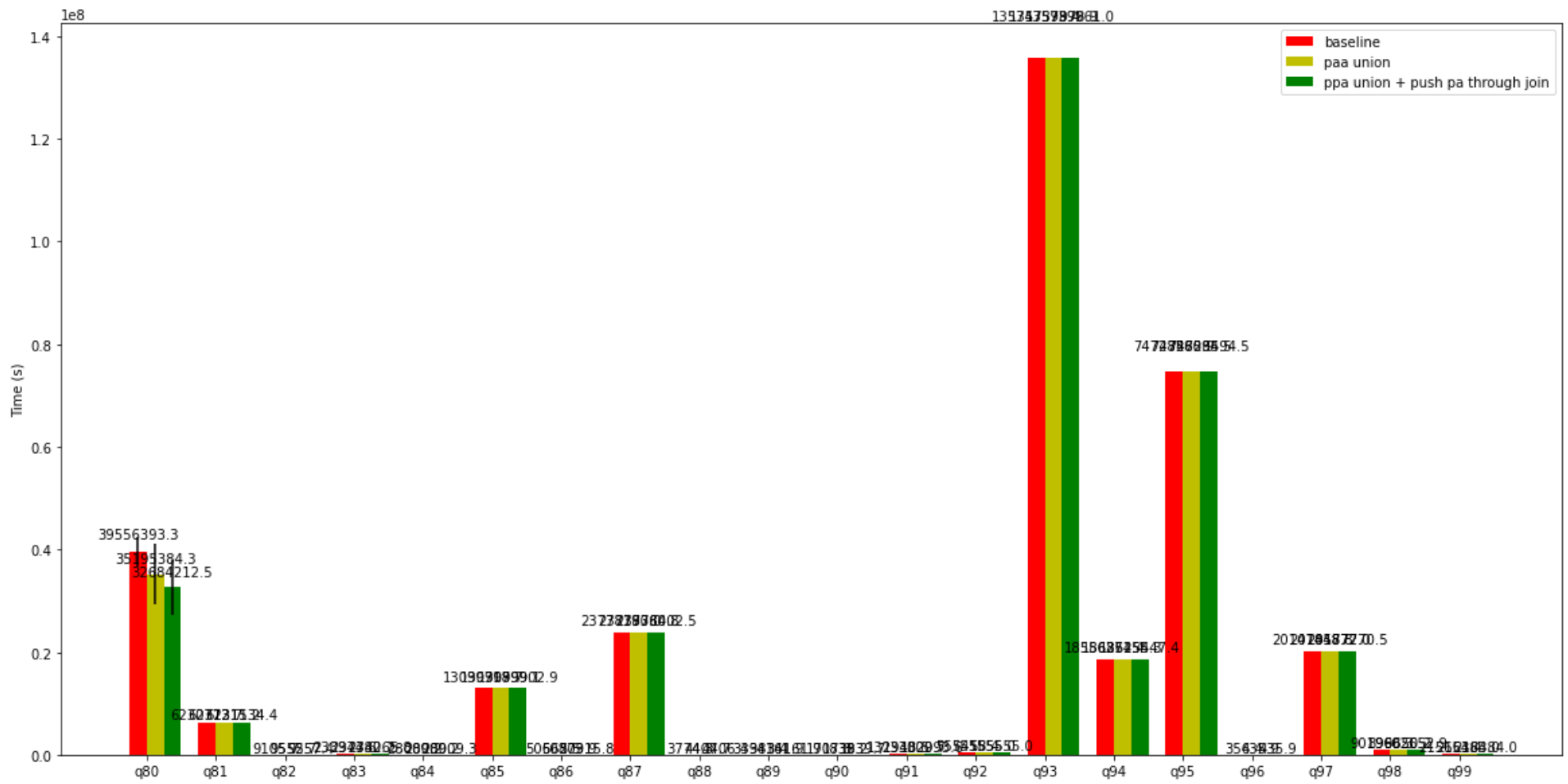
TPC-DS Comparison (Network)











query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
43 presto/tpcds: q44	720989.89	25.88	465272.12	71.92	465400.91	125.60	-35.47	-255717.77	-35.45	0.00	0.02	0.03	0.00000
38 presto/tpcds: q39	2162963.98	3.21	1432651.81	3.70	1432648.64	3.38	-33.76	-730312.17	-33.76	0.00	0.00	0.00	0.00000
64 presto/tpcds: q65	56306766.05	4572.64	37693576.91	860043.78	36846222.26	1027220.88	-33.06	-18613189.14	-34.56	0.01	2.28	2.79	0.00000
0 presto/tpcds: q01	6417421.53	1232.17	4745707.55	84796.67	4681850.19	70362.99	-26.05	-1671713.98	-27.04	0.02	1.79	1.50	0.00000
77 presto/tpcds: q78	158727794.28	2628132.15	120439501.91	3082248.09	119421273.18	1580805.18	-24.12	-38288292.37	-24.76	1.66	2.56	1.32	0.00000
79 presto/tpcds: q80	39556393.29	2810376.62	35195384.28	5863646.59	32684212.48	5376143.96	-11.02	-4361009.01	-17.37	7.10	16.66	16.45	0.13145

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
60	presto/tpcds:q61	1147003.23	21093.31	1087021.88	124653.54	1121331.66	53152.37	-5.23	-59981.35	-2.24	1.84	11.47	4.74	0.27217
19	presto/tpcds:q20	550989.40	5804.99	534770.84	5035.98	544334.18	5772.76	-2.94	-16218.57	-1.21	1.05	0.94	1.06	0.00042
25	presto/tpcds:q26	525426.11	9591.44	511419.25	14332.43	519555.80	9191.80	-2.67	-14006.87	-1.12	1.83	2.80	1.77	0.07469
53	presto/tpcds:q54	11780985.59	2155058.89	11506737.02	2186074.55	11625705.47	2055533.67	-2.33	-274248.57	-1.32	18.29	19.00	17.68	0.83118
20	presto/tpcds:q21	146188.43	0.00	143723.89	0.00	143723.89	0.00	-1.69	-2464.54	-1.69	0.00	0.00	0.00	0.00000
58	presto/tpcds:q59	321219.09	580.31	316520.46	1718.84	318735.72	1514.58	-1.46	-4698.62	-0.77	0.18	0.54	0.48	0.00008
39	presto/tpcds:q40	17704097.21	386089.38	17491577.67	328958.83	17718187.82	233594.49	-1.20	-212519.54	0.08	2.18	1.88	1.32	0.32894
71	presto/tpcds:q72	22148461.54	10.83	21955340.02	118.93	21955380.19	75.91	-0.87	-193121.52	-0.87	0.00	0.00	0.00	0.00000
97	presto/tpcds:q98	901968.32	5039.71	896650.16	10957.20	902652.88	8089.72	-0.59	-5318.16	0.08	0.56	1.22	0.90	0.30546
6	presto/tpcds:q07	769610.38	9201.62	766742.10	7119.84	772294.82	12833.12	-0.37	-2868.28	0.35	1.20	0.93	1.66	0.55937
57	presto/tpcds:q58	579410.79	2525.38	577818.54	2374.01	577933.91	3857.08	-0.27	-1592.25	-0.25	0.44	0.41	0.67	0.28676
59	presto/tpcds:q60	897622.88	5157.81	896322.25	3359.15	892517.73	5281.65	-0.14	-1300.62	-0.57	0.57	0.37	0.59	0.61600
29	presto/tpcds:q30	3074100.35	64.50	3073694.93	672.25	3074053.22	429.80	-0.01	-405.42	-0.00	0.00	0.02	0.01	0.17218
55	presto/tpcds:q56	259041.06	528.44	259018.64	376.11	258697.73	880.10	-0.01	-22.42	-0.13	0.20	0.15	0.34	0.93419
92	presto/tpcds:q93	135747598.39	132.73	135737978.93	4444.64	135739961.02	2622.22	-0.01	-9619.46	-0.01	0.00	0.00	0.00	0.00035
63	presto/tpcds:q64	251713995.16	148214.29	251699457.80	172957.71	251645424.38	129186.58	-0.01	-14537.36	-0.03	0.06	0.07	0.05	0.87888
45	presto/tpcds:q46	785375.65	43.58	785365.64	36.73	785360.31	41.91	-0.00	-10.01	-0.00	0.01	0.00	0.01	0.67619
83	presto/tpcds:q84	28009.21	0.06	28009.21	0.06	28009.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00000
94	presto/tpcds:q95	74728560.92	0.00	74728594.53	0.00	74728594.53	0.00	0.00	33.60	0.00	0.00	0.00	0.00	0.00000
73	presto/tpcds:q74	51771761.20	1326.97	51771858.48	1635.54	51772019.27	2740.61	0.00	97.28	0.00	0.00	0.00	0.01	0.91216
24	presto/tpcds:q25	6781282.01	0.00	6781296.29	0.00	6781296.29	0.00	0.00	14.28	0.00	0.00	0.00	0.00	0.00000

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
16	presto/tpcds: q17	10347197.09	27.55	10347234.61	39.51	10347254.56	55.69	0.00	37.52	0.00	0.00	0.00	0.00	0.08547
28	presto/tpcds: q29	4591054.11	11.35	4591074.67	0.00	4591079.31	11.35	0.00	20.57	0.00	0.00	0.00	0.00	0.00126
37	presto/tpcds: q38	23778261.66	55.57	23778372.61	127.01	23778374.79	209.68	0.00	110.96	0.00	0.00	0.00	0.00	0.07837
21	presto/tpcds: q22	13413268.05	0.00	13413348.69	0.00	13413348.69	0.00	0.00	80.64	0.00	0.00	0.00	0.00	0.00000
84	presto/tpcds: q85	13099718.73	183.09	13099799.10	122.82	13099902.86	4.94	0.00	80.37	0.00	0.00	0.00	0.00	0.39289
86	presto/tpcds: q87	23778190.04	159.46	23778360.82	161.50	23778402.50	92.49	0.00	170.79	0.00	0.00	0.00	0.00	0.09509
23	presto/tpcds: q24	33133648.80	20.73	33133916.80	15.65	33133903.70	38.53	0.00	268.00	0.00	0.00	0.00	0.00	0.00000
69	presto/tpcds: q70	21770170.44	3.25	21770377.98	1.96	21770374.72	14.16	0.00	207.55	0.00	0.00	0.00	0.00	0.00000
10	presto/tpcds: q11	61705626.46	22.20	61706257.73	23.83	61706272.62	65.49	0.00	631.28	0.00	0.00	0.00	0.00	0.00000
3	presto/tpcds: q04	128839256.98	815.11	128841835.79	636.35	128841448.19	691.89	0.00	2578.81	0.00	0.00	0.00	0.00	0.00011
1	presto/tpcds: q02	35139783.07	365.01	35140580.39	265.71	35140679.51	190.05	0.00	797.33	0.00	0.00	0.00	0.00	0.00150
47	presto/tpcds: q48	584083.40	0.00	584096.84	0.00	584096.84	0.00	0.00	13.44	0.00	0.00	0.00	0.00	0.00000
5	presto/tpcds: q06	2434100.78	10.76	2434157.26	2.43	2434157.27	1.46	0.00	56.48	0.00	0.00	0.00	0.00	0.00000
12	presto/tpcds: q13	1138480.44	0.04	1138507.28	0.06	1138507.26	0.10	0.00	26.84	0.00	0.00	0.00	0.00	0.00000
22	presto/tpcds: q23	277202906.39	52544.06	277210024.59	21661.28	277181606.81	56911.66	0.00	7118.20	-0.01	0.02	0.01	0.02	0.76530
14	presto/tpcds: q15	2465845.08	10.83	2465920.49	10.17	2465926.80	8.14	0.00	75.41	0.00	0.00	0.00	0.00	0.00000
44	presto/tpcds: q45	1902998.77	20.18	1903060.23	37.38	1903052.33	23.87	0.00	61.46	0.00	0.00	0.00	0.00	0.00532
30	presto/tpcds: q31	13792852.43	829.29	13793421.19	1181.10	13792961.53	1384.24	0.00	568.76	0.00	0.01	0.01	0.01	0.35713
27	presto/tpcds: q28	3182914.06	7.83	3183049.13	9.17	3183042.28	5.90	0.00	135.07	0.00	0.00	0.00	0.00	0.00000
70	presto/tpcds: q71	5277576.25	641.54	5277800.38	198.23	5277343.80	513.07	0.00	224.13	-0.00	0.01	0.00	0.01	0.43262
18	presto/tpcds: q19	1517565.14	0.00	1517632.34	0.00	1517632.34	0.00	0.00	67.20	0.00	0.00	0.00	0.00	0.00000

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
50	presto/tpcds:q51	12604920.40	134.60	12605678.68	78.32	12605883.41	111.87	0.01	758.28	0.01	0.00	0.00	0.00	0.00000
74	presto/tpcds:q75	58083877.03	134.33	58087506.72	171.66	58087519.50	189.95	0.01	3629.70	0.01	0.00	0.00	0.00	0.00000
48	presto/tpcds:q49	11200629.74	0.91	11201500.81	0.43	11201499.23	1.96	0.01	871.07	0.01	0.00	0.00	0.00	0.00000
80	presto/tpcds:q81	6230772.69	51.12	6231315.24	29.13	6231134.42	166.49	0.01	542.55	0.01	0.00	0.00	0.00	0.00000
7	presto/tpcds:q08	2577068.88	135.08	2577332.58	64.75	2577148.48	175.79	0.01	263.70	0.00	0.01	0.00	0.01	0.00153
78	presto/tpcds:q79	1840214.41	0.25	1840404.58	0.27	1840404.38	0.28	0.01	190.17	0.01	0.00	0.00	0.00	0.00000
17	presto/tpcds:q18	2836132.62	12.38	2836461.70	35.36	2836446.86	11.54	0.01	329.09	0.01	0.00	0.00	0.00	0.00000
35	presto/tpcds:q36	869708.07	28.62	869851.98	32.08	869825.61	41.05	0.02	143.91	0.01	0.00	0.00	0.00	0.00001
34	presto/tpcds:q35	4347830.21	586.84	4348562.76	236.36	4348267.68	287.08	0.02	732.55	0.01	0.01	0.01	0.01	0.01766
56	presto/tpcds:q57	2939069.58	0.00	2939721.00	0.00	2939721.00	0.00	0.02	651.42	0.02	0.00	0.00	0.00	0.00000
91	presto/tpcds:q92	555418.35	0.00	555554.96	0.00	555554.96	0.00	0.02	136.60	0.02	0.00	0.00	0.00	0.00000
67	presto/tpcds:q68	601998.38	59.24	602156.90	75.28	602105.39	52.81	0.03	158.52	0.02	0.01	0.01	0.01	0.00231
31	presto/tpcds:q32	677171.43	0.00	677357.28	0.00	677357.28	0.00	0.03	185.85	0.03	0.00	0.00	0.00	0.00000
90	presto/tpcds:q91	132948.52	12.20	133000.74	15.17	132993.59	11.73	0.04	52.22	0.03	0.01	0.01	0.01	0.00006
11	presto/tpcds:q12	197898.67	0.00	197979.31	0.00	197979.31	0.00	0.04	80.64	0.04	0.00	0.00	0.00	0.00000
68	presto/tpcds:q69	606478.19	253.60	606728.37	81.33	602019.22	11395.01	0.04	250.18	-0.74	0.04	0.01	1.89	0.04418
49	presto/tpcds:q50	583488.94	0.00	583748.50	0.00	583748.50	0.00	0.04	259.56	0.04	0.00	0.00	0.00	0.00000
9	presto/tpcds:q10	310322.50	740.39	310502.42	604.79	310741.73	0.00	0.06	179.92	0.14	0.24	0.19	0.00	0.65467
66	presto/tpcds:q67	154182529.82	157944.27	154466718.77	338493.14	154316199.07	360952.18	0.18	284188.95	0.09	0.10	0.22	0.23	0.09197
96	presto/tpcds:q97	20147448.85	542.74	20185872.01	11787.21	20177770.52	8524.03	0.19	38423.17	0.15	0.00	0.06	0.04	0.00001
72	presto/tpcds:q73	7826.93	0.01	7844.15	0.01	7844.14	0.02	0.22	17.22	0.22	0.00	0.00	0.00	0.00000

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
13	presto/tpcds: q14	7398719.21	17700.01	7417293.09	6989.18	7407460.98	4344.07	0.25	18573.89	0.12	0.24	0.09	0.06	0.03791
26	presto/tpcds: q27	79734.71	9.56	79935.53	6.85	79940.28	0.48	0.25	200.82	0.26	0.01	0.01	0.00	0.00000
98	presto/tpcds: q99	215654.43	0.00	216383.97	0.00	216383.97	0.00	0.34	729.54	0.34	0.00	0.00	0.00	0.00000
82	presto/tpcds: q83	233974.63	2963.67	234780.71	3117.08	234265.81	2640.09	0.34	806.09	0.12	1.27	1.33	1.13	0.65600
93	presto/tpcds: q94	18556371.44	4.13	18625455.31	95.27	18625447.43	72.10	0.37	69083.87	0.37	0.00	0.00	0.00	0.00000
33	presto/tpcds: q34	16395.37	0.00	16456.69	0.00	16456.69	0.00	0.37	61.32	0.37	0.00	0.00	0.00	0.00000
85	presto/tpcds: q86	50662.50	2.63	50873.86	82.25	50915.75	19.18	0.42	211.36	0.50	0.01	0.16	0.04	0.00009
51	presto/tpcds: q52	5410.64	0.00	5435.42	0.00	5435.42	0.00	0.46	24.78	0.46	0.00	0.00	0.00	0.00000
88	presto/tpcds: q89	33983.45	0.00	34161.95	0.00	34161.95	0.00	0.53	178.50	0.53	0.00	0.00	0.00	0.00000
76	presto/tpcds: q77	12293.08	623.74	12357.67	598.74	12556.67	636.35	0.53	64.59	2.14	5.07	4.85	5.07	0.85846
32	presto/tpcds: q33	1097807.98	14364.35	1103848.29	966.45	1097938.90	14596.39	0.55	6040.31	0.01	1.31	0.09	1.33	0.32831
54	presto/tpcds: q55	3786.73	0.00	3811.09	0.00	3811.09	0.00	0.64	24.36	0.64	0.00	0.00	0.00	0.00000
61	presto/tpcds: q62	82608.21	0.00	83220.57	0.00	83220.57	0.00	0.74	612.36	0.74	0.00	0.00	0.00	0.00000
52	presto/tpcds: q53	20176.63	0.00	20356.39	0.00	20356.39	0.00	0.89	179.76	0.89	0.00	0.00	0.00	0.00000
46	presto/tpcds: q47	1938612.64	45487.57	1956228.71	33661.99	1945320.88	41527.00	0.91	17616.07	0.35	2.35	1.72	2.13	0.46335
15	presto/tpcds: q16	11595300.90	4.10	11738923.51	91.16	11738935.04	81.03	1.24	143622.61	1.24	0.00	0.00	0.00	0.00000
75	presto/tpcds: q76	96080.21	92.69	97746.29	57.70	97762.40	128.20	1.73	1666.08	1.75	0.10	0.06	0.13	0.00000
41	presto/tpcds: q42	1073.62	0.00	1094.27	0.00	1094.27	0.00	1.92	20.65	1.92	0.00	0.00	0.00	0.00000
4	presto/tpcds: q05	39000860.05	2600742.13	40008489.14	845843.14	38989131.58	2620071.72	2.58	1007629.09	-0.03	6.67	2.11	6.72	0.38801
2	presto/tpcds: q03	3663.83	0.00	3786.89	0.00	3786.89	0.00	3.36	123.06	3.36	0.00	0.00	0.00	0.00000
62	presto/tpcds: q63	4308.33	0.00	4488.09	0.00	4488.09	0.00	4.17	179.76	4.17	0.00	0.00	0.00	0.00000

query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
42 presto/tpcds:q43	9069.77	0.00	9505.01	0.00	9505.01	0.00	4.80	435.25	4.80	0.00	0.00	0.00	0.00000
81 presto/tpcds:q82	9105.74	6.90	9552.74	9.49	9557.35	4.66	4.91	447.00	4.96	0.08	0.10	0.05	0.00000
40 presto/tpcds:q41	60.07	0.00	64.48	0.00	64.48	0.00	7.34	4.41	7.34	0.00	0.00	0.00	0.00000
89 presto/tpcds:q90	1707.84	0.28	1839.20	0.80	1839.65	0.38	7.69	131.36	7.72	0.02	0.04	0.02	0.00000
36 presto/tpcds:q37	2504.65	0.00	2722.21	0.43	2722.39	0.00	8.69	217.56	8.69	0.00	0.02	0.00	0.00000
65 presto/tpcds:q66	10142.77	0.00	11052.71	0.00	11052.71	0.00	8.97	909.94	8.97	0.00	0.00	0.00	0.00000
87 presto/tpcds:q88	3774.26	0.68	4407.67	1.45	4406.43	1.96	16.78	633.41	16.75	0.02	0.03	0.04	0.00000
95 presto/tpcds:q96	356.35	0.05	435.91	0.06	435.92	0.04	22.32	79.55	22.33	0.01	0.01	0.01	0.00000
8 presto/tpcds:q09	2310.92	3.14	4298.48	2.85	4287.52	11.89	86.01	1987.56	85.53	0.14	0.07	0.28	0.00000

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Name: % change, dtype: float64

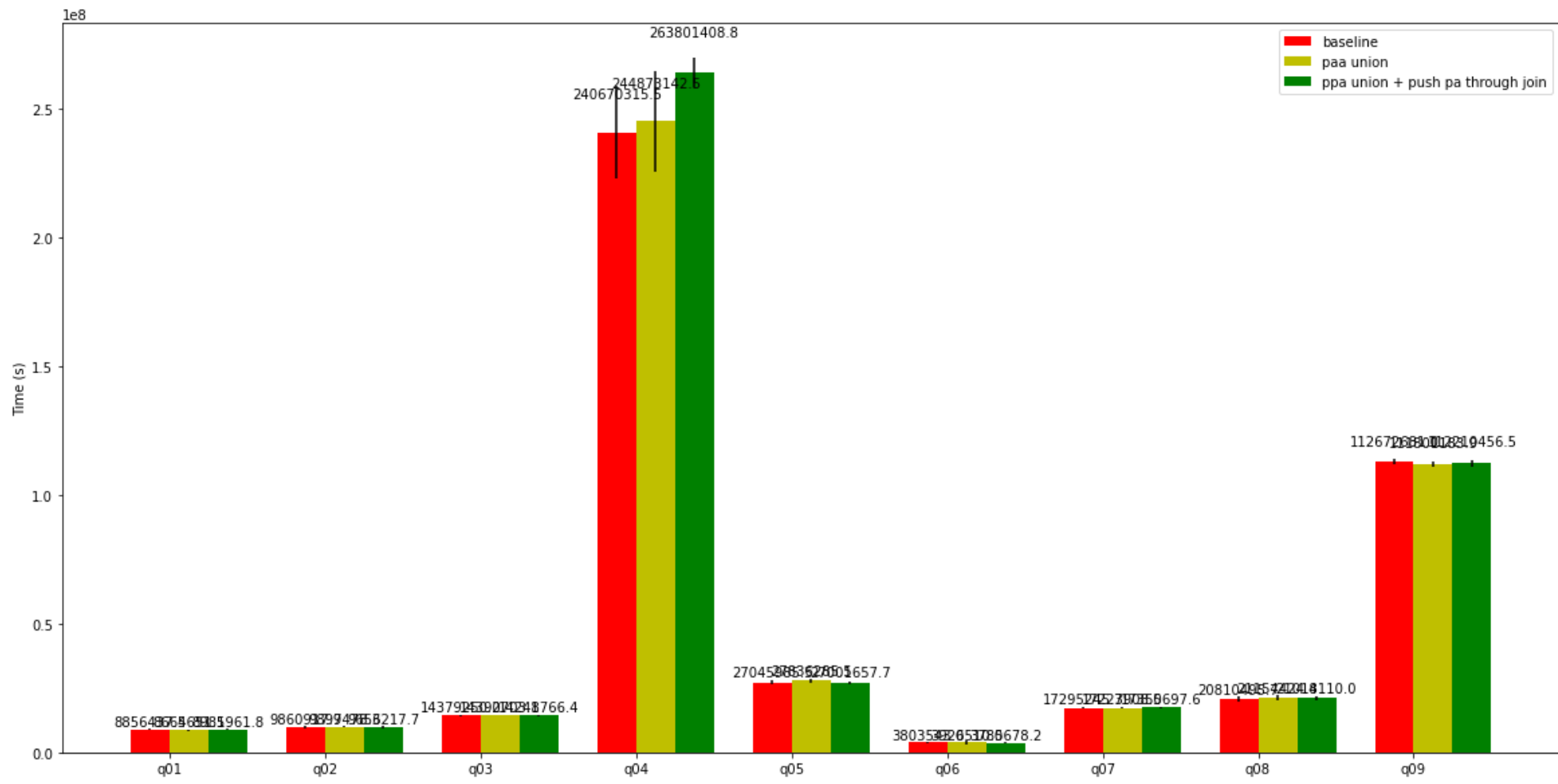
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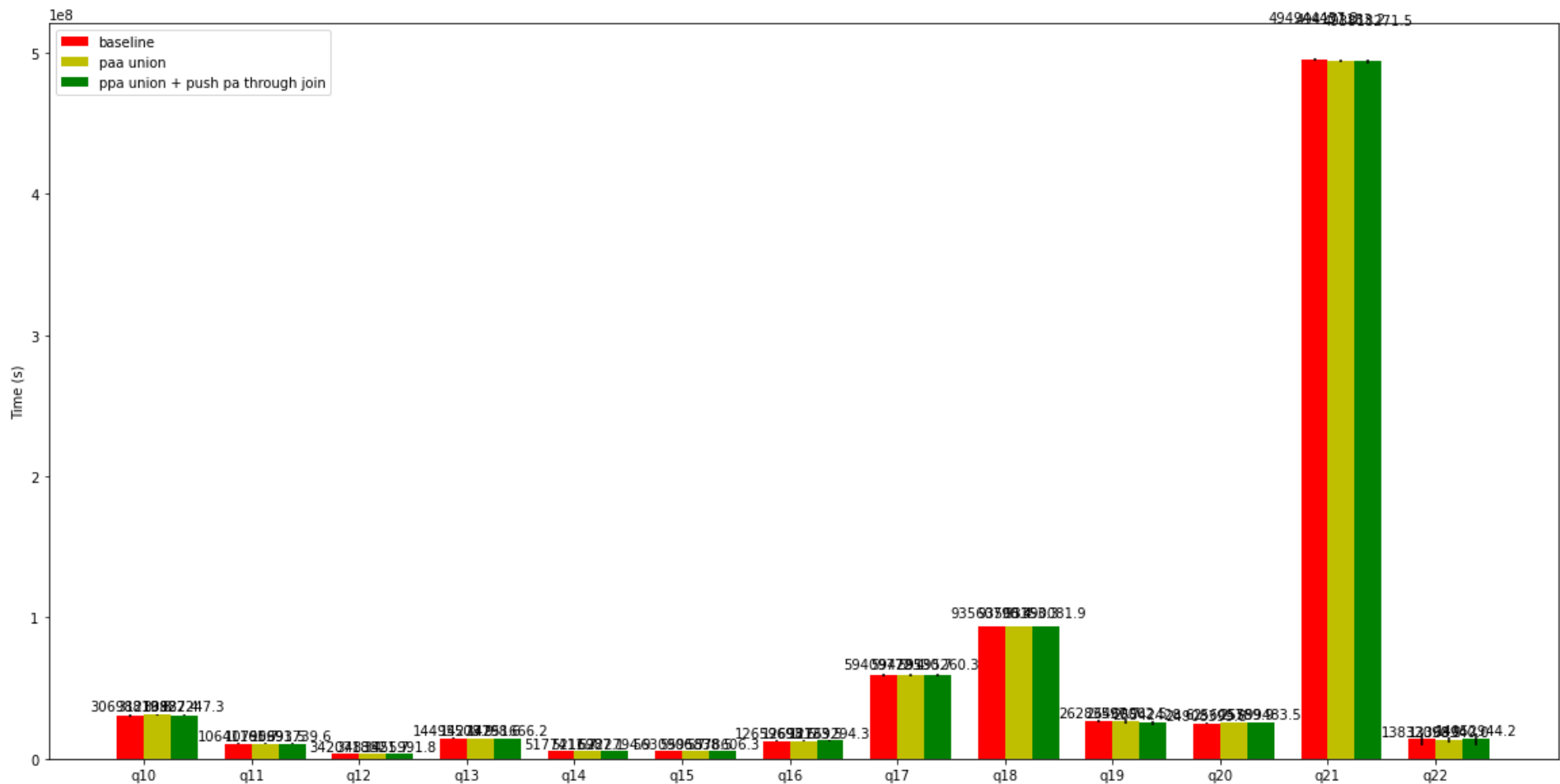
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Name: % change base -> ppa union + push pa through join, dtype: float64

TPC-H Comparison (Peak memory)





	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
21	presto/tpch: q22	13832090.94	4160848.41	13368940.02	2038516.86	14052944.23	4430591.54	-3.35	-463150.92	1.60	30.08	15.25	31.53	0.81152
0	presto/tpch: q01	8856437.53	235624.28	8664651.53	335445.87	8981961.85	460162.20	-2.17	-191786.01	1.42	2.66	3.87	5.12	0.27848
12	presto/tpch: q13	14495508.85	241856.30	14277798.57	329073.87	14251666.15	162973.68	-1.50	-217710.28	-1.68	1.67	2.30	1.14	0.22086
8	presto/tpch: q09	112672680.99	1091997.57	111801183.94	1069400.58	112210456.47	1246838.48	-0.77	-871497.05	-0.41	0.97	0.96	1.11	0.19273
14	presto/tpch: q15	5630906.70	56847.70	5595838.46	44515.25	5578606.30	75125.99	-0.62	-35068.23	-0.93	1.01	0.80	1.35	0.26165
6	presto/tpch: q07	17295245.71	385545.12	17223908.52	279678.82	17350697.56	506738.23	-0.41	-71337.19	0.32	2.23	1.62	2.92	0.72136

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base - > ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
20	presto/tpch: q21	494944457.35	1136381.34	494171183.18	1002233.79	493818271.49	1310854.58	-0.16	-773274.16	-0.23	0.23	0.20	0.27	0.23973
17	presto/tpch: q18	93560790.36	154856.74	93505153.29	149785.70	93390081.86	49961.21	-0.06	-55637.07	-0.18	0.17	0.16	0.05	0.54121
16	presto/tpch: q17	59409772.36	765245.85	59429530.66	972845.41	59195260.29	539446.67	0.03	19758.30	-0.36	1.29	1.64	0.91	0.96958
2	presto/tpch: q03	14379250.18	187227.84	14390703.15	108105.19	14248766.43	99392.68	0.08	11452.97	-0.91	1.30	0.75	0.70	0.89933
15	presto/tpch: q16	12659693.60	294359.01	12698133.52	217034.79	12769294.32	238189.63	0.30	38439.92	0.87	2.33	1.71	1.87	0.80204
1	presto/tpch: q02	9860917.95	608612.03	9897478.30	288901.42	9656217.70	512904.27	0.37	36560.36	-2.08	6.17	2.92	5.31	0.89689
18	presto/tpch: q19	26283597.72	942054.28	26460062.46	1372219.72	25542428.61	1563685.23	0.67	176464.74	-2.82	3.58	5.19	6.12	0.80037
13	presto/tpch: q14	5177411.75	71848.80	5216987.07	114984.24	5222794.91	86928.57	0.76	39575.32	0.88	1.39	2.20	1.66	0.49099
10	presto/tpch: q11	10641161.72	336017.72	10795993.51	388371.89	10691739.63	475374.72	1.46	154831.79	0.48	3.16	3.60	4.45	0.47719
7	presto/tpch: q08	20810495.71	1032852.00	21154424.44	1069659.08	21018110.05	856006.49	1.65	343928.72	1.00	4.96	5.06	4.07	0.58350
9	presto/tpch: q10	30698819.83	971767.08	31213987.37	513685.93	30822247.26	472729.82	1.68	515167.54	0.40	3.17	1.65	1.53	0.27768
3	presto/tpch: q04	240670315.50	17970924.49	244873142.55	19467290.13	263801408.80	5738730.67	1.75	4202827.05	9.61	7.47	7.95	2.18	0.70574
11	presto/tpch: q12	3420718.36	219584.40	3483521.73	137998.96	3455991.83	141629.48	1.84	62803.37	1.03	6.42	3.96	4.10	0.56624
19	presto/tpch: q20	24908399.82	480224.53	25605789.94	301226.97	25599483.52	246061.22	2.80	697390.12	2.77	1.93	1.18	0.96	0.01304
4	presto/tpch: q05	27045985.49	852023.12	27836285.48	927290.22	27001657.71	632284.47	2.92	790299.99	-0.16	3.15	3.33	2.34	0.15525
5	presto/tpch: q06	3803542.98	196331.69	3926509.99	717652.05	3785678.16	190720.96	3.23	122967.01	-0.47	5.16	18.28	5.04	0.69412

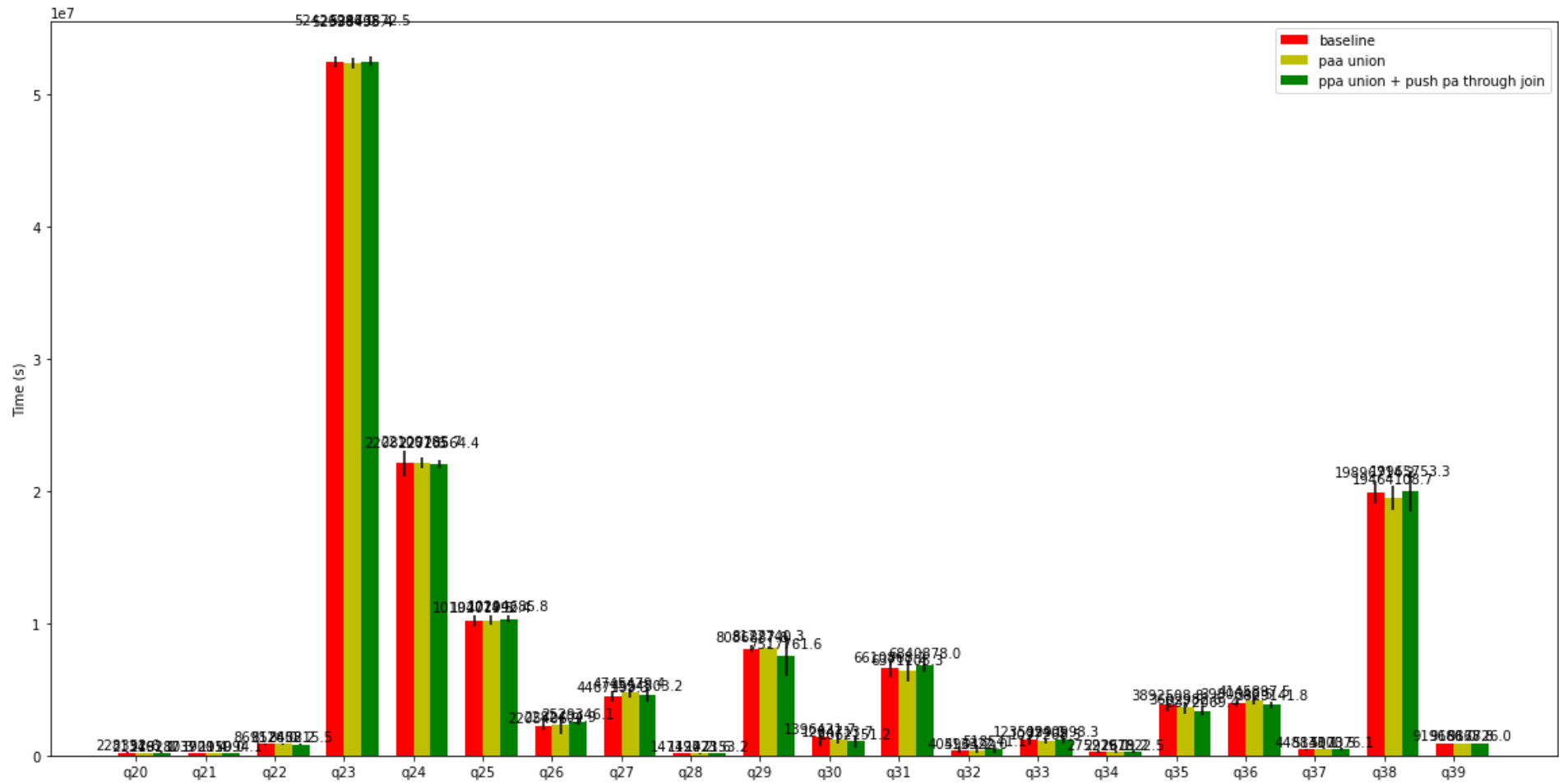
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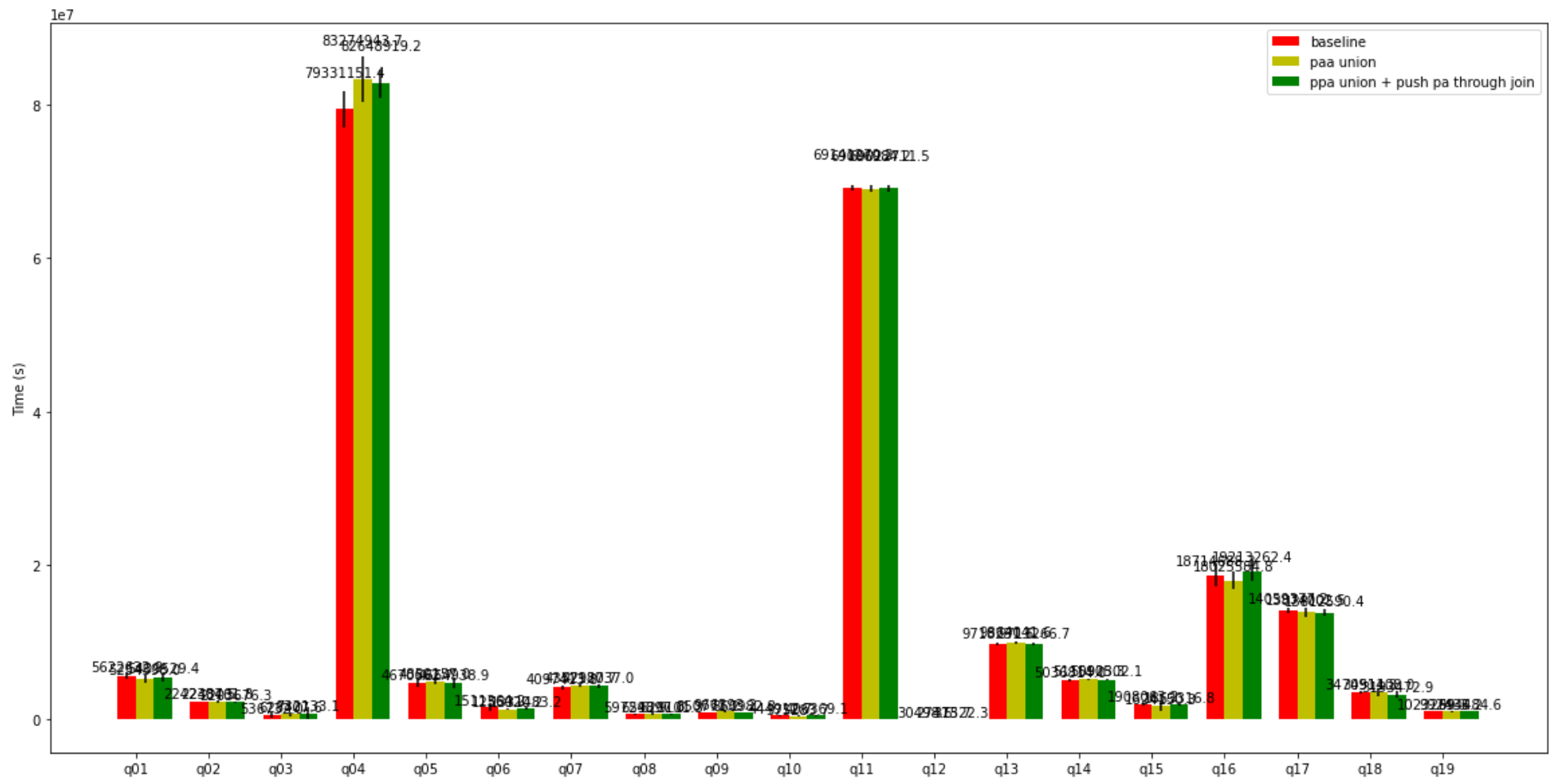
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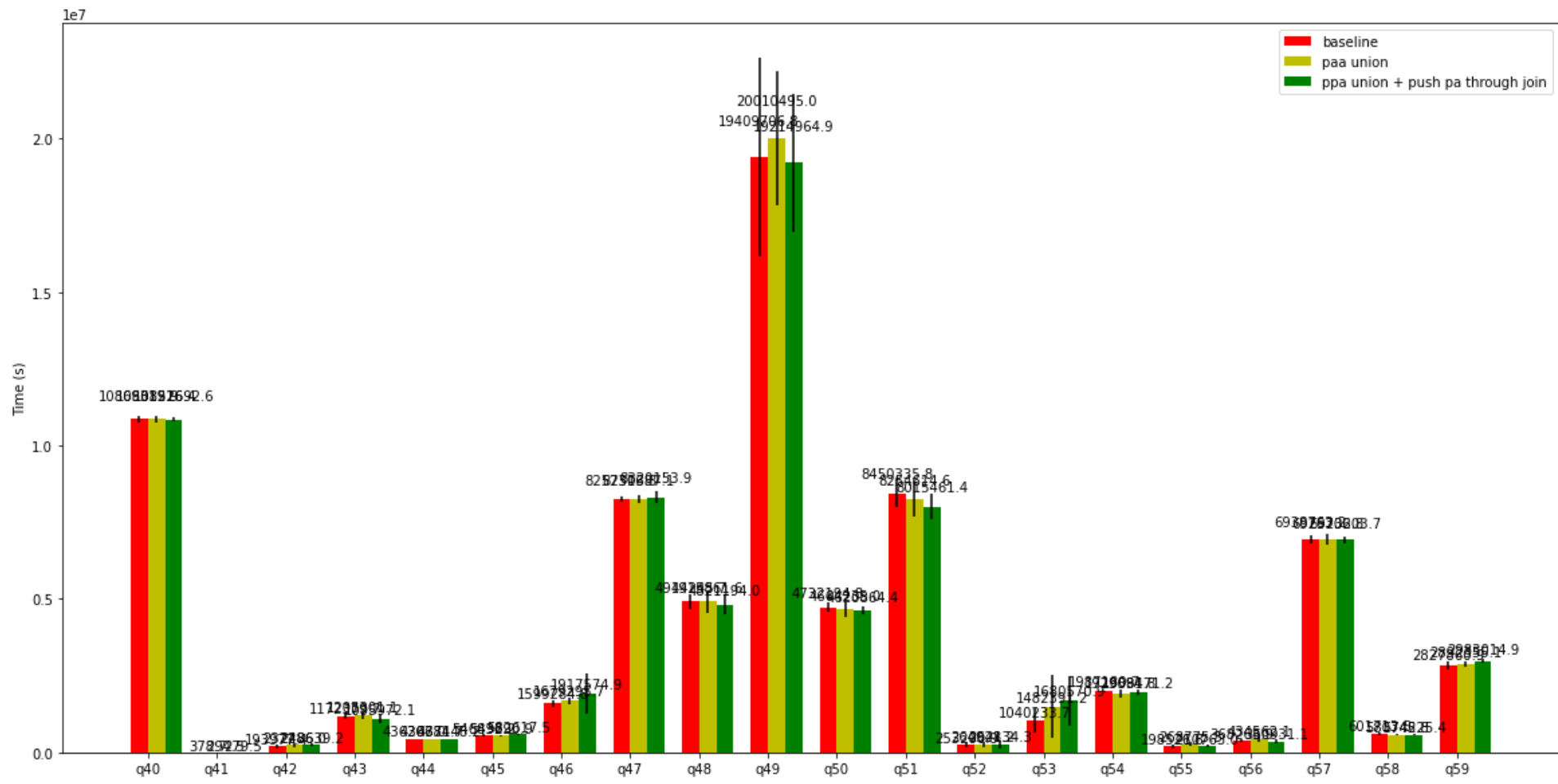
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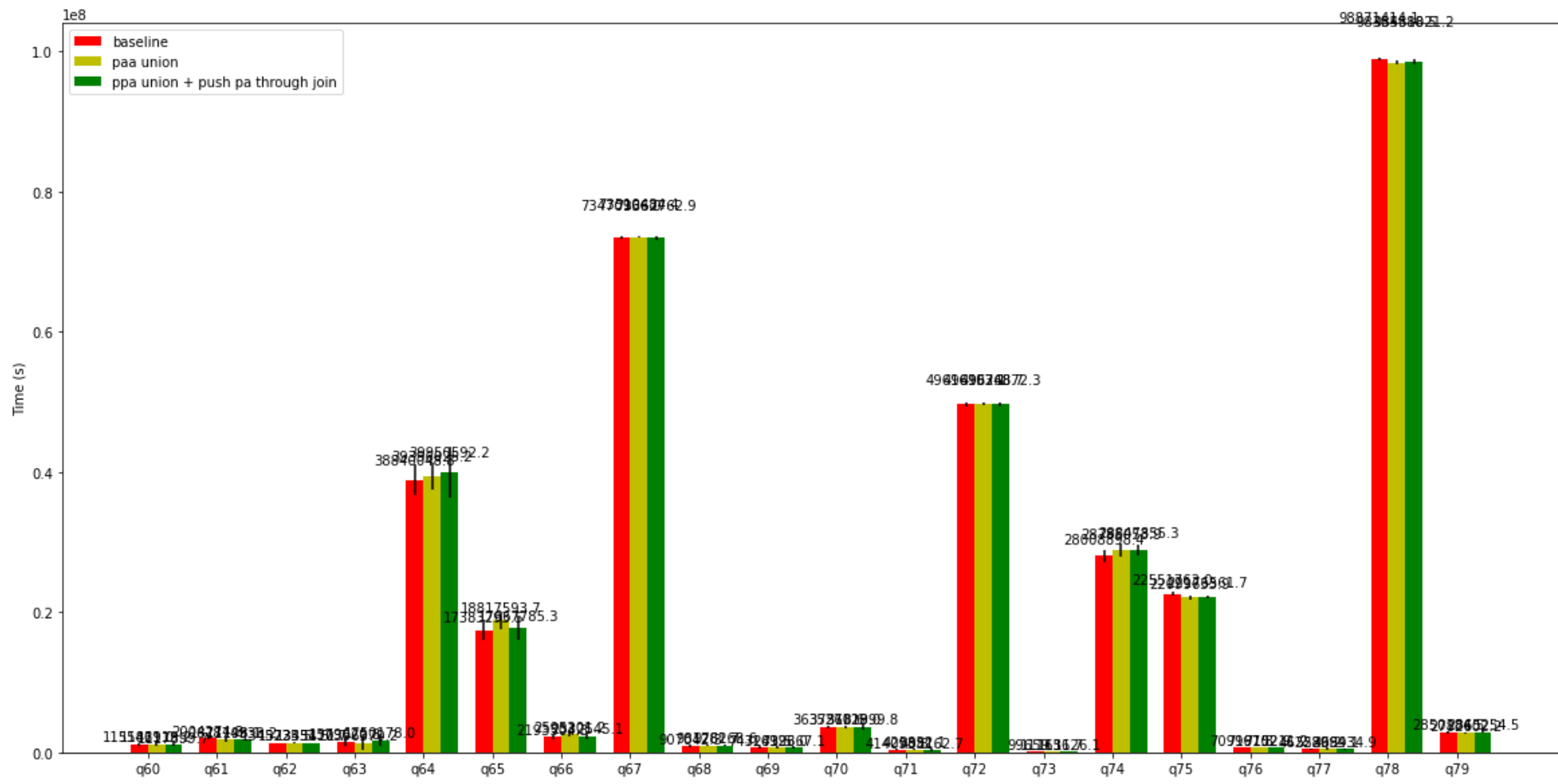
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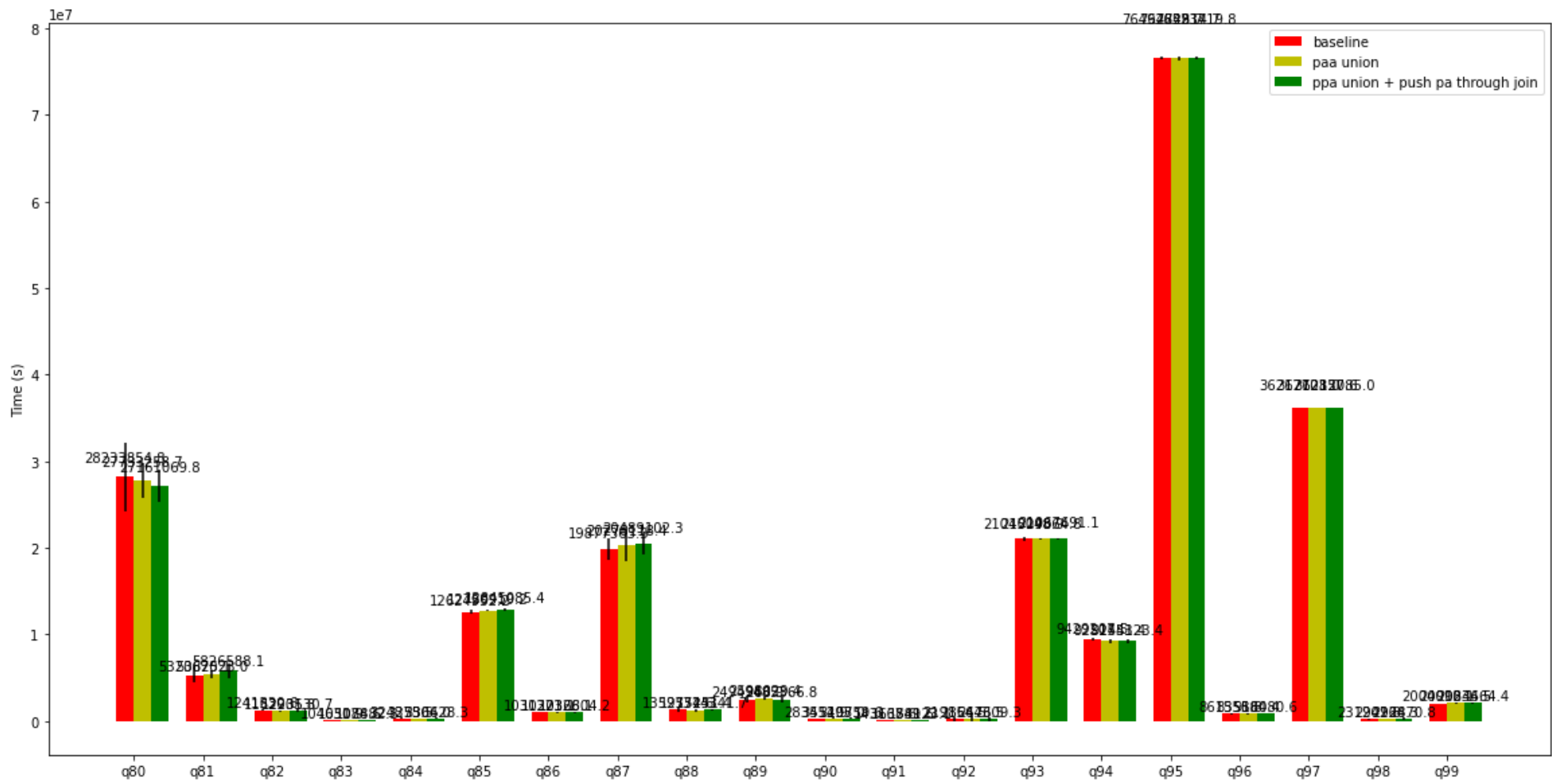
TPC-DS Comparison (Peak memory)

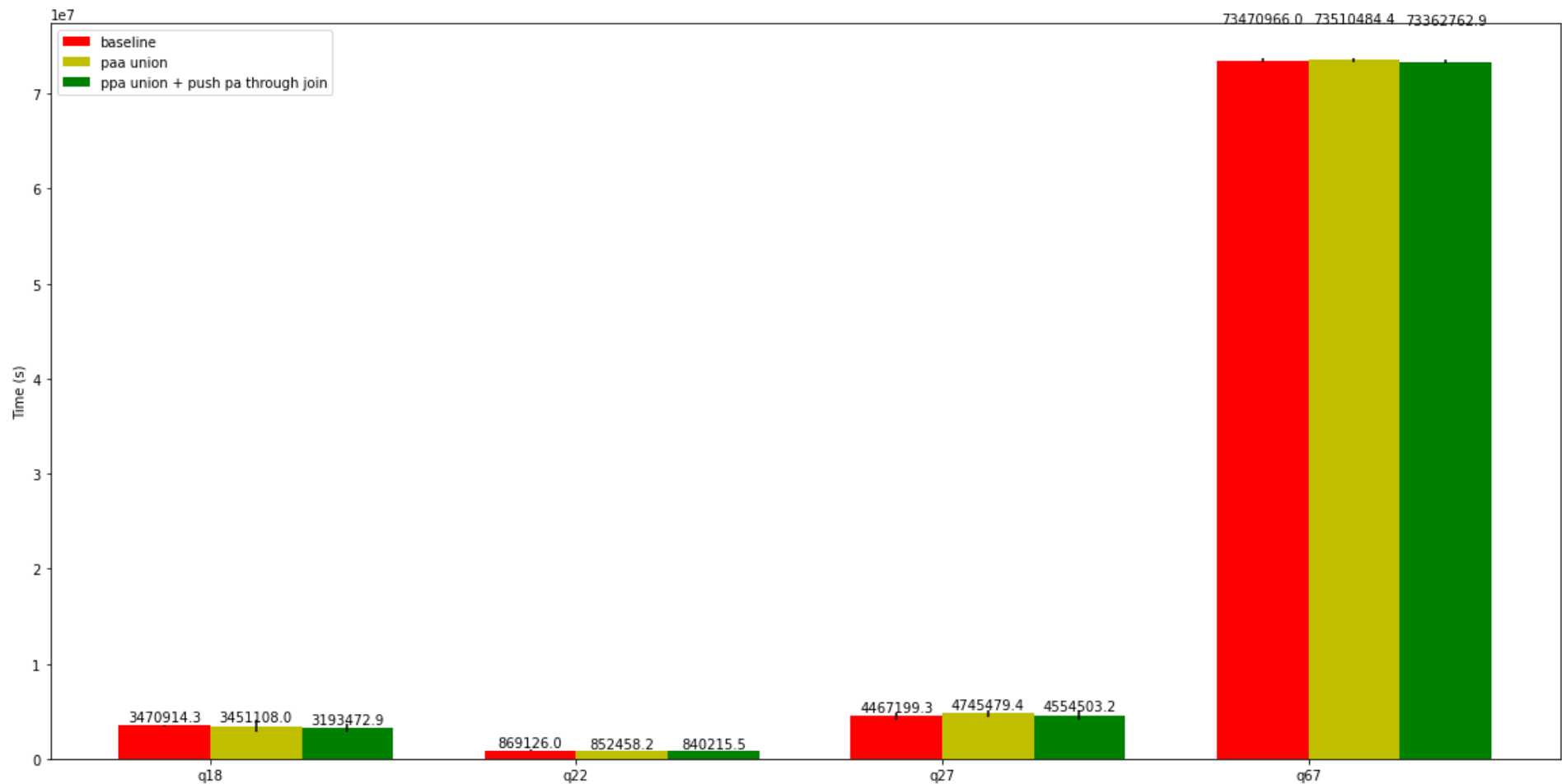












query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
40 presto/tpcds: q41	378.66	120.77	294.48	52.10	279.48	81.60	-22.23	-84.18	-26.19	31.89	17.69	29.20	0.14804
5 presto/tpcds: q06	1511364.19	475989.55	1256020.18	132994.70	1331483.25	195884.27	-16.89	-255344.01	-11.90	31.49	10.59	14.71	0.23436
9 presto/tpcds: q10	444912.70	95014.44	375283.75	82372.18	406369.15	132871.05	-15.65	-69628.96	-8.66	21.36	21.95	32.70	0.20483
14 presto/tpcds: q15	1908063.25	156672.31	1624150.27	632560.62	1863316.83	104235.86	-14.88	-283912.97	-2.35	8.21	38.95	5.59	0.31098
29 presto/tpcds: q30	1396421.75	652610.12	1204713.72	314059.88	1062151.17	456600.34	-13.73	-191708.02	-23.94	46.73	26.07	42.99	0.53135
62 presto/tpcds: q63	1579620.82	728165.81	1396370.15	1068312.98	1750177.97	885490.23	-11.60	-183250.66	10.80	46.10	76.51	50.59	0.73565

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
32	presto/tpcds:q33	1235999.05	410432.81	1097268.47	248254.94	1240998.30	305235.81	-11.22	-138730.58	0.40	33.21	22.62	24.60	0.49485
11	presto/tpcds:q12	30498.64	6557.09	27473.72	5383.13	31522.32	10433.23	-9.92	-3024.92	3.36	21.50	19.59	33.10	0.40294
34	presto/tpcds:q35	3892508.76	589625.68	3602982.57	415145.57	3372069.37	359058.08	-7.44	-289526.19	-13.37	15.15	11.52	10.65	0.34857
60	presto/tpcds:q61	2004274.30	204038.91	1871198.06	285548.26	1874938.16	61022.71	-6.64	-133076.24	-6.45	10.18	15.26	3.25	0.37487
0	presto/tpcds:q01	5622632.95	475496.02	5254598.02	513290.44	5439529.43	518711.64	-6.55	-368034.92	-3.26	8.46	9.77	9.54	0.22661
19	presto/tpcds:q20	228352.59	28362.40	213461.10	13976.61	219280.33	24638.79	-6.52	-14891.49	-3.97	12.42	6.55	11.24	0.27548
81	presto/tpcds:q82	1241530.64	89345.64	1162901.76	124724.82	1223530.70	96485.77	-6.33	-78628.88	-1.45	7.20	10.73	7.89	0.23789
87	presto/tpcds:q88	1359574.55	253128.18	1275251.39	155329.92	1314341.68	135605.87	-6.20	-84323.16	-3.33	18.62	12.18	10.32	0.50260
15	presto/tpcds:q16	18714688.26	1446042.32	18025584.81	1177781.37	19213262.37	1336678.89	-3.68	-689103.45	2.66	7.73	6.53	6.96	0.38671
30	presto/tpcds:q31	6610868.24	736067.65	6371105.32	819519.76	6840878.03	547860.19	-3.63	-239762.92	3.48	11.13	12.86	8.01	0.60557
68	presto/tpcds:q69	743243.54	114369.50	716926.01	120449.77	719367.09	219069.65	-3.54	-26317.53	-3.21	15.39	16.80	30.45	0.70607
27	presto/tpcds:q28	147197.15	11172.17	142023.63	9895.75	147153.18	4713.42	-3.51	-5173.52	-0.03	7.59	6.97	3.20	0.41569
57	presto/tpcds:q58	601713.49	32604.42	580745.78	29621.36	574225.43	18146.31	-3.48	-20967.71	-4.57	5.42	5.10	3.16	0.27070
69	presto/tpcds:q70	3637518.61	219137.42	3527127.96	200635.24	3601999.77	301946.34	-3.03	-110390.65	-0.98	6.02	5.69	8.38	0.38418
18	presto/tpcds:q19	1023269.26	76157.67	992436.18	107100.95	994484.57	65438.97	-3.01	-30833.08	-2.81	7.44	10.79	6.58	0.57820
95	presto/tpcds:q96	861555.83	74083.64	835884.36	62498.97	916080.63	47281.88	-2.98	-25671.46	6.33	8.60	7.48	5.16	0.53110
53	presto/tpcds:q54	1987180.71	31700.60	1929091.83	124007.98	1958471.24	68736.91	-2.92	-58088.87	-1.44	1.60	6.43	3.51	0.29229
78	presto/tpcds:q79	2850184.51	119079.52	2782602.16	100464.43	2865254.48	106749.69	-2.37	-67582.35	0.53	4.18	3.61	3.73	0.31297
50	presto/tpcds:q51	8450335.79	473481.61	8254614.65	562107.48	8015461.40	406867.43	-2.32	-195721.14	-5.15	5.60	6.81	5.08	0.52891
37	presto/tpcds:q38	19896714.17	837336.43	19464108.69	915605.97	19965753.32	1566156.68	-2.17	-432605.47	0.35	4.21	4.70	7.84	0.41307
74	presto/tpcds:q75	22551763.05	288393.43	22099633.93	300125.78	22176561.69	171491.15	-2.00	-452129.12	-1.66	1.28	1.36	0.77	0.02387

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
21	presto/tpcds:q22	869126.02	46858.75	852458.22	14990.65	840215.48	7345.53	-1.92	-16667.79	-3.33	5.39	1.76	0.87	0.42599
93	presto/tpcds:q94	9429207.49	157333.86	9251553.41	263307.74	9244123.37	178719.10	-1.88	-177654.08	-1.96	1.67	2.85	1.93	0.18639
79	presto/tpcds:q80	28233854.76	3953562.59	27733258.68	1990114.18	27161069.83	1841552.90	-1.77	-500596.08	-3.80	14.00	7.18	6.78	0.78740
49	presto/tpcds:q50	4732194.76	150511.97	4664234.95	240443.54	4620864.44	142069.01	-1.44	-67959.80	-2.35	3.18	5.16	3.07	0.57032
16	presto/tpcds:q17	14059377.18	339284.55	13874002.53	635886.11	13812590.44	430677.58	-1.32	-185374.65	-1.76	2.41	4.58	3.12	0.54281
85	presto/tpcds:q86	1031371.14	35669.97	1022326.13	32927.23	1036804.17	52292.13	-0.88	-9045.02	0.53	3.46	3.22	5.04	0.65785
17	presto/tpcds:q18	3470914.35	121333.14	3451108.00	601329.27	3193472.86	426948.49	-0.57	-19806.35	-7.99	3.50	17.42	13.37	0.93852
77	presto/tpcds:q78	98871414.10	178140.95	98355688.45	291167.15	98431021.22	410443.30	-0.52	-515725.65	-0.45	0.18	0.30	0.42	0.00410
38	presto/tpcds:q39	919685.96	6642.58	916868.77	12047.01	917725.96	3914.73	-0.31	-2817.19	-0.21	0.72	1.31	0.43	0.62680
10	presto/tpcds:q11	69141270.22	314565.50	69006984.24	398709.80	69022711.51	371704.56	-0.19	-134285.99	-0.17	0.45	0.58	0.54	0.53178
56	presto/tpcds:q57	6938763.19	136401.17	6925706.78	173171.11	6923203.69	126891.58	-0.19	-13056.41	-0.22	1.97	2.50	1.83	0.88753
22	presto/tpcds:q23	52426986.03	401655.24	52338495.38	430182.62	52473872.46	319085.70	-0.17	-88490.66	0.09	0.77	0.82	0.61	0.72033
46	presto/tpcds:q47	8257316.77	67421.19	8250387.15	135299.07	8320153.87	183117.82	-0.08	-6929.62	0.76	0.82	1.64	2.20	0.91282
39	presto/tpcds:q40	10869319.95	106563.97	10861216.41	119089.75	10852692.57	68408.31	-0.07	-8103.53	-0.15	0.98	1.10	0.63	0.90361
92	presto/tpcds:q93	21045048.91	198774.18	21029864.78	79811.88	21067691.05	83630.57	-0.07	-15184.13	0.11	0.94	0.38	0.40	0.86561
94	presto/tpcds:q95	76492849.69	134572.07	76472814.71	177450.36	76523719.80	192444.07	-0.03	-20034.98	0.04	0.18	0.23	0.25	0.83003
96	presto/tpcds:q97	36217702.98	5839.47	36212857.62	2052.91	36212085.02	1221.22	-0.01	-4845.36	-0.02	0.02	0.01	0.00	0.08416
47	presto/tpcds:q48	4914245.67	243778.92	4915861.60	371238.53	4821194.01	336630.09	0.03	1615.92	-1.89	4.96	7.55	6.98	0.99306
66	presto/tpcds:q67	73470966.03	237768.26	73510484.41	160874.50	73362762.88	224301.90	0.05	39518.37	-0.15	0.32	0.22	0.31	0.74294
24	presto/tpcds:q25	10194774.51	372611.39	10201992.37	351040.22	10294685.84	251223.38	0.07	7217.86	0.98	3.65	3.44	2.44	0.97313
43	presto/tpcds:q44	436207.02	865.67	436684.66	1078.40	437148.22	1363.61	0.11	477.64	0.22	0.20	0.25	0.31	0.41731

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
23	presto/tpcds:q24	22082272.59	1005650.27	22109785.67	422040.62	22016564.39	270781.49	0.12	27513.08	-0.30	4.55	1.91	1.23	0.95195
71	presto/tpcds:q72	49616103.08	236393.91	49695748.68	218130.26	49626872.31	287924.50	0.16	79645.61	0.02	0.48	0.44	0.58	0.55769
83	presto/tpcds:q84	324375.47	49955.15	325303.95	31258.19	336628.34	65658.16	0.29	928.49	3.78	15.40	9.61	19.50	0.96997
1	presto/tpcds:q02	2242334.46	68109.07	2248761.76	103141.27	2203676.27	100799.92	0.29	6427.30	-1.72	3.04	4.59	4.57	0.90117
82	presto/tpcds:q83	104631.94	8966.59	105074.63	10378.32	108882.34	10783.65	0.42	442.68	4.06	8.57	9.88	9.90	0.93854
44	presto/tpcds:q45	546836.25	39851.46	549290.92	21104.55	582617.47	41656.42	0.45	2454.68	6.54	7.29	3.84	7.15	0.89657
80	presto/tpcds:q81	5320670.09	833104.02	5362523.02	479859.21	5826588.08	830300.77	0.79	41852.94	9.51	15.66	8.95	14.25	0.91719
84	presto/tpcds:q85	12624952.22	225248.47	12750919.17	73565.29	12845085.44	152507.61	1.00	125966.95	1.74	1.78	0.58	1.19	0.22206
28	presto/tpcds:q29	8086887.80	261624.86	8177740.31	58502.37	7517761.60	1544815.29	1.12	90852.51	-7.04	3.24	0.72	20.55	0.42585
75	presto/tpcds:q76	709967.78	40487.11	719102.92	84290.84	715211.17	58092.15	1.29	9135.14	0.74	5.70	11.72	8.12	0.81571
63	presto/tpcds:q64	38840048.80	2187824.95	39396025.18	1974475.97	39950592.24	3648815.65	1.43	555976.38	2.86	5.63	5.01	9.13	0.65389
12	presto/tpcds:q13	9718231.56	152061.27	9864041.58	201666.38	9713266.68	229040.04	1.50	145810.02	-0.05	1.56	2.04	2.36	0.18770
13	presto/tpcds:q14	5036814.02	136344.69	5115905.28	54040.42	5092302.06	40419.43	1.57	79091.26	1.10	2.71	1.06	0.79	0.21595
31	presto/tpcds:q32	405964.20	269836.29	413321.99	278814.05	518541.12	324303.25	1.81	7357.79	27.73	66.47	67.46	62.54	0.96387
86	presto/tpcds:q87	19877363.25	1242870.32	20278118.43	1859685.42	20489102.32	1291242.44	2.02	400755.18	3.08	6.25	9.17	6.30	0.67009
61	presto/tpcds:q62	1345225.46	39013.03	1373351.49	59035.51	1343410.70	49149.36	2.09	28126.04	-0.13	2.90	4.30	3.66	0.35321
58	presto/tpcds:q59	2827860.93	127852.67	2892355.12	92697.27	2983014.90	82114.84	2.28	64494.19	5.49	4.52	3.20	2.75	0.34073
59	presto/tpcds:q60	1155460.96	146328.78	1182919.18	207303.95	1117899.71	170767.00	2.38	27458.23	-3.25	12.66	17.52	15.28	0.79634
73	presto/tpcds:q74	28008898.38	833490.59	28785053.95	966003.41	28847855.31	844981.81	2.77	776155.57	3.00	2.98	3.36	2.93	0.16705
42	presto/tpcds:q43	1172379.70	109563.98	1205301.14	107122.62	1095972.08	151931.15	2.81	32921.44	-6.52	9.35	8.89	13.86	0.61017
70	presto/tpcds:q71	414093.85	136272.66	425852.14	107469.14	408162.69	181536.49	2.84	11758.29	-1.43	32.91	25.24	44.48	0.87150

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
48	presto/tpcds:q49	19409706.79	3230252.64	20010494.97	2184325.87	19214964.95	2264536.00	3.10	600788.18	-1.00	16.64	10.92	11.79	0.71377
25	presto/tpcds:q26	2205406.90	314372.90	2282404.91	668102.87	2529346.15	245191.44	3.49	76998.01	14.69	14.25	29.27	9.69	0.80356
4	presto/tpcds:q05	4670662.71	481370.11	4850156.98	327127.60	4664938.89	767739.49	3.84	179494.27	-0.12	10.31	6.74	16.46	0.46741
88	presto/tpcds:q89	2494966.94	416918.02	2598029.38	192505.48	2485366.85	342900.31	4.13	103062.44	-0.38	16.71	7.41	13.80	0.59456
35	presto/tpcds:q36	3980646.45	155409.47	4145897.48	308542.53	3829141.85	251321.25	4.15	165251.02	-3.81	3.90	7.44	6.56	0.26849
51	presto/tpcds:q52	253200.93	81201.44	264928.19	84779.69	264134.27	128554.31	4.63	11727.25	4.32	32.07	32.00	48.67	0.81164
98	presto/tpcds:q99	2004010.11	61630.57	2099236.52	56853.69	2084464.41	49560.42	4.75	95226.42	4.01	3.08	2.71	2.38	0.01939
3	presto/tpcds:q04	79331151.44	2295044.42	83274943.68	2952332.64	82648919.19	1830576.56	4.97	3943792.23	4.18	2.89	3.55	2.21	0.02726
45	presto/tpcds:q46	1599284.78	104734.27	1679295.73	115728.19	1917574.93	646798.40	5.00	80010.96	19.90	6.55	6.89	33.73	0.23779
33	presto/tpcds:q34	275226.12	95074.07	291619.18	68612.54	297822.54	151507.93	5.96	16393.06	8.21	34.54	23.53	50.87	0.73908
26	presto/tpcds:q27	4467199.33	391325.81	4745479.44	354160.98	4554503.16	497219.55	6.23	278280.10	1.95	8.76	7.46	10.92	0.22558
6	presto/tpcds:q07	4097413.76	279157.00	4357187.67	221221.16	4292037.02	267762.17	6.34	259773.91	4.75	6.81	5.08	6.24	0.10432
67	presto/tpcds:q68	907042.25	195104.27	981281.72	152500.15	976268.57	146776.39	8.18	74239.46	7.63	21.51	15.54	15.03	0.47960
64	presto/tpcds:q65	17383293.53	1260678.94	18817593.73	1252955.72	17667785.33	1639277.75	8.25	1434300.20	1.64	7.25	6.66	9.28	0.07630
20	presto/tpcds:q21	173720.42	23523.65	190118.98	21061.50	195094.12	27660.24	9.44	16398.56	12.30	13.54	11.08	14.18	0.23210
7	presto/tpcds:q08	597248.86	64541.50	659397.02	150746.61	620101.30	75552.30	10.41	62148.16	3.83	10.81	22.86	12.18	0.37510
72	presto/tpcds:q73	99659.06	23318.98	111656.67	13384.50	113126.08	21836.00	12.04	11997.61	13.51	23.40	11.99	19.30	0.30002
8	presto/tpcds:q09	850771.21	51225.17	966393.22	113789.16	860982.77	34927.28	13.59	115622.01	1.20	6.02	11.77	4.06	0.04660
90	presto/tpcds:q91	143167.60	14994.17	163849.58	13325.24	158123.10	11034.17	14.45	20681.98	10.45	10.47	8.13	6.98	0.03010
36	presto/tpcds:q37	448831.13	41950.11	514300.54	45286.09	507376.11	69724.81	14.59	65469.41	13.04	9.35	8.81	13.74	0.02659
2	presto/tpcds:q03	536732.02	312616.48	628407.55	250588.67	732133.08	783289.06	17.08	91675.53	36.41	58.24	39.88	106.99	0.58749

	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
55	presto/tpcds:q56	368263.91	41645.65	434562.15	90616.04	360931.13	56745.45	18.00	66298.24	-1.99	11.31	20.85	15.72	0.13450
65	presto/tpcds:q66	2193504.29	327426.02	2595201.18	273716.77	2332545.06	376558.21	18.31	401696.89	6.34	14.93	10.55	16.14	0.04383
76	presto/tpcds:q77	462289.25	68181.44	552094.12	131537.33	468934.93	53735.86	19.43	89804.87	1.44	14.75	23.83	11.46	0.16844
41	presto/tpcds:q42	193977.40	60642.07	232286.02	50610.10	248639.16	43984.57	19.75	38308.62	28.18	31.26	21.79	17.69	0.26228
89	presto/tpcds:q90	283452.85	30108.44	351493.04	87791.24	310759.63	72353.59	24.00	68040.19	9.63	10.62	24.98	23.28	0.10276
97	presto/tpcds:q98	231201.82	113593.07	294264.30	32996.19	292870.76	126843.91	27.28	63062.48	26.67	49.13	11.21	43.31	0.22083
91	presto/tpcds:q92	219154.47	208215.44	286643.52	319573.25	247609.29	255535.70	30.80	67489.05	12.98	95.01	111.49	103.20	0.67391
54	presto/tpcds:q55	198526.78	63078.60	268775.47	71871.70	210763.02	51427.17	35.38	70248.69	6.16	31.77	26.74	24.40	0.10215
52	presto/tpcds:q53	1040233.65	387497.71	1482391.23	1030033.75	1680570.86	814565.82	42.51	442157.58	61.56	37.25	69.48	48.47	0.34826

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max       43

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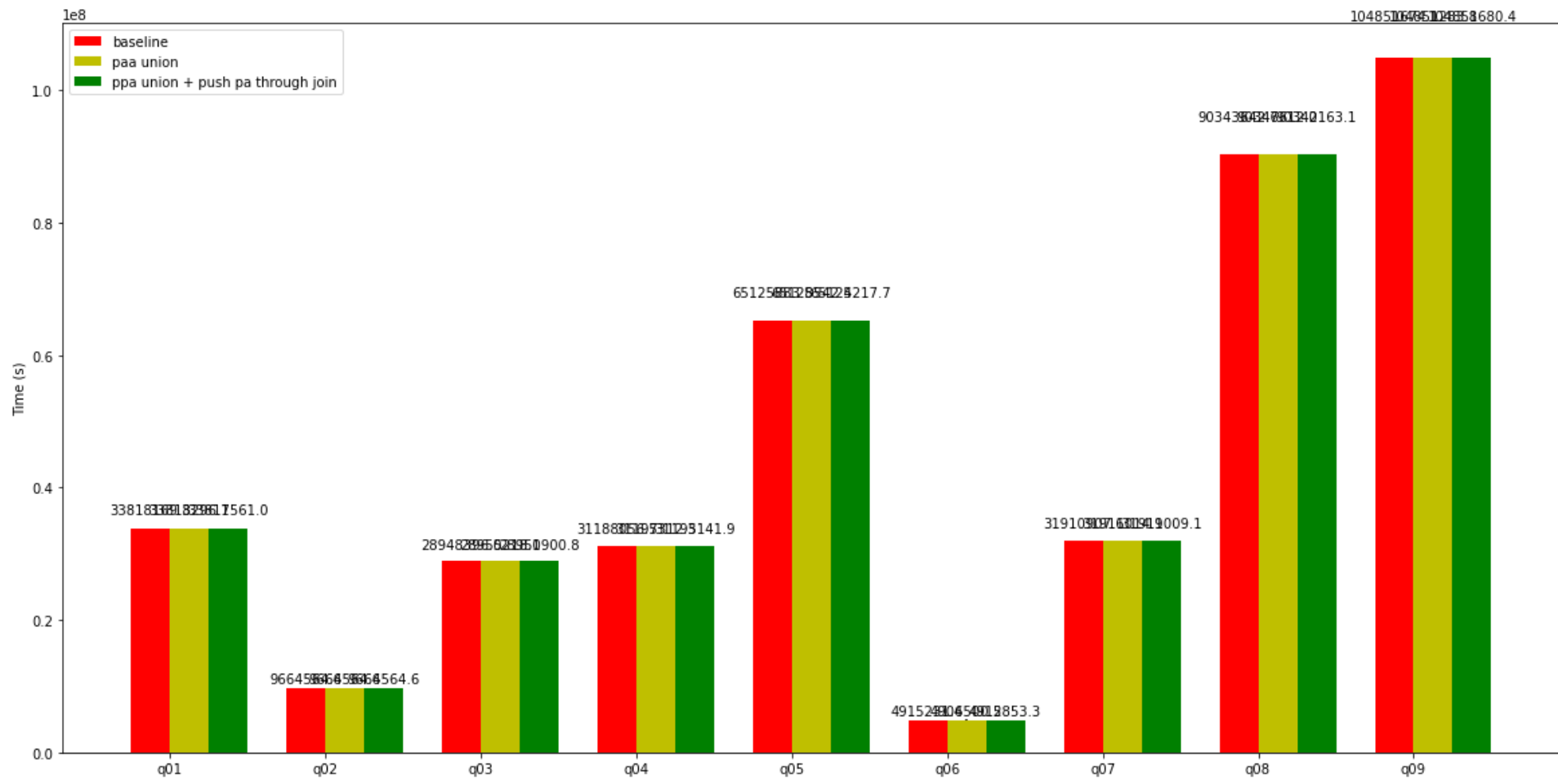
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count    99
mean      2
std      11
min     -26
25%      -2
50%       0
75%       4
max       62

```

Name: % change base -> ppa union + push pa through join, dtype: float64

TPC-H Comparison (physicalInputDataSize)



	query	baseline mean	baseline std.dev	paa union mean	paa union std.dev	ppa union + push pa through join mean	ppa union + push pa through join std.dev	% change	absolute change	% change base -> ppa union + push pa through join	baseline std.dev %	paa union std.dev %	ppa union + push pa through join std.dev %	p-value
14	presto/tpch: q15	3991858.28	0.00	3991858.28	0.00	3991858.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
13	presto/tpch: q14	848493.32	0.00	848493.32	0.00	848493.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
12	presto/tpch: q13	28845283.36	0.00	28845283.36	0.00	28845283.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
11	presto/tpch: q12	12131104.14	0.00	12131104.14	0.00	12131104.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
21	presto/tpch: q22	8777637.66	0.00	8777637.66	0.00	8777637.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
9	presto/tpch: q10	29540590.93	0.00	29540590.93	0.00	29540590.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
1	presto/tpch: q02	9664564.58	0.00	9664564.58	0.00	9664564.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
18	presto/tpch: q19	60189286.03	160.40	60189364.62	184.81	60190082.37	1864.76	0.00	78.60	0.00	0.00	0.00	0.00	0.44967
19	presto/tpch: q20	14207794.30	123.64	14207825.44	173.76	14207831.16	99.19	0.00	31.14	0.00	0.00	0.00	0.00	0.72798
6	presto/tpch: q07	31910907.63	197.83	31911014.87	226.23	31911009.10	400.17	0.00	107.25	0.00	0.00	0.00	0.00	0.40255
0	presto/tpch: q01	33818169.29	2285.74	33818296.07	1066.59	33817561.04	8854.06	0.00	126.79	-0.00	0.01	0.00	0.03	0.90445
7	presto/tpch: q08	90343642.74	5459.77	90346612.04	3568.74	90342163.09	2266.88	0.00	2969.29	-0.00	0.01	0.00	0.00	0.29090
4	presto/tpch: q05	65125883.51	8453.70	65128542.45	8595.77	65124217.72	5444.78	0.00	2658.94	-0.00	0.01	0.01	0.01	0.60087
20	presto/tpch: q21	148829779.44	4878.94	148842729.10	15774.57	148814673.17	5343.91	0.01	12949.66	-0.01	0.00	0.01	0.00	0.08366
2	presto/tpch: q03	28948395.98	9743.16	28955218.06	10069.48	28950900.77	6576.82	0.02	6822.08	0.01	0.03	0.03	0.02	0.26054
3	presto/tpch: q04	31188056.45	22320.47	31197312.28	15142.76	31195141.85	18896.48	0.03	9255.83	0.02	0.07	0.05	0.06	0.42023

```

count    22
mean     -0
std       0
min      -0
25%      0
50%      0
75%      0
max       0
Name: % change, dtype: float64
count    22
mean     -0
std       0
min      -0

```

25%	-0
50%	0
75%	0
max	0

Name: % change base -> ppa union + push pa through join, dtype: float64