Benchmark details

```
[('dec-serde-oss-393-S-87aafb6f91-hive_sf1000_orc_part-s1185',
  'dec serde opt'),
 ('dec-serde-push-pa-through-join-oss-393-S-87aafb6f91-hive_sf1000_orc_part-r538',
  'dec serde opt + push-pa-through-join'),
 ('paa-union-dec-serde-push-pa-t-join-oss-393-S-17a4c5177b-hive_sf1000_orc_part-r543',
  'dec serde opt + push-pa-through-join + paa union')]
```

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	dec serde opt	550	990	61,519	104,599	1.830 PiB	1.644 PiB	1.145 TiB	0.935 TiB	833.211 GiB	1.009 TiB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	dec serde opt + push-pa-through-join	567	992	62,923	106,399	1.823 PiB	1.651 PiB	1.141 TiB	0.936 TiB	833.190 GiB	1.012 TiB	3.00	0.22	2.28	1.72	-0.37	0.44	-0.31	0.11	-0.00	0.26
2	dec serde opt + push-pa-through-join + paa union	523	966	58,282	104,156	1.792 PiB	1.629 PiB	1.173 TiB	0.932 TiB	833.227 GiB	1.009 TiB	-4.88	-2.47	-5.26	-0.42	-2.09	-0.89	2.49	-0.36	0.00	0.01

FAILED QUERIES

dec serde opt

benchmark	query	mean_duration	std_dev

dec serde opt + push-pa-through-join

benchmark	query	mean_duration	std_dev

dec serde opt + push-pa-through-join + paa union

benchmark	query	mean_duration	std_dev

TPC-H Comparison (DURATION)

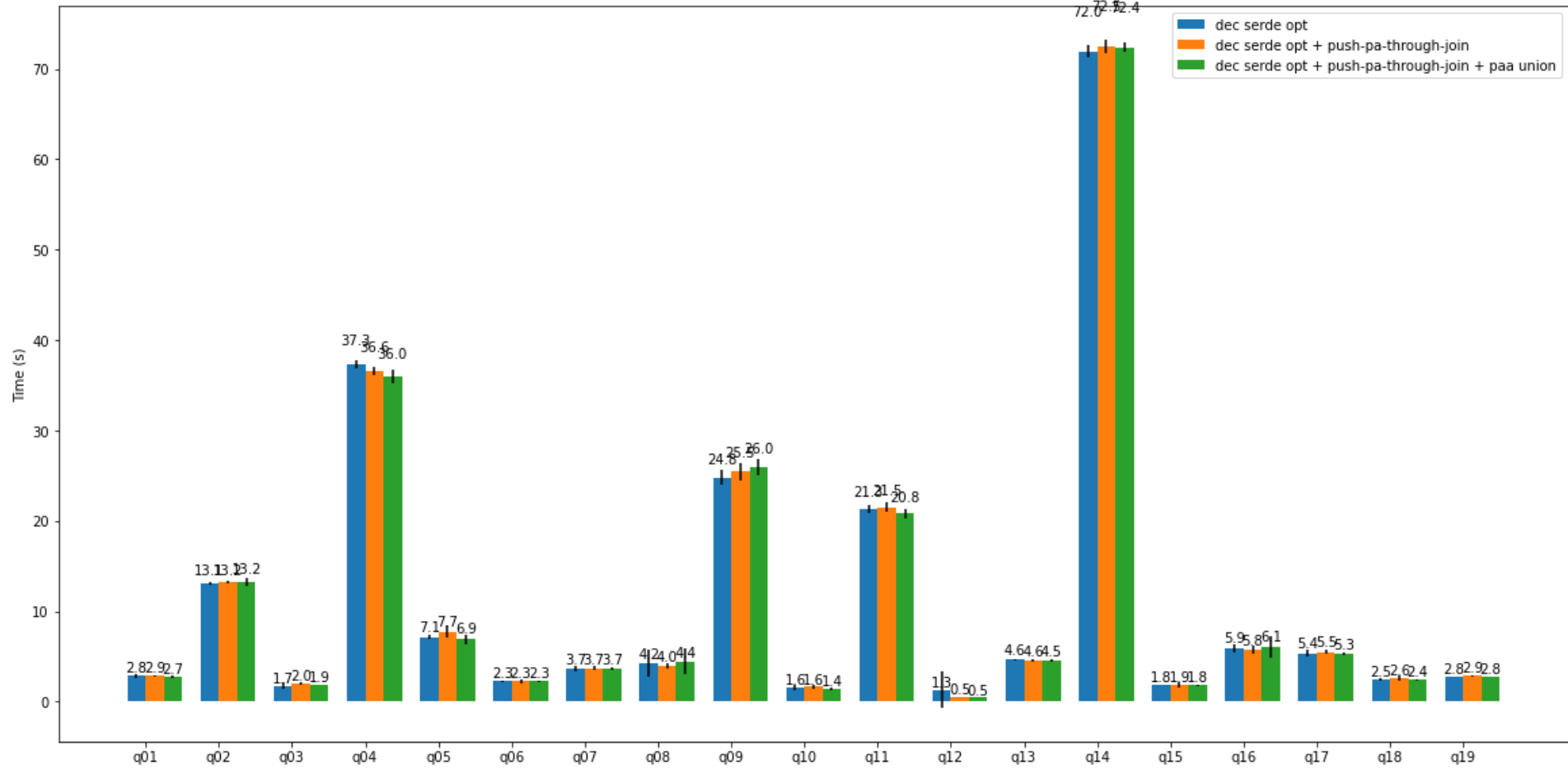|	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
14	presto/tpch: q15	5.06	2.04	4.03	0.25	3.33	0.11	-20.43	-1.03	-34.14	40.28	6.15	3.36	0.24576
0	presto/tpch: q01	18.36	0.17	18.02	0.16	17.72	0.41	-1.89	-0.35	-3.49	0.93	0.90	2.34	0.00490
21	presto/tpch: q22	5.91	0.39	5.65	0.29	5.78	0.54	-4.35	-0.26	-2.24	6.65	5.16	9.39	0.22720
13	presto/tpch: q14	2.63	0.19	2.56	0.06	2.49	0.21	-2.54	-0.07	-5.01	7.38	2.52	8.44	0.44250
15	presto/tpch: q16	5.59	0.11	5.62	0.12	5.40	0.13	0.36	0.02	-3.53	1.98	2.06	2.41	0.76399
19	presto/tpch: q20	12.88	0.07	12.94	0.21	10.53	0.09	0.45	0.06	-18.31	0.55	1.62	0.89	0.53940

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
5	presto/tpch: q06	1.40	0.10	1.49	0.09	1.33	0.06	6.11	0.09	-4.87	7.22	6.16	4.57	0.15527
16	presto/tpch: q17	52.36	0.32	52.51	0.38	42.59	0.91	0.29	0.15	-18.65	0.62	0.73	2.13	0.47045
10	presto/tpch: q11	7.80	0.53	8.09	0.10	8.40	0.41	3.67	0.29	7.69	6.76	1.29	4.82	0.22137
8	presto/tpch: q09	75.58	0.92	75.92	0.77	74.25	1.41	0.45	0.34	-1.76	1.21	1.02	1.89	0.49868
11	presto/tpch: q12	10.74	0.36	11.09	0.28	10.51	0.34	3.23	0.35	-2.19	3.39	2.51	3.27	0.09363
7	presto/tpch: q08	19.92	0.35	20.27	0.63	19.46	0.39	1.75	0.35	-2.34	1.74	3.13	1.99	0.26461
6	presto/tpch: q07	14.64	0.56	15.00	0.39	14.67	0.46	2.49	0.36	0.20	3.85	2.58	3.11	0.22132
20	presto/tpch: q21	85.71	0.89	86.20	2.57	83.64	1.90	0.57	0.49	-2.42	1.04	2.99	2.27	0.66839
18	presto/tpch: q19	13.82	0.32	14.35	0.20	13.88	0.14	3.79	0.52	0.40	2.31	1.42	1.01	0.00689
2	presto/tpch: q03	22.10	0.43	22.77	0.47	21.60	0.43	3.03	0.67	-2.26	1.97	2.08	2.00	0.02885
12	presto/tpch: q13	21.58	1.19	22.27	0.90	21.65	0.74	3.15	0.68	0.32	5.52	4.03	3.43	0.28971
1	presto/tpch: q02	11.25	0.90	11.94	1.04	11.42	0.32	6.19	0.70	1.55	8.04	8.73	2.76	0.24484
4	presto/tpch: q05	31.95	1.04	33.00	0.75	32.38	0.50	3.26	1.04	1.33	3.25	2.27	1.55	0.07435
17	presto/tpch: q18	64.72	0.77	66.38	1.19	54.41	1.28	2.57	1.66	-15.94	1.19	1.79	2.36	0.01653
9	presto/tpch: q10	22.88	0.58	27.81	5.07	22.12	0.30	21.55	4.93	-3.32	2.52	18.24	1.37	0.03962
3	presto/tpch: q04	43.23	1.63	48.75	3.00	45.73	0.85	12.76	5.52	5.79	3.78	6.15	1.87	0.00269

```
count    22
mean      2
std       7
min     -20
25%       0
50%       3
75%       4
max      22
Name: % change, dtype: float64
count    22
mean     -5
std       9
```
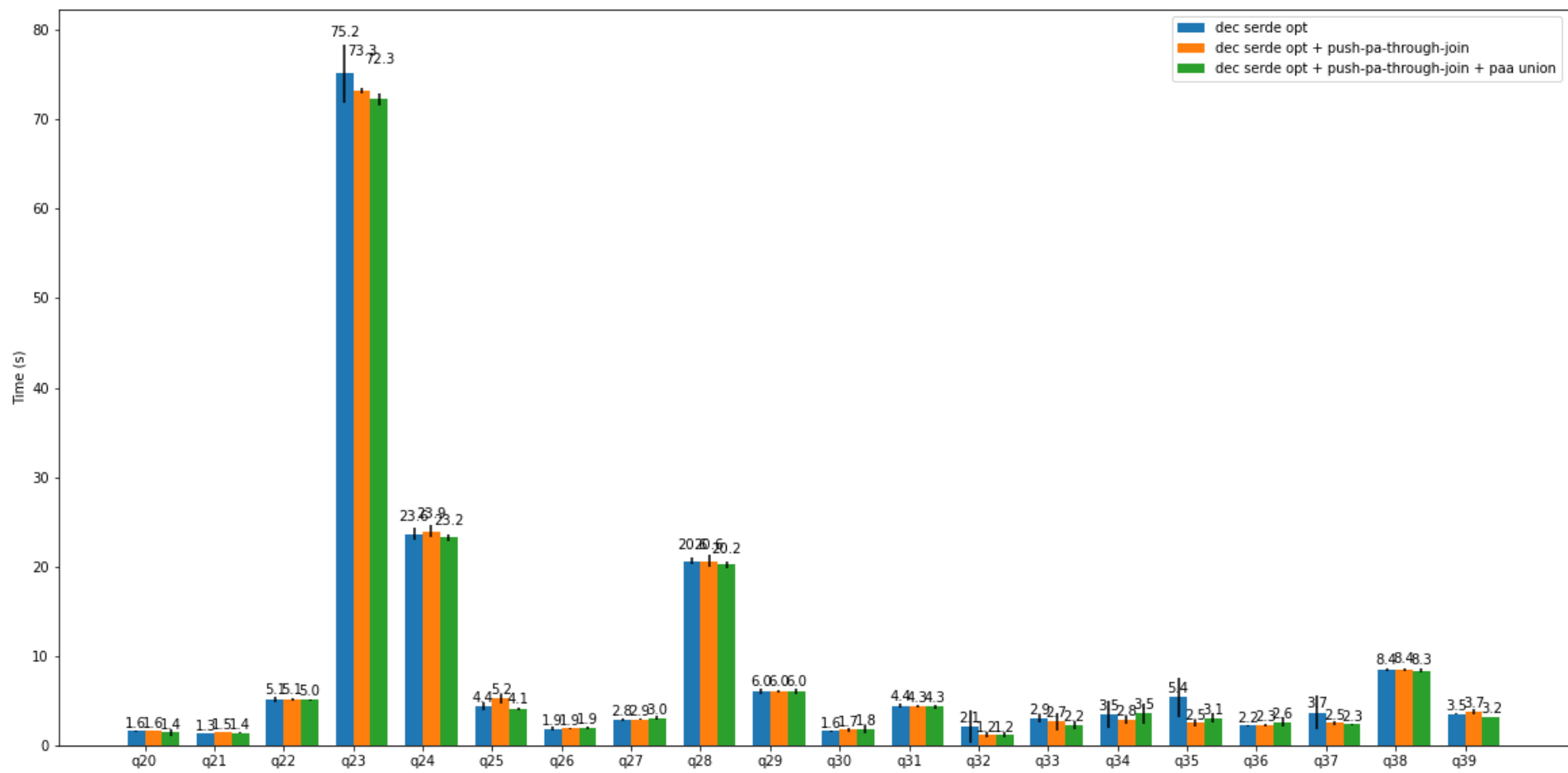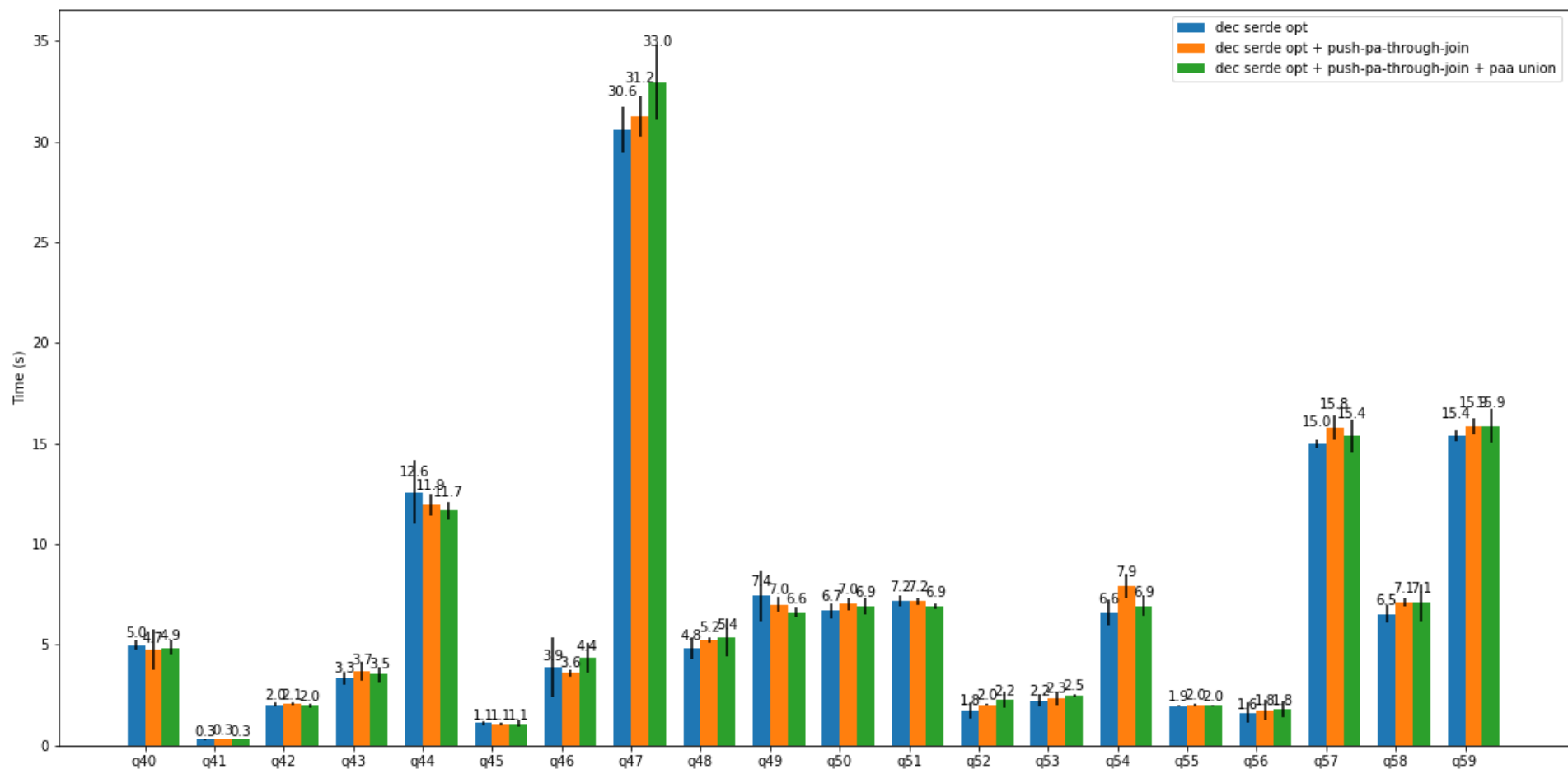
```
min      -34
25%       -5
50%       -2
75%        0
max        8
Name: % change base -> dec serde opt + push-pa-through-join + paa union, dtype: float64
```
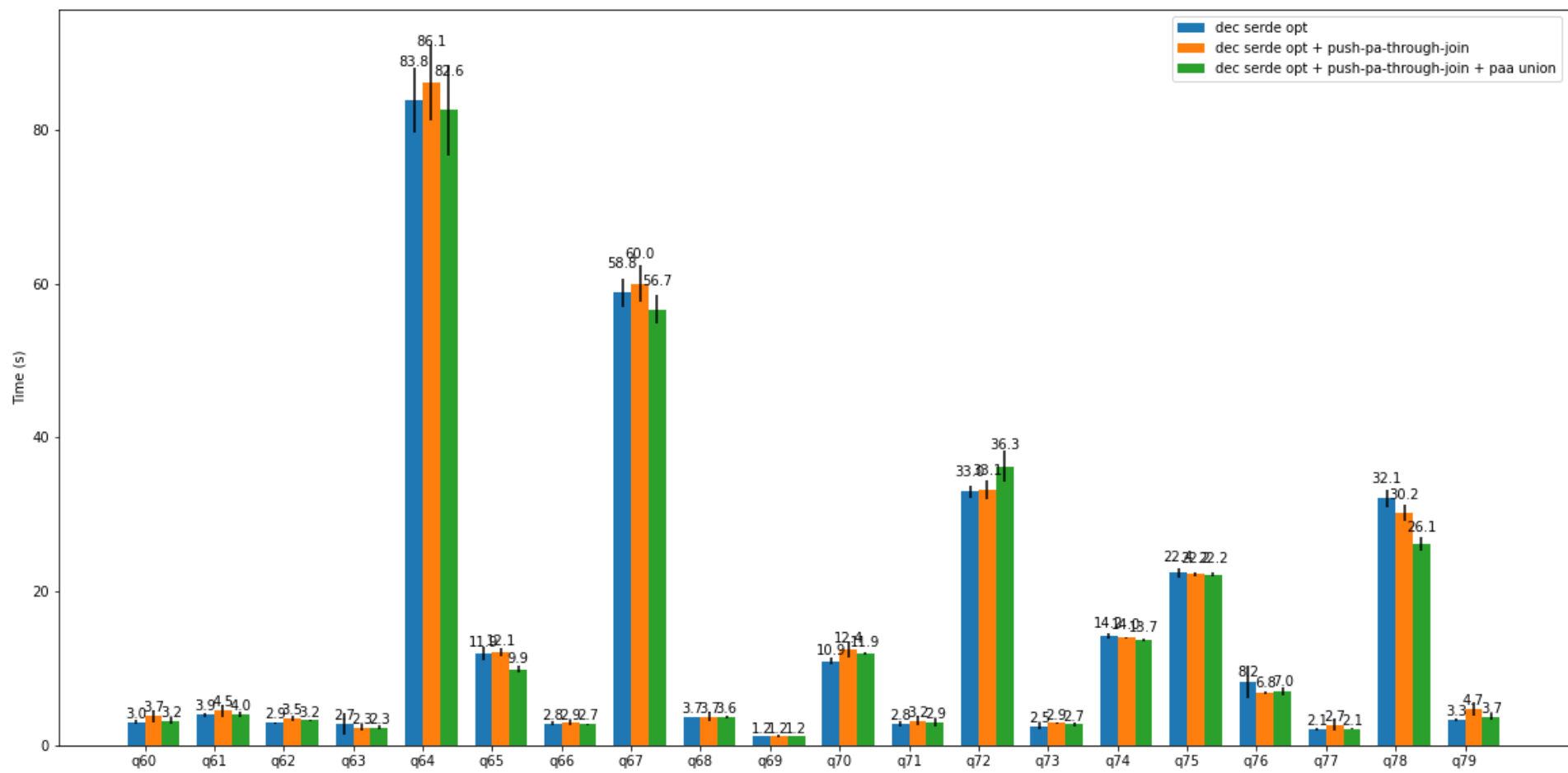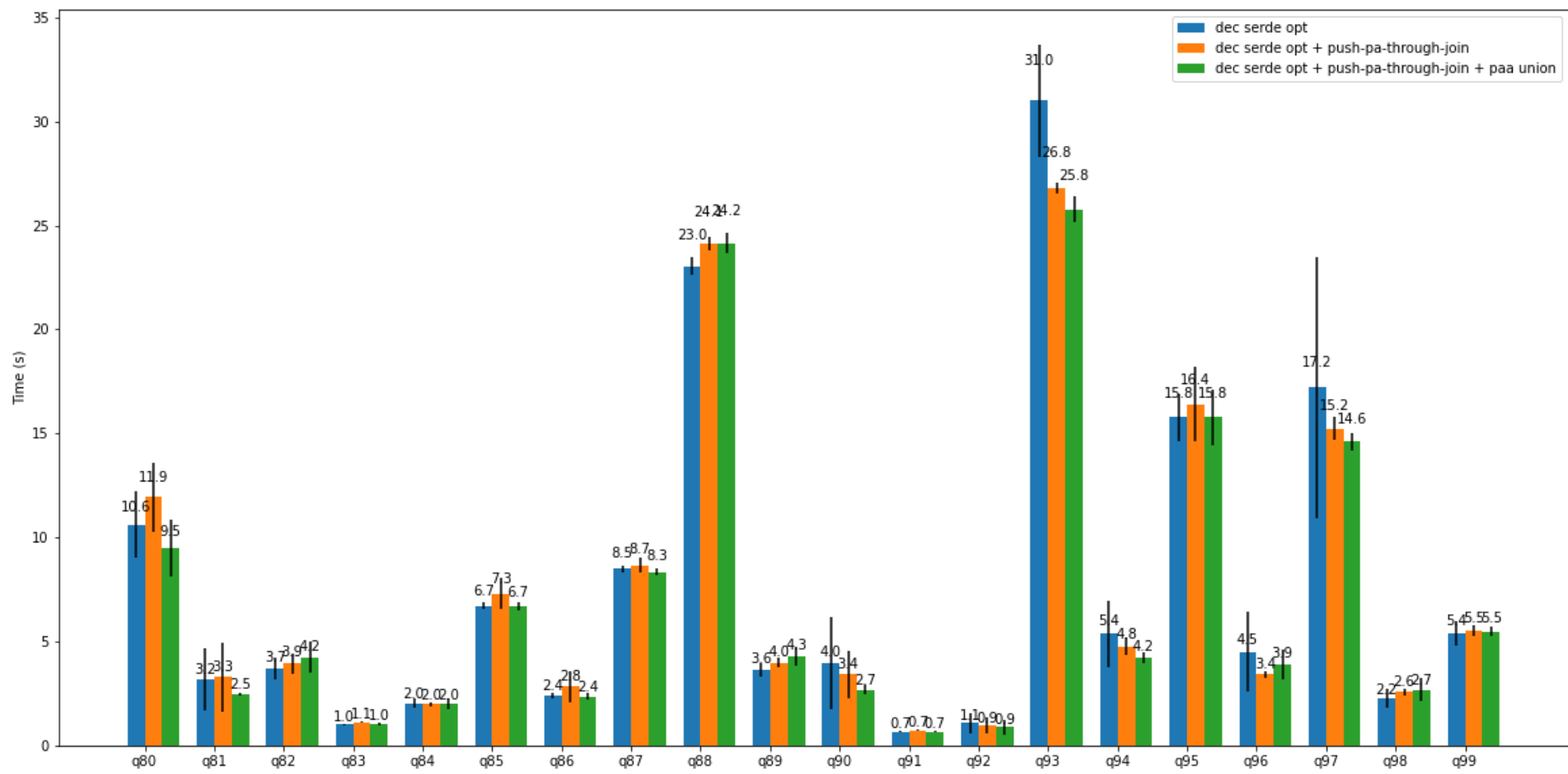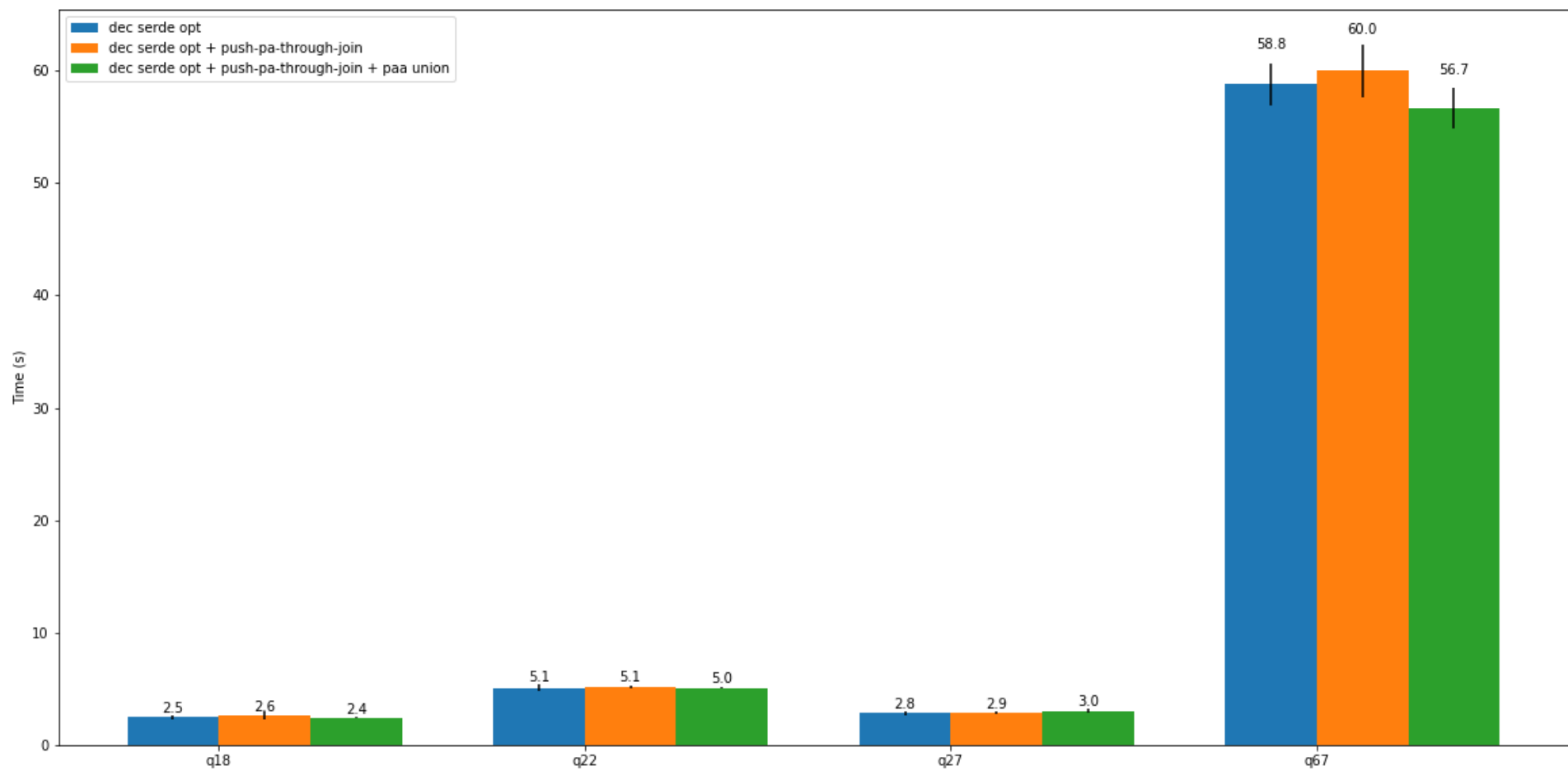
TPC-DS Comparison (DURATION)

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
92	presto/tpcds: q93	31.00	2.68	26.80	0.26	25.78	0.64	-13.56	-4.20	-16.84	8.65	0.98	2.50	0.00338
34	presto/tpcds: q35	5.36	2.15	2.49	0.33	3.06	0.48	-53.57	-2.87	-42.90	40.12	13.38	15.60	0.00899
96	presto/tpcds: q97	17.21	6.26	15.24	0.56	14.60	0.40	-11.47	-1.97	-15.21	36.39	3.68	2.74	0.45972
22	presto/tpcds: q23	75.16	3.21	73.27	0.30	72.28	0.65	-2.50	-1.88	-3.83	4.27	0.41	0.89	0.18317
77	presto/tpcds: q78	32.06	1.12	30.19	1.01	26.12	0.85	-5.82	-1.87	-18.53	3.49	3.35	3.26	0.01266
75	presto/tpcds: q76	8.22	2.18	6.82	0.11	6.99	0.51	-17.05	-1.40	-14.94	26.58	1.63	7.33	0.14761

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
36	presto/tpcds: q37	3.66	1.87	2.48	0.24	2.33	0.03	-32.13	-1.18	-36.23	51.03	9.57	1.48	0.15696
95	presto/tpcds: q96	4.49	1.92	3.42	0.15	3.89	0.70	-23.95	-1.08	-13.42	42.78	4.40	17.99	0.20151
31	presto/tpcds: q32	2.06	1.82	1.16	0.36	1.17	0.29	-43.61	-0.90	-43.31	88.32	30.59	25.11	0.26265
11	presto/tpcds: q12	1.33	2.03	0.53	0.02	0.50	0.04	-60.25	-0.80	-62.60	152.21	4.69	7.30	0.35514
3	presto/tpcds: q04	37.34	0.50	36.57	0.51	35.95	0.79	-2.07	-0.77	-3.72	1.35	1.40	2.21	0.02496
43	presto/tpcds: q44	12.59	1.57	11.94	0.52	11.67	0.44	-5.13	-0.65	-7.32	12.51	4.31	3.77	0.36239
33	presto/tpcds: q34	3.45	1.50	2.85	0.39	3.53	1.11	-17.60	-0.61	2.21	43.39	13.74	31.47	0.35899
93	presto/tpcds: q94	5.36	1.57	4.75	0.43	4.22	0.27	-11.23	-0.60	-21.21	29.35	8.95	6.44	0.38693
89	presto/tpcds: q90	3.95	2.20	3.41	1.12	2.66	0.22	-13.61	-0.54	-32.61	55.61	32.84	8.35	0.60487
62	presto/tpcds: q63	2.75	1.45	2.32	0.38	2.29	0.28	-15.65	-0.43	-16.79	52.90	16.20	12.08	0.49881
48	presto/tpcds: q49	7.43	1.23	7.01	0.40	6.58	0.23	-5.65	-0.42	-11.38	16.49	5.67	3.49	0.44362
45	presto/tpcds: q46	3.89	1.49	3.59	0.18	4.37	0.75	-7.83	-0.30	12.30	38.36	5.09	17.15	0.63056
7	presto/tpcds: q08	4.24	1.46	3.96	0.29	4.42	1.43	-6.58	-0.28	4.13	34.49	7.44	32.35	0.65650
32	presto/tpcds: q33	2.93	0.46	2.66	0.95	2.22	0.46	-9.07	-0.27	-24.34	15.80	35.83	20.78	0.55312
73	presto/tpcds: q74	14.23	0.35	14.00	0.09	13.70	0.16	-1.62	-0.23	-3.71	2.46	0.63	1.19	0.14766
39	presto/tpcds: q40	4.98	0.22	4.75	1.00	4.85	0.37	-4.61	-0.23	-2.49	4.44	21.13	7.55	0.59591
74	presto/tpcds: q75	22.40	0.66	22.22	0.33	22.21	0.21	-0.80	-0.18	-0.83	2.94	1.48	0.93	0.56248
15	presto/tpcds: q16	5.93	0.45	5.77	0.42	6.07	1.16	-2.72	-0.16	2.32	7.58	7.21	19.15	0.53390
91	presto/tpcds: q92	1.06	0.48	0.94	0.39	0.87	0.38	-11.51	-0.12	-18.02	45.26	40.98	43.00	0.63722
30	presto/tpcds: q31	4.42	0.28	4.35	0.13	4.30	0.17	-1.60	-0.07	-2.77	6.23	3.00	3.94	0.58129

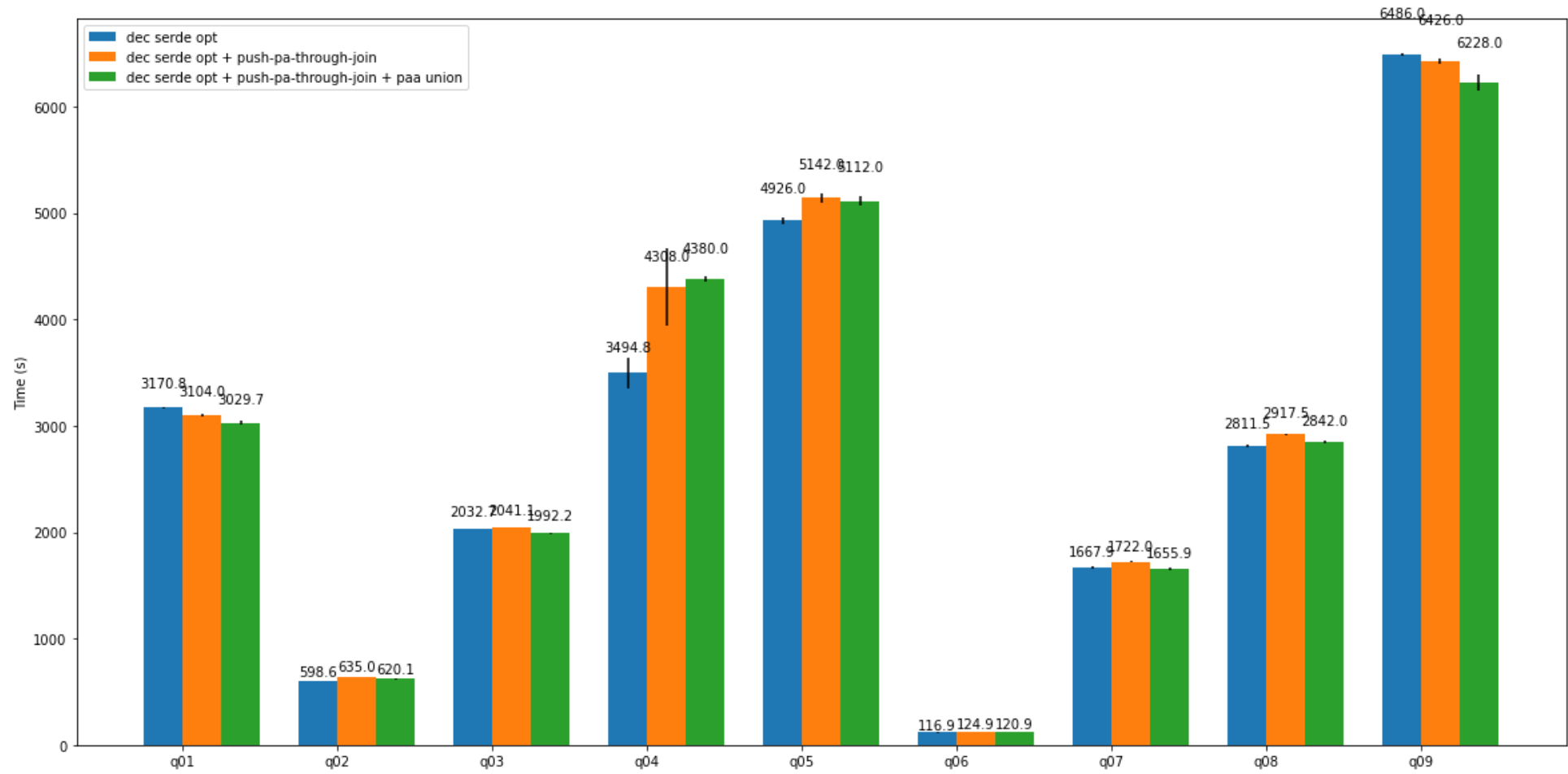|	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
12	presto/tpcds: q13	4.64	0.10	4.58	0.16	4.54	0.16	-1.31	-0.06	-2.01	2.25	3.56	3.52	0.45854
83	presto/tpcds: q84	2.03	0.25	1.98	0.11	1.99	0.26	-2.66	-0.05	-2.00	12.42	5.41	12.95	0.63939
50	presto/tpcds: q51	7.19	0.29	7.15	0.19	6.91	0.12	-0.50	-0.04	-3.92	3.97	2.67	1.81	0.80348
44	presto/tpcds: q45	1.10	0.12	1.08	0.07	1.10	0.14	-2.26	-0.02	-0.45	10.53	6.19	12.68	0.65861
6	presto/tpcds: q07	3.70	0.28	3.68	0.21	3.68	0.13	-0.53	-0.02	-0.60	7.56	5.81	3.64	0.89487
5	presto/tpcds: q06	2.29	0.09	2.29	0.21	2.25	0.05	-0.12	-0.00	-1.59	3.81	9.08	2.17	0.97743
19	presto/tpcds: q20	1.59	0.04	1.60	0.02	1.42	0.38	0.51	0.01	-10.88	2.63	1.26	26.53	0.67577
25	presto/tpcds: q26	1.86	0.20	1.87	0.09	1.93	0.22	0.63	0.01	3.62	10.93	4.71	11.16	0.90001
28	presto/tpcds: q29	6.00	0.26	6.01	0.20	6.00	0.35	0.20	0.01	-0.07	4.36	3.27	5.83	0.93017
21	presto/tpcds: q22	5.09	0.29	5.10	0.13	5.04	0.07	0.28	0.01	-0.93	5.73	2.57	1.33	0.91570
37	presto/tpcds: q38	8.40	0.13	8.42	0.18	8.33	0.25	0.28	0.02	-0.89	1.59	2.19	2.99	0.80571
41	presto/tpcds: q42	2.03	0.09	2.05	0.06	1.98	0.08	1.27	0.03	-2.21	4.54	3.15	4.16	0.58570
27	presto/tpcds: q28	20.59	0.36	20.62	0.64	20.19	0.34	0.14	0.03	-1.96	1.73	3.10	1.71	0.92449
68	presto/tpcds: q69	1.18	0.07	1.22	0.11	1.15	0.04	2.60	0.03	-2.73	5.78	9.18	3.16	0.57674
40	presto/tpcds: q41	0.30	0.01	0.34	0.01	0.32	0.02	12.29	0.04	5.95	4.80	4.21	5.81	0.00120
0	presto/tpcds: q01	2.84	0.26	2.89	0.06	2.72	0.15	1.72	0.05	-4.29	9.00	2.24	5.59	0.65980
67	presto/tpcds: q68	3.66	0.08	3.71	0.66	3.64	0.14	1.49	0.05	-0.38	2.17	17.84	3.96	0.84585
90	presto/tpcds: q91	0.66	0.03	0.72	0.02	0.67	0.04	9.40	0.06	1.31	5.04	2.67	6.11	0.00272
9	presto/tpcds: q10	1.57	0.33	1.64	0.29	1.38	0.15	4.13	0.06	-12.63	21.02	17.50	11.12	0.72383
54	presto/tpcds: q55	1.94	0.04	2.01	0.06	1.97	0.05	3.43	0.07	1.44	1.94	2.79	2.67	0.03621

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
26	presto/tpcds: q27	2.83	0.16	2.89	0.09	3.03	0.21	2.39	0.07	7.30	5.53	3.27	6.79	0.38650
18	presto/tpcds: q19	2.78	0.02	2.86	0.05	2.77	0.04	2.68	0.07	-0.44	0.82	1.79	1.34	0.00874
65	presto/tpcds: q66	2.81	0.25	2.89	0.34	2.73	0.12	2.94	0.08	-2.73	8.84	11.67	4.37	0.63990
35	presto/tpcds: q36	2.17	0.10	2.26	0.13	2.60	0.47	4.27	0.09	19.85	4.80	5.63	18.26	0.19795
1	presto/tpcds: q02	13.09	0.19	13.19	0.16	13.22	0.49	0.75	0.10	0.98	1.47	1.20	3.73	0.35913
52	presto/tpcds: q53	2.24	0.31	2.34	0.35	2.47	0.09	4.51	0.10	10.61	13.77	15.09	3.62	0.60962
14	presto/tpcds: q15	1.82	0.01	1.92	0.30	1.80	0.05	5.68	0.10	-0.61	0.66	15.80	2.73	0.42449
80	presto/tpcds: q81	3.17	1.49	3.28	1.68	2.45	0.08	3.33	0.11	-22.65	47.05	51.24	3.35	0.91067
82	presto/tpcds: q83	1.00	0.05	1.11	0.05	1.03	0.06	10.59	0.11	2.49	4.49	4.18	6.20	0.00241
17	presto/tpcds: q18	2.47	0.15	2.60	0.35	2.44	0.08	5.22	0.13	-1.02	5.91	13.38	3.15	0.42150
98	presto/tpcds: q99	5.38	0.57	5.52	0.28	5.48	0.21	2.71	0.15	1.89	10.64	5.15	3.92	0.58871
55	presto/tpcds: q56	1.60	0.50	1.75	0.49	1.79	0.40	9.40	0.15	12.05	31.42	27.99	22.07	0.61122
16	presto/tpcds: q17	5.37	0.38	5.52	0.23	5.29	0.09	2.83	0.15	-1.47	7.04	4.22	1.75	0.42110
71	presto/tpcds: q72	32.96	0.75	33.12	1.23	36.26	2.05	0.47	0.16	10.01	2.27	3.72	5.64	0.79668
29	presto/tpcds: q30	1.58	0.03	1.74	0.19	1.80	0.46	9.96	0.16	14.12	1.94	10.68	25.49	0.06762
86	presto/tpcds: q87	8.51	0.16	8.67	0.34	8.34	0.18	1.89	0.16	-2.00	1.90	3.96	2.16	0.32329
64	presto/tpcds: q65	11.89	0.85	12.07	0.55	9.89	0.40	1.47	0.17	-16.83	7.14	4.57	4.01	0.68088
20	presto/tpcds: q21	1.30	0.02	1.48	0.06	1.38	0.05	13.91	0.18	6.26	1.60	3.75	3.35	0.00002
81	presto/tpcds: q82	3.72	0.52	3.93	0.48	4.23	0.75	5.61	0.21	13.56	13.97	12.21	17.75	0.48613
10	presto/tpcds: q11	21.31	0.44	21.53	0.53	20.81	0.52	1.03	0.22	-2.36	2.04	2.44	2.52	0.44878

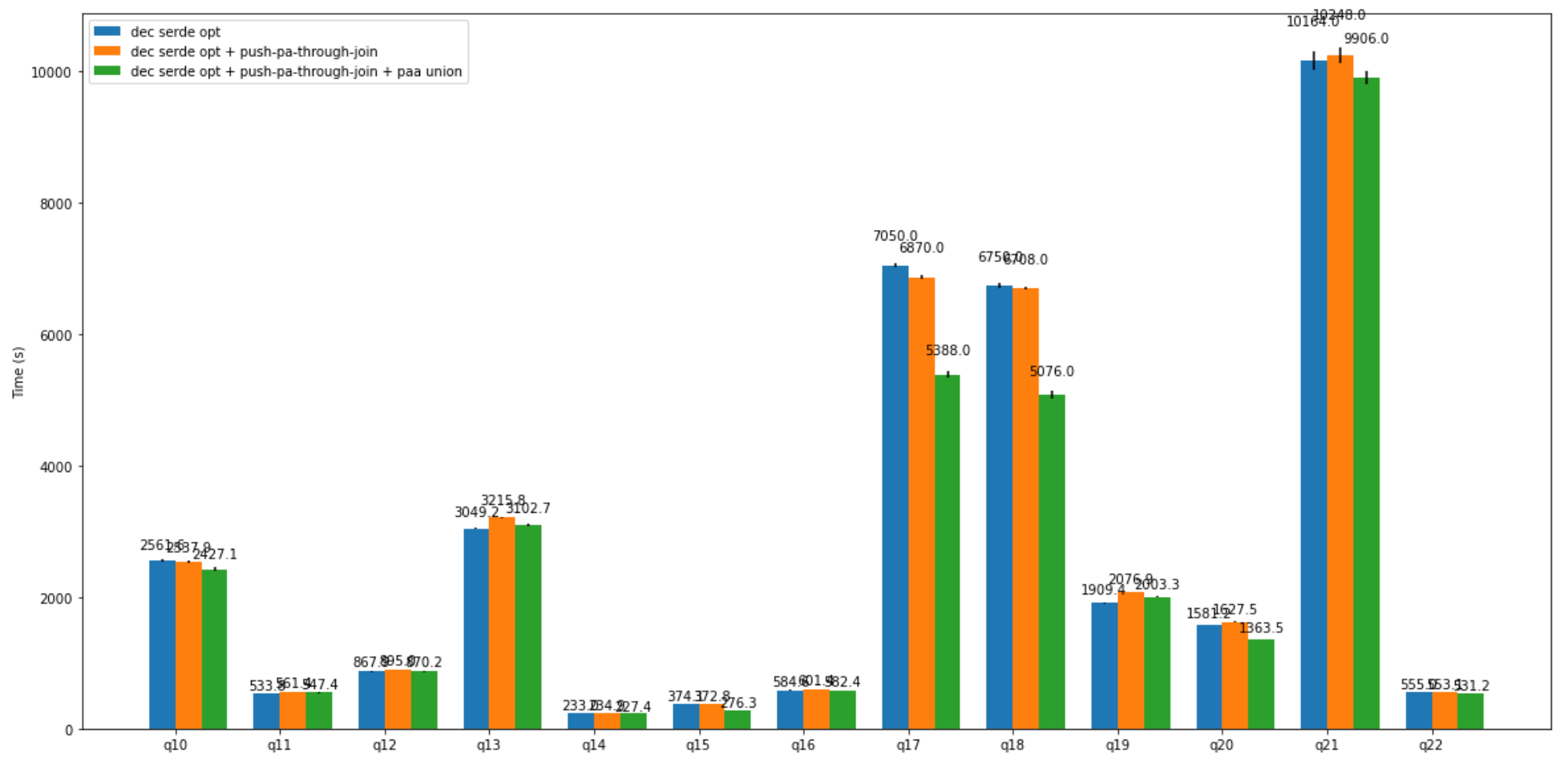|	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
38	presto/tpcds:q39	3.50	0.03	3.75	0.28	3.16	0.05	7.14	0.25	-9.76	0.97	7.56	1.51	0.05758
51	presto/tpcds:q52	1.75	0.40	2.03	0.06	2.25	0.41	15.82	0.28	28.24	22.64	2.87	18.05	0.12125
2	presto/tpcds:q03	1.73	0.37	2.04	0.19	1.86	0.06	17.96	0.31	7.45	21.65	9.43	3.16	0.10092
23	presto/tpcds:q24	23.63	0.65	23.94	0.69	23.25	0.40	1.34	0.32	-1.59	2.74	2.90	1.71	0.43391
97	presto/tpcds:q98	2.24	0.45	2.56	0.16	2.66	0.55	14.27	0.32	18.84	20.10	6.13	20.47	0.13144
49	presto/tpcds:q50	6.69	0.38	7.03	0.29	6.90	0.39	5.04	0.34	3.10	5.68	4.08	5.68	0.11373
88	presto/tpcds:q89	3.63	0.32	3.98	0.24	4.26	0.45	9.50	0.35	17.09	8.79	5.93	10.54	0.05904
42	presto/tpcds:q43	3.31	0.31	3.69	0.47	3.53	0.37	11.30	0.37	6.35	9.34	12.82	10.63	0.13561
72	presto/tpcds:q73	2.49	0.39	2.87	0.09	2.71	0.22	15.28	0.38	9.10	15.64	3.10	8.24	0.04184
47	presto/tpcds:q48	4.83	0.51	5.22	0.13	5.36	0.96	8.07	0.39	10.87	10.60	2.45	17.98	0.10064
85	presto/tpcds:q86	2.40	0.16	2.82	0.75	2.36	0.15	17.53	0.42	-1.73	6.58	26.43	6.21	0.20618
70	presto/tpcds:q71	2.76	0.41	3.20	0.59	2.92	0.48	16.01	0.44	6.02	14.68	18.29	16.56	0.15945
58	presto/tpcds:q59	15.38	0.29	15.87	0.40	15.87	0.85	3.24	0.50	3.19	1.87	2.50	5.36	0.03203
60	presto/tpcds:q61	3.94	0.33	4.46	0.83	3.96	0.38	13.18	0.52	0.52	8.35	18.53	9.54	0.18316
13	presto/tpcds:q14	71.96	0.69	72.51	0.74	72.36	0.54	0.77	0.55	0.56	0.96	1.02	0.74	0.21039
84	presto/tpcds:q85	6.72	0.16	7.28	0.75	6.68	0.18	8.31	0.56	-0.64	2.37	10.31	2.77	0.10494
57	presto/tpcds:q58	6.53	0.43	7.09	0.21	7.09	0.92	8.64	0.56	8.57	6.61	2.93	12.99	0.01620
61	presto/tpcds:q62	2.93	0.10	3.50	0.30	3.22	0.14	19.50	0.57	10.00	3.29	8.65	4.48	0.00133
76	presto/tpcds:q77	2.08	0.18	2.68	0.75	2.09	0.08	28.84	0.60	0.30	8.87	27.87	4.00	0.08523
94	presto/tpcds:q95	15.78	1.13	16.40	1.78	15.77	1.32	3.93	0.62	-0.02	7.13	10.85	8.40	0.48661

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
4	presto/tpcds: q05	7.11	0.22	7.74	0.64	6.92	0.53	8.95	0.64	-2.62	3.06	8.30	7.68	0.04467
46	presto/tpcds: q47	30.56	1.13	31.25	0.99	32.96	1.85	2.23	0.68	7.83	3.69	3.17	5.60	0.29165
8	presto/tpcds: q09	24.78	0.82	25.49	0.99	25.96	0.91	2.85	0.71	4.78	3.32	3.88	3.49	0.20781
59	presto/tpcds: q60	3.01	0.31	3.75	0.86	3.16	0.43	24.30	0.73	4.69	10.22	22.99	13.64	0.07828
56	presto/tpcds: q57	14.99	0.21	15.79	0.57	15.37	0.81	5.31	0.80	2.57	1.39	3.64	5.29	0.00964
24	presto/tpcds: q25	4.35	0.42	5.20	0.55	4.11	0.15	19.54	0.85	-5.61	9.76	10.56	3.77	0.01331
87	presto/tpcds: q88	23.05	0.42	24.12	0.31	24.16	0.46	4.66	1.07	4.81	1.81	1.27	1.92	0.00047
66	presto/tpcds: q67	58.79	1.86	60.00	2.32	56.66	1.78	2.05	1.21	-3.63	3.17	3.87	3.15	0.34415
53	presto/tpcds: q54	6.60	0.63	7.89	0.61	6.92	0.51	19.52	1.29	4.77	9.51	7.74	7.34	0.00482
79	presto/tpcds: q80	10.61	1.61	11.93	1.63	9.48	1.39	12.42	1.32	-10.63	15.14	13.67	14.66	0.18890
78	presto/tpcds: q79	3.32	0.11	4.73	0.83	3.71	0.48	42.18	1.40	11.70	3.39	17.50	12.85	0.00210
69	presto/tpcds: q70	10.94	0.43	12.41	1.04	11.94	0.18	13.47	1.47	9.18	3.91	8.38	1.50	0.00933
63	presto/tpcds: q64	83.77	4.23	86.14	4.90	82.61	5.89	2.83	2.37	-1.38	5.04	5.69	7.13	0.38986

```
count     99
mean       1
std       14
min      -60
25%       -2
50%        2
75%        8
max       42
Name: % change, dtype: float64
count     99
mean      -2
std       13
min      -63
25%       -4
50%       -1
75%        5
max       28
Name: % change base -> dec serde opt + push-pa-through-join + paa union, dtype: float64
```

TPC-H Comparison (CPU)

Legend:
- dec serde opt
- dec serde opt + push-pa-through-join
- dec serde opt + push-pa-through-join + paa union

Data labels by query:

Query	dec serde opt	+ push-pa-through-join	+ paa union
q01	3170.8	3104.0	3029.7
q02	598.6	635.0	620.1
q03	2032.7	2041.1	1992.2
q04	3494.8	4308.0	4380.0
q05	4926.0	5142.0	5112.0
q06	116.9	124.9	120.9
q07	1667.9	1722.0	1655.9
q08	2811.5	2917.5	2842.0
q09	6486.0	6426.0	6228.0

Y-axis: Time (s)

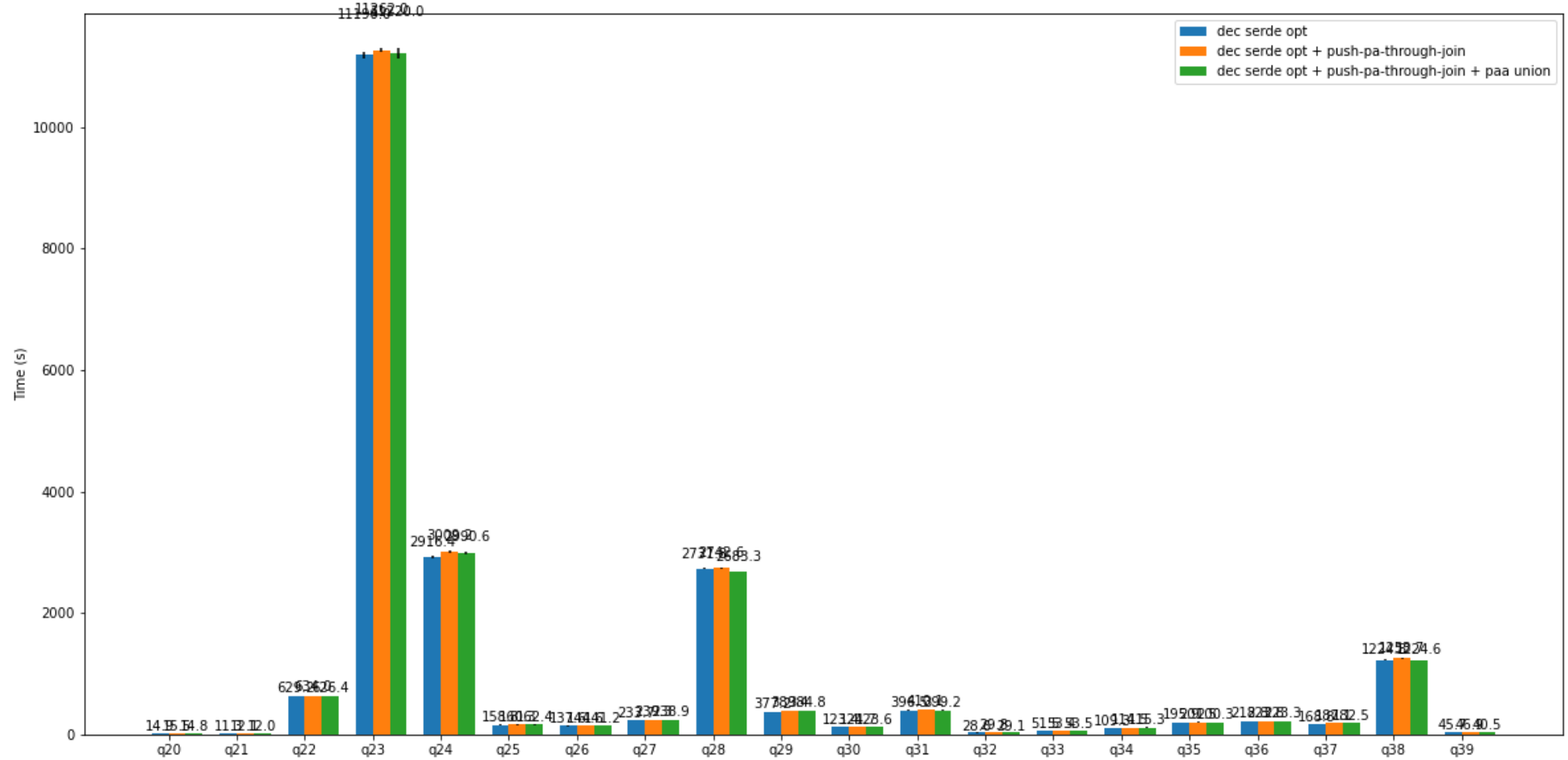|	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
16	presto/tpch: q17	7050.00	35.39	6870.00	35.39	5388.00	49.19	-2.55	-180.00	-23.57	0.50	0.52	0.91	0.00001
0	presto/tpch: q01	3170.80	9.34	3104.00	12.02	3029.70	14.21	-2.11	-66.80	-4.45	0.29	0.39	0.47	0.00000
9	presto/tpch: q10	2561.60	23.36	2537.90	19.33	2427.10	31.21	-0.93	-23.70	-5.25	0.91	0.76	1.29	0.08457
8	presto/tpch: q09	6486.00	14.70	6426.00	19.72	6228.00	75.51	-0.93	-60.00	-3.98	0.23	0.31	1.21	0.00014
17	presto/tpch: q18	6750.00	37.76	6708.00	18.59	5076.00	55.77	-0.62	-42.00	-24.80	0.56	0.28	1.10	0.03458
14	presto/tpch: q15	374.10	1.55	372.80	2.62	276.30	0.63	-0.35	-1.30	-26.14	0.42	0.70	0.23	0.32039

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
21	presto/tpch: q22	555.00	1.90	553.10	2.97	531.20	1.45	-0.34	-1.90	-4.29	0.34	0.54	0.27	0.21647
2	presto/tpch: q03	2032.70	4.73	2041.10	1.71	1992.20	7.71	0.41	8.40	-1.99	0.23	0.08	0.39	0.00218
13	presto/tpch: q14	233.00	2.39	234.90	1.60	227.40	1.00	0.82	1.90	-2.40	1.03	0.68	0.44	0.13661
20	presto/tpch: q21	10164.00	143.40	10248.00	117.58	9906.00	97.71	0.83	84.00	-2.54	1.41	1.15	0.99	0.29315
15	presto/tpch: q16	584.60	2.48	601.40	1.18	582.40	2.42	2.87	16.80	-0.38	0.42	0.20	0.42	0.00000
19	presto/tpch: q20	1581.20	4.84	1627.50	4.08	1363.50	2.65	2.93	46.30	-13.77	0.31	0.25	0.19	0.00000
11	presto/tpch: q12	867.90	2.10	895.00	3.71	870.20	3.28	3.12	27.10	0.27	0.24	0.41	0.38	0.00000
6	presto/tpch: q07	1667.90	8.41	1722.00	5.62	1655.90	8.82	3.24	54.10	-0.72	0.50	0.33	0.53	0.00000
7	presto/tpch: q08	2811.50	9.69	2917.50	10.20	2842.00	12.82	3.77	106.00	1.08	0.34	0.35	0.45	0.00000
4	presto/tpch: q05	4926.00	27.10	5142.00	42.09	5112.00	45.54	4.38	216.00	3.78	0.55	0.82	0.89	0.00000
10	presto/tpch: q11	533.80	1.30	561.40	2.20	547.40	4.15	5.17	27.60	2.55	0.24	0.39	0.76	0.00000
12	presto/tpch: q13	3049.20	6.76	3215.80	7.08	3102.70	21.99	5.46	166.60	1.75	0.22	0.22	0.71	0.00000
1	presto/tpch: q02	598.60	2.36	635.00	1.50	620.10	5.91	6.08	36.40	3.59	0.39	0.24	0.95	0.00000
5	presto/tpch: q06	116.90	0.24	124.90	0.24	120.90	0.33	6.84	8.00	3.42	0.21	0.20	0.27	0.00000
18	presto/tpch: q19	1909.40	6.96	2076.90	3.05	2003.30	5.07	8.77	167.50	4.92	0.36	0.15	0.25	0.00000
3	presto/tpch: q04	3494.80	142.47	4308.00	362.63	4380.00	29.39	23.27	813.20	25.33	4.08	8.42	0.67	0.00046

```
count    22
mean      3
std       5
min      -3
25%      -0
50%       3
75%       5
max      23
Name: % change, dtype: float64
count    22
mean     -3
std      11
```
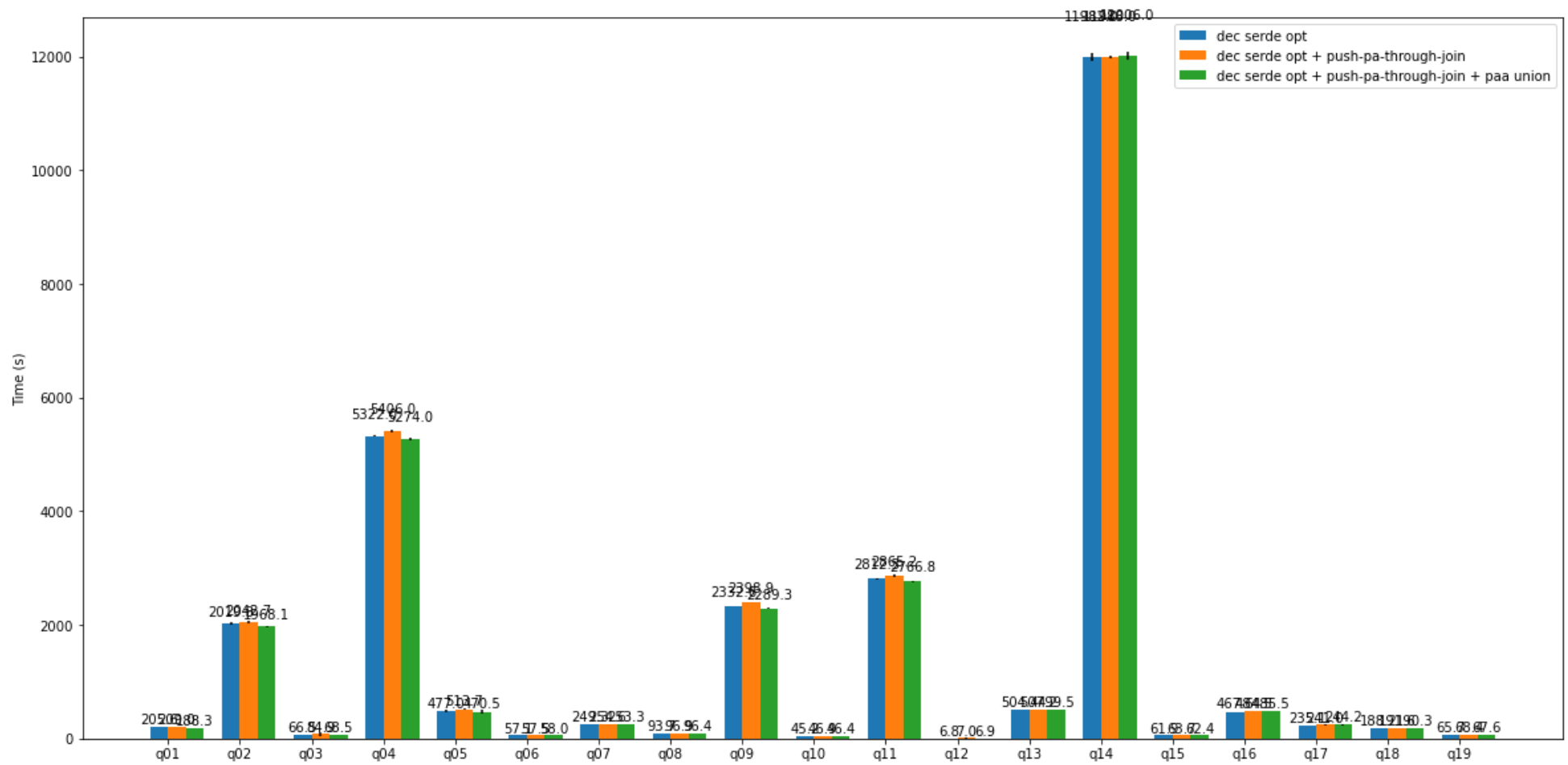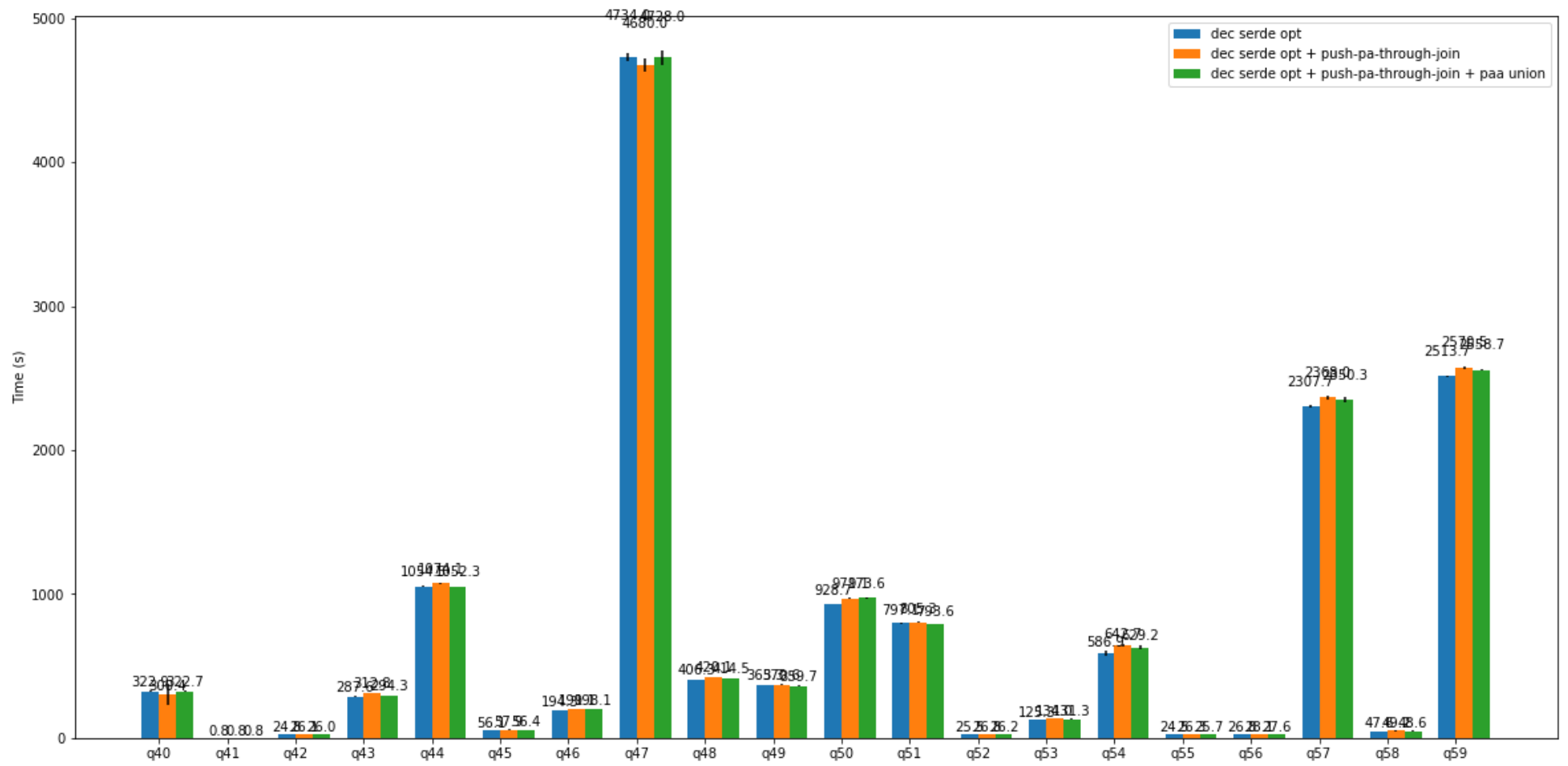
```
min       -26
25%        -4
50%        -1
75%         2
max        25
Name: % change base -> dec serde opt + push-pa-through-join + paa union, dtype: float64
```
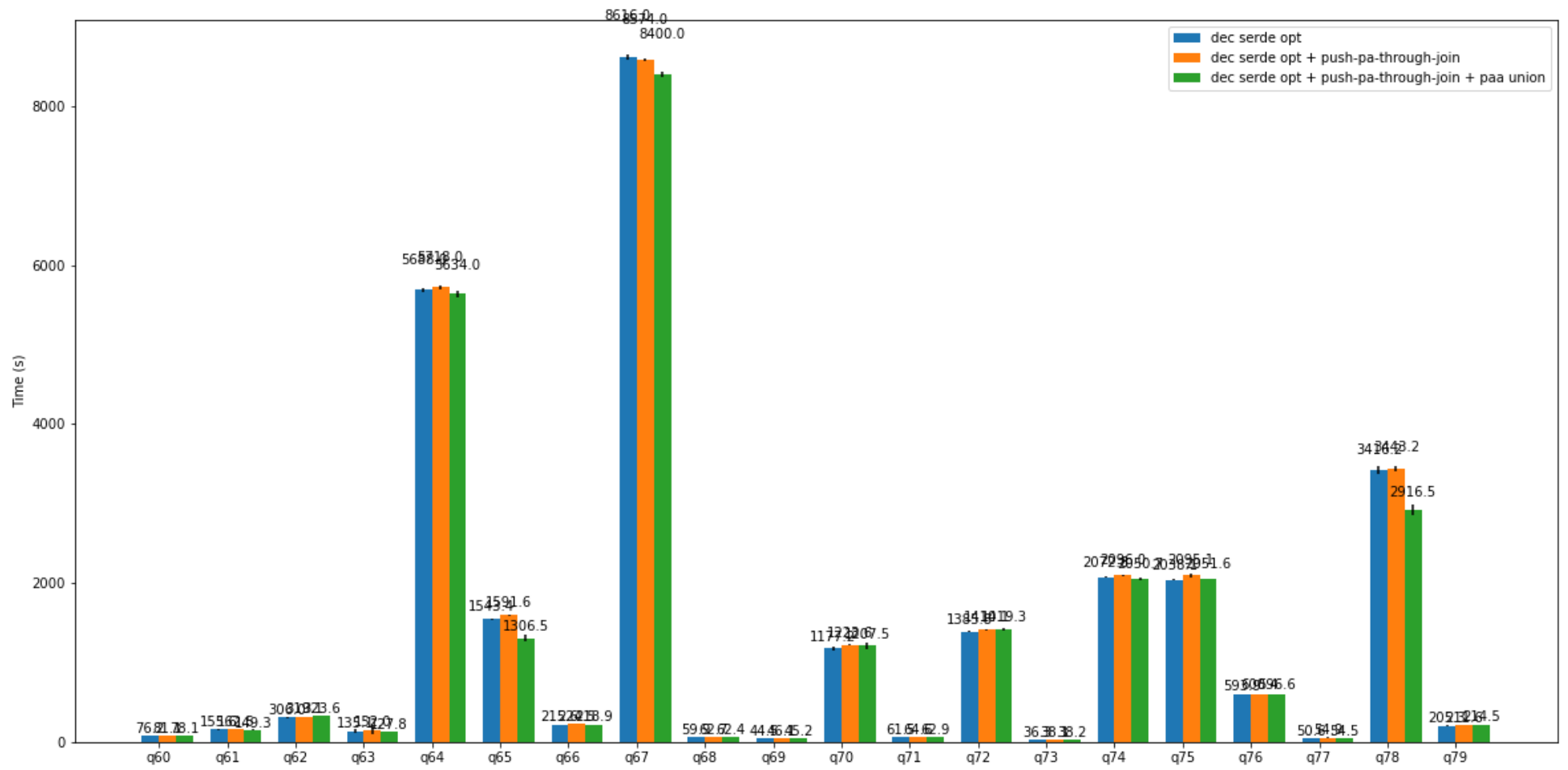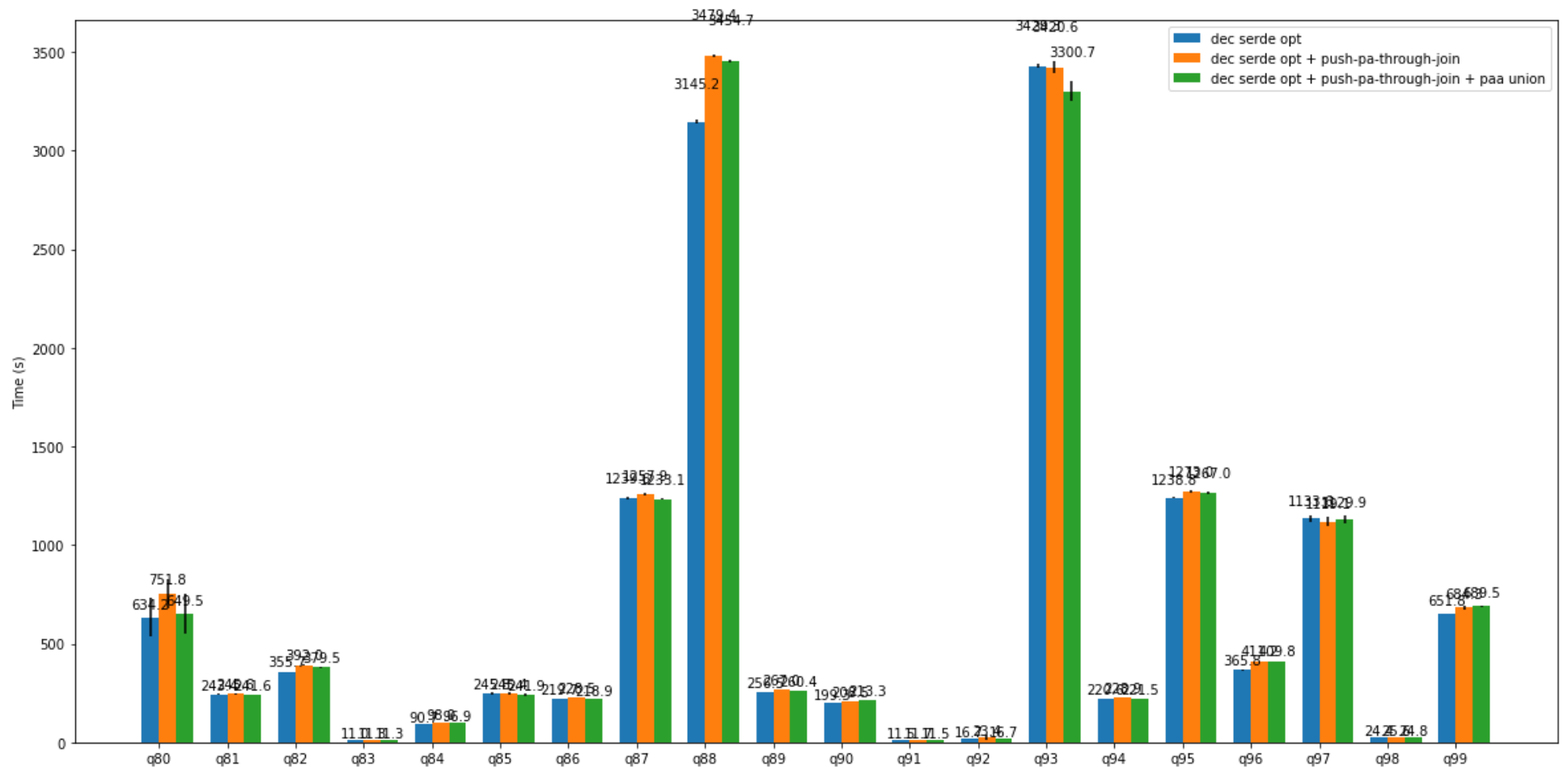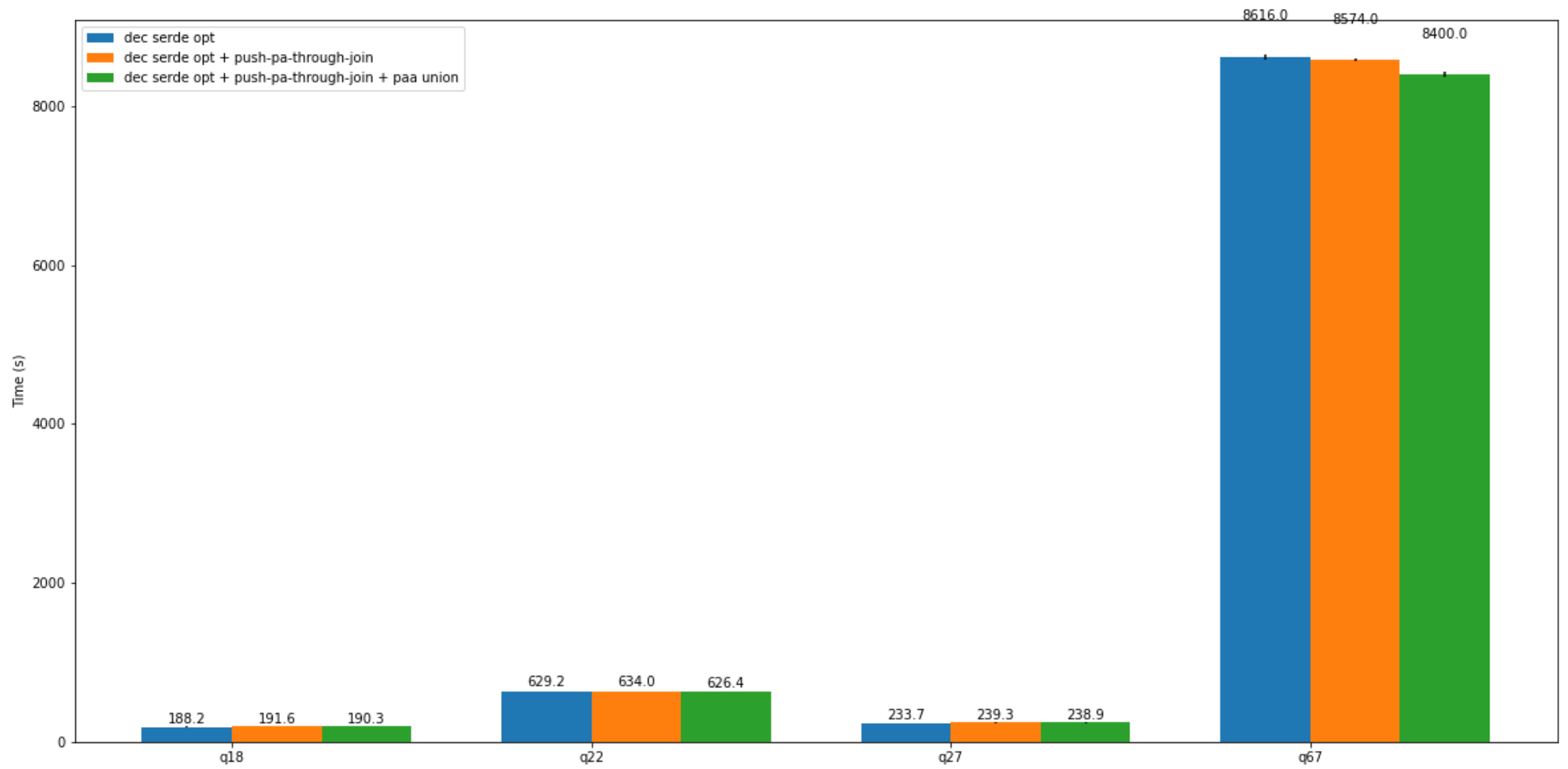
TPC-DS Comparison (CPU)

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
39	presto/tpcds: q40	322.90	4.13	300.40	71.67	322.70	3.86	-6.97	-22.50	-0.06	1.28	23.86	1.20	0.46043
96	presto/tpcds: q97	1133.60	18.07	1119.10	23.35	1129.90	22.13	-1.28	-14.50	-0.33	1.59	2.09	1.96	0.25668
46	presto/tpcds: q47	4734.00	30.12	4680.00	45.54	4728.00	49.19	-1.14	-54.00	-0.13	0.64	0.97	1.04	0.03589
66	presto/tpcds: q67	8616.00	29.39	8574.00	14.70	8400.00	37.18	-0.49	-42.00	-2.51	0.34	0.17	0.44	0.01068
92	presto/tpcds: q93	3429.30	10.01	3420.60	29.31	3300.70	48.69	-0.25	-8.70	-3.75	0.29	0.86	1.48	0.50707
84	presto/tpcds: q85	245.80	5.48	245.40	6.55	241.90	6.54	-0.16	-0.40	-1.59	2.23	2.67	2.71	0.91095

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
13	presto/tpcds: q14	11982.00	66.05	11988.00	22.77	12006.00	74.65	0.05	6.00	0.20	0.55	0.19	0.62	0.83762
27	presto/tpcds: q28	2731.80	6.36	2742.60	7.85	2683.30	6.02	0.40	10.80	-1.78	0.23	0.29	0.22	0.02568
63	presto/tpcds: q64	5688.00	22.77	5718.00	27.10	5634.00	37.76	0.53	30.00	-0.95	0.40	0.47	0.67	0.06462
12	presto/tpcds: q13	504.40	2.65	507.20	1.40	499.50	0.83	0.56	2.80	-0.97	0.52	0.28	0.17	0.04507
22	presto/tpcds: q23	11190.00	52.99	11262.00	35.39	11220.00	81.03	0.64	72.00	0.27	0.47	0.31	0.72	0.01987
5	presto/tpcds: q06	57.12	0.30	57.53	0.49	58.02	0.37	0.72	0.41	1.58	0.53	0.85	0.63	0.10885
21	presto/tpcds: q22	629.20	1.55	634.00	3.77	626.40	2.43	0.76	4.80	-0.45	0.25	0.59	0.39	0.01624
77	presto/tpcds: q78	3416.20	54.00	3443.20	33.18	2916.50	64.16	0.79	27.00	-14.63	1.58	0.96	2.20	0.32129
80	presto/tpcds: q81	243.40	1.35	245.60	3.84	241.60	0.73	0.90	2.20	-0.74	0.55	1.57	0.30	0.21550
24	presto/tpcds: q25	158.80	9.92	160.30	2.75	162.40	6.45	0.94	1.50	2.27	6.25	1.71	3.97	0.72860
50	presto/tpcds: q51	797.10	2.20	805.30	2.32	793.60	2.73	1.03	8.20	-0.44	0.28	0.29	0.34	0.00009
40	presto/tpcds: q41	0.76	0.01	0.77	0.02	0.77	0.01	1.05	0.01	0.74	1.88	2.11	1.35	0.38876
29	presto/tpcds: q30	123.40	1.18	124.70	0.59	123.60	1.47	1.05	1.30	0.16	0.96	0.47	1.19	0.03643
75	presto/tpcds: q76	593.90	2.75	600.40	2.88	596.60	4.06	1.09	6.50	0.45	0.46	0.48	0.68	0.00252
73	presto/tpcds: q74	2072.80	4.19	2096.00	7.27	2050.70	14.56	1.12	23.20	-1.07	0.20	0.35	0.71	0.00005
1	presto/tpcds: q02	2019.30	22.84	2042.70	19.27	1968.10	21.25	1.16	23.40	-2.54	1.13	0.94	1.08	0.08406
48	presto/tpcds: q49	365.30	2.47	370.60	2.23	359.70	3.08	1.45	5.30	-1.53	0.68	0.60	0.86	0.00298
86	presto/tpcds: q87	1239.60	6.35	1257.90	3.47	1233.10	3.86	1.48	18.30	-0.52	0.51	0.28	0.31	0.00010
3	presto/tpcds: q04	5322.00	14.70	5406.00	27.10	5274.00	19.72	1.58	84.00	-0.90	0.28	0.50	0.37	0.00006
0	presto/tpcds: q01	205.60	1.18	209.00	2.36	188.30	3.42	1.65	3.40	-8.41	0.57	1.13	1.82	0.01021

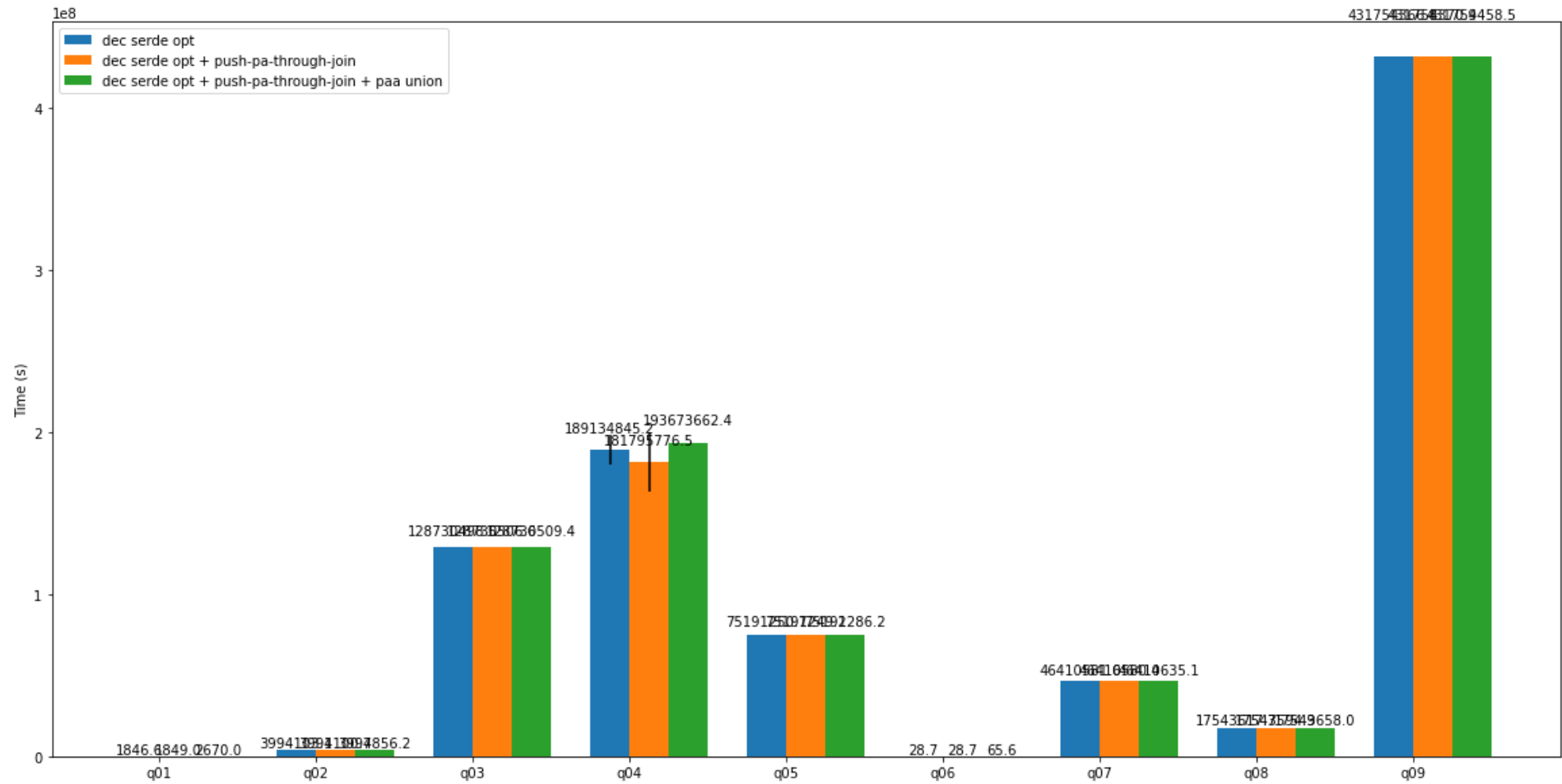|	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
71	presto/tpcds: q72	1385.80	7.10	1410.10	10.51	1419.30	16.97	1.75	24.30	2.42	0.51	0.75	1.20	0.00085
17	presto/tpcds: q18	188.20	1.30	191.60	0.49	190.30	0.70	1.81	3.40	1.12	0.69	0.26	0.37	0.00013
43	presto/tpcds: q44	1054.50	4.20	1074.10	7.75	1052.30	2.09	1.86	19.60	-0.21	0.40	0.72	0.20	0.00028
90	presto/tpcds: q91	11.52	0.43	11.74	0.90	11.54	0.66	1.88	0.22	0.13	3.76	7.64	5.74	0.60560
10	presto/tpcds: q11	2812.30	16.20	2865.20	17.87	2766.80	9.03	1.88	52.90	-1.62	0.58	0.62	0.33	0.00031
6	presto/tpcds: q07	249.30	1.60	254.60	0.62	253.30	0.45	2.13	5.30	1.60	0.64	0.24	0.18	0.00002
58	presto/tpcds: q59	2513.70	5.98	2570.50	9.61	2558.70	5.00	2.26	56.80	1.79	0.24	0.37	0.20	0.00000
35	presto/tpcds: q36	218.80	0.62	223.80	0.38	223.30	0.70	2.29	5.00	2.06	0.28	0.17	0.31	0.00000
37	presto/tpcds: q38	1224.80	6.45	1253.70	9.33	1224.60	2.99	2.36	28.90	-0.02	0.53	0.74	0.24	0.00010
26	presto/tpcds: q27	233.70	0.83	239.30	0.70	238.90	0.70	2.40	5.60	2.23	0.35	0.29	0.29	0.00000
45	presto/tpcds: q46	194.30	1.54	199.10	0.45	198.10	0.96	2.47	4.80	1.96	0.79	0.23	0.49	0.00002
16	presto/tpcds: q17	235.10	4.70	241.00	5.68	244.20	6.33	2.51	5.90	3.87	2.00	2.35	2.59	0.07828
38	presto/tpcds: q39	45.73	0.23	46.89	0.30	40.48	0.15	2.54	1.16	-11.47	0.50	0.64	0.38	0.00002
56	presto/tpcds: q57	2307.70	10.40	2368.00	14.20	2350.30	17.31	2.61	60.30	1.85	0.45	0.60	0.74	0.00001
94	presto/tpcds: q95	1238.80	3.05	1273.00	8.06	1267.00	6.65	2.76	34.20	2.28	0.25	0.63	0.52	0.00000
74	presto/tpcds: q75	2038.10	4.45	2095.10	19.62	2051.60	7.01	2.80	57.00	0.66	0.22	0.94	0.34	0.00004
8	presto/tpcds: q09	2332.60	6.84	2398.90	6.22	2289.30	15.63	2.84	66.30	-1.86	0.29	0.26	0.68	0.00000
34	presto/tpcds: q35	195.90	2.30	201.50	2.64	200.30	1.76	2.86	5.60	2.25	1.17	1.31	0.88	0.00288
14	presto/tpcds: q15	61.90	1.39	63.70	1.22	62.40	0.66	2.91	1.80	0.81	2.25	1.92	1.05	0.03861
11	presto/tpcds: q12	6.81	0.05	7.01	0.05	6.91	0.04	2.94	0.20	1.39	0.79	0.65	0.57	0.00004

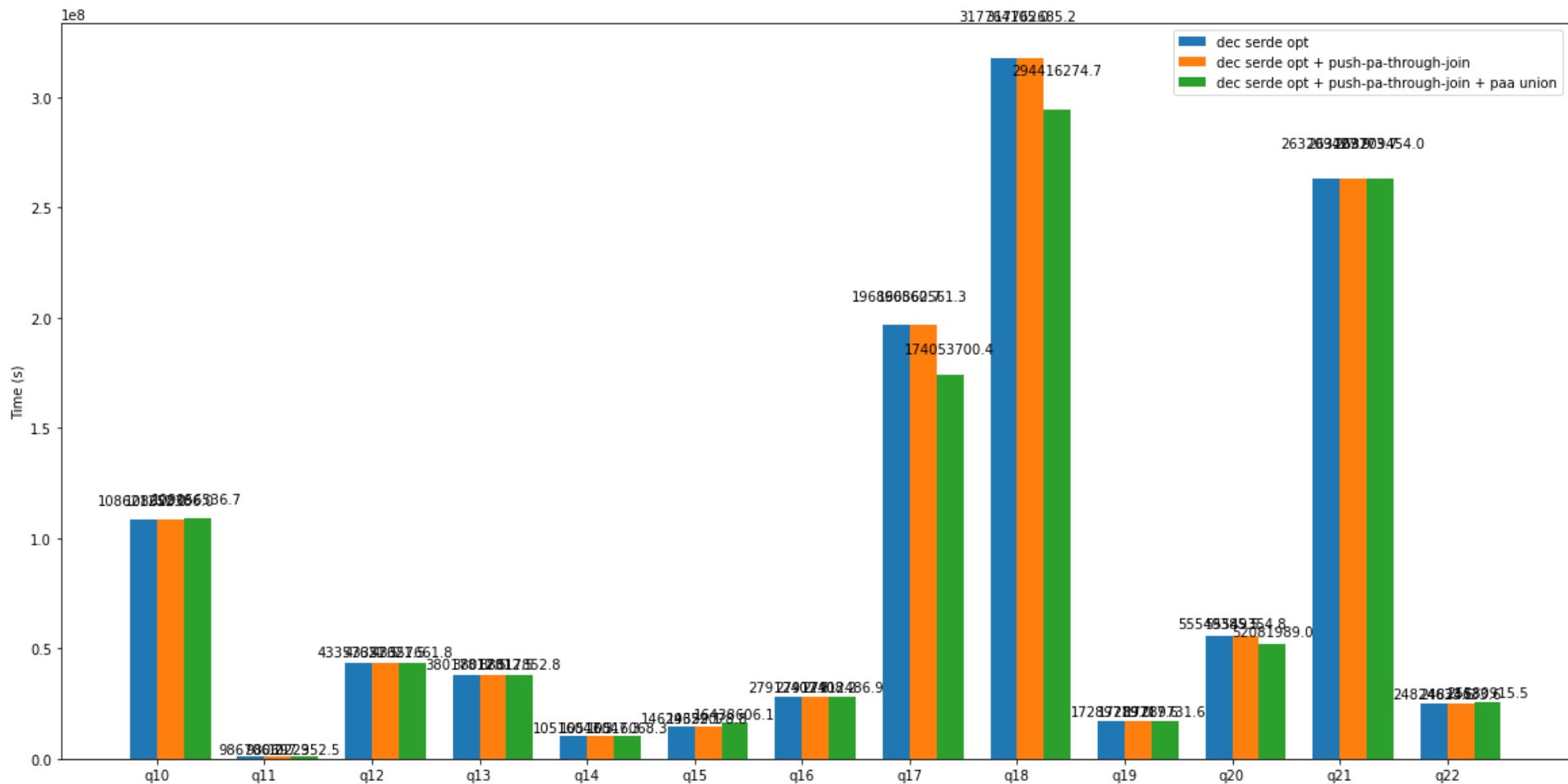|	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
78	presto/tpcds: q79	205.30	1.03	211.60	0.31	214.50	1.51	3.07	6.30	4.48	0.50	0.15	0.70	0.00000
64	presto/tpcds: q65	1543.40	14.08	1591.60	14.06	1306.50	44.73	3.12	48.20	-15.35	0.91	0.88	3.42	0.00014
23	presto/tpcds: q24	2916.40	18.30	3009.20	17.93	2990.60	17.40	3.18	92.80	2.54	0.63	0.60	0.58	0.00000
82	presto/tpcds: q83	10.99	0.27	11.34	0.30	11.32	0.39	3.22	0.35	3.00	2.42	2.66	3.44	0.05695
44	presto/tpcds: q45	56.09	0.15	57.90	0.44	56.41	0.28	3.22	1.81	0.56	0.27	0.77	0.50	0.00000
28	presto/tpcds: q29	377.20	0.31	389.40	1.56	384.80	2.39	3.23	12.20	2.01	0.08	0.40	0.62	0.00000
57	presto/tpcds: q58	47.64	0.47	49.22	0.39	48.56	0.64	3.32	1.58	1.93	0.99	0.80	1.31	0.00009
47	presto/tpcds: q48	406.30	1.22	420.10	0.80	414.50	1.44	3.40	13.80	2.02	0.30	0.19	0.35	0.00000
7	presto/tpcds: q08	93.70	0.24	96.90	0.83	96.40	0.49	3.42	3.20	2.88	0.26	0.85	0.51	0.00000
30	presto/tpcds: q31	396.50	5.82	410.10	2.54	399.20	6.47	3.43	13.60	0.68	1.47	0.62	1.62	0.00038
15	presto/tpcds: q16	467.60	2.23	484.50	3.32	485.50	2.35	3.61	16.90	3.83	0.48	0.69	0.48	0.00000
32	presto/tpcds: q33	51.50	0.38	53.37	0.33	53.52	0.47	3.63	1.87	3.94	0.74	0.62	0.88	0.00000
68	presto/tpcds: q69	44.49	0.60	46.11	0.67	45.15	0.37	3.63	1.61	1.48	1.36	1.46	0.81	0.00137
9	presto/tpcds: q10	45.24	0.14	46.89	0.22	46.42	0.34	3.63	1.64	2.59	0.31	0.46	0.74	0.00000
19	presto/tpcds: q20	14.94	0.14	15.51	0.11	14.80	0.14	3.76	0.56	-0.96	0.91	0.72	0.94	0.00001
93	presto/tpcds: q94	220.60	0.90	228.90	0.63	221.50	0.59	3.76	8.30	0.41	0.41	0.27	0.27	0.00000
69	presto/tpcds: q70	1177.20	25.19	1223.60	12.14	1207.50	34.08	3.94	46.40	2.57	2.14	0.99	2.82	0.00227
85	presto/tpcds: q86	219.70	0.59	228.50	0.70	218.90	0.70	4.01	8.80	-0.36	0.27	0.31	0.32	0.00000
31	presto/tpcds: q32	28.63	0.31	29.78	0.88	29.06	0.29	4.02	1.15	1.51	1.09	2.95	1.01	0.01279
88	presto/tpcds: q89	256.50	0.63	267.00	1.42	260.40	0.66	4.09	10.50	1.52	0.25	0.53	0.25	0.00000

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
18	presto/tpcds: q19	65.70	0.33	68.40	0.93	67.60	0.49	4.11	2.70	2.89	0.50	1.36	0.72	0.00005
65	presto/tpcds: q66	215.60	0.82	224.50	1.58	218.90	0.70	4.13	8.90	1.53	0.38	0.71	0.32	0.00000
61	presto/tpcds: q62	306.00	1.00	319.10	1.44	323.60	0.82	4.28	13.10	5.75	0.33	0.45	0.25	0.00000
60	presto/tpcds: q61	155.60	0.49	162.50	4.38	149.30	10.59	4.43	6.90	-4.05	0.31	2.70	7.10	0.00331
49	presto/tpcds: q50	928.70	2.26	971.10	1.96	973.60	2.42	4.57	42.40	4.83	0.24	0.20	0.25	0.00000
89	presto/tpcds: q90	199.30	0.70	208.50	0.83	213.30	0.91	4.62	9.20	7.02	0.35	0.40	0.43	0.00000
67	presto/tpcds: q68	59.88	0.41	62.70	0.73	62.40	0.38	4.72	2.83	4.22	0.68	1.17	0.61	0.00001
55	presto/tpcds: q56	26.83	0.18	28.10	0.11	27.56	0.15	4.74	1.27	2.73	0.69	0.38	0.55	0.00000
33	presto/tpcds: q34	109.30	0.45	114.50	0.80	115.30	0.45	4.76	5.20	5.49	0.41	0.70	0.39	0.00000
72	presto/tpcds: q73	36.28	0.14	38.08	0.15	38.23	0.07	4.96	1.80	5.39	0.40	0.39	0.18	0.00000
98	presto/tpcds: q99	651.80	1.05	684.30	9.21	689.50	2.50	4.99	32.50	5.78	0.16	1.35	0.36	0.00001
51	presto/tpcds: q52	25.52	0.19	26.79	0.05	26.25	0.13	4.99	1.27	2.85	0.73	0.19	0.51	0.00000
70	presto/tpcds: q71	61.48	1.28	64.60	2.27	62.90	1.16	5.08	3.12	2.31	2.08	3.51	1.85	0.01479
25	presto/tpcds: q26	137.60	1.12	144.60	0.76	141.20	0.62	5.09	7.00	2.62	0.81	0.52	0.44	0.00000
97	presto/tpcds: q98	24.38	0.13	25.64	0.17	24.77	0.15	5.15	1.26	1.59	0.53	0.65	0.62	0.00000
41	presto/tpcds: q42	24.77	0.07	26.12	0.15	25.97	0.43	5.45	1.35	4.84	0.30	0.58	1.64	0.00000
59	presto/tpcds: q60	76.20	0.54	81.10	0.88	78.10	0.45	6.43	4.90	2.49	0.70	1.09	0.58	0.00000
20	presto/tpcds: q21	11.35	0.10	12.07	0.25	11.96	0.05	6.43	0.73	5.42	0.87	2.08	0.45	0.00006
52	presto/tpcds: q53	125.30	1.03	134.00	0.82	131.30	0.88	6.94	8.70	4.79	0.82	0.61	0.67	0.00000
54	presto/tpcds: q55	24.51	0.06	26.32	0.21	25.68	0.03	7.39	1.81	4.77	0.23	0.79	0.11	0.00000

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
4	presto/tpcds: q05	477.00	25.34	513.70	16.44	470.50	34.67	7.69	36.70	-1.36	5.31	3.20	7.37	0.01389
83	presto/tpcds: q84	90.70	0.45	98.00	1.12	96.90	0.33	8.05	7.30	6.84	0.50	1.14	0.34	0.00000
76	presto/tpcds: q77	50.65	0.50	54.91	1.22	54.47	0.39	8.41	4.26	7.54	0.99	2.22	0.71	0.00001
42	presto/tpcds: q43	287.60	2.73	312.80	1.05	294.30	1.85	8.76	25.20	2.33	0.95	0.34	0.63	0.00000
53	presto/tpcds: q54	586.90	15.89	642.70	12.28	629.20	14.83	9.51	55.80	7.21	2.71	1.91	2.36	0.00005
81	presto/tpcds: q82	355.70	1.03	392.00	1.18	379.50	0.91	10.21	36.30	6.69	0.29	0.30	0.24	0.00000
87	presto/tpcds: q88	3145.20	8.81	3479.40	6.97	3454.70	4.90	10.63	334.20	9.84	0.28	0.20	0.14	0.00000
36	presto/tpcds: q37	168.80	0.49	187.10	0.59	182.50	0.24	10.84	18.30	8.12	0.29	0.32	0.13	0.00000
95	presto/tpcds: q96	365.80	0.98	411.20	0.49	409.80	0.54	12.41	45.40	12.03	0.27	0.12	0.13	0.00000
62	presto/tpcds: q63	135.10	29.65	152.00	50.47	127.80	0.76	12.51	16.90	-5.40	21.94	33.20	0.59	0.49558
79	presto/tpcds: q80	634.20	95.26	751.80	74.29	649.50	101.97	18.54	117.60	2.41	15.02	9.88	15.70	0.03832
2	presto/tpcds: q03	66.50	5.07	84.90	36.89	68.50	0.24	27.67	18.40	3.01	7.62	43.45	0.36	0.25397
91	presto/tpcds: q92	16.71	0.16	23.44	12.44	16.70	0.24	40.29	6.73	-0.05	0.97	53.06	1.43	0.21443

```
count    99
mean      4
std       6
min      -7
25%       2
50%       3
75%       5
max      40
Name: % change, dtype: float64
count    99
mean      1
std       4
min     -15
25%      -0
50%       2
75%       3
max      12
Name: % change base -> dec serde opt + push-pa-through-join + paa union, dtype: float64
```

TPC-H Comparison (Network)

Legend:
- dec serde opt
- dec serde opt + push-pa-through-join
- dec serde opt + push-pa-through-join + paa union

1e8

Query	Values
q01	1846.6 1849.0 2670.0
q02	3994110 3994110 3994856.2
q03	128730248 128730248 130509.4
q04	189134845.2 181795776.5 193673662.4
q05	75191750917 75492286.2
q06	28.7 28.7 65.6
q07	464104641 4641046410635.1
q08	1754367543 17549658.0
q09	431754366548 7059458.5

Time (s)

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
3	presto/tpch: q04	189134845.16	8988925.04	181795776.54	18421036.85	193673662.45	714.06	-3.88	-7339068.62	2.40	4.75	10.13	0.00	0.40104
10	presto/tpch: q11	986706.20	5767.63	980697.88	7237.54	1022352.47	29767.15	-0.61	-6008.31	3.61	0.58	0.74	2.91	0.14286
14	presto/tpch: q15	14629352.11	93.66	14629078.82	230.86	16438606.08	3938.54	-0.00	-273.29	12.37	0.00	0.00	0.02	0.02282
9	presto/tpch: q10	108621252.05	1811.59	108620385.98	1728.75	109056536.74	1236.81	-0.00	-866.07	0.40	0.00	0.00	0.00	0.41671
17	presto/tpch: q18	317764104.99	1768.37	317762685.22	3806.32	294416274.69	15848.38	-0.00	-1419.77	-7.35	0.00	0.00	0.01	0.42666
7	presto/tpch: q08	17543617.72	20.07	17543594.87	40.28	17543658.01	27.80	-0.00	-22.85	0.00	0.00	0.00	0.00	0.24199

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
1	presto/tpch: q02	3994103.13	16.83	3994100.74	21.76	3994856.19	26.47	-0.00	-2.39	0.02	0.00	0.00	0.00	0.83564
19	presto/tpch: q20	55549385.52	106.80	55549354.78	28.76	52081989.03	13203.53	-0.00	-30.74	-6.24	0.00	0.00	0.03	0.51140
18	presto/tpch: q19	17289719.04	2.34	17289717.58	0.00	17289731.63	0.55	-0.00	-1.46	0.00	0.00	0.00	0.00	0.15910
6	presto/tpch: q07	46410581.62	2.82	46410580.37	3.78	46410635.09	6.87	-0.00	-1.26	0.00	0.00	0.00	0.00	0.52834
4	presto/tpch: q05	75191250.71	13.14	75191249.17	13.72	75191286.17	4.24	-0.00	-1.54	0.00	0.00	0.00	0.00	0.84657
16	presto/tpch: q17	196860562.69	23.31	196860561.34	11.22	174053700.42	16420.92	-0.00	-1.35	-11.59	0.00	0.00	0.01	0.90068
13	presto/tpch: q14	10516047.33	0.00	10516047.33	0.00	10516068.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
21	presto/tpch: q22	24824633.62	0.00	24824633.62	0.00	25580915.51	1366.58	0.00	0.00	3.05	0.00	0.00	0.01	nan
11	presto/tpch: q12	43357621.51	0.00	43357621.51	0.00	43357661.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
12	presto/tpch: q13	38017812.50	0.00	38017812.50	0.00	38017852.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nan
8	presto/tpch: q09	431754366.76	7.04	431754370.86	4.59	431754458.51	8.11	0.00	4.10	0.00	0.00	0.00	0.00	0.25942
15	presto/tpch: q16	27912407.85	5.03	27912408.25	4.54	27912486.94	3.98	0.00	0.40	0.00	0.00	0.00	0.00	0.88726
2	presto/tpch: q03	128730498.53	24.18	128730506.57	7.57	128730509.40	15.38	0.00	8.04	0.00	0.00	0.00	0.00	0.45505
20	presto/tpch: q21	263209427.93	327.54	263209773.67	198.06	263209454.01	631.21	0.00	345.74	0.00	0.00	0.00	0.00	0.05133
0	presto/tpch: q01	1846.63	2.97	1848.95	0.72	2669.97	8.85	0.13	2.32	44.59	0.16	0.04	0.33	0.09269
5	presto/tpch: q06	28.67	0.09	28.73	0.05	65.60	0.11	0.20	0.06	128.80	0.30	0.17	0.16	0.19613

```
count    22
mean     -0
std       1
min      -4
25%      -0
50%      -0
75%       0
max       0
Name: % change, dtype: float64
count    22
mean      8
```

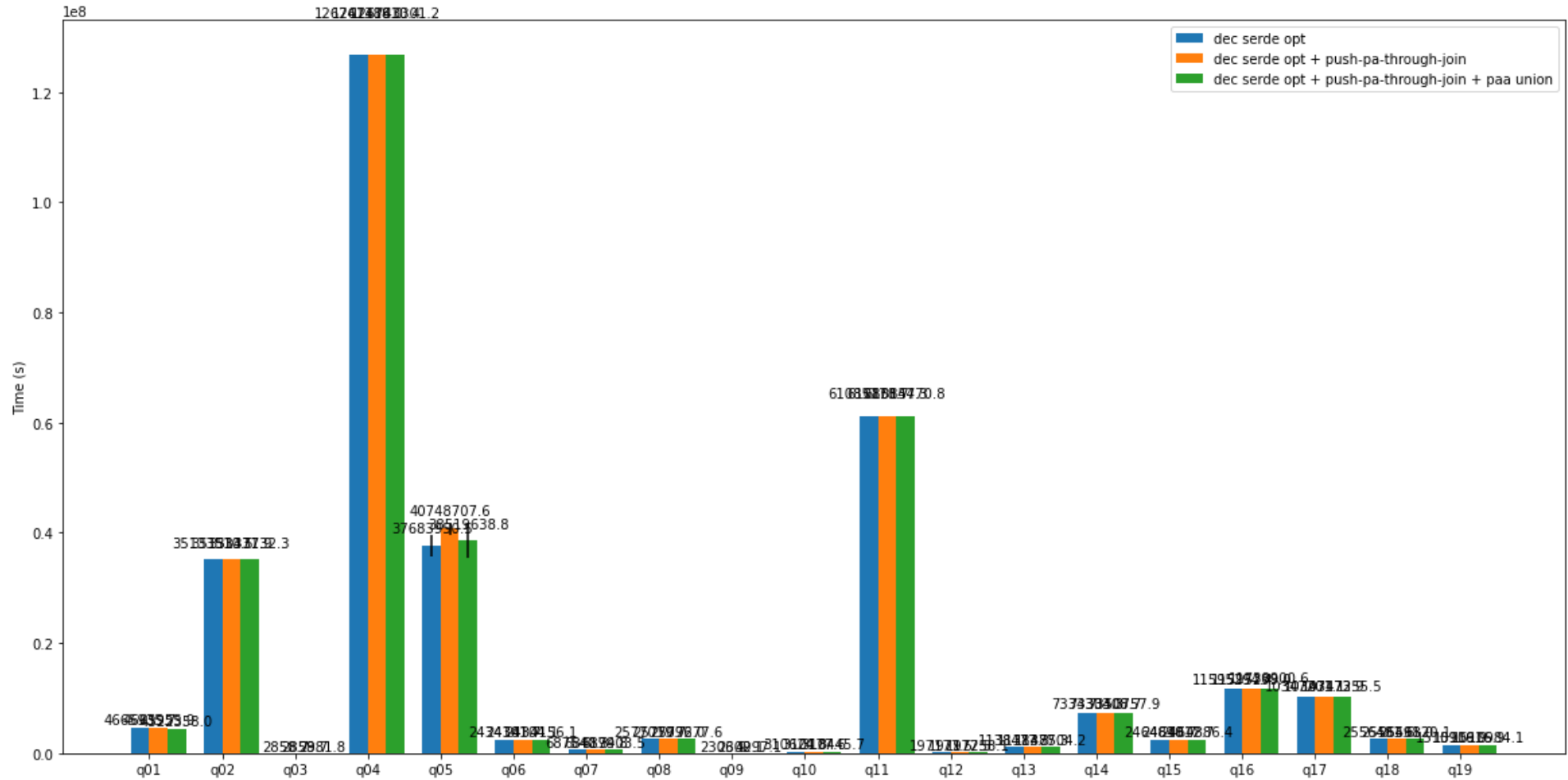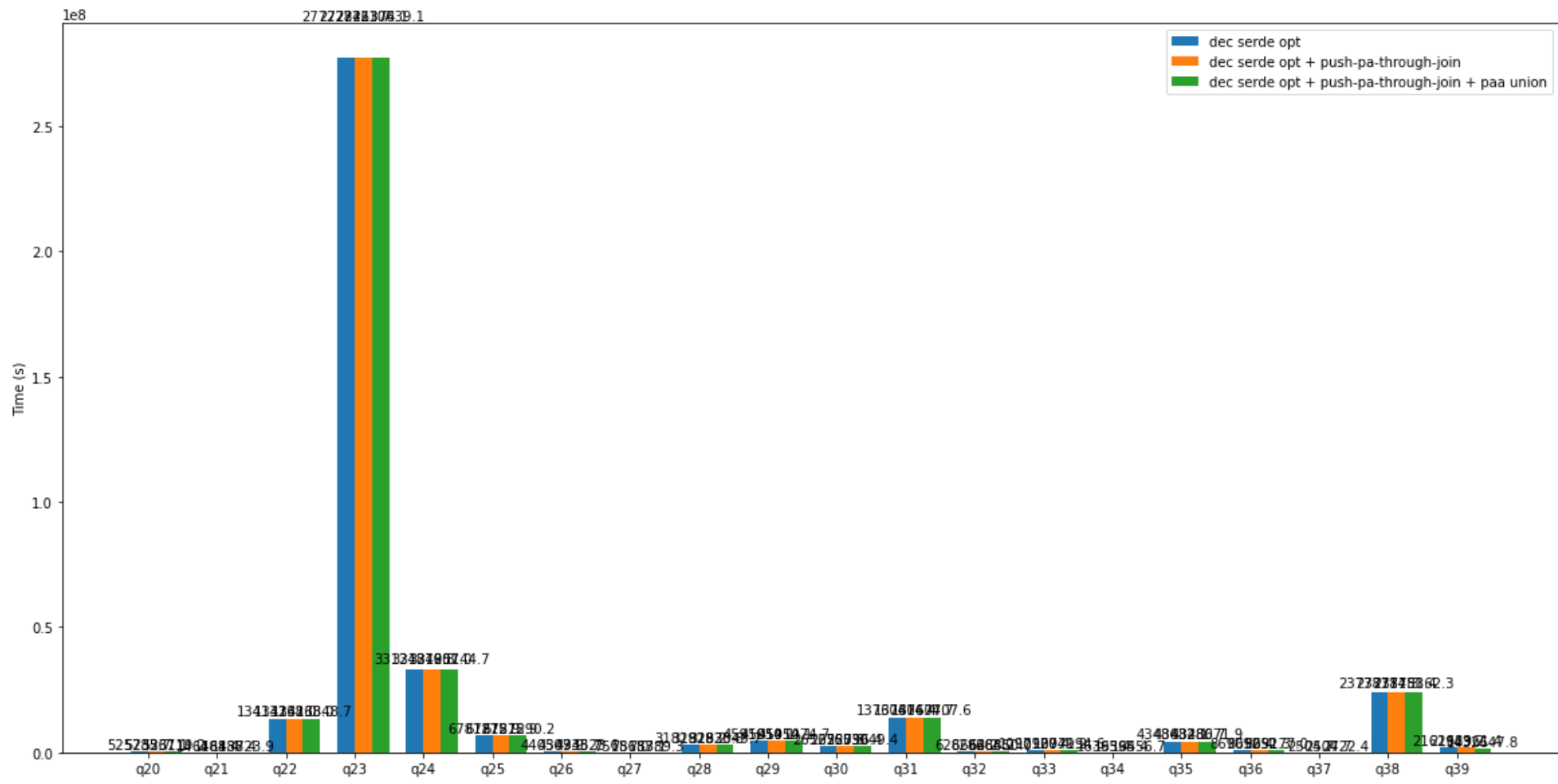```
std   29
min   -12
25%   0
50%   0
75%   2
max   129
Name: % change base -> dec serde opt + push-pa-through-join + paa union, dtype: float64
```
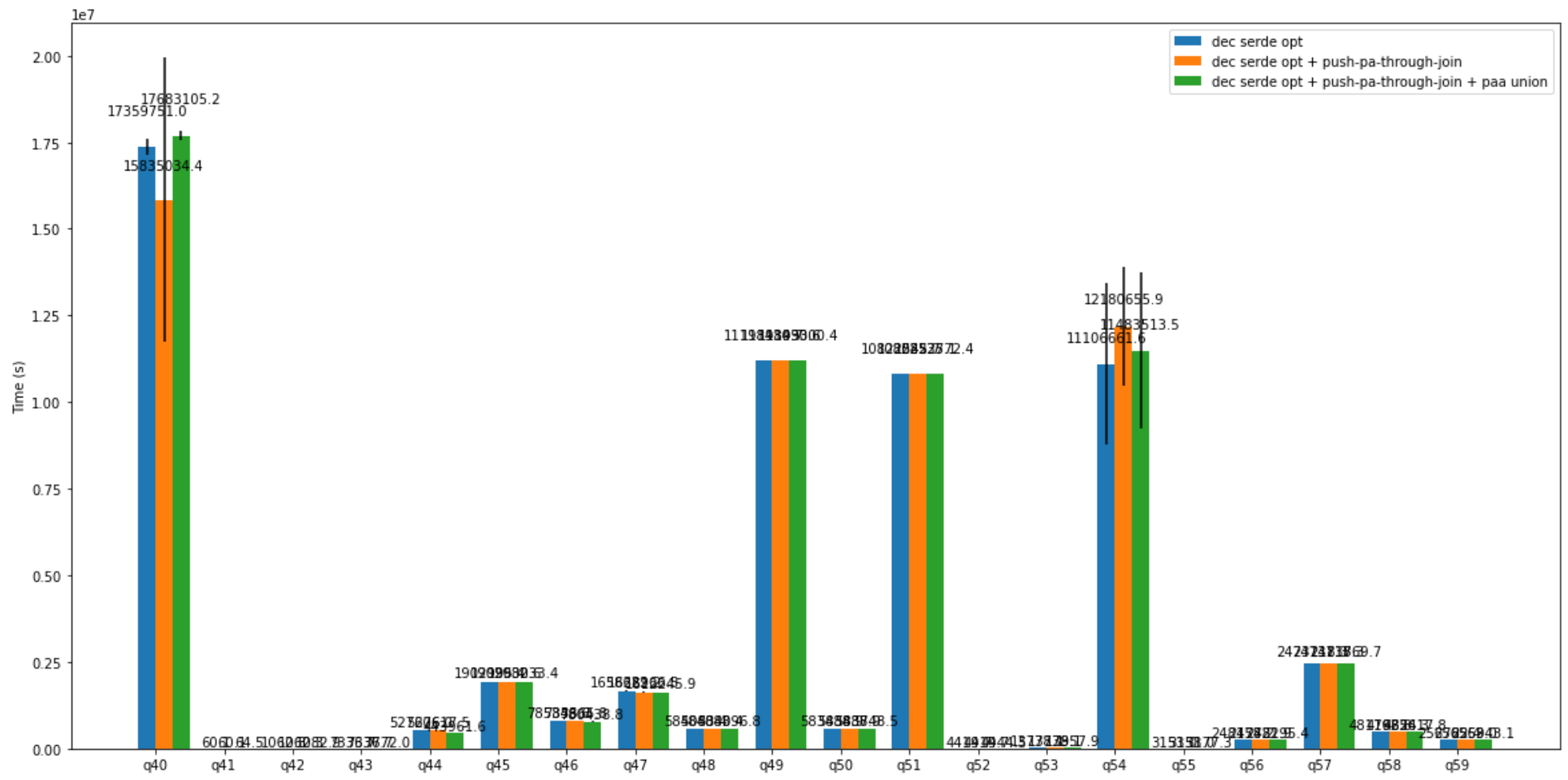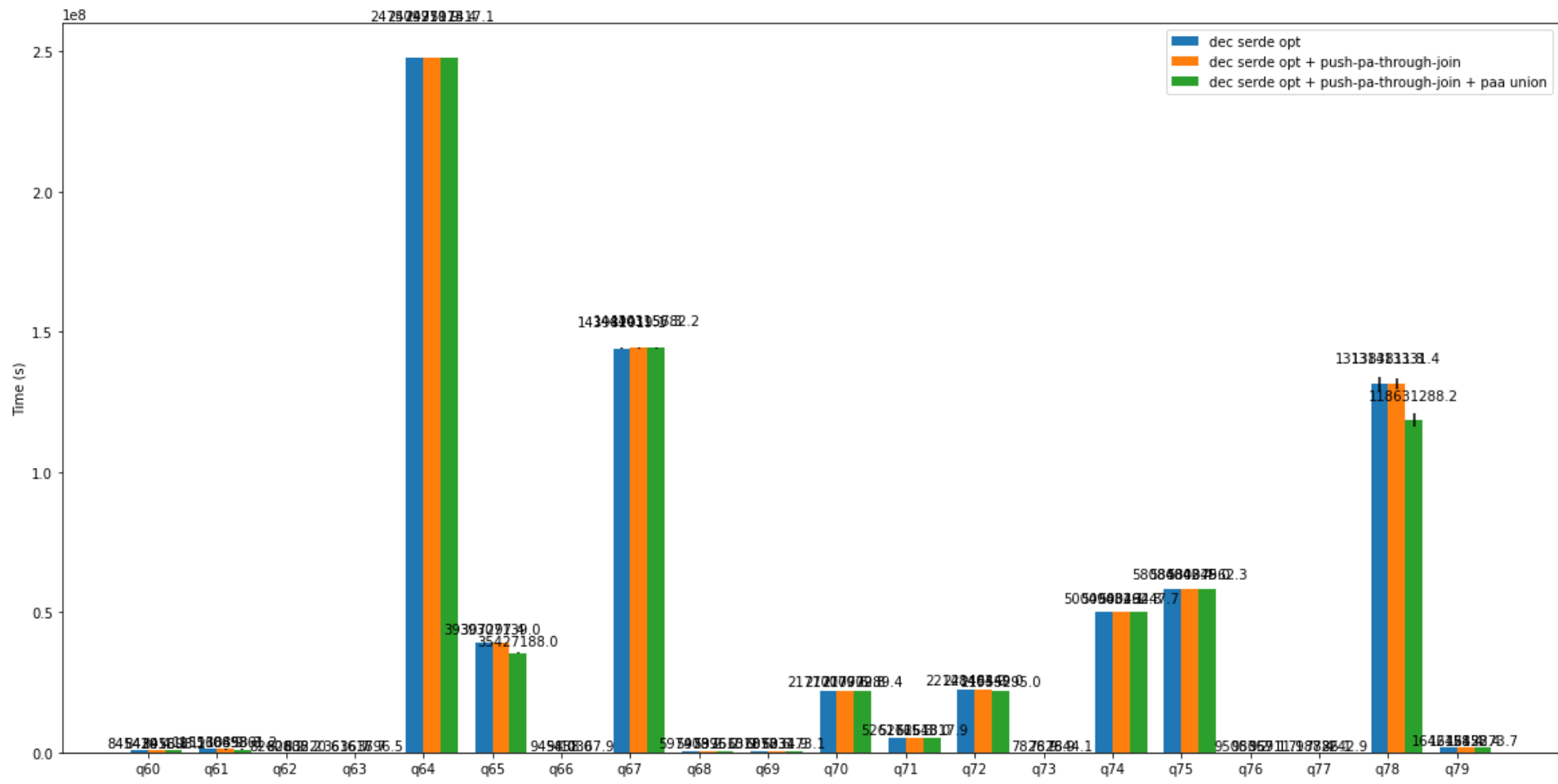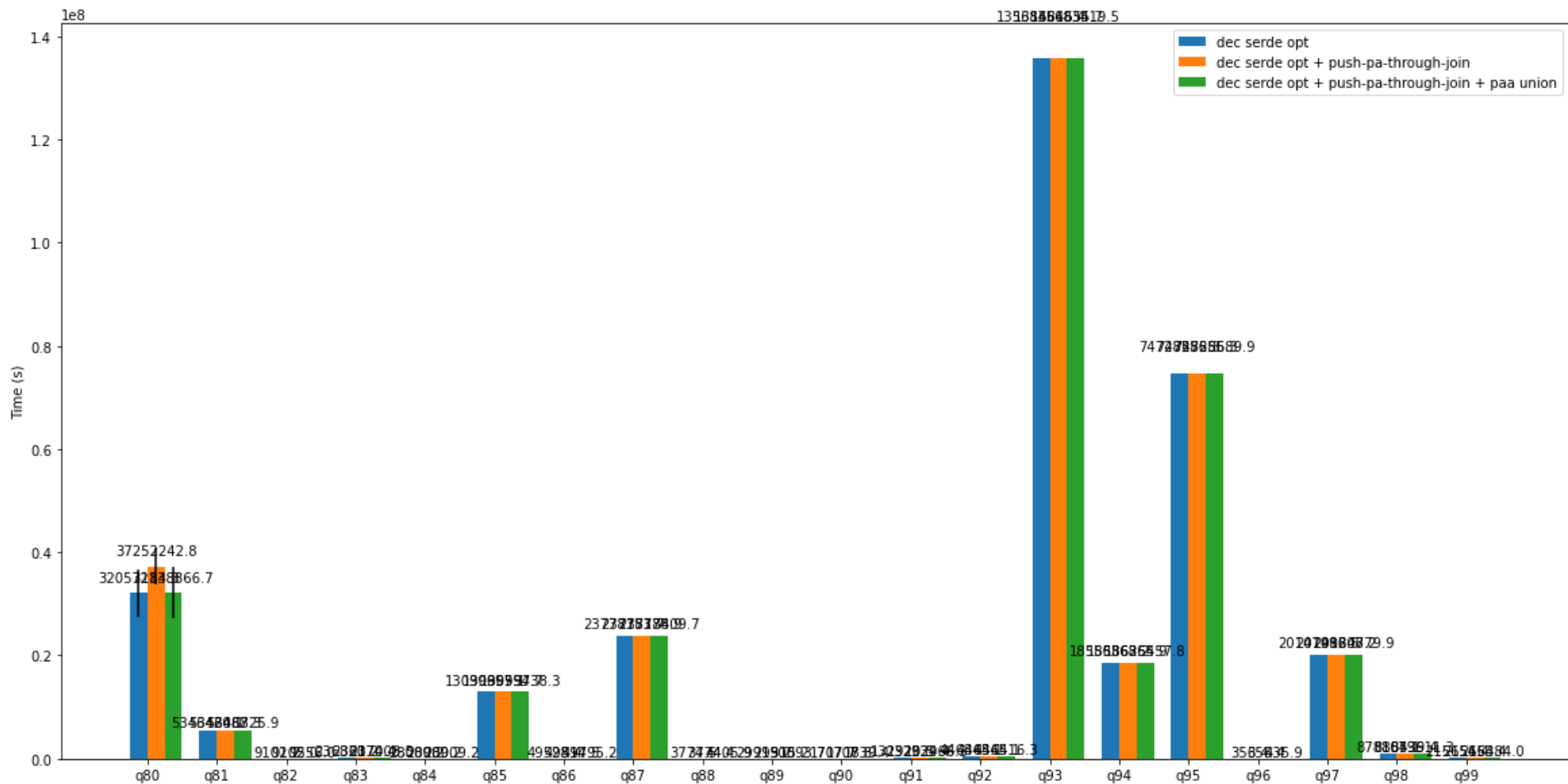
## TPC-DS Comparison (Network)

| | query | dec serde opt mean | dec serde opt std.dev | dec serde opt + push-pa-through-join mean | dec serde opt + push-pa-through-join std.dev | dec serde opt + push-pa-through-join + paa union mean | dec serde opt + push-pa-through-join + paa union std.dev | % change | absolute change | % change base -> dec serde opt + push-pa-through-join + paa union | dec serde opt std.dev % | dec serde opt + push-pa-through-join std.dev % | dec serde opt + push-pa-through-join + paa union std.dev % | p-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **39** | presto/tpcds: q40 | 17359750.99 | 230294.42 | 15835034.44 | 4109803.95 | 17683105.24 | 128748.64 | -8.78 | -1524716.55 | 1.86 | 1.33 | 25.95 | 0.73 | 0.38558 |
| **76** | presto/tpcds: q77 | 7987.37 | 421.70 | 7826.13 | 424.64 | 8242.90 | 432.52 | -2.02 | -161.24 | 3.20 | 5.28 | 5.43 | 5.25 | 0.52420 |
| **46** | presto/tpcds: q47 | 1658622.19 | 22966.82 | 1628966.53 | 24141.49 | 1612245.93 | 8125.32 | -1.79 | -29655.65 | -2.80 | 1.38 | 1.48 | 0.50 | 0.05424 |
| **60** | presto/tpcds: q61 | 1155608.90 | 0.51 | 1138453.85 | 42020.81 | 1069861.16 | 101199.50 | -1.48 | -17155.06 | -7.42 | 0.00 | 3.69 | 9.46 | 0.34089 |
| **25** | presto/tpcds: q26 | 440507.93 | 5801.66 | 434933.70 | 6690.60 | 434523.55 | 11777.00 | -1.27 | -5574.22 | -1.36 | 1.32 | 1.54 | 2.71 | 0.15414 |
| **6** | presto/tpcds: q07 | 687540.29 | 11063.61 | 684179.77 | 5592.45 | 689403.48 | 5518.79 | -0.49 | -3360.52 | 0.27 | 1.61 | 0.82 | 0.80 | 0.52170 |

| | query | dec serde opt mean | dec serde opt std.dev | dec serde opt + push-pa-through-join mean | dec serde opt + push-pa-through-join std.dev | dec serde opt + push-pa-through-join + paa union mean | dec serde opt + push-pa-through-join + paa union std.dev | % change | absolute change | % change base -> dec serde opt + push-pa-through-join + paa union | dec serde opt std.dev % | dec serde opt + push-pa-through-join std.dev % | dec serde opt + push-pa-through-join + paa union std.dev % | p-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | presto/tpcds: q20 | 525785.75 | 8292.66 | 523367.13 | 5877.67 | 523119.16 | 6506.41 | -0.46 | -2418.61 | -0.51 | 1.58 | 1.12 | 1.24 | 0.57290 |
| 57 | presto/tpcds: q58 | 481162.80 | 1240.55 | 479656.25 | 2237.53 | 482417.77 | 3135.27 | -0.31 | -1506.55 | 0.26 | 0.26 | 0.47 | 0.65 | 0.17977 |
| 59 | presto/tpcds: q60 | 845430.44 | 1922.80 | 842916.79 | 4130.07 | 845398.15 | 2035.84 | -0.30 | -2513.65 | -0.00 | 0.23 | 0.49 | 0.24 | 0.20631 |
| 82 | presto/tpcds: q83 | 236820.19 | 2407.08 | 236174.39 | 4198.72 | 237008.53 | 1503.89 | -0.27 | -645.80 | 0.08 | 1.02 | 1.78 | 0.63 | 0.75052 |
| 55 | presto/tpcds: q56 | 248158.18 | 922.48 | 247721.88 | 752.42 | 248295.36 | 580.98 | -0.18 | -436.30 | 0.06 | 0.37 | 0.30 | 0.23 | 0.39041 |
| 9 | presto/tpcds: q10 | 310624.77 | 0.00 | 310177.60 | 1113.73 | 310445.74 | 743.61 | -0.14 | -447.16 | -0.06 | 0.00 | 0.36 | 0.24 | 0.34857 |
| 58 | presto/tpcds: q59 | 256782.38 | 204.33 | 256562.95 | 606.26 | 255943.09 | 934.29 | -0.09 | -219.43 | -0.33 | 0.08 | 0.24 | 0.37 | 0.42046 |
| 32 | presto/tpcds: q33 | 1097120.40 | 538.22 | 1096749.18 | 408.41 | 1097194.57 | 538.16 | -0.03 | -371.23 | 0.01 | 0.05 | 0.04 | 0.05 | 0.20806 |
| 85 | presto/tpcds: q86 | 49528.36 | 28.85 | 49514.46 | 58.45 | 49795.16 | 9.28 | -0.03 | -13.90 | 0.54 | 0.06 | 0.12 | 0.02 | 0.61282 |
| 75 | presto/tpcds: q76 | 95083.25 | 121.48 | 95057.06 | 82.13 | 96911.14 | 81.89 | -0.03 | -26.19 | 1.92 | 0.13 | 0.09 | 0.08 | 0.67102 |
| 13 | presto/tpcds: q14 | 7334303.30 | 17084.17 | 7333408.73 | 18450.24 | 7350757.88 | 8768.92 | -0.01 | -894.58 | 0.22 | 0.23 | 0.25 | 0.12 | 0.93228 |
| 34 | presto/tpcds: q35 | 4348632.11 | 467.47 | 4348286.72 | 280.86 | 4348071.87 | 713.40 | -0.01 | -345.39 | -0.01 | 0.01 | 0.01 | 0.02 | 0.15187 |
| 63 | presto/tpcds: q64 | 247509210.94 | 24013.90 | 247497973.37 | 22610.79 | 247511417.06 | 43246.17 | -0.00 | -11237.58 | 0.00 | 0.01 | 0.01 | 0.02 | 0.42346 |
| 70 | presto/tpcds: q71 | 5261765.34 | 350.00 | 5261543.03 | 299.73 | 5261817.87 | 136.02 | -0.00 | -222.32 | 0.00 | 0.01 | 0.01 | 0.00 | 0.26464 |
| 73 | presto/tpcds: q74 | 50049632.07 | 2279.91 | 50048162.76 | 796.88 | 50049447.72 | 2105.01 | -0.00 | -1469.31 | -0.00 | 0.00 | 0.00 | 0.00 | 0.16702 |
| 22 | presto/tpcds: q23 | 277228463.71 | 30727.15 | 277221374.07 | 50562.35 | 277210639.09 | 42540.37 | -0.00 | -7089.64 | -0.01 | 0.01 | 0.02 | 0.02 | 0.77513 |
| 81 | presto/tpcds: q82 | 9102.21 | 6.21 | 9101.99 | 11.93 | 9555.99 | 7.64 | -0.00 | -0.23 | 4.99 | 0.07 | 0.13 | 0.08 | 0.96774 |
| 67 | presto/tpcds: q68 | 597408.17 | 40.45 | 597396.16 | 65.97 | 597513.89 | 106.47 | -0.00 | -12.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.71169 |
| 87 | presto/tpcds: q88 | 3774.48 | 0.48 | 3774.42 | 0.66 | 4405.94 | 1.70 | -0.00 | -0.06 | 16.73 | 0.01 | 0.02 | 0.04 | 0.86336 |
| 84 | presto/tpcds: q85 | 13099657.11 | 123.77 | 13099554.73 | 246.38 | 13099738.27 | 124.12 | -0.00 | -102.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.38445 |

| | query | dec serde opt mean | dec serde opt std.dev | dec serde opt + push-pa-through-join mean | dec serde opt + push-pa-through-join std.dev | dec serde opt + push-pa-through-join + paa union mean | dec serde opt + push-pa-through-join + paa union std.dev | % change | absolute change | % change base -> dec serde opt + push-pa-through-join + paa union | dec serde opt std.dev % | dec serde opt + push-pa-through-join std.dev % | dec serde opt + push-pa-through-join + paa union std.dev % | p-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44 | presto/tpcds: q45 | 1902995.35 | 24.92 | 1902982.62 | 20.73 | 1903033.44 | 24.19 | -0.00 | -12.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35863 |
| 64 | presto/tpcds: q65 | 39307297.36 | 2309.68 | 39307139.03 | 1731.64 | 35427187.98 | 250931.60 | -0.00 | -158.34 | -9.87 | 0.01 | 0.00 | 0.71 | 0.89579 |
| 16 | presto/tpcds: q17 | 10347201.07 | 31.36 | 10347173.94 | 22.61 | 10347255.53 | 60.62 | -0.00 | -27.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11626 |
| 27 | presto/tpcds: q28 | 3182928.15 | 5.55 | 3182923.82 | 6.02 | 3183043.66 | 3.82 | -0.00 | -4.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22436 |
| 1 | presto/tpcds: q02 | 35133510.50 | 216.60 | 35133471.89 | 184.81 | 35133732.31 | 309.20 | -0.00 | -38.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.74662 |
| 50 | presto/tpcds: q51 | 10822545.69 | 162.68 | 10822535.14 | 167.70 | 10822772.38 | 149.16 | -0.00 | -10.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.91417 |
| 38 | presto/tpcds: q39 | 2162963.18 | 4.60 | 2162961.44 | 3.56 | 1432647.80 | 2.28 | -0.00 | -1.74 | -33.76 | 0.00 | 0.00 | 0.00 | 0.48021 |
| 71 | presto/tpcds: q72 | 22148463.86 | 10.86 | 22148449.02 | 13.70 | 21955294.96 | 181.70 | -0.00 | -14.84 | -0.87 | 0.00 | 0.00 | 0.00 | 0.06431 |
| 10 | presto/tpcds: q11 | 61085178.69 | 33.83 | 61085144.26 | 40.50 | 61085770.85 | 77.16 | -0.00 | -34.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14116 |
| 93 | presto/tpcds: q94 | 18556368.18 | 1.59 | 18556365.94 | 4.00 | 18625457.85 | 69.34 | -0.00 | -2.24 | 0.37 | 0.00 | 0.00 | 0.00 | 0.23070 |
| 35 | presto/tpcds: q36 | 869052.38 | 44.72 | 869052.28 | 38.08 | 869176.96 | 20.60 | -0.00 | -0.10 | 0.01 | 0.01 | 0.00 | 0.00 | 0.99683 |
| 78 | presto/tpcds: q79 | 1642158.40 | 0.31 | 1642158.37 | 0.24 | 1642273.68 | 0.27 | -0.00 | -0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.89398 |
| 12 | presto/tpcds: q13 | 1138477.35 | 0.05 | 1138477.34 | 0.06 | 1138504.23 | 0.03 | -0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.85232 |
| 48 | presto/tpcds: q49 | 11198430.68 | 0.00 | 11198430.63 | 0.12 | 11199300.40 | 1.45 | -0.00 | -0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 0.34089 |
| 52 | presto/tpcds: q53 | 13778.12 | 0.00 | 13778.12 | 0.00 | 13957.88 | 0.00 | 0.00 | 0.00 | 1.30 | 0.00 | 0.00 | 0.00 | nan |
| 54 | presto/tpcds: q55 | 3152.98 | 0.00 | 3152.98 | 0.00 | 3177.34 | 0.00 | 0.00 | 0.00 | 0.77 | 0.00 | 0.00 | 0.00 | nan |
| 95 | presto/tpcds: q96 | 356.36 | 0.04 | 356.36 | 0.05 | 435.91 | 0.08 | 0.00 | 0.00 | 22.32 | 0.01 | 0.02 | 0.02 | 1.00000 |
| 94 | presto/tpcds: q95 | 74728556.28 | 0.00 | 74728556.28 | 0.00 | 74728589.89 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | nan |
| 88 | presto/tpcds: q89 | 29915.19 | 0.00 | 29915.19 | 0.00 | 30093.69 | 0.00 | 0.00 | 0.00 | 0.60 | 0.00 | 0.00 | 0.00 | nan |
| 91 | presto/tpcds: q92 | 446345.07 | 0.00 | 446345.07 | 0.00 | 446416.26 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | nan |

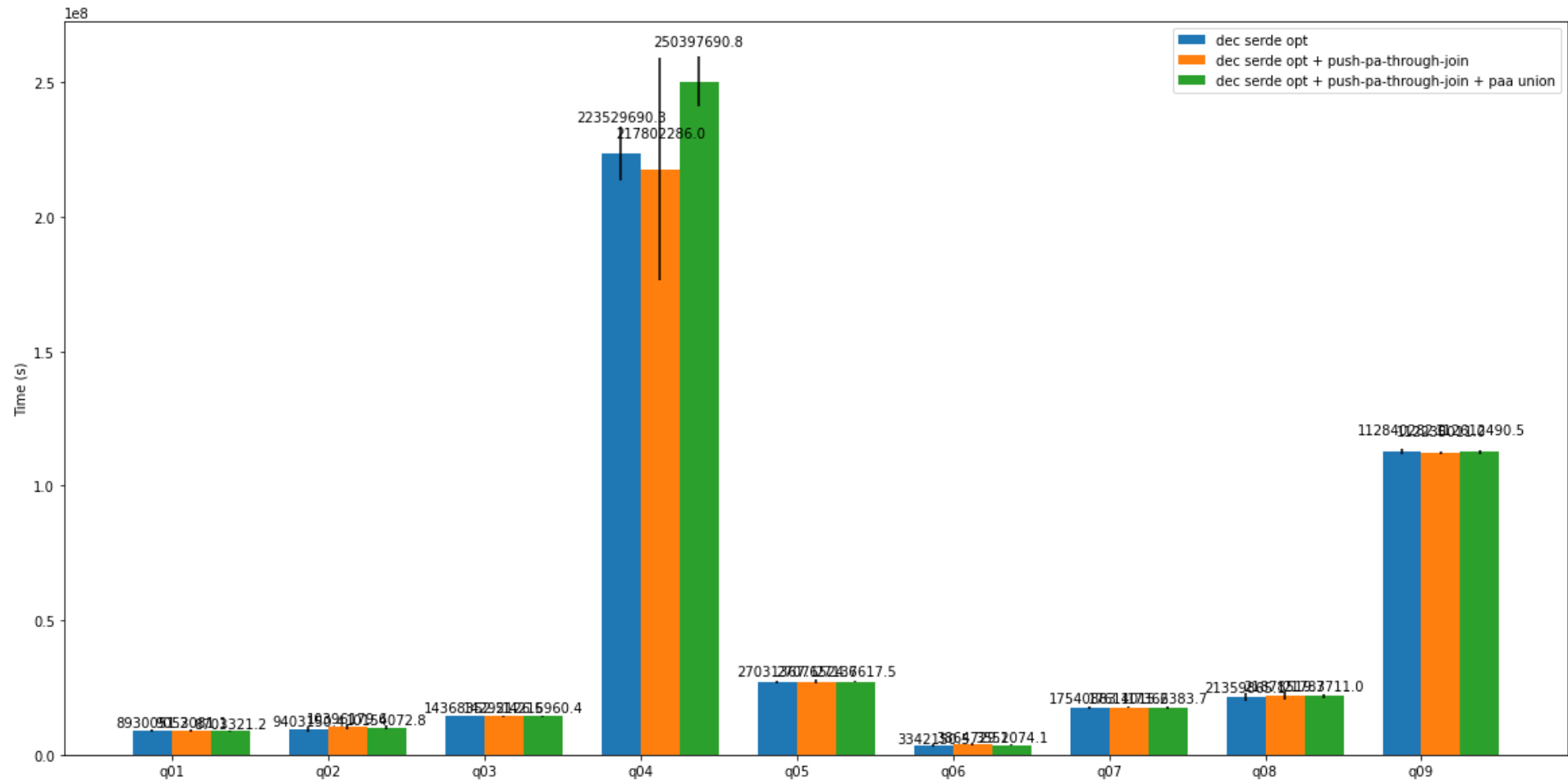| | query | dec serde opt mean | dec serde opt std.dev | dec serde opt + push-pa-through-join mean | dec serde opt + push-pa-through-join std.dev | dec serde opt + push-pa-through-join + paa union mean | dec serde opt + push-pa-through-join + paa union std.dev | % change | absolute change | % change base -> dec serde opt + push-pa-through-join + paa union | dec serde opt std.dev % | dec serde opt + push-pa-through-join std.dev % | dec serde opt + push-pa-through-join + paa union std.dev % | p-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | presto/tpcds: q66 | 9457.97 | 0.00 | 9457.97 | 0.00 | 10367.91 | 0.00 | 0.00 | 0.00 | 9.62 | 0.00 | 0.00 | 0.00 | nan |
| 61 | presto/tpcds: q62 | 82608.21 | 0.00 | 82608.21 | 0.00 | 83220.57 | 0.00 | 0.00 | 0.00 | 0.74 | 0.00 | 0.00 | 0.00 | nan |
| 62 | presto/tpcds: q63 | 3616.72 | 0.00 | 3616.72 | 0.00 | 3796.47 | 0.00 | 0.00 | 0.00 | 4.97 | 0.00 | 0.00 | 0.00 | nan |
| 56 | presto/tpcds: q57 | 2473118.31 | 0.00 | 2473118.31 | 0.00 | 2473769.73 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | nan |
| 49 | presto/tpcds: q50 | 583488.94 | 0.00 | 583488.94 | 0.00 | 583748.50 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | nan |
| 98 | presto/tpcds: q99 | 215654.43 | 0.00 | 215654.43 | 0.00 | 216383.97 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00 | 0.00 | 0.00 | nan |
| 21 | presto/tpcds: q22 | 13413268.05 | 0.00 | 13413268.05 | 0.00 | 13413348.69 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | nan |
| 24 | presto/tpcds: q25 | 6781275.94 | 0.00 | 6781275.94 | 0.00 | 6781290.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | nan |
| 28 | presto/tpcds: q29 | 4591054.11 | 11.35 | 4591054.11 | 11.35 | 4591074.67 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00000 |
| 11 | presto/tpcds: q12 | 197177.47 | 0.00 | 197177.47 | 0.00 | 197258.11 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | nan |
| 18 | presto/tpcds: q19 | 1510916.90 | 0.00 | 1510916.90 | 0.00 | 1510984.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | nan |
| 36 | presto/tpcds: q37 | 2504.65 | 0.00 | 2504.65 | 0.00 | 2722.39 | 0.00 | 0.00 | 0.00 | 8.69 | 0.00 | 0.00 | 0.00 | nan |
| 20 | presto/tpcds: q21 | 146188.43 | 0.00 | 146188.43 | 0.00 | 143723.89 | 0.00 | 0.00 | 0.00 | -1.69 | 0.00 | 0.00 | 0.00 | nan |
| 31 | presto/tpcds: q32 | 628664.18 | 0.00 | 628664.18 | 0.00 | 628850.03 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | nan |
| 41 | presto/tpcds: q42 | 1062.29 | 0.00 | 1062.29 | 0.00 | 1082.94 | 0.00 | 0.00 | 0.00 | 1.94 | 0.00 | 0.00 | 0.00 | nan |
| 42 | presto/tpcds: q43 | 7336.73 | 0.00 | 7336.73 | 0.00 | 7771.97 | 0.00 | 0.00 | 0.00 | 5.93 | 0.00 | 0.00 | 0.00 | nan |
| 47 | presto/tpcds: q48 | 584083.40 | 0.00 | 584083.40 | 0.00 | 584096.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | nan |
| 2 | presto/tpcds: q03 | 2858.71 | 0.00 | 2858.71 | 0.00 | 2981.77 | 0.00 | 0.00 | 0.00 | 4.30 | 0.00 | 0.00 | 0.00 | nan |
| 40 | presto/tpcds: q41 | 60.07 | 0.00 | 60.07 | 0.00 | 64.48 | 0.00 | 0.00 | 0.00 | 7.34 | 0.00 | 0.00 | 0.00 | nan |
| 51 | presto/tpcds: q52 | 4419.75 | 0.00 | 4419.75 | 0.00 | 4444.53 | 0.00 | 0.00 | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | nan |

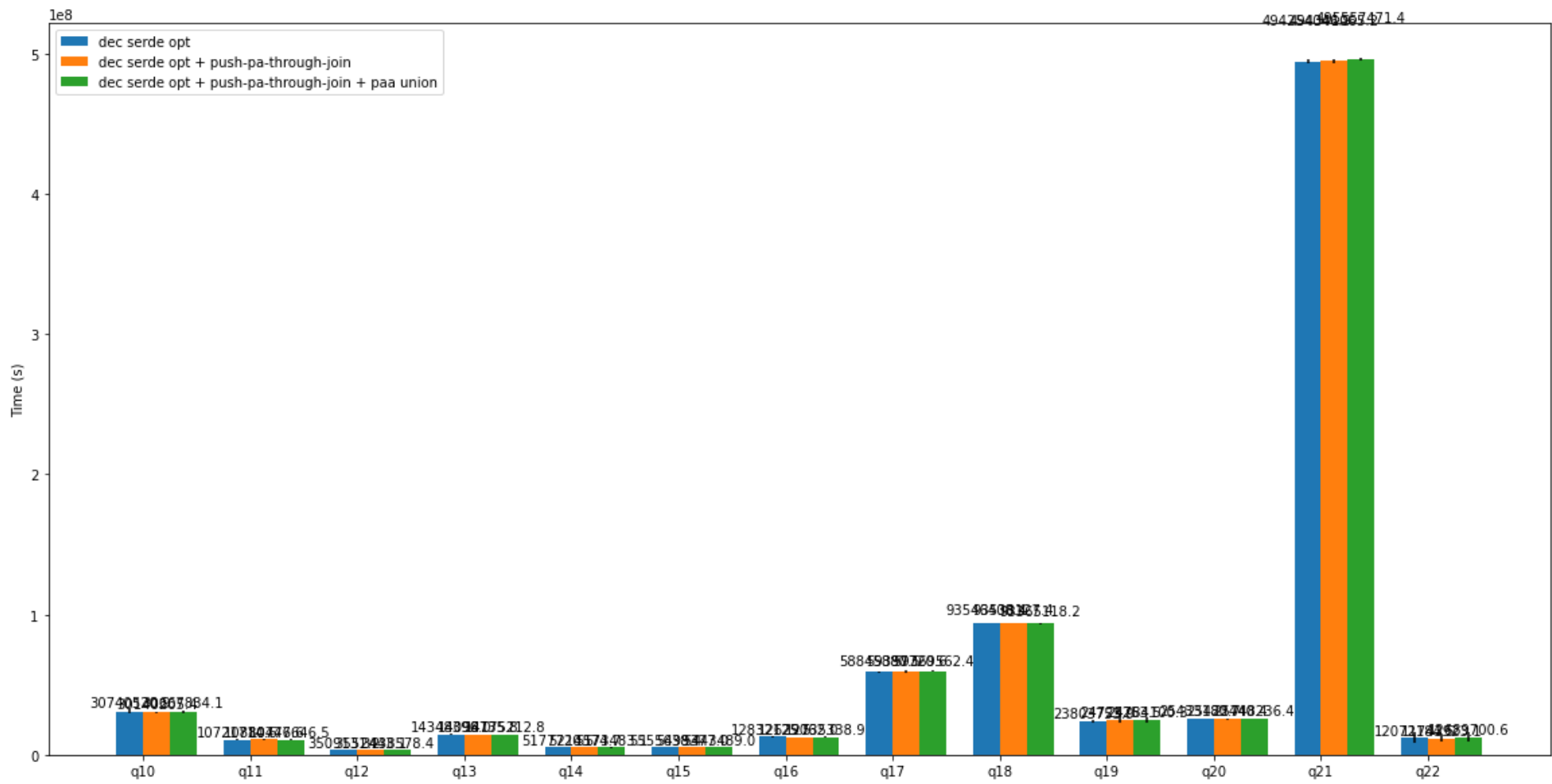| | query | dec serde opt mean | dec serde opt std.dev | dec serde opt + push-pa-through-join mean | dec serde opt + push-pa-through-join std.dev | dec serde opt + push-pa-through-join + paa union mean | dec serde opt + push-pa-through-join + paa union std.dev | % change | absolute change | % change base -> dec serde opt + push-pa-through-join + paa union | dec serde opt std.dev % | dec serde opt + push-pa-through-join std.dev % | dec serde opt + push-pa-through-join + paa union std.dev % | p-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 69 | presto/tpcds: q70 | 21770079.61 | 4.22 | 21770079.84 | 4.35 | 21770289.38 | 2.47 | 0.00 | 0.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.93003 |
| 33 | presto/tpcds: q34 | 16395.37 | 0.00 | 16395.37 | 0.00 | 16456.69 | 0.00 | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 | 0.00 | 0.34089 |
| 74 | presto/tpcds: q75 | 58084042.43 | 230.96 | 58084049.02 | 192.01 | 58087562.25 | 143.95 | 0.00 | 6.59 | 0.01 | 0.00 | 0.00 | 0.00 | 0.95821 |
| 92 | presto/tpcds: q93 | 135684615.40 | 165.21 | 135684655.72 | 90.73 | 135683419.49 | 410.17 | 0.00 | 40.33 | -0.00 | 0.00 | 0.00 | 0.00 | 0.61164 |
| 15 | presto/tpcds: q16 | 11595294.45 | 5.95 | 11595298.99 | 4.66 | 11738900.56 | 201.00 | 0.00 | 4.55 | 1.24 | 0.00 | 0.00 | 0.00 | 0.17136 |
| 72 | presto/tpcds: q73 | 7826.93 | 0.02 | 7826.93 | 0.01 | 7844.15 | 0.02 | 0.00 | 0.01 | 0.22 | 0.00 | 0.00 | 0.00 | 0.62871 |
| 83 | presto/tpcds: q84 | 28009.21 | 0.06 | 28009.23 | 0.05 | 28009.23 | 0.05 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.54901 |
| 14 | presto/tpcds: q15 | 2464810.71 | 4.40 | 2464812.69 | 2.77 | 2464886.36 | 9.05 | 0.00 | 1.97 | 0.00 | 0.00 | 0.00 | 0.00 | 0.37494 |
| 23 | presto/tpcds: q24 | 33124876.76 | 47.02 | 33124906.97 | 12.07 | 33125144.74 | 43.15 | 0.00 | 30.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15838 |
| 5 | presto/tpcds: q06 | 2434101.73 | 12.26 | 2434104.10 | 12.80 | 2434156.11 | 1.22 | 0.00 | 2.37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.74997 |
| 86 | presto/tpcds: q87 | 23778153.71 | 112.28 | 23778178.95 | 81.31 | 23778409.73 | 111.30 | 0.00 | 25.24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.66508 |
| 37 | presto/tpcds: q38 | 23778114.34 | 125.17 | 23778151.44 | 118.12 | 23778362.32 | 143.36 | 0.00 | 37.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.60893 |
| 3 | presto/tpcds: q04 | 126741387.98 | 510.48 | 126741610.37 | 546.79 | 126743301.23 | 402.15 | 0.00 | 222.39 | 0.00 | 0.00 | 0.00 | 0.00 | 0.48318 |
| 17 | presto/tpcds: q18 | 2556481.60 | 31.44 | 2556490.96 | 21.83 | 2556820.14 | 18.57 | 0.00 | 9.36 | 0.01 | 0.00 | 0.00 | 0.00 | 0.56234 |
| 0 | presto/tpcds: q01 | 4665935.69 | 975.05 | 4665955.86 | 1304.78 | 4322358.02 | 21058.27 | 0.00 | 20.17 | -7.36 | 0.02 | 0.03 | 0.49 | 0.97640 |
| 96 | presto/tpcds: q97 | 20147996.50 | 500.71 | 20148208.19 | 249.50 | 20184779.90 | 9815.36 | 0.00 | 211.69 | 0.18 | 0.00 | 0.00 | 0.05 | 0.37580 |
| 80 | presto/tpcds: q81 | 5346420.13 | 66.75 | 5346487.27 | 54.98 | 5346825.93 | 49.14 | 0.00 | 67.14 | 0.01 | 0.00 | 0.00 | 0.00 | 0.08635 |
| 26 | presto/tpcds: q27 | 75186.02 | 3.09 | 75187.08 | 1.56 | 75389.30 | 0.76 | 0.00 | 1.06 | 0.27 | 0.00 | 0.00 | 0.00 | 0.47049 |
| 29 | presto/tpcds: q30 | 2652750.76 | 51.13 | 2652796.39 | 55.24 | 2653049.40 | 61.80 | 0.00 | 45.63 | 0.01 | 0.00 | 0.00 | 0.00 | 0.16839 |
| 30 | presto/tpcds: q31 | 13760414.38 | 614.30 | 13760674.69 | 627.05 | 13760707.55 | 674.47 | 0.00 | 260.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.48426 |

| | query | dec serde opt mean | dec serde opt std.dev | dec serde opt + push-pa-through-join mean | dec serde opt + push-pa-through-join std.dev | dec serde opt + push-pa-through-join + paa union mean | dec serde opt + push-pa-through-join + paa union std.dev | % change | absolute change | % change base -> dec serde opt + push-pa-through-join + paa union | dec serde opt std.dev % | dec serde opt + push-pa-through-join std.dev % | dec serde opt + push-pa-through-join + paa union std.dev % | p-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | presto/tpcds: q44 | 527605.99 | 13.02 | 527617.53 | 8.61 | 443961.61 | 73.85 | 0.00 | 11.54 | -15.85 | 0.00 | 0.00 | 0.02 | 0.10020 |
| 45 | presto/tpcds: q46 | 785346.55 | 62.12 | 785365.81 | 27.09 | 780438.79 | 12109.03 | 0.00 | 19.26 | -0.62 | 0.01 | 0.00 | 1.55 | 0.50225 |
| 7 | presto/tpcds: q08 | 2577019.67 | 130.54 | 2577096.03 | 64.44 | 2577277.57 | 90.46 | 0.00 | 76.37 | 0.01 | 0.01 | 0.00 | 0.00 | 0.22777 |
| 89 | presto/tpcds: q90 | 1707.69 | 0.42 | 1707.76 | 0.40 | 1839.36 | 0.42 | 0.00 | 0.07 | 7.71 | 0.02 | 0.02 | 0.02 | 0.76206 |
| 90 | presto/tpcds: q91 | 132920.45 | 18.55 | 132934.39 | 6.57 | 132966.30 | 22.72 | 0.01 | 13.94 | 0.03 | 0.01 | 0.00 | 0.02 | 0.11345 |
| 77 | presto/tpcds: q78 | 131383811.83 | 2492725.07 | 131413331.38 | 1877862.89 | 118631288.22 | 2424648.85 | 0.02 | 29519.55 | -9.71 | 1.90 | 1.43 | 2.04 | 0.98197 |
| 66 | presto/tpcds: q67 | 143982019.08 | 202169.64 | 144103156.32 | 299992.95 | 144115782.22 | 266090.22 | 0.08 | 121137.24 | 0.09 | 0.14 | 0.21 | 0.18 | 0.43120 |
| 8 | presto/tpcds: q09 | 2306.93 | 3.14 | 2309.11 | 3.82 | 4297.12 | 4.91 | 0.09 | 2.18 | 86.27 | 0.14 | 0.17 | 0.11 | 0.30572 |
| 68 | presto/tpcds: q69 | 601878.59 | 7905.45 | 605231.94 | 3892.41 | 603473.12 | 4958.33 | 0.56 | 3353.36 | 0.26 | 1.31 | 0.64 | 0.82 | 0.37321 |
| 97 | presto/tpcds: q98 | 878104.10 | 2880.27 | 885539.42 | 4300.95 | 879611.33 | 10439.80 | 0.85 | 7435.32 | 0.17 | 0.33 | 0.49 | 1.19 | 0.00555 |
| 4 | presto/tpcds: q05 | 37683950.54 | 1878018.72 | 40748707.56 | 1117289.75 | 38519638.77 | 3059580.90 | 8.13 | 3064757.02 | 2.22 | 4.98 | 2.74 | 7.94 | 0.00638 |
| 53 | presto/tpcds: q54 | 11106661.61 | 2326351.48 | 12180655.92 | 1709432.78 | 11483513.48 | 2258587.15 | 9.67 | 1073994.31 | 3.39 | 20.95 | 14.03 | 19.67 | 0.38359 |
| 79 | presto/tpcds: q80 | 32057184.28 | 4652571.33 | 37252242.78 | 3552901.96 | 32138866.65 | 4893673.22 | 16.21 | 5195058.50 | 0.25 | 14.51 | 9.54 | 15.23 | 0.05482 |

```
count    99
mean      0
std       2
min      -9
25%      -0
50%       0
75%       0
max      16
Name: % change, dtype: float64
count    99
mean      1
std      10
min     -34
25%       0
50%       0
75%       0
max      86
Name: % change base -> dec serde opt + push-pa-through-join + paa union, dtype: float64
```

TPC-H Comparison (Peak memory)

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
21	presto/tpch: q22	12072184.46	3812213.06	11743923.11	2796451.83	12689700.61	3354360.73	-2.72	-328261.34	5.12	31.58	23.81	26.43	0.86835
3	presto/tpch: q04	223529690.33	9897133.54	217802286.01	41604795.42	250397690.81	9263208.66	-2.56	-5727404.32	12.02	4.43	19.10	3.70	0.74964
9	presto/tpch: q10	30740520.95	1346736.71	30140205.43	400763.60	30667834.15	834801.89	-1.95	-600315.51	-0.24	4.38	1.33	2.72	0.31996
12	presto/tpch: q13	14348396.00	393321.75	14098735.84	110164.96	14175212.80	249837.59	-1.74	-249660.16	-1.21	2.74	0.78	1.76	0.16522
15	presto/tpch: q16	12832125.46	346821.20	12629061.98	122179.68	12735338.91	380851.85	-1.58	-203063.49	-0.75	2.70	0.97	2.99	0.20595
14	presto/tpch: q15	5555638.43	28658.94	5499377.03	165580.96	5443489.00	129635.01	-1.01	-56261.40	-2.02	0.52	3.01	2.38	0.43127

	query	dec serde opt mean	dec serde opt std.dev	dec serde opt + push-pa-through-join mean	dec serde opt + push-pa-through-join std.dev	dec serde opt + push-pa-through-join + paa union mean	dec serde opt + push-pa-through-join + paa union std.dev	% change	absolute change	% change base -> dec serde opt + push-pa-through-join + paa union	dec serde opt std.dev %	dec serde opt + push-pa-through-join std.dev %	dec serde opt + push-pa-through-join + paa union std.dev %	p-value
8	presto/tpch: q09	112840282.03	1069341.84	112235011.02	589267.61	112612490.50	870043.28	-0.54	-605271.01	-0.20	0.95	0.53	0.77	0.25253
2	presto/tpch: q03	14368352.47	30479.35	14292126.53	256038.87	14216960.45	188516.33	-0.53	-76225.94	-1.05	0.21	1.79	1.33	0.48558
19	presto/tpch: q20	25433180.71	105740.78	25422440.39	258183.37	25748236.39	147149.21	-0.04	-10740.32	1.24	0.42	1.02	0.57	0.92674
17	presto/tpch: q18	93546408.40	153624.11	93538127.37	107988.11	93365118.22	138832.15	-0.01	-8281.03	-0.19	0.16	0.12	0.15	0.91612
20	presto/tpch: q21	494254046.91	1076906.67	494341065.19	1062340.74	495557471.42	1089181.07	0.02	87018.28	0.26	0.22	0.21	0.22	0.89074
4	presto/tpch: q05	27031367.64	561614.46	27071524.57	696127.16	27137617.54	397352.31	0.15	40156.93	0.39	2.08	2.57	1.46	0.91461
6	presto/tpch: q07	17540883.06	436944.45	17614015.21	354109.60	17366383.74	517831.52	0.42	73132.15	-0.99	2.49	2.01	2.98	0.75665
13	presto/tpch: q14	5177720.53	49551.17	5214574.66	61770.84	5173483.11	99203.62	0.71	36854.13	-0.08	0.96	1.18	1.92	0.28087
16	presto/tpch: q17	58845880.49	375622.11	59397720.64	1136348.80	59369562.38	558299.79	0.94	551840.15	0.89	0.64	1.91	0.94	0.28508
11	presto/tpch: q12	3509131.20	160405.36	3552443.06	348531.47	3438578.40	144576.70	1.23	43311.86	-2.01	4.57	9.81	4.20	0.78778
0	presto/tpch: q01	8930051.21	453770.36	9053081.11	399758.93	8703321.16	223707.46	1.38	123029.90	-2.54	5.08	4.42	2.57	0.62903
10	presto/tpch: q11	10721714.60	418929.35	10880476.60	441220.20	10747646.46	697280.11	1.48	158762.00	0.24	3.91	4.06	6.49	0.53708
7	presto/tpch: q08	21359865.09	1490627.57	21878519.74	1550402.23	21783711.01	854854.73	2.43	518654.65	1.98	6.98	7.09	3.92	0.56783
18	presto/tpch: q19	23803753.85	904802.07	24725253.47	1679761.95	24784100.34	1954891.71	3.87	921499.62	4.12	3.80	6.79	7.89	0.26415
1	presto/tpch: q02	9403150.40	1049721.52	10396179.65	863208.11	10154072.84	757022.19	10.56	993029.25	7.99	11.16	8.30	7.46	0.10376
5	presto/tpch: q06	3342150.50	560897.99	3864729.12	385515.59	3552074.13	240654.21	15.64	522578.63	6.28	16.78	9.98	6.78	0.08941

```
count    22
mean      1
std       4
min      -3
25%      -1
50%       0
75%       1
max      16
Name: % change, dtype: float64
count    22
mean      1
```
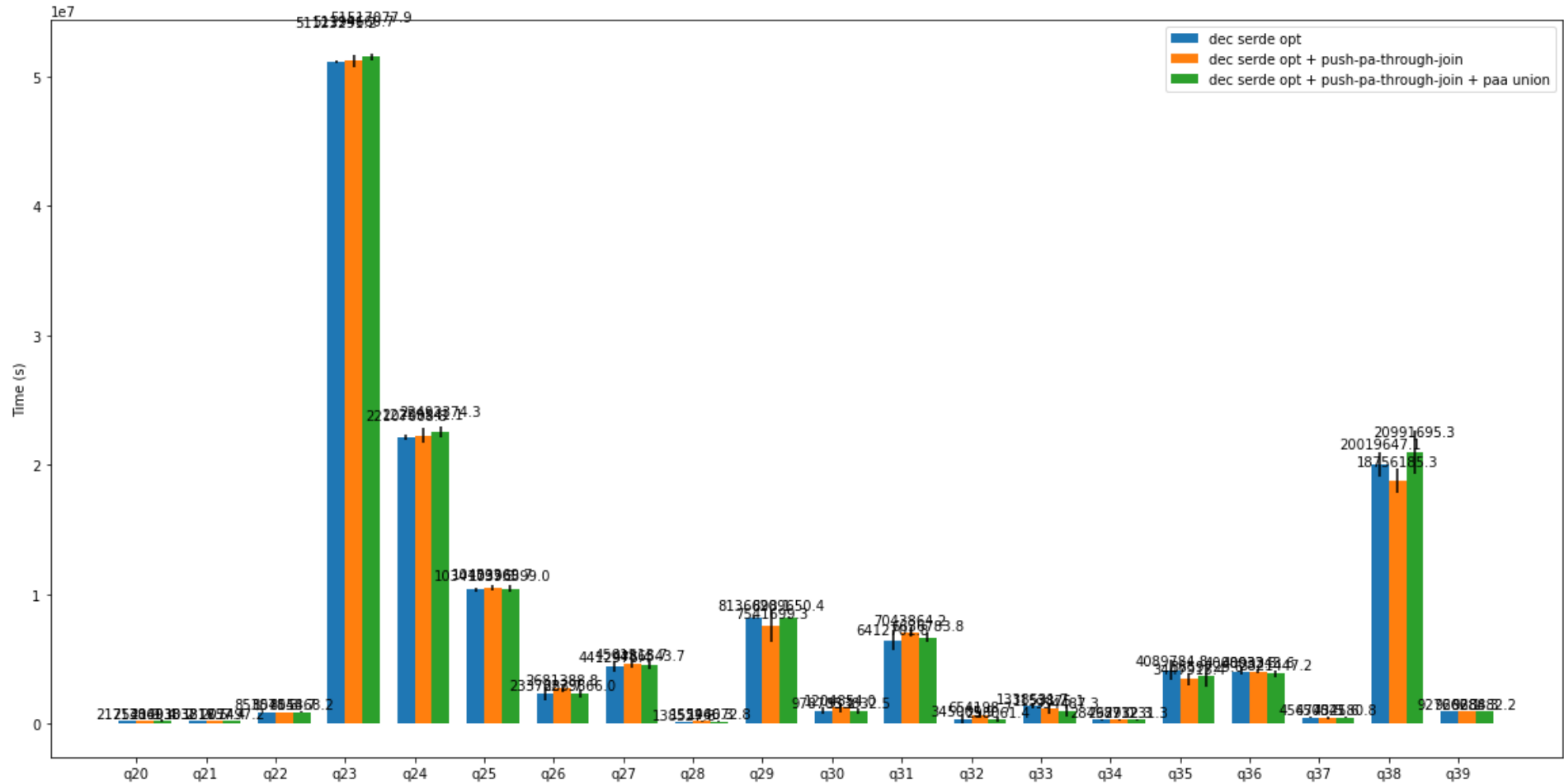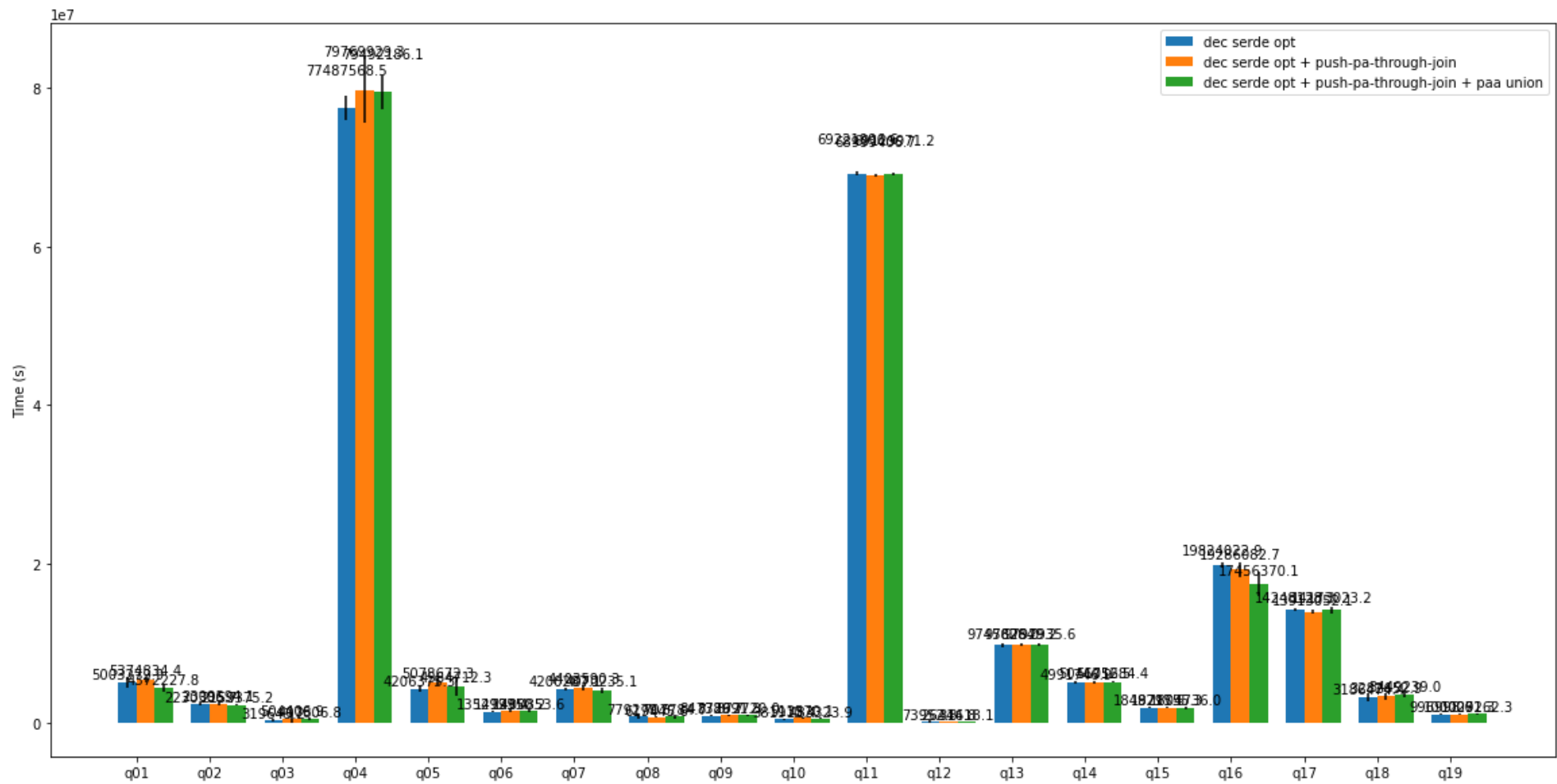
```
std        4
min       -3
25%       -1
50%        0
75%        2
max       12
Name: % change base -> dec serde opt + push-pa-through-join + paa union, dtype: float64
```

TPC-DS Comparison (Peak memory)

TPC-H Comparison (physicalInputDataSize)