

1 TB TPC-DS Performance comparison (Iceberg Parquet): GCP, 2 workers n2-custom (14 vCPU / 112 GB) + 1 driver

TabbyDB 4.1.3-tabbydb.2 vs Apache Spark 4.1.3

Summary

Table format	Stock Spark total (s)	TabbyDB total (s)	Less total time	Geo-mean speedup	Queries faster on TabbyDB
Iceberg Parquet	9,034.4	7,066.7	21.8%	1.40x	85 of 103
Hive Parquet	7,884.7	6,253.7	20.7%	1.49x	88 of 103

Benchmark setup

Cloud / region	Google Cloud, us-west4-a
Driver node	1 x e2-highmem-4 (4 vCPU, 32 GB) - Spark master + driver (24 GB heap)
Worker nodes	2 x n2-custom-14-114688 (14 vCPU, 112 GB RAM), 2 x 375 GB local NVMe SSD each for shuffle/spill
Executors	4 executors (2 per worker) x 7 cores x 40 GB heap (+1 GB overhead) = 28 cores, 160 GB
OS / JVM	Ubuntu 24.04 LTS (amd64), OpenJDK 21
Engines	Apache Spark 4.1.3 (stock) vs TabbyDB 4.1.3-tabbydb.2
Iceberg	Stock: iceberg-spark-runtime-4.1_2.13-1.11.0 TabbyDB: iceberg-tabbydb-runtime-4.1.3_2.13-1.11.0-tabbydb.2
Data	TPC-DS scale factor 1000 (1 TB), Parquet on Google Cloud Storage, non-partitioned, date-sorted on locally written partition; DECIMAL generated as DOUBLE
Table formats	Hive external tables (with ANALYZE statistics) and Iceberg tables over the same data
Workload	spark-sql-perf, TPC-DS v2.4 queries: 103 queries incl. ss_max (q84 excluded); 1 iteration; OS page caches dropped on workers before each run
Common Spark settings	autoBroadcastJoinThreshold=100MB, shuffle.partitions=448, preferSortMergeJoin=false, maxShuffledHashJoinLocalMapThreshold=10MB
TabbyDB-only settings	See tabbydb-spark-defaults.conf (e.g. autoBroadcastJoinThresholdInnerJoin=125MB, BHJ key pushdown flags)
Timing	Per-query time = compile (parse/analyze/optimize/plan) + execution, as reported by spark-sql-perf

Result correctness

Every query's full result set was compared with stock Spark on Hive. On both formats 93 queries match exactly and 8 match as unordered sets (ORDER BY ties). q65 and q67 differ in values; they also differ between stock Spark on Iceberg and stock Spark on Hive, because of ORDER BY ties and DOUBLE rounding. Row counts match for all 103 queries.

Per-query results (Iceberg Parquet)

Query	Stock Spark (s)	Result rows Stock Spark	TabbyDB (s)	Result rows TabbyDB	Time diff (s)	Improvement	Speedup	Row count match	Result check
q1	32.32	100	24.27	100	-8.05	24.9%	1.33x	TRUE	MATCH
q2	49.05	2513	32.10	2513	-16.95	34.6%	1.53x	TRUE	MATCH
q3	20.98	100	23.70	100	+2.72	-12.9%	0.89x	TRUE	MATCH
q4	350.46	100	265.03	100	-85.43	24.4%	1.32x	TRUE	MATCH
q5	124.43	100	81.25	100	-43.18	34.7%	1.53x	TRUE	MATCH
q6	27.74	52	16.73	52	-11.01	39.7%	1.66x	TRUE	MATCH
q7	43.52	100	25.71	100	-17.81	40.9%	1.69x	TRUE	MATCH
q8	34.07	10	22.45	10	-11.62	34.1%	1.52x	TRUE	MATCH
q9	220.70	1	224.21	1	+3.51	-1.6%	0.98x	TRUE	MATCH
q10	38.17	100	25.47	100	-12.70	33.3%	1.50x	TRUE	MATCH
q11	199.47	100	166.45	100	-33.02	16.6%	1.20x	TRUE	MATCH
q12	11.40	100	11.30	100	-0.10	0.9%	1.01x	TRUE	MATCH
q13	59.74	1	49.81	1	-9.93	16.6%	1.20x	TRUE	MATCH
q14a	266.14	100	230.40	100	-35.74	13.4%	1.16x	TRUE	MATCH
q14b	245.52	100	212.54	100	-32.98	13.4%	1.16x	TRUE	MATCH
q15	34.02	100	20.41	100	-13.61	40.0%	1.67x	TRUE	MATCH
q16	107.72	1	83.52	1	-24.20	22.5%	1.29x	TRUE	MATCH
q17	70.11	100	41.30	100	-28.81	41.1%	1.70x	TRUE	MATCH
q18	44.74	100	22.95	100	-21.79	48.7%	1.95x	TRUE	MATCH(unordered)
q19	41.85	100	27.75	100	-14.10	33.7%	1.51x	TRUE	MATCH
q20	17.44	100	3.32	100	-14.12	81.0%	5.26x	TRUE	MATCH
q21	7.53	100	2.44	100	-5.09	67.6%	3.09x	TRUE	MATCH
q22	30.07	100	24.27	100	-5.80	19.3%	1.24x	TRUE	MATCH
q23a	356.01	1	323.46	1	-32.55	9.1%	1.10x	TRUE	MATCH
q23b	367.63	100	333.20	100	-34.43	9.4%	1.10x	TRUE	MATCH
q24a	176.45	2919	191.77	2919	+15.32	-8.7%	0.92x	TRUE	MATCH(unordered)

Query	Stock Spark (s)	Result rows Stock Spark	TabbyDB (s)	Result rows TabbyDB	Time diff (s)	Improvement	Speedup	Row count match	Result check
q24b	160.42	322	177.26	322	+16.84	-10.5%	0.90x	TRUE	MATCH(unordered)
q25	70.01	100	36.13	100	-33.88	48.4%	1.94x	TRUE	MATCH
q26	27.77	100	10.75	100	-17.02	61.3%	2.58x	TRUE	MATCH
q27	41.06	100	19.43	100	-21.63	52.7%	2.11x	TRUE	MATCH
q28	156.74	1	160.45	1	+3.71	-2.4%	0.98x	TRUE	MATCH
q29	94.21	100	72.73	100	-21.48	22.8%	1.30x	TRUE	MATCH
q30	26.09	100	21.94	100	-4.15	15.9%	1.19x	TRUE	MATCH
q31	102.45	278	71.38	278	-31.07	30.3%	1.44x	TRUE	MATCH
q32	32.44	1	4.19	1	-28.25	87.1%	7.74x	TRUE	MATCH
q33	54.61	100	31.05	100	-23.56	43.1%	1.76x	TRUE	MATCH
q34	28.03	8489	31.06	8489	+3.03	-10.8%	0.90x	TRUE	MATCH
q35	54.29	100	42.23	100	-12.06	22.2%	1.29x	TRUE	MATCH
q36	35.08	100	26.75	100	-8.33	23.8%	1.31x	TRUE	MATCH
q37	58.76	12	54.80	12	-3.96	6.7%	1.07x	TRUE	MATCH
q38	113.97	1	94.81	1	-19.16	16.8%	1.20x	TRUE	MATCH
q39a	16.13	14551	6.84	14551	-9.29	57.6%	2.36x	TRUE	MATCH
q39b	14.66	594	5.38	594	-9.28	63.3%	2.73x	TRUE	MATCH
q40	32.99	100	9.41	100	-23.58	71.5%	3.50x	TRUE	MATCH
q41	1.36	100	1.30	100	-0.06	4.4%	1.05x	TRUE	MATCH
q42	20.30	13	11.34	13	-8.96	44.1%	1.79x	TRUE	MATCH
q43	21.98	100	14.79	100	-7.19	32.7%	1.49x	TRUE	MATCH
q44	42.89	10	43.68	10	+0.79	-1.8%	0.98x	TRUE	MATCH
q45	28.04	100	27.00	100	-1.04	3.7%	1.04x	TRUE	MATCH
q46	45.68	100	47.54	100	+1.86	-4.1%	0.96x	TRUE	MATCH
q47	60.25	100	53.22	100	-7.03	11.7%	1.13x	TRUE	MATCH
q48	40.60	1	24.52	1	-16.08	39.6%	1.66x	TRUE	MATCH
q49	93.76	100	45.35	100	-48.41	51.6%	2.07x	TRUE	MATCH(unordered)

Query	Stock Spark (s)	Result rows Stock Spark	TabbyDB (s)	Result rows TabbyDB	Time diff (s)	Improvement	Speedup	Row count match	Result check
q50	155.35	100	182.45	100	+27.10	-17.4%	0.85x	TRUE	MATCH
q51	100.10	100	94.15	100	-5.95	6.0%	1.06x	TRUE	MATCH
q52	20.85	100	12.19	100	-8.66	41.5%	1.71x	TRUE	MATCH
q53	24.89	100	12.19	100	-12.70	51.0%	2.04x	TRUE	MATCH
q54	56.37	100	30.04	100	-26.33	46.7%	1.88x	TRUE	MATCH
q55	20.44	100	18.17	100	-2.27	11.1%	1.13x	TRUE	MATCH
q56	53.78	100	33.92	100	-19.86	36.9%	1.59x	TRUE	MATCH
q57	32.76	100	22.14	100	-10.62	32.4%	1.48x	TRUE	MATCH
q58	48.65	6	51.27	6	+2.62	-5.4%	0.95x	TRUE	MATCH
q59	48.95	100	36.17	100	-12.78	26.1%	1.35x	TRUE	MATCH
q60	54.46	100	30.51	100	-23.95	44.0%	1.78x	TRUE	MATCH
q61	77.20	1	39.19	1	-38.01	49.2%	1.97x	TRUE	MATCH
q62	13.56	100	13.14	100	-0.42	3.1%	1.03x	TRUE	MATCH
q63	24.72	100	12.40	100	-12.32	49.8%	1.99x	TRUE	MATCH
q64	245.06	12185	93.46	12185	-151.60	61.9%	2.62x	TRUE	MATCH(unordered)
q65	126.59	100	103.50	100	-23.09	18.2%	1.22x	TRUE	DIFF values (first at row 1)
q66	41.36	20	22.54	20	-18.82	45.5%	1.84x	TRUE	MATCH
q67	389.21	100	370.84	100	-18.37	4.7%	1.05x	TRUE	DIFF values (first at row 1)
q68	52.06	100	55.72	100	+3.66	-7.0%	0.93x	TRUE	MATCH
q69	36.04	100	24.23	100	-11.81	32.8%	1.49x	TRUE	MATCH
q70	56.89	49	36.62	49	-20.27	35.6%	1.55x	TRUE	MATCH
q71	46.60	207916	30.29	207916	-16.31	35.0%	1.54x	TRUE	MATCH(unordered)
q72	626.67	100	132.04	100	-494.63	78.9%	4.75x	TRUE	MATCH
q73	29.68	253	29.89	253	+0.21	-0.7%	0.99x	TRUE	MATCH(unordered)
q74	164.93	100	142.13	100	-22.80	13.8%	1.16x	TRUE	MATCH
q75	223.75	29	169.33	29	-54.42	24.3%	1.32x	TRUE	MATCH
q76	49.87	100	49.65	100	-0.22	0.4%	1.00x	TRUE	MATCH

Query	Stock Spark (s)	Result rows Stock Spark	TabbyDB (s)	Result rows TabbyDB	Time diff (s)	Improvement	Speedup	Row count match	Result check
q77	70.00	100	35.85	100	-34.15	48.8%	1.95x	TRUE	MATCH
q78	263.84	100	230.81	100	-33.03	12.5%	1.14x	TRUE	MATCH
q79	46.06	100	50.54	100	+4.48	-9.7%	0.91x	TRUE	MATCH(unordered)
q80	117.09	100	51.21	100	-65.88	56.3%	2.29x	TRUE	MATCH
q81	29.41	100	22.91	100	-6.50	22.1%	1.28x	TRUE	MATCH
q82	108.70	19	104.18	19	-4.52	4.2%	1.04x	TRUE	MATCH
q83	15.55	100	15.64	100	+0.09	-0.6%	0.99x	TRUE	MATCH
q85	26.34	64	24.34	64	-2.00	7.6%	1.08x	TRUE	MATCH
q86	13.17	100	13.07	100	-0.10	0.8%	1.01x	TRUE	MATCH
q87	111.66	1	104.06	1	-7.60	6.8%	1.07x	TRUE	MATCH
q88	146.21	1	166.96	1	+20.75	-14.2%	0.88x	TRUE	MATCH
q89	28.12	100	21.25	100	-6.87	24.5%	1.32x	TRUE	MATCH
q90	13.69	1	19.70	1	+6.01	-43.9%	0.69x	TRUE	MATCH
q91	9.66	42	5.92	42	-3.74	38.7%	1.63x	TRUE	MATCH
q92	17.58	1	16.87	1	-0.71	4.0%	1.04x	TRUE	MATCH
q93	177.50	100	175.69	100	-1.81	1.0%	1.01x	TRUE	MATCH
q94	58.76	1	59.13	1	+0.37	-0.6%	0.99x	TRUE	MATCH
q95	261.13	1	257.96	1	-3.17	1.2%	1.01x	TRUE	MATCH
q96	18.55	1	21.43	1	+2.88	-15.6%	0.87x	TRUE	MATCH
q97	128.03	1	114.61	1	-13.42	10.5%	1.12x	TRUE	MATCH
q98	26.06	44858	13.00	44858	-13.06	50.1%	2.01x	TRUE	MATCH
q99	25.80	100	14.19	100	-11.61	45.0%	1.82x	TRUE	MATCH
ss_max	48.85	1	48.07	1	-0.78	1.6%	1.02x	TRUE	MATCH
Total	9,034.40		7,066.70		-1,967.70	21.8%	1.28x		