



China Telecom Cloud Technology Co., Ltd

TPC Benchmark™ DS

Full Disclosure Report

for

China Telecom Cloud TeleDB

(with 22 China Telecom Cloud ECX Compute Unit)

using

TeleDB V5.1

and

CentOS Linux release 7.9.2009

First Edition
(First Edition released on Dec 26, 2024)

Dec 26, 2024

First Edition – Dec 26, 2024

China Telecom Cloud is a technology-based, platform-based and service-oriented company under China Telecom, which provides customers with public cloud, private cloud, exclusive cloud, hybrid cloud, edge cloud and full-stack cloud services with the advantages of "cloud-network integration, security and credibility, and exclusive customization" to meet the digital transformation needs of government agencies and large and medium-sized enterprises. As the world's leading cloud service provider, China Telecom Cloud is committed to becoming the main force of the digital economy and provides users with safe and inclusive cloud services.

China Telecom Cloud TeleDB is a distributed database system, which has excellent performance and reliability. The system adopts sharing-free cluster architecture to ensure high scalability and excellent data consistency, its SQL is highly compatible, and fully supports distributed transactions to ensure data security and stability.

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Abstract

This document contains the methodology and results of the TPC Benchmark™ DS (TPC-DS) test conducted in conformance with the requirements of the TPC-DS Standard Specification, Revision 3.2.0.


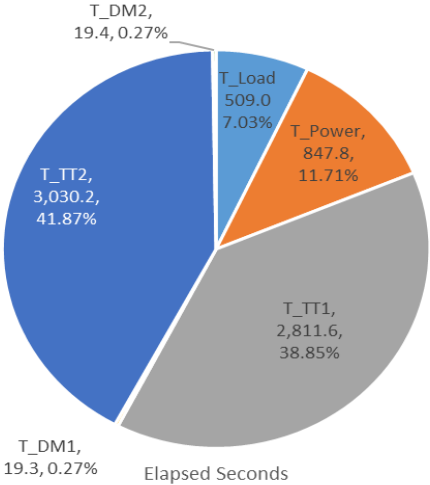
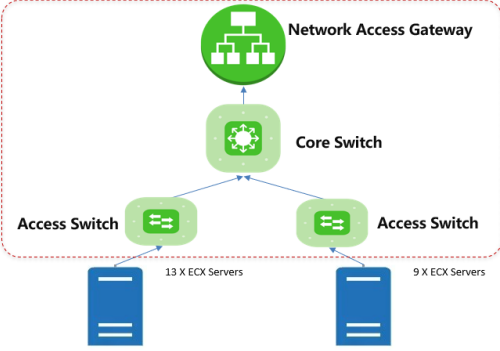
The test was conducted at a Scale Factor of 10000GB with 22 China Telecom Cloud ECX Server running China Telecom Cloud TeleDB version 5.1 on CentOS Linux release 7.9.2009.

Measured Configuration

Company Name	Cluster Node	Database Software	Operation System
China Telecom Cloud Technology Co., Ltd	China Telecom Cloud ECX Compute Unit	China Telecom Cloud TeleDB V5.1	CentOS Linux release 7.9.2009

TPC Benchmark™ DS Metrics

Total System Cost (RMB)	TPC-DS Throughput (QphDS@10000 GB)	Price/Performance (RMB/kQphDS@10000 GB)	Availability Date
7,225,937	40,206,063 QphDS@10000GB	¥ 179.73	6-Dec-2024

		China Telecom Cloud TeleDB		TPC-DS: 3.2.0 TPC-Pricing: 2.9.0 Report Date: 6-Dec-2024		
Total System Cost		TPC-DS Throughput	Price / Performance		System Available Date	
¥ 7,225,937 RMB		40,206,063 QphDS@10000GB	¥ 179.73 RMB/kQphDS@10000GB		6-Dec-2024	
Dataset Size		Database Manager	Operating System		Other Software	Cluster
10,000GB		TeleDB V5.1	CentOS Linux release 7.9.2009		No	Yes
22x ECX Servers, each with: <ul style="list-style-type: none"> Processors: 4x Intel Xeon Gold 6348H Memory: 768 GB (24x 32 GB DDR4) Storage: <ul style="list-style-type: none"> 2x 480 GB SSD Local Disks (RAID-1) 4x 3.2 TB NVMe (RAID-10) Network: <ul style="list-style-type: none"> Bandwidth (Gbit/s): 25.0 						
			Elapsed Time			
Benchmarked Configuration			Elapsed Time			
Load includes backup = No			RAID-10			
System Configuration			China Telecom Cloud TeleDB Cluster			
Servers:			22 * China Telecom Cloud ECX Compute			
Total Processors/Cores/Threads:			2,112 cores			
Total Memory:			16,896 GB			
Total Storage:			278,949.74 GB			
Storage Ratio:			27.9			
Server Configuration:			Per node			
Processors/Cores/Threads:			88/2,112/4,224			
Memory:			24 * 32GB DDR4			
Network:			25 Gbit/s			
Storage Device:			2 * 480GB SSD Local Disk and 4 * 3.2TB NVMe SSD			



**China Telecom Cloud
TeleDB**

TPC-DS: 3.2.0
 TPC-Pricing: 2.9.0
 Report Date: 6-Dec-2024

Description	Part Number	Price Source	List Price	Quantity	Extended Price	3-Yr. Maintenance Price
Hardware						
China Telecom Cloud ECX Compute Server:	N/A					
4x Intel Xeon Gold 6348H CPU @ 2.30 GHz (RMB/Yr.)	N/A	1	115,200.00			
24x 32 GB DDR4 (RMB/Yr.)	N/A	1	46,080.00			
2x 480 GB SSD (RMB/Yr.)	N/A	1	921.60			
4x 3.2 TB NVMe SSD (RMB/Yr.)	N/A	1	19,968.00			
Server Total (RMB/Yr.)		1	182,169.60	66	12,023,193.60	incl.
Discount (See Note 1)	45%				-6612756.48	0.00
Software						
TeleDB V5.1 software license buyout with a complimentary 1yr. 7x24 Support	N/A	1	150,000.00	22	3300000	0.00
2yr. 7x24 Support	N/A	1	16,500.00	44	0.00	726,000.00
Discount (See Note 1)	45%				-1815000	399,300.00
Other						
Thinkpad E14 laptop	N/A	2	3,799.00	1	3,799.00	incl.
				Total	6,899,236.12	326,700.00
Source: 1 - China Telecom Cloud; 2 - jd.com					3-Year Cost of Ownership RMB:	7,225,937
Note 1: Discount applies to all line items where Price Source = 1					QphDS@10000:	40,206,063
Benchmark results and test methodology audited by Doug Johnson, InfoSizing					RMB/kQphDS@10000:	179.73
<p>Prices used in TPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated Line Items. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflect standard pricing policies for the listed Line Items. For complete details, see the pricing section of the TPC Benchmark Standard. If you find that the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank you.</p>						



Metric Details		
Name	Value	Description / Unit
SF	10,000	Scale Factor 10TB
S	8	Total Throughput Streams
Sq	4	Streams / Throughput Test
Q	396	Queries / Throughput Test
T_LD	0.0057	hours@10000
T_PT	0.9420	hours@10000
T_TT	1.6228	hours@10000
T_DM	0.0108	hours@10000

Secondary Metrics		
Name	Value	Unit
T_Load	509.0	seconds@10000
T_Power	847.8	seconds@10000
T_TT1	2,811.6	seconds@10000
T_TT2	3,030.2	seconds@10000
T_DM1	19.3	seconds@10000
T_DM2	19.4	seconds@10000

Test Timeline				
Test	Start	End	Seconds	hh:mm:ss
Load	2024-12-06 01:31:52.562	2024-12-06 01:40:21.520	508.9580006	0:08:29
Audit/Admin	2024-12-06 01:40:21.553	2024-12-06 02:20:10.478	2388.925	0:39:49
Power	2024-12-06 02:20:10.570	2024-12-06 02:34:18.280	847.710	0:14:08
TT-1	2024-12-06 02:34:18.395	2024-12-06 03:21:09.908	2,811.513	0:46:52
DM-1	2024-12-06 03:21:10.012	2024-12-06 03:21:29.225	19.213	0:00:19
TT-2	2024-12-06 03:21:29.324	2024-12-06 04:11:59.344	3,030.020	0:50:30
DM-2	2024-12-06 04:11:59.442	2024-12-06 04:12:18.798	19.356	0:00:19

Stream	Start Time	End Time	Seconds	hh:mm:ss
Power - 0	2024-12-06 02:20:10.570	2024-12-06 02:34:18.280	847.710	0:14:08
TT-1 - 1	2024-12-06 02:34:18.395	2024-12-06 03:18:33.795	2,655.400	0:44:15
TT-1 - 2	2024-12-06 02:34:18.395	2024-12-06 03:21:09.908	2,811.513	0:46:52
TT-1 - 3	2024-12-06 02:34:18.396	2024-12-06 03:17:26.183	2,587.787	0:43:08
TT-1 - 4	2024-12-06 02:34:18.395	2024-12-06 03:17:33.961	2,595.566	0:43:16
DM-1 - 1	2024-12-06 03:21:10.012	2024-12-06 03:21:19.566	9.554	0:00:10
DM-1 - 2	2024-12-06 03:21:19.611	2024-12-06 03:21:29.225	9.614	0:00:10
TT-2 - 5	2024-12-06 03:21:29.324	2024-12-06 04:11:59.344	3,030.020	0:50:30
TT-2 - 6	2024-12-06 03:21:29.324	2024-12-06 04:04:29.768	2,580.444	0:43:00
TT-2 - 7	2024-12-06 03:21:29.325	2024-12-06 04:05:22.755	2,633.430	0:43:53
TT-2 - 8	2024-12-06 03:21:29.325	2024-12-06 04:05:55.191	2,665.866	0:44:26
DM-2 - 3	2024-12-06 04:11:59.442	2024-12-06 04:12:09.009	9.567	0:00:10
DM-2 - 4	2024-12-06 04:12:09.052	2024-12-06 04:12:18.798	9.746	0:00:10

Timing Intervals for Queries (in Seconds)

Query ID	Power	Throughput Test 1										Throughput Test 2									
		Stream 0	Stream 1	Stream 2	Stream 3	Stream 4	Min	25th	Median	75th	Max	Stream 5	Stream 6	Stream 7	Stream 8	Min	25th	Median	75th	Max	
1	9.1	9.7	8.1	10.0	8.0	8.00	8.08	8.90	9.78	10.00	10.1	9.8	12.2	8.5	8.50	9.48	9.95	10.63	12.20		
2	2.6	17.1	14.9	19.7	28.4	14.90	16.55	18.40	21.88	28.40	15.3	15.1	20.7	26.3	15.10	15.25	18.00	22.10	26.30		
3	8.8	10.7	5.0	9.7	8.0	5.00	7.25	8.85	9.95	10.70	8.2	9.0	6.5	11.5	6.50	7.78	8.60	9.63	11.50		
4	53.8	96.1	90.8	91.6	66.1	66.10	84.63	91.20	92.73	96.10	83.0	72.2	107.7	69.7	69.70	71.58	77.60	89.18	107.70		
5	4.0	36.1	33.4	26.0	26.2	26.00	26.15	29.80	34.08	36.10	18.6	26.7	29.9	32.2	18.60	24.68	28.30	30.48	32.20		
6	9.0	10.3	8.3	8.0	8.5	8.00	8.23	8.40	8.95	10.30	14.5	10.1	7.6	9.3	7.60	8.88	9.70	11.20	14.50		
7	19.0	14.8	28.1	18.6	26.1	14.80	17.65	22.35	26.60	28.10	22.1	15.8	20.0	15.6	15.60	15.75	17.90	20.53	22.10		
8	17.3	24.4	51.3	52.1	25.3	24.40	25.08	38.30	51.50	52.10	26.3	21.7	28.0	25.8	21.70	24.78	26.05	26.73	28.00		
9	4.0	27.7	28.2	20.7	25.4	20.70	24.23	26.55	27.83	28.20	18.6	24.4	28.7	24.4	18.60	22.95	24.40	25.48	28.20		
10	11.5	9.5	15.6	9.6	9.5	9.50	9.50	9.55	11.10	15.60	7.7	13.3	14.2	9.8	7.70	9.28	11.55	13.53	14.20		
11	3.4	54.6	50.7	48.0	64.0	48.00	50.03	52.65	56.95	64.00	48.5	77.6	54.0	56.5	48.50	52.63	55.25	61.78	77.60		
12	3.9	7.5	5.1	4.8	4.6	4.60	4.75	4.95	5.70	7.50	3.2	4.3	4.4	4.6	3.20	4.03	4.35	4.45	4.60		
13	3.7	39.7	19.5	35.9	29.2	19.50	26.78	32.55	36.85	39.70	62.0	27.3	36.4	28.1	27.30	27.90	32.25	42.80	62.00		
14	5.5	77.4	69.4	61.3	66.4	61.30	65.13	67.90	71.40	77.40	83.8	61.8	107.6	63.4	61.80	63.00	73.60	89.75	107.60		
15	8.9	12.7	17.6	11.9	18.2	11.90	12.50	15.15	17.75	18.20	6.8	12.2	12.0	7.2	6.80	7.10	9.60	12.05	12.20		
16	3.4	70.2	83.9	85.5	105.7	70.20	80.48	84.70	90.55	105.70	78.1	25.9	64.3	115.6	25.90	54.70	71.20	87.48	115.60		
17	17.2	13.8	17.7	15.1	13.6	13.60	13.75	14.45	15.75	17.20	13.9	15.3	11.9	20.5	11.90	13.40	14.60	16.60	20.50		
18	3.4	18.4	14.0	16.3	19.0	14.00	15.73	17.35	18.55	19.00	21.7	20.3	15.0	13.6	13.60	14.65	17.65	20.65	21.70		
19	29.2	21.5	18.9	22.5	21.4	18.90	20.78	21.45	21.75	22.50	20.3	24.4	22.2	24.8	20.30	21.73	23.30	24.50	24.80		
20	5.2	6.6	4.4	5.2	5.8	4.40	5.00	5.50	6.00	6.60	3.7	7.0	6.3	4.8	3.70	4.53	5.55	6.48	7.00		
21	11.2	11.6	27.8	15.7	21.9	11.60	14.68	18.80	23.83	27.80	11.1	23.0	14.4	10.3	10.30	10.90	12.75	16.55	23.00		
22	7.7	9.3	8.5	18.3	13.8	8.50	9.10	11.55	14.93	18.30	10.8	11.1	8.1	11.3	8.10	10.13	10.95	11.15	11.30		
23	6.7	169.3	152.3	205.4	173.3	152.30	165.05	171.30	181.33	205.40	193.1	178.4	190.8	161.5	161.50	174.18	184.60	191.38	193.10		
24	5.7	95.8	81.5	95.6	91.2	81.50	88.78	93.40	95.65	95.80	80.1	80.6	128.0	96.2	80.10	80.48	88.40	104.15	128.00		
25	32.8	16.7	18.6	15.5	16.2	15.50	16.03	16.45	17.18	18.60	18.8	14.1	27.3	17.2	14.10	16.43	18.00	20.93	27.30		
26	8.1	11.1	10.5	17.5	8.4	8.40	9.98	10.80	12.70	17.50	14.8	11.7	10.5	12.8	10.50	11.40	12.25	13.30	14.80		
27	2.6	17.1	23.7	21.0	18.1	17.10	17.85	19.55	21.68	23.70	26.1	24.5	14.7	13.4	13.40	14.38	19.60	24.90	26.10		
28	3.5	66.5	66.0	60.0	57.2	57.20	59.30	63.00	66.13	66.50	66.1	66.6	59.0	71.1	59.00	64.23	66.35	67.73	71.10		
29	17.9	14.6	14.8	15.5	11.6	11.60	13.85	14.70	14.98	15.50	8.4	21.8	12.0	13.3	8.40	11.10	12.65	15.43	21.80		
30	7.7	9.8	9.4	8.5	9.7	8.50	9.18	9.55	9.73	9.80	7.8	8.0	9.2	8.1	7.80	7.95	8.05	8.38	9.20		
31	4.3	17.3	26.2	19.2	30.3	17.30	18.73	22.70	27.23	30.30	25.5	17.7	23.9	12.4	12.40	16.38	20.80	24.30	25.50		
32	6.2	8.3	14.7	7.3	6.3	6.30	7.05	7.80	9.90	14.70	7.6	9.0	7.7	9.4	7.60	7.68	8.35	9.10	9.40		
33	3.8	16.2	13.6	14.8	21.0	13.60	14.50	15.50	17.40	21.00	19.1	16.8	15.6	10.9	10.90	14.43	16.20	17.38	19.10		
34	5.8	19.5	14.1	36.1	21.6	14.10	18.15	20.55	25.23	36.10	13.1	24.2	22.5	32.7	13.10	20.15	23.35	26.33	32.70		
35	24.5	19.6	14.3	16.4	15.5	14.30	15.20	15.95	17.20	19.60	17.5	21.7	25.3	18.3	17.50	18.10	20.00	22.60	25.30		
36	2.9	19.5	18.3	16.1	17.7	16.10	17.30	18.00	18.60	19.50	18.1	15.2	21.6	16.2	15.20	15.95	17.15	18.98	21.60		
37	7.9	13.5	9.8	11.8	9.6	9.60	9.75	10.80	12.23	13.50	6.7	16.9	8.9	9.8	6.70	8.35	9.35	11.58	16.90		
38	2.5	17.3	22.4	26.4	21.0	17.30	20.08	21.70	23.40	26.40	22.2	19.0	28.2	24.2	19.00	21.40	23.20	25.20	28.20		
39	10.2	14.4	19.5	13.3	15.2	13.30	14.13	14.80	16.28	19.50	8.8	11.5	16.0	15.7	8.80	10.83	13.60	15.78	16.00		
40	7.5	7.9	8.5	9.9	7.7	7.70	7.85	8.20	8.85	9.90	11.3	12.2	8.7	7.5	7.50	8.40	10.00	11.53	12.20		
41	3.1	3.3	2.5	3.2	2.9	2.50	2.80	3.05	3.23	3.30	2.4	3.4	3.1	6.6	2.40	2.93	3.25	4.20	6.60		
42	8.0	7.6	8.8	13.7	7.8	7.60	7.75	8.30	10.03	13.70	8.2	8.8	6.9	11.7	6.90	7.88	8.50	9.53	11.70		
43	12.6	11.4	42.1	11.5	13.7	11.40	11.48	12.60	20.80	42.10	7.8	12.0	12.2	11.7	7.80	10.73	11.85	12.05	12.20		
44	12.1	12.8	10.9	21.6	14.5	10.90	12.33	13.65	16.28	21.60	13.9	16.3	14.5	12.1	12.10	13.45	14.20	14.95	16.30		
45	8.0	8.7	7.8	6.3	12.7	6.30	7.43	8.25	9.70	12.70	11.3	11.1	12.2	8.9	8.90	10.55	11.20	11.53	12.20		
46	3.0	19.5	12.6	18.2	27.8	12.60	16.80	18.85	21.58	27.80	18.5	26.0	16.5	20.1	16.50	18.00	19.30	21.58	26.00		

47	4.1	22.4	14.6	21.0	23.7	14.6 0	19.4 0	21.70	22.7 3	23.7 0	14.6	22.3	19.9	22.4	14.6 0	18.5 8	21.10	22.3 3	22.4 0
48	3.3	21.4	17.9	32.7	59.5	17.9 0	20.5 3	27.05	39.4 0	59.5 0	25.9	30.1	29.7	19.3	19.3 0	24.2 5	27.80	29.8 0	30.1 0
49	4.1	20.9	21.5	33.8	24.2	20.9 0	21.3 5	22.85	26.6 0	33.8 0	52.1	31.1	28.6	25.5	25.5 0	27.8 3	29.85	36.3 5	52.1 0
50	9.5	11.2	8.7	9.1	10.2	8.70	9.00	9.65	10.4 5	11.2 0	15.6	8.7	7.6	17.3	7.60	8.43	12.15	16.0 3	17.3 0
51	3.0	58.6	54.3	73.3	67.8	54.3 0	57.5 3	63.20	69.1 8	73.3 0	68.0	48.7	58.3	51.4	48.7 0	50.7 3	54.85	60.7 3	68.0 0
52	9.2	19.3	13.3	14.8	19.1	13.3 0	14.4 3	16.95	19.1 5	19.3 0	18.7	15.6	18.3	15.0	15.0 0	15.4 5	16.95	18.4 0	18.7 0
53	11.6	11.0	10.8	9.9	14.9	9.90	10.5 8	10.90	11.9 8	14.9 0	8.9	10.2	8.2	11.2	8.20	8.73	9.55	10.4 5	11.2 0
54	3.1	38.9	32.4	30.2	27.4	27.4 0	29.5 0	31.30	34.0 3	38.9 0	29.8	17.3	16.5	38.9	16.5 0	17.1 0	23.55	32.0 8	38.9 0
55	6.1	8.9	14.3	8.3	7.9	7.90	8.20	8.60	10.2 5	14.3 0	8.4	7.3	7.7	8.3	7.30	7.60	8.00	8.33	8.40
56	2.6	17.0	17.8	25.8	16.9	16.9 0	16.9 8	17.40	19.8 0	25.8 0	20.6	24.9	16.3	18.2	16.3 0	17.7 3	19.40	21.6 8	24.9 0
57	12.9	11.3	10.7	12.8	10.2	10.2 0	10.5 8	11.00	11.6 8	12.8 0	13.0	14.9	10.0	11.6	10.0 0	11.2 0	12.30	13.4 8	14.9 0
58	11.4	12.2	11.6	16.0	16.2	11.6 0	12.0 5	14.10	16.0 5	16.2 0	14.7	10.0	13.1	10.7	10.0 0	10.5 3	11.90	13.5 0	14.7 0
59	3.4	37.2	31.3	38.8	43.4	31.3 0	35.7 3	38.00	39.9 5	43.4 0	23.6	36.7	31.7	38.3	23.6 0	29.6 8	34.20	37.1 0	38.3 0
60	4.1	41.7	18.1	25.3	34.3	18.1 0	23.5 0	29.80	36.1 5	41.7 0	24.1	23.8	26.1	30.3	23.8 0	24.0 3	25.10	27.1 5	30.3 0
61	10.7	22.4	25.3	13.4	14.5	13.4 0	14.2 3	18.45	23.1 3	25.3 0	15.6	18.8	16.2	43.0	15.6 0	16.0 5	17.50	24.8 5	43.0 0
62	6.7	5.8	7.3	5.7	5.9	5.70	5.78	5.85	6.25	7.30	4.7	6.9	8.4	6.8	4.70	6.28	6.85	7.28	8.40
63	10.5	15.7	10.1	8.1	10.7	8.10	9.60	10.40	11.9 5	15.7 0	10.2	13.7	11.0	6.7	6.70	9.33	10.60	11.6 8	13.7 0
64	3.4	96.1	332.2	60.0	58.1	58.1 0	59.5 3	78.05	155. 13	332. 20	581.0	121.3	69.3	66.4	66.4 0	68.5 8	95.30	236. 23	581. 00
65	3.1	22.0	19.9	20.3	19.8	19.8 0	19.8 8	20.10	20.7 3	22.0 0	20.9	25.2	31.6	48.9	20.9 0	24.1 3	28.40	35.9 3	48.9 0
66	11.0	12.2	8.9	17.8	14.2	8.90	11.3 8	13.20	15.1 0	17.8 0	12.6	12.9	12.8	12.0	12.0 0	12.4 5	12.70	12.8 3	12.9 0
67	3.9	97.8	110.6	99.1	115.0	97.8 0	98.7 8	104.8 5	111. 70	115. 00	140.0	97.4	111.9	118.7	97.4 0	108. 28	115.3 0	124. 03	140. 00
68	3.3	31.9	26.5	25.0	22.1	22.1 0	24.2 8	25.75	27.8 5	31.9 0	18.9	30.7	22.9	20.8	18.9 0	20.3 3	21.85	24.8 5	30.7 0
69	7.1	8.6	9.4	13.4	10.1	8.60	9.20	9.75	10.9 3	13.4 0	11.8	9.8	13.5	9.2	9.20	9.65	10.80	12.2 3	13.5 0
70	5.5	18.8	26.6	20.8	32.5	18.8 0	20.3 0	23.70	28.0 8	32.5 0	15.5	26.3	23.0	53.5	15.5 0	21.1 3	24.65	33.1 0	53.5 0
71	5.3	41.8	20.0	18.8	19.0	18.8 0	18.9 5	19.50	25.4 5	41.8 0	23.4	26.7	31.8	28.9	23.4 0	25.8 8	27.80	29.6 3	31.8 0
72	15.5	14.6	18.2	23.8	20.1	14.6 0	17.3 0	19.15	21.0 3	23.8 0	12.6	46.4	22.1	17.7	12.6 0	16.4 3	19.90	28.1 8	46.4 0
73	12.1	10.2	15.3	12.0	11.2	10.2 0	10.9 5	11.60	12.8 3	15.3 0	12.0	13.4	12.2	14.8	12.0 0	12.1 5	12.80	13.7 5	14.8 0
74	4.1	97.4	33.2	48.1	46.1	33.2 0	42.8 8	47.10	60.4 3	97.4 0	48.0	51.8	50.5	121.7	48.0 0	49.8 8	51.15	69.2 8	121. 70
75	28.1	25.4	25.4	31.5	30.4	25.4 0	25.4 0	27.90	30.6 8	31.5 0	16.9	34.5	25.6	22.8	16.9 0	21.3 3	24.20	27.8 3	34.5 0
76	9.3	14.3	20.7	20.6	16.3	14.3 0	15.8 0	18.45	20.6 3	20.7 0	14.5	21.0	13.2	12.1	12.1 0	12.9 3	13.85	16.1 3	21.0 0
77	2.9	20.9	16.8	14.4	27.9	14.4 0	16.2 0	18.85	22.6 5	27.9 0	20.4	18.7	24.4	16.0	16.0 0	18.0 3	19.55	21.4 0	24.4 0
78	3.6	175.8	149.9	147.5	140.3	140. 30	145. 70	148.7 0	156. 38	175. 80	153.9	169.2	132.5	158.1	132. 50	148. 55	156.0 0	160. 88	169. 20
79	3.9	20.1	24.3	18.8	22.3	18.8 0	19.7 8	21.20	22.8 0	24.3 0	20.7	19.7	22.3	32.8	19.7 0	20.4 5	21.50	24.9 3	32.8 0
80	27.2	34.9	39.5	37.3	30.3	30.3 0	33.7 5	36.10	37.8 5	39.5 0	38.5	30.1	33.3	30.8	30.1 0	30.6 3	32.05	34.6 0	38.5 0
81	13.4	17.0	10.4	15.2	12.7	10.4 0	12.1 3	13.95	15.6 5	17.0 0	10.4	11.6	14.0	8.6	8.60	9.95	11.00	12.2 0	14.0 0
82	11.7	11.8	14.2	13.1	11.5	11.5 0	11.7 3	12.45	13.3 8	14.2 0	7.9	12.7	15.2	13.9	7.90	11.5 0	13.30	14.2 3	15.2 0
83	5.8	7.1	12.5	7.8	16.5	7.10	7.63	10.15	13.5 0	16.5 0	8.4	12.4	7.4	6.6	6.60	7.20	7.90	9.40	12.4 0
84	2.6	17.6	27.6	17.1	17.5	17.1 0	17.4 0	17.55	20.1 0	27.6 0	18.4	20.5	20.5	21.1	18.4 0	19.9 8	20.50	20.6 5	21.1 0
85	14.9	14.4	12.7	14.9	12.3	12.3 0	12.6 0	13.55	14.5 3	14.9 0	12.2	14.0	17.8	13.6	12.2 0	13.2 5	13.80	14.9 5	17.8 0
86	6.4	11.8	10.2	8.0	6.4	6.40	7.60	9.10	10.6 0	11.8 0	4.4	9.3	6.6	6.6	4.40	6.05	6.60	7.28	9.30
87	3.8	17.7	26.9	18.6	19.2	17.7 0	18.3 8	18.90	21.1 3	26.9 0	20.6	20.0	22.9	19.7	19.7 0	19.9 3	20.30	21.1 8	22.9 0
88	4.1	22.4	22.5	20.9	24.1	20.9 0	22.0 3	22.45	22.9 0	24.1 0	23.0	30.5	28.4	21.4	21.4 0	22.6 0	25.70	28.9 3	30.5 0
89	16.6	10.0	7.6	11.8	14.1	7.60	9.40	10.90	12.3 8	14.1 0	12.2	15.4	15.4	14.7	12.2 0	14.0 8	15.05	15.4 0	15.4 0
90	4.2	5.2	6.6	4.9	11.1	4.90	5.13	5.90	7.73	11.1 0	5.1	4.5	4.6	4.8	4.50	4.58	4.70	4.88	5.10
91	5.2	4.7	10.6	5.0	5.6	4.70	4.93	5.30	6.85	10.6 0	4.1	5.0	4.9	5.8	4.10	4.70	4.95	5.20	5.80
92	7.4	4.7	3.4	6.4	6.4	3.40	4.38	5.55	6.40	6.40	4.7	8.4	6.5	4.7	4.70	4.70	5.60	6.98	8.40
93	11.0	12.2	11.1	10.7	11.7	10.7 0	11.0 0	11.40	11.8 3	12.2 0	17.9	11.6	11.6	13.6	11.6 0	11.6 0	12.60	14.6 8	17.9 0
94	2.4	15.4	36.4	17.5	18.5	15.4 0	16.9 8	18.00	22.9 8	36.4 0	36.9	18.4	42.9	33.3	18.4 0	29.5 8	35.10	38.4 0	42.9 0

95	5.1	102.2	87.4	60.4	79.3	60.40	74.58	83.35	91.10	102.20	61.7	62.9	56.6	61.5	56.60	60.28	61.60	62.00	62.90
96	2.7	5.9	6.6	7.3	7.2	5.90	6.43	6.90	7.23	7.30	4.4	14.7	6.2	5.6	4.40	5.30	5.90	8.33	14.70
97	2.7	24.3	25.8	28.7	16.9	16.90	22.45	25.05	26.53	28.70	20.7	18.5	18.8	20.9	18.50	18.73	19.75	20.75	20.90
98	11.1	9.4	10.6	9.5	9.0	9.00	9.30	9.45	9.78	10.60	9.6	12.0	9.9	9.8	9.60	9.75	9.85	10.43	12.00
99	5.7	8.6	9.7	13.2	10.8	8.60	9.43	10.25	11.40	13.20	5.7	9.8	19.1	7.2	5.70	6.83	8.50	12.13	19.10

Timing Intervals for Refresh Functions (in Seconds)

Function	DM-1		DM-2		Min	25th	Median	75th	Max
	Run 1	Run 2	Run 3	Run 4					
DF_CS	3.0	3.0	2.9	3.1	2.90	2.98	3.00	3.03	3.10
DF_I	2.1	2.0	1.9	1.9	1.90	1.90	1.95	2.03	2.10
DF_SS	2.9	3.0	2.9	3.1	2.90	2.90	2.95	3.03	3.10
DF_WS	3.0	3.0	2.9	3.1	2.90	2.98	3.00	3.03	3.10
LF_CR	2.7	2.7	2.8	2.8	2.70	2.70	2.75	2.80	2.80
LF_CS	3.9	3.9	4.0	4.0	3.90	3.90	3.95	4.00	4.00
LF_I	2.5	2.6	2.7	2.5	2.50	2.50	2.55	2.63	2.70
LF_SR	2.6	2.6	2.6	2.6	2.60	2.60	2.60	2.60	2.60
LF_SS	3.8	3.8	3.8	3.9	3.80	3.80	3.80	3.83	3.90
LF_WR	2.6	2.6	2.8	2.7	2.60	2.60	2.65	2.73	2.80
LF_WS	3.8	4.0	3.9	4.0	3.80	3.88	3.95	4.00	4.00

Preface

TPC Benchmark™ DS Overview

The TPC Benchmark™ DS (TPC -DS) is a decision support benchmark that models several generally applicable aspects of a decision support system, including queries and data maintenance. The benchmark provides a representative evaluation of the System Under Test's (SUT) performance as a general-purpose decision support system.

This benchmark illustrates decision support systems that:

- Examine large volumes of data;
- Give answers to real-world business questions;
- Execute queries of various operational requirements and complexities (e.g., ad-hoc, reporting, iterative OLAP, data mining);
- Are characterized by high CPU and IO load;
- Are periodically synchronized with source OLTP databases through database maintenance functions.
- Run on "Big Data" solutions, such as RDBMS as well as Hadoop/Spark based systems.

A benchmark result measures query response time in single user mode, query throughput in multi user mode and data maintenance performance for a given hardware, operating system, and data processing system configuration under a controlled, complex, multi-user decision support workload.

The purpose of TPC benchmarks is to provide relevant, objective performance data to industry users. To achieve that purpose, TPC benchmark specifications require benchmark tests be implemented with systems, products, technologies and pricing that:

- a) Are generally available to users;
- b) Are relevant to the market segment that the individual TPC benchmark models or represents (e.g., TPC -DS models and represents complex, high data volume, decision support environments);
- c) Would plausibly be implemented by a significant number of users in the market segment modeled or represented by the benchmark.

In keeping with these requirements, the TPC -DS database must be implemented using commercially available data processing software, and its queries must be executed via SQL interface. The use of new systems, products, technologies (hardware or software) and pricing is encouraged so long as they meet the requirements above. Specifically prohibited are benchmark systems, products, technologies or pricing (hereafter referred to as "implementations") whose primary purpose is performance optimization of TPC benchmark results without any corresponding applicability to real-world applications and environments. In other words, all "benchmark special" implementations, which improve benchmark results but not real-world performance or pricing, are prohibited.

TPC benchmark results are expected to be accurate representations of system performance. Therefore, there are specific guidelines that are expected to be followed when measuring those results. The approach or methodology to be used in the measurements are either explicitly described in the specification or left to the discretion of the test sponsor.

When not described in the specification, the methodologies and approaches used must meet the following requirements:

- The approach is an accepted engineering practice or standard;
- The approach does not enhance the result;
- Equipment used in measuring the results is calibrated according to established quality standards;
- Fidelity and candor is maintained in reporting any anomalies in the results, even if not specified in the benchmark requirements.

Further information is available at <http://www.tpc.org/>

General Items

0.1 Test Sponsor

A statement identifying the benchmark sponsor(s) and other participating companies must be provided.

This benchmark was sponsored by China Telecom Cloud Technology Co., Ltd.

0.2 Parameter Settings

Settings must be provided for all customer-tunable parameters and options which have been changed from the defaults found in actual products, including by not limited to:

Database Tuning Options

- *Optimizer/Query execution options*
- *Query processing tool/ language configuration parameters*
- *Recovery/commit options*
- *Consistency/locking options*
- *Operating system and configuration parameters*
- *Configuration parameters and options for any other software component incorporated into the pricing structure*
- *Compiler optimization options*

This requirement can be satisfied by providing a full list of all parameters and options, as long as all those which have been modified from their default values have been clearly identified and these parameters and options are only set once.

The Supporting File Archive contains the Operating System and DBMS parameters used in this benchmark.

0.3 Configuration Diagrams

Diagrams of both measured and priced configurations must be provided, accompanied by a description of the differences. This includes, but is not limited to:

- *Number and type of processors*
- *Size of allocated memory, and any specific mapping/partitioning of memory unique to the test. Number and type of disk units (and controllers, if applicable).*
- *Number of channels or bus connections to disk units, including their protocol type.*
- *Number of LAN (e.g. Ethernet) Connections, including routers, workstations, terminals, etc., that were physically used in the test or are incorporated into the pricing structure.*
- *Type and the run-time execution location of software components (e.g., DBMS, query processing tools/languages, middle-ware components, software drivers, etc.).*

Measured Configuration

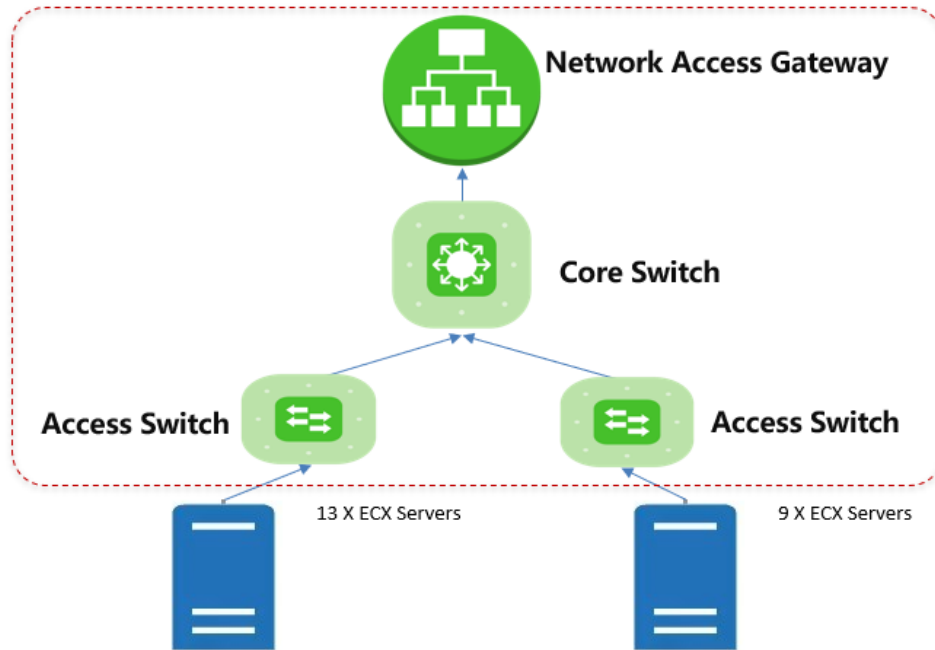


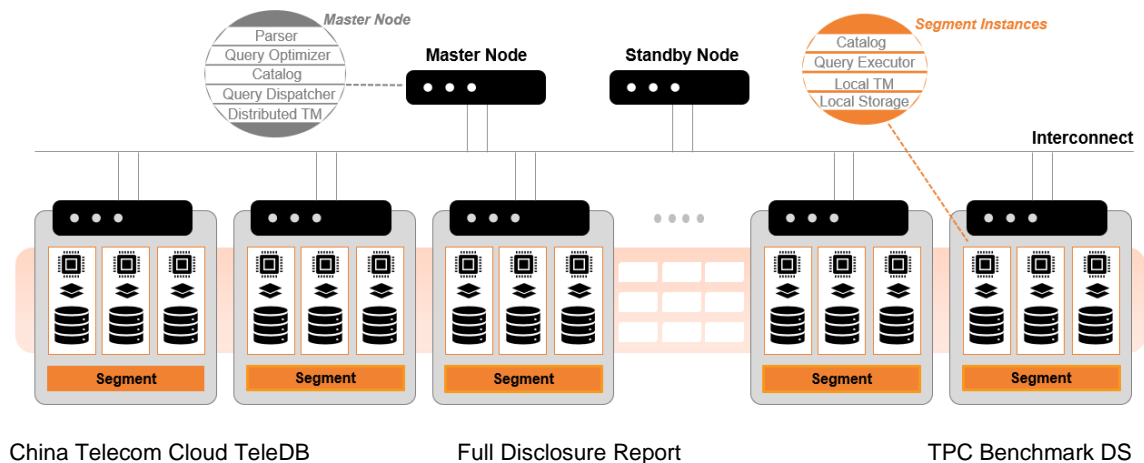
Figure 0.3: Measured Configuration

The measured configuration consisted of 22 ECX Servers:

ECX Server details (22 ECXs):

- Processors: 96 cores (4 * Intel(R) Xeon(R) Gold 6348H CPU @ 2.30GHz)
- Memory: 768 GB (24 * 32GB DDR4)
- Storage:
 - 960 GB SSD Local Disk (2 * 480GB SSD Local Disk RAID-1)
 - 12800 GB NVMe SSD (4 * 3.2TB NVMe SSD RAID-10)
- Network:
 - Bandwidth (Gbit/s): 25.0

TeleDB Logical architecture



Priced Configuration

There are no differences between the priced and measured configurations.

Clause 2: Logical Database Design Related Items

2.1 Database Definition Statements

Listings must be provided for the DDL scripts and must include all table definition statements and all other statements used to set up the test and qualification databases.

The Supporting File Archive contains the table definitions and all other statements used to set up the test and qualification databases.

2.2 Physical Organization

The physical organization of tables and indices within the test and qualification databases must be disclosed. If the column ordering of any table is different from that specified in Clause 2.3 or 2.4, it must be noted.

Horizontal partitioning is used.

2.3 Horizontal Partitioning

If any directives to DDLs are used to horizontally partition tables and rows in the test and qualification databases, these directives, DDLs, and other details necessary to replicate the partitioning behavior must be disclosed.

All tables are partitioned. The partition columns for the tables are:

- 1|call_center|cc_call_center_sk
- 2|catalog_page|cp_catalog_page_sk
- 3|catalog_returns|cr_item_sk,cr_order_number
- 4|catalog_sales|cs_item_sk,cs_order_number
- 5|customer|c_customer_sk
- 6|customer_address|ca_address_sk
- 7|customer_demographics|cd_demo_sk
- 8|date_dim|d_date_sk
- 9|household_demographics|hd_demo_sk
- 10|income_band|ib_income_band_sk
- 11|inventory|inv_date_sk,inv_item_sk,inv_warehouse_sk
- 12|item|i_item_sk
- 13|promotion|p_promo_sk
- 14|reason|r_reason_sk
- 15|ship_mode|sm_ship_mode_sk
- 16|store|s_store_sk
- 17|store_returns|sr_item_sk,sr_ticket_number
- 18|store_sales|ss_item_sk,ss_ticket_number
- 19|time_dim|t_time_sk

20|warehouse|w_warehouse_sk

21|web_page|wp_web_page_sk

22|web_returns|wr_order_number,wr_item_sk

23|web_sales|ws_item_sk,ws_order_number

24|web_site|web_site_sk

2.4 Replication

Any replication of physical objects must be disclosed and must conform to the requirements of Clause 2.5.3.

No physical object was replicated.

Clause 3: Scaling and Database Population

3.1 Initial Cardinality of Tables

The cardinality (e.g., the number of rows) of each table of the test database, as it existed at the completion of the database load (see Clause 7.1.2) must be disclosed.

Table 3.1 lists the cardinality of each table as they existed upon completion of the build.

Table 3.1 Initial Number of Rows

Table Name	Row Count
call_center	54
catalog_page	40,000
catalog_returns	1,440,033,112
catalog_sales	14,399,964,710
customer	65,000,000
customer_address	32,500,000
customer_demographics	1,920,800
date_dim	73,049
household_demographics	7,200
income_band	20
inventory	1,311,525,000
item	402,000
promotion	2,000
reason	70
ship_mode	20
store	1,500
store_returns	2,879,712,175
store_sales	28,799,916,426
time_dim	86,400
warehouse	25
web_page	4,002
web_returns	720,020,485
web_sales	7,199,963,324
web_site	78

3.2 Distribution of Tables and Logs Across Media

The distribution of tables and logs across all media must be explicitly described using a format similar to that shown in the following example for both the tested and priced systems.

Table 3.2 Distribution of Tables and Logs

Server Node	Disk Type	Disk drive	Description of Content
Coordinator (1)	Local SSD Disk	/dev/nvme[0-3]n1	event log and transaction log
worker (1- 22)	Local SSD Disk	/dev/nvme[0-3]n1	event log, temp files, cache of table data

All the base Tables were stored on local storage.

Table size on local storage:

table_name	size

store_sales	1669 GB
catalog_sales	1300 GB
web_sales	666 GB
store_returns	140 GB
catalog_returns	97 GB
web_returns	46 GB
inventory	5756 MB
customer	3099 MB
customer_address	733 MB
date_dim	579 MB
store	62 MB
item	39 MB
web_page	33 MB
customer_demographics	15 MB
web_site	6567 kB
call_center	5456 kB
catalog_page	2533 kB
warehouse	1551 kB
time_dim	1520 kB
promotion	714 kB
ship_mode	622 kB
reason	550 kB
household_demographics	283 kB
income_band	226 kB

3.3 Mapping of Database Partitions/Replications

The mapping of database partitions/replications must be explicitly described.

Neither database partitions nor replications were mapped to specific devices.

3.4 Implementation of RAID

Implementations may use some form of RAID. The RAID level used must be disclosed for each device. If RAID is used in an implementation, the logical intent of its use must be disclosed

For each ECX node, RAID10 is used, each of four PCIe NVMe drives is mounted on /data0 directly.

3.5 DBGEN Modifications

The version number (i.e., the major revision number, the minor revision number, and third tier number) of dsdgen must be disclosed. Any modifications to the dsdgen source code (see Appendix B:) must be disclosed. In the event that a program other than dsdgen was used to populate the database, it must be disclosed in its entirety.

Dsdgen version v3.2.0rc1 was used. No changes were made to the dsdgen tool.

3.6 Database Load time

The database load time for the test database (see Clause 7.4.3.7) must be disclosed.

The database load time was 508.958 seconds.

3.7 Data Storage Ratio

The data storage ratio must be disclosed. It is computed by dividing the total data storage of the priced configuration (expressed in GB) by SF corresponding to the scale factor chosen for the test database as defined in Clause 3.1. The ratio must be reported to the nearest 1/100th, rounded up. For example, a system configured with 96 disks of 2.1 GB capacity for a 100GB test database has a data storage ratio of 2.02.

The data storage ratio is $(278,949.74) / 10,000 = 27.9$

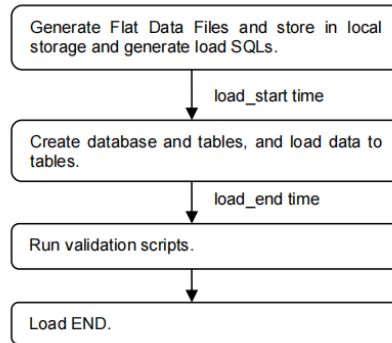
Total Storage Capacity (Local node) = 22 (ECX) * 13,760GB (960GB SSD Local Disk and 4 * 3.2TB NVMe SSD) = 278,949.74 GB

3.8 Database Load Mechanism Details and Illustration

The details of the database load must be disclosed, including a block diagram illustrating the overall process. Disclosure of the load procedure includes all steps, scripts, input and configuration files required to completely reproduce the test and qualification databases.

The database was built as shown in Figure 3.8. All of the related source code and scripts are included in the Supporting Files.

Figure 3.8: Block Diagram of database build process:



The final database load time is calculated as (load end time – load start time – duration of validation scripts).

3.9 Qualification Database Configuration

Any differences between the configuration of the qualification database and the test database must be disclosed.

The qualification database was built using the same scripts as the test database with the following exceptions:

- The Scale factor is adjusted to 1 GB

All of the related source code and scripts are included in the Supporting Files.

Clause 4 and 5: Query and Data Maintenance Related Items

4.1 Query Language

The query language used to implement the queries must be identified.

SQL was the query language used to implement the queries.

4.2 Verifying Method of Random Number Generation

The method of verification for the random number generation must be described unless the supplied dsdgen and dsqgen were used.

TPC-supplied dsdgen version 3. 2.0rc1 and dsqgen version 3. 2.0rc1 were used.

4.3 Generating Values for Substitution Parameters

The method used to generate values for substitution parameters must be disclosed. The version number (i.e., the major revision number, the minor revision number, and third tier number) of dsqgen must be disclosed.

TPC supplied dsqgen version 3.2.0rc1 was used to generate the substitution parameters, as follows:

```
./dsqgen -streams $stream -input ../query_templates/templates.lst -directory ../query_templates -dialect teleadb -scale $TPCDS_SCALE -rngseed $SEED -verbose y -output_dir $STREAM_TMP
```

4.4 Query Text and Output Data from Qualification Database

The executable query text used for query validation must be disclosed along with the corresponding output data generated during the execution of the query text against the qualification database. If minor modifications have been applied to any functional query definitions or approved variants in order to obtain executable query text, these modifications must be disclosed and justified. The justification for a particular minor query modification can apply collectively to all queries for which it has been used. The output data for the power and Throughput Tests must be made available electronically upon request.

Supporting Files Archive contains the actual query text and query output. Following are the modifications to the query.

The following MQM are used:

- Use vendor-specific syntax of date expressions.
 - Q5
 - Q12
 - Q16
 - Q20
 - Q21
 - Q32
 - Q37
 - Q40
 - Q77

- Q80
- Q82
- Q92
- Q94
- Q95
- Q98
- Subqueries must add aliases , The syntax in the following queries is needed
 - Q2
 - Q14
 - Q23
 - Q49
- The 'where' condition does not support field expression aliases, so it is directly adjusted to an expression
 - Q36
 - Q70
 - Q86
- Adding “null if(...,0)” , to prevent the occurrence of a/0 in a/b expression without null if (b)
 - Q75

The Supporting Files Archive contains the full set of executable query text template used in the test.

4.5 Query Substitution Parameters and Seeds Used

All the query substitution parameters used during the performance test must be disclosed in tabularformat, along with the seeds used to generate these parameters.

The Supporting Files Archive contains the query substitution parameters and seed used in the test.

4.6 Refresh Setting

All query and refresh session initialization parameters, settings and commands must be disclosed.

The Supporting Files Archive contains the query and scripts.

4.7 Source Code of Refresh Functions

The details of how the data maintenance functions were implemented must be disclosed (including source code of any non-commercial program used).

The Supporting Files Archive contains the source code implementing the refresh functions.

4.8 Staging Area

Any object created in the staging area (see Clause 5.1.8 for definition and usage restrictions) used to implement the data maintenance functions must be disclosed. Also, any disk storage usedfor the staging area must be priced, and any mapping or virtualization of disk storage must be disclosed.

The staging area is not used.

Clause 6: Data Persistence Properties Related Items

The results of the data accessibility tests must be disclosed along with a description of how the data accessibility requirements were met.

The data accessibility test was performed by failing the local storage of one ECX Server. This failure was induced during the execution of the first data maintenance test.

The Data disk on each ECX Server is made up of 4 PCIe NVMe. The storage failure was simulated by removing access to 1 of the PCIe NVMe.

The Supporting Files Archive contains the logs of status before and after the storage failures.

Clause 7: Performance Metrics and Execution Rules

Related Items

7.1 System Activity

Any system activity on the SUT that takes place between the conclusion of the load test and the beginning of the performance test must be fully disclosed including listings of scripts or command logs.

The only activities between the end of the load test and the beginning of the performance test were the generation of the executable query text and the execution of audit scripts.

7.2 Test Steps

The details of the steps followed to implement the performance test must be disclosed.

The Supporting Files Archive contains the scripts and logs.

7.3 Timing Intervals for Each Query and Refresh Function

The timing intervals defined in Clause 7 must be disclosed.

See the Executive Summary at the beginning of this report.

7.4 Throughput Test Result

For each Throughput Test, the minimum, the 25th percentile, the median, the 75th percentile, and the maximum times for each query shall be reported.

See the Executive Summary at the beginning of this report.

7.5 Time for Each Stream

The start time and finish time for each query stream must be reported.

See the Executive Summary at the beginning of this report.

7.6 Time for Each Refresh Function

The start time and finish time for each data maintenance function in the refresh run must be reported for the Throughput Tests

See the Executive Summary at the beginning of this report.

7.7 Performance Metrics

The computed performance metric, related numerical quantities and the price/performance metric must be reported.

QphDS@10000GB = 40,206,063

See the Executive Summary at the beginning of this report for more detail.

Clause 8: SUT and Driver Implementation Related Items

8.1 Driver

A detailed textual description of how the driver performs its functions, how its various components interact and any product functionalities or environmental settings on which it relies must be provided. All related source code, scripts and configuration files must be disclosed. The information provided should be sufficient for an independent reconstruction of the driver.

The shell script run `runall.sh` was used to submit the queries. It connects to the TeleDB instance via psql client. The command is like : `psql -h ${host} -P ${port} -d {database} -f {sql_file.sql}`

The TeleDB instance accepts SQL queries from the psql clients and processes the queries. All queries are sent to the TeleDB Coordinator node and then dispatched to the TeleDB worker nodes as distributed tasks. When the tasks finish, their results are collected by the Coordinator which sends the query output to the TeleDB client.

The Supporting Files Archive contains all the command, scripts and logs.

8.2 Implementation Specific Layer (ISL)

If an implementation specific layer is used, then a detailed description of how it performs its functions, how its various components interact and any product functionalities or environmental setting on which it relies must be provided. All related source code, scripts and configuration files must be disclosed. The information provided should be sufficient for an independent reconstruction of the implementation specific layer.

No Implementation Specific Layer was used.

8.3 Profile-Directed Optimization

If profile-directed optimization as described in Clause 7.2.10 is used, such use must be disclosed. In particular, the procedure and any scripts used to perform the optimization must be disclosed.

Profile-directed optimization was not used.

Clause 9: Pricing Related Items

9.1 Hardware and Software Used

A detailed list of hardware and software used in the priced system must be reported. The rules for pricing are included in the current revision of the TPC Pricing Specification located on the TPC website (<http://www.tpc.org>)

A detailed list of all licensed services, hardware and software, is provided in the Executive Summary of this report.

9.2 Availability Date

The System Availability Date (see Clause 7.6.5) must be the single availability date reported on the first page of the executive summary. The full disclosure report must report Availability Dates individually for at least each of the categories for which a pricing subtotal must be. All Availability Dates required to be reported must be disclosed to a precision of 1 day, but the precise format is left to the test sponsor.

The total system is available as of the date of this report.

9.3 Country-Specific Pricing

Additional Clause 7 related items may be included in the full disclosure report for each country specific priced configuration.

The configuration is priced in RMB for the China market.

Clause 11: Audit Related Items

Auditor's Information and Attestation Letter

The auditor's agency name, address, phone number, and attestation letter with a brief audit summary report indicating compliance must be included in the full disclosure report. A statement should be included specifying whom to contact in order to obtain further information regarding the audit process.

This benchmark was audited by: Doug Johnson, of InfoSizing.

Qingcong Zeng
 China Telecom Cloud Technology Co., Ltd
 502 Room
 Skirt Building of Skyworth Semiconductor Design Building
 Nanshan District, Shenzhen, Guangdong Province, China

January 11, 2025

I verified the TPC Benchmark™ DS v3.2.0 performance of the following configuration:

Platform: 22x China Telecom Cloud ECX Compute Servers
 Operating System: CentOS Linux release 7.9.2009
 Database Manager: TeleDB V5.1

The results were:

Performance Metric 40,206,063 QphDS@10000

Secondary Metrics

T _{Load}	509.0	seconds@10000
T _{Power}	847.8	seconds@10000
T _{TT1}	2,811.6	seconds@10000
T _{TT2}	3,030.2	seconds@10000
T _{DM1}	19.3	seconds@10000
T _{DM2}	19.4	seconds@10000

System Under Test 22x China Telecom Cloud ECX Compute Servers each with:

CPU	4x Intel® Xeon® Gold 6348H		
Memory	768 GiB		
Storage	Qty	Size	Type
	2	480 GB	SSD (RAID-1)
	4	3.2 TB	NVMe (RAID-10)

In my opinion, these performance results were produced in compliance with the TPC requirements for the benchmark.

The following verification items were given special attention:

- The database records were defined with the proper layout and size.
- The database population was generated using DSDGen v3.2.0

- The database was properly scaled to 10,000 GB and populated accordingly.
- The primary and secondary metrics were correctly measured and reported.
- The query templates were produced using approved minor query modifications.
- The query substitution parameters were generated using DSQGen v3.2.0.
- The execution of the queries against the qualification database produced compliant output.
- The tests were driven and sequenced according to the requirements.
- Each throughput test comprised 4 query streams.
- The execution times for queries and data maintenance functions were correctly measured and reported.
- The data accessibility test was performed and verified.
- The system pricing was verified for major components and maintenance.
- The major pages from the FDR were verified for accuracy.

Additional Audit Notes:

None.

Respectfully Yours,

A handwritten signature in black ink, appearing to read "Doug Johnson", with a long horizontal flourish extending to the right.

Doug Johnson, Certified TPC Auditor

63 Lourdes Dr. | Leominster, MA 01453 | 978-343-6562 | www.sizing.com

Supporting Files Index

Clause	Description	Archive File Pathname
Clause 3	Tools for data generation, data split (including base table and table for maintenance)	teledb_tpcds/Clause_3/doDatagen.sh teledb_tpcds/Clause_3/generate_data.sh teledb_tpcds/Clause_3/logs/doGenData.log
	Scripts, SQL and logs for load base tables (doLoad.sh is for creating base/foreign tables, loading data to base tables ,all tasks are scheduled in parallel)	teledb_tpcds/Clause_3/doLoad.sh teledb_tpcds/Clause_3/import_data.sh teledb_tpcds/Clause_3/start_gpfdist.sh teledb_tpcds/Clause_3/stop_gpfdist.sh teledb_tpcds/Clause_3/create_external_table.sh teledb_tpcds/Clause_3/create_table.sh teledb_tpcds/Clause_3/sqls/analyze.sql teledb_tpcds/Clause_3/impot_sql/*.sql teledb_tpcds/Clause_3/logs/create_tpcds_tables.out teledb_tpcds/Clause_3/load_tpcds.out teledb_tpcds/Clause_3/load_tpcds_time.log
	Scripts and SQL for validation and log files	teledb_tpcds/Clause_3/doValidate.sh teledb_tpcds/Clause_3/sqls/analyze.sql teledb_tpcds/Clause_3/sqls/count_tables.sql teledb_tpcds/Clause_3/sqls/desc_tables.sql teledb_tpcds/Clause_3/sqls/Validate_Data.sql teledb_tpcds/Clause_3/sqls/create_tpcds_vld.sql teledb_tpcds/Clause_3/sqls/Check_Insert.sql teledb_tpcds/Clause_3/sqls/Check_RI.sql teledb_tpcds/Clause_3/sqls/load_vld.sql
	pre-generated SQL to data maintenance and output	teledb_tpcds/Clause_3/mtsqls/*.sql teledb_tpcds/Clause_3/logs/fetch*.out
Clause 4	The script to execute qualification test and log file	teledb_tpcds/Clause_4/doQualification_test.sh teledb_tpcds/Clause_4/logs/qual*.out teledb_tpcds/Clause_4/qualification.log
	Qualification queries	teledb_tpcds/Clause_4/queries/query*.sql
	Output from executing qualification queries	teledb_tpcds/Clause_4/output/
	Query templates modify	teledb_tpcds/Clause_4/query_templates_modify/ query_templates_teledb.patch
Clause 5	Data maintenance execution scripts and logs files for each stream [s]	teledb_tpcds/Clause_5/doRefresh.sh teledb_tpcds/Clause_5/refresh.sh teledb_tpcds/Clause_5/logs/mt_[r]_time.log teledb_tpcds/Clause_5/logs/refresh_[s]_timing.log
	SQL scripts for DM functions for stream [s]	teledb_tpcds/Clause_5/mtsqls_[s]/LF*.sql teledb_tpcds/Clause_5/mtsqls_[s]/DF*.sql
	Output from executing DM functions	teledb_tpcds/Clause_5/output/*.out
	Raw data files for maintenance	teledb_tpcds/Clause_5/data/delete_[s].dat teledb_tpcds/Clause_5/data/inventory_delete_[s].dat
	MT function and data verification scripts, sqls, outputs and logs	teledb_tpcds/Clause_5/doVerify_mt.sh teledb_tpcds/Clause_5/logs/run_verify_mt_[s].log teledb_tpcds/Clause_5/mtsqls_[s]/fetch*.sql teledb_tpcds/Clause_5/mtsqls_[s]/verify*.sql teledb_tpcds/Clause_5/mtsqls_[s]/count_mt_tables.sql teledb_tpcds/Clause_5/output/mt_verify/*.out

Clause 6	Data accessibility test scripts, logs and output files	teledb_tpcds/Clause_6/data_access.sh teledb_tpcds/Clause_6/data_access_test.log teledb_tpcds/Clause_6/data_disk_remove.out teledb_tpcds/Clause_6/data_disk_status_fail.out teledb_tpcds/Clause_6/data_disk_status_good.out
Clause 7	Performance test scripts and logs	teledb_tpcds/Clause_7/doQueryGen.sh teledb_tpcds/Clause_7/logs/generate_queries.log teledb_tpcds/Clause_7/doPower.sh teledb_tpcds/Clause_7/doTT.sh teledb_tpcds/Clause_7/doStream.sh teledb_tpcds/Clause_7/logs/pt_time.log teledb_tpcds/Clause_7/logs/tt_[s]_time.log teledb_tpcds/Clause_7/logs/stream_[s]_time.log
	Query text for query [q] in stream [s]	teledb_tpcds/Clause_7/stream[s]/query_[q].sql
	Output of query [q] in stream [s]	teledb_tpcds/Clause_7/stream_[s]_out/q*.out
Clause 8	System config	teledb_tpcds/Clause_8/collect_system_profiles.sh teledb_tpcds/Clause_8/collect_teledb_config.sh teledb_tpcds/Clause_8/collect_teledb_dir.sh

Appendix A: ECX Server Price

Hi Qingcong,

Here is the information you requested regarding the pricing of ECX server products, Part number is ebm.io7.48xlarge768, totaling 22 servers. All prices are displayed in RMB (¥).

Type	Hardware Components	Number of Components	Unit Price(RMB Per Month)	3 Year Price(RMB)
CPU	4 * Intel(R) Xeon(R) Gold 6348H CPU @ 2.30GHz	1	9600	345600
Memory	24 * 32GB DDR4	1	3840	138240
Operating System Disk	2 * 480GB SSD	1	76.8	2764.8
Storage	4 * 3.2TB NVME SSD	1	1664	59904
3 Year Price(RMB) Per Server				546508.8
Qty				22
Discount				45%
SubTotal				5410437.12

Appendix B: Database Software Price

Hi Qingcong,

Here is the information you requested regarding pricing for TeleDB V5.1 products to be used in conjunction with your TPC-DS benchmark testing. All prices are displayed in RMB (¥)

Part Code	Description	Unit Price	Qty	Discount	Support	Extended Price
TeleDB V5.1	TeleDB V5.1 With 1 year 7 * 24 support	150000	22	45%	45% 2 years 7 * 24 support	1811700

天翼云科技有限公司 数据库产品线 王晶
wangj16@chinatelecom.cn

Appendix C: Third Party Price Quotes

Thinkpad E14 laptop (Chinese version)

ThinkPad E14 13代i5-13500H可选 14英寸高性能 编程设计 联想笔记本电脑 六核 R6-7530U 16G 512G 定制

Thinkpad E14 laptop (Chrome translated English version)

