
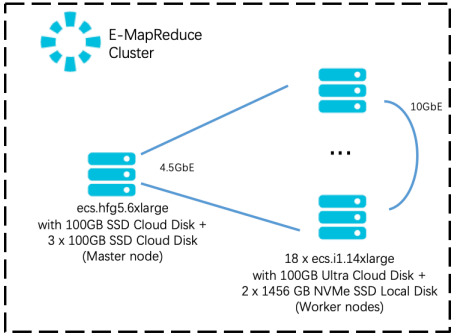
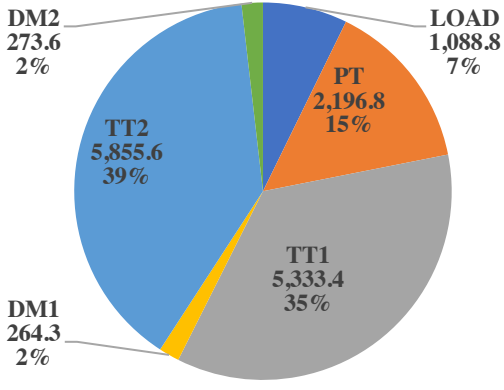

 Alibaba Cloud	Alibaba Cloud E-MapReduce		TPC-DS: 2.11.0 TPC-Pricing: 2.5.0 Report Date: Apr. 16, 2020	
Total System Cost	TPC-DS Throughput	Price / Performance	System Availability Date	
¥2,742,339.36 CNY	11,569,838 QphDS@10000GB	¥0.24 CNY/QphDS@10000GB	As of Publication	
Dataset Size ¹	Database Manager	Operation System	Other Software	Cluster
10,000 GB	E-MapReduce 4.0.1	CentOS Linux Release 7.4	N/A	Yes
  Benchmarked Configuration		 Elapsed Time		
Load includes backup = No		RAID = RAID-1 for metadata; HDFS with 3-way replication for table data		
System Configuration:		Alibaba Cloud E-MapReduce Cluster		
Servers:		1 x ecs.hfg5.6xlarge + 18 x ecs.i1.14xlarge		
Total Processors/Cores/Threads:		19/516/1,032		
Total Memory:		4,128 GB		
Total Storage ² :		54,616 GB		
Storage Ratio ³ :		5.46		
Server Configuration:		Per node (ecs.hfg5.6xlarge)		
Processors:		Intel(R)Xeon(R) Gold 6149 CPU @ 3.10GHz, 22 MB L3		
Memory:		96 GB		
Network:		Bandwidth: 4.5 Gbps, Packet forwarding rate: 2,000,000		
Storage Device:		3 x 100 GB SSD Cloud Disk (data disk) 1 x 100 GB SSD Cloud Disk (boot disk)		
Server Configuration:		Per node (ecs.i1.14xlarge)		
Processors:		Intel(R)Xeon(R) CPU E5-2682 v4 @ 2.50GHz, 40 MB L3		
Memory:		224 GB		
Network:		Bandwidth: 10.0 Gbps, Packet forwarding rate: 1,200,000		
Storage Device:		2 x 1456 GB NVMe SSD Local Disk (data disk) 1 x 100 GB Ultra Cloud Disk (boot disk)		
¹ . Dataset Size includes only raw data (i.e., no temp, index, redundant storage space, etc.). ² . Total Storage = (100 + 100 * 3) (Master node) + (100 + 1,456 * 2) * 18 (Worker nodes) = 54,616 GB ³ . Storage Ratio = Total Storage / SF = 54,616 GB / 10,000 GB				

 Alibaba Cloud	Alibaba Cloud E-MapReduce			TPC-DS: 2.11.0 TPC-Pricing: 2.5.0 Report Date: Apr. 16, 2020		
Description	Part Number	Src	Unit Price (CNY)	Qty	Ext. Price (CNY)	3-Year Maint. (CNY)
Licensed Compute Services						
<u>Virtual cloud server</u>						
ECS Instance ecs.hfg5.6xlarge	ecs.hfg5.6xlarge (China North 2)	1	1,952.16	36	70,277.76	included
ECS System Disk (SSD Cloud Disk 100GB)	Option	1	50.00	36	1,800.00	included
ECS Data Disk (SSD Cloud Disk 100GB)	Option	1	50.00	108	5,400.00	included
<u>Virtual cloud server</u>						
ECS Instance ecs.i1.14xlarge	ecs.i1.14xlarge (China North 2)	1	4,088.70	648	2,649,477.60	included
- NVMe SSD Local Disk (2 x 1456 GB)	Included					
ECS System Disk (Ultra Cloud Disk 100GB)	Option	1	17.50	648	11,340.00	included
Licensed Compute Services Sub-Total					2,738,295.36	0.00
Licensed Software Services						
E-MapReduce for emr.hfg5.6xlarge	included	1		36		
E-MapReduce for emr.i1.14xlarge	included	1		648		
Licensed Software Services Sub-Total					0.00	0.00
Other Components						
Lenovo MIIX 210 Laptop (Includes spares)		2	1,348.00	3	4,044.00	
Other Components Sub-Total					4,044.00	0.00
1 = Alibaba Cloud, 2 = Tmall.com					3-Year Cost of Ownership: 2,742,339.36	
All Licensed Services prices are per month and based on 3-year pre-paid subscriptions.					QphDS@10000GB: 11,569,838	
Audited by Francois Raab, InfoSizing					¥/QphDS@10000GB: 0.24	
Prices used in TPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated components. 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 components. For complete details, see the pricing sections of the TPC benchmark specifications. If you find that the stated prices are not available according to these terms, please inform at pricing@tpc.org. Thank you.						

Alibaba Cloud		Alibaba Cloud E-MapReduce		TPC-DS: 2.11.0 TPC-Pricing: 2.5.0 Report Date: Apr. 16, 2020		
Metrics Details:						
Name	Value	Unit				
Scale Factor (SF)	10,000	GB				
Streams	4	Stream				
Queries (Q)	396	Queries				
T_load	1,088.8	Second				
T_ld	0.0121	Hour				
T_power	2,196.8	Second				
T_pt	2.4409	Hour				
T_tt1	5,333.4	Second				
T_tt2	5,855.6	Second				
T_dm1	264.3	Second				
T_dm2	273.6	Second				
T_tt	3.1081	Hour				
T_dm	0.1495	Hour				
Load Step	Start		End		(sec.)	(hh:mm:ss)
Build	04/01/20	13:36:26.18	04/01/20	13:54:34.98	1,088.80	0:18:09
Audit	04/01/20	13:54:34.98	04/01/20	14:14:16.47	1,181.49	0:19:41
Finish	04/01/20	14:14:16.47	04/01/20	14:14:16.47	0.00	0:00:00
Reported	04/01/20	13:36:26.18	04/01/20	14:14:16.47	1,088.80	0:18:09
Test	Start		End		(sec.)	(hh:mm:ss)
Power	04/01/20	14:29:50.09	04/01/20	15:06:26.85	2,196.76	0:36:37
Thruput-1	04/01/20	15:06:26.87	04/01/20	16:35:20.26	5,333.39	1:28:53
Thruput-2	04/01/20	16:35:20.28	04/01/20	16:39:44.55	264.27	0:04:24
DM-1	04/01/20	16:39:44.57	04/01/20	18:17:20.17	5,855.60	1:37:36
DM-2	04/01/20	18:17:20.19	04/01/20	18:21:53.72	273.53	0:04:34
Stream	Start		End		(sec.)	(hh:mm:ss)
Pt - 0	04/01/20	14:29:50.09	04/01/20	15:06:26.85	2,196.76	0:36:37
Tt1 - 1	04/01/20	15:06:26.87	04/01/20	16:33:42.35	5,235.48	1:27:15
Tt1 - 2	04/01/20	15:06:26.87	04/01/20	16:33:55.93	5,249.06	1:27:29
Tt1 - 3	04/01/20	15:06:26.87	04/01/20	16:35:20.26	5,333.39	1:28:53
Tt1 - 4	04/01/20	15:06:26.87	04/01/20	16:33:56.40	5,249.53	1:27:30
Tt2 - 5	04/01/20	16:39:44.57	04/01/20	18:17:20.17	5,855.60	1:37:36
Tt2 - 6	04/01/20	16:39:44.57	04/01/20	18:15:46.08	5,761.51	1:36:02
Tt2 - 7	04/01/20	16:39:44.57	04/01/20	18:16:52.95	5,828.38	1:37:08
Tt2 - 8	04/01/20	16:39:44.57	04/01/20	18:16:23.07	5,798.50	1:36:39
DMt1 - 1	04/01/20	16:35:20.28	04/01/20	16:37:36.22	135.94	0:02:16
DMt1 - 2	04/01/20	16:37:36.23	04/01/20	16:39:44.55	128.32	0:02:08
DMt2 - 3	04/01/20	18:17:20.19	04/01/20	18:19:37.78	137.59	0:02:18
DMt2 - 4	04/01/20	18:19:37.79	04/01/20	18:21:53.72	135.93	0:02:16

Timing Intervals for Each Query (In Seconds)

Table with 18 columns (Query, Stream 0-8, Min, 25thtile, Median, 75thtile, Max) and 94 rows of timing data for each query.

95	69.5	86.0	178.2	98.0	90.6	86.0	89.5	94.3	118.1	178.2	100.0	111.0	105.6	115.3	100.0	104.2	108.3	112.1	115.3
96	10.3	17.8	13.1	17.7	11.8	11.8	12.8	15.4	17.7	17.8	29.8	111.5	20.0	53.5	20.0	27.4	41.7	68.0	111.5
97	56.9	76.5	66.8	75.5	76.5	66.8	73.3	76.0	76.5	76.5	82.4	66.5	103.6	121.6	66.5	78.4	93.0	108.1	121.6
98	5.9	34.7	8.1	23.1	8.3	8.1	8.3	15.7	26.0	34.7	70.6	13.9	7.0	21.8	7.0	12.2	17.9	34.0	70.6
99	6.3	50.4	37.6	36.2	23.4	23.4	33.0	36.9	40.8	50.4	15.4	56.5	68.3	49.8	15.4	41.2	53.2	59.5	68.3

Timing Intervals for Each Refresh Function (In Seconds)

DM Fx	R-Run 1	R-Run 2	R-Run 3	R-Run 4	Min	25%tile	Median	75%tile	Max
DF_CS	62.8	48.9	65.8	50.9	48.9	50.4	56.8	63.6	65.8
DF_I	16.5	15.7	15.3	13.6	13.6	14.9	15.5	15.9	16.5
DF_SS	64.3	57.0	76.3	67.1	57.0	62.5	65.7	69.4	76.3
DF_WS	63.5	47.9	72.1	53.8	47.9	52.3	58.6	65.6	72.1
LF_CR	32.1	28.3	26.6	34.7	26.6	27.8	30.2	32.7	34.7
LF_CS	36.8	40.2	29.0	28.9	28.9	29.0	32.9	37.7	40.2
LF_I	5.9	6.1	6.5	6.3	5.9	6.0	6.2	6.3	6.5
LF_SR	20.2	18.2	20.1	19.4	18.2	19.1	19.8	20.2	20.2
LF_SS	33.5	35.4	28.1	25.6	25.6	27.5	30.8	34.0	35.4
LF_WR	26.5	24.1	30.6	38.4	24.1	25.9	28.5	32.5	38.4
LF_WS	30.5	35.2	26.8	27.7	26.8	27.5	29.1	31.7	35.2