

Alibaba Cloud		Alibaba Cloud E-MapReduce		TPC-DS: 2.11.0 TPC-Pricing: 2.4.0 Report Date: Sep. 16, 2019	
Total System Cost		TPC-DS Throughput		Price / Performance	
¥ 2,742,339.36 CNY		5,261,414 QphDS@10000GB		¥ 0.53 CNY/QphDS@10000GB	
Dataset Size ¹		Database Manager		System Availability Date	
10,000 GB		E-MapReduce 3.21.2		As of Publication	
		Operation System		Other Software	
		CentOS Linux Release 7.4		Cluster	
				N/A	
				Yes	
Alibaba Cloud E-MapReduce Cluster ecs.hfg5.6xlarge with 100GB SSD Cloud Disk + 3 x 100GB SSD Cloud Disk (Master node) 4.5GbE 10GbE 18 x ecs.i1.14xlarge with 100GB Ultra Cloud Disk + 2 x 1456 GB NVMe SSD Local Disk (Worker nodes) Benchmarked Configuration		DM2 503.5 1% LOAD 2,402.1 7% PT 4,860.0 13% TT2 14,595.0 39% TT1 14,330.9 39% DM1 493.6 1% 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:		54,616 GB			
Storage Ratio:		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					

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	E-MapReduce				TPC-Pricing: 2.4.0	
					Report Date: Sep. 16, 2019	
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: 5,261,414		
Audited by Francois Raab, InfoSizing				¥/QphDS@10000GB: 0.53		
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.						

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Timing Intervals for Each Query (In Seconds)

Query	Stream 0	Stream 1	Stream 2	Stream 3	Stream 4	Min	25%tile	Median	75%tile	Max	Stream 5	Stream 6	Stream 7	Stream 8	Min	25%tile	Median	75%tile	Max
1	14.3	72.1	34.2	51.7	38.9	34.2	37.7	45.3	56.8	72.1	61.2	65.0	135.2	61.3	61.2	61.3	63.2	82.6	135.2
2	36.2	356.0	76.3	91.5	157.9	76.3	87.7	124.7	207.4	356.0	122.7	100.1	81.0	62.5	62.5	76.4	90.6	105.8	122.7
3	4.0	8.7	23.2	30.8	27.7	8.7	19.6	25.5	28.5	30.8	5.6	8.0	8.7	36.4	5.6	7.4	8.4	15.6	36.4
4	331.2	385.0	404.7	462.2	371.4	371.4	381.6	394.9	419.1	462.2	430.6	382.3	412.3	364.4	364.4	377.8	397.3	416.9	430.6
5	46.1	175.6	119.5	89.1	96.6	89.1	94.7	108.1	133.5	175.6	435.3	128.4	439.6	125.2	125.2	127.6	281.9	436.4	439.6
6	9.6	105.1	80.8	362.5	35.6	35.6	69.5	93.0	169.5	362.5	93.3	21.7	132.2	52.2	21.7	44.6	72.8	103.0	132.2
7	18.1	23.3	54.4	31.7	18.4	18.4	22.1	27.5	37.4	54.4	16.4	42.7	19.6	78.4	16.4	18.8	31.2	51.6	78.4
8	11.9	146.5	127.5	67.5	54.4	54.4	64.2	97.5	132.3	146.5	17.2	61.4	165.3	51.7	17.2	43.1	56.6	87.4	165.3
9	23.4	49.7	32.0	42.7	24.7	24.7	30.2	37.4	44.5	49.7	36.6	52.9	51.9	57.8	36.6	48.1	52.4	54.1	57.8
10	16.5	25.9	40.0	83.9	35.4	25.9	33.0	37.7	51.0	83.9	47.9	44.8	47.1	104.9	44.8	46.5	47.5	62.2	104.9
11	68.8	97.0	159.2	112.9	125.2	97.0	108.9	119.1	133.7	159.2	231.7	93.2	122.5	137.6	93.2	115.2	130.1	161.1	231.7
12	4.0	128.0	77.4	10.0	34.2	10.0	28.2	55.8	90.1	128.0	183.6	19.6	26.4	39.0	19.6	24.7	32.7	75.2	183.6
13	17.4	74.3	55.9	39.2	102.9	39.2	51.7	65.1	81.5	102.9	197.8	30.0	71.5	44.4	30.0	40.8	58.0	103.1	197.8
14	433.4	1,099.1	1,066.1	1,222.6	985.1	985.1	1,045.9	1,082.6	1,130.0	1,222.6	892.7	1,124.9	869.5	1,095.0	869.5	886.9	993.9	1,102.5	1,124.9
15	13.1	22.0	72.9	40.0	49.0	22.0	35.5	44.5	55.0	72.9	101.4	148.5	67.9	13.9	13.9	54.4	84.7	113.2	148.5
16	42.1	84.3	225.1	161.6	132.2	84.3	120.2	146.9	177.5	225.1	157.3	62.5	68.6	98.8	62.5	67.1	83.7	113.4	157.3
17	22.3	185.7	174.3	252.5	78.1	78.1	150.3	180.0	202.4	252.5	86.4	63.5	159.4	32.5	32.5	55.8	75.0	104.7	159.4
18	29.8	69.4	60.5	70.2	40.1	40.1	55.4	65.0	69.6	70.2	301.3	96.0	130.9	65.7	65.7	88.4	113.5	173.5	301.3
19	10.6	46.8	62.3	50.5	42.6	42.6	45.8	48.7	53.5	62.3	55.8	35.9	84.2	53.6	35.9	49.2	54.7	62.9	84.2
20	4.0	6.0	11.3	8.9	112.7	6.0	8.2	10.1	36.7	112.7	17.1	6.6	27.5	376.2	6.6	14.5	22.3	114.7	376.2
21	2.6	119.7	34.6	38.2	6.2	6.2	27.5	36.4	58.6	119.7	13.7	18.3	83.9	20.7	13.7	17.2	19.5	36.5	83.9
22	16.2	42.7	106.6	42.3	58.0	42.3	42.6	50.4	70.2	106.6	60.4	50.0	75.8	41.6	41.6	47.9	55.2	64.3	75.8
23	663.5	1,152.7	1,441.4	1,470.8	1,295.7	1,152.7	1,260.0	1,368.6	1,448.8	1,470.8	1,167.6	1,333.5	1,205.1	1,282.2	1,167.6	1,195.7	1,243.7	1,295.0	1,333.5
24	228.5	920.8	528.5	658.8	1,198.8	528.5	626.2	789.8	990.3	1,198.8	794.5	779.9	690.3	633.3	633.3	676.1	735.1	783.6	794.5
25	29.4	195.3	55.6	70.5	36.7	36.7	50.9	63.1	101.7	195.3	28.1	43.8	52.7	76.7	28.1	39.9	48.3	58.7	76.7
26	7.5	155.2	117.5	57.4	30.5	30.5	50.7	87.5	126.9	155.2	13.1	22.1	24.6	161.1	13.1	19.9	23.4	58.7	161.1
27	9.0	110.1	67.5	246.9	36.4	36.4	59.7	88.8	144.3	246.9	28.5	55.0	19.4	13.5	13.5	17.9	24.0	35.1	55.0
28	54.7	115.8	130.9	94.3	92.9	92.9	94.0	105.1	119.6	130.9	87.8	73.2	250.7	301.5	73.2	84.2	169.3	263.4	301.5
29	61.7	103.2	70.5	77.9	101.9	70.5	76.1	89.9	102.2	103.2	75.1	150.8	150.1	427.6	75.1	131.4	150.5	220.0	427.6
30	21.7	52.7	72.2	182.4	133.1	52.7	67.3	102.7	145.4	182.4	74.5	54.0	89.8	66.6	54.0	63.5	70.6	78.3	89.8
31	39.0	88.0	88.9	256.3	362.7	88.0	88.7	172.6	282.9	362.7	48.9	99.8	98.7	39.2	39.2	46.5	73.8	99.0	98.8
32	10.0	26.6	110.8	13.6	44.6	13.6	23.4	35.6	61.2	110.8	78.4	33.0	20.0	84.4	20.0	29.8	55.7	79.9	84.4
33	13.3	38.9	122.9	32.5	31.8	31.8	32.3	35.7	59.9	122.9	125.1	100.0	29.8	7.1	7.1	24.1	64.9	106.3	125.1
34	14.0	64.5	270.4	103.4	28.3	28.3	55.5	84.0	145.2	270.4	168.6	40.1	48.1	95.6	40.1	46.1	71.9	113.9	168.6
35	46.1	182.0	192.2	115.3	277.0	115.3	165.3	187.1	213.4	277.0	434.2	114.4	127.5	109.4	109.4	113.2	121.0	204.2	434.2
36	8.9	34.4	301.0	98.5	70.6	34.4	61.6	84.6	149.1	301.0	21.7	24.4	19.6	138.4	19.6	21.2	23.1	52.9	138.4
37	28.3	281.0	69.1	83.3	305.8	69.1	79.8	182.2	305.8	281.0	54.8	56.3	80.8	129.5	54.8	55.9	68.6	93.0	129.5
38	116.4	383.7	253.7	311.4	395.0	253.7	297.0	347.6	386.5	395.0	168.4	347.3	256.6	219.1	168.4	206.4	237.9	279.3	347.3
39	24.8	122.6	106.5	106.9	85.7	85.7	101.3	106.7	110.8	122.6	56.9	78.4	183.7	46.2	46.2	54.2	67.7	104.7	183.7
40	19.1	29.6	27.2	381.0	100.6	27.2	29.0	65.1	170.7	381.0	23.6	44.3	199.2	55.1	23.6	39.1	49.7	91.1	199.2
41	1.3	31.2	40.4	8.8	19.1	8.8	16.5	25.2	33.5	40.4	18.7	4.9	1.9	4.1	1.9	3.6	4.5	8.4	18.7
42	2.4	9.4	43.4	11.2	14.4	9.4	10.8	12.8	21.7	43.4	133.1	56.7	8.2	3.9	3.9	7.1	32.5	75.8	133.1
43	7.7	25.2	14.7	75.2	52.1	14.7	22.6	38.7	57.9	75.2	9.8	31.4	12.8	28.2	9.8	12.1	20.5	29.0	31.4
44	6.9	55.2	13.2	27.8	234.1	13.2	24.2	41.5	99.9	234.1	52.6	359.7	220.3	105.9	52.6	92.6	163.1	255.2	359.7
45	10.0	36.2	70.9	12.7	33.2	12.7	28.1	34.7	44.9	70.9	36.1	39.4	28.1	77.9	28.1	34.1	37.8	49.0	77.9
46	16.6	22.0	126.1	147.2	123.5	22.0	98.1	124.8	131.4	147.2	42.6	135.8	242.0	66.4	42.6	60.5	101.1	162.4	242.0
47	26.2	80.6	76.2	37.5	38.8	37.5	38.5	57.5	77.3	80.6	113.0	161.6	44.0	410.0	44.0	95.8	137.3	223.7	410.0
48	18.6	54.6	23.0	28.0	234.7	23.0	26.8	41.3	99.6	234.7	62.5	79.6	75.4	25.3	25.3	53.2	69.0	76.5	79.6
49	18.4	45.2	47.2	21.2	37.0	21.2	33.1	41.1	45.7	47.2	100.2	139.9	58.1	103.3	58.1	89.7	101.8	112.5	139.9
50	152.3	297.5	265.6	262.1	182.3	182.3	242.2	263.9	273.6	297.5	280.6	250.6	217.5	229.1	217.5	226.2	239.9	258.1	280.6
51	31.3	263.7	133.9	224.5	66.5	66.5	117.1	179.2	234.3	263.7	57.0	187.6	48.6	169.2	48.6	54.9	113.1	173.8	187.6
52	2.5	3.0	5.2	8.5	6.0	3.0	4.7	5.6	6.6	8.5	251.3	3.8	14.3	5.3	3.8	4.9	9.8	73.6	251.3
53	5.0	12.8	26.0	143.3	5.2	5.2	10.9	19.4	55.3	143.3	25.7	54.4	15.4	110.0	15.4	23.1	40.1	68.3	110.0
54	15.0	98.9	172.6	40.8	43.9	40.8	43.1	71.4	117.3	172.6	105.8	276.3	77.2	249.9	77.2	98.7	177.9	256.5	276.3
55	2.5	4.4	5.5	27.6	91.7	4.4	5.2	16.6	43.6	91.7	5.7	4.0	174.5	6.3	4.0	5.3	6.0	48.4	174.5
56	14.1	25.6	31.5	63.3	26.5	26.5	26.3	29.0	39.5	63.3	10.2	164.1	12.7	44.0	10.2	12.1	28.4	74.0	164.1
57	16.2	31.2	24.4	18.8	38.8	18.8	23.0	27.8	33.1	38.8	70.1	60.7	333.2	34.5	34.5	54.2	65.4	135.9	333.2
58	25.6	70.2	167.4	72.9	177.5	70.2	72.2	120.2	169.9	177.5	48.3	93.0	65.8	43.7	43.7	47.2	57.1	72.6	93.0
59	112.4	149.7	65.3	138.1	233.6	65.3	119.9	143.9	170.7	233.6	46.9	55.3	43.6	337.9	43.6	46.1	51.1	126.0	337.9
60	13.7	140.1	76.5	152.4	60.7	60.7	72.6	108.3	143.2	152.4	150.9	17.1	52.0	21.5	17.1	20.4	36.8	76.7	150.9
61	17.7	40.4	387.6	45.7	28.0	28.0	37.3	43.1	131.2	387.6	39.9	47.0	47.3	94.5	39.9	45.2	47.2	59.1	94.5
62	21.4	17.8	15.3	88.7	156.9	15.3	17.2	53.3	105.8	156.9	32.0	422.4	152.3	362.4	32.0	122.2	257.4	377.4	422.4
63	4.8	39.7	144.1	10.7	59.5	10.7	32.5	49.6	80.7	144.1	197.4	25.0	16.9	5.4	5.4	14.0	21.0	68.1	197.4
64	204.3	674.9	478.8	594.9	515.9	478.8	506.6	555.4	614.9	674.9	409.7	574.9	338.4	352.8	338.4	349.2	381.3	451.0	

95	70.8	90.1	125.7	110.2	83.6	83.6	88.5	100.2	114.1	125.7	136.1	204.0	128.0	222.5	128.0	134.1	170.1	208.6	222.5
96	36.0	22.3	35.0	95.2	17.8	17.8	21.2	28.7	50.1	95.2	43.6	89.4	13.2	19.4	13.2	17.9	31.5	55.1	89.4
97	62.7	298.8	207.7	295.6	106.2	106.2	182.3	251.7	296.4	298.8	105.8	210.8	225.7	72.1	72.1	97.4	158.3	214.5	225.7
98	5.9	27.5	18.4	13.5	20.4	13.5	17.2	19.4	22.2	27.5	9.1	51.3	53.4	9.9	9.1	9.7	30.6	51.8	53.4
99	25.1	42.1	98.4	43.9	87.4	42.1	43.5	65.7	90.2	98.4	447.9	50.8	55.9	353.9	50.8	54.6	204.9	377.4	447.9

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
LF_CR	48.1	48.4	48.4	44.6	44.6	47.2	48.3	48.4	48.4
LF_CS	77.4	73.4	86.1	77.5	73.4	76.4	77.5	79.7	86.1
LF_I	31.6	29.6	31.6	31.8	29.6	31.1	31.6	31.7	31.8
LF_SR	44.8	45.1	44.5	48.0	44.5	44.7	45.0	45.8	48.0
LF_SS	75.9	76.4	84.0	71.5	71.5	74.8	76.2	78.3	84.0
LF_WR	39.1	38.0	38.8	38.7	38.0	38.5	38.8	38.9	39.1
LF_WS	65.0	68.1	73.7	64.5	64.5	64.9	66.6	69.5	73.7
DF_CS	109.8	104.6	90.6	111.2	90.6	101.1	107.2	110.2	111.2
DF_SS	136.5	102.6	104.5	137.1	102.6	104.0	120.5	136.7	137.1
DF_WS	107.9	94.3	93.2	73.0	73.0	88.2	93.8	97.7	107.9
DF_I	30.6	37.4	35.8	33.7	30.6	32.9	34.8	36.2	37.4