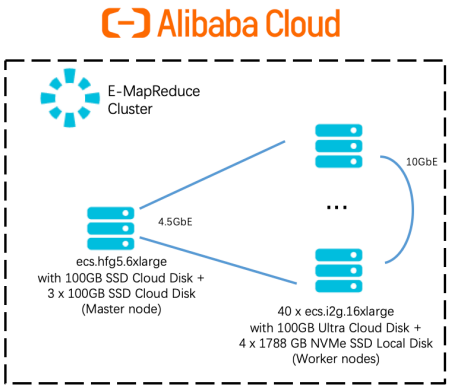
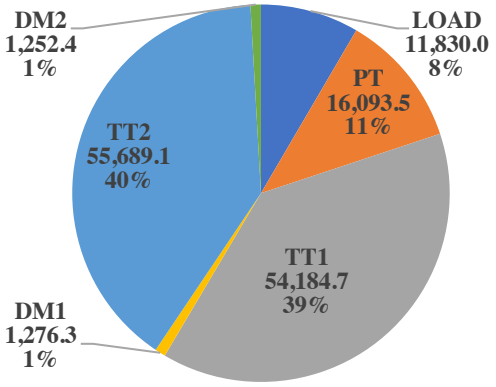
Alibaba Cloud	Alibaba Cloud E-MapReduce		TPC-DS: 3.0.0 TPC-Pricing: 2.4.0 Report Date: Apr. 2, 2021	
Total System Cost	TPC-DS Throughput	Price / Performance	System Availability Date	
$2,604,064.68 USD	**14,861,137** QphDS@100000GB	**$175.23** USD/kQphDS@100000GB	**As of Publication**	
Dataset Size[1]	Database Manager	Operation System	Other Software	Cluster
100,000 GB	E-MapReduce 3.21.2	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 + 40 x ecs.i2g.16xlarge
Total Processors/Cores/Threads:	41/1,292/2,584
Total Memory:	10,336 GB
Total Storage[2]:	290,480 GB
Storage Ratio[3]:	2.91
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.i2g.16xlarge)**
Processors:	Intel(R)Xeon(R) Platinum 8163 CPU @ 2.50GHz, 33 MB L3
Memory:	256 GB
Network:	Bandwidth: 10.0 Gbps, Packet forwarding rate: 4,000,000
Storage Device:	4 x 1788 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 + 1,788 * 4) * 40 (Worker nodes) = 290,480 GB
3. Storage Ratio = Total Storage / SF = 290,480 GB / 100,000 GB

Alibaba Cloud	**Alibaba Cloud E-MapReduce**	TPC-DS: 3.0.0 TPC-Pricing: 2.4.0 Report Date: Apr. 2, 2021

Description	Part Number	Src	Unit Price (USD)	Qty	Ext. Price (USD)	3-Year Maint. (USD)
Licensed Compute Services						
Virtual cloud server						
ECS Instance ecs.hfg5.6xlarge	ecs.hfg5.6xlarge (China North 2)	1	6,389.48	3	19,168.44	included
ECS System Disk (SSD Cloud Disk 100GB)	Option	1	156.06	3	468.18	included
ECS Data Disk (SSD Cloud Disk 100GB)	Option	1	156.06	9	1,404.54	included
Virtual cloud server						
ECS Instance ecs.i2g.16xlarge	ecs.i2g.16xlarge (China North 2)	1	18,628.46	120	2,235,415.20	included
- NVMe SSD Local Disk (4 x 1788 GB)	Included					
ECS System Disk (Ultra Cloud Disk 100GB)	Option	1	78.54	120	9,424.80	included
	Licensed Compute Services Sub-Total				**2,265,881.16**	**0.00**
Licensed Software Services						
E-MapReduce for emr.hfg5.6xlarge	emr.hfg5.6xlarge (China North 2)	1	818.4888	3	2,455.47	included
E-MapReduce for emr.i2g.16xlarge	emr.i2g.16xlarge (China North 2)	1	2,793.9840	120	335,278.08	included
	Licensed Software Services Sub-Total				**337,733.55**	**0.00**
Other Components						
Lenovo 120S-14IAP Laptop (Includes spares)	81A5001UUS	2	149.99	3	449.97	
	Other Components Sub-Total				**449.97**	**0.00**

1 = Alibaba Cloud, 2 = Bestbuy.com	**3-Year Cost of Ownership:**	**2,604,064.68**
All Licensed Services prices are per year and based on 1-year pre-paid subscriptions.	**QphDS@100000GB:**	**14,861,137**
Audited by Francois Raab, InfoSizing	**$ /kQphDS@100000GB:**	**175.23**

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: 3.0.0 TPC-Pricing: 2.4.0 Report Date: Apr. 2, 2021

Metrics Details:

Name	Value	Unit
Scale Factor (SF)	100,000	GB
Streams	4	Stream
Queries (Q)	396	Queries
T_load	11,830.0	Second
T_ld	0.1315	Hour
T_power	16,093.5	Second
T_pt	17.8817	Hour
T_tt1	54,184.7	Second
T_tt2	55,689.1	Second
T_dm1	1,276.3	Second
T_dm2	1,252.4	Second
T_tt	30.5205	Hour
T_dm	0.7025	Hour

Load Step	Start	End	(sec.)	(hh:mm:ss)
Build	08/25/19 12:58:52.38	08/25/19 16:16:02.34	11,829.96	3:17:10
Audit	08/25/19 16:16:02.34	08/25/19 17:32:28.84	4,586.50	1:16:26
Finish	08/25/19 17:32:28.84	08/25/19 17:32:28.84	0.00	0:00:00
Reported	08/25/19 12:58:52.38	08/25/19 17:32:28.84	11,829.96	3:17:10

Test	Start	End	(sec.)	(hh:mm:ss)
Power	08/25/19 19:57:45.09	08/26/19 00:25:58.52	16,093.44	4:28:13
Thruput-1	08/26/19 00:25:58.54	08/26/19 15:29:03.18	54,184.64	15:03:05
Thruput-2	08/26/19 15:50:19.48	08/27/19 07:18:28.56	55,689.08	15:28:09
DM-1	08/26/19 15:29:03.20	08/26/19 15:50:19.46	1,276.26	0:21:16
DM-2	08/27/19 07:18:28.58	08/27/19 07:39:20.93	1,252.35	0:20:52

Stream	Start	End	(sec.)	(hh:mm:ss)
Pt - 0	08/25/19 19:57:45.09	08/26/19 00:25:58.52	16,093.44	4:28:13
Tt1 - 1	08/26/19 00:25:58.54	08/26/19 15:27:16.22	54,077.69	15:01:18
Tt1 - 2	08/26/19 00:25:58.54	08/26/19 15:29:03.18	54,184.64	15:03:05
Tt1 - 3	08/26/19 00:25:58.54	08/26/19 15:28:20.11	54,141.57	15:02:22
Tt1 - 4	08/26/19 00:25:58.54	08/26/19 15:17:44.17	53,505.63	14:51:46
Tt2 - 5	08/26/19 15:50:19.48	08/27/19 07:18:28.56	55,689.08	15:28:09
Tt2 - 6	08/26/19 15:50:19.48	08/27/19 07:04:23.97	54,844.49	15:14:04
Tt2 - 7	08/26/19 15:50:19.48	08/27/19 06:58:46.02	54,506.54	15:08:27
Tt2 - 8	08/26/19 15:50:19.48	08/27/19 06:47:42.76	53,843.28	14:57:23
DMt1 - 1	08/26/19 15:29:03.20	08/26/19 15:40:16.00	672.79	0:11:13
DMt1 - 2	08/26/19 15:40:16.00	08/26/19 15:50:19.46	603.46	0:10:03
DMt2 - 3	08/27/19 07:18:28.58	08/27/19 07:28:55.60	627.02	0:10:27
DMt2 - 4	08/27/19 07:28:55.61	08/27/19 07:39:20.93	625.32	0:10:25

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	20.5	60.1	213.1	153.6	302.9	60.1	130.2	183.4	235.6	302.9	607.5	221.2	540.1	296.1	221.2	277.4	418.1	557.0	607.5
2	94.7	293.6	166.3	1,386.9	324.4	166.3	261.8	309.0	590.0	1,386.9	547.2	676.9	618.5	933.8	547.2	600.7	647.7	741.1	933.8
3	15.3	414.8	361.3	64.1	30.6	30.6	55.7	212.7	374.7	414.8	32.0	33.2	273.5	142.6	32.0	32.9	87.9	175.3	273.5
4	1,112.7	1,587.3	1,204.7	1,409.0	1,631.6	1,204.7	1,357.9	1,498.2	1,598.4	1,631.6	1,624.1	1,436.9	1,280.3	1,131.8	1,131.8	1,243.2	1,358.6	1,483.7	1,624.1
5	188.1	487.2	525.0	274.8	245.3	245.3	267.4	381.0	496.7	525.0	1,226.1	618.5	1,448.6	731.3	618.5	703.1	978.7	1,281.7	1,448.6
6	25.1	125.6	55.7	481.4	129.6	55.7	108.1	127.6	217.6	481.4	115.2	207.0	250.2	92.3	92.3	109.5	161.1	217.8	250.2
7	38.1	206.9	379.6	62.3	65.2	62.3	64.5	136.1	250.1	379.6	119.8	237.1	122.8	87.4	87.4	111.7	121.3	151.4	237.1
8	29.1	257.7	915.6	323.0	474.9	257.7	306.7	399.0	585.1	915.6	419.8	80.5	397.5	1,485.4	80.5	318.3	408.7	686.2	1,485.4
9	90.0	773.2	129.3	363.3	133.4	129.3	132.4	248.4	465.8	773.2	133.2	179.6	565.7	144.4	133.2	141.6	162.0	276.1	565.7
10	45.2	947.0	307.0	153.1	227.2	153.1	208.7	267.1	467.0	947.0	147.0	493.9	126.7	661.8	126.7	141.9	320.5	535.9	661.8
11	261.7	442.3	1,040.8	371.7	418.2	371.7	406.6	430.3	591.9	1,040.8	1,054.5	369.5	422.8	404.9	369.5	396.1	413.9	580.7	1,054.5
12	6.5	368.3	156.9	321.4	709.6	156.9	280.3	344.9	453.6	709.6	15.9	220.0	48.0	28.4	15.9	25.3	38.2	91.0	220.0
13	65.7	165.5	625.0	410.6	324.5	165.5	284.8	367.6	464.2	625.0	693.3	143.7	216.8	269.3	143.7	198.5	243.1	375.3	693.3
14	1,359.9	4,030.5	3,178.4	4,555.1	5,532.8	3,178.4	3,817.5	4,292.8	4,799.5	5,532.8	3,300.7	3,120.0	3,905.9	2,585.7	2,585.7	2,986.4	3,210.4	3,452.0	3,905.9
15	21.8	112.1	987.8	255.8	137.5	112.1	131.2	196.7	438.8	987.8	165.3	286.8	63.8	456.1	63.8	139.9	226.1	329.1	456.1
16	191.6	385.1	843.6	574.8	365.1	365.1	380.1	480.0	642.0	843.6	354.2	219.4	363.1	531.2	219.4	320.5	358.7	405.1	531.2
17	87.3	1,008.8	1,112.1	173.1	495.7	173.1	415.1	752.3	1,034.6	1,112.1	349.5	725.6	161.8	119.2	119.2	151.2	255.7	443.5	725.6
18	63.4	1,011.6	369.8	166.7	564.0	166.7	319.0	466.9	675.9	1,011.6	792.2	200.5	169.6	196.2	169.6	189.6	198.4	348.4	792.2
19	18.5	1,437.9	184.5	605.5	274.0	184.5	251.6	439.8	813.6	1,437.9	75.9	107.9	719.1	538.0	75.9	99.9	323.0	583.3	719.1
20	7.8	244.6	212.5	15.8	75.4	15.8	60.5	144.0	220.5	244.6	42.7	14.5	196.3	507.0	14.5	35.7	119.5	274.0	507.0
21	3.5	269.9	11.9	146.9	132.0	11.9	102.0	139.5	177.7	269.9	118.0	10.2	15.2	67.6	10.2	14.0	41.4	80.2	118.0
22	23.7	34.0	39.2	293.5	754.1	34.0	37.9	166.4	408.7	754.1	676.8	428.6	181.3	247.8	181.3	231.2	338.2	490.7	676.8
23	3,022.4	3,868.1	5,776.6	4,450.6	5,692.4	3,868.1	4,305.0	5,071.5	5,713.5	5,776.6	5,847.4	4,796.9	5,049.0	4,993.3	4,796.9	4,944.2	5,021.2	5,248.6	5,847.4
24	686.3	2,221.5	2,055.2	3,107.1	3,795.3	2,055.2	2,179.9	2,664.3	3,279.2	3,795.3	2,828.6	3,611.3	3,925.8	2,721.8	2,721.8	2,801.9	3,220.0	3,689.9	3,925.8
25	73.7	511.9	143.5	131.8	198.0	131.8	140.6	170.8	276.5	511.9	69.8	91.6	864.2	782.2	69.8	86.2	436.9	802.7	864.2
26	24.8	248.7	258.4	143.6	56.6	56.6	121.9	196.2	251.1	258.4	31.0	171.1	879.2	143.0	31.0	115.0	157.1	348.1	879.2
27	30.4	714.1	517.1	296.6	389.4	296.6	366.2	453.3	566.4	714.1	811.7	579.2	81.0	208.3	81.0	176.5	393.8	637.3	811.7
28	247.3	1,208.7	1,212.4	349.7	378.1	349.7	371.0	793.4	1,209.6	1,212.4	688.4	458.0	405.4	365.3	365.3	395.4	431.7	515.6	688.4
29	222.1	645.9	290.5	516.3	421.8	290.5	389.0	469.1	548.7	645.9	211.6	805.4	494.9	1,014.8	211.6	424.1	650.2	857.8	1,014.8
30	37.8	438.4	182.6	291.7	637.6	182.6	264.4	365.1	488.2	637.6	353.5	145.1	165.1	127.3	127.3	140.7	155.1	212.2	353.5
31	92.7	512.0	501.4	256.6	286.3	256.6	278.9	393.9	504.1	512.0	106.0	542.8	496.3	193.9	106.0	171.9	345.1	507.9	542.8
32	47.3	104.8	237.7	228.0	409.3	104.8	197.2	232.9	280.6	409.3	78.0	508.0	283.4	642.8	78.0	232.1	395.7	541.7	642.8
33	12.2	112.7	316.2	221.4	421.8	112.7	194.2	268.8	342.6	421.8	318.7	90.3	370.6	55.0	55.0	81.5	204.5	331.7	370.6
34	47.3	245.3	251.5	155.1	57.9	57.9	130.8	200.2	246.9	251.5	37.1	138.4	379.2	79.5	37.1	68.9	109.0	198.6	379.2
35	107.6	662.0	897.8	372.4	403.8	372.4	396.0	532.9	721.0	897.8	621.6	633.4	836.5	638.9	621.6	630.5	636.2	688.3	836.5
36	33.5	101.0	765.2	79.0	990.6	79.0	95.5	433.1	821.6	990.6	103.4	120.8	61.7	134.1	61.7	93.0	112.1	124.1	134.1
37	89.7	365.0	310.5	306.0	164.5	164.5	270.6	308.3	324.1	365.0	169.3	438.4	356.8	255.9	169.3	234.3	306.4	377.2	438.4
38	297.1	317.7	450.7	640.4	1,423.9	317.7	417.5	545.6	836.3	1,423.9	323.8	497.9	880.8	934.4	323.8	454.4	689.4	894.2	934.4
39	36.4	87.5	494.0	412.6	276.0	87.5	228.9	344.3	433.0	494.0	62.9	1,106.7	866.1	209.2	62.9	172.6	537.7	926.3	1,106.7
40	47.6	374.3	401.2	805.8	291.5	291.5	353.6	387.8	502.4	805.8	77.7	64.3	392.9	66.7	64.3	66.1	72.2	156.5	392.9
41	3.2	280.5	20.8	198.7	17.3	17.3	19.9	109.8	219.2	280.5	15.0	3.6	234.9	116.4	3.6	12.2	65.7	146.0	234.9
42	6.3	41.8	147.2	133.2	66.0	41.8	60.0	99.6	136.7	147.2	54.6	44.5	34.3	9.5	9.5	28.1	39.4	47.0	54.6
43	19.5	69.4	170.5	392.4	55.6	55.6	66.0	120.0	226.0	392.4	1,135.8	289.5	175.3	241.2	175.3	224.7	265.4	501.1	1,135.8
44	32.8	624.0	842.8	855.1	653.9	624.0	646.4	748.4	845.9	855.1	469.8	718.7	651.3	897.0	469.8	605.9	685.0	763.3	897.0
45	17.1	115.3	59.5	190.3	90.5	59.5	82.8	102.9	134.1	190.3	81.6	328.9	79.6	147.0	79.6	81.1	114.3	192.5	328.9
46	35.1	407.8	158.8	790.5	287.0	158.8	255.0	347.4	503.5	790.5	123.5	990.8	181.1	591.6	123.5	166.7	386.4	691.4	990.8
47	57.9	445.7	209.2	155.1	105.2	105.2	142.6	182.2	268.3	445.7	1,702.0	452.2	231.9	130.9	130.9	206.7	342.1	764.7	1,702.0
48	49.4	348.6	53.2	737.0	508.8	53.2	274.8	428.7	565.9	737.0	384.1	496.4	560.0	568.1	384.1	468.3	528.2	562.0	568.1
49	48.8	234.5	159.7	78.3	208.1	78.3	139.4	183.9	214.7	234.5	369.5	737.4	145.3	790.4	145.3	313.5	553.5	750.7	790.4
50	638.4	1,088.5	2,146.1	1,066.2	954.6	954.6	1,038.3	1,077.4	1,352.9	2,146.1	1,517.7	825.8	800.6	1,517.3	800.6	819.5	1,171.6	1,517.4	1,517.7
51	61.8	220.8	367.8	1,024.6	451.9	220.8	331.1	409.9	595.1	1,024.6	144.1	548.7	567.5	369.2	144.1	312.9	459.0	553.4	567.5
52	8.5	80.7	12.7	9.2	24.5	9.2	11.8	18.6	38.6	80.7	26.2	17.5	80.3	12.4	12.4	16.2	21.9	39.7	80.3
53	17.8	203.0	94.6	807.5	170.8	94.6	151.8	186.9	354.1	807.5	132.3	254.3	455.2	41.1	41.1	109.5	193.3	304.5	455.2
54	52.3	437.3	338.7	1,982.5	424.8	338.7	403.3	431.1	823.6	1,982.5	848.9	296.3	1,283.5	55.0	55.0	236.0	572.6	957.6	1,283.5
55	11.1	11.8	128.8	16.6	89.6	11.8	15.4	53.1	99.4	128.8	62.5	5.6	32.0	1,082.9	5.6	25.4	47.3	317.6	1,082.9
56	24.4	147.2	69.6	101.9	300.2	69.6	93.8	124.6	185.5	300.2	426.5	950.5	327.3	394.7	327.3	377.9	410.6	557.5	950.5
57	43.2	933.5	188.5	86.5	382.3	86.5	163.0	285.4	520.1	933.5	226.4	253.1	220.8	116.1	116.1	194.6	223.6	233.1	253.1
58	93.8	395.9	839.8	376.2	337.8	337.8	366.6	386.1	506.9	839.8	599.7	294.2	197.1	244.9	197.1	233.0	269.6	370.6	599.7
59	123.0	254.1	435.0	313.9	637.7	254.1	299.0	374.5	485.7	637.7	731.7	352.8	294.7	301.2	294.7	299.6	327.0	447.5	731.7
60	23.3	890.6	684.3	1,144.1	388.4	388.4	610.3	787.5	954.0	1,144.1	341.8	26.9	563.7	694.6	26.9	263.1	452.8	596.4	694.6
61	44.9	334.6	95.8	188.0	227.3	95.8	165.0	207.7	254.1	334.6	235.8	115.1	170.9	164.9	115.1	152.5	167.9	187.1	235.8
62	19.2	51.3	86.6	268.6	663.1	51.3	77.8	177.6	367.2	663.1	835.7	1,383.4	725.7	1,287.6	725.7	808.2	1,061.7	1,311.6	1,383.4
63	17.4	24.5	260.5	101.3	119.3	24.5	82.1	110.3	154.6	260.5	164.1	272.7	429.5	342.8	164.1	245.6	307.8	364.5	429.5
64	674.6	2,142.5	2,124.1	1,256.9	1,351.1	1,256.9	1,327.6	1,737.6	2,128.7	2,142.5	1,826.5	1,137.6	1,109.5	1,187.3	1,109.5	1,130.6	1,162.5	1,347.1	1,826.5
65	109.3	389.5	622.8	1,499.5	234.7	234.7	350.8	506.2	842.0	1,499.5	437.8	267.1	232.0	348.5	232.0	258.3	307.8	370.8	437.8
66	44.9	130.8	338.9	380.3	146.0	130.8	142.2	242.5	349.3	380.3	70.2	67.8	198.3	194.8	67.8	69.6	132.5	195.7	198.3
67	736.0	1,148.3	1,067.1	2,369.3	1,071.1	1,067.1	1,070.1	1,109.7	1,453.6	2,369.3	3,004.1	2,447.8	1,266.9	3,494.0	1,266.9	2,152.6	2,726.0	3,126.6	3,494.0
68	15.7	570.5	169.2	784.1	97.7	97.7	151.3	369.9	623.9	784.1	171.4	427.1	601.8	54.9	54.9	142.3	299.3	470.8	601.8
69	41.3	40.8	443.8	58.9	287.5	40.8	54.4	173.2	326.6	443.8	185.3	75.8	98.9	407.7	75.8	93.1	142.1	240.9	407.7
70	50.6	1,034.9	73.7	143.2	128.6	73.7	114.9	135.9	366.1	1,034.9	292.8	62.5	125.6	122.3	62.5	107.4	124.0	167.4	292.8
71	22.5	54.9	145.0	159.7	177.2	54.9	122.5	152.4	164.1	177.2	94.8	34.3	973.2	201.6	34.3	79.7	148.2	394.5	973.2
72	164.3	880.2	1,026.6	492.0	388.4	388.4	466.1	686.1	916.8	1,026.6	326.4	420.8	498.4	374.1	326.4	362.2	397.5	440.2	498.4
73	14.5	514.1	24.4	17.0	588.5	17.0	22.6	269.3	532.7	588.5	55.8	70.4	37.3	102.3	37.3	51.2	63.1	78.4	102.3
74	194.8	492.5	226.3	447.6	484.9	226.3	392.3	466.3	486.8	492.5	712.2	864.6	410.1	619.0	410.1	566.8	665.6	750.3	864.6
75	360.3	1,167.8	750.4	1,133.8	1,290.2	750.4	1,038.0	1,150.8	1,198.4	1,290.2	698.7	1,001.0	789.9	727.7	698.7	720.5	758.8	842.7	1,001.0
76	131.4	649.9	302.4	1,015.8	422.8	302.4	392.7	536.4	741.4	1,015.8	1,227.0	200.7	450.6	236.4	200.7	227.5	343.5	644.7	1,227.0
77	14.6	124.5	204.7	72.8	123.6	72.8	110.9	124.1	144.6	204.7	1,025.2	502.3	507.8	59.4	59.4	391.6	505.1	637.2	1,025.2
78	524.1	1,382.4	808.9	1,029.1	1,026.3	808.9	972.0	1,027.7	1,117.4	1,382.4	848.6	1,528.7	680.5	668.5	668.5	677.5	764.6	1,018.6	1,528.7
79	31.7	221.6	112.2	224.5	69.4	69.4	101.5	166.9	222.3	224.5	198.7	1,256.6	587.6	56.2	56.2	163.1	393.2	754.9	1,256.6
80	148.7	629.5	855.6	549.5	707.3	549.5	609.5	668.4	744.4	855.6	386.1	492.9	399.0	218.8	218.8	344.3	392.6	422.5	492.9
81	41.5	204.5	1,394.9	212.4	320.6	204.5	210.4	266.5	589.2	1,394.9	270.3	377.2	802.8	332.9	270.3	317.3	355.1	483.6	802.8
82	34.3	281.2	227.4	385.3	945.8	227.4	267.8	333.3	525.4	945.8	164.2	368.2	613.3	310.6	164.2	274.0	339.4	429.5	613.3
83	19.2	73.9	203.8	294.8	504.1	73.9	171.3	249.3	347.1	504.1	345.5	526.4	434.3	63.4	63.4	275.0	389.9	457.3	526.4
84	19.0	147.6	47.8	285.3	110.9	47.8	95.1	129.3	182.0	285.3	110.1	319.2	275.3	577.1	110.1	234.0	297.3	383.7	577.1
85	35.6	428.6	480.1	120.1	485.4	120.1	351.5	454.4	481.4	485.4	163.4	398.4	823.0	677.7	163.4	339.7	538.1	714.0	823.0
86	18.0	116.5	78.4	169.4	111.8	78.4	103.5	114.2	129.7	169.4	19.8	85.1	51.2	57.9	19.8	43.4	54.6	64.7	85.1
87	377.4	1,864.5	1,794.2	970.1	1,042.2	970.1	1,024.2	1,418.2	1,811.8	1,864.5	675.2	635.0	328.2	1,181.1	328.2	558.3	655.1	801.7	1,181.1
88	268.4	412.4	377.7	311.4	267.8	267.8	300.5	344.6	386.4	412.4	323.6	990.0	417.7	334.5	323.6	331.8	376.1	560.8	990.0
89	26.5	68.9	50.9	64.3	104.1	50.9	61.0	66.6	77.7	104.1	326.0	836.5	91.1	518.4	91.1	267.3	422.2	597.9	836.5
90	21.8	73.3	333.8	586.9	73.4	73.3	73.4	203.6	397.1	586.9	268.0	111.2	256.6	49.0	49.0	95.7	183.9	259.5	268.0
91	11.2	55.3	326.5	59.7	327.9	55.3	58.6	193.1	326.9	327.9	88.4	79.9	86.6	150.6	79.9	84.9	87.5	104.0	150.6
92	21.2	727.2	996.5	97.6	486.3	97.6	389.1	606.8	794.5	996.5	118.1	494.1	1,260.7	199.7	118.1	179.3	346.9	685.8	1,260.7
93	928.8	1,662.2	1,192.5	1,212.8	1,116.9	1,116.9	1,173.6	1,202.7	1,325.2	1,662.2	1,128.7	1,155.8	1,428.1	1,147.3	1,128.7	1,142.7	1,151.6	1,223.9	1,428.1
94	85.3	427.8	207.4	395.6	490.4	207.4	348.6	411.7	443.5	490.4	435.9	261.9	304.5	449.4	261.9	293.9	370.2	439.3	449.4

95	284.7	395.7	353.3	360.0	374.3	353.3	358.3	367.2	379.7	395.7	713.9	429.4	394.5	435.8	394.5	420.7	432.6	505.3	713.9
96	67.3	111.2	411.3	257.2	74.6	74.6	102.1	184.2	295.7	411.3	397.6	55.1	46.5	645.1	46.5	53.0	226.4	459.5	645.1
97	114.5	224.7	537.3	303.7	309.6	224.7	284.0	306.7	366.5	537.3	1,537.6	943.1	399.2	430.3	399.2	422.5	686.7	1,091.7	1,537.6
98	11.0	34.3	102.5	17.7	60.5	17.7	30.2	47.4	71.0	102.5	494.9	686.8	105.5	145.0	105.5	135.1	320.0	542.9	686.8
99	55.8	151.9	122.4	61.8	899.5	61.8	107.3	137.2	338.8	899.5	569.7	746.8	105.2	1,726.2	105.2	453.6	658.3	991.7	1,726.2

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	72.1	90.9	79.7	90.0	72.1	77.8	84.9	90.2	90.9
LF_CS	235.4	210.2	232.8	229.4	210.2	224.6	231.1	233.5	235.4
LF_I	35.8	30.9	39.2	36.0	30.9	34.6	35.9	36.8	39.2
LF_SR	90.8	76.5	73.1	64.5	64.5	71.0	74.8	80.1	90.8
LF_SS	276.5	238.8	255.4	256.5	238.8	251.3	256.0	261.5	276.5
LF_WR	77.5	67.5	84.4	89.8	67.5	75.0	81.0	85.8	89.8
LF_WS	189.5	181.4	180.1	177.2	177.2	179.4	180.8	183.4	189.5
DF_CS	265.7	266.6	243.4	246.1	243.4	245.4	255.9	265.9	266.6
DF_SS	301.9	285.6	294.7	297.1	285.6	292.4	295.9	298.3	301.9
DF_WS	253.5	205.5	205.6	224.6	205.5	205.6	215.1	231.8	253.5
DF_I	60.8	78.9	79.5	53.4	53.4	59.0	69.9	79.1	79.5