



Dell PowerEdge R720xd using EXASolution 5.0

TPC-H Rev. 2.17.0
TPC-Pricing Rev. 1.7.0

Report Date
September 22, 2014

Total System Cost

Composite Query per Hour Metric

Price / Performance

\$4,222,459

11,612,395.5

\$0.37

QphH@100000GB

\$/ QphH@100000GB

Database Size

Database Manager

Operating System

Other
Software

Availability Date

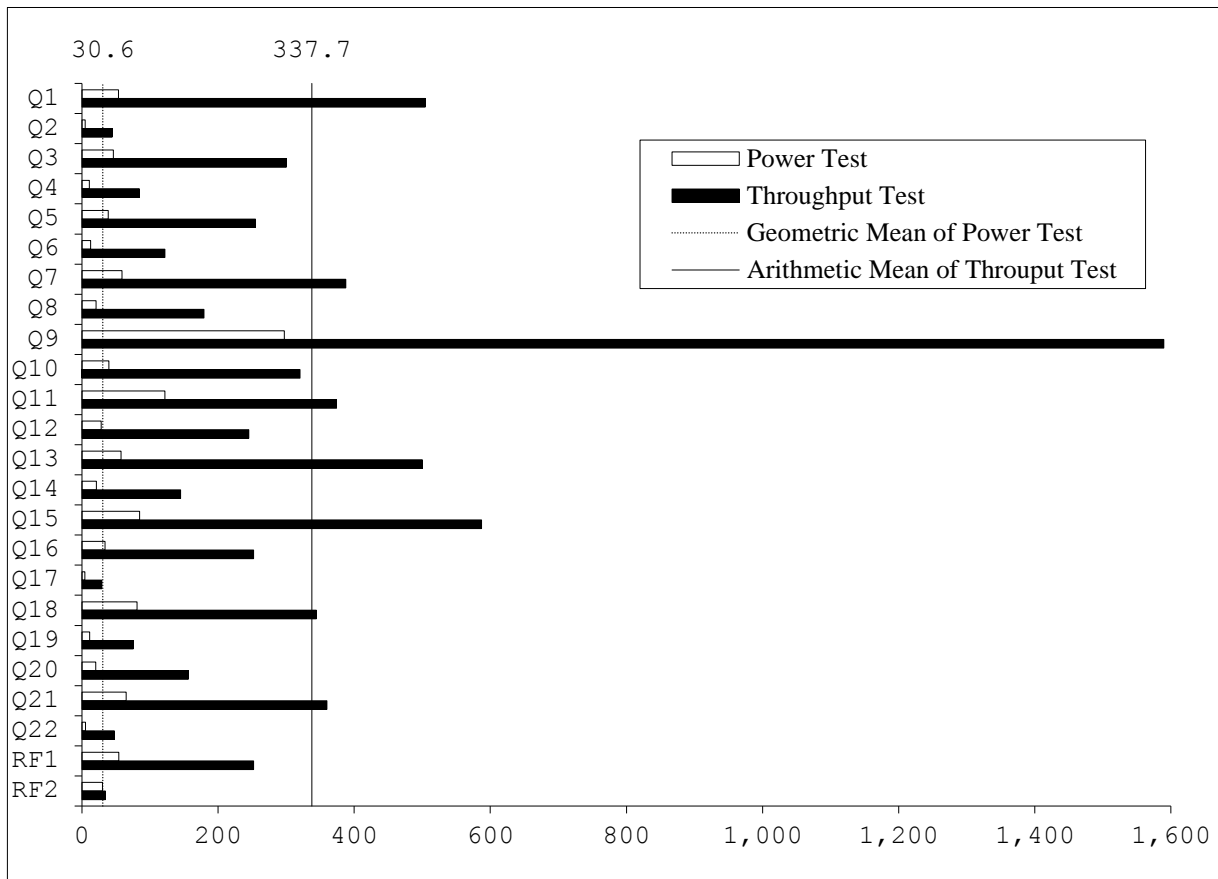
100,000GB

EXASolution 5.0

EXAClusterOS 5.0

None

September 22, 2014



Database Load Time = 16:38:43
Load Includes Backup: N
Total Data Storage / Database Size = 7.95
Memory to Database Size Percentage = 38.4%

Storage Redundancy Levels:

Base Tables	Level One
Auxiliary Data Structures	Level One
DBMS Temporary Space	Level One
OS and DBMS Software	Level One

System Configuration:

50 x Dell PowerEdge R720xd Server, each with:
768 GB RAM
2 x Intel Xeon E5-2680v2 10C 2.8 GHz processors (each 10 cores, 20 threads)
2 x 146 GB (15k rpm) internal SAS disks
14 x 1199 GB (10k rpm) internal SAS disks

Total Storage: 795,256 GB



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Description	Key	Part Number	Unit Price \$	Qty	Ext. Price \$	3 Yr. Maint.
Hardware						
Server Hardware	1		49,342.48	50	2,467,124.00	included
OEM R720XD Chassis up to 24 HDDs+2 Flex bays	1	210-ABNG		1		
Intel Xeon E5-2680v2, 2.8GHz, 10C	1	338-BCUH		2		
32GB LRDIMM , 1,866MT/s, Quad Rank	1	370-ABGL		24		
1.2TB SAS 6Gbit/s, 2.5", 10k, Hot Plug HDD	1	400-AAHL		14		
146GB, SAS 6Gbit/s, 2.5", 15k Hit Plug HDD (Flex Bay)	1	408-10128		2		
PERC H710p integrated RAID-Controller 1GB Cache	1	405-12071		1		
Hot-Plug redundat Power Supply (1+1) 1100W	1	450-17883		1		
Intel Ethernet i350 QP 1Gbit/s Network Daughtercard	1	540-11050		1		
Intel X520 DP 10Gbit/s DA/SFP+Serveradapter	1	540-11063		2		
iDRAC7 Enterprise including 8GB SD Card	1	528-10006		1		
Sliding Ready Rack Rails with cable management arm	1	770-11607		1		
39M ProSupport for OEM and Next Business Day On-Site Service	1	710-33226		1		
Exasol Bezel Branding	1	CFI BGMK01		1		
DELL DISCOUNT 30%	1				-740,137.20	
S4810P, 48x10GbE SFP+ Ports, 4xQSFP 40GbE Ports	1	210-38654	32,806.62	2	65,613.24	included
Dell Networking N2048, L2, 48x 1GbE + 2x10GbE SFO	1	210-ABNX	4,710.64	3	14,131.92	included
Rack TFT + Keyboard	1	A7485906	1,621.55	4	6,486.20	included
DELL DISCOUNT 30%	1				-25,869.41	
Dell Networking, Cable, SFP+ to SFP+, 10GbE, 3 meter	1	470-13555	186.48	100	18,648.00	
Dell Networking, Cable, 40GbE (QSFP+) to 4x10GbE SFP+	1	470-13548	748.61	2	1,497.22	
C2G Cat6 550MHz Snagless Patch Cable, 3 meter	1	A6928965	4.11	100	411.00	
DELL DISCOUNT 10%	1				-2,055.62	
APC Smart-UPS RT 12 kW 15000VA incl. Shutdown Software	1	A7067515	12,416.91	4	49,667.64	included
APC Basic Rack PDU Zero U, 120/208/230 V	1	A7067488	429.89	16	6,878.24	included
Dell NetShelter SX Deep Enclosure 42U	1	A7545497	1,486.42	4	5,945.68	included
APC IEC 320 EN 60320 C19 (W) - IEC 309 (M) – 2.4 m	1	A7155860	166.84	8	1,334.72	included
POWER CORD IEC 320 C19 TO IEC 320 C20 NS	1	A7294276	97.92	8	783.36	included
Reference offer Dell: 29862683	1					
Hardware Subtotal					1,870,458.99	
Software						
EXASolution 5.0 (incl. EXACluster OS 5.0)	2	35-40TB	2,100,000.00	1	2,100,000.00	252,000.00
Software Subtotal					2,100,000.00	252,000.00
Total					\$3,970,458.99	\$252,000.00

Three-Year Cost of Ownership: **\$4,222,459**
QphH@100000GB: **11,612,395.5**
\$/QphH@100000GB: **\$0.37**

Price Key: 1 DELL Emanuel Lippmann emanuel_lippmann@dell.com
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Audited by Francois Raab of InfoSizing, Inc. (www.sizing.com)

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 the TPC at pricing@tpc.org. Thank you.



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Numerical Quantities

Measurement Results

Database Scale Factor	100,000 GB
Total Data Storage / Database Size	7.95
Percentage Memory / Database Size	38.4%
Start of Database Load	2014-08-27 23:43:04
End of Database Load	2014-08-28 16:21:47
Database Load Time	16:38:43
Query Streams for Throughput Test	11
TPC-H Power	11,754,288.9
TPC-H Throughput	11,472,214.9
TPC-H Composite Query-per-Hour Metric (QphH@100000GB)	11,612,395.5
Total System Price Over 3 Years	\$4,222,459
TPC-H Price/ Performance Metric (\$/QphH@100000GB)	\$0.37

Measurement Interval

Measurement Interval in Throughput Test (Ts) 7,594 seconds

Duration of Stream Execution

Power Run	Seed	Query Start Time	Duration (sec)	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
	828162147	2014-08-28 18:43:54	00 00:18:40	2014-08-28 18:43:00	2014-08-28 19:02:34
		2014-08-28 19:02:34		1,120	2014-08-28 18:43:54

Throughput Stream	Seed	Query Start Time	Duration (sec)	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
1	828162148	2014-08-28 19:03:03	00 02:02:39	2014-08-28 19:03:03	2014-08-28 19:06:19
		2014-08-28 21:05:42		7,359	2014-08-28 19:06:19
2	828162149	2014-08-28 19:03:04	00 02:00:01	2014-08-28 19:06:50	2014-08-28 19:10:41
		2014-08-28 21:03:05		7,201	2014-08-28 19:10:41
3	828162150	2014-08-28 19:03:12	00 02:05:36	2014-08-28 19:11:06	2014-08-28 19:15:12
		2014-08-28 21:08:48		7,536	2014-08-28 19:15:12
4	828162151	2014-08-28 19:03:07	00 02:02:40	2014-08-28 19:15:37	2014-08-28 19:21:58
		2014-08-28 21:05:47		7,360	2014-08-28 19:21:58
5	828162152	2014-08-28 19:03:06	00 02:03:07	2014-08-28 19:22:17	2014-08-28 19:25:45
		2014-08-28 21:06:13		7,387	2014-08-28 19:25:45
6	828162153	2014-08-28 19:03:04	00 02:02:43	2014-08-28 19:26:18	2014-08-28 19:29:55
		2014-08-28 21:05:47		7,363	2014-08-28 19:29:55
7	828162154	2014-08-28 19:03:10	00 02:04:55	2014-08-28 19:30:43	2014-08-28 19:35:01
		2014-08-28 21:08:05		7,495	2014-08-28 19:35:01
8	828162155	2014-08-28 19:03:11	00 02:06:26	2014-08-28 19:35:40	2014-08-28 19:39:04
		2014-08-28 21:09:37		7,586	2014-08-28 19:39:04
9	828162156	2014-08-28 19:03:14	00 02:05:30	2014-08-28 19:39:46	2014-08-28 19:43:47
		2014-08-28 21:08:44		7,530	2014-08-28 19:43:47
10	828162157	2014-08-28 19:03:18	00 02:05:28	2014-08-28 19:44:34	2014-08-28 19:48:44
		2014-08-28 21:08:46		7,528	2014-08-28 19:48:44
11	828162158	2014-08-28 19:03:19	00 02:03:02	2014-08-28 19:49:17	2014-08-28 19:58:19
		2014-08-28 21:06:21		7,382	2014-08-28 19:58:19



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TPC-H Timing Intervals (in seconds)

Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
0	53.5	4.7	46.3	11.0	38.7	12.6	58.7	20.7	297.3	39.5	121.9	28.5
1	499.2	47.6	341.3	70.7	258.9	114.2	457.4	147.3	1,596.3	305.6	391.1	311.0
2	503.5	58.7	357.0	89.4	340.8	178.2	389.2	466.0	1,077.2	405.8	381.7	255.9
3	575.0	42.5	152.1	121.3	308.2	98.2	400.3	149.1	2,151.2	291.2	406.5	226.7
4	474.2	36.8	320.9	86.9	278.5	138.3	417.9	144.6	1,794.3	353.2	373.8	366.1
5	622.6	36.6	372.9	80.5	307.5	110.7	416.6	119.6	1,587.9	294.5	449.4	261.4
6	492.8	40.8	319.5	92.2	335.6	151.7	471.1	140.9	1,784.4	333.2	380.1	259.3
7	574.4	37.9	311.5	86.9	282.6	116.2	445.2	131.3	2,025.2	332.6	384.1	123.6
8	633.2	59.9	349.2	104.2	283.3	111.2	418.4	137.0	2,003.4	315.7	263.4	287.3
9	565.3	68.3	306.3	110.4	172.3	124.7	393.5	172.3	1,671.5	499.7	536.8	256.3
10	582.8	45.2	379.0	58.9	95.7	183.0	411.0	54.4	1,701.2	361.2	396.5	284.6
11	476.0	51.2	344.7	100.0	356.5	123.8	375.6	467.4	1,386.8	311.1	404.2	283.8
Min	53.5	4.7	46.3	11.0	38.7	12.6	58.7	20.7	297.3	39.5	121.9	28.5
Avg	504.4	44.2	300.1	84.4	254.9	121.9	387.9	179.2	1,589.7	320.3	374.1	245.4
Max	633.2	68.3	379.0	121.3	356.5	183.0	471.1	467.4	2,151.2	499.7	536.8	366.1

Stream ID	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
0	57.6	21.3	84.7	34.0	4.2	81.2	11.2	20.5	65.0	5.1	54.3	30.1
1	523.9	143.9	652.8	517.5	79.9	266.9	41.9	200.0	344.5	46.5	195.3	30.5
2	504.2	190.6	642.4	241.6	35.1	417.8	80.7	197.9	343.4	43.8	231.3	24.8
3	507.7	153.9	600.6	231.0	22.0	416.6	64.3	157.3	414.4	44.5	246.4	25.0
4	524.9	132.3	567.6	253.9	21.4	384.6	115.8	120.4	399.9	52.5	380.2	19.6
5	571.0	176.2	717.6	297.4	18.7	332.3	74.2	123.9	364.9	49.7	207.9	32.9
6	512.6	125.6	601.2	281.5	25.7	419.0	50.6	163.3	328.7	51.8	217.0	47.6
7	522.6	133.5	560.1	270.3	26.7	420.9	60.1	164.1	433.2	51.1	258.3	39.2
8	526.4	177.0	602.7	219.5	25.4	401.1	140.9	123.3	356.1	46.7	203.6	42.3
9	554.3	106.6	639.5	81.5	29.1	345.6	126.9	309.0	405.7	53.0	240.6	46.9
10	675.8	188.8	698.2	309.3	42.9	328.7	63.7	122.9	481.4	61.9	250.4	32.8
11	517.6	190.8	678.6	287.2	19.0	315.6	72.6	171.8	382.9	63.4	542.0	41.2
Min	57.6	21.3	84.7	34.0	4.2	81.2	11.2	20.5	65.0	5.1	54.3	19.6
Avg	499.9	145.0	587.2	252.1	29.2	344.2	75.2	156.2	360.0	47.5	252.3	34.4
Max	675.8	190.8	717.6	517.5	79.9	420.9	140.9	309.0	481.4	63.4	542.0	47.6