



Dell Inc.

TPC Benchmark™ H Full Disclosure Report

Dell PowerEdge R6415

(with 20x Dell PowerEdge R6415 Servers)

using

Exasol 6.2

**First Edition
July 8, 2019**

*Dell PowerEdge R6415
using
Exasol 6.2*

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Dell PowerEdge R6415 using Exasol 6.2

TPC-H Rev. 2.18.0
TPC-Pricing Rev. 2.4.0

Report Date
July 8, 2019

Total System Cost

Composite Query per Hour Metric

Price / Performance

\$809,230

8,667,578
QphH@10000GB

\$ 0.10
\$ / QphH@10000GB

Database Size

Database Manager

Operating System

Other Software

Availability Date

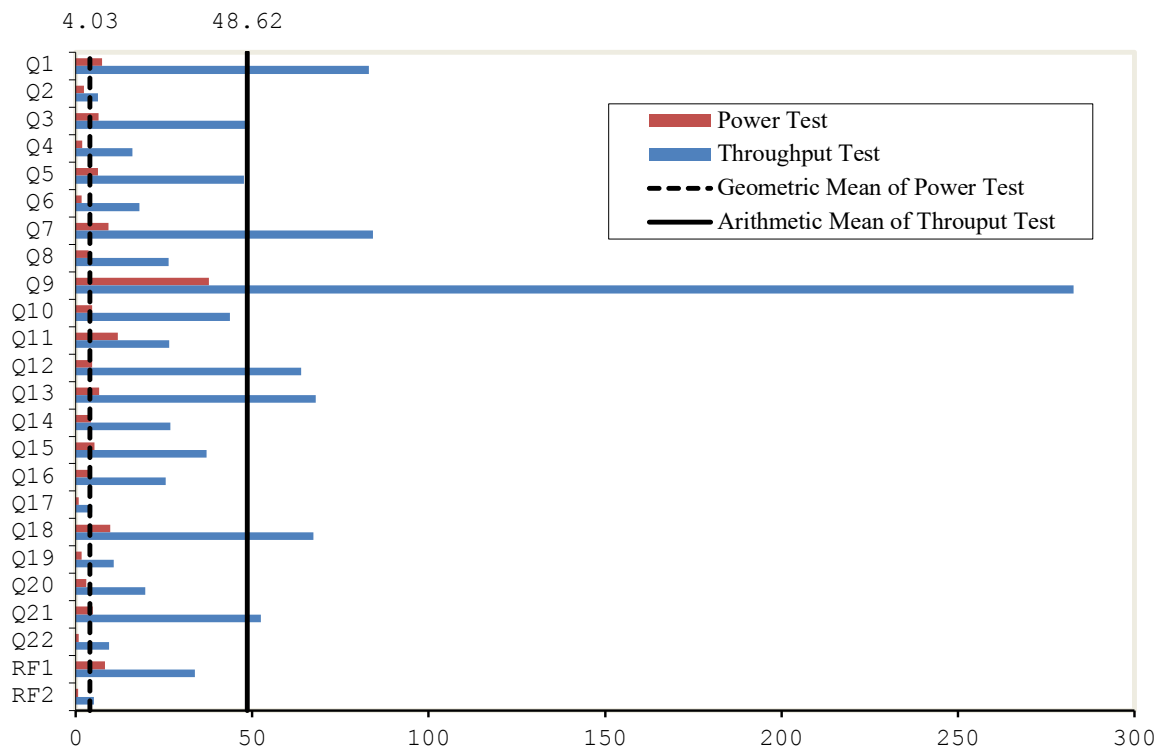
10,000GB

Exasol 6.2

CentOS 7.6

None

July 8, 2019



Database Load Time = 00d 02h 34m 20s
 Load Includes Backup: N
 Total Data Storage / Database Size = 1.94
 Memory to Database Size Percentage = 51.2%

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:

20 x Dell PowerEdge R6415 Server, each with:
 256 GB RAM
 1 x AMD EPYC™ 7551P 2.00GHz/2.55GHz processor (each 32 cores, 64 threads)
 2 x 480 GB SSD internal SSD disks
 + 1 x 1600 GB NVMe internal drive

Total Storage: 19,372 GiB



Dell PowerEdge R6415 using Exasol 6.2

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Description	Part	Key	Unit Price	Qty	Ext. Price \$	3 Yr.
SERVER COMPONENTS						
PowerEdge R6415 Server						
PowerEdge R6415/R7415 Motherboard	210-ANJO	1	319.00	20	6,380.00	
No Trusted Platform Module	384-BBSR	1	0.00	20	0.00	
2.5" Chassis with up to 10 Hard Drives, including up to 8 SAS/SATA or 9 NVME Drives	461-AADZ	1	0.00	20	0.00	
PowerEdge R6415 Shipping	321-BDFY	1	100.00	20	2,000.00	
PowerEdge R6415 x4 or x10 Drive Shipping Material	340-BTFM	1	0.00	20	0.00	
AMD EPYC™ 7551P 2.00GHz/2.55GHz, 32C/64T, 64M Cache (180W) DDR4-2666	343-BBGL	1	99.00	20	1,980.00	
Standard Heatsink	338-BNCU	1	2,849.00	20	56,980.00	
2666MT/s RDIMMs	412-AALH	1	19.00	20	380.00	
Performance Optimized	370-ADNU	1	0.00	20	0.00	
Unconfigured RAID	370-AAIP	1	0.00	20	0.00	
PERC H740P RAID Controller, 8GB NV Cache, Mini card	780-BCDS	1	0.00	20	0.00	
iDRAC9,Enterprise	405-AAMS	1	1,049.00	20	20,980.00	
iDRAC Group Manager, Disabled	385-BBKT	1	489.00	20	9,780.00	
iDRAC,Factory Generated Password	379-BCQY	1	0.00	20	0.00	
Riser Config 1, 2 x 16 LP	379-BCSF	1	0.00	20	0.00	
On-Board LOM	330-BBIV	1	79.00	20	1,580.00	
No Internal Optical Drive	542-BBBP	1	0.00	20	0.00	
Dual, Hot Plug, Redundant Power Supply (1+1), 550W	429-AAIQ	1	0.00	20	0.00	
No Bezel	450-AGZB	1	559.00	20	11,180.00	
Dell EMC Luggage Tag	350-BBBW	1	0.00	20	0.00	
No Quick Sync	350-BBME	1	0.00	20	0.00	
Performance BIOS Settings	350-BBKR	1	49.00	20	980.00	
UEFI BIOS Boot Mode with GPT Partition	384-BBBL	1	0.00	20	0.00	
ReadyRails Sliding Rails With Cable Management Arm	800-BBDM	1	0.00	20	0.00	
No Systems Documentation, No OpenManage DVD Kit	770-BCKT	1	189.00	20	3,780.00	
32GB RDIMM 2666MT/s Dual Rank	631-AAACK	1	0.00	20	0.00	
480GB SSD SATA Mixed Use 6Gbps 512e 2.5in Hot Plug S4610 Drive	370-ADNF	1	1,119.00	160	179,040.00	
Mellanox ConnectX-4 Lx Dual Port 25GbE SFP28 Network Adapter, Low Profile C13 to C14, PDU Style, 12 AMP, 6.5 Feet (2m) Power Cord, North America	400-ATHD	1	629.00	40	25,160.00	
Dell 1.6 TB, NVMe, Mixed Use Express Flash, 2.5 SFFDrive, U.2, PM1725a with Carrier	406-BBLD	1	749.00	20	14,980.00	
Dell Hardware Limited Warranty Plus On-Site Service	492-BBDI	1	20.00	40	800.00	
ProSupport Mission Critical: 7x24 HW/SW Technical Support & Assistance, 3 Years	400-AUMP	1	3,099.00	1	3,099.00	
ProSupport Mission Critical: 4-Hour 7x24 On-Site Service with Emergency Dispatch, 3 Years	816-0779	1	200.00	20	4,000.00	4,000.00
	816-0796	1	1,438.00	20	28,760.00	28,760.00
	816-0784	1	262.00	20	5,240.00	5,240.00
OTHER HARDWARE COMPONENTS						
Dell EMC S5048F-ON Switch,48x 25GbE,6x 100GbE QSFP28, IO to PSU, 2 PSU, OS10	210-ANCK	1	22,010.00	1	22,010.00	
OS10 Enterprise S5048F-ON	634-BMIF	1	0.00	1	0.00	
Dell Networking, Cable, SFP28 to SFP28, 25GbE, Passive Copper Twinax Direct Attach Cable, 2 Meter	470-ACET	1	215.00	20	4,300.00	
Dell EMC S5048 Series User Guide	343-BBFV	1	6.00	1	6.00	
Force10, Power Cord, 125V, 15A, 10 Feet, NEMA 5-15/C13, S-Series	450-AAFH	1	20.00	1	20.00	
Dell Hardware Limited Warranty 1 Year	814-8268	1	422.00	1	422.00	
Dell Limited Hardware Warranty Extended Year(s)	975-3461	1	0.00	1	0.00	0.00
Mission Critical Package: 4-Hour 7X24 On-Site Service with Emergency Dispatch, 2 Year Extended	814-8278	1	423.00	1	423.00	423.00
ProSupport: 7x24 HW / SW Tech Support and Assistance, 3 Year	814-8288	1	5,956.00	1	5,956.00	5,956.00
Info 3rd Party Software Warranty provided by Vendor	997-6306	1	0.00	1	0.00	0.00
Mission Critical Package: 4-Hour 7X24 On-Site Service with Emergency Dispatch, 1 Year	814-8277	1	111.00	1	111.00	111.00
APC NetShelter SX 24U 600mm x 1070mm Deep Enclosure	A7067508	1	1,129.99	1	1,129.99	
Rack PDU, Basic, Zero U, 15A, 120V, 5-15 input, (14) 5-15 output	A7541364	1	174.99	1	174.99	
Logitech MK120 Keyboard and Mouse	A6999510	1	15.99	1	15.99	
Dell 24 Monitor	210-AIWG	1	169.99	1	169.99	
Hardware Subtotal					367,327.96	44,490.00

SOFTWARE

Exasol 10TB Subscription ¹⁾	2	15,034.00	36	541,548.00	
Software Subtotal				541,548.00	
Total				908,875.96	44,490.00
Large Purchase Discount (35%) ²⁾				-128,564.79	-15,571.50

Three-Year Cost of Ownership: \$809,230
QphH@10000GB: 8,667,578
\$/QphH@10000GB: \$ 0.10

Price Key: 1 DELL Waseem Raja
Weyman Trichel
2 Exasol Gunther Schweer sales@Exasol.com

¹⁾ Includes software (DB & OS) support 24x7

²⁾ Discount applies to all line items where Key = 1. Discount based upon total system cost as purchased by a regular customer.

Audited by Francois Raab of InfoSizing (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.



**Dell PowerEdge R6415
using Exasol 6.2**

TPC-H Rev. 2.18.0
TPC-Pricing Rev. 2.4.0

Report Date
July 8, 2019

Numerical Quantities

Measurement Results

Database Scale Factor	10,000 GB
Total Data Storage / Database Size	1.94
Percentage Memory / Database Size	51.2%
Start of Database Load	2019-06-18 13:17:18
End of Database Load	2019-06-18 15:51:38
Database Load Time	00d 02h 34m 20s
Query Streams for Throughput Test	12
TPC-H Power	8,930,331.9
TPC-H Throughput	8,412,555.1
TPC-H Composite Query-per-Hour Metric (QphH@10000GB)	8,667,578
Total System Price Over 3 Years	\$809,230
TPC-H Price/ Performance Metric (\$/QphH@10000GB)	\$ 0.10

Measurement Interval

Measurement Interval in Throughput Test (Ts)	1129.74 seconds
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Duration of Stream Execution

Power Run	Seed	Query Start Time	Total Time (hh:mm:ss)	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
	618155138	2019-06-18 15:51:53.00	0:02:19	2019-06-18 15:51:44.56	2019-06-18 15:54:12.13
		2019-06-18 15:54:12.13		2019-06-18 15:51:52.90	2019-06-18 15:54:12.76
Throughput Stream	Seed	Query Start Time	Total Time (hh:mm:ss)	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
1	618155139	2019-06-18 15:54:15.40	0:17:38	2019-06-18 15:54:12.77	2019-06-18 15:54:35.21
		2019-06-18 16:11:53.08		2019-06-18 15:54:35.19	2019-06-18 15:54:37.32
2	618155140	2019-06-18 15:54:12.87	0:18:50	2019-06-18 15:54:37.35	2019-06-18 15:55:00.38
		2019-06-18 16:13:02.51		2019-06-18 15:55:00.33	2019-06-18 15:55:03.20
3	618155141	2019-06-18 15:54:15.63	0:17:54	2019-06-18 15:55:03.22	2019-06-18 15:55:31.96
		2019-06-18 16:12:09.33		2019-06-18 15:55:31.95	2019-06-18 15:55:34.26
4	618155142	2019-06-18 15:54:14.17	0:17:53	2019-06-18 15:55:34.29	2019-06-18 15:56:04.43
		2019-06-18 16:12:06.90		2019-06-18 15:56:04.43	2019-06-18 15:56:06.91
5	618155143	2019-06-18 15:54:13.90	0:17:30	2019-06-18 15:56:06.92	2019-06-18 15:56:30.03
		2019-06-18 16:11:44.23		2019-06-18 15:56:30.00	2019-06-18 15:56:35.84
6	618155144	2019-06-18 15:54:15.27	0:17:49	2019-06-18 15:56:35.87	2019-06-18 15:57:06.41
		2019-06-18 16:12:04.45		2019-06-18 15:57:06.38	2019-06-18 15:57:11.49
7	618155145	2019-06-18 15:54:15.70	0:17:51	2019-06-18 15:57:11.50	2019-06-18 15:57:36.73
		2019-06-18 16:12:07.18		2019-06-18 15:57:36.72	2019-06-18 15:57:40.26
8	618155146	2019-06-18 15:54:15.32	0:17:54	2019-06-18 15:57:40.28	2019-06-18 15:58:10.21
		2019-06-18 16:12:09.07		2019-06-18 15:58:10.20	2019-06-18 15:58:16.75
9	618155147	2019-06-18 15:54:13.07	0:17:28	2019-06-18 15:58:16.78	2019-06-18 15:58:57.38
		2019-06-18 16:11:40.92		2019-06-18 15:58:57.34	2019-06-18 15:59:06.03
10	618155148	2019-06-18 15:54:13.94	0:17:49	2019-06-18 15:59:06.12	2019-06-18 15:59:52.97
		2019-06-18 16:12:02.79		2019-06-18 15:59:52.97	2019-06-18 16:00:00.37
11	618155149	2019-06-18 15:54:17.41	0:17:32	2019-06-18 16:00:00.38	2019-06-18 16:00:50.19
		2019-06-18 16:11:49.09		2019-06-18 16:00:50.16	2019-06-18 16:00:56.33
12	618155150	2019-06-18 15:54:13.92	0:17:49	2019-06-18 16:00:56.34	2019-06-18 16:01:52.21
		2019-06-18 16:12:02.94		2019-06-18 16:01:52.18	2019-06-18 16:02:00.28



**Dell PowerEdge R6415
using Exasol 6.2**

TPC-H Rev. 2.18.0
TPC-Pricing Rev. 2.4.0

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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	7.50	2.31	6.53	1.86	6.40	1.73	9.29	3.68	37.82	4.74	11.96	4.65
1	87.28	5.92	50.69	16.56	41.42	17.12	84.69	24.58	256.42	41.23	27.81	64.61
2	7.59	12.25	6.80	1.83	93.61	26.39	99.33	53.27	381.59	73.56	12.00	134.11
3	84.78	6.33	29.29	16.74	44.68	18.04	83.77	26.18	299.29	40.32	28.08	61.49
4	89.97	6.04	46.94	15.68	44.77	16.04	79.27	26.25	288.24	40.43	31.34	56.64
5	89.46	6.08	62.63	15.82	42.99	17.57	83.50	23.11	256.26	37.40	27.83	58.77
6	93.72	4.80	51.95	19.04	43.69	17.11	81.99	22.38	284.14	38.66	31.53	56.73
7	88.91	5.45	57.72	15.56	41.19	17.44	85.72	22.47	300.27	40.71	28.94	36.06
8	97.82	5.59	52.06	16.29	46.18	16.74	81.27	20.94	276.28	40.52	21.19	59.94
9	88.53	5.17	59.39	20.10	41.91	18.16	81.71	21.82	250.62	46.56	28.96	56.91
10	86.34	5.91	61.50	18.59	36.99	17.95	83.37	24.32	262.12	40.15	26.98	64.48
11	90.40	5.99	55.23	19.75	52.58	16.62	80.12	23.95	254.32	43.34	26.40	59.06
12	91.71	5.58	56.12	17.97	41.96	17.73	85.60	26.54	283.55	41.97	26.84	58.07
Qi Min	7.50	2.31	6.53	1.83	6.40	1.73	9.29	3.68	37.82	4.74	11.96	4.65
Qi Avg	77.23	5.96	45.91	15.06	44.49	16.82	78.43	24.58	263.92	40.74	25.37	59.35
Qi Max	97.82	12.25	62.63	20.10	93.61	26.39	99.33	53.27	381.59	73.56	31.53	134.11

Stream ID	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
0	6.65	4.29	5.39	3.46	0.79	9.83	1.61	2.93	4.85	0.86	8.34	0.63
1	69.25	22.36	35.92	28.28	4.35	73.88	9.51	24.98	63.02	7.78	22.41	2.10
2	7.76	50.10	62.89	37.63	9.34	10.17	21.32	2.78	5.22	20.11	22.98	2.83
3	70.65	28.87	34.81	21.78	3.57	76.22	10.40	21.91	58.07	8.42	28.73	2.29
4	75.62	21.81	38.18	25.39	3.37	78.24	9.96	11.42	58.68	8.45	30.14	2.48
5	77.75	25.66	32.60	23.83	3.94	69.71	8.82	21.48	59.12	5.99	23.08	5.81
6	75.58	21.84	33.66	22.74	3.90	80.20	11.06	21.58	44.23	8.65	30.52	5.08
7	67.29	24.88	36.99	23.19	3.45	68.89	10.28	21.57	66.20	8.33	25.22	3.54
8	72.10	27.18	36.18	23.86	4.35	83.03	10.89	22.19	50.95	8.20	29.92	6.54
9	72.35	21.29	37.29	25.24	3.63	72.68	10.94	23.23	52.24	9.13	40.56	8.65
10	80.56	26.85	33.69	26.30	7.57	64.23	8.26	21.29	62.21	9.20	46.85	7.40
11	73.71	24.23	36.19	23.20	4.16	64.48	8.95	21.60	57.24	10.13	49.77	6.15
12	74.60	26.23	27.64	25.07	3.70	65.64	8.85	21.75	52.76	9.12	55.84	8.07
Qi Min	6.65	4.29	5.39	3.46	0.79	9.83	1.61	2.78	4.85	0.86	8.34	0.63
Qi Avg	63.37	25.05	34.73	23.84	4.32	62.86	10.07	18.36	48.83	8.80	31.87	4.74
Qi Max	80.56	50.10	62.89	37.63	9.34	83.03	21.32	24.98	66.20	20.11	55.84	8.65