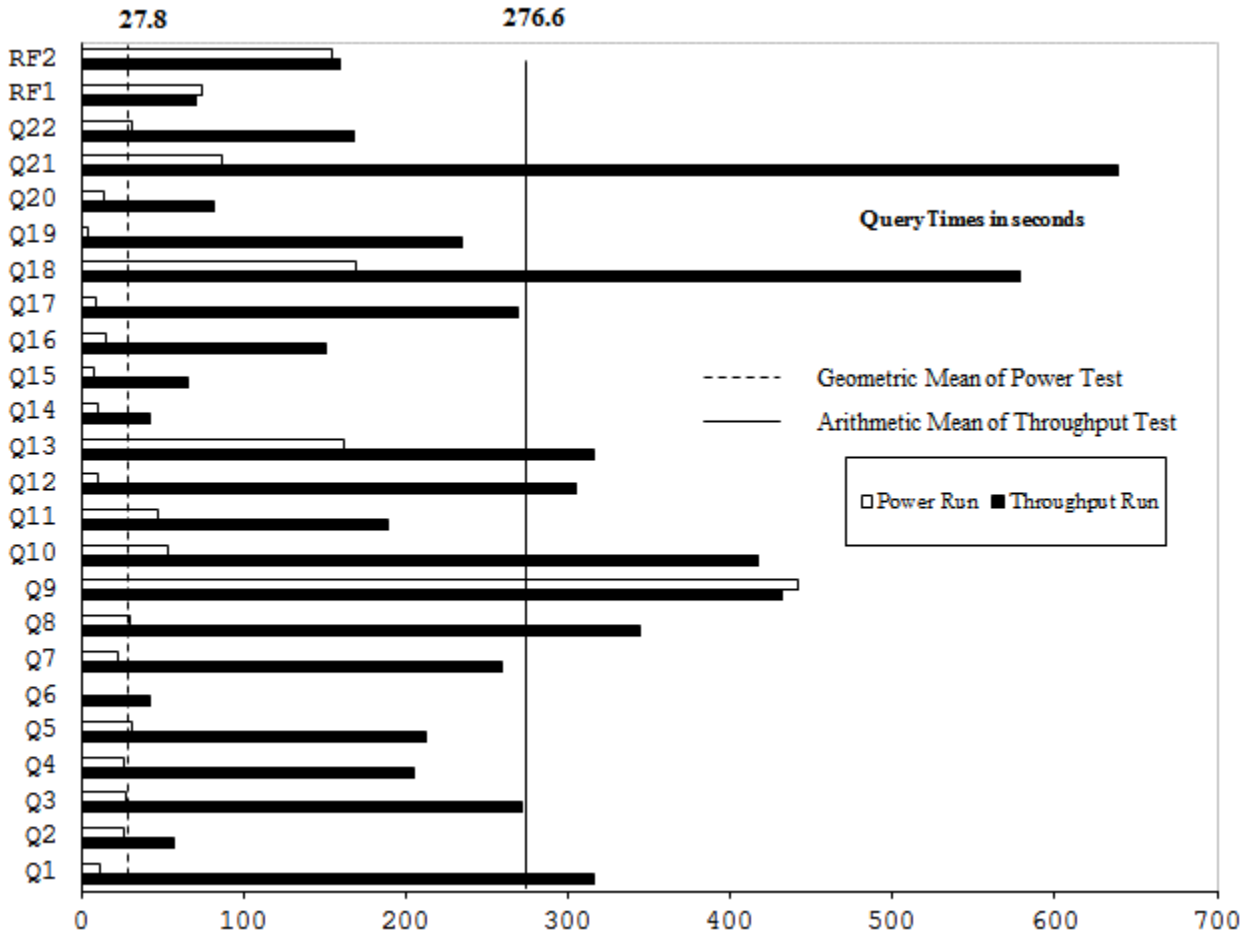


<b>Hewlett Packard Enterprise</b>		<b>HPE ProLiant DL580 Gen9</b>		TPC-H Rev. 2.17.0 TPC Pricing Rev. 1.7.0
Total System Cost		Composite Query per Hour Rating		Report Date: June 27, 2016
<b>\$1,113,548 USD</b>		<b>1,047,243.5</b> QphH @ 10000GB		<b>\$1.07 USD</b> \$/ QphH @10000GB
Database Size	Database Manager	Operating System	Other Software	Availability Date
10000GB	SQL Server 2016 Enterprise Edition	Windows Server 2016 Standard Edition	None	September 30, 2016



Database Load Time = 00d 15h 17m 22s	Storage Redundancy Level	
Load included backup: Y	Base Tables and Auxiliary Data Structures	0
Total Data Storage / Database Size = 6.37	DBMS Temporary Space	0
Memory/Database Size = 61.4%	OS and DBMS Software	1

System Components	System Total	Per Node
Nodes:	1	n.a.
Intel(R) Xeon(R) CPU E7-8890 v4 @ 2.20GHz:	4	4
Cores/Threads:	48/96	48/96
Memory:	6TB	6TB
Network Interfaces (on-board GigE):	1	1
(P431 HBA):	3	3
Storage Shelves D3700:	9	9
Storage Subsystem Disk Drives (400GB 12G SAS SSD):	87	n.a.
(300GB 6G SAS HDD):	112	n.a.
Total Storage:	63,689 GB	n.a.

Description	Price Key	Part Number	Unit Price	Qty	Extended Price	3 Yr Maint Price
<b>Server Hardware</b>						
HPE ProLiant DL580 G9 CTO Server (Customer to Order)	1	793161-B21	\$4,999	1	\$4,999	
HPE DL580 Gen9 Intel® Xeon® E7-8890 v4 (2.20GHz/24-core)	1	816643-B21	\$10,579	1	\$10,579	
HPE DL580 Gen9 Intel® Xeon® E7-8890 v4 (2.20GHz/24-core)	1	816643-L21	\$10,579	3	\$31,737	
HPE 64GB 4Rx4 PC4-2133P-L Kit	1	726724-B21	\$1,999	96	\$191,904	
HPE DL580 Gen9 12 DIMM Memory Cartridge	1	788360-B21	\$549	8	\$4,392	
HP DL580 Gen8/Gen9 5 SFF Drive Backplane Kit	1	739405-B21	\$349	1	\$349	
HPE Smart Array 2GB 24in FIO Flashback Write Cache	1	758836-B21	\$549	1	\$549	
HPE DL580 Gen9 SSD Express Bay Enablement Kit	1	788359-B21	\$999	1	\$999	
HP 400GB PCIe Mixed Use SFF 2.5-in SC2 3yr Wty SSD	1	765034-B21	\$2,029	3	\$6,087	
HPE 1200W CS Plat PL HtPlg Pwr Supply Kit	1	656364-B21	\$429	2	\$858	
HPE 3y 4h 24x7 ProLiant D380 Gen9 FC SVC HW Support	1	U8NF6E	\$2,961	1		\$2,961
HP 17" FlatPanel Monitor	1	GV537A8	\$130	3	\$390	
HP PS/2 Keyboard And Mouse Bundle	1	RC464AA	\$39	3	\$117	
			<b>Subtotal</b>		<b>\$252,960</b>	<b>\$2,961</b>
<b>Storage</b>						
HPE Universal Rack 11642 1075mm Shock Rack	1	H6J66A	\$1,699	1	\$1,699	
HPE 24A High Voltage Core Only Corded PDU	1	252663-D74	\$259	2	\$518	
HPE StorageWorks D3700 Disk Enclosure	1	QW967A	\$3,399	9	\$30,591	
HPE StorageWorks D3700 Disk Enclosure (10% Spares)	1	QW967A	\$3,399	2	\$6,798	
HPE 400GB 12G SAS ME 2.5in SC EM SSD	1	J9F37A	\$3,099	84	\$260,316	
HPE 400GB 12G SAS ME 2.5in SC EM SSD (10% Spares)	1	J9F37A	\$3,099	9	\$12,396	
HP 300GB 6G SAS 15K 2.5-inch DP Enterprise 3-yr warrant	1	652611-B21	\$579	112	\$64,848	
HP 300GB 6G SAS 15K 2.5-inch DP Enterp 3-yr (10% spares)	1	652611-B21	\$579	12	\$6,948	
HPE Smart Array P431/2GB FBWC 8-Port Ext SAS	1	698531-B21	\$949	3	\$2,847	
HPE Smart Array P431/2GB FBWC 8-Port SAS (10% spares)	1	698531-B21	\$949	2	\$1,898	
			<b>Subtotal</b>		<b>\$404,354</b>	<b>\$0</b>
<b>Server Software</b>						
SQL Server 2016 Enterprise Edition (2 core license, 48 cores)	2		\$13,472.50	48	\$646,680	
Windows Server 2016 Standard Edition (2 processor license)	2		\$92	48	\$4,416	
Microsoft Problem Resolution Services	2	N/A	\$259	1		\$259
			<b>Subtotal</b>		<b>\$651,096</b>	<b>\$259</b>
			<b>Total Extended Price</b>		<b>\$1,308,410</b>	<b>\$3,220</b>
			<b>Total Discounts</b>		<b>\$197,194</b>	<b>\$888</b>
Price Key: 1 - HPE , 2 - Microsoft <b>Audited by Francois Raab of InfoSizing, Inc. (www.sizing.com)</b>			<b>Grand Total</b>		<b>\$1,111,216</b>	<b>\$2,332</b>
All discounts are based on US list prices and for similar quantities and configurations. A 30% discount was based on the overall specific components pricing from vendor 1 in this single quotation. Discounts for similarly sized configurations will be similar to those quoted here, but may vary based on the components in the configuration.			<b>3 year cost of ownership USD:</b>		<b>\$1,113,548</b>	
			<b>QpH @ 10000GB:</b>		<b>1,047,293.3</b>	
			<b>\$ USD/QpH @ 10000GB</b>		<b>\$1.07</b>	
Sales contact: HPE WW Headquarters, 3000 Hanover St., Palo Alto, CA 94304-1185 (650) 857-1501 or H-P direct: 800-203-6748						
Microsoft Corporation, One Microsoft Way, Redmond, WA 98052-6399 (425) 882 8080						
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.						



## Numerical Quantities

### Measurement Results

Database Scale Factor	10,000
Total Data Storage / Database Size	6.37
Percentage Memory / Database Size	61.4
Start of Database Load	2016-06-10 17:23:40
End of Database Load	2016-06-11 22:27:31
Database Load Time	00d 15h 17m 22s
Query Streams for Throughput Test	9
TPC-H Power	1,294,429.8
TPC-H Throughput	847,260.2
TPC-H Composite Query-per-Hour (QphH@10000GB)	1,047,243.5
Total System Price over 3 Years (\$ USD)	\$1,113,548
TPC-H Price/Performance Metric (\$ USD / QphH@10000GB)	\$1.07

### Measurement Interval

Measurement Interval in Throughput Test 8,413 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
	611222731	2016-06-12 09:19:44	1,246	2016-06-12 09:18:29	2016-06-12 09:40:30
		2016-06-12 09:40:30		2016-06-12 09:19:43	2016-06-12 09:43:04
Throughput Stream	Seed	Query Start Time	Duration (sec)	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
1	611222732	2016-06-12 09:43:04	5,453	2016-06-12 11:28:39	2016-06-12 11:29:55
		2016-06-12 11:13:57		2016-06-12 11:29:55	2016-06-12 11:32:32
2	611222733	2016-06-12 09:43:04	6,330	2016-06-12 11:32:32	2016-06-12 11:33:43
		2016-06-12 11:28:34		2016-06-12 11:33:43	2016-06-12 11:36:22
3	611222734	2016-06-12 09:43:04	6,211	2016-06-12 11:36:22	2016-06-12 11:37:32
		2016-06-12 11:26:35		2016-06-12 11:37:32	2016-06-12 11:40:12
4	611222735	2016-06-12 09:43:04	6,255	2016-06-12 11:40:13	2016-06-12 11:41:19
		2016-06-12 11:27:19		2016-06-12 11:41:18	2016-06-12 11:43:57
5	611222736	2016-06-12 09:43:04	6,154	2016-06-12 11:43:57	2016-06-12 11:44:59
		2016-06-12 11:25:38		2016-06-12 11:44:59	2016-06-12 11:47:40
6	611222737	2016-06-12 09:43:04	6,335	2016-06-12 11:47:40	2016-06-12 11:48:51
		2016-06-12 11:28:39		2016-06-12 11:48:51	2016-06-12 11:51:27
7	611222738	2016-06-12 09:43:04	6,335	2016-06-12 11:51:27	2016-06-12 11:52:41
		2016-06-12 11:28:39		2016-06-12 12:52:40	2016-06-12 11:55:25



Throughput Stream	Seed	Query Start Time	Duration (sec)	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
8	611222739	2016-06-12 09:43:04	5,579	2016-06-12 11:55:26	2016-06-12 11:56:39
		2016-06-12 11:16:03		2016-06-12 11:56:39	2016-06-12 11:59:22
9	611222740	2016-06-12 09:43:04	6,115	2016-06-12 11:59:22	2016-06-12 12:00:34
		2016-06-12 11:24:59		2016-06-12 12:00:33	2016-06-12 12:03:17



**TPC-H Timing Intervals (in seconds):**

Quer	Strm 0	Strm 1	Strm 2	Strm 3	Strm 4	Strm 5	Strm 6	Strm 7	Strm 8	Strm 9	Min Qi	Max Qi	Avg. Qi
Q1	11.9	473.6	477.8	455.1	239.9	168.6	507.8	399.9	73.8	358.1	11.9	316.7	507.8
Q2	27.0	65.2	46.5	35.7	99.8	59.8	59.1	64.4	64.2	56.3	27.0	57.8	99.8
Q3	27.9	240.7	458.9	51.9	56.9	401.1	701.1	311.1	248.6	224.6	27.9	272.3	701.1
Q4	26.0	140.7	300.8	426.2	197.7	148.6	153.2	267.1	161.2	230.6	26.0	205.2	426.2
Q5	31.4	175.1	272.8	467.5	64.5	194.3	194.7	362.0	174.0	186.4	31.4	212.3	467.5
Q6	1.1	60.7	2.3	92.5	39.6	29.3	61.6	29.8	69.9	35.1	1.1	42.2	92.5
Q7	23.2	336.4	187.7	318.6	356.8	413.1	282.4	119.4	386.9	169.6	23.2	259.4	413.1
Q8	30.5	330.0	338.9	321.6	494.2	454.6	437.9	210.9	501.3	328.9	30.5	344.9	501.3
Q9	441.9	341.3	446.3	678.2	394.8	370.9	326.6	394.4	475.2	446.2	326.6	431.6	678.2
Q10	53.5	535.7	586.6	378.3	615.6	453.9	79.5	574.7	489.5	405.1	53.5	417.2	615.6
Q11	47.9	192.8	194.3	203.0	246.0	153.5	217.6	243.0	217.7	179.5	47.9	189.5	246.0
Q12	10.3	264.3	683.1	272.6	502.4	448.2	405.2	199.8	111.1	154.8	10.3	305.2	683.1
Q13	162.1	236.5	215.8	310.8	330.2	316.3	238.4	205.0	459.9	689.0	162.1	316.4	689.0
Q14	9.9	38.0	42.4	33.7	123.6	49.8	33.7	25.1	32.9	35.0	9.9	42.4	123.6
Q15	8.4	80.4	52.8	59.8	92.0	99.1	60.9	52.2	78.4	79.7	8.4	66.4	99.1
Q16	15.6	81.3	356.7	246.2	93.7	282.4	134.1	98.0	103.9	101.8	15.6	151.4	356.7
Q17	9.8	201.0	174.2	157.8	87.0	455.2	263.1	553.9	495.7	289.2	9.8	268.7	553.9
Q18	169.6	593.3	731.3	474.1	606.8	638.0	692.2	580.6	628.6	668.2	169.6	578.3	731.3
Q19	4.5	280.9	219.8	266.9	317.7	170.8	584.0	165.0	21.3	319.2	4.5	235.0	584.0
Q20	13.7	102.4	97.9	88.2	51.1	67.5	84.8	104.8	104.5	102.0	13.7	81.7	104.8
Q21	87.5	542.4	250.4	701.9	1088.1	570.2	650.2	1117.6	524.9	852.6	87.5	638.6	1117.6
Q22	31.8	140.0	191.7	170.2	156.0	208.1	166.3	255.7	155.1	201.9	31.8	167.7	255.7
RF1	74.5	75.6	70.5	69.8	65.7	62.1	70.8	73.6	73.1	71.6	62.1	70.7	75.6
RF2	154.5	156.2	159.3	159.9	158.2	160.7	155.1	164.6	162.6	162.9	154.5	159.4	164.6