



**Hewlett Packard**  
Enterprise

# **Hewlett-Packard Enterprise Company**

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TPC Benchmark™ H  
Full Disclosure Report  
for  
Hewlett Packard Enterprise ProLiant DL580 Gen9  
using  
Actian Vector 5.0  
and  
Red Hat Enterprise Linux Server 7.2 Edition

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**First Edition**  
**June 6, 2016**

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Benchmark results are highly dependent upon workload, specific application requirements, and system design and implementation. Relative system performance will vary as a result of these and other factors. Therefore, the TPC Benchmark™ H should not be used as a substitute for a specific customer application benchmark when critical capacity planning and/or product evaluation decisions are contemplated.

All performance data contained in this report was obtained in a rigorously controlled environment. Results obtained in other operating environments may vary significantly. No warranty of system performance or price/performance is expressed or implied in this report.

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# Abstract

## Overview

This report documents the methodology and results of the TPC Benchmark™ H test conducted on the HPE DL580 Gen9 using Actian Vector 5.0 database, in conformance with the requirements of the TPC Benchmark™ H Standard Specification, Revision 2.17.1. The operating system used for the benchmark was Red Hat Enterprise Linux 7.2

The TPC Benchmark™ H was developed by the Transaction Processing Performance Council (TPC). The TPC was founded to define transaction processing benchmarks and to disseminate objective, verifiable performance data to the industry.

TPC Benchmark™ H Full Disclosure Report and other information can be downloaded from the Transaction Processing Performance Council web site at [www.tpc.org](http://www.tpc.org).


## Standard and Executive Summary Statements

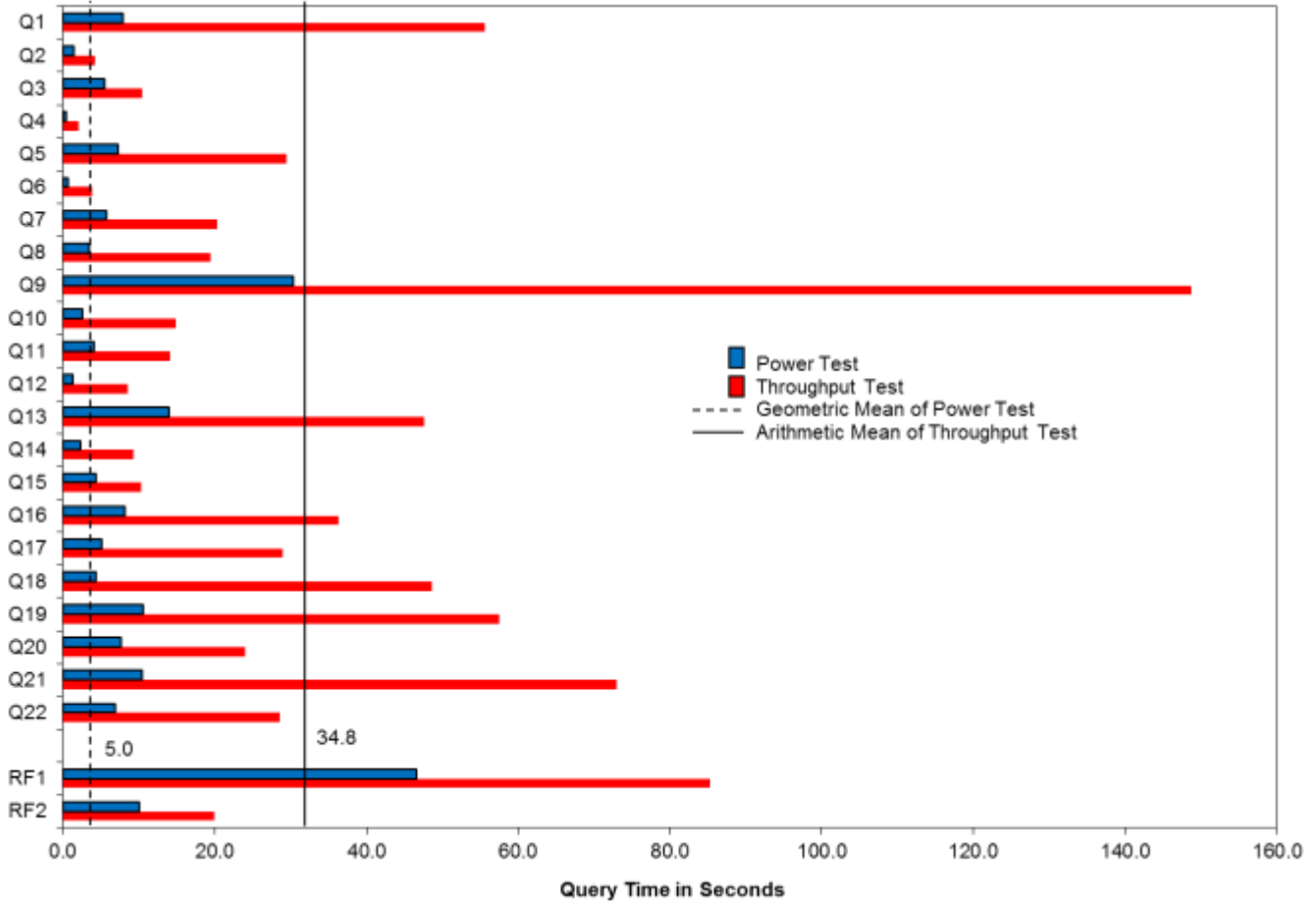
Pages iv – vii contain the Executive Summary and Numerical Quantities Summary of the benchmark results for Actian Vector 5.0 on HPE ProLiant DL580 Gen9.

## Auditor

The benchmark configuration, environment and methodology used to produce and validate the test results, and the pricing model used to calculate the QphH metric and the cost per QphH were audited by Francois Raab of InfoSizing to verify compliance with the relevant TPC specifications.

The auditor's letter of attestation is attached in Section 9.1 "Auditors' Report."

 <b>Hewlett Packard Enterprise</b>		<b>HPE ProLiant DL580 Gen9 Action Vector 5.0</b>		TPC-H Rev. 2.17.1 TPC Pricing Rev. 1.7.0	
Total System Cost		Composite Query per Hour Rating		Report Date: June 6, 2016	
<b>\$812,400 USD</b>		<b>2,140,307.2</b> QphH @ 3000GB		<b>\$0.38 USD</b> \$/ QphH @3000GB	
Database Size	Database Manager	Operating System	Other Software	Availability Date	
<b>3000GB</b>	<b>Action Vector 5.0</b>	<b>RHEL 7.2</b>	<b>None</b>	<b>July 31, 2016</b>	



Database Load Time = 00d 01h 10m 34s	<b>Storage Redundancy Level</b>	
Load included backup: N	Base Tables and Auxiliary Data Structures	1
Total Data Storage / Database Size = 5.42	DBMS Temporary Space	1
Memory/Database Size = 102.4%	OS and DBMS Software	1

System Components	System Total
HPE ProLiant DL580 Gen9 :	1
Intel(R) Xeon(R) CPU E7-8890 v4 (24c/2.2Ghz / 60 MB L3):	4
Cores/Threads:	96/192
Memory:	3,072 GB
HPE 3.2 TB PCIe Workload Accelerator:	6
Operating System Drives (480GB SAS SSD):	2
Total Formatted Storage:	16,254 GB



# HPE ProLiant DL580 Gen9 Action Vector 5.0

TPC-H Rev. 2.17.1  
TPC Pricing Rev. 1.7.0

Report Date: June 6, 2016

Description	Price Key	Part Number	Unit Price	Qty	Extended Price	3 Yr Maint Price
<b>Server Hardware</b>						
HPE ProLiant DL580 G9 CTO Server	1	793161-B21	\$4,999	1	\$4,999	
HPE DL580 Gen9 Intel® Xeon® E7-8890 v4 (2.20GHz/24-core) 1P Kit	1	816643-B21	\$10,579	1	\$10,579	
HPE DL580 Gen9 Intel® Xeon® E7-8890 v4 (2.20GHz/24-core) FIO 1P Kit	1	816643-L21	\$10,579	3	\$31,737	
HPE DL580 Gen8/Gen9 12 DIMM Memory Cartridge	1	788360-B21	\$549	8	\$4,392	
HPE 32GB 4Rx4 PC4-2400 Kit	1	728629-B21	\$719	96	\$69,024	
HPE Smart Array 2GB 24in FIO Flashback Write Cache	1	758836-B21	\$549	1	\$549	
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	1	\$259	
HPE 480GB 6G SATA RI-2 SFF SC SSD	1	804593-B21	\$1,039	2	\$2,078	
HPE 3.2TB Read Intensive-2 HH/HL PCIe Workload Accelerator	1	831737-B21	\$15,639	6	\$93,834	
HPE 1200W CS Plat PL HtPlg Pwr Supply Kit	1	656364-B21	\$429	4	\$1,716	
HPE 3y 4h 24x7 ProLiant D580 Gen9 FC SVC HW Support	1	U8NF6E	\$2,961	1		\$2,961
HPE 17" FlatPanel Monitor	1	GV537A8	\$130	1	\$130	
HPE PS/2 Keyboard And Mouse Bundle	1	RC464AA	\$39	1	\$39	
			<b>Subtotal</b>		<b>\$221,035</b>	\$2,961
<b>Server Software</b>						
Action Vector Capacity Based VECTOR-PPL VW 5.0	2	NA	\$70,000	5	\$350,000	
Action Vector Gold Support VECTOR-PPL-GOLD-MNT	2	NA	\$77,000	3		\$231,000
RHEL Server 2 Sockets w/ 3Y Subscription 24x7 Support E-LTU	1	G3J30AAE	\$3,702	2	\$7,404	included
			<b>Subtotal</b>		<b>\$357,404</b>	<b>\$231,000</b>
			<b>Total Extended Price</b>		<b>\$578,439</b>	<b>\$233,961</b>
Price Key: 1 - HPE, 2 - Action		<b>3 year cost of ownership USD:</b>				<b>\$812,400</b>
<b>Audited by Francois Raab of InfoSizing, Inc. (www.sizing.com)</b>		<b>QpH @ 3000GB:</b>				<b>2,140,307.2</b>
		<b>\$ USD/QpH @ 3000GB</b>				<b>\$0.38</b>
Sales contact: HPE WW Headquarters, 3000 Hanover St., Palo Alto, CA 94304-1185 (650) 857-1501 or HPE direct: 800-203-6748						
Action Corporation, 2300 Geng Rd., Suite 150, Palo Alto, CA (888) 446-4737						
<p>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.</p>						



## Numerical Quantities

### Measurement Results

Database Scale Factor	3,000
Total Data Storage / Database Size	5.42
Percentage Memory / Database Size	102.4 %
Start of Database Load	2016-05-19 21:21:38
End of Database Load	2016-05-19 22:32:12
Database Load Time	00d 01h 10m 34s
Query Streams for Throughput Test	8
TPC-H Power	2,149,713.8
TPC-H Throughput	2,130,941.7
TPC-H Composite Query-per-Hour (QphH@3000GB)	2,140,307.2
Total System Price over 3 Years (\$ USD)	\$812,400
TPC-H Price/Performance Metric (\$ USD / QphH@3000GB)	\$0.38

### Measurement Interval

Measurement Interval in Throughput Test 892 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
	519223212	2016-05-19 22:50:12	145	2016-05-19 22:49:25	2016-05-19 22:52:37
		2016-05-19 22:52:37		2016-05-19 22:50:12	2016-05-19 22:52:47

Throughput Stream	Seed	Query Start Time	Duration (sec)	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
1	519223213	2016-05-19 22:52:48	758	2016-05-19 22:52:47	2016-05-19 22:54:51
		2016-05-19 23:05:26		2016-05-19 22:54:51	2016-05-19 22:55:11
2	519223214	2016-05-19 22:52:49	795	2016-05-19 22:55:11	2016-05-19 22:56:12
		2016-05-19 23:06:04		2016-05-19 22:56:12	2016-05-19 22:56:31
3	519223215	2016-05-19 22:52:50	779	2016-05-19 22:56:31	2016-05-19 22:58:11
		2016-05-19 23:05:49		2016-05-19 22:58:11	2016-05-19 22:58:54
4	519223216	2016-05-19 22:52:51	799	2016-05-19 22:58:54	2016-05-19 22:59:45
		2016-05-19 23:06:10		2016-05-19 22:59:45	2016-05-19 23:00:08
5	519223217	2016-05-19 22:52:52	666	2016-05-19 23:00:08	2016-05-19 23:02:15
		2016-05-19 23:03:58		2016-05-19 23:02:15	2016-05-19 23:02:33
6	519223218	2016-05-19 22:52:53	703	2016-05-19 23:02:33	2016-05-19 23:03:22
		2016-05-19 23:04:36		2016-05-19 23:03:22	2016-05-19 23:03:45
7	519223219	2016-05-19 22:52:54	802	2016-05-19 23:03:45	2016-05-19 23:06:44
		2016-05-19 23:06:16		2016-05-19 23:06:44	2016-05-19 23:06:54
8	519223220	2016-05-19 22:52:55	823	2016-05-19 23:06:54	2016-05-19 23:07:26
		2016-05-19 23:06:38		2016-05-19 23:07:26	2016-05-19 23:07:39

TPC-H Timing Intervals (in seconds)

Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
0	7.9	1.4	5.5	0.4	7.3	0.7	5.7	3.4	30.4	2.5	4.1	1.3
1	35.7	4.0	15.6	1.7	26.6	3.4	18.9	15.9	219.8	9.0	26.7	13.0
2	91.4	3.6	10.8	3.9	31.8	2.1	25.2	36.8	205.3	23.8	10.0	15.0
3	88.2	4.2	9.1	1.7	55.5	3.6	25.5	23.0	111.1	23.5	13.6	4.1
4	87.6	4.6	8.1	3.3	36.3	7.7	17.9	16.0	212.3	13.7	13.3	7.7
5	46.8	4.2	10.2	1.9	28.3	3.6	15.5	33.7	112.5	14.9	11.3	8.4
6	46.1	4.3	11.8	2.1	28.1	2.8	38.2	17.5	112.3	29.0	11.0	7.5
7	47.9	4.3	11.8	1.6	24.0	1.8	16.3	15.8	115.4	6.6	32.8	2.3
8	48.8	7.1	11.4	2.1	27.6	8.7	20.2	12.5	219.3	10.7	4.3	17.6
<b>Min</b>	<b>7.9</b>	<b>1.4</b>	<b>5.5</b>	<b>0.4</b>	<b>7.3</b>	<b>0.7</b>	<b>5.7</b>	<b>3.4</b>	<b>30.4</b>	<b>2.5</b>	<b>4.1</b>	<b>1.3</b>
<b>Avg</b>	<b>55.6</b>	<b>4.2</b>	<b>10.5</b>	<b>2.1</b>	<b>29.5</b>	<b>3.8</b>	<b>20.4</b>	<b>19.4</b>	<b>148.7</b>	<b>14.9</b>	<b>14.1</b>	<b>8.5</b>
<b>Max</b>	<b>91.4</b>	<b>7.1</b>	<b>15.6</b>	<b>3.9</b>	<b>55.5</b>	<b>8.7</b>	<b>38.2</b>	<b>36.8</b>	<b>219.8</b>	<b>29.0</b>	<b>32.8</b>	<b>17.6</b>

Stream ID	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
0	14.0	2.3	4.4	8.1	5.1	4.3	10.6	7.6	10.4	6.9	46.6	10.1
1	53.7	18.8	9.7	28.7	24.1	85.1	49.2	21.4	22.1	54.5	122.2	20.7
2	43.6	7.5	8.7	30.0	40.1	43.5	43.9	38.6	52.9	25.5	60.9	18.5
3	82.1	6.6	10.5	23.1	27.5	90.8	43.9	23.7	74.7	31.8	100.4	42.4
4	73.8	7.9	17.0	80.9	27.0	30.2	50.3	12.2	56.1	14.0	51.1	23.5
5	47.2	8.0	11.0	32.9	34.8	39.1	87.0	22.9	65.1	26.1	127.3	17.7
6	35.5	10.1	8.8	79.6	21.0	43.6	50.4	39.4	78.1	24.7	48.6	23.1
7	37.6	4.9	5.0	13.8	59.5	92.2	87.6	25.3	161.7	32.7	178.9	10.1
8	40.6	17.4	17.7	29.7	21.4	9.0	95.2	24.7	135.3	40.9	31.8	13.1
<b>Min</b>	<b>14.0</b>	<b>2.3</b>	<b>4.4</b>	<b>8.1</b>	<b>5.1</b>	<b>4.3</b>	<b>10.6</b>	<b>7.6</b>	<b>10.4</b>	<b>6.9</b>	<b>31.8</b>	<b>10.1</b>
<b>Avg</b>	<b>47.6</b>	<b>9.3</b>	<b>10.3</b>	<b>36.3</b>	<b>28.9</b>	<b>48.6</b>	<b>57.6</b>	<b>24.0</b>	<b>72.9</b>	<b>28.6</b>	<b>85.3</b>	<b>19.9</b>
<b>Max</b>	<b>82.1</b>	<b>18.8</b>	<b>17.7</b>	<b>80.9</b>	<b>59.5</b>	<b>92.2</b>	<b>95.2</b>	<b>39.4</b>	<b>161.7</b>	<b>54.5</b>	<b>178.9</b>	<b>42.4</b>