



Reshaping the Server™

PANTA Systems PANTAmatrix

TPC-H Rev. 2.5.0

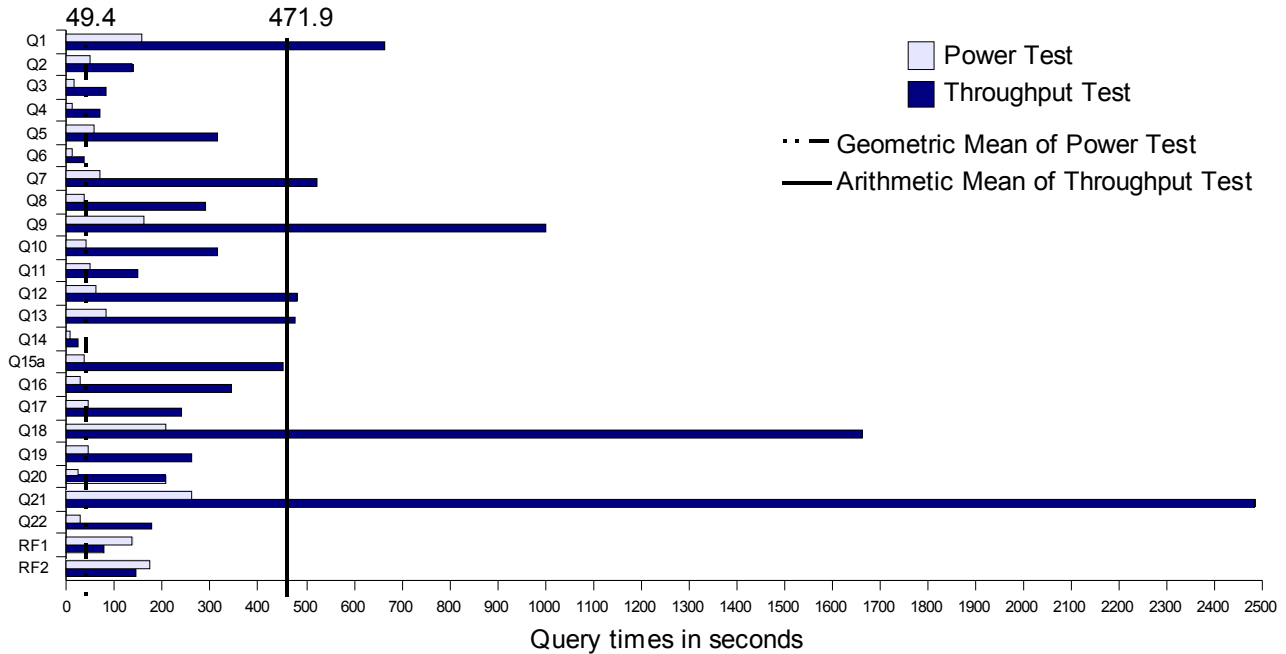
Report Date:
October 19, 2006

Total System Cost
\$1,480,369.65

Composite Query per Hour Metric
59,353.9
QphH@1000GB

Price / Performance
\$24.94
\$/ QphH@1000GB

Database Size	Database Manager	Operating System	Other Software	Availability Date
1000 GB	Oracle Database 10g Enterprise Edition Release 2 with Oracle Real Application Clusters and Partitioning	Red Hat Enterprise Linux 4 Advanced Server Update 3	None	April 15, 2007



Database Load Time = 6:07:59	Load Included Backup: Y	Total Data Storage / Database Size = 133.0
RAID (Base tables only): N	RAID (Base tables and auxiliary data structures): N	RAID (All): N

System Components	System Total	Per Node
Nodes:	8	n.a.
Processor (Dual-Core AMD Opteron™ processor Model 875HE 2.2GHz/1MB L2 cache per core for 2MB total/1GHz Hyper Transport):	32	4
Cores:	64	8
Threads:	64	8
Memory:	256GB	32GB
OS Storage (PANTA Systems PANTAmatrix System Storage Module):	1	n.a.
OS Disk Drives (250GB 7200RPM SATA HDD):	14	n.a.
Network Interfaces (Infiniband 4x ports):	32	4
Storage Switch (PANTA Systems 24-port Infiniband switch):	2	n.a.
Storage Switch (Silverstorm Technologies 9024 24-port Infiniband switch):	2	n.a.
Storage Subsystem (PANTA Systems Storage Array Module):	37	n.a.
Storage Subsystem Disk Drives (250GB 7200RPM SATA HDD):	518	n.a.
Total Storage:	133,000GB	n.a.



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Description	Part Number	Brand	Pricing	Unit Price	Qty	Extended Price	3 yr. Maint. Price
System Hardware							
Compute Module; 4 x 2.2GHz DUAL CORE (Opteron 875HE) processors, NO memory, 16 available DIMM slots, dual port InfiniBand 4X, single PCIe 8X slot	CPE-0424		1	26,000.00	8	208,000.00	80,500.00
16GB Memory Kit (Kit contains 8x2GB DDR-400MHz ECC Registered DIMMs), for use with 4-socket Compute Module	MEM-0116		1	6,100.00	16	97,600.00	
PANTA 8U Enclosure for Compute, Visualization, and Switch Modules	SUB-0100		1	5,400.00	1	5,400.00	
PANTA Switch Module, 24 port based InfiniBand switch with 8 connections to Compute Modules and 16 externally accessible connections	SWE-0124-A		1	6,300.00	2	12,600.00	
Silverstorm 9024 (24-port InfiniBand SDR switch w/ embedded management support, single power supply and subnet manager key for up to 288 nodes).	SWE-S124		1	10,100.00	2	20,200.00	4,600.00
PANTA 42U rack with standard front door	RCK-0100		1	6,700.00	3	20,100.00	
Rack side panels	RCK-0101		1	0.00	1	0.00	
42U rack rear door - standard	RCK-0102		1	0.00	3	0.00	
PANTA 42U Tall Rack Shipping Crate	RCK-0900		1	0.00	3	0.00	
3 x powercables from PANTA 8U enclosure to rack based power distribution unit	CBL-0001		1	80.00	1	80.00	
16 port Gigabit Ethernet switch for PANTA management network	HUB-0001		1	550.00	3	1,650.00	
PANTA Rack mounted power distribution units (includes 2 PDU's for full rack configuration, total of 4 cords, 220V 3Phase-20A)	PWR-0001		1	3,800.00	3	11,400.00	
3M InfiniBand Cable	CBL-0103		1	105.00	19	1,995.00	
Ethernet Cable (RJ45 Cat-5E) 7 feet	CBL-0041		1	5.25	4	21.00	
2 port InfiniBand 4X HBA (PCIe based)	IOE-0002		1	1,500.00	8	12,000.00	
				Subtotal		391,046.00	85,100.00
Storage and System Management Hardware							
PANTAmatrix System Control Module with dual port InfiniBand 4X HBA, and PANTA Sys-Manager software	SCM-0210		1	6,800.00	1	6,800.00	3,840.00
PANTAmatrix System Storage Module with dual port InfiniBand 4X support, dual RAID controllers with battery backup, 14 externally accessible drive bays (empty), battery backup, and PANTA Sys-Manager Software	SSM-0310		1	13,400.00	1	13,400.00	
PANTA Storage Array Module with dual port InfiniBand 4X support, dual RAID controllers with battery backup, and 14 externally accessible drive bays (empty).	SAM-0510		1	13,400.00	37	495,800.00	149,500.00
Sled mounted 250GB 7200 RPM SATA drive for the SCM-0210, SCE-0300, SSM-0310, and SAM-0510	HD3-250GB		1	280.00	532	148,960.00	
3M InfiniBand Cable	CBL-0103		1	105.00	39	4,095.00	
Ethernet Cable (RJ45 Cat-5E) 7 feet	CBL-0041		1	5.25	39	204.75	
				Subtotal		669,259.75	153,340.00
Software							
PANTA Sys-Manager 2.0 License for up to 8 Compute Modules	PSM-0020		1	1,500.00	1	1,500.00	1,500.00
PANTA Sys-Manager Media Kit	PSM-0001-MK		1	150.00	1	150.00	
Red Hat Enterprise Linux AS 4.0, Update 3, Standard Edition (single node license, 1yr support)	RHAS-0001		1	2,500.00	8	20,000.00	40,000.00
Oracle Database 10g Enterprise Edition Release 2, Named User Plus for 3 Years	run-time	Oracle	2	10,000.00	32	320,000.00	
Oracle Real Application Clusters, Named User Plus for 3 Years	run-time	Oracle	2	5,000.00	32	160,000.00	
Partitioning, Named User Plus for 3 Years	run-time	Oracle	2	2,500.00	32	80,000.00	
Database Server Support Package for 3 Years	run-time	Oracle	2	16,000.00	3		48,000.00
				Subtotal		581,650.00	89,500.00
PANTA Large Purchase and Net30 Discount			1			-367,926.10	
Oracle Mandatory E-Business Discount			2			-121,600.00	
				Total		1,152,429.65	327,940.00
Pricing: 1- PANTA Systems Direct Pricing: 2- Oracle at 15% discount, Oracle pricing contact: Mary Beth Pierantoni, mary.beth.pierantoni@oracle.com, 916-315-5081. **32 = 0.50 * 64. Explanation: For the purposes of counting the number of processors which require licensing, an AMD multicore chip with "n" cores shall be determined by multiplying "n" cores by a factor of 0.50. All discounts are based on US list prices and for similar quantities and configurations.						3-Year Cost of Ownership: \$1,480,369.65	
						QpH Rating: 59,353.9	
						\$/QpH@1000GB: \$24.94	
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. Results independently audited by Francois Raab of InfoSizing, Inc.							

Numerical Quantities

Measurement Results

Database Scale Factor	= 1,000
Total Data Storage / Database Size	= 133.0
Start of Database Load	= 10/18/2006 18:13:18
End of Database Load	= 10/19/2006 00:05:30
Database Load Time	= 6:07:59 *
Query Streams for Throughput Test	= 8
TPC-H Power	= 72,848.5
TPC-H Throughput	= 48,359.0
TPC-H Composite Query-per-Hour Metric (QpH@1000GB)	= 59,353.9
Total System Price Over 3 Years	= \$1,480,369.65
TPC-H Price/ Performance Metric (\$/QpH@300GB)	= \$24.94

Measurement Intervals

Measurement Interval in Throughput Test	= 13,102 seconds
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Duration of Stream Execution

Power Stream	Seed	RF1 Start Time RF1 End Time	Query Start Time Query End Time	RF2 Start Time RF2 End Time	Duration
	1019000530	10/19/06 07:21:47 10/19/06 07:24:02	10/19/06 07:24:02 10/19/06 07:48:39	10/19/06 07:48:39 10/19/06 07:51:33	0:29:46

Throughput Stream	Seed	Query Start Time Query End Time	RF1 Start Time RF1 End Time	RF2 Start Time RF2 End Time	Duration
1	1019000531	10/19/06 07:51:35 10/19/06 10:53:17	10/19/06 11:00:25 10/19/06 11:01:57	10/19/06 11:01:57 10/19/06 11:04:33	3:12:58
2	1019000532	10/19/06 07:51:35 10/19/06 10:54:26	10/19/06 11:04:33 10/19/06 11:05:59	10/19/06 11:05:59 10/19/06 11:08:30	3:16:55
3	1019000533	10/19/06 07:51:35 10/19/06 10:38:03	10/19/06 11:08:30 10/19/06 11:09:53	10/19/06 11:09:53 10/19/06 11:12:21	3:20:46
4	1019000534	10/19/06 07:51:35 10/19/06 10:30:23	10/19/06 11:12:21 10/19/06 11:13:41	10/19/06 11:13:41 10/19/06 11:16:09	3:24:34
5	1019000535	10/19/06 07:51:35 10/19/06 11:00:24	10/19/06 11:16:09 10/19/06 11:17:22	10/19/06 11:17:22 10/19/06 11:19:43	3:28:08
6	1019000536	10/19/06 07:51:35 10/19/06 10:57:23	10/19/06 11:19:43 10/19/06 11:20:58	10/19/06 11:20:58 10/19/06 11:23:24	3:31:49
7	1019000537	10/19/06 07:51:35 10/19/06 10:50:30	10/19/06 11:23:24 10/19/06 11:24:33	10/19/06 11:24:33 10/19/06 11:26:43	3:35:08
8	1019000538	10/19/06 07:51:35 10/19/06 10:12:30	10/19/06 11:26:43 10/19/06 11:27:48	10/19/06 11:27:48 10/19/06 11:29:57	3:38:22

* A backup of the database partitions is required to meet the durability requirements.
The backup time (15 min. 47 sec.) was added into the elapsed load time.

TPC-H Timing Intervals (in seconds)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Stream 0	155.5	47.7	16.7	10.4	54.7	10.4	67.4	33.9	161.0	41.3	50.3	59.5
Stream 1	216.7	151.3	126.6	24.1	283.6	31.4	852.4	203.1	543.8	465.3	122.8	536.5
Stream 2	962.2	159.8	135.0	95.9	213.2	21.2	529.9	135.8	874.1	298.5	170.6	649.0
Stream 3	739.5	119.3	71.1	45.3	211.4	32.1	637.0	255.9	755.7	399.4	145.1	275.2
Stream 4	619.3	121.4	49.9	119.7	253.4	44.1	249.1	325.4	2341.8	484.7	129.9	649.2
Stream 5	234.3	107.2	36.3	72.6	378.4	31.5	647.1	139.3	271.3	65.9	132.8	330.0
Stream 6	838.2	105.4	89.1	26.4	355.8	78.0	228.5	402.4	1814.2	229.0	108.8	743.9
Stream 7	801.3	223.5	45.4	114.2	198.3	29.5	718.0	609.6	716.8	152.6	234.0	314.7
Stream 8	907.8	83.6	88.3	52.3	617.1	30.6	311.7	242.8	687.8	418.8	127.0	346.8
Minimum	216.7	83.6	36.3	24.1	198.3	21.2	228.5	135.8	271.3	65.9	108.8	275.2
Average	664.9	133.9	80.2	68.8	313.9	37.3	521.7	289.3	1000.7	314.3	146.3	480.7
Maximum	962.2	223.5	135.0	119.7	617.1	78.0	852.4	609.6	2341.8	484.7	234.0	743.9

	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 0	81.1	8.4	37.9	28.9	44.4	208.3	45.4	24.2	260.8	29.2	135.5	173.3
Stream 1	649.6	24.9	924.7	446.9	227.1	1538.9	156.9	310.1	2961.4	102.0	92.9	155.9
Stream 2	361.1	25.4	128.6	176.0	539.0	1863.1	175.8	239.6	3047.0	169.6	85.2	151.5
Stream 3	597.1	20.4	153.1	623.6	184.8	624.6	221.5	143.9	3577.5	153.6	83.2	147.4
Stream 4	339.7	20.3	243.8	159.8	245.7	1379.7	243.4	92.1	1279.8	133.2	80.2	148.2
Stream 5	211.9	27.6	170.0	307.3	110.4	4059.5	681.8	112.5	2903.0	298.3	72.6	141.5
Stream 6	1085.0	17.1	854.6	829.8	175.1	818.6	136.9	111.3	1991.9	107.5	74.3	146.6
Stream 7	320.4	12.9	212.6	98.6	222.1	1988.4	170.0	329.2	2885.5	336.5	68.4	130.3
Stream 8	260.4	21.9	920.4	120.0	218.0	1031.3	304.8	306.6	1235.6	121.0	65.5	129.0
Minimum	211.9	12.9	128.6	98.6	110.4	624.6	136.9	92.1	1235.6	102.0	65.5	129.0
Average	478.1	21.3	451.0	345.3	240.3	1663.0	261.4	205.7	2485.2	177.7	77.8	143.8
Maximum	1085.0	27.6	924.7	829.8	539.0	4059.5	681.8	329.2	3577.5	336.5	92.9	155.9