



HP BladeSystem c-Class ProLiant BL480c Cluster 16P DC

TPC-H Rev. 2.3.0

Report Date:
December 18, 2006

Total System Cost

\$754,232 USD

Composite Query per Hour Metric

40,411.3
QphH@300GB

Price / Performance

\$18.67 USD
\$ / QphH@300GB

Database Size

300GB

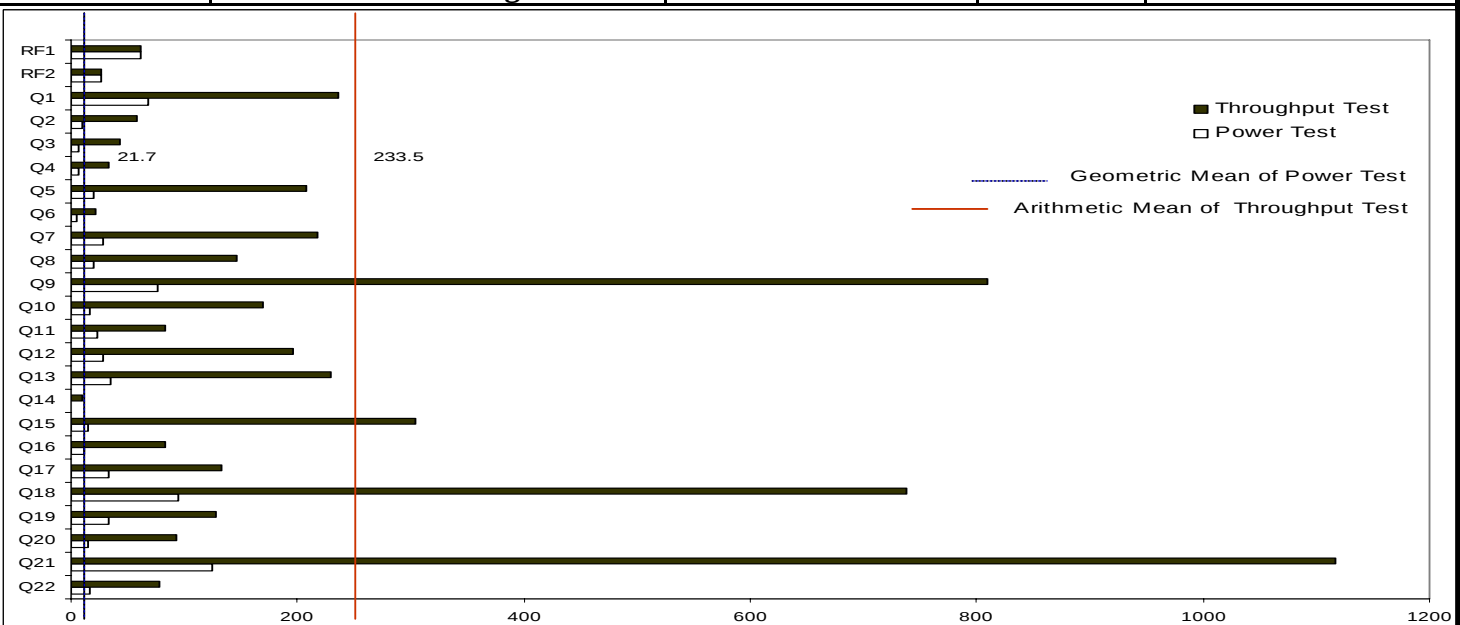
Database Manager

**Oracle Database 10g Release 2,
Enterprise Edition with Oracle
Real Application Clusters and
Partitioning**

Operating System

**Red Hat Enterprise
Linux 4**Other
Software

Availability Date

December 18, 2006

Database Load Time = 01:13:26

Load Included Backup: N

Total Data Storage / Database Size = 55.68

RAID (Base tables only): Y

RAID (Base tables and auxiliary data structures): Y

RAID (All): Y

System Components	System Total	Per Node
Nodes:	8	n.a.
Processors (Dual-Core Intel Xeon processor 5160, 3.00GHz, 4M cache, 1333 MHz FSB):	16	2
Cores:	32	4
Threads:	32	4
Memory:	128GB	16GB
OS Disk Drives (HP 36GB 10K SAS 2.5 Hot Plug HDD)	16	2
Network Interfaces (embedded Gb NIC Ports):	32	4
Network Switch (HP GbE2 Switch):	2	n.a.
Network Interfaces (HP 4X DDR InfiniBand Mezzanine HCA):	8	1
Network Switch (HP 4X DDR InfiniBand Switch):	1	n.a.
FC Host Bus Adapters (HP QMH2662 4Gb FC HBA):	16	2
SAN Storage Switch (Brocade 4/24 SAN Switch):	4	n.a.
Storage Subsystem (HP StorageWorks MSA1000):	32	n.a.
Storage Subsystem Disk Drives (36GB 15k rpm U320 HDD):	448	n.a.
Total Storage:	16704 GB	n.a.

	HP BladeSystem c-Class ProLiant BL480c Cluster 16P DC				TPC-H Rev. 2.3.0		
					Report Date:		18-Dec-06
Description	Part Number	Brand	Pricing	Unit Price	Qty	Extended Price	3 yr. Maint. Price
Server Hardware							
HP ProLiant BL480c G1 MOD-FX Svr, 4 embedded NIC ports, HP Smart Array P400i Cntrlr	404707-B21		1	2,004	8	16,032	
Dual-Core Intel Xeon Processor 5160 (3.00 GHz, 1333 MHz FSB) Option Kit	416673-L21		1	1,499	16	23,984	
4 GB FBD PC2-5300 2 x 2 GB Kit	397413-B21		1	1,099	32	35,168	
QLogic QMH2462 4Gb FC HBA for HP c-Class BladeSystem	403619-B21		1	749	16	11,984	
HP 4X DDR InfiniBand Mezzanine HCA for HP BladeSystem c-Class	410533-B21		1	579	8	4,632	
HP 36GB 10K SAS 2.5 Hot Plug Hard Drive	375859-B21		1	279	16	4,464	
HP 3y 4h 24x7 c-Class Svr Blade HW Supp	UE459E		1	369	8		2,952
HP BLc7000 3PH 6 Fan NA/Jp Full ICDC Kit	412136-B21		1	8,283	1	8,283	
HP 3y 4h 24x7 c7000 Enclosure HW Supp	UE479E		1	927	1		927
HP BLc Bnt 1GbE2 Switch Opt Kit	410917-B21		1	1,399	2	2,798	
HP Brocade 4/24 SAN Switch	AE372A		1	9,500	4	38,000	
HP BLc 4X DDR InfiniBand Switch Option Kit	410398-B21		1	5999	1	5999	
HP 3y 4h 24x7 4/24 B Series 4/24 c-Class SAN Switch	UE438E		1	1957	4		7,828
HP 5642 Pallet Unassembled Rack	358254-B21		1	689	8	5,512	
HP R5500 VA NA/Jp UPS	AF426A		1	3,099	1	3,099	
HP CAT5 KVM USB 1 Pack Interface Adapter	336047-B21		1	99	1	99	
HP s7540 CRT Monitor	PF997AA#ABA		1	139	1	139	
HP USB Standard Keyboard	DX752AV#ABA		1	12	1	12	
HP USB 2-Button Optical Scroll Mouse	PT951AV		1	5	1	5	
					Subtotal	160,210	11,707
Storage							
HP Storageworks Modular SAN Array 1000 (32+4 spares)	201723-B22		1	6,995	36	251,820	Included
36GB, 15krpm HDD Ultra320 HP (448+45 spares)	286776-B22		1	269	493	132,617	Included
5m SW LC/LC FC cable kit	221692-B22		1	82	16	1,312	
15m SW LC/LC FC cable kit	221692-B23		1	103	16	1,648	
4GB SW Single Pack SFP Transceiver	A7446B		1	199	32	6,368	
					Subtotal	393,765	0
Software							
Oracle Database 10g Enterprise Edition Release 2, Named User Plus for 3 Years	run-time	Oracle	2	10,000	16 **	160,000	
Oracle Real Application Clusters, Named User Plus for 3 Years	run-time	Oracle	2	5,000	16 **	80,000	
Partitioning, Named User Plus for 3 Years	run-time	Oracle	2	2,500	16 **	40,000	
Database Server Support Package for 3 Years	run-time	Oracle	2	6,000	8		48,000
Red Hat Ent Linux 4 AS Prm 24X7	384956-B21		1	699	24	16,776	Included
					Subtotal	296,776	48,000
HP Large Purchase and Net30 discount			1			(88,636)	(1,990)
Oracle Mandatory E-Business Discount on Licenses and Support			2			(65,600)	
					Total	696,515	57,717
Pricing: 1- HP Direct at 16% discount 800-203-7648 Pricing: 2- Oracle pricing contact: Herve Lejeune, herve.lejeune@oracle.com, 650 560-1894 (***) 16 = 32 x 0.50. Explanation: for the purposes of counting the number of processors which require licensing for Intel multicore chips, "n" cores shall be determined by multiplying the total number of cores by a core processor licensing factor of .50. All discounts are based on US list prices and for similar quantities and configurations. Oracle Price quote is in Appendix G					3-Year Cost of Ownership in USD:		\$754,232 USD
					QphH Rating:		40,411.3
					USD\$ / QphH@300GB:		\$18.67 USD



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Numerical Quantities

Measurement Results:

Database Scale Factor	= 300
Total Data Storage / Database Size	= 55.68
Start of Database Load	= 12/14/2006 14:58:06
End of Database Load	= 12/14/2006 16:09:49
Database Load Time	= 01:11:43
Query Streams for Throughput Test	= 9
TPC-H Power	= 49,769.6
TPC-H Throughput	= 32,812.6
TPC-H Composite Query-per-Hour Metric (QphH@300GB)	= 40,411.3
Total System Price Over 3 Years	= \$754,232 USD
TPC-H Price/ Performance Metric (\$/QphH@300GB)	= \$18.67 USD

Measurement Intervals:

Measurement Interval in Throughput Test (Ts)	= 6517.0 seconds
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Duration of Stream Execution:

Power Stream	Seed	RF1 Start Time	Query Start Time	RF2 Start Time	Duration
		RF1 End Time	Query End Time	RF2 End Time	
	1214160949	12/14/2006 21:31:40	12/14/2006 21:32:41	12/14/2006 21:44:11	0:12:58
		12/14/2006 21:32:41	12/14/2006 21:44:11	12/14/2006 21:44:38	

Throughput Stream	Seed	Query Start Time	Duration	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
1	1214160950	12/14/2006 21:44:39	1:22:58	12/14/2006 23:20:03	12/14/2006 23:21:09
		12/14/2006 23:07:37		12/14/2006 23:21:09	12/14/2006 23:21:31
2	1214160951	12/14/2006 21:44:39	1:18:56	12/14/2006 23:21:31	12/14/2006 23:22:34
		12/14/2006 23:03:35		12/14/2006 23:22:34	12/14/2006 23:23:05
3	1214160952	12/14/2006 21:44:39	1:11:14	12/14/2006 23:23:05	12/14/2006 23:24:18
		12/14/2006 22:55:53		12/14/2006 23:24:18	12/14/2006 23:26:11
4	1214160953	12/14/2006 21:44:39	1:35:24	12/14/2006 23:24:39	12/14/2006 23:25:45
		12/14/2006 23:20:03		12/14/2006 23:25:45	12/14/2006 23:27:23
5	1214160954	12/14/2006 21:44:39	1:25:48	12/14/2006 23:26:11	12/14/2006 23:26:58
		12/14/2006 23:10:27		12/14/2006 23:26:58	12/14/2006 23:28:46
6	1214160955	12/14/2006 21:44:39	1:29:11	12/14/2006 23:27:23	12/14/2006 23:28:15
		12/14/2006 23:13:50		12/14/2006 23:28:15	12/14/2006 23:28:46
7	1214160956	12/14/2006 21:44:39	1:27:22	12/14/2006 23:28:46	12/14/2006 23:29:51
		12/14/2006 23:12:01		12/14/2006 23:29:51	12/14/2006 23:30:19
8	1214160957	12/14/2006 21:44:39	1:28:49	12/14/2006 23:30:19	12/14/2006 23:31:20
		12/14/2006 23:13:28		12/14/2006 23:31:20	12/14/2006 23:31:47
9	1214160958	12/14/2006 21:44:39	1:30:43	12/14/2006 23:31:47	12/14/2006 23:32:49
		12/14/2006 23:15:22		12/14/2006 23:32:49	12/14/2006 23:33:15



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TPC-H Timing Intervals (in seconds)

Query	Stream 0	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5	Stream 6	Stream 7	Stream 8	Stream 9	Min Qi	Max Qi	Avg Qi
1	68.5	130.5	107.7	311.4	68.9	115.4	602.5	117.3	343	325.8	68.9	602.5	235.8
2	10	45.4	74.5	100.3	40.2	51.1	33.5	37.8	40.9	96.5	33.5	100.3	57.8
3	6.9	68.4	37	40	8	27.5	28.9	68.5	24.5	81.9	8.0	81.9	42.7
4	6.3	44.2	14.7	52.4	51.1	16.2	39.8	13.6	9.7	57.9	9.7	57.9	33.3
5	20.5	67.2	142.7	341.4	89.2	153.5	355.7	444.5	248.2	28.5	28.5	444.5	207.9
6	5.1	14.7	9.3	19.2	45.4	13.7	28.2	37.6	11	21.8	9.3	45.4	22.3
7	28.1	122.8	181.8	94.4	27.6	320.1	401.8	236.9	325.4	245.4	27.6	401.8	217.4
8	19.3	74.2	254.7	186.9	244.3	73.3	142	97	85	162.9	73.3	254.7	146.7
9	75.9	873.2	1148.4	296.4	757.6	393.5	1278.7	1430.7	986.8	119.6	119.6	1430.7	809.4
10	17.2	98.8	197.1	69.1	398.8	120.5	104.9	289.7	49.4	197.4	49.4	398.8	169.5
11	22.8	47.1	44	54.4	136.5	75.0	161.1	58.5	50	122.6	44.0	161.1	83.2
12	29	280.4	79.4	362.7	102.6	108.0	376.3	221.7	133.8	92.8	79.4	376.3	195.3
13	34.2	184.1	102.3	401.3	33.1	139.5	118.4	455	194.4	440.9	33.1	455.0	229.9
14	2.4	8.5	14.3	7.8	11.7	12.1	4.8	27.1	6.7	2.8	2.8	27.1	10.6
15	15.4	460.9	480.1	97.4	56.4	537.3	67.1	113.5	360.8	559.7	56.4	559.7	303.7
16	12.2	159.8	83.8	70.3	160.1	47.5	33.3	139.6	40.6	17.2	17.2	160.1	83.6
17	33.3	105.6	295.5	117.4	72.3	119.6	129	99.7	107.3	145.2	72.3	295.5	132.4
18	94.1	373.7	887.5	469.7	1313.6	939.0	433.3	617	371	1235.2	371.0	1313.6	737.8
19	34	96.5	70.5	81.2	201	87.2	77.4	223.1	237.7	82.8	70.5	237.7	128.6
20	15.5	131.2	131.3	44.9	18.1	53.8	171.9	71.1	48.3	174	18.1	174.0	93.8
21	124	1474.7	314.8	993.2	1873.1	1626.4	693.7	402.9	1606.8	1060.5	314.8	1873.1	1116.2
22	15.8	116.9	65	62.4	15	118.2	69.6	39.3	48.1	171.8	15.0	171.8	78.5
RF1	61.4	66.2	63.8	73.5	65.6	46.8	51.7	64.7	61.4	61.6	46.8	73.5	61.7
RF2	26.8	21.5	30	21.3	25.7	25.7	30.9	28.3	26.9	25.9	21.3	30.9	26.2