

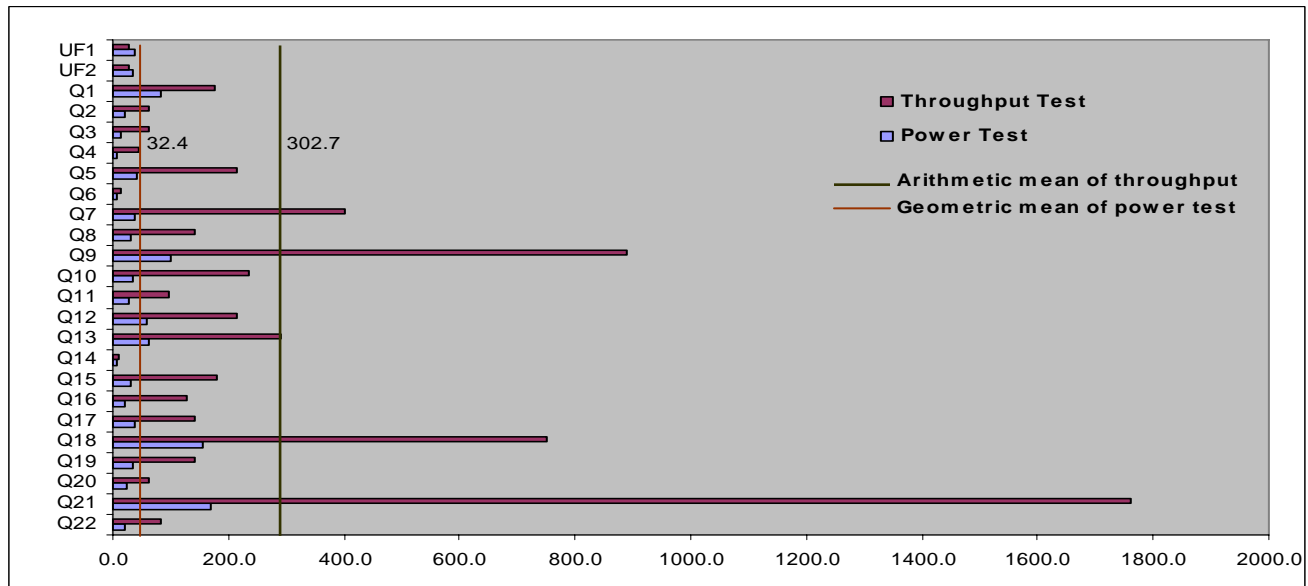


HP BladeSystem c-Class ProLiant BL480c Cluster 8P QC

TPC-H Rev. 2.6.0

Report Date:
March 9, 2007

Total System Cost		Composite Query per Hour Metric		Price / Performance	
\$704,253 USD		30,765.0 QphH@300GB		\$22.90 USD \$ / QphH@300GB	
Database Size	Database Manager	Operating System		Other Software	Availability Date
300GB	Oracle Database 10g Release 2, Enterprise Edition with Oracle Real Application Clusters and Partitioning	Red Hat Enterprise Linux 4			March 9, 2007



Database Load Time = 1:09:37	Load Included Backup: N	Total Data Storage / Database Size = 54.72
RAID (Base tables only): Y	RAID (Base tables and auxiliary data structures): Y	RAID (All): Y

System Components	System Total	Per Node
Nodes:	4	n.a.
Processors (Quad-Core Intel Xeon X5355, 2.66 GHz, 1333 MHz FSB):	8	2
Cores:	32	8
Threads:	32	8
Memory:	64GB	16GB
OS Disk Drives (HP 36GB 10K SAS 2.5 Hot Plug HDD)	8	2
Network Interfaces (embedded Gb NIC Ports):	16	4
Network Switch (HP GbE2 Switch):	2	n.a.
Network Interfaces (HP 4X DDR InfiniBand Mezzanine HCA):	4	1
Network Switch (HP 4X DDR InfiniBand Switch):	1	n.a.
FC Host Bus Adapters (HP QMH2662 4Gb FC HBA):	8	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:	16416 GB	n.a.



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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 Cntrl	404707-B21		1	2,004	4	8,016	
Quad-Core Intel Xeon processor X5355 (2.66 GHz, 1333 MHz FSB) Option Kit, FIO Base	435579-L21		1	1,629	8	13,032	
4 GB FBD PC2-5300 2 x 2 GB Kit	397413-B21		1	1,099	16	17,584	
QLogic QMH2462 4Gb FC HBA for HP c-Class BladeSystem	403619-B21		1	749	8	5,992	
HP 4X DDR InfiniBand Mezzanine HCA for HP BladeSystem c-Class	410533-B21		1	579	4	2,316	
HP 36GB 10K SAS 2.5 Hot Plug Hard Drive	375859-B21		1	279	8	2,232	
HP 3y 4h 24x7 c-Class Svr Blade HW Supp	UE459E		1	369	4		1,476
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	599	1	599	
HP 3y 4h 24x7 4/24 B Series 4/24 c-Class SAN Switch	UE438E		1	1,957	4		7,828
HP 5642 Pallet Unassembled Rack	358254-B21		1	689	4	2,756	
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	110,362	10,231
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	319	493	157,267	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	418,415	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	4		24,000
Red Hat Ent Linux 4 AS Prm 24X7	384956-B21		1	699	12	8,388	Included
					Subtotal	288,388	24,000
HP Large Purchase and Net30 discount			1			(84,604)	(1,739)
Oracle Mandatory E-Business Discount on Licenses and Support			2			(60,800)	
					Total	671,761	32,492
Pricing: 1- HP Direct at 16% discount 800-203-7648 Pricing: 2- Oracle pricing contact: MaryBeth Pierantoni, mary.beth.pierantoni@oracle.com, 916-315-5081. (***) 16 = 0.50 * 32. Explanation: For the purposes of counting the number of processors which require licensing, an Intel multicore chip with "n" cores shall be determined by multiplying "n" cores by a 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:		\$704,253 USD
					QpH Rating:		30,765.0
					USD\$ / QpH@300GB:		22.90



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Numerical Quantities

Measurement Results:

Database Scale Factor	= 300
Total Data Storage / Database Size	= 54.72
Start of Database Load	= 3/4/2007 23:43:10
End of Database Load	= 3/5/2007 00:52:47
Database Load Time	= 1:09:37
Query Streams for Throughput Test	= 9
TPC-H Power	= 33,333.3
TPC-H Throughput	= 28,394.6
TPC-H Composite Query-per-Hour Metric (QpH@300GB)	= 30,765.0
Total System Price Over 3 Years	= \$704,253 USD
TPC-H Price/ Performance Metric (\$/QpH@300GB)	= \$22.90 USD

Measurement Intervals:

Measurement Interval in Throughput Test (Ts)	= 7531.0 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	
	305005247	3/5/2007 2:47:24	3/5/2007 2:48:02	3/5/2007 2:48:02	0:18:22
		3/5/2007 3:05:11	3/5/2007 3:05:11	3/5/2007 3:05:46	

Throughput Stream	Seed	Query Start Time	Duration	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
1	305005248	3/5/2007 3:05:47	1:54:14	3/5/2007 5:03:09	3/5/2007 5:03:36
		3/5/2007 5:00:01		3/5/2007 5:03:36	3/5/2007 5:04:10
2	305005249	3/5/2007 3:05:47	1:57:22	3/5/2007 5:04:10	3/5/2007 5:04:36
		3/5/2007 5:03:09		3/5/2007 5:04:36	3/5/2007 5:05:02
3	305005250	3/5/2007 3:05:47	1:54:06	3/5/2007 5:05:02	3/5/2007 5:05:27
		3/5/2007 4:59:53		3/5/2007 5:05:27	3/5/2007 5:05:55
4	305005251	3/5/2007 3:05:47	1:52:46	3/5/2007 5:05:55	3/5/2007 5:06:19
		3/5/2007 4:58:33		3/5/2007 5:06:19	3/5/2007 5:06:47
5	305005252	3/5/2007 3:05:47	1:56:32	3/5/2007 5:06:47	3/5/2007 5:07:11
		3/5/2007 5:02:19		3/5/2007 5:07:11	3/5/2007 5:07:34
6	305005253	3/5/2007 3:05:47	1:56:39	3/5/2007 5:07:34	3/5/2007 5:08:03
		3/5/2007 5:02:26		3/5/2007 5:08:03	3/5/2007 5:08:28
7	305005254	3/5/2007 3:05:47	1:51:15	3/5/2007 5:08:28	3/5/2007 5:09:00
		3/5/2007 4:57:02		3/5/2007 5:09:00	3/5/2007 5:09:27
8	305005255	3/5/2007 3:05:47	1:42:48	3/5/2007 5:09:27	3/5/2007 5:09:57
		3/5/2007 4:48:35		3/5/2007 5:09:57	3/5/2007 5:10:24
9	305005256	3/5/2007 3:05:47	1:33:10	3/5/2007 5:10:24	3/5/2007 5:10:53
		3/5/2007 4:38:57		3/5/2007 5:10:53	3/5/2007 5:11:18



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TPC-H Timing Intervals (in seconds)

Query	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Stream00	84.5	20.3	13.0	7.9	41.8	6.1	36.8	29.7
Stream01	101.3	34.3	59.7	8.2	168.4	15.0	404.5	98.0
Stream02	136.0	85.4	109.1	26.0	322.3	12.3	511.2	164.8
Stream03	318.8	105.5	39.7	101.0	194.4	28.2	433.0	161.3
Stream04	129.6	60.4	17.7	64.8	131.2	13.2	134.1	294.8
Stream05	134.4	34.3	55.7	31.9	150.8	14.7	917.8	119.0
Stream06	134.5	37.9	41.5	74.2	207.0	16.6	585.1	137.4
Stream07	310.8	74.9	142.4	59.0	213.0	8.7	328.3	149.1
Stream08	288.7	64.1	65.8	42.5	257.4	13.5	291.0	91.2
Stream09	136.5	92.2	72.0	17.5	451.9	11.2	385.9	161.7
Min Qi	84.5	20.3	13.0	7.9	41.8	6.1	36.8	29.7
Max Qi	318.8	105.5	142.4	101.0	451.9	28.2	917.8	294.8
Avg Qi	181.5	61.3	64.3	45.2	219.3	14.5	415.2	144.3
Query	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Stream00	100.7	36.0	28.5	58.9	61.8	5.9	31.9	21.2
Stream01	1059.1	190.4	79.7	258.7	301.8	9.6	87.9	220.4
Stream02	1182.4	283.2	146.3	360.3	288.3	10.0	241.5	115.5
Stream03	486.9	355.6	49.0	266.4	268.5	8.4	149.3	226.9
Stream04	953.9	185.2	140.9	253.7	134.5	15.1	259.6	207.4
Stream05	846.1	215.4	117.7	132.0	620.0	13.1	358.1	71.5
Stream06	1060.8	273.4	119.8	299.2	204.9	5.6	218.4	48.6
Stream07	1429.7	196.2	151.0	110.5	309.8	6.5	89.6	55.9
Stream08	488.0	373.6	95.3	93.4	378.0	8.9	215.4	114.8
Stream09	1286.9	239.1	51.3	309.2	343.5	13.8	133.1	181.7
Min Qi	100.7	36	28.5	58.9	61.8	5.6	31.9	21.2
Max Qi	1429.7	373.6	151	360.3	620	15.1	358.1	226.9
Avg Qi	868.7	229.8	96.6	213.5	299.4	9.8	181.2	126.0
Query	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream00	36.8	156.4	35.0	25.3	170.1	20.4	38.4	34.9
Stream01	220.8	1149.5	84.1	128.6	2135.0	39.0	27.2	34.3
Stream02	334.5	749.5	268.0	39.9	1556.1	99.6	25.4	26.3
Stream03	306.8	746.1	80.9	63.2	2358.7	97.3	25.3	27.3
Stream04	100.9	464.5	95.7	56.4	3020.4	32.1	24.1	28.2
Stream05	68.2	519.3	89.0	61.7	2287.6	133.6	24.0	23.4
Stream06	82.9	1135.8	72.4	41.6	2075.2	126.8	29.0	24.9
Stream07	92.4	1091.5	291.2	61.0	1367.9	135.6	31.6	26.9
Stream08	74.4	983.6	310.6	45.8	1767.6	105.4	30.6	26.4
Stream09	117.3	514.1	77.9	88.9	859.3	45.7	29.7	24.5
Min Qi	36.8	156.4	35	25.3	170.1	20.4	24	23.4
Max Qi	334.5	1149.5	310.6	128.6	3020.4	135.6	38.4	34.9
Avg Qi	150.5	734.7	145.9	63.9	1732.4	82.6	29.0	28.0