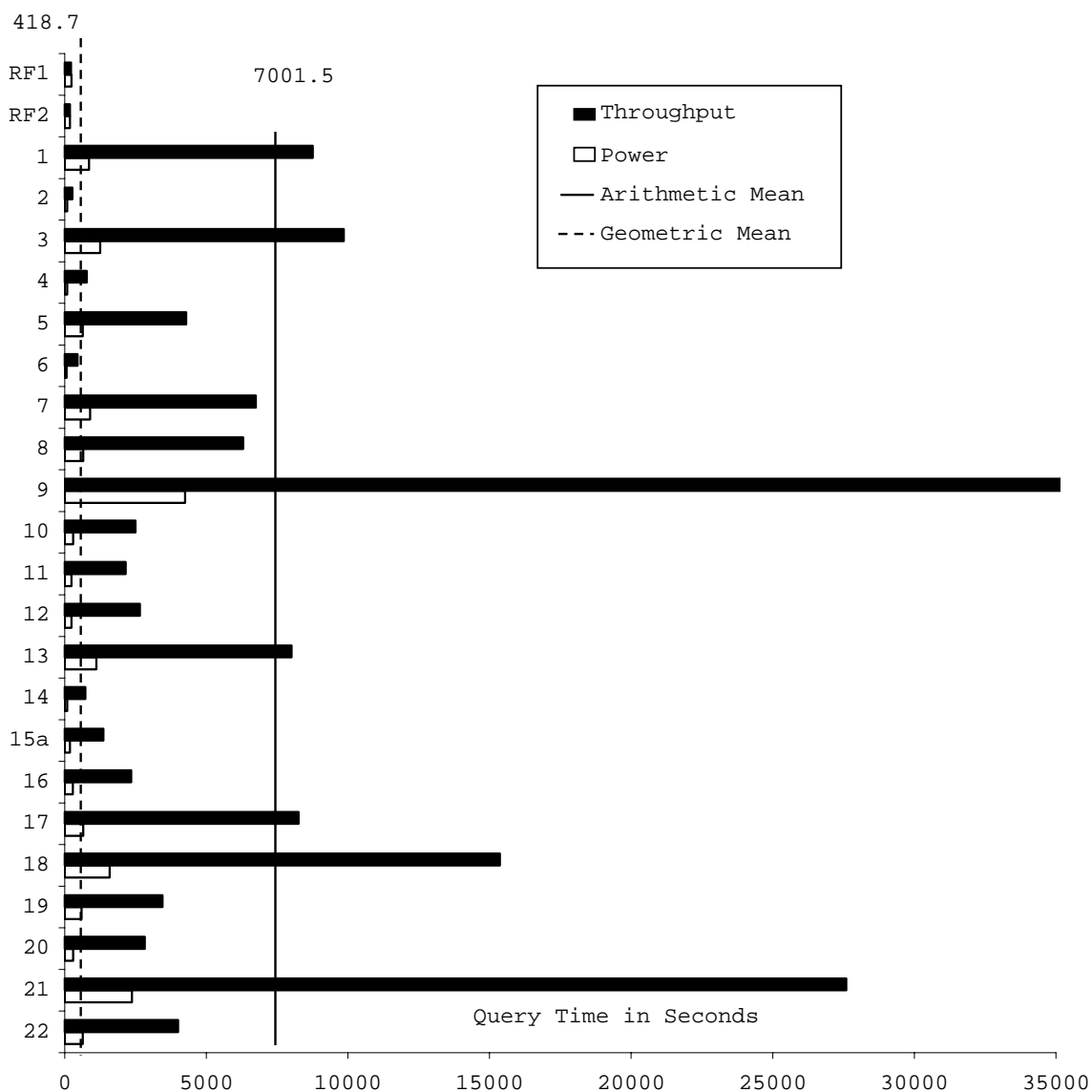


# IBM @server p690 with DB2 UDB 8.1

TPC-H Rev. 2.0.0

Report Date: Dec. 5, 2002  
Updated: Feb. 26, 2003

Total System Cost	Composite Query per Hour Rating			Price/Performance
\$15,112,757	62,214.7 QphH@10000GB			243 \$/QphH@10000GB
Database Size	Database Manager	Operating System	Other Software	Availability Date
10000GB	DB2 UDB 8.1	AIX 5L V5.2	none	May 15, 2003

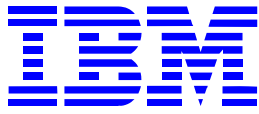


Database Load Time: 10:06:33	Load included backup: N	Total Data Storage/Database Size: 8.99
RAID (base tables): N	RAID (Base Tables and Auxiliary Data Structures): N	RAID (All): Y

### System Configuration

5 IBM @server p690 servers, each server with

Processors	32 x 1300MHz POWER4 with 4x 128MB L3 Cache
Memory	256GB
Disk Controllers	64 Advanced Serial RAID Plus adapters - 1 Integrated SCSI-2
Disk Drives	512 x 36.4GB 10K RPM SSA disks -- 6 x 36.4GB 10K RPM Ultra-160
Network	8 Gigabit Ethernet Adapters - 1 Integrated 10/100 Ethernet
Total Disk Storage	89,908.6GB (GB is defined as 1024 * 1024 * 1024 bytes)

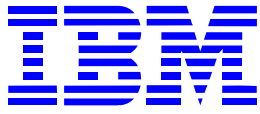


# IBM @server p690 with DB2 UDB 8.1

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Part Number	Description	Source	Unit Price	Qty	Ext Price	3 Yr Maint.
<b>Server Hardware</b>						
7040-681	IBM eserver pSeries 690	1	17,789	5	88,945	103,800
2624	32x/40x CDROM w/ 16bit Connector	1	375	5	1,875	0
3155	Disk Drive Cable	1	150	5	750	0
3255	Operator panel Attachment cable	1	100	5	500	0
3627	P76 Color Monitor	1	995	1	995	0
4139	128MB (4x32) L3 Cache, 433MHz	1	25,000	20	500,000	0
4188	32 GB H-Memory (inward facing)	1	120,500	20	2,410,000	0
4189	32 GB H-Memory (outward facing)	1	120,500	20	2,410,000	0
5244	8-w POWER4 Turbo Processor (first)	1	275,000	5	1,375,000	504,000
5251	Programmable Clock Card	1	350	5	1,750	0
5254	8-w POWER4 Turbo Processor option	1	275,000	15	4,125,000	1,512,000
6161	Cable group, power center to CEC and Fans	1	400	5	2,000	0
6162	Interface cable, Service processor to power subsystem	1	200	5	1,000	0
6170	Standard CEC DC/DC Converter Assembly	1	4,700	10	47,000	0
6181	Power cable group to 1st processor group	1	270	5	1,350	0
6182	Power cable group to 2nd processor group option	1	150	5	750	0
6183	Power cable group to 3rd processor group option	1	150	5	750	0
6184	Power cable group to 4th processor group option	1	150	5	750	0
6189	Additional DC/DC Converter Assembly, (DCA)	1	4,200	15	63,000	0
6198	Capacitor book (for 2 MCMS)	1	1,800	10	18,000	0
6404	Service Processor + Dual Rio Loop (GX)	1	7,000	5	35,000	0
6410	Remote I/O Loop Adapter	1	8,000	10	80,000	0
6565	Backplane, CEC	1	50,000	5	250,000	0
7316	Hardware Management Console	1	4,325	1	4,325	0
8692	Media Drawer, Operator panel, Diskette	1	1,700	5	8,500	0
7040-61D	I/O Drawer	1	3,980	40	159,200	163,200
2122	SCSI cable - B&C to Media Drawer	1	275	5	1,375	0
5700	Gigabit Adapter (Fiber)	1	1,700	40	68,000	0
3145	Remote I/O Cable, 500MHz, 0.5m (RIO)	1	310	40	12,400	0
3149	Remote I/O Cable, 500MHz, 2m (RIO)	1	350	80	28,000	0
3158	36.4 GB Ultra3 10K RPM 1" U3 Module	1	2,000	30	60,000	0
6121	Cable Group, 4xUPIC/2xRIO, BPM(IO#1) to B&C(pos 4609)	1	400	5	2,000	0
6122	Cable Group, 4xUPIC/2xRIO, BPM(IO#2) to B&C(pos 4605)	1	400	5	2,000	0
6123	Cable Group, 4xUPIC/2xRIO, BPM(IO#3) to B&C(pos 4601)	1	400	5	2,000	0
6124	Cable Group, 4xUPIC/2xRIO, BPM(IO#4) to B&C(pos 4613)	1	400	5	2,000	0
6125	Cable Group, 4xUPIC/2xRIO, BPM(IO#4) to B&C(pos 4613)	1	400	5	2,000	0
6126	Cable Group, 4xUPIC/2xRIO, BPM(IO#4) to B&C(pos 4613)	1	400	5	2,000	0
6128	Cable Group, 4xUPIC/2xRIO, BPM(IO#4) to B&C(pos 4613)	1	400	5	2,000	0
6129	Cable Group, 4xUPIC/2xRIO, BPM(IO#4) to B&C(pos 4613)	1	400	5	2,000	0
6172	I/O Drawer DC/DC Converter assembly, (DCA)	1	4,000	80	320,000	0
6179	Power Cable, B&C to Media Drawer	1	300	5	1,500	0
6206	Ultra SCSI PCI-Bus Adapter	1	395	5	1,975	0
6230	Advanced Serial RAID Plus adapters	1	3,000	320	960,000	0
6235	32 MB Fast_Write Cache option card	1	575	320	184,000	0
6563	I/O drawer PCI pliner, 2 Int. Ultra3 SCSI ports	1	8,000	80	640,000	0
6564	Ultra3 SCSI 4-Pack	1	500	160	80,000	0
7040-61R	System Rack	1	5,500	5	27,500	19,800
6070	Front Door, 24W, 2M, IBM Black/Copper	1	3,000	5	15,000	0
6071	Front Door, Secondary rack	1	550	5	2,750	0
6074	Rear Door, Slimline	1	750	10	7,500	0



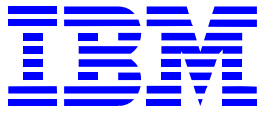
# IBM @server p690 with DB2 UDB 8.1

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	6186 Bulk Power Regulator (BPR)	1	4,000	30	120,000	0
	6187 Bulk Power Controller (BPC), 4 Fans + 3 DCAs	1	1,900	10	19,000	0
	6188 Bulk Power Distribution (BPD), 10 DCAs	1	3,500	20	70,000	0
	6200 Integrated Battery Backup, primary	1	4,500	15	67,500	0
	6201 Integrated Battery Backup, redundant	1	4,500	15	67,500	0
	6240 Cable Integrated Battery Backup, t	1	100	20	2,000	0
	6241 Cable Integrated Battery Backup, Exp. rack	1	135	10	1,350	0
	8678 Line Cord, 60A, 14', IEC309 Plug, Chargeable	1	1,000	10	10,000	0
	8690 Regatta-H Bulk Power Module (2x BPA, EPO PNL)	1	5,000	5	25,000	0
	8691 Expansion Rack 24", 42 EIA	1	8,000	5	40,000	0
	<b>Server Subtotal</b>				<b>14,434,790</b>	<b>2,302,800</b>
<b>Storage</b>						
7014-T42	System Rack Model T42 (6089,6098)	1	5,000	20	100,000	17,760
	6171 Additional Power Distribution Unit	1	1,000	60	60,000	0
7133-D40	SSA Disk Subsystem	1	12,750	160	2,040,000	706,560
	8022 50/60 Hz AC, 300 VDC Power Supply	1	2,000	160	320,000	0
	8031 Raven Black Drawer Cover	1	250	160	40,000	0
	8536 10K/36.4 GB Advanced Disk Drive Module	1	5,900	2,560	15,104,000	0
	8801 SSA Cables (8801)	1	60	160	9,600	0
	<b>DASD Storage Subtotal</b>				<b>17,513,600</b>	<b>724,320</b>
	<b>RACK Hardware Subtotal</b>				<b>160,000</b>	
<b>Software</b>						
	AIX 5.2 (Media only)	1	50	5	250	0
	D5A1ELL, E1A1FLL AIX C Compiler	1	559	1	559	104
	D5BISLLDB2 FOR EBUSINESS Lic/1 yr Maint (500 user Lic)	1	221,000	1	221,000	
	E1BIQLLDB2 FOR EBUSINESS Maint Renew (year)	1	49,500	2	0	99,000
	<b>Software Subtotal</b>				<b>221,809</b>	<b>99,104</b>
<b>Third Party Hardware</b>						
WS-C3508G-XL-EN	Catalyst 3508G XL Enterprise Edition		4,995	10	49,950	0
	<b>Third Party Hardware Subtotal</b>				<b>49,950</b>	<b>0</b>
	<b>Subtotal</b>				<b>32,380,149</b>	<b>3,126,224</b>
	<b>Total</b>					<b>35,506,373</b>
<b>Discounts</b>	All IBM hardware & AIX one time volume Discount			60%	(19,182,768)	
	Storage Service Discount			40%	(289,728)	
	Server Service Discount			40%	(921,120)	
<b>Total</b>					<b>(20,393,616)</b>	<b>15,112,757</b>
Notes (Source):					3 Year Cost of Ownership	\$ 15,112,757
1. IBM					QpH @ 10000 GB	62,214
					\$/QpH @ 10000 GB	\$ 242.92
For assistance with any of these prices or their applicability to any customer's requirements, please contact one of the following individuals:						
William R. Casey, eServer pSeries Offering Manager, email: wrcasey@us.ibm.com, phone 1-512-838-1422						
Paul Rivot, Director Database Servers and Business Intelligence Software, email: privot@us.ibm.com, phone 1-914-766-1325						
Audited by: Francois Raab & Brad Askins of Infosizing (www.infosizing.com)						
Note: Hardware immediately available. All software will be available May 15, 2003						

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 base 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 the stated prices are not available according to these terms, please notify the TPC at pricing@tpc.org. Thank You.



# IBM @server p690 with DB2 UDB 8.1

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## Numerical Quantities Summary

### Measurement Results:

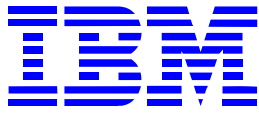
Database Scaling (SF/Size)	=	10000
Total Data Storage/Database Size	=	8.99
Start of Database Load	=	11/19/2002 18:58:31
End of Database Load	=	11/20/2002 05:05:04
Database Load Time	=	10:06:33
Query Streams for Throughput Test	=	9
TPC-H Power Metric (QppH@10000GB)	=	85,972.5
TPC-H Throughput Metric (QthH@10000GB)	=	45,022.2
Composite Query-per-Hour Rating (QphH@10000GB)	=	62,214.7
Total System Price over 3 years	=	\$15,112,757
TPC-H Price/Performance Metric (\$/QphH@10000GB)	=	243

### Measurement Intervals

Measurement Interval in Throughput Test (Ts) = 158,322.1 seconds

### Duration of Stream Execution

Stream Id	Seed Used	Start Date & Time		End Date & Time		Duration
Stream 00	1120050504	11/22/2002	18:16:29	11/22/2002	23:13:07	4:56:38
Stream 01	1120050505	11/22/2002	23:13:45	11/24/2002	18:11:23	42:57:38
Stream 02	1120050506	11/22/2002	23:13:45	11/24/2002	18:11:37	42:57:52
Stream 03	1120050507	11/22/2002	23:13:45	11/24/2002	17:49:47	42:36:02
Stream 04	1120050508	11/22/2002	23:13:45	11/24/2002	17:52:13	42:38:28
Stream 05	1120050509	11/22/2002	23:13:45	11/24/2002	17:52:48	42:39:03
Stream 06	1120050510	11/22/2002	23:13:45	11/24/2002	17:58:00	42:44:15
Stream 07	1120050511	11/22/2002	23:13:45	11/24/2002	18:08:40	42:54:55
Stream 08	1120050512	11/22/2002	23:13:45	11/24/2002	17:55:57	42:42:12
Stream 09	1120050513	11/22/2002	23:13:45	11/24/2002	18:08:27	42:54:42
Refresh		11/24/2002	18:11:37	11/24/2002	19:12:28	1:00:51



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## Timing Intervals (in Seconds)

Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Stream 0	859.9	85.0	1247.1	82.4	630.8	63.9	896.4	651.8	4248.2	301.8	239.2	243.5
Stream 01	6053.6	774.7	9843.9	99.0	4676.6	422.4	6781.3	6191.8	38497.5	2267.1	1829.1	2872.9
Stream 02	8756.1	179.0	9697.9	909.2	4328.9	554.8	6650.7	6560.6	37624.7	2105.5	2109.8	2761.4
Stream 03	8874.1	201.1	9657.5	831.9	4079.0	380.1	6946.3	7092.4	34043.3	2366.7	2476.8	3314.0
Stream 04	9233.4	206.3	10595.4	704.6	4823.7	394.0	6458.7	5998.6	33800.0	2997.1	2335.6	2761.8
Stream 05	9731.9	163.8	10291.4	903.5	4055.9	410.7	6612.7	5930.8	33400.8	2558.3	2494.5	2645.0
Stream 06	8940.3	224.2	9934.1	849.7	4221.8	358.1	6584.6	6147.8	34535.1	2539.4	2181.2	2823.2
Stream 07	9087.8	248.6	9842.1	1068.5	4485.7	627.3	7433.6	5981.9	35327.6	2516.4	2045.3	943.4
Stream 08	9370.0	185.9	9317.3	772.5	4222.3	440.3	6642.5	5751.6	34421.7	2151.6	1695.2	2912.6
Stream 09	8828.1	221.2	9522.2	841.3	3685.3	449.9	6661.9	7050.7	36302.4	2978.4	2248.8	2889.0
Minimum	6053.6	163.8	9317.3	99.0	3685.3	358.1	6458.7	5751.6	33400.8	2105.5	1695.2	943.4
Average	8763.9	267.2	9855.8	775.6	4286.6	448.6	6752.5	6300.7	35328.1	2497.8	2157.4	2658.1
Maximum	9731.9	774.7	10595.4	1068.5	4823.7	627.3	7433.6	7092.4	38497.5	2997.1	2494.5	3314.0
Stream ID	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 0	1116.6	87.3	185.3	293.2	652.5	1589.4	597.9	294.7	2374.5	634.1	237.3	184.9
Stream 01	7970.4	663.4	1432.9	2556.3	8687.0	13513.5	3499.4	3081.1	28792.6	4151.6	219.9	185.9
Stream 02	8084.3	727.1	1359.5	2452.5	8801.7	15833.8	3424.8	2737.4	25173.3	3838.9	227.6	188.9
Stream 03	8292.6	777.5	1386.4	2753.9	8170.7	14879.8	3215.5	2765.8	26682.2	4173.5	217.3	173.5
Stream 04	7452.4	726.6	1313.7	2536.4	7822.4	14719.9	3378.2	2524.1	28585.7	4138.1	226.8	181.3
Stream 05	8348.8	738.2	1407.8	2513.1	7391.9	15068.7	3428.8	2980.3	28500.5	3964.7	229.8	180.1
Stream 06	8002.5	764.3	1355.2	2291.8	8118.6	15265.0	3314.5	2878.2	28455.6	4068.9	222.7	189.9
Stream 07	7805.4	676.7	1114.3	2388.2	8859.9	16168.0	3486.1	2957.4	27405.0	4024.0	227.9	177.5
Stream 08	7901.3	765.4	1463.2	2606.9	7899.7	16925.5	3902.4	2775.1	27827.9	3779.1	220.9	181.3
Stream 09	8190.2	724.9	1457.5	1032.5	8582.7	15944.4	3388.3	2717.1	26938.3	3824.3	225.2	173.6
Minimum	7452.4	663.4	1114.3	1032.5	7391.9	13513.5	3215.5	2524.1	25173.3	3779.1	217.3	173.5
Average	8005.3	729.3	1365.6	2348.0	8259.4	15368.7	3448.7	2824.1	27595.7	3995.9	224.2	181.3
Maximum	8348.8	777.5	1463.2	2753.9	8859.9	16925.5	3902.4	3081.1	28792.6	4173.5	229.8	189.9

