

**IBM® @server™ xSeries® 445
with
IBM DB2® UDB 8.1**

TPC-H Rev 2.0

Report Date: August 8, 2003

Total System Cost

Composite Query-per-Hour Metric

Price/Performance

\$435,373

**6,354.9
QphH @ 300GB**

**\$69
per QphH @ 300GB**

Database Size

Database Manager

Operating System

Other Software

Availability Date

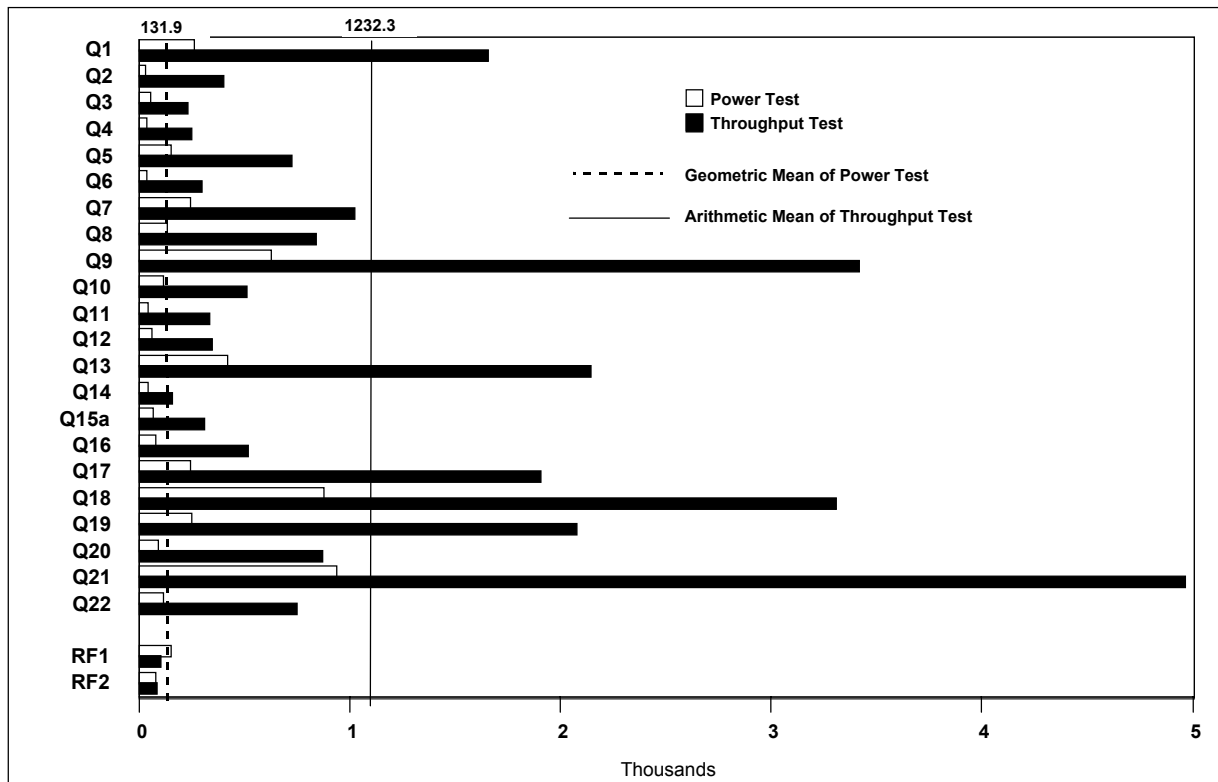
300GB

**IBM DB2 UDB 8.1
Enterprise Server
Edition**

**Microsoft®
Windows® Server
2003 Enterprise
Edition**

**Microsoft
Visual
Studio
Professional**

**February 7,
2004**



Database Load Time: 03:24:00

Load Included Backup: Y

Total Data Storage /
Database Size: 15.59

RAID (Base Tables Only): N

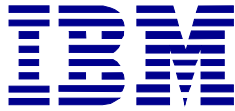
RAID (Base Tables and Auxiliary
Data Structures): N

RAID (All): N

Configuration

Processors 8
Memory 16
Disk Controllers 5
Disk Drives 136
2
Total Disk Storage

Intel Xeon MP 2.8GHz / 2MB ECC L3 Cache
1GB PC2100 DDR ECC SDRAM RDIMM
ServeRAID-6M Ultra320 SCSI Adapter
36.4GB 15K Ultra160 SCSI Drive
36.4GB 15K Ultra320 SCSI Drive
4678.2GB



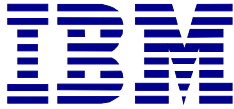
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Description	Part Number	Source	Unit Price	Qty	Ext. Price	3-Yr. Maint.
Server Hardware						
xSeries 445 w / 4 x 2.8GHz/2MB L3 Xeon MP and 4 x 512MB Memory	8870-7RX	1	40,799	1	40,799	3,390
2.8GHz / 2MB L3 Cache Xeon MP	02R2064	1	6,599	4	26,396	0
xSeries 445 SMP Expansion Module	02R1870	1	4,849	1	4,849	0
1GB PC2100 DDR ECC SDRAM	33L5039	1	659	16	10,544	0
ServeRAID-6M Ultra320 Adapter	32P0033	1	999	5	4,995	0
36.4GB 15K Ultra320 SCSI Drive	32P0734	1	659	2	1,318	0
4.2M Ultra2 SCSI Cable	03K9311	1	105	10	1,050	0
APC Smart-UPS Model 1400	32P1020	1	855	1	855	0
IBM Preferred Pro Full-Size Keyboard	31P7415	1	29	1	29	0
IBM Sleek 2-Button Mouse	28L3673	1	19	1	19	0
E54 15" (13.8" Viewable) Display	633147N	1	129	1	129	90
NetBAY42S Enterprise Rack	9306421	1	1,439	1	1,439	168
Subtotal					\$92,422	\$3,648
Server Storage						
RXE-100 Remote Exp. Enclosure	8684-1RX	1	4,569	1	\$4,569	\$1,330
EXP300 Rack Storage Enclosure	35311RU	1	3,179	10	31,790	2,000
36.4GB 15K Ultra160 SCSI H/S Drive	06P5768	1	549	136	74,664	0
					\$111,023	\$3,330
Server Software						
DB2 UDB ESE 8.1 SW License & Maintenance to 1st Anniv.	D518GLL	1	21,425	8	171,400	
SW Maintenance Renewal - 1 Year	E00BILL	1	8,160	2		16,320
DPF SW License & Maintenance to 1st Anniv.	D518JLL	1	6,436	8	51,488	
DPT SW Maintenance Renewal - 1 Year	E00BILL	1	306	16		4,896
Microsoft Windows Server 2003 Enterprise Edition	P72-00264	2	2,399	1	2,399	Incl Below
Microsoft Visual Studio Professional	659-00844	2	1,079	1	1,079	Incl Below
Operating System Support Package	PROPRORS165U01	2	1,950	3		5,850
Subtotal					\$226,366	\$27,066
IBM hardware discount of 14%.					\$28,482	\$0
Total					\$401,329	\$34,044
Notes: Standard 3-Year and extended warranties upgraded to 7x24 with 4-hour response time coverage. Pricing: 1 - IBM List Prices - 919-254-0367; 2 - Microsoft Corp.				3-Year Cost of Ownership:		\$435,373
Audited by Brad Askins of InfoSizing, Inc.				QphH @ 300GB:		6,354.9
				\$/ QphH @ 300GB:		\$69

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 specification. If you find that stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank you.



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Measurement Results:

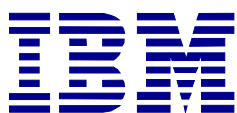
Database Scale Factor	300
Total Data Storage/Database Size	15.59
Start of Database Load	17:18:17
End of Database Load	20:41:35
Database Load Time	03:24:00
Query Streams for Throughput Test	6
TPC-H Power	8,189.1
TPC-H Throughput	4,931.5
TPC-H Composite Query-per-Hour (QphH@300GB)	6,354.9
Total System Price over 3 Years	\$435,373
TPC-H Price/Performance Metric (\$/QphH@300GB)	\$69

Measurement Interval:

Measurement Interval in Throughput Test (Ts) = 28,908 seconds

Duration of Stream Execution:

	Seed	Query Start Date/Time Query End Date/Time	RF1 Start Date/Time RF1 End Date/Time	RF2 Start Date/Time RF2 End Date/Time	Duration
Stream 00	728204135	07/28/03 21:13:15 07/28/03 22:40:34	07/28/03 21:13:15 07/28/03 21:15:51	07/28/03 22:39:13 07/28/03 22:40:34	01:27:19
Stream 01	728204136	07/28/03 22:40:36 07/29/03 06:13:54	07/28/03 22:40:36 07/29/03 06:24:04	07/29/03 06:24:04 07/29/03 06:25:32	07:33:18
Stream 02	728204137	07/28/03 22:40:36 07/29/03 06:12:04	07/29/03 06:25:32 07/29/03 06:27:25	07/29/03 06:27:25 07/29/03 06:28:58	07:31:28
Stream 03	728204138	07/28/03 22:40:36 07/29/03 06:12:05	07/29/03 06:28:58 07/29/03 06:30:51	07/29/03 06:30:51 07/29/03 06:32:41	07:31:29
Stream 04	728204139	07/28/03 22:40:37 07/29/03 06:06:11	07/29/03 06:32:41 07/29/03 06:34:31	07/29/03 06:34:31 07/29/03 06:35:57	07:25:34
Stream 05	728204140	07/28/03 22:40:03 07/29/03 06:07:22	07/29/03 06:35:57 07/29/03 06:37:48	07/29/03 06:37:48 07/29/03 06:39:02	07:27:19
Stream 06	728204141	07/28/03 22:40:37 07/29/03 06:22:31	07/29/03 06:39:02 07/29/03 06:40:50	07/29/03 06:40:50 07/29/03 06:42:24	07:41:54



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TPC-H Timing Intervals (in seconds):

Query	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Stream 00	266.6	33.2	56.0	39.3	155.0	36.8	244.9	139.7	630.1	119.5	47.2	61.4
Stream 01	1,381.6	384.1	274.4	67.0	887.1	270.3	981.4	876.0	3,075.7	634.9	286.4	302.0
Stream 02	1,680.0	450.4	198.9	202.2	625.5	267.6	1,224.5	873.5	3,724.2	404.5	220.8	318.6
Stream 03	1,790.6	420.2	152.1	210.4	680.5	202.0	797.0	846.2	3,757.3	662.7	259.2	233.0
Stream 04	1,584.5	470.0	262.8	568.1	641.3	580.8	1,075.0	826.7	2,923.9	323.2	492.9	330.5
Stream 05	1,717.3	392.3	262.4	213.8	620.8	284.3	1,182.3	825.1	2,767.5	628.9	395.9	286.7
Stream 06	1,817.6	330.6	248.4	244.1	899.5	221.5	909.0	828.9	4,270.3	442.4	365.3	641.0
Minimum	1,381.6	330.6	152.1	67.0	620.8	202.0	797.0	825.1	2,767.5	323.2	220.8	233.0
Average	1,661.9	407.9	233.2	250.9	725.8	304.4	1,028.2	846.1	3,419.8	516.1	336.8	352.0
Maximum	1,817.6	470.0	274.4	568.1	899.5	580.8	1,224.5	876.0	4,270.3	662.7	492.9	641.0

Stream ID	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 00	425.8	48.5	70.7	82.3	249.5	881.9	255.7	94.9	942.0	121.6	156.0	80.6
Stream 01	1,713.3	142.2	372.7	477.2	2,303.4	3,040.5	1,797.0	1,325.8	5,486.1	1,118.1	93.0	87.7
Stream 02	2,166.3	146.0	209.2	740.9	2,070.6	2,871.9	1,502.3	1,053.1	5,533.4	645.0	113.1	93.1
Stream 03	2,268.7	127.4	469.3	371.0	1,465.0	3,310.0	1,946.9	635.7	5,806.2	677.9	112.7	110.1
Stream 04	1,423.2	261.8	181.8	717.0	2,094.8	2,223.4	2,855.2	634.1	5,612.2	651.4	109.7	86.5
Stream 05	2,021.5	176.0	230.8	385.6	1,820.3	2,606.5	2,642.1	984.3	5,570.3	790.2	110.6	74.1
Stream 06	3,271.3	106.7	420.5	415.4	1,689.9	5,808.5	1,751.8	614.7	1,805.1	612.1	107.9	94.3
Minimum	1,423.2	106.7	181.8	371.0	1,465.0	2,223.4	1,502.3	614.7	1,805.1	612.1	93.0	74.1
Average	2,144.1	160.0	314.1	517.9	1,907.3	3,310.1	2,082.6	874.6	4,968.9	749.1	107.8	91.0
Maximum	3,271.3	261.8	469.3	740.9	2,303.4	5,808.5	2,855.2	1,325.8	5,806.2	1,118.1	113.1	110.1