

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

TPC-H Rev 2.0

Report Date: June 30, 2003

Total System Cost

Composite Query-per-Hour Metric

Price/Performance

\$410,229

**5602.6
QphH @ 100GB**

**\$73
per QphH@100GB**

Database Size

Database Manager

Operating System

Other Software

Availability Date

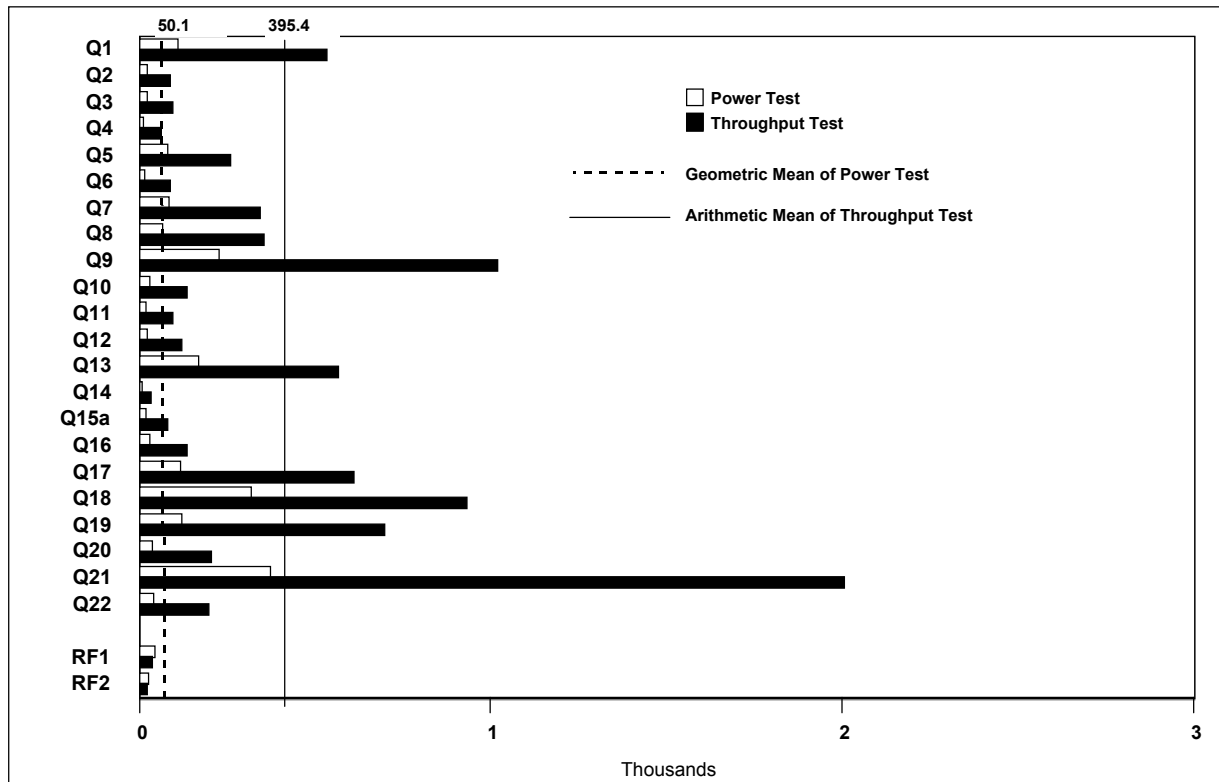
100GB

IBM DB2 UDB 8.1

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

**Microsoft
Visual
Studio
Professional**

Dec. 31, 2003



Database Load Time: 01:37:22

Load Included Backup: Y

**Total Data Storage /
Database Size: 24.39**

RAID (Base Tables Only): N

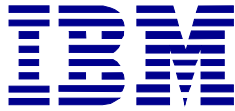
**RAID (Base Tables and Auxiliary
Data Structures): N**

RAID (All): N

Configuration

Processors/Cores/Threads 8/8/16
Memory 32
Disk Controllers 5
Disk Drives 140
 2
Total Disk Storage

**Intel Xeon MP 2.8GHz / 2MB ECC L3 Cache
 512MB PC2100 DDR ECC SDRAM RDIMM
 ServeRAID-6M Ultra320 SCSI Adapter
 18.2GB 15K Ultra160 SCSI Drive
 36.4GB 15K Ultra160 SCSI Drive
 2439.4GB**



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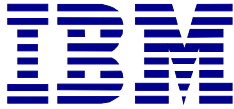
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Description	Part Number	Source	Unit Price	Qty	Ext. Price	3-Yr. Maint.
Server Hardware						
xSeries 445 w / 4 x 2.8GHz/2MB L3 Xeon MP and 4 x 512MB Memory	8870-7RX	1	40,799	1	40,799	3,390
2.8GHz / 2MB L3 Cache Xeon MP	02R2064	1	6,599	4	26,396	0
xSeries 445 SMP Expansion Module	02R1870	1	4,849	1	4,849	0
512MB PC2100 DDR ECC SDRAM	33L5038	1	305	28	8,540	0
ServeRAID-6M Ultra320 Adapter	32P0033	1	999	5	4,995	0
36.4GB 15K Ultra160 SCSI Drive	06P5768	1	549	2	1,098	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					\$90,198	\$3,648
Server Storage						
RXE-100 Remote Exp. Enclosure	8684-1RX	1	4,569	1	\$4,569	\$1,330
EXP300 Rack Storage Expansion Enclosure	35311RU	1	3,179	10	31,790	2,000
18.2GB 15K Ultra160 SCSI Drive	06P5767	1	329	140	46,060	0
Subtotal					\$82,419	\$3,330
Server Software						
DB2 UDB ESE 8.1License/1-Yr Maint.	D518GLL	1	21,242	8	169,936	
DB2 UDB ESE 8.1 Support -1Yr/Proc.	E00BILL	1	4,721	16		75,536
Microsoft Windows Server 2003 Enterprise Edition	P72-00264	2	2,399	1	2,399	Incl Below
Visual Studio Professional	659-00844	2	1,079	1	1,079	Incl Below
Operating System Support Package	PROPROPS16U01	2	1,950	3		5,850
Subtotal					\$173,414	\$81,386
IBM hardware discount of 14%.					\$24,166	\$0
Total					\$321,865	\$88,364

Notes: Standard 3-Year and extended warranties upgraded to 7x24, 4-hour response time coverage. *10% or minimum 2 spares are added in place of on-site service; product has a 5-year return-to-vendor warranty.
Pricing: 1 - IBM List Prices - 919-254-0367; 2 - Microsoft Corp.
Audited by Brad Askins of InfoSizing, Inc.

3-Year Cost of Ownership: \$410,229
QphH @ 100GB: 5,602.6
\$/ QphH @ 100GB: \$73

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:

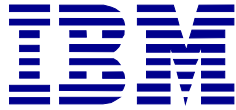
Database Scale Factor	100
Total Data Storage/Database Size	24.39
Start of Database Load	15:11:31
End of Database Load	16:48:53
Database Load Time	01:37:22
Query Streams for Throughput Test	5
TPC-H Power	7,187.7
TPC-H Throughput	4,367.0
TPC-H Composite Query-per-Hour (QphH@100GB)	5,602.6
Total System Price over 3 Years	\$410,229
TPC-H Price/Performance Metric (\$/QphH@100GB)	\$73

Measurement Interval:

Measurement Interval in Throughput Test (Ts) = 9068 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	608164853	06/08/03 17:04:17 06/08/03 17:36:58	06/08/03 17:03:22 06/08/03 17:04:06	06/08/03 17:36:58 06/08/03 17:37:24	00:32:41
Stream 01	608164854	06/08/03 17:37:26 06/08/03 20:02:11	06/08/03 20:03:26 06/08/03 20:04:10	06/08/03 20:04:10 06/08/03 20:04:34	02:24:45
Stream 02	608164855	06/08/03 17:37:26 06/08/03 20:01:31	06/08/03 20:04:34 06/08/03 20:05:06	06/08/03 20:05:06 06/08/03 20:05:29	02:24:05
Stream 03	608164856	06/08/03 17:37:26 06/08/03 20:01:59	06/08/03 20:05:29 06/08/03 20:06:09	06/08/03 20:06:09 06/08/03 20:06:34	02:24:33
Stream 04	608164857	06/08/03 17:37:26 06/08/03 20:03:00	06/08/03 20:06:34 06/08/03 20:07:13	06/08/03 20:07:13 06/08/03 20:07:36	02:25:34
Stream 05	608164858	06/08/03 17:37:26 06/08/03 20:03:27	06/08/03 20:07:36 06/08/03 20:08:10	06/08/03 20:08:10 06/08/03 20:08:34	02:26:01



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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	111.9	23.5	15.1	12.5	84.0	17.1	86.5	65.8	229.2	32.1	19.5	25.4
Stream 01	581.2	70.2	64.1	25.6	309.2	79.2	320.4	274.2	978.5	109.8	85.0	139.3
Stream 02	494.9	112.2	72.2	64.4	239.8	91.0	402.7	415.8	1,123.9	126.7	103.3	119.5
Stream 03	565.4	108.4	50.2	53.3	240.5	76.9	300.1	302.9	980.3	186.3	89.0	92.3
Stream 04	538.2	74.0	49.8	114.2	246.0	116.8	289.8	510.8	1,215.1	113.8	90.0	153.8
Stream 05	491.7	84.0	242.5	57.9	272.3	87.3	420.7	282.5	812.0	152.3	110.8	111.8
Minimum	491.7	70.2	49.8	25.6	239.8	76.9	289.8	274.2	812.0	109.8	85.0	92.3
Average	534.3	89.8	95.8	63.1	261.6	90.2	346.7	357.2	1,022.0	137.8	95.6	123.3
Maximum	581.2	112.2	242.5	114.2	309.2	116.8	420.7	510.8	1,215.1	186.3	110.8	153.8

Stream ID	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 00	170.1	10.9	21.6	32.8	118.8	318.2	121.4	39.7	374.9	41.3	44.1	25.7
Stream 01	606.7	26.1	80.5	208.4	731.0	964.6	648.4	222.2	1,916.0	244.0	44.0	23.8
Stream 02	498.0	30.4	128.0	95.6	611.1	961.9	578.1	212.3	1,965.6	197.7	32.1	22.2
Stream 03	533.7	29.6	85.1	125.3	546.7	1,030.1	579.9	231.6	2,258.6	206.5	40.3	25.2
Stream 04	504.2	48.6	60.9	97.8	641.1	790.8	877.2	87.8	1,961.5	151.5	38.8	23.0
Stream 05	694.5	41.2	61.7	161.2	538.5	927.2	810.4	278.8	1,933.7	187.5	34.1	23.9
Minimum	498.0	26.1	60.9	95.6	538.5	790.8	578.1	87.8	1,916.0	151.5	32.1	22.2
Average	567.4	35.2	83.2	137.7	613.7	934.9	698.8	206.5	2,007.1	197.4	37.9	23.6
Maximum	694.5	48.6	128.0	208.4	731.0	1,030.1	877.2	278.8	2,258.6	244.0	44.0	25.2