

**IBM @server xSeries 440
with
IBM DB2 UDB 8.1**

TPC-H Rev 2.0

Report Date: Dec. 16, 2002

Total System Cost

Composite Query-per-Hour Metric

Price/Performance

\$436,680

**3,342.7
QphH @ 100GB**

**\$131
per QphH@100GB**

Database Size

Database Manager

Operating System

Other Software

Availability Date

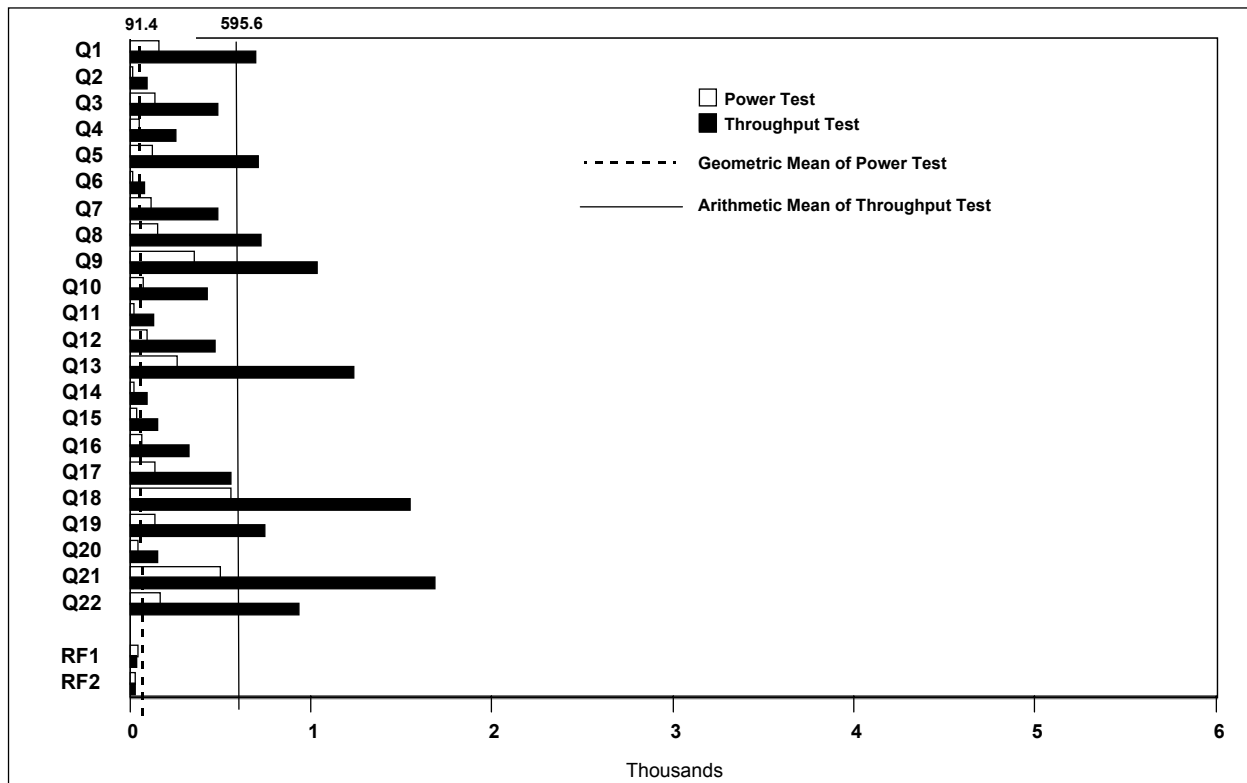
100GB

IBM DB2 UDB 8.1

**Microsoft
Windows .NET
Enterprise Server
2003**

**Visual Studio
.NET
Professional**

May 15, 2003



Database Load Time: 05:57:00

Load Included Backup: Y

Total Data Storage /
Database Size: 25.24

RAID (Base Tables Only): N

RAID (Base Tables and
Auxiliary Data Structures): N

RAID (All): N

Configuration

Processors

8

Memory

16

Disk Controllers

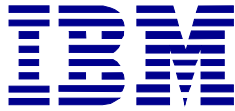
10

Disk Drives

149

Total Disk Storage

**Intel Xeon MP 2.0GHz / 2MB ECC L3 Cache
512MB PC133 CL3 ECC SDRAM RDIMM
ServeRAID-4Mx Ultra160 SCSI Adapter
18.2GB 15K Ultra160 SCSI Drive
2524GB**



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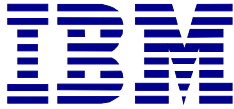
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Description	Part Number	Source	Unit Price	Qty	Ext. Price	3-Yr. Maint.
Server Hardware						
xSeries 440 w / 4 x 2.0GHz/2MB L3 I Xeon MP and 4 x 512MB Memory	8687-7RX	1	40,299	1	40,299	3,390
2.0GHz / 2MB L3 Cache Xeon MP	59P5173	1	6,599	4	26,396	0
xSeries SMP Expansion Module	59P5188	1	5,199	1	5,199	0
512MB PC133 ECC SDRAM RDIMM	33L3324	1	499	12	5,988	0
ServeRAID-4Mx Ultra160 Adapter	06P5736	1	879	10	8,790	0
4.2M Ultra2 SCSI Cable	03K9311	1	105	20	2,100	0
APC Smart-UPS Model 1400	32P1020	1	855	1	855	0
E54 15" (13.8" Viewable) Display	633147N	1	139	1	139	90
Intel PRO/1000 Gigabit Server Adapter	22P6801	1	185	1	185	0
NetBAY11 Standard Rack	9306110	1	519	1	519	300
NetBAY42S Enterprise Rack	9306421	1	1,439	1	1,439	300
Subtotal					\$91,909	\$4,080
Server Storage						
EXP300 Rack Storage Expansion Enclosure	35311RU	1	3,179	12	38,148	2,400
RXE-100 Remote Expansion	8684-1RX	1	4,569	1	4,569	1,050
Remote I/O PCI-X 6-Slot Expansion	31P5998	1	1,699	1	1,699	0
3.5M Interconnect Management Kit	31P6087	1	49	1	49	0
3.5M Remote I/O Cable Kit	31P6102	1	599	1	599	0
18.2GB 15K Ultra160 SCSI Drive	06P5767	1	439	149	65,411	0
Subtotal					\$110,475	\$3,450
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 .NET Enterprise Server 2003	N/A	2	2,699	16	2,699	InclBelow
Visual Studio .NET Professional	659-00844	2	1,079	1	1,079	Incl Below
Database Server Support Package	PROPRORS16U01	2	1,950	3		5,850
Subtotal					\$173,714	\$81,386
Large volume discount of 14% on IBM hardware; prices vary if purchased separately.					(\$28,334)	
Total					\$347,764	\$88,916

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; 2 - Microsoft Corp.
Audited by Brad Askins of InfoSizing, Inc.

3-Year Cost of Ownership: \$436,680
QphH @ 100GB: 3,342.7
\$ / QphH @ 100GB: \$131

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:

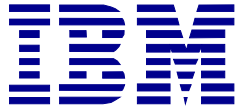
Database Scale Factor	100
Total Data Storage/Database Size	25.24
Start of Database Load	01:59:42
End of Database Load	07:56:09
Database Load Time	05:57:00
Query Streams for Throughput Test	5
TPC-H Power	3,936.9
TPC-H Throughput	2,838.1
TPC-H Composite Query-per-Hour (QphH@100GB)	3,342.7
Total System Price over 3 Years	\$436,680
TPC-H Price/Performance Metric (\$/QphH@100GB)	\$131

Measurement Interval:

Measurement Interval in Throughput Test (Ts) = 13,953 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	1211075609	12/11/02 9:06:21	12/11/02 9:05:32	12/11/02 10:01:45	0:56:45
		12/11/02 10:01:45	12/11/02 9:06:21	12/11/02 10:02:17	
Stream 01	1211075610	12/11/02 10:02:23	12/11/02 13:48:55	12/11/02 13:49:40	3:46:33
		12/11/02 13:48:56	12/11/02 13:49:40	12/11/02 13:50:11	
Stream 02	1211075611	12/11/02 10:02:23	12/11/02 13:50:11	12/11/02 13:50:51	3:39:32
		12/11/02 13:41:55	12/11/02 13:50:51	12/11/02 13:51:22	
Stream 03	1211075612	12/11/02 10:02:23	12/11/02 13:51:22	12/11/02 13:52:02	3:22:20
		12/11/02 13:24:43	12/11/02 13:52:02	12/11/02 13:52:33	
Stream 04	1211075613	12/11/02 10:02:24	12/11/02 13:53:33	12/11/02 13:53:15	3:37:11
		12/11/02 13:39:35	12/11/02 13:53:15	12/11/02 13:53:45	
Stream 05	1211075614	12/11/02 10:02:25	12/11/02 13:53:45	12/11/02 13:54:25	3:46:19
		12/11/02 13:48:44	12/11/02 13:54:25	12/11/02 13:54:56	



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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	166.2	20.2	138.5	51.8	124.9	20.9	122.1	157.1	357.6	74.0	28.5	95.4
Stream 01	288.0	108.6	480.7	119.1	691.2	92.5	563.5	999.8	1,364.0	711.8	232.4	380.9
Stream 02	507.1	97.3	555.2	204.5	751.0	62.6	293.7	959.3	1,635.5	512.1	139.7	207.9
Stream 03	968.8	90.5	475.6	306.2	821.8	81.6	549.9	690.6	826.8	285.3	80.3	549.9
Stream 04	857.8	111.4	346.3	283.3	692.9	109.9	405.6	260.0	867.1	361.4	101.6	847.7
Stream 05	858.0	63.5	583.9	358.9	616.7	78.1	635.9	739.0	483.0	291.1	127.6	381.7
Minimum	288.0	63.5	346.3	119.1	616.7	62.6	293.7	260.0	483.0	285.3	80.3	207.9
Average	695.9	94.3	488.3	254.4	714.7	84.9	489.7	729.7	1,035.3	432.3	136.3	473.6
Maximum	968.8	111.4	583.9	358.9	821.8	109.9	635.9	999.8	1,635.5	711.8	232.4	847.7

Stream ID	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 00	262.8	25.8	41.0	69.2	140.8	561.5	143.1	45.9	504.8	172.6	49.1	31.5
Stream 01	1,396.6	71.3	145.5	371.5	482.0	1,640.4	423.0	189.9	1,991.9	849.0	45.0	31.3
Stream 02	1,417.1	111.0	170.9	404.9	613.9	1,519.0	663.3	199.6	1,061.3	1,084.7	39.2	31.2
Stream 03	944.5	65.4	113.0	309.3	571.1	1,530.6	758.0	125.7	1,525.9	468.9	40.5	30.4
Stream 04	942.6	127.5	166.3	245.2	737.8	1,414.8	1,001.5	102.8	1,957.9	1,089.2	42.6	30.2
Stream 05	1,514.2	116.0	190.0	312.8	407.7	1,649.0	901.1	172.6	1,919.3	1,178.7	39.7	31.3
Minimum	942.6	65.4	113.0	245.2	407.7	1,414.8	423.0	102.8	1,061.3	468.9	39.2	30.2
Average	1,243.0	98.2	157.1	328.7	562.5	1,550.8	749.4	158.1	1,691.3	934.1	41.4	30.9
Maximum	1,514.2	127.5	190.0	404.9	737.8	1,649.0	1,001.5	199.6	1,991.9	1,178.7	45.0	31.3