

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

TPC-H Rev 2.1.0

Report Date: March 2, 2004

Total System Cost

Composite Query-per-Hour Metric

Price/Performance

**\$431,836**

**6551.8  
QphH @ 300GB**

**\$66  
per QphH @ 300GB**

Database Size

Database Manager

Operating System

Other Software

Availability Date

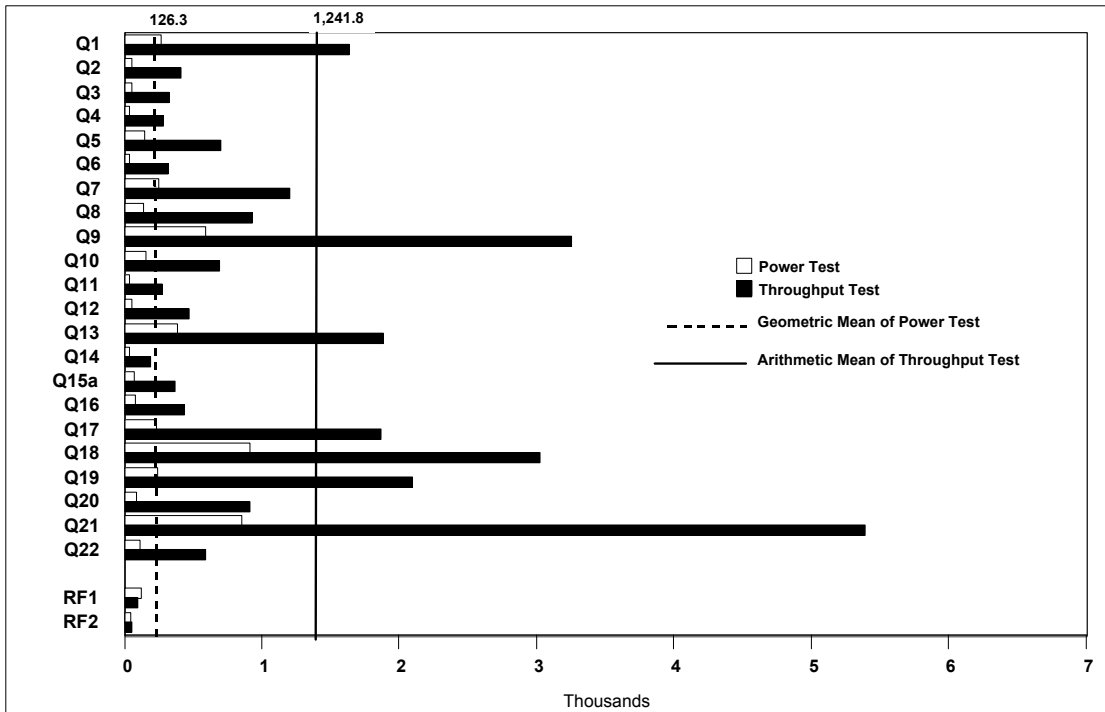
**300GB**

**IBM DB2 UDB 8.1**

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

**Microsoft  
Visual C++  
.NET  
Standard**

**Aug. 31, 2004**



Database Load Time: 03:26:00

Load Included Backup: Y

Total Data Storage /  
Database Size: 15.59

RAID (Base Tables Only): N

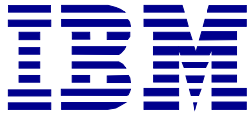
RAID (Base Tables and Auxiliary  
Data Structures): N

RAID (All): N

**Configuration**

Processors/Cores/Threads 8/8/16  
Memory 32  
Disk Controllers 5  
Disk Drives 136  
2  
Total Disk Storage

Intel Xeon MP 3.0GHz / 4MB ECC L3 Cache  
512MB 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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**TPC-H 2.1.0 Executive Summary**

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Description	Part Number	Third Party Brand	Pricing	Unit Price	Quantity	Extended Price	3-Yr. Maint. Price
<b>Server Hardware</b>							
IBM e(logo)server xSeries 445 w/3.0GHz Xeon MP w/4 x 3.0GHz/4MB Xeon MP Processors w/4 x 512MB ECC SDRAM RDIMMs	8870-42X	IBM		40,799	1	40,799	3,221
xSeries 3.0GHz/4MB Processor	13N0721	IBM		6,599	4	26,396	
xSeries 445 SMP Expansion Module	02R1870	IBM		4,849	1	4,849	
512MB PC2100 DDR ECC SDRAM RDIMM	33L5038	IBM		249	28	6,972	
36.4GB 15K Ultra320 SCSI Hot-Swap Drive	32P0734	IBM		495	2	990	
ServeRAID-6M Ultra320 SCSI Contoller	32P0033	IBM		999	5	4,995	
APC Smart-UPS Model 1400	32P1020	IBM		855	1	855	
Netfinity 4.2M Ultra2 SCSI Cable	03K9311	IBM		105	10	1,050	
IBM Preferred Pro Full-Size Keyboard	31P7415	IBM		29	1	29	
IBM Sleek 2-Button Mouse	28L3673	IBM		15	1	15	
E54 15" (13.8" Viewable) Color Monitor	633147N	IBM		119	1	119	90
NetBAY42S Enterprise Rack	9306421	IBM		1,439	1	1,439	168
<b>Subtotal</b>						<b>88,508</b>	<b>3,479</b>
<b>Server Storage</b>							
IBM RXE-100 Remote Expansion Enclosure	8684-2RX	IBM		4,569	1	4,569	1,330
IBM EXP400 Rack Storage Exp. Enclosure	17331RU	IBM		3,099	10	30,990	7,600
36.4GB 15K Ultra320 SCSI Hot-Swap Drive	32P0734	IBM		495	136	67,320	
<b>Subtotal</b>						<b>102,879</b>	<b>8,930</b>
<b>Server Software</b>							
DB2 UDB ESE 8.1 SW Lic.& Maintenance 12 Months	D518GLL	IBM		21,425	8	171,400	
SW Maintenance Renewal - 1 Year	E00BILL	IBM		1,020	16		16,320
DPF SW License & Maintenance 12 Months	D518JLL	IBM		6,436	8	51,488	
DPF SW Maintenance Renewal - 1 Year	E00BILL	IBM		306	16		4,896
Microsoft Windows Server 2003 Enterprise Edition	P7200264	Microsoft		2,399	1	2,399	Incl Below
Operating System Support Package	PRO-PRORS-16U-01	Microsoft		1,950	3		5,850
Microsoft Visual C++ .NET Standard		Microsoft		92	1	92	
<b>Subtotal</b>						<b>225,379</b>	<b>27,066</b>
Compsat Technology discount						<b>Discount</b>	<b>1,329</b>
<b>Total</b>						<b>393,690</b>	<b>38,146</b>

**Three-Year Cost of Ownership: 431,836**

Pricing: 1 - Compsat Technology; 2 - IBM 919-254-0367; 3 - Microsoft; 4 - Amazon.com  
Warranty and Maintenance: The standard warranty has been upgraded to 3 years of 24x7x4 coverage.

**QpH@300GB: 6,551.8**

**\$/QpH@300GB: \$66**

Audited by Francois Raab, InfoSizing, Inc.

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 specifications. 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	23:54:27
End of Database Load	03:19:43
Database Load Time	03:26:00
Query Streams for Throughput Test	6
TPC-H Power	8,551.1
TPC-H Throughput	5,019.9
TPC-H Composite Query-per-Hour (QphH@300GB)	6,551.8
Total System Price over 3 Years	\$431,836
TPC-H Price/Performance Metric (\$/QphH@300GB)	\$66

Measurement Interval:

Measurement Interval in Throughput Test (Ts) = 28,399

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
<b>Stream 00</b>	222031943	02/20/04 03:54:56 02/20/04 05:18:52	02/20/04 03:54:56 02/20/04 03:56:55	02/20/04 05:18:03 02/20/04 05:18:52	01:23:56
<b>Stream 01</b>	222031944	02/20/04 05:18:56 02/20/04 12:52:01	02/20/04 05:18:56 02/20/04 12:58:17	02/20/04 12:58:17 02/20/04 12:59:14	07:33:05
<b>Stream 02</b>	222031945	02/20/04 05:18:56 02/20/04 12:55:46	02/20/04 12:59:14 02/20/04 13:00:50	02/20/04 13:00:50 02/20/04 13:01:46	07:36:50
<b>Stream 03</b>	222031946	02/20/04 05:18:56 02/20/04 12:54:22	02/20/04 13:01:46 02/20/04 13:03:27	02/20/04 13:03:27 02/20/04 13:04:29	07:35:26
<b>Stream 04</b>	222031947	02/20/04 05:18:56 02/20/04 12:51:14	02/20/04 13:04:29 02/20/04 13:06:11	02/20/04 13:06:11 02/20/04 13:07:04	07:32:18
<b>Stream 05</b>	222031948	02/20/04 05:18:56 02/20/04 12:55:12	02/20/04 13:07:04 02/20/04 13:08:40	02/20/04 13:08:40 02/20/04 13:09:36	07:36:16
<b>Stream 06</b>	222031949	02/20/04 05:18:56 02/20/04 12:56:57	02/20/04 13:09:36 02/20/04 13:11:19	02/20/04 13:11:19 02/20/04 13:12:15	07:38:01



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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	269.9	54.4	55.3	37.1	150.6	34.1	249.5	141.5	594.5	154.1	41.1	59.4
Stream 01	1,538.5	263.2	229.8	147.4	938.8	279.1	986.2	925.3	2,930.2	803.3	261.3	394.2
Stream 02	1,535.2	578.0	878.7	200.8	635.8	246.2	1,718.5	823.6	3,424.5	607.8	249.0	412.3
Stream 03	1,766.8	390.0	133.9	162.5	668.4	194.1	787.4	866.7	3,750.4	741.2	352.5	354.5
Stream 04	1,494.8	337.2	189.5	823.1	563.4	686.9	823.4	1,269.6	3,322.2	424.0	206.0	464.4
Stream 05	1,884.5	280.8	347.3	187.9	556.8	311.0	1,167.9	855.4	2,694.6	1,031.5	322.5	604.8
Stream 06	1,603.9	624.0	208.9	202.5	821.3	206.1	1,731.0	843.7	3,431.6	545.8	294.3	624.3
Minimum	269.9	54.4	55.3	37.1	150.6	34.1	249.5	141.5	594.5	154.1	41.1	59.4
Average	1,637.3	412.2	331.4	287.4	704.9	320.6	1,202.4	930.7	3,258.9	692.3	280.9	475.8
Maximum	1,884.5	624.0	878.7	823.1	983.8	686.9	1,731.0	1,269.6	3,750.4	1,031.5	352.5	624.3

Stream ID	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 00	389.8	39.6	68.6	80.6	230.6	913.9	246.4	86.8	852.8	117.3	119.3	48.4
Stream 01	1,511.8	134.1	328.8	571.5	2,276.0	3,128.2	1,733.2	1,489.5	5,519.3	750.4	80.0	57.1
Stream 02	1,895.5	157.9	640.6	486.0	1,771.8	2,670.8	1,509.0	962.0	5,325.8	680.6	96.0	56.6
Stream 03	2,511.7	95.8	426.3	229.6	1,392.9	3,550.9	1,798.0	668.3	5,917.0	567.5	100.3	62.7
Stream 04	1,707.8	238.1	267.2	350.1	2,088.5	2,097.4	3,164.7	673.1	5,471.3	465.7	101.6	53.2
Stream 05	1,485.7	122.7	317.4	503.4	1,594.8	3,434.4	2,776.6	1,016.1	5,350.2	529.8	96.0	56.2
Stream 06	2,213.9	397.9	254.9	492.1	2,072.9	3,287.6	1,590.3	697.4	4,786.9	549.2	102.7	56.0
Minimum	389.8	39.6	68.6	80.6	230.6	913.9	246.4	86.8	852.8	117.3	80.0	48.4
Average	1,887.7	191.1	372.5	438.8	1,866.2	3,028.2	2,095.3	917.7	5,395.1	592.2	96.1	57.0
Maximum	2,511.7	397.9	640.6	571.5	2,276.0	3,550.9	3,164.7	1,489.5	5,917.0	750.4	102.7	62.7