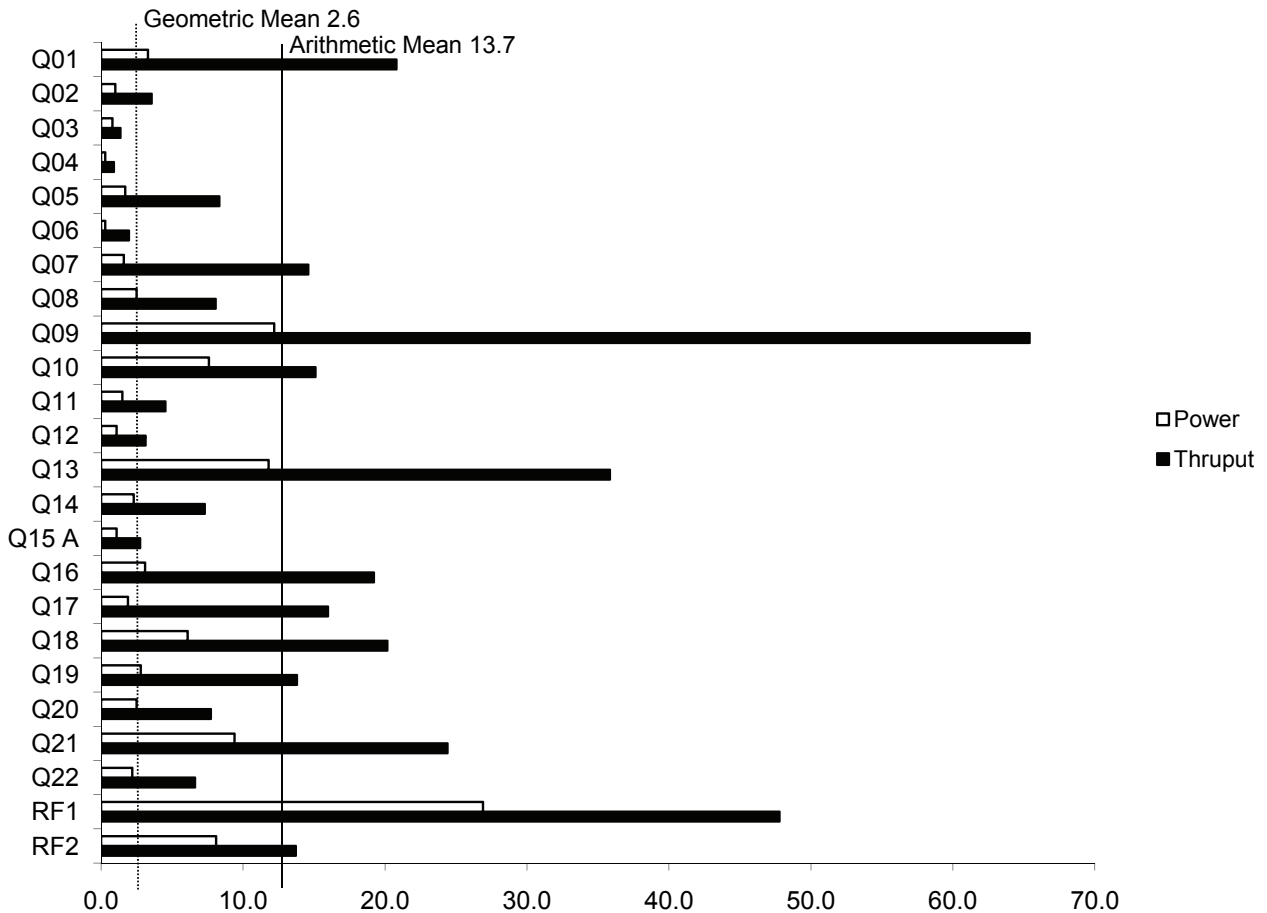


# Dell PowerEdge R910 using VectorWise 1.6

TPC-H Rev 2.14.0  
TPC Pricing Rev 1.6.0

Report Date:  
May 3, 2011

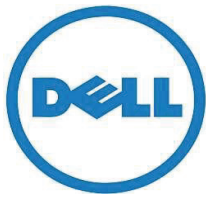
|                      |                                 |                                       |                                  |                   |
|----------------------|---------------------------------|---------------------------------------|----------------------------------|-------------------|
| Total System Cost    | Composite Query per Hour Metric | Price/Performance                     | TPC-Energy Metric                |                   |
| <b>\$139,459 USD</b> | <b>400,931.8</b><br>QphH@300GB  | <b>\$0.35 USD</b><br>Price/QphH@300GB | <b>2.38</b><br>Watts/KQphH@300GB |                   |
| Database Size        | Database Manager                | Operating System                      | Other Software                   | Availability Date |
| <b>300 GB</b>        | <b>VectorWise 1.6</b>           | <b>RedHat Enterprise Linux 6.0</b>    | <b>None</b>                      | <b>6/30/2011</b>  |



|   |  |
|---|--|
| Database Load Time = 04:35:56   | Load Includes Backup: N                  |
| Total Data Storage/Database Size = 7.79   | Memory/Database Size Percentage = 170.7% |
| Storage Redundancy Level 1 for Base Tables, Auxiliary Data Structures, DBMS temporary space, and OS and DBMS Software |  |

### System Configuration

Number of Nodes: 1  
Processors/Cores/Threads/Type: 4/32/32/Intel Xeon E7-8837 2.67 Ghz, 24MB L3 cache  
Memory: 512 GB  
Disk Controller: Dell PERC H700 RAID Controller with 1GB NVRAM Cache on-board  
Disk Drives: 16 x 146GB 2.5in SAS 6Gb/s 15k rpm  
Total Disk Storage: 2336  
LAN Controllers: 4 x 1Gb Ethernet on-board



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| Description  | Part Number           | Source | Reference Price | Qty | Extended Price      | 3 yr Maint Price   |
|--|-----------------------|--------|-----------------|-----|---------------------|--------------------|
| <b>Server Hardware</b>                               |                       |        |                 |     |                     |                    |
| R910 Chassis for 16 2.5" HDD & Intel E7 Processors   | 225-1158              | 1      | \$2,954.00      | 1   | \$2,954.00          | included           |
| 2x Intel® Xeon® E7-8837 2.67Gz 24MB Cache            | 317-7086              | 1      | \$6,078.00      | 1   | \$6,078.00          |                    |
| Upgrade to 4 Intel® Xeon® E7-8837 2.67GHz 24MB Cache | 317-7097              | 1      | \$6,078.00      | 1   | \$6,078.00          |                    |
| 512GB Memory (32x16GB) 1066MHz, Perf Optimized       | 317-7168              | 1      | \$26,153.00     | 1   | \$26,153.00         |                    |
| Memory Riser PER910, Qty 8                           | 331-2767              | 1      | \$1,596.00      | 1   | \$1,596.00          |                    |
| Red Hat Enterprise Linux 6.0 ,Factory Install, x64   | 421-5717              | 1      | \$0.00          | 1   | \$0.00              |                    |
| Red Hat Enterprise Linux,4SKT,3yr Subscription       | 421-5730              | 1      | \$4,679.00      | 1   | \$4,679.00          |                    |
| Red Hat Enterprise Linux 6,Media Only X86_64         | 421-5737              | 1      | \$0.00          | 1   | \$0.00              |                    |
| PERC H700 Integrated RAID Controller, 1GB NV Cache   | 342-1571              | 1      | \$799.00        | 1   | \$799.00            |                    |
| RAID 5 for PERC H700 Controller                      | 342-0392              | 1      | \$0.00          | 1   | \$0.00              |                    |
| High Output Power Supply (1100W), Redundant          | 330-7498              | 1      | \$1,196.00      | 1   | \$1,196.00          |                    |
| 146GB 15K RPM SAS 6Gbps 2.5in Hard Drive             | 342-0427              | 1      | \$359.00        | 16  | \$5,744.00          |                    |
| Dual Two-Port Embedded Broadcom NetXtreme 5709       | 330-7444              | 1      | \$299.00        | 1   | \$299.00            |                    |
| Sliding Rails Without Cable Management Arm           | 330-9420              | 1      | \$169.00        | 1   | \$169.00            |                    |
| DVD-ROM, SATA  | 313-9126              | 1      | \$30.00         | 1   | \$30.00             |                    |
| Dell Keyboard, USB, Black, English                   | 331-2254              | 1      | \$10.00         | 1   | \$10.00             |                    |
| Optical Mouse, Two Buttons, USB, Black               | 331-0846              | 1      | \$9.00          | 1   | \$9.00              |                    |
| Dell E170S 17in LCD Monitor, VGA Only                | 320-8083              | 1      | \$149.00        | 1   | \$149.00            |                    |
| 3 Year ProSupport and Mission Critical 4HR 7x24      | 923-6692              | 1      | \$1,067.00      | 1   | \$1,067.00          |                    |
| PSMC TECH SPT,PER910,3 YR                            | 923-6882              | 1      | \$1,575.00      | 1   | \$1,575.00          |                    |
| PSMC 4H7X24 OS,PER910,UNY,INIT                       | 926-9840              | 1      | \$333.00        | 1   | \$333.00            |                    |
| HW WRTY + SVC,PER910,UNY,INIT                        | 909-3537              | 1      | \$280.00        | 1   | \$280.00            |                    |
| HW WRTY + SVC,PER910,UNY,EXT                         | 909-3558              | 1      | \$419.00        | 1   | \$419.00            |                    |
| PSMC MISSION CRIT SVC,PER910,3YR                     | 909-3608              | 1      | \$324.00        | 1   | \$324.00            |                    |
| Dell Discount 30%                                    |                       |        |                 |     | -\$17,982.30        |                    |
| <b>Subtotal</b>                                      |                       |        |                 |     | <b>\$41,958.70</b>  |                    |
| <b>No External Storage Required</b>                  |                       |        |                 |     |                     |                    |
| <b>Server Software</b>                               |                       |        |                 |     |                     |                    |
| VectorWise 1.6 3-year license Dell server**          | ING-VW-3Y-GB-DELL     | 2      | \$250.00        | 300 | \$75,000.00         |                    |
| VectorWise 1-year maintenance bug fixes**            | ING-VW-3Y-GB-DELL-MNT | 2      | \$25.00         | 900 |                     | \$22,500.00        |
| <b>Subtotal</b>                                      |                       |        |                 |     | <b>\$75,000.00</b>  | <b>\$22,500.00</b> |
| <b>Total</b>   |                       |        |                 |     | <b>\$116,958.70</b> | <b>\$22,500.00</b> |

\*All discounts are based on US list prices and for similar quantities and configurations. **3-yr Cost of Ownership: \$139,458.70**

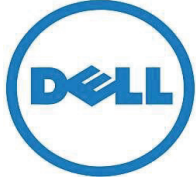
\*\* These components are not immediately orderable. See FDR for more information. **QpH@300GB: 400,931.8**

Source 1=Dell: Pricing may be verified by calling 1-800-BUY-DELL, contact: **\$/QpH@300GB: \$0.35**  
Gregory Olsen, Greg\_Olsen@Dell.com, referencing quote #582792206.

2=Ingres: Pricing may be verified by calling 1-650-7-5538, contact:  
Mark Van de Wiel, mark.vandwiel@ingres.com.

Audited By: Steve Barrish for Performance Metrics, Inc.

Prices used in TPC benchmarks reflect 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 the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank you.



# Dell PowerEdge R910 using VectorWise 1.6

TPC-H Rev 2.14.0  
TPC Pricing Rev 1.6.0

Report Date:  
May 3, 2011

## Measurement Results

|  |                   |
|--|-------------------|
| Database Scaling (SF/size)                         | 300               |
| Total Data Storage/Database Size                   | 7.79              |
| Memory/Database Size Percentage                    | 170.67%           |
| Start of Database Load Time                        | 04/27/11 21:08:18 |
| End of Database Load Time                          | 04/28/11 01:44:14 |
| Database Load Time                                 | 4:35:56           |
| Query Streams for Throughput Test (S)              | 6                 |
| TPC-H Power  | 416,862.3         |
| TPC-H Throughput                                   | 385,610.0         |
| TPC-H Composite Query-per-Hour Metric (QphH@300GB) | 400,931.8         |
| Total System Price Over 3 Years                    | 139,459           |
| TPC-H Price/Performance Metric (\$/QphH@300GB)     | 0.35              |

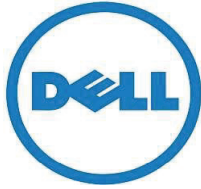
## Measurement Intervals

|  |     |
|--|-----|
| Measurement Interval in Throughput Test (Ts) | 369 |
|--|-----|

## Duration of Stream Execution:

| Power Run | Seed      | Query Start Time<br>Query End Time     | Duration (sec) | RF1 Start Time<br>RF1 End Time         | RF2 Start Time<br>RF2 End Time         |
|-----------|-----------|--|----------------|--|--|
|           | 428014414 | 04/28/11 12:06:33<br>04/28/11 12:07:50 | 77             | 04/28/11 12:06:07<br>04/28/11 12:06:33 | 04/28/11 12:07:50<br>04/28/11 12:07:58 |

| Thruput Stream | Seed      | Query Start Time<br>Query End Time     | Duration (sec) | RF1 Start Time<br>RF1 End Time         | RF2 Start Time<br>RF2 End Time         |
|----------------|-----------|--|----------------|--|--|
| 1              | 428014415 | 04/28/11 12:08:00<br>04/28/11 12:13:06 | 307            | 04/28/11 12:08:00<br>04/28/11 12:08:42 | 04/28/11 12:08:42<br>04/28/11 12:08:56 |
| 2              | 428014416 | 04/28/11 12:08:00<br>04/28/11 12:12:12 | 252            | 04/28/11 12:08:56<br>04/28/11 12:09:35 | 04/28/11 12:09:35<br>04/28/11 12:09:53 |
| 3              | 428014417 | 04/28/11 12:08:00<br>04/28/11 12:13:09 | 309            | 04/28/11 12:09:53<br>04/28/11 12:10:35 | 04/28/11 12:10:35<br>04/28/11 12:10:48 |
| 4              | 428014418 | 04/28/11 12:08:00<br>04/28/11 12:13:14 | 315            | 04/28/11 12:10:48<br>04/28/11 12:11:25 | 04/28/11 12:11:26<br>04/28/11 12:11:41 |
| 5              | 428014419 | 04/28/11 12:08:00<br>04/28/11 12:13:05 | 306            | 04/28/11 12:11:41<br>04/28/11 12:13:08 | 04/28/11 12:13:08<br>04/28/11 12:13:20 |
| 6              | 428014420 | 04/28/11 12:08:00<br>04/28/11 12:13:19 | 320            | 04/28/11 12:13:20<br>04/28/11 12:14:01 | 04/28/11 12:14:01<br>04/28/11 12:14:09 |



# Dell PowerEdge R910 using VectorWise 1.6

TPC-H Rev 2.14.0  
TPC Pricing Rev 1.6.0

Report Date:  
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## TPC-H Timing Intervals (in seconds)

Duration of stream execution:

| Stream ID | Q1   | Q2  | Q3  | Q4  | Q5   | Q6  | Q7   | Q8   | Q9   | Q10  | Q11 | Q12 |
|-----------|------|-----|-----|-----|------|-----|------|------|------|------|-----|-----|
| Stream 00 | 3.3  | 1.0 | 0.8 | 0.3 | 1.7  | 0.3 | 1.6  | 2.5  | 12.2 | 7.6  | 1.5 | 1.1 |
| Stream 01 | 50.7 | 3.0 | 1.6 | 1.0 | 5.1  | 0.7 | 7.1  | 10.9 | 70.4 | 13.9 | 5.1 | 4.0 |
| Stream 02 | 10.9 | 2.8 | 1.4 | 0.9 | 7.4  | 0.3 | 6.8  | 6.0  | 46.7 | 13.0 | 4.4 | 3.5 |
| Stream 03 | 13.1 | 2.4 | 1.0 | 1.0 | 14.0 | 1.3 | 7.5  | 7.8  | 70.5 | 14.7 | 2.9 | 1.9 |
| Stream 04 | 10.6 | 3.8 | 1.0 | 0.6 | 6.9  | 5.8 | 52.3 | 8.0  | 46.0 | 12.5 | 6.4 | 3.8 |
| Stream 05 | 19.3 | 3.4 | 2.0 | 0.8 | 8.3  | 1.3 | 7.3  | 6.2  | 99.5 | 16.1 | 5.6 | 2.9 |
| Stream 06 | 20.2 | 6.0 | 1.2 | 1.1 | 8.3  | 2.4 | 6.6  | 9.5  | 59.3 | 20.4 | 2.8 | 2.7 |
| Minimum   | 3.3  | 1.0 | 0.8 | 0.3 | 1.7  | 0.3 | 1.6  | 2.5  | 12.2 | 7.6  | 1.5 | 1.1 |
| Maximum   | 50.7 | 6.0 | 2.0 | 1.1 | 14.0 | 5.8 | 52.3 | 10.9 | 99.5 | 20.4 | 6.4 | 4.0 |
| Average   | 16.4 | 2.9 | 1.2 | 0.8 | 6.7  | 1.6 | 11.4 | 6.7  | 52.1 | 13.2 | 3.8 | 2.6 |

| Stream ID | Q13  | Q14  | Q15a | Q16  | Q17  | Q18  | Q19  | Q20  | Q21  | Q22 | RF1  | RF2  |
|-----------|------|------|------|------|------|------|------|------|------|-----|------|------|
| Stream 00 | 11.8 | 2.3  | 1.1  | 3.1  | 1.9  | 6.1  | 2.8  | 2.5  | 9.4  | 2.2 | 26.9 | 8.1  |
| Stream 01 | 29.9 | 7.3  | 2.0  | 16.0 | 9.3  | 20.5 | 16.5 | 5.7  | 18.3 | 7.9 | 42.3 | 14.3 |
| Stream 02 | 34.5 | 13.9 | 4.1  | 10.0 | 8.4  | 21.2 | 12.1 | 12.0 | 25.6 | 6.3 | 38.5 | 18.1 |
| Stream 03 | 32.2 | 6.7  | 2.6  | 53.6 | 8.6  | 18.4 | 14.7 | 7.0  | 21.7 | 5.9 | 41.5 | 13.4 |
| Stream 04 | 38.8 | 4.0  | 2.6  | 14.1 | 8.8  | 20.0 | 11.3 | 3.9  | 49.8 | 4.2 | 37.3 | 15.8 |
| Stream 05 | 41.3 | 7.3  | 2.6  | 10.8 | 6.6  | 21.3 | 11.8 | 7.1  | 17.9 | 6.6 | 86.3 | 12.2 |
| Stream 06 | 38.3 | 4.6  | 2.6  | 10.8 | 54.2 | 19.6 | 16.4 | 10.7 | 13.1 | 8.8 | 40.8 | 8.5  |
| Minimum   | 11.8 | 2.3  | 1.1  | 3.1  | 1.9  | 6.1  | 2.8  | 2.5  | 9.4  | 2.2 | 26.9 | 8.1  |
| Maximum   | 41.3 | 13.9 | 4.1  | 53.6 | 54.2 | 21.3 | 16.5 | 12.0 | 49.8 | 8.8 | 86.3 | 18.1 |
| Average   | 32.4 | 6.6  | 2.5  | 16.9 | 14.0 | 18.2 | 12.2 | 7.0  | 22.3 | 6.0 | 44.8 | 12.9 |