TPC Benchmark™ TPCx-HS
Full Disclosure Report
DELL PowerEdge R730/730xd
Using
Cloudera CDH 5.4.2,
And
Red Hat Enterprise Linux Server 6.5

First Edition
Submitted for Review
October 15, 2015
# DELL PowerEdge R730/R730xd w/ Cloudera CDH 5.4.2

## System Configuration

<table>
<thead>
<tr>
<th>1x Dell R730 Server (Namenode)</th>
<th>2x Intel Xeon E5-2650 v3, 8x 1TB, 3.5&quot;, 6G, SATA HDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>12x Dell R730xd Servers (Data nodes)</td>
<td>2x Intel Xeon E5-2690 v3, 24x 1.2TB, 2.5&quot;, 6G, SAS + 2x 300GB, 2.5&quot;, 6G, SAS (OS)</td>
</tr>
</tbody>
</table>

## Physical Storage/Scale Factor

<table>
<thead>
<tr>
<th>Server Configuration</th>
<th>R730</th>
<th>R730xd</th>
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<tbody>
<tr>
<td>Processors</td>
<td>2x Intel Xeon E5-2650 v3</td>
<td>2x Intel Xeon E5-2690 v3</td>
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<tr>
<td>Memory</td>
<td>2.3GHz, 25MB L3</td>
<td>2.6GHz, 30MB L3</td>
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<tr>
<td>Storage Controller</td>
<td>Dell PERC H730 Mini</td>
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</tr>
<tr>
<td>Storage Device</td>
<td>8x 1TB, 3.5&quot;, 7.2K, 6G SATA</td>
<td>24x 1.2TB, 2.5&quot;, 10K, 6G, SAS</td>
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<tr>
<td>Network Interface Cards</td>
<td>Intel x520 DP 10Gb</td>
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<tr>
<td></td>
<td>Intel x520 DP 10Gb + I350 1GbE</td>
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<tr>
<td>Switches</td>
<td>2x Dell Force10 S4810</td>
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## Report Date:

October 15, 2015

## Total System Cost

USD 345,578

## TPCx-HS Performance Metric

9.07 HSph@10TB

## Price/Performance

38,101.22 $/HSph@10TB
<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
<th>Key</th>
<th>Unit Price</th>
<th>Qty</th>
<th>Extended Price</th>
<th>3 yr. Maint. Price</th>
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<td><strong>HARDWARE COMPONENTS</strong></td>
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<td>PowerEdge R730xd Server</td>
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<tr>
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<td>330-BBCO</td>
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<td>$0.00</td>
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<td>Intel X520 DP 10Gb DA/SFP+, + I350 DP 1Gb Ethernet, Network Daughter Card</td>
<td>540-BBBB</td>
<td>1</td>
<td>$0.00</td>
<td>12</td>
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<tr>
<td>Chassis with up to 24, 2.5 Hard Drives and 2, 2.5” Flex Bay Hard Drives</td>
<td>350-BBFE</td>
<td>1</td>
<td>$0.00</td>
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<td>Performance BIOS Settings</td>
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<td>UEFI BIOS</td>
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<td>338-BFFL</td>
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<td>Upgrade to Two Intel Xeon E5-2690 v3 2.6GHz,30M Cache,9.60GT/s QPI,Turbo,</td>
<td>374-BBGS</td>
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<td>$0.00</td>
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<td>Hot,HT,12C/24T (135W) Max Mem 2133MHZ</td>
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<tr>
<td>16GB RDIMM, 2133 MT/s, Dual Rank, x4 Data Width</td>
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<td>$0.00</td>
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<tr>
<td>Performance Optimized</td>
<td>370-AAIP</td>
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<td>$0.00</td>
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<td>300GB 10K RPM SAS 6Gbps 2.5in Flex Bay Hard Drive,13G</td>
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<td>PowerEdge R730/xd</td>
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<tr>
<td>ReadyRails Sliding Rails With Cable Management Arm</td>
<td>770-BBBR</td>
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<td>$0.00</td>
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<td>1</td>
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<tr>
<td>DIMM Blanks for System with 2 Processors</td>
<td>370-ABWE</td>
<td>1</td>
<td>$0.00</td>
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</table>
### Standard Heat sink for PowerEdge R730/R730xd
- **Part Number:** 374-BBHM
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 12

### INFO QS, 13G HADOOP BUNDLE
- **Part Number:** 379-BBMW
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 12

### 4hr Response, 24x7 Maintenance Package, R730xd
- **Price:** $2,529.00
- **Order Quantity:** 12
- **Total Price:** $30,348.00

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- Thank you choosing Dell ProSupport. For tech support, visit [http://support.dell.com/ProSupport](http://support.dell.com/ProSupport)
- Dell Limited Hardware Warranty Plus Service, Initial Year
- ProSupport Mission Critical Package: Enhanced Services, 3 Year
- ProSupport Mission Critical: 7X24 HW / SW Tech Support and Assistance, 3 Year
- Mission Critical Package: 4-Hours 7X24 On-Site Service with Emergency Dispatch, 3 Year
- On-Site Installation Declined
- US Order

### PowerEdge R730 Server
- **Part Number:** 210-ACKU
- **Quantity:** 1
- **Price:** $13,026.00
- **Order Quantity:** 1
- **Total Price:** $13,026.00

### PowerEdge R730/R730xd Motherboard
- **Part Number:** 591-BBBH
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### R730/xd PCIe Riser 2, Center
- **Part Number:** 330-BBCO
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### R730/xd PCIe Riser 3, Left
- **Part Number:** 330-BBCQ
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### Intel X520 DP 10Gb DA/SFP+ Server Adapter, Low Profile
- **Part Number:** 540-BBHY
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### Intel X520 DP 10Gb DA/SFP+, + I350 DP 1Gb Ethernet, Network Daughter Card
- **Part Number:** 540-BBBB
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### Chassis with up to 8, 3.5" Hard Drives
- **Part Number:** 350-BBEO
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### Performance BIOS Settings
- **Part Number:** 384-BBBL
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### UEFI BIOS
- **Part Number:** 800-BBDM
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### No RAID for H330/H730/H730P (1-16 HDDs or SSDs)
- **Part Number:** 780-BBJS
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### PERC H730 Integrated RAID Controller, 1GB Cache
- **Part Number:** 405-AAEG
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### Intel Xeon E5-2650 v3 2.3GHz, 25M Cache, 9.60GT/s QPI, Turbo, HT, 10C/20T (105W) Max Mem 2133MHz
- **Part Number:** 338-BFFF
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### Upgrade to Two Intel Xeon E5-2650 v3 2.3GHz, 25M Cache, 9.60GT/s QPI, Turbo, HT, 10C/20T (105W)
- **Part Number:** 374-BBGM
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### 16GB RDIMM, 2133 MT/s, Dual Rank, x4 Data Width
- **Part Number:** 370-ABUG
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 8

### 2133MT/s RDIMMs
- **Part Number:** 370-ABUF
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### Performance Optimized
- **Part Number:** 370-AAIP
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 1

### 1TB 7.2K RPM SATA 6Gbps 3.5in Hot-plug Hard Drive, 13G
- **Part Number:** 400-AEEZ
- **Quantity:** 1
- **Price:** $0.00
- **Order Quantity:** 8
<table>
<thead>
<tr>
<th>Item Description</th>
<th>Code</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic System Documentation and OpenManage DVD Kit, PowerEdge R730/xd</td>
<td>631-AAJG</td>
<td>1</td>
<td>$0.00</td>
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<tr>
<td>DVD+/-RW, SATA, Internal</td>
<td>429-AAPS</td>
<td>1</td>
<td>$0.00</td>
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<tr>
<td>ReadyRails Sliding Rails With Cable Management Arm</td>
<td>770-BBBR</td>
<td>1</td>
<td>$0.00</td>
</tr>
<tr>
<td>Dual, Hot-plug, Redundant Power Supply (1+1), 750W</td>
<td>450-ADWS</td>
<td>1</td>
<td>$0.00</td>
</tr>
<tr>
<td>C13 to C14, PDU Style, 12 AMP, 2 Feet (.6m) Power Cord, North America</td>
<td>492-BBDH</td>
<td>1</td>
<td>$0.00</td>
</tr>
<tr>
<td>DIMM Blanks for System with 2 Processors</td>
<td>370-ABWE</td>
<td>1</td>
<td>$0.00</td>
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<tr>
<td>Standard Heat sink for PowerEdge R730/R730xd</td>
<td>374-BBBHM</td>
<td>1</td>
<td>$0.00</td>
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<tr>
<td>Standard Heat sink for PowerEdge R730/R730xd</td>
<td>374-BBBHM</td>
<td>1</td>
<td>$0.00</td>
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<tr>
<td>INFO QS, 13G HADOOP BUNDLE</td>
<td>379-BBWM</td>
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<td>4hr response, 24x7 Maintenance Package, R730</td>
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<tr>
<td>- Thank you choosing Dell ProSupport. For tech support, visit</td>
<td>911-6619</td>
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<td>$0.00</td>
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<td><a href="http://support.dell.com/ProSupport">http://support.dell.com/ProSupport</a></td>
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<tr>
<td>- Dell Limited Hardware Warranty Plus Service, Initial Year</td>
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<td>- US Order</td>
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<tr>
<td>Dell Force10 S4810 Switch</td>
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</tr>
</tbody>
</table>
- **ProSupport:** 7x24 HW / SW Tech Support and Assistance, 3 Years  
  935-0143 1 $0.00 2
- Thank you choosing Dell ProSupport. For tech support, visit http://www.dell.com/support or call 1-800-945-3355  
  989-3439 1 $0.00 2
- **Dell Hardware Limited Warranty Initial Year**  
  996-2670 1 $0.00 2
- **Dell Hardware Limited Warranty Extended Year(s)**  
  996-2760 1 $0.00 2
- **On-Site Installation Declined**  
  900-9997 1 $0.00 2
- Declined Remote Consulting Service  
  973-2426 1 $0.00 2

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
<th>Quantity</th>
<th>Unit Price</th>
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<tbody>
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**HARDWARE COMPONENTS**  
Subtotal $362,877.98 $38,704.98

**SOFTWARE COMPONENTS**  
Subtotal $129,623.00 $0.00

**Total** $492,500.98 $38,704.98

* Discount based upon total system cost as purchased by a regular customer.

**Three-Year Cost of Ownership:** $345,578  
**HSPh@10TB:** 9.07  
**Audited by Doug Johnson, Infosizing Inc.** (www.sizing.com)  
$ / HSPh@10TB: 38,101.22

*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 the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org.*
### Measurement Results for Performance Run

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<th>Measurement</th>
<th>Value</th>
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### Measurement Results for Repeatability Run

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Run Report

Full run report is provided in the SupportingFiles Archive. Summary lines are shown below.

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Performance Metric (HSph@SF) Report

Test Run 1 details: Total Time = 3905
Total Size = 100000000000
Scale-Factor = 10.0000

TPCx-HS Performance Metric (HSph@SF): 9.2191

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TPCx-HS Performance Metric (HSph@SF) Report

Test Run 2 details: Total Time = 3968
Total Size = 100000000000
Scale-Factor = 10.0000

TPCx-HS Performance Metric (HSph@SF): 9.0727

===============================================


Abstract

This report documents the methodology and results of the TPC Benchmark TPCx-HS test conducted on a cluster of 13 Dell 13g PowerEdge Servers using Cloudera CDH 5.4.2 in conformance with the requirements of the TPCx-HS Benchmark Specification. The operating system used on each server for the benchmark was Red Hat Enterprise Linux Server 6.5.

Measured Configuration

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
<th>Virtualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x Dell PowerEdge R730 with 10-core 2.30GHz Intel Xeon E5 2650v3 12x Dell PowerEdge R730xd with 12-core 2.60GHz Intel Xeon E5 2690v3</td>
<td>Red Hat Enterprise Linux 6.5 Cloudera CDH 5.4.2</td>
<td>N/A</td>
</tr>
</tbody>
</table>

TPC Express Benchmark© HSMetrics

<table>
<thead>
<tr>
<th>Total System Cost</th>
<th>HSph@10TB</th>
<th>$/HSph@10TB</th>
<th>Availability Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>$345,578</td>
<td>9.07</td>
<td>38,101.22</td>
<td>October 15, 2015</td>
</tr>
</tbody>
</table>

The Transaction Processing Performance Council (TPC) developed the TPCx-HS Benchmark. The TPC was founded to define transactions processing benchmarks and to disseminate objective, verifiable performance data to the industry.

In order to verify compliance to the TPCx-HS benchmark specification, Doug Johnson audited the benchmark configuration, environment and methodology used to produce and validate the test results, and the pricing model used to calculate the price/performance.
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CLAUSE1: General Items

1.1: Test Sponsor

7.4.1 A statement identifying the benchmark sponsor(s) and other participating companies must be provided.

DELL is the sponsor of this TPC Benchmark™ TPCx-HS result.

1.2: Parameter Settings

7.4.2 Settings must be provided for all customer-tunable parameters and options that have been changed from the defaults found in actual products, including but not limited to:

- Configuration parameters and options for server, storage, network and other hardware component incorporated into the pricing structure;
- Configuration parameters and options for operating system and file system component incorporated into the pricing structure;
- Configuration parameters and options for any other software component incorporated into the pricing structure.
- Compiler optimization options.

Comment 1: In the event that some parameters and options are set multiple times, it must be easily discernible by an interested reader when the parameter or option was modified and what new value it received each time.

Comment 2: This requirement can be satisfied by providing a full list of all parameters and options, as long as all those that have been modified from their default values have been clearly identified and these parameters and options are only set once.

Details of system and Hadoop configurations and parameters are provided in SupportingFiles Archive.

1.3: Disclosure Requirements

7.4.3 Explicit response to individual disclosure requirements specified in the body of earlier sections of this document must be provided.

Not applicable

1.4: Measured and Priced Configurations

7.4.4 Diagrams of both measured and priced configurations must be provided, accompanied by a description of the differences. This includes, but is not limited to:

- Total number of nodes used
- Total number and type of processors used/total number of cores used/total number of threads used (including sizes of L2 and L3 caches);
• Size of allocated memory, and any specific mapping/partitioning of memory unique to the test;
• Number and type of disk units (and controllers, if applicable);
• Number of channels or bus connections to disk units, including their protocol type;
• Number of LAN (e.g., Ethernet) connections and speed for switches and other hardware components physically used in the test or are incorporated into the pricing structure;
• Type and the run-time execution location of software components.

The following sample diagram illustrates a measured benchmark configuration using Ethernet, an external driver, and four processors each with two cores and four threads per node in the SUT. Note that this diagram does not depict or imply any optimal configuration for the TPCx-HS benchmark measurement.

Depending on the implementation of the SUT the Name Node, Job Tracker, Task Tracker, Data Nodes etc or the functional equivalents must be specified in the diagram.

Comment: Detailed diagrams for system configurations and architectures can vary widely, and it is impossible to provide exact guidelines suitable for all implementations. The intent here is to describe the system components and connections in sufficient detail to allow independent reconstruction of the measurement environment. This example diagram shows homogeneous nodes. This does not preclude tests sponsors from using heterogeneous nodes as long as the system diagram reflects the correct system configuration.

The System Under Test (SUT) comprises 1 x DELL PowerEdge R730 Server (Namenode), 12 x Dell PowerEdge R730xd Servers (Datanodes) and 2x Dell Force 10 S4810 switches, depicted in the next diagram. The Namenode server is named r3s1. The Datanode servers are named r3s1xd1 through r3s1xd12. Each Server consists of:

• 2 x 2.30GHz Intel ® Xeon E5-2650v3 Processors, each with a 25MiB L3 cache and 10x 256KiB L2 caches (one per core), Hyper-Threading enabled, 40 total hardware threads (Namenode)
• 2x 2.60GHz Intel ® Xeon E5-2690v3 Processors, each with a 30MiB L3 cache and 12x 256KiB L2 caches (one per core), Hyper-Threading enabled, 48 total hardware threads (Datanodes)
• 128GiB ECC DDR3 2133 MHz RAM (All nodes)
• Local storage controller: Dell PERC H730, RAID bus controller: LSI Logic / Symbios Logic MegaRAID SAS-3 3108 [Invader] (All nodes)
• Intel Ethernet X520 DP 10GBASE-T + I350 DP 1GbE. Each 10GbE port is connected to one of the switches (All nodes)
• Intel Ethernet X520 DP 10GBASE-T: 2-port 10GbE, each port connected to one of the switches (Namenode)
• 24 x 1.2TB 10K RPM SAS 6Gbps 2.5in + 2 x 300GB, 10K RPM SAS , 2.5in (Datanodes)
• 8 x 1TB, 7.2K RPM SAS 6Gbps 3.5in (Namenode)
Each Server has Red Hat Enterprise Linux Server 6.5 installed natively in a partition on the “root” disk. Log files are written to this partition. The root disk also holds the swap partition. The rest of the disks on the Datanodes are configured with a single partition each which is formatted with ext4. These are used for all Hadoop data except the log files. The two network ports are bonded together in Linux.

There are no differences between the priced and measured configurations.

1.5: Distribution of Data

7.4.5 The distribution of dataset across all media must be explicitly described using a format similar to that shown in the following example for both the tested and priced systems.

Table 1.5.1: Layout Description. Measured and priced configurations are the same.

<table>
<thead>
<tr>
<th>Server</th>
<th>Physical Disk Drive</th>
<th>Description of Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>r3s1</td>
<td>0 (8 HDD, RAID10)</td>
<td>Operating system, root, swap</td>
</tr>
<tr>
<td>r3s1xd(1-12)</td>
<td>0 (2 HDD, RAID1)</td>
<td>Operating system, root, swap</td>
</tr>
<tr>
<td></td>
<td>1-24</td>
<td>Data</td>
</tr>
</tbody>
</table>

1.6: Software Components

7.4.6 The distribution of various software components across the system must be explicitly described using a format similar to that shown in the following example for both the tested and priced systems.
Table 1.6: Distribution of Software Components. Measured and priced configurations are the same.

<table>
<thead>
<tr>
<th>Server</th>
<th>Software Component(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>r3s1</td>
<td>NameNode, benchmark driver, JobTracker, Secondary Namenode</td>
</tr>
<tr>
<td>r3s1xd(1-12)</td>
<td>DataNode, TaskTracker</td>
</tr>
</tbody>
</table>

1.7: Distributed File Systems

7.4.7 Distributed file system implementation (e.g. Apache HDFS, Red Hat Storage, IBM GPFS, EMC Isilon OneFS) and corresponding Hadoop File System API version must be disclosed.

Cloudera Distribution for Apache Hadoop (CDH) 5.4.2. Apache HDFS version 2 was used. This is the only version of HDFS supported by CDH 5.4.2.

1.8: Map/Reduce

7.4.8 Map/Reduce implementation (e.g. Apache Map/Reduce, IBM Platform Symphony) and corresponding version must be disclosed

Cloudera Distribution for Apache Hadoop (CDH) 5.4.2. Apache Map/Reduce version 1 was used.
Clause 2: Workload Related Items

2.1: Scripts
7.5.1 Script or text used to set for all hardware and software tunable parameters must be reported.

The tunable parameters involved in this benchmark are contained in the supporting files.

2.2: Version Number and Checksums
7.5.2 Version number of TPCx-HS kit and checksum for HSGen, HSSort and HSValidate Programs must be reported.

Version number of the kit used is 1.3.0
md5sum checksums:

58c13ddb98a2d1228f2df10f4a087a71 BigData_cluster_validate_suite.sh
70ba6b440de47b4e4a902bf4983ee4c1 TPCx-HS-master.sh
4ceaeefc51c698c0733b57244b7760808 TPCx-HS-master.jar

2.3: Run Report
7.5.3 The run report generated by TPCx-HS benchmark kit must be reported.

The full output file is provided in the SupportingFiles Archive. The summary lines of the 2 runs from that file are:

Performance Metric (HSph@SF) Report

Test Run 1 details: Total Time = 3905

    Total Size = 1000000000000
    Scale-Factor = 10.0000

TPCx-HS Performance Metric (HSph@SF): 9.2191
Performance Metric (HSph@SF) Report

Test Run 2 details: Total Time = 3968
  Total Size = 1000000000000
  Scale-Factor = 10.0000

TPCx-HS Performance Metric (HSph@SF): 9.0727

2.4: Benchmark Kit Changes
No modifications were made to the TPC provided kit.
Clause 3: SUT Related Items

3.1: Hardware and Software Options
7.6.1 All hardware and software options must be reported.

Hardware and software options are contained in the supporting files

3.2: Data Storage and Memory Ratios
7.6.2 The data storage ratio must be disclosed. It is computed by dividing the total physical data storage present in the priced configuration (expressed in TB) by the chosen Scale Factor as defined in Clause 4.1. Let r be the ratio. The reported value for r must be rounded to the nearest 0.01. That is, reported value=round(r,2). For example, a system configured with 96 disks of 1TB capacity for a 1TB Scale Factor has a data storage ratio of 96.

The Scale Factor to memory ratio must be disclosed. It is computed by dividing the Scale Factor by the total physical memory present in the priced configuration (see clause 3). Let r be this ratio. The reported ratio must be rounded to the nearest 0.1. That is, reported value=round(r,1). For example, a system configured with 1TB of physical memory for a 10TB Scale Factor has a memory ratio of 10.

Total physical data storage for R730 (r3s1) is 8 disks X 1TB = 8TB.
Total physical data storage for R730xd (r3s1xd(1-12) is 12 servers (24 disks X 1.2TB + 2 disks X 300GB) = 352.80
Total Physical Storage = 8TB + 352.80TB = 360.80
Total physical memory is 13 hosts X 128GB = 1664GB = 1.664TB. Scale factor is 10TB.

Data storage ratio is 360.80/10 = 36.08

Scale Factor to memory ratio is 10/1.664 = 6.01.
Clause 4: Performance Metric and Execution Rules Related Items

7.7.1 The HSGen time must be disclosed for Run1 and Run2.

7.7.2 The HSSort time must be disclosed for Run1 and Run2.

7.7.3 The HSVValidate time must be disclosed for Run1 and Run2.

7.7.4 Both HSDataCheck times must be disclosed for Run1 and Run2.

7.7.5 The performance metric (HSph@SF) must be disclosed for Run1 and Run2. Price-performance metric ($/HSph@SF) must be disclosed for the performance run. See Clause 2.3 and Clause 4.

<table>
<thead>
<tr>
<th></th>
<th>Run1</th>
<th>Run2</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSGen</td>
<td>933.331</td>
<td>932.300</td>
</tr>
<tr>
<td>HSSort</td>
<td>2580.766</td>
<td>2525.273</td>
</tr>
<tr>
<td>HSVValidate</td>
<td>444.555</td>
<td>437.551</td>
</tr>
<tr>
<td>HSDataCheck</td>
<td>9.348</td>
<td>9.876</td>
</tr>
<tr>
<td>HSph@SF</td>
<td>9.2191</td>
<td>9.0727</td>
</tr>
<tr>
<td>$/HSph@SF</td>
<td></td>
<td>$38,101.22</td>
</tr>
</tbody>
</table>
Clause 8: Auditor-Related Items

Auditor’s Report

The auditor’s agency name, address, phone number, and Attestation letter with a brief audit summary report indicating compliance must be included in the full disclosure report. A statement should be included specifying who to contact in order to obtain further information regarding the audit process.
## SUPPORTING FILES

The following table describes the files contained in the supporting files archive.

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clause 1</td>
<td>Parameters and options used to configure the system</td>
<td>SupportingFilesArchive\Clause1</td>
</tr>
<tr>
<td>Clause 2</td>
<td>Configuration Scripts &amp; Run report</td>
<td>SupportingFilesArchive\Clause2</td>
</tr>
<tr>
<td>Clause 3</td>
<td>System configuration details</td>
<td>SupportingFilesArchive\Clause3</td>
</tr>
</tbody>
</table>
ViewSonic VA2055Sa - LED monitor - 20”


Availability: In Stock
- Ships same day if ordered before 4 PM CT
- LED monitor
- 20’’
- 1920 x 1080
- MVA
- 250 cd/m2
- 3000:1
- 25 ms

Recommended Warranty and Services
4 Yr Replacement for Monitors (360EM) (0-99.99)
DOP
0
$8.99
Advertised Price

CDW/CDWG Asset Tag install w/o another Configuration Center service
0
$9.99
Advertised Price

Add All Items To Cart

Log On To Email this page or Save as Favorite

Customers Who Viewed This Product Also Viewed... (12)

ViewSonic VA2055Sm - LED monitor - 20”
HP V20i 20” LED monitor
ViewSonic VA2037a(LED) - LED monitor - 20”