



**SPC BENCHMARK 2™  
EXECUTIVE SUMMARY**

**HEWLETT-PACKARD COMPANY  
HP XP7 STORAGE**

**SPC-2™ V1.5**

**Submitted for Review: December 1, 2014  
Submission Identifier: B00070**

## EXECUTIVE SUMMARY

### Test Sponsor and Contact Information

| Test Sponsor and Contact Information      |  |
|---|--|
| <b>Test Sponsor<br/>Primary Contact</b>   | Hewlett-Packard Company – <a href="http://www.hp.com">http://www.hp.com</a><br>Chuck Paridon – <a href="mailto:chuck.paridon@hp.com">chuck.paridon@hp.com</a><br>8000 Foothills Blvd., M/S 5785.<br>Roseville, CA 95747<br>Phone: (916) 785-5155<br>FAX: (919) 785-1812  |
| <b>Test Sponsor<br/>Alternate Contact</b> | Hewlett-Packard Company - <a href="http://www.hp.com">http://www.hp.com</a><br>Michael Fuhrman – <a href="mailto:michael.fuhrman@hp.com">michael.fuhrman@hp.com</a><br>8000 Foothills Blvd., M/S 5218<br>Roseville, CA 95747<br>Phone: (916) 785-3167<br>FAX: (919) 785-1812   |
| <b>Auditor</b>                            | Storage Performance Council – <a href="http://www.storageperformance.org">http://www.storageperformance.org</a><br>Walter E. Baker – <a href="mailto:AuditService@StoragePerformance.org">AuditService@StoragePerformance.org</a><br>643 Bair Island Road, Suite 103<br>Redwood City, CA 94063<br>Phone: (650) 556-9384<br>FAX: (650) 556-9385 |

### Revision Information and Key Dates

| Revision Information and Key Dates                              |                     |
|---|---------------------|
| <b>SPC-2 Specification revision number</b>                      | V1.5                |
| <b>SPC-2 Workload Generator revision number</b>                 | V1.2                |
| <b>Date Results were first used publicly</b>                    | December 1, 2014    |
| <b>Date FDR was submitted to the SPC</b>                        | December 1, 2014    |
| <b>Date the TSC will be available for shipment to customers</b> | currently available |
| <b>Date the TSC completed audit certification</b>               | November 30, 2014   |

### Tested Storage Product (TSP) Description

The HP XP7 Storage is bulletproof storage for mission-critical converged infrastructure where constant access to data is required-even in the event of a disaster. Designed for organizations that simply cannot afford any downtime, the XP7 combines an ultra-high-performance on-line scalable fully redundant hardware platform with unique data replication capabilities integrated with clustering solutions for complete business continuity and data protection. The XP7 can adapt to changing business conditions in real time, while increasing data center capacity and lifespan and providing solutions that decrease risk and costs.

Massive consolidation becomes a reality by managing open systems, mainframe, and HP Non-Stop applications all on a single XP7 with ultra-high performance, low latency and reduced data center costs.

## SPC-2 Reported Data

SPC-2 Reported Data consists of three groups of information:

- The following SPC-2 Primary Metrics, which characterize the overall benchmark result:
  - SPC-2 MBPS™
  - SPC-2 Price Performance
  - Application Storage Unit (ASU) Capacity
- Supplemental data to the SPC-2 Primary Metrics.
  - Total Price
  - Data Protection Level
- Reported Data for each SPC Test: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand Delivery (VOD) Test.

**SPC-2 MBPS™** represents the aggregate data rate, in megabytes per second, of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand (VOD).

**SPC-2 Price-Performance™** is the ratio of **Total Price** to **SPC-2 MBPS™**.

**ASU (Application Storage Unit) Capacity** represents the total storage capacity available to be read and written in the course of executing the SPC-2 benchmark.

**Total Price** includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page on page 8.

**Data Protection Level** of **Protected 2** using **RAID-5** by distributing check data corresponding to user data across multiple disks in the form of bit-by-bit parity.

***Protected 2:** The single point of failure of any **component** in the configuration will not result in permanent loss of access to or integrity of the SPC-2 Data Repository.*

**Currency Used** is formal name for the currency used in calculating the **Total Price** and **SPC-2 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

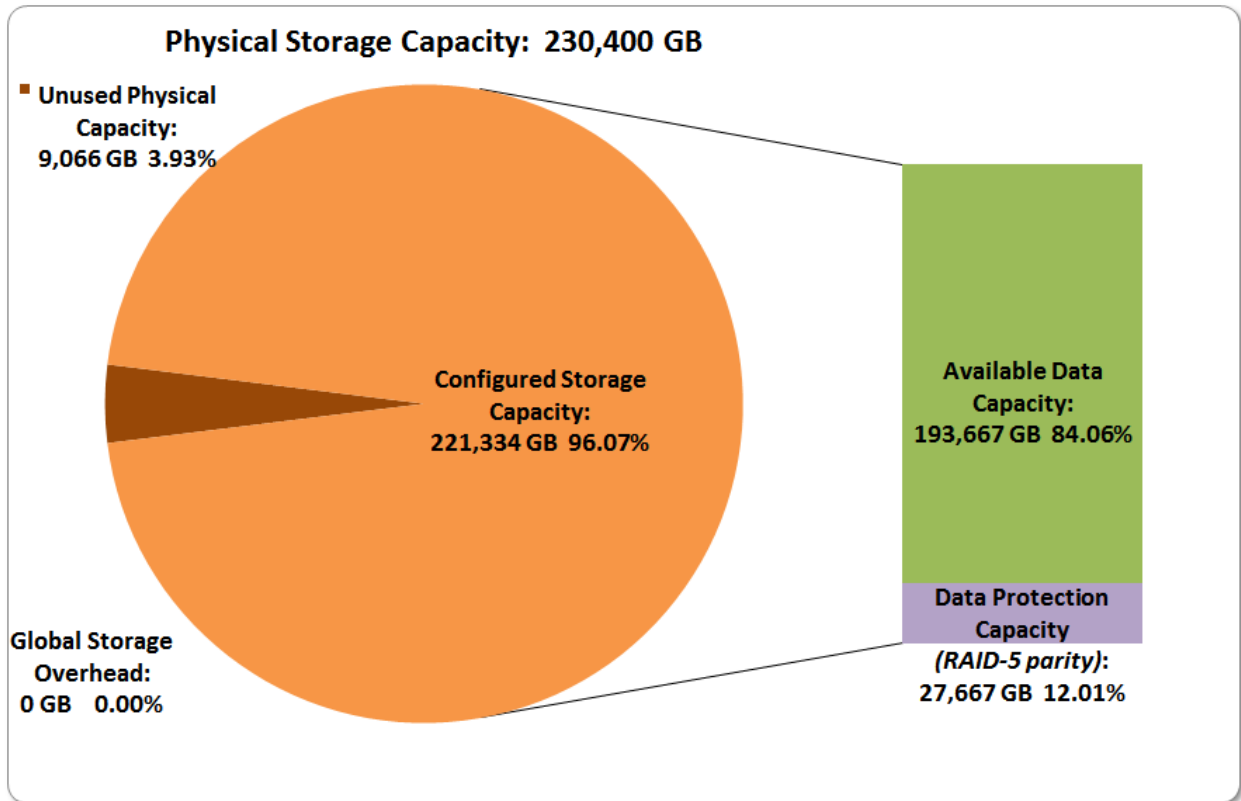
## SPC-2 Reported Data (continued)

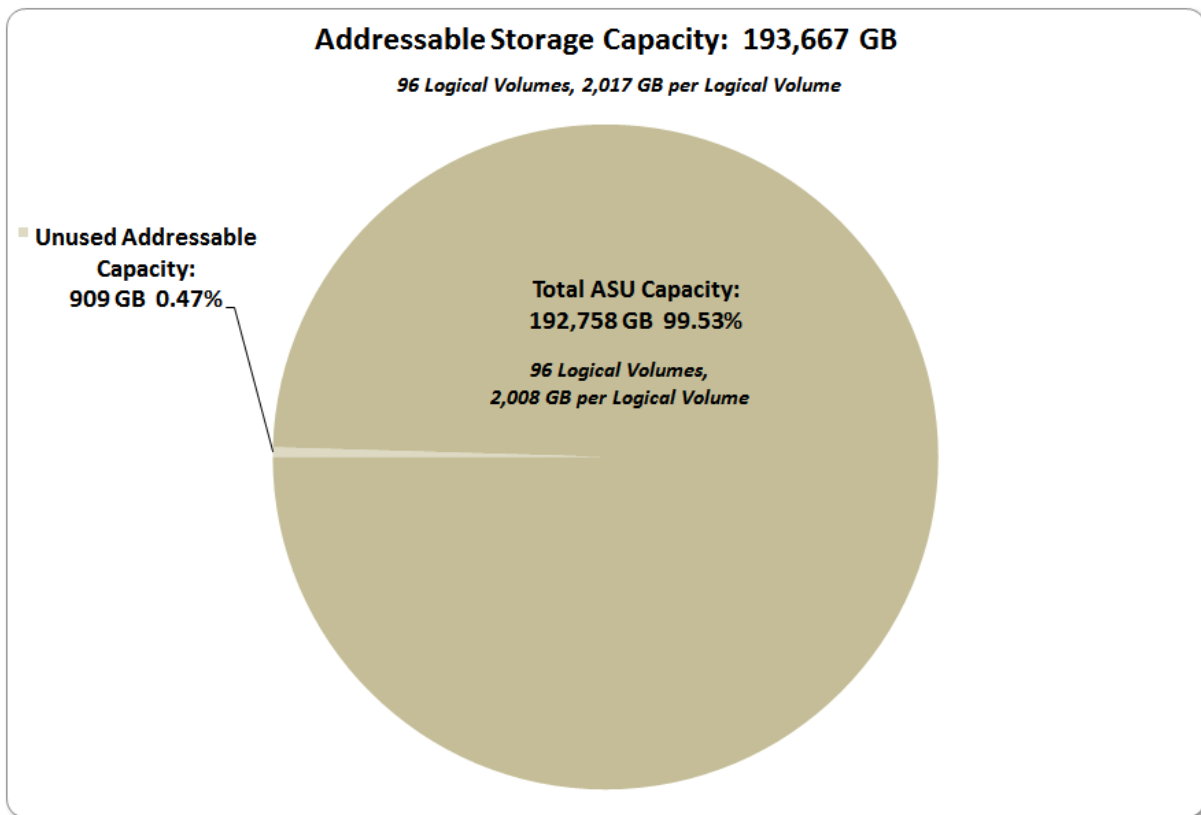
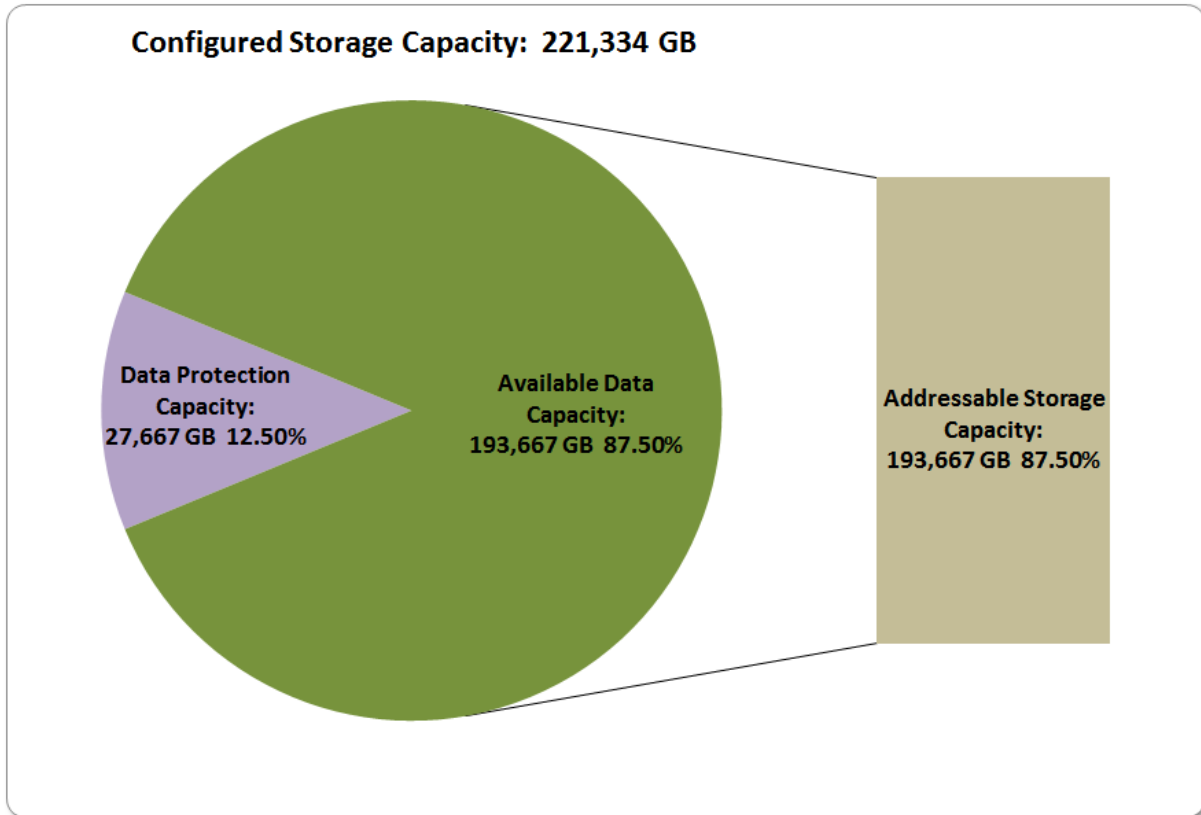
| SPC-2 Reported Data  |                         |                          |                      |                       |
|--|-------------------------|--------------------------|----------------------|-----------------------|
| HP XP7 Storage   |                         |                          |                      |                       |
| SPC-2 MBPS™  | SPC-2 Price-Performance | ASU Capacity (GB)        | Total Price          | Data Protection Level |
| 43,012.53  | \$28.30                 | 192,758.132              | \$1,217,462.00       | Protected 2 (RAID-5)  |
| <i>The above SPC-2 MBPS™ value represents the aggregate data rate of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video On Demand (VOD)</i> |                         |                          |                      |                       |
| <b>Currency Used:</b>  |                         | <b>"Target Country":</b> |                      |                       |
| U.S. dollars   |                         | USA                      |                      |                       |
| SPC-2 Large File Processing (LFP) Reported Data  |                         |                          |                      |                       |
|  | Data Rate (MB/second)   | Number of Streams        | Data Rate per Stream | Price-Performance     |
| LFP Composite  | 34,662.80               |                          |                      | \$35.12               |
| Write Only:  |                         |                          |                      |                       |
| 1024 KiB Transfer  | 20,697.93               | 1,400                    | 14.78                |                       |
| 256 KiB Transfer   | 24,157.48               | 1,400                    | 17.26                |                       |
| Read-Write:  |                         |                          |                      |                       |
| 1024 KiB Transfer  | 31,433.55               | 1,400                    | 22.45                |                       |
| 256 KiB Transfer   | 33,082.57               | 1,400                    | 23.63                |                       |
| Read Only:   |                         |                          |                      |                       |
| 1024 KiB Transfer  | 48,922.26               | 1,400                    | 34.94                |                       |
| 256 KiB Transfer   | 49,682.98               | 1,400                    | 35.49                |                       |
| <i>The above SPC-2 Data Rate value for LFP Composite represents the aggregate performance of all three LFP Test Phases: (Write Only, Read-Write, and Read Only).</i>                   |                         |                          |                      |                       |
| SPC-2 Large Database Query (LDQ) Reported Data   |                         |                          |                      |                       |
|  | Data Rate (MB/second)   | Number of Streams        | Data Rate per Stream | Price-Performance     |
| LDQ Composite  | 48,762.56               |                          |                      | \$24.97               |
| 1024 KiB Transfer Size   |                         |                          |                      |                       |
| 4 I/Os Outstanding   | 49,295.36               | 1,400                    | 35.21                |                       |
| 1 I/O Outstanding  | 48,826.27               | 1,400                    | 34.88                |                       |
| 64 KiB Transfer Size   |                         |                          |                      |                       |
| 4 I/Os Outstanding   | 48,508.23               | 1,400                    | 34.65                |                       |
| 1 I/O Outstanding  | 48,420.40               | 1,400                    | 34.59                |                       |
| <i>The above SPC-2 Data Rate value for LDQ Composite represents the aggregate performance of the two LDQ Test Phases: (1024 KiB and 64 KiB Transfer Sizes).</i>                        |                         |                          |                      |                       |
| SPC-2 Video On Demand (VOD) Reported Data  |                         |                          |                      |                       |
|  | Data Rate (MB/second)   | Number of Streams        | Data Rate per Stream | Price-Performance     |
|  | 45,612.23               | 58,000                   | 0.79                 | \$26.69               |

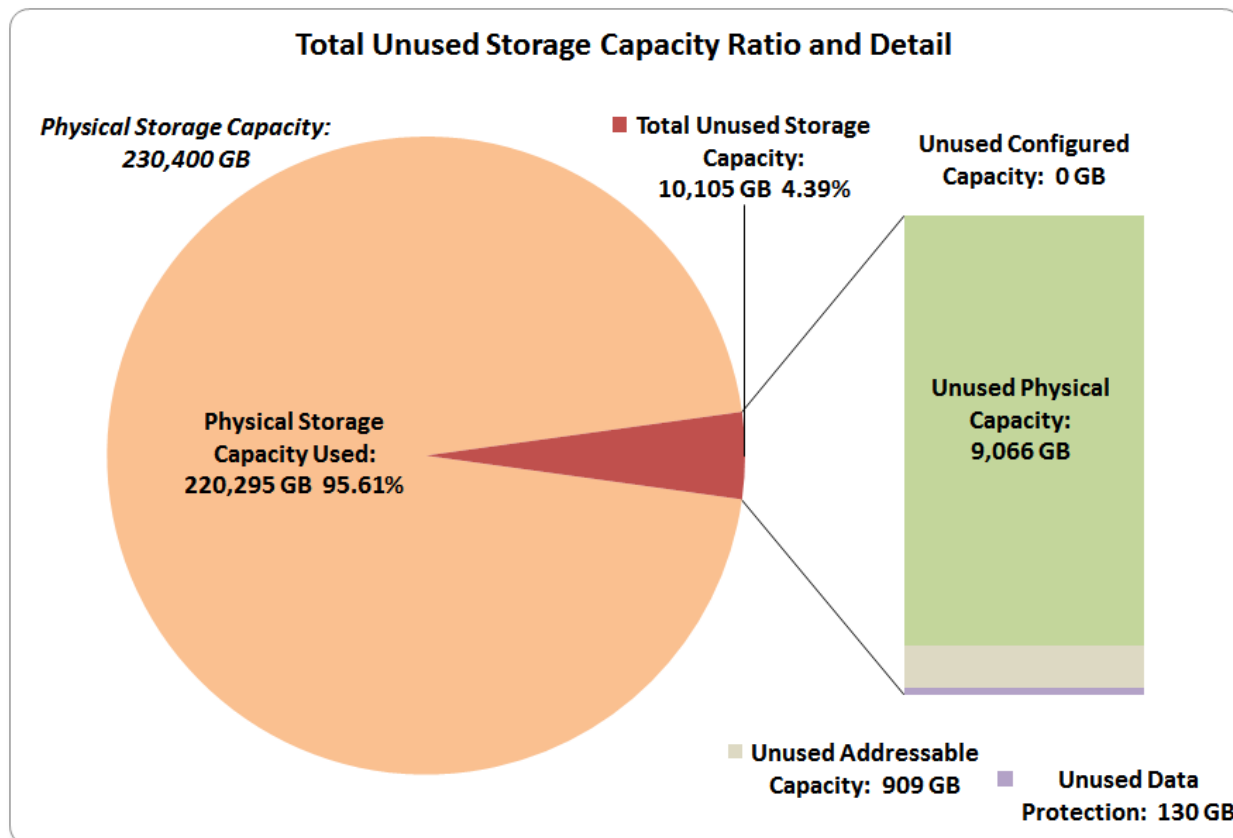
### Storage Capacities and Relationships

The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.

The capacity values in each of the following four charts are listed as integer values, for readability, rather than the decimal values listed elsewhere in this document.







| SPC-2 Storage Capacity Utilization |        |
|------------------------------------|--------|
| Application Utilization            | 83.66% |
| Protected Application Utilization  | 95.61% |
| Unused Storage Ratio               | 4.39%  |

**Application Utilization:** Total ASU Capacity (192,758.132 GB) divided by Physical Storage Capacity (230,400.000 GB).

**Protected Application Utilization:** Total ASU Capacity (192,758.132 GB) plus total Data Protection Capacity (27,666.756 GB) minus unused Data Protection Capacity (129.880 GB) divided by Physical Storage Capacity (230,400.000 GB).

**Unused Storage Ratio:** Total Unused Capacity (10,104.992 GB) divided by Physical Storage Capacity (230,400.000 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 26-27 in the Full Disclosure Report.

## Priced Storage Configuration Pricing

| Qty | Part No. | Description                                  | List Price   | Ext. Price   | Discount | Price        |
|-----|----------|--|--------------|--------------|----------|--------------|
| 1   | H6F99A   | HP XP7 Storage System                        | \$0.00       | \$0.00       | 63.00%   | \$0.00       |
| 1   | H6F54A   | HP XP7 Storage Rack                          | \$17,100.00  | \$17,100.00  | 63.00%   | \$6,327.00   |
| 1   | H6F56A   | HP XP7 Primary DKC                           | \$80,950.00  | \$80,950.00  | 63.00%   | \$29,951.50  |
| 2   | H6F71A   | HP XP7 Three Phase 60Hz PDU                  | \$2,525.00   | \$5,050.00   | 63.00%   | \$1,868.50   |
| 2   | H6F60A   | HP XP7 2.5 inch Drive Chassis                | \$51,965.00  | \$103,930.00 | 63.00%   | \$38,454.10  |
| 1   | H6F80A   | HP XP7 60Hz DKC Power Cord                   | \$692.00     | \$692.00     | 63.00%   | \$256.04     |
| 2   | H6F81A   | HP XP7 60Hz DKU Power Cord                   | \$1,040.00   | \$2,080.00   | 63.00%   | \$769.60     |
| 2   | H6G30A   | HP XP7 16-port 8Gbps Fibre Host Adapter Pair | \$17,967.00  | \$35,934.00  | 63.00%   | \$13,295.58  |
| 1   | H6G08A   | HP XP7 Processor Blade Pair                  | \$211,180.00 | \$211,180.00 | 63.00%   | \$78,136.60  |
| 1   | H6F95A   | HP XP7 Service Processor                     | \$21,399.00  | \$21,399.00  | 63.00%   | \$7,917.63   |
| 1   | H6G20A   | HP XP7 Cache Path Controller Adapter Pair    | \$64,654.00  | \$64,654.00  | 63.00%   | \$23,921.98  |
| 16  | H6G21A   | HP XP7 16GB Cache Memory Pair                | \$3,780.00   | \$60,480.00  | 63.00%   | \$22,377.60  |
| 2   | H6G23A   | HP XP7 Small Backup Memory Kit               | \$4,385.00   | \$8,770.00   | 63.00%   | \$3,244.90   |
| 2   | H6G25A   | HP XP7 128GB Backup Memory Pair              | \$37,210.00  | \$74,420.00  | 63.00%   | \$27,535.40  |
| 2   | H6G06A   | HP XP7 Disk Adapter Pair                     | \$19,563.00  | \$39,126.00  | 63.00%   | \$14,476.62  |
| 1   | H6G10A   | HP XP7 1M Cu Intra-chassis Dev Int Cable     | \$5,647.00   | \$5,647.00   | 63.00%   | \$2,089.39   |
| 3   | H6G11A   | HP XP7 2M Cu Intra-rack Dev Int Cable        | \$5,647.00   | \$16,941.00  | 63.00%   | \$6,268.17   |
| 384 | H6G40A   | HP XP7 300GB 15K 2.5in SAS HDD               | \$1,550.00   | \$595,200.00 | 63.00%   | \$220,224.00 |
| 1   | H6F54A   | HP XP7 Storage Rack                          | \$17,100.00  | \$17,100.00  | 63.00%   | \$6,327.00   |
| 1   | H6F57A   | HP XP7 Secondary DKC                         | \$85,880.00  | \$85,880.00  | 63.00%   | \$31,775.60  |
| 2   | H6F71A   | HP XP7 Three Phase 60Hz PDU                  | \$2,525.00   | \$5,050.00   | 63.00%   | \$1,868.50   |
| 2   | H6F60A   | HP XP7 2.5 inch Drive Chassis                | \$51,965.00  | \$103,930.00 | 63.00%   | \$38,454.10  |
| 1   | H6F80A   | HP XP7 60Hz DKC Power Cord                   | \$692.00     | \$692.00     | 63.00%   | \$256.04     |
| 2   | H6F81A   | HP XP7 60Hz DKU Power Cord                   | \$1,040.00   | \$2,080.00   | 63.00%   | \$769.60     |
| 2   | H6G30A   | HP XP7 16-port 8Gbps Fibre Host Adapter Pair | \$17,967.00  | \$35,934.00  | 63.00%   | \$13,295.58  |
| 1   | H6G08A   | HP XP7 Processor Blade Pair                  | \$211,180.00 | \$211,180.00 | 63.00%   | \$78,136.60  |
| 1   | H6F97A   | HP XP7 Internal Hub                          | \$4,737.00   | \$4,737.00   | 63.00%   | \$1,752.69   |
| 1   | H6G20A   | HP XP7 Cache Path Controller Adapter Pair    | \$64,654.00  | \$64,654.00  | 63.00%   | \$23,921.98  |
| 16  | H6G21A   | HP XP7 16GB Cache Memory Pair                | \$3,780.00   | \$60,480.00  | 63.00%   | \$22,377.60  |
| 2   | H6G23A   | HP XP7 Small Backup Memory Kit               | \$4,385.00   | 8770.00      | 63.00%   | \$3,244.90   |
| 2   | H6G25A   | HP XP7 128GB Backup Memory Pair              | \$37,210.00  | \$74,420.00  | 63.00%   | \$27,535.40  |
| 2   | H6G06A   | HP XP7 Disk Adapter Pair                     | \$19,563.00  | \$39,126.00  | 63.00%   | \$14,476.62  |
| 1   | H6G00A   | HP XP7 5M DKC Interconnect Kit               | \$17,379.00  | \$17,379.00  | 63.00%   | \$6,430.23   |
| 1   | H6G03A   | HP XP7 5M DKC Interconnect Cable             | \$13,292.00  | \$13,292.00  | 63.00%   | \$4,918.04   |
| 1   | H6G10A   | HP XP7 1M Cu Intra-chassis Dev Int Cable     | \$5,647.00   | \$5,647.00   | 63.00%   | \$2,089.39   |
| 3   | H6G11A   | HP XP7 2M Cu Intra-rack Dev Int Cable        | \$5,647.00   | \$16,941.00  | 63.00%   | \$6,268.17   |
| 384 | H6G40A   | HP XP7 300GB 15K 2.5in SAS HDD               | \$1,550.00   | \$595,200.00 | 63.00%   | \$220,224.00 |
| 1   | TK914AA  | HP XP7 Array Mgr Suite Base LTU              | \$271.00     | \$271.00     | 63.00%   | \$100.27     |
| 173 | TK914AC  | HP XP7 Array Mgr Suite 1TB 101-250TB LTU     | \$1,762.00   | \$304,826.00 | 63.00%   | \$112,785.62 |



**Priced Storage Configuration Pricing (continued)**

| Qty                         | Part No. | Description                              | List Price  | Ext. Price     | Discount | Price                 |
|-----------------------------|----------|--|-------------|----------------|----------|-----------------------|
| <b>Services and Support</b> |          |  |             |                |          |                       |
| 1                           | HA114A1  | HP Installation and Startup Service      | \$0.00      | \$0.00         | 50.00%   | \$0.00                |
| 1                           | HA114A1  | HP Startup XP7 P9500 Array DKC Mod 0 SVC | \$22,125.00 | \$22,125.00    | 50.00%   | \$11,062.50           |
| 1                           | HA114A1  | HP Startup XP7 P9500 Array DKC DKU SVC   | \$1,775.00  | \$1,775.00     | 50.00%   | \$887.50              |
| 4                           | HA114A1  | HP Startup XP7 P9500 Array Expansion SVC | \$900.00    | \$3,600.00     | 50.00%   | \$1,800.00            |
| 1                           | HA114A1  | HP Startup XP7 P9500 Software Type 6 SVC | \$5,250.00  | \$5,250.00     | 50.00%   | \$2,625.00            |
| 1                           | H7J34A3  | HP 3yr Foundation Care 24x7 Service      | \$0.00      | \$0.00         | 63.00%   | \$0.00                |
| 173                         | H7J34A3  | HP XP7 Array Mgr St 101-250TB LTU SWSup  | \$375.00    | \$64,875.00    | 63.00%   | \$24,003.75           |
|                             |          | <b>Total</b>                             |             | \$3,108,767.00 |          | \$1,154,501.29        |
| <b>Additional Hardware</b>  |          |  |             |                |          |                       |
| 64                          | QK734AH  | HP Premier Flex LC/LC OM4 2f 5m Cable    | \$114.00    | \$7,296.00     | 35.00%   | \$4,742.40            |
| 32                          | QW972A   | HP SN1000Q 16Gb 2P FC HBA                | \$2,799.00  | \$89,568.00    | 35.00%   | \$58,219.00           |
|                             |          | <b>Total</b>                             |             |                |          | \$62,961.40           |
|                             |          | <b>Grand Total</b>                       |             |                |          | <b>\$1,217,462.69</b> |

**Note:** Line item “HP XP7 Primary DKC” includes:

- 1 HP XP7 Service Processor (SVP)
- 1 HP XP7 Processor Blade Pair
- 1 HP XP7 Cache Path Controller Adapter Pair

Line item “HP XP7 Secondary DKC” includes:

- 1 HP XP7 Processor Blade Pair
- 1 HP XP7 Cache Path Controller Adapter Pair

The following pricing includes the following:

- Acknowledgement of new and existing hardware and/or software problems within four hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration component.

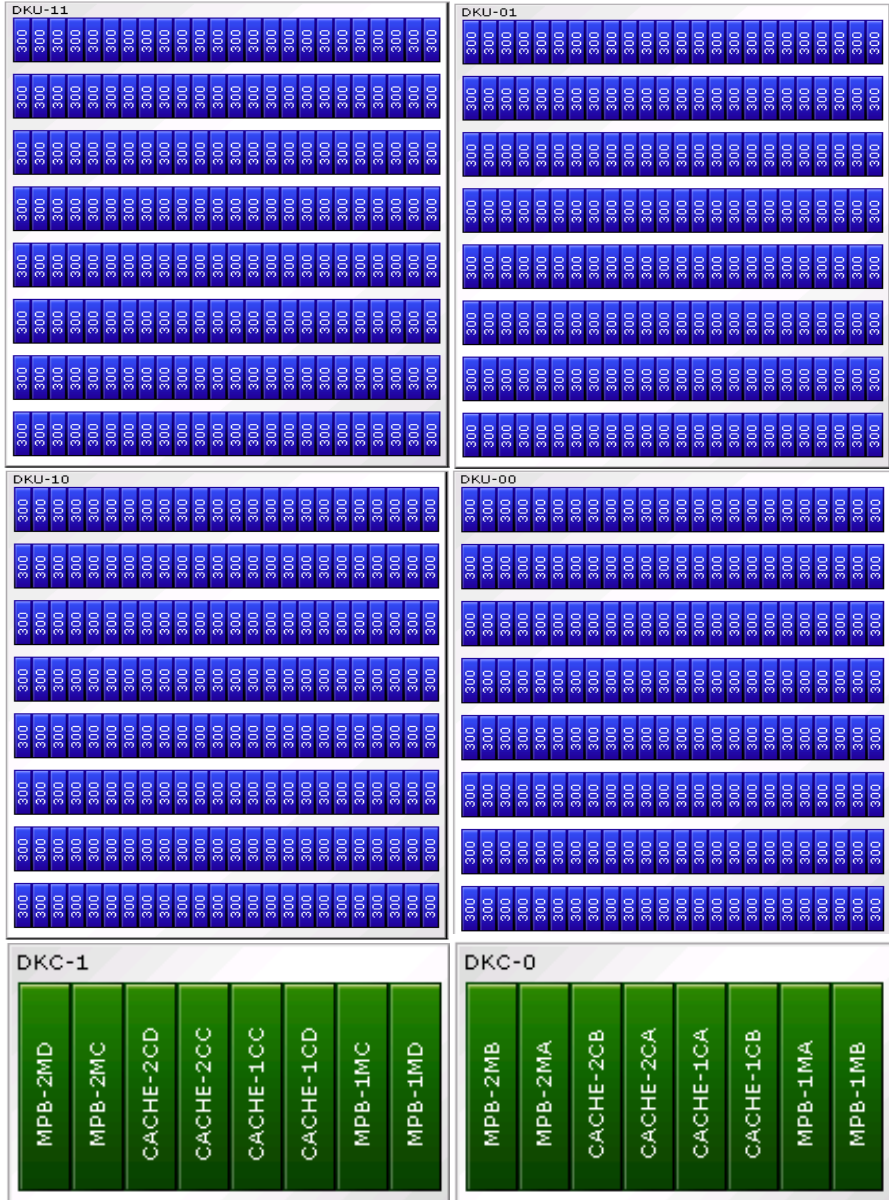
### **Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration**

There were no differences between the TSC and the Priced Storage Configuration.

**Priced Storage Configuration Diagram (front view)**

**HP XP7 Storage (Front View)**

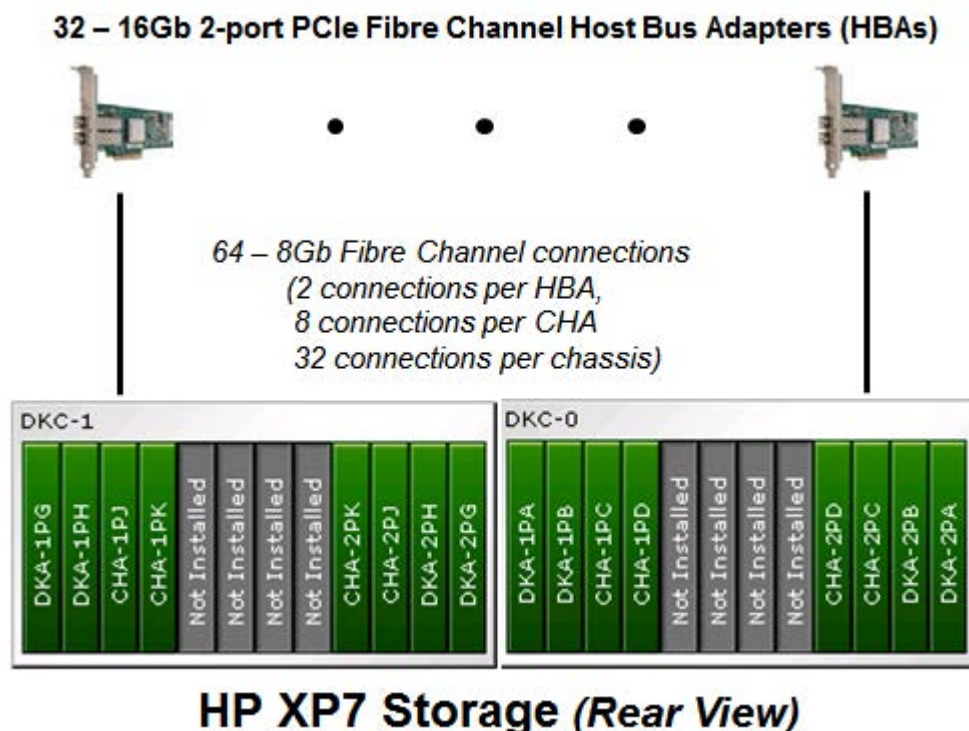
**4 – 2.5 inch Drive Chassis (DKU)**  
**768 – 300 GB, 15K RPM,**  
**2.5" SAS disk drives**  
**192 per Drive Chassis**



**Primary and Secondary Controller Chassis (DKC-0, DKC-1)**

- 1 – Service Processor (in chassis DKC-0)**
- 8 – MP Blades (MPB) (2 pairs/4 MP blades per chassis)**
- 8 – Cache Path Controller Adapters (CACHE) (2 pairs/4 adapters per chassis)**
- 64 – Cache Memory Modules (16 pairs/32 modules per chassis) (128 GB/module, 512 GB/chassis, 1024 GB total)**

## Priced Storage Configuration Diagram (*rear view*)



### Primary and Secondary Controller Chassis (DKC-0, DKC-1)

#### 4 – 16 port, 8Gb FC Host Adapters (CHA)

(2 – 8 port boards per adapter, 2 adapters per chassis)  
(32 ports per chassis, 64 ports total)  
(32 ports used per chassis, 64 ports used total)

#### 4 – Disk Adapters (DKA) (SAS controllers)

(2 boards per adapter, 4 – 6Gb connections per board)  
(2 adapters per chassis, 8 – 6Gb connections per adapter)  
(16 connections per chassis, 32 connections total)  
(16 connections used per chassis, 32 connections used total)

## Priced Storage Configuration Components

| Priced Storage Configuration   |
|--|
| 32 – 16Gb 2-port PCIe Fibre Channel Host Bus Adapters (HBAs)<br><i>(2 HBAs per server)</i>   |
| <b>HP XP7 Storage</b> <i>Error! Unknown document property name.</i><br>Primary and Secondary Controller Chassis (DKC-0, DKC-1)<br>1 – Service Processor <i>(in chassis DKC-0)</i><br>8 – MP Blades (MPB) in 4 pairs<br><i>(2 pairs/4 MP Blades per chassis)</i><br>8 – Cache Path Controller Adapters (CACHE) in 4 pairs<br><i>(2 pairs/4 adapters per chassis)</i><br>64 – Cache Memory Modules in 32 pairs<br><i>(16 pairs/32 modules per chassis)</i><br><i>(16 GB per module, 512 GB per chassis, 1024 GB total)</i><br>8 – Backup Memory Modules in 4 pairs<br><i>(2 pairs/4 modules per chassis)</i><br><i>(128 GB per module, 512 GB per chassis, 1024 GB total)</i><br>4 – 16-port, 8Gb FC Host Adapters (CHA)<br><i>(2 – 8-port boards per adapter, 2 adapters per chassis)</i><br><i>(16 ports per adapter, 32 ports per chassis, 64 ports total)</i><br><i>(32 ports used per chassis, 64 ports used total)</i><br>4 – Disk Adapters (DKA) in 4 pairs (SAS controllers)<br><i>(2 boards per adapter, 4 – 6Gb connections per board)</i><br><i>(2 adapters per chassis, 8 – 6Gb connections per adapter)</i><br><i>(16 connections per chassis, 32 connections total)</i><br><i>(16 connections used per chassis, 32 connections used total)</i> |
| 4 – 2.5 inch Drive Chassis (DKU)   |
| 768 – 300 GB, 15K RPM, 2.5" SAS disk drives<br><i>(192 disk drives per Drive Chassis)</i>  |
| 2 – 19" 42U Storage Racks each with 2 Three-Phase 60Hz PDUs  |