



**SPC BENCHMARK 1™  
EXECUTIVE SUMMARY**

**NETAPP, INC.  
NETAPP FAS8040 (2-NODE CLUSTER)**

**SPC-1 V1.14**

**Submitted for Review: February 19, 2014  
Submission Identifier: A00141**

## EXECUTIVE SUMMARY

### Test Sponsor and Contact Information

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<b>Auditor</b>	Storage Performance Council – <a href="http://www.storageperformance.org">http://www.storageperformance.org</a> Walter E. Baker – <a href="mailto:AuditService@StoragePerformance.org">AuditService@StoragePerformance.org</a> 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

### Revision Information and Key Dates

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<b>SPC-1 Specification revision number</b>	V1.14
<b>SPC-1 Workload Generator revision number</b>	V2.3.0
<b>Date Results were first used publicly</b>	February 19, 2014
<b>Date the FDR was submitted to the SPC</b>	February 19, 2014
<b>Date the Priced Storage Configuration is available for shipment to customers</b>	currently available
<b>Date the TSC completed audit certification</b>	February 19, 2014

## **Tested Storage Product (TSP) Description**

Powered by Data ONTAP and optimized for scale out, the FAS8000 series unifies your storage infrastructure and has the flexibility to keep up with changing business needs while delivering on core IT requirements for uptime, scalability and cost-efficiency.

The FAS8000 features a multi-processor Intel chip set and leverages high-performance memory modules, NVRAM to accelerate and optimize writes, and an I/O-tuned PCIe gen3 architecture that maximizes application throughput. Building on a decade of multi-core optimization, Data ONTAP drives the latest cores and increased core counts to keep up with continuous growth in storage demands. The result is a flexible, efficient I/O design capable of supporting large numbers of high-speed network connections and massive capacity scaling.

By delivering more onboard ports to support drive, cluster, and host connectivity, the FAS8000 offers exceptional flexibility and expandability in an extremely dense package. Integrated unified target adapter (UTA) ports support 16Gb Fibre Channel, 10GbE, or FCoE, so your storage is ready on day one for whatever choices the future holds.

## Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: NetApp FAS8040 (2-node cluster)	
Metric	Reported Result
SPC-1 IOPS™	86,072.33
SPC-1 Price-Performance™	\$5.76/SPC-1 IOPS™
Total ASU Capacity	32,219.301 GB
Data Protection Level	Protected 2 (RAID DP™)
Total Price	\$495,652.43
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

SPC-1 Price-Performance™ is the ratio of **Total Price** to SPC-1 IOPS™.

**Total ASU** (Application Storage Unit) **Capacity** represents the total storage capacity available to be read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of **Protected 2** using **RAID DP™**, which provides double-parity RAID protection against data loss with negligible performance overhead and no cost penalty compared to single-parity RAID. Additional information is available at the following location: <http://www.netapp.com/us/products/platform-os/raid-dp.aspx>.

***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-1 Data Repository.*

**Total Price** includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 9.

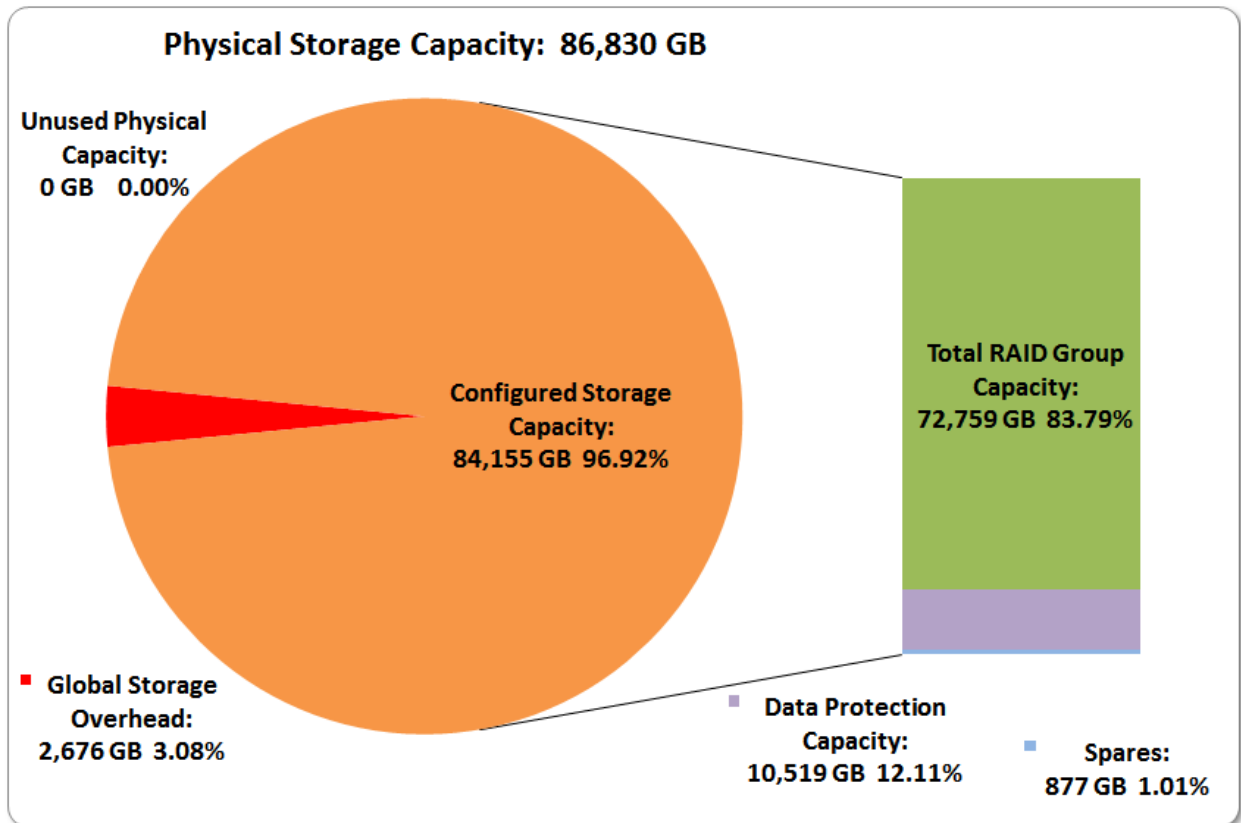
**Currency Used** is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

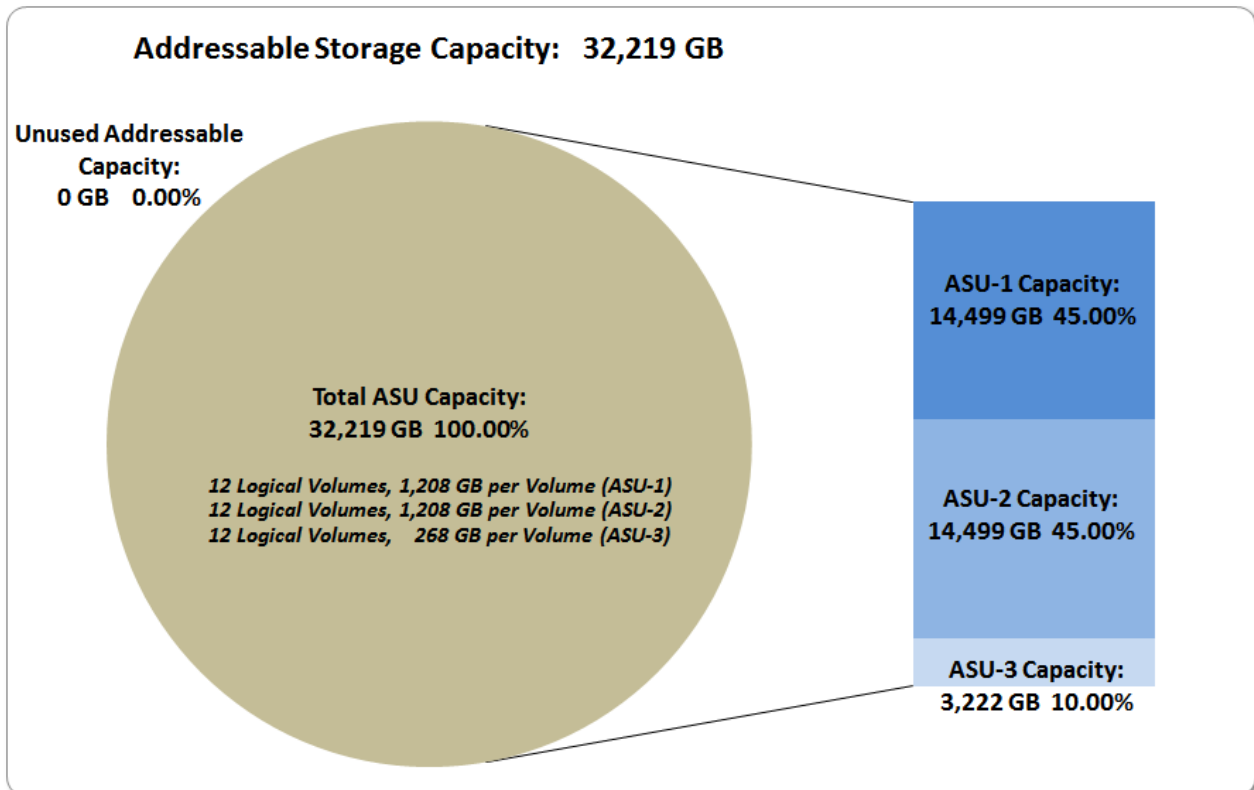
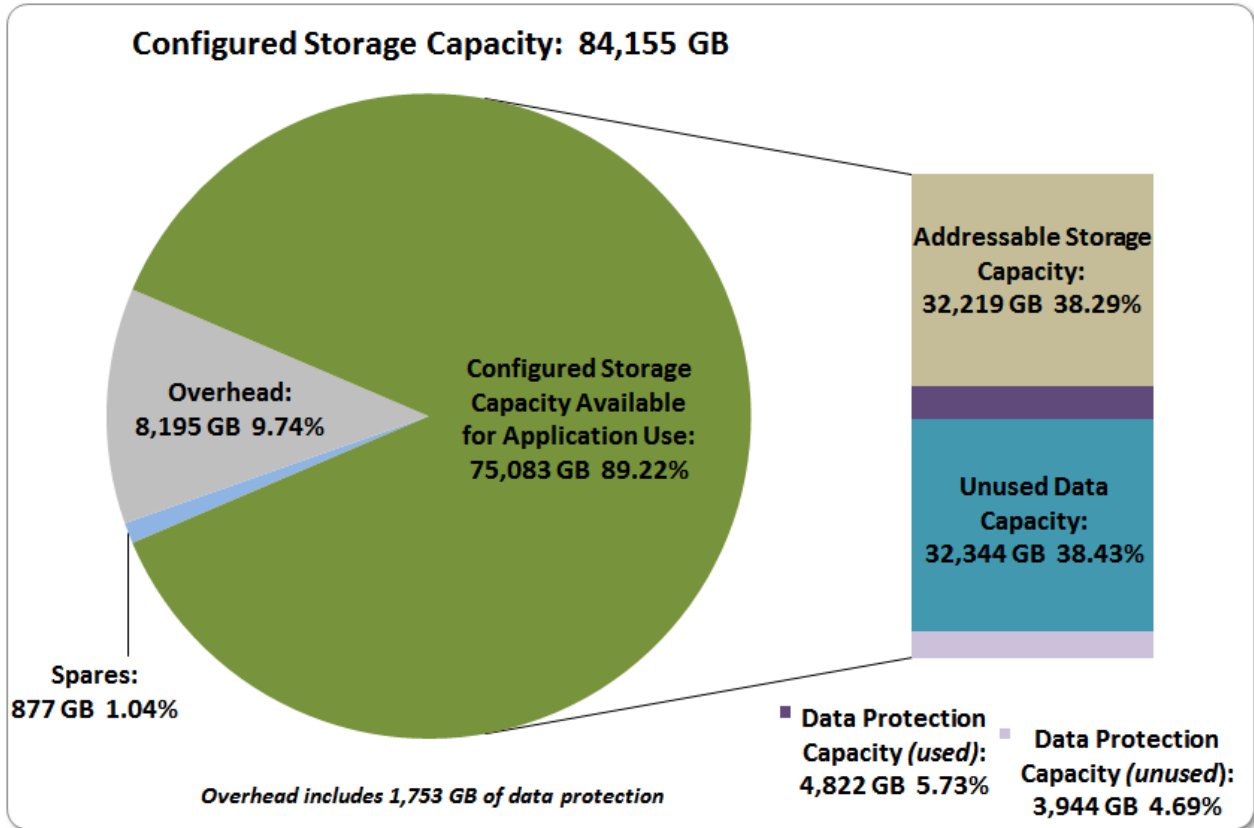
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

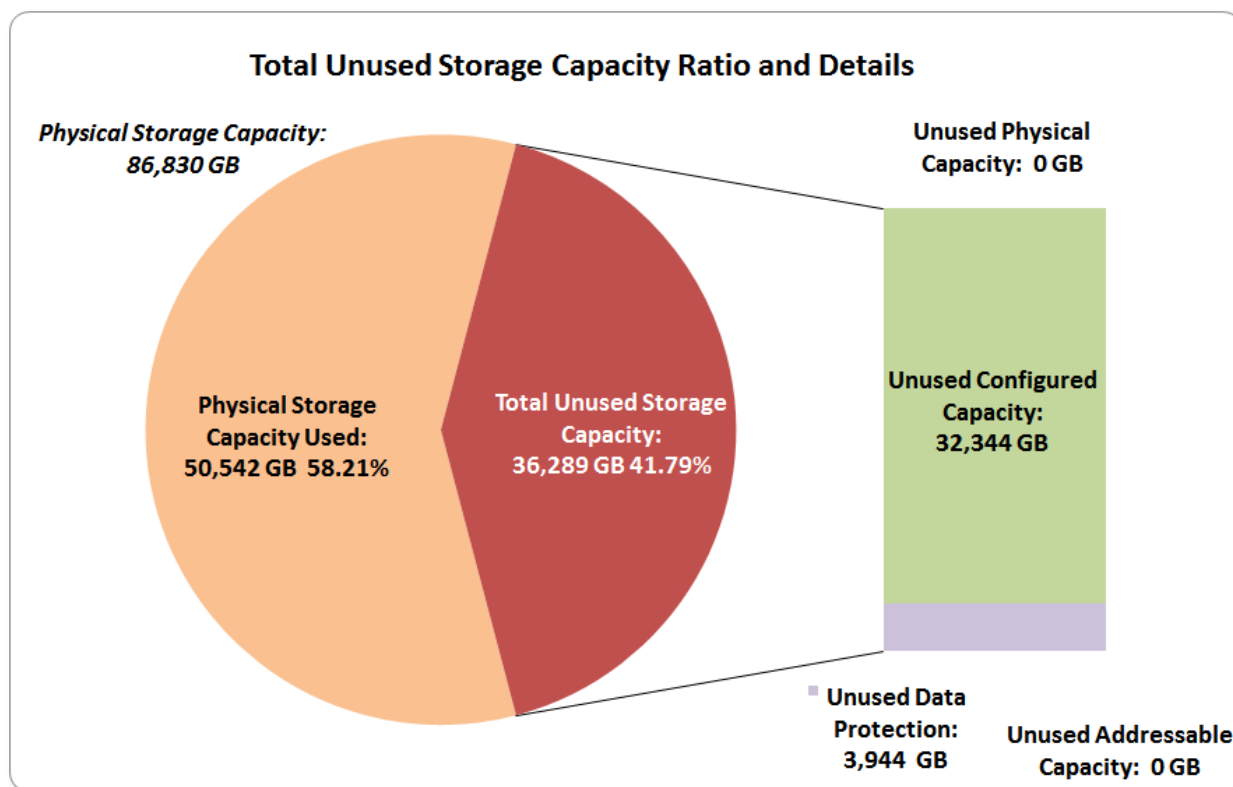
### Storage Capacities, Relationships, and Utilization

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-1 Storage Capacity Utilization	
Application Utilization	37.11%
Protected Application Utilization	44.68%
Unused Storage Ratio	41.79%

**Application Utilization:** Total ASU Capacity (32,219.301 GB) divided by Physical Storage Capacity (86.830.090 GB).

**Protected Application Utilization:** Total ASU Capacity (32,219.301 GB) plus total Data Protection Capacity (10,519.314 GB) minus unused Data Protection Capacity (3,944.408 GB) divided by Physical Storage Capacity (86.830.090 GB).

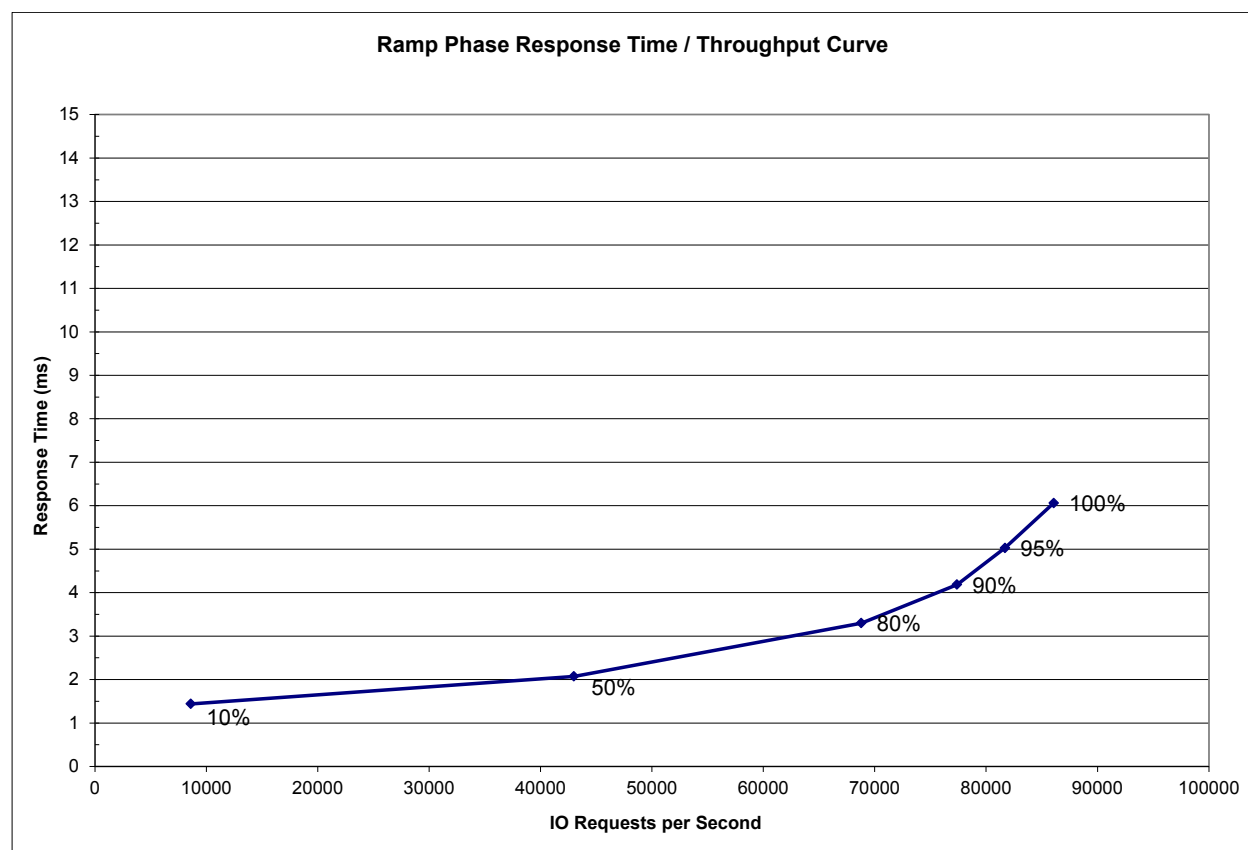
**Unused Storage Ratio:** Total Unused Capacity (36,288.553 GB) divided by Physical Storage Capacity (86.830.090 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 32-33 in the Full Disclosure Report.

## Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at the any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.



## Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
<b>I/O Request Throughput</b>	8,599.29	43,003.32	68,797.42	77,390.38	81,693.51	86,072.33
<b>Average Response Time (ms):</b>						
<b>All ASUs</b>	1.44	2.07	3.30	4.19	5.03	6.06
<b>ASU-1</b>	1.73	2.48	3.91	4.97	6.05	7.42
<b>ASU-2</b>	2.11	3.05	4.60	5.56	6.32	7.11
<b>ASU-3</b>	0.53	0.78	1.44	1.93	2.30	2.72
<b>Reads</b>	2.71	3.89	5.90	7.28	8.57	10.12
<b>Writes</b>	0.62	0.89	1.60	2.17	2.72	3.42



## Priced Storage Configuration Pricing

	Description	QTY	List Price	Extended List
FAS8040A-001-R6	FAS8040 High Availability System	2	\$ 22,350.00	\$ 44,700.00
DS2246-1011-24S-0P-R6-C	DSK SHLF,24x450GB,10K,0P,-C	8	\$ 25,560.00	\$ 204,480.00
OS-ONTAP-CAP2	OS Enable,Per-0.1TB,ONTAP,Perf-Stor	844	\$ 92.00	\$ 77,648.00
SW-2-8040A-FCP-C	SW-2-8040A-FCP-C - FCP protocol	2	\$ 7,000.00	\$ 14,000.00
X-6505-24-16G-1R-R6	Switch,Brocade 6505 24-Pt w/16Gb SWL SFP+ Ent	2	\$ 19,580.00	\$ 39,160.00
X-SFP-H10GB-CU1M-R6-C	Cisco N5020 10GBase Copper SFP+cable, 1m, -C, R6 (Cluster interconnect)	2	\$ 112.00	\$ 224.00
X1973A-R6	Flash Cache 512GB PCIe Module 2	2	\$ 27,050.00	\$ 54,100.00
X6524-R6	Cable,Cntlr-Shelf/Switch,2m,Pair,LC/LC,Op	16	\$ 125.00	\$ 2,000.00
X2065A-EN-R6-C	HBA SAS 4-Port Copper 3/6 Gb QSFP PCIe,EN,-C	2	\$ 1,400.00	\$ 2,800.00
X1095A-R6	HBA Qlogic QLE2562 2-Port 8Gb PCIe	4	\$ 2,005.00	\$ 8,020.00
X6558-R6-C	Cable, SAS Cntlr-Shelf/Shelf-Shelf/HA, 2m, -C	16	\$ 125.00	\$ 2,000.00
X6557-R6	Cable,SAS Cntlr-Shelf/Shelf-Shelf/HA,0.5m	8	\$ 100.00	\$ 800.00
X8712C-R6-C	PDU, 1-Phase, 24 Outlet, 30A, NEMA, -C, R6	2	\$ 550.00	\$ 1,100.00
X870D-EN-R6-C	Cab,Deep,HeavyDuty,Empty,No PDU,No Rail,EN,-C	1	\$ 3,595.00	\$ 3,595.00
X8778-R6-C	Mounting Bracket, Tie-Down, 32X0, -C, R6	2	\$ 50.00	\$ 100.00
CS-A-INST-4R	SupportEdge Standard Replace 4hr, Hardware Support: 3 years	1	\$ 40,925.43	\$ 40,925.43
<b>Total (\$)</b>				<b>\$ 495,652.43</b>

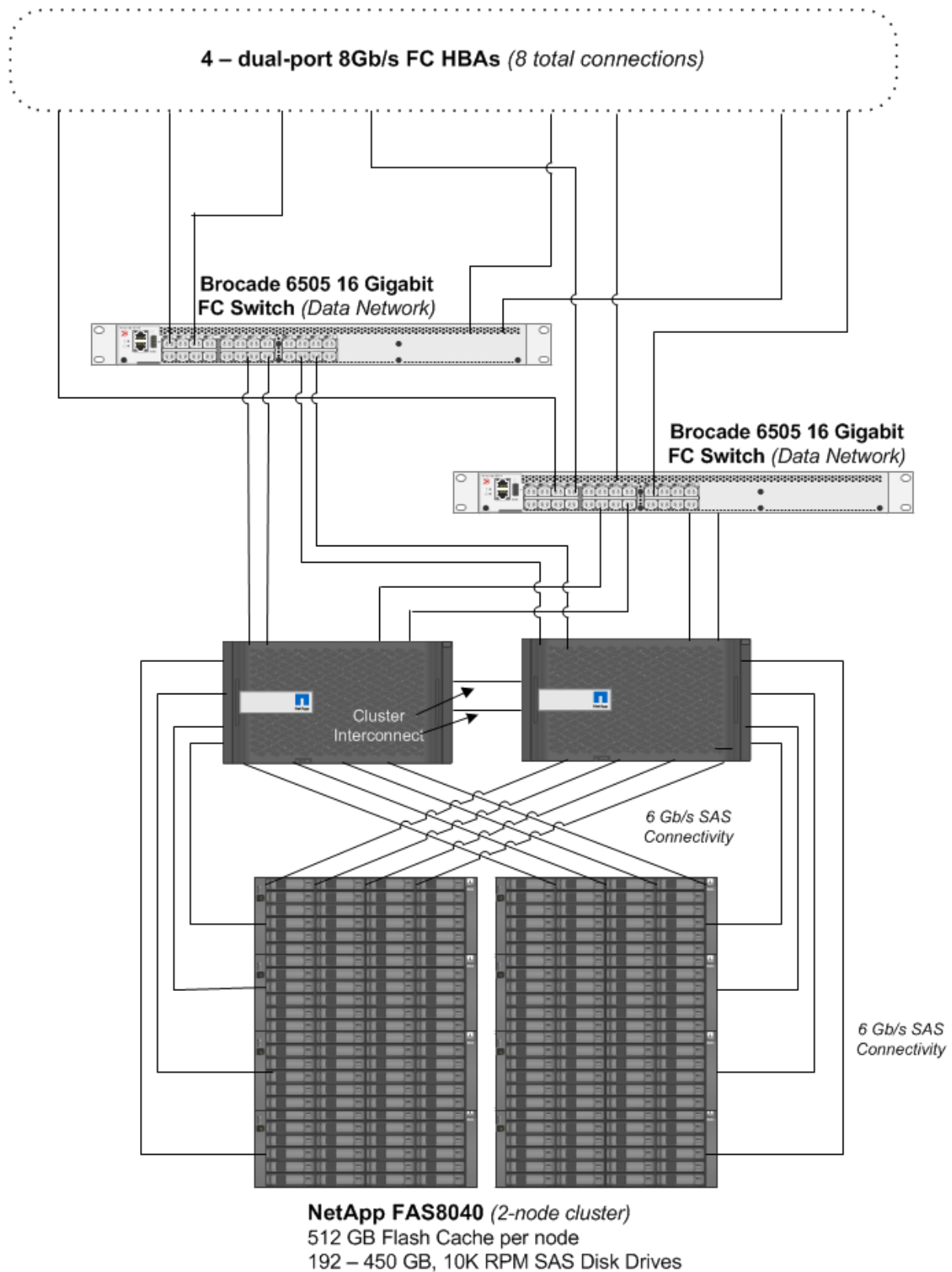
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems with four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration that can be remedied by the repair or replacement of a 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



## Priced Storage Configuration Components

<b>Priced Storage Configuration</b>
4 – QLogic QLE2562 dual-port, 8 Gbps, FC HBAs
2 – Brocade 6505 24 port, 16Gb switches with SFPs
<b>NetApp FAS8040 (2-node cluster)</b>
2 – controller nodes, each with 32 GB memory/cache (64 GB total) 512 GB Flash Cache (1024 GB total) 4 – 16Gb FC front-end connections (8 connections total and used) 2 – 4 port 3/6 Gb SAS adapters (8 ports total and used in a Multipath High Availability (HA) configuration)
2 – Cisco N5020 10GBase Copper SFP + cable (cluster interconnect)
8 – Disk Enclosures (4 enclosures per controller node)
192 – 450 GB, 10K RPM SAS Disk Drives (24 disk drives per disk enclosure)
2 – 24 outlet PDUs
1 – Cabinet