



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**NETAPP, INC.
NETAPP FAS3170**

SPC-1 V1.10.1

**Submitted for Review: June 10, 2008
Submission Identifier: A00066**

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.10.1
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	June 10, 2008
Date the FDR was submitted to the SPC	June 10, 2008
Date the TSC is available for shipment to customers	June 10, 2008
Date the TSC completed audit certification	June 7, 2008

Tested Storage Product (TSP) Description

The FAS3100 Series Storage Systems are the newest members of the NetApp FAS family of storage systems which deliver outstanding price-performance and unsurpassed flexibility.

The FAS3170 performance is driven by a 64-bit architecture that uses high throughput, low latency links and PCI Express for all internal and external data transfers. Integrated 4 Gb/sec Fibre Channel ports and optional 10 Gb/sec Ethernet maximize the speed and throughput of connections to hosts and storage. The FAS3170 scales to a maximum of 840 disk drives and 840TB of capacity. NetApp FAS systems can be upgraded for performance or storage capacity by changing storage controllers with no need for painful data migration. Existing storage can be left in place, protecting the storage investment and minimizing disruption to operations.

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: NetApp FAS3170	
Metric	Reported Result
SPC-1 IOPS™	60,515.34
SPC-1 Price-Performance	\$10.01/SPC-1 IOPS™
Total ASU Capacity	19,628.500 GB
Data Protection Level	Other Data Protection (<i>NetApp RAID-DP™</i>)
Total TSC Price (including three-year maintenance)	\$605,492

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

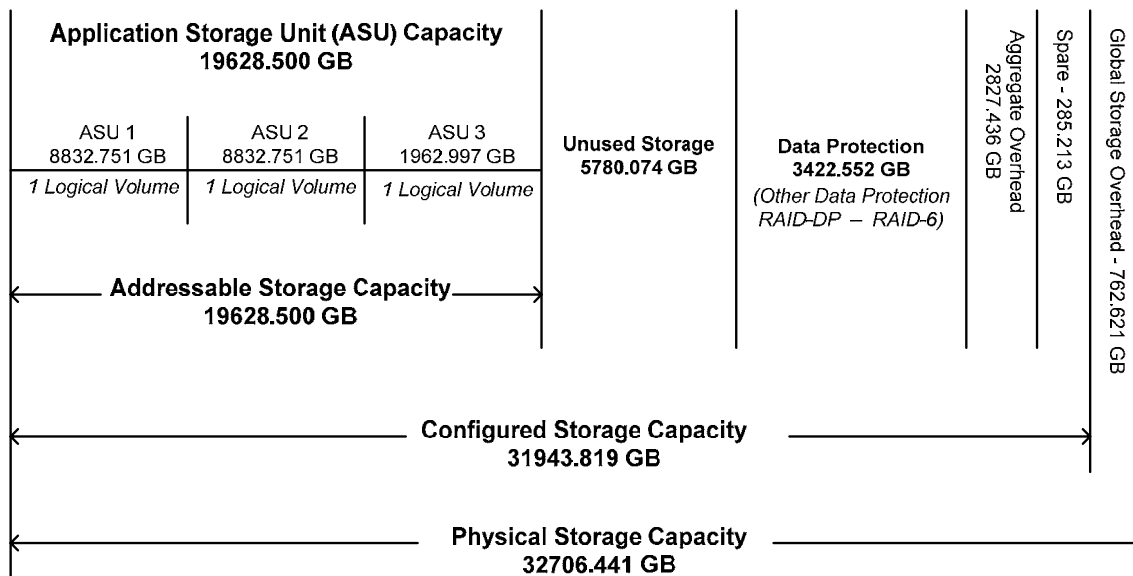
Total ASU (Application Storage Unit) Capacity represents the total storage capacity read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of “Other Protection Level” utilized NetApp’s RAID-DP™, a RAID 6 implementation, 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/products/software/raid-dp.html>

Storage Capacities and Relationships

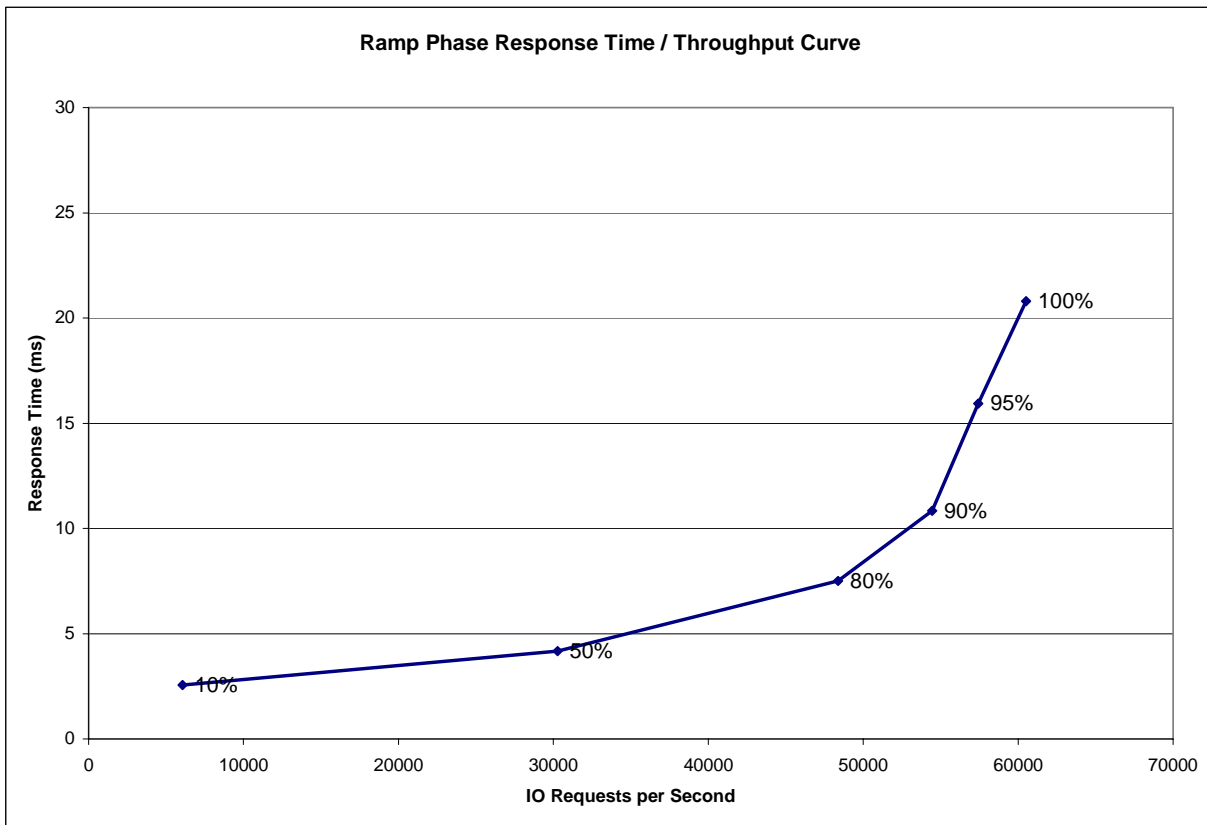
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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
I/O Request Throughput	6,051.65	30,259.87	48,382.46	54,437.98	57,435.07	60,515.34
Average Response Time (ms):						
All ASUs	2.56	4.16	7.51	10.83	15.93	20.80
ASU-1	3.47	5.40	9.38	13.04	19.99	25.90
ASU-2	2.79	4.87	8.41	12.15	14.90	18.77
ASU-3	0.52	1.23	3.14	5.56	7.77	10.86
Reads	5.73	8.78	14.31	19.09	26.25	32.70
Writes	0.49	1.16	3.07	5.45	9.21	13.04

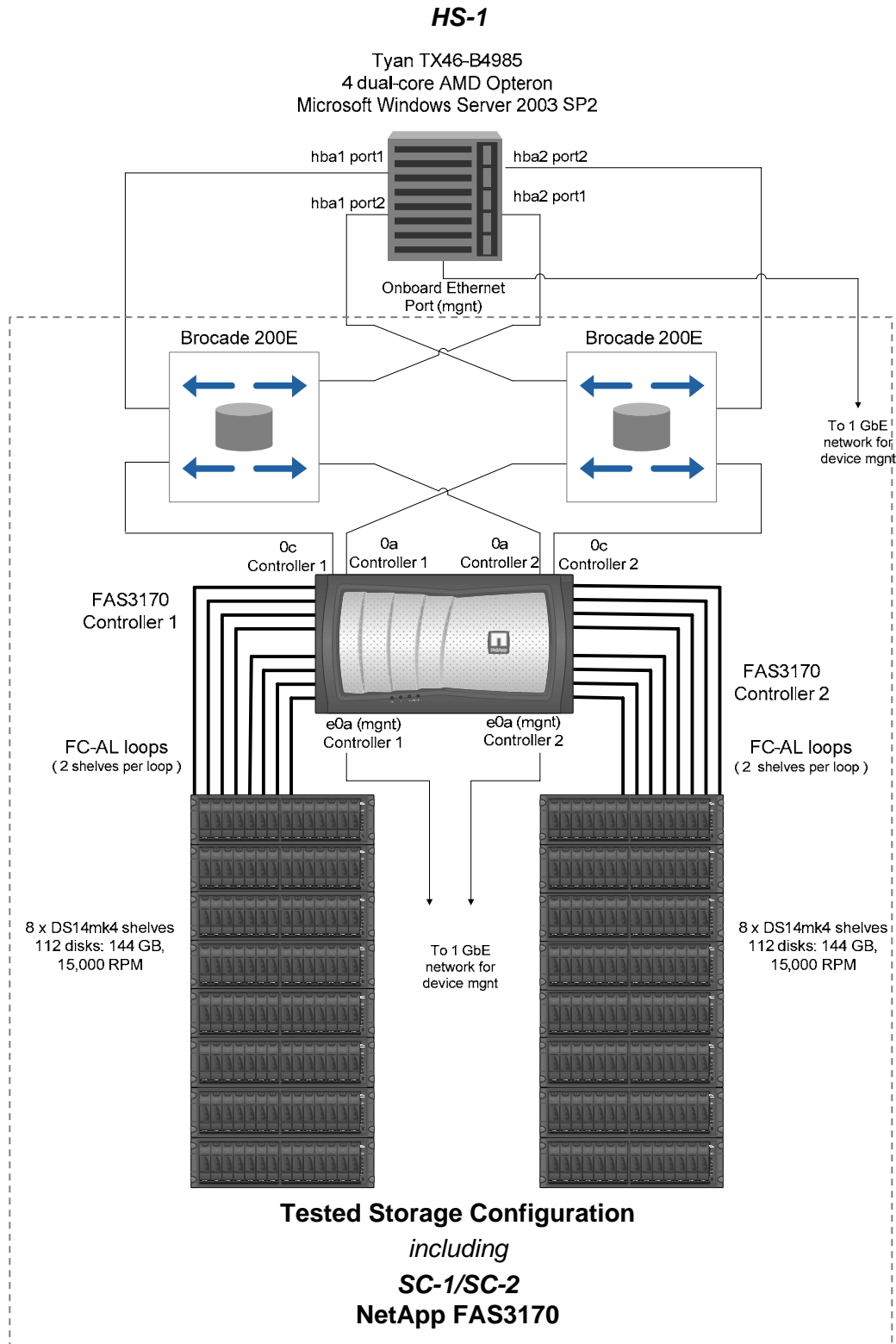
Tested Storage Configuration Pricing (Priced Storage Configuration)

Storage System		Ext Qty	List Price	Disc %	Net Price	Ext Net Price	
SES-SYSTEM	Support Edge Services Attach PN	1	\$0.00	0	\$0.00	\$0.00	
X1558A-R6-C	Cabinet Component Power Cable,48-IN,-C,R6	34	\$0.00	0	\$0.00	\$0.00	
X1941A-R6-C	Cable,Cluster 4X,Copper,5M,-C,R6	2	\$97.00	0	\$97.00	\$194.00	
X2055A-R6-C	HBA,FC,2-Port,4Gb,Disk,Optical,PCIe,-C,R6	6	\$2,300.00	0	\$2,300.00	\$13,800.00	
X6530-R6-C	Cable,Patch,FC SFP to SFP,0.5M,-C,R6	20	\$0.00	0	\$0.00	\$0.00	
X6536-R6-C	Cable,Optical,LC/LC,5M,X,-C,R6	16	\$150	0	\$150.00	\$2,400.00	
X6539-R6-C	SFP,Optical,4.25Gb,-C,R6	12	\$120	0	\$120.00	\$1,440.00	
X8781-R6-C	Hardware Kit,Add-On Peripheral,Cabinet,-C,R6	17	\$0.00	0	\$0.00	\$0.00	
DOC-3XXX-C	Documents,3XXX,-C	1	\$0.00	0	\$0.00	\$0.00	
FAS3170A-CHASSIS-R5-C	FAS3170,ACT-ACT,Chassis,AC PS,-C,R5	1	\$10,000.00	0	\$10,000.00	\$10,000.00	
FAS3170AS-IB-SYS-R5	FAS3170A,IB,ACT-ACT,SAN,OS,R5	2					
FAS3170AS-BASE-R5-C	FAS3170A,IB,ACT-ACT,SAN,OS,-C,R5	2	\$54,300.00	0	\$54,300.00	\$108,600.00	
X74015B-ESH4-R5-C	DS14MK4 SHLF,AC,14x144GB,15K,B,ESH4,-C,R5	16	\$22,700.00	0	\$22,700.00	\$363,200.00	
SW-T5C-CLUSTERSAN-C	CFO Software,SAN Bundle,T5C,-C	2	\$7,700.00	0	\$7,700.00	\$15,400.00	
SW-T5C-FCPSAN-C	FCP Software,SAN Bundle,T5C,-C	2	\$0.00	0	\$0.00	\$0.00	
SW-T5C-ISCSISAN-C	iSCSI Software,SAN Bundle,T5C,-C	2	\$0.00	0	\$0.00	\$0.00	
SW-ONTAP4-3XXX	SW_DataONTAP4,3XXX	2	\$0.00	0	\$0.00	\$0.00	
SVC-A-4R-Z	HW Support,Standard Replace,4hr,z FAS3170-R5	Mths: 36	1	\$65,043.00	0	\$65,043.00	\$65,043.00
SW-SSP-A-4R-Z	SW Subs,Standard Replace,4hr,z FAS3170-R5	Mths: 36	1	\$5,544.00	0	\$5,544.00	\$5,544.00
Storage Subtotal						\$585,621.00	
Host Attach Hardware and Software							
X1558A-R6-C	Cabinet Component Power Cable,48-IN,-C,R6	2	\$0.00	0	\$0.00	\$0.00	
X5515A-R6	Rackmount Kit,4N2,DS14-Middle,R6	2	\$100.00	0	\$100.00	\$200.00	
X1610-R5-C	Brocade 8-Port 200e FC Switch,-C,R5	2	\$4,450.00	0	\$4,450.00	\$8,900.00	
SW-BSW2E-FF-C	Brocade 200E/300 Full Fabric,-C	2	\$1,200.00	0	\$1,200.00	\$2,400.00	
SVC-A-4R-Y	HW Support,Standard Replace,4hr,y BSWITCH-8PORT-R5	Mths: 36	2	\$600.75	0	\$600.75	\$1,201.50
SW-SSP-A-4R-Y	SW Subs,Standard Replace,4hr,y BSWITCH-8PORT-R5	Mths: 36	2	\$432.00	0	\$432.00	\$864.00
SW-SSP-COTERM	SSP,co-termed with existing agmnt BSWITCH-8PORT-R5	Mths: 36	2	\$0.00	0	\$0.00	\$0.00
X1089A-R6	HBA,QLogic QLE2462,2-Port,4Gb,PCIe,R6	2	\$2,615.00	0	\$2,615.00	\$5,230.00	
SW-DSM-MPIO-WIN	Software,Data ONTAP DSM for Windows MPIO	1	\$1,000.00	0	\$1,000.00	\$1,000.00	
SW-FAK-WIN	FCP Windows Host Utilities	1	\$75.00	0	\$75.00	\$75.00	
Host Subtotal						\$19,870.50	
Total						\$605,491.50	

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

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

Benchmark Configuration/Tested Storage Configuration Diagram



Benchmark Configuration/Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
HS-1: Tyan TX46-B4985	2 – Qlogic QLE2462, 2-Port 4Gb PCIe, R6 HBAs <i>(Host System)</i>
4 – dual-core AMD Opteron 8220 processors	6 – FC, 2-Port, PCIe, 4Gb, -C, R6 HBAs <i>(3 per FAS3170 controller)</i>
2.8 GHz cores, 2 MB L2 cache per CPU	
64 GB main memory	2 – Brocade 8-Port 200e FC switches
Windows Server 2003 Enterprise Edition with SP2	SC-1/SC-2: NetApp FAS3170
Priced Host System Software: FCP Windows Host Utilities 4.0 for Native OS and Veritas Data ONTAP® DSM 3.2 for Windows MPIO	2 – FAS3170 Storage Controllers each with: 2 – AMD 2.6 GHz Opteron CPUs 16384 MB main memory 512 KB L2 cache 2 FCP front-end connections 8 FCP backend connections
PCIe	
WG	
	224 – 144 GB 15K RPM disk drives