



# SPC BENCHMARK 2<sup>TM</sup> EXECUTIVE SUMMARY

# HEWLETT-PACKARD COMPANY HP STORAGEWORKS XP24000 DISK ARRAY

**SPC-2**<sup>TM</sup> **V1.2.1** 

**Submitted for Review: September 8, 2008** 

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## **EXECUTIVE SUMMARY**

# **Test Sponsor and Contact Information**

Test Sponsor and Contact Information					
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## **Revision Information and Key Dates**

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SPC-2 Specification revision number V1.2.1				
SPC-2 Workload Generator revision number	V1.0			
Date Results were first used publicly	September 8, 2008			
Date FDR was submitted to the SPC	September 8, 2008			
Date the TSC will be available for shipment to customers	May 14, 2007			
Date the TSC completed audit certification	September 4, 2008			

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

The HP StorageWorks XP24000/XP20000 Disk Arrays are large enterprise-class storage systems designed for organizations that simply cannot afford any downtime or tolerate any data loss. The XP mitigates the risk of business downtime by providing a bulletproof platform with complete hardware redundancies, hot-swappable components, and nondisruptive online upgrades. Data replication and tightly integrated clustering solutions, along with disaster recovery support, enable a multi-site disaster tolerant design to achieve complete business continuity. And with enhanced data protection and security features, you can decrease exposure to data loss.

The XP24000 offers four gigabit per second connection to disk drives and hosts, and supports up to 1,152 disk drives and 1.15 petabytes of capacity. The new array features an unprecedented peak performance range of up to 3.5 million input output operations from cache. It comes with newly enhanced and cost-reduced HP StorageWorks XP Array Manager software, which allows customers to easily configure, manage, partition and secure their data using a web-based interface. In addition, HP Services professionals worldwide can help with site preparation to ensure a smooth installation and start-up of the system.

The XP24000 is the latest enterprise disk array product to come from HP's long-term, joint engineering and original equipment manufacturer relationship with Hitachi Limited of Japan.

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#### **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<sup>TM</sup>
  - > 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 Reported Data						
HP StorageWorks XP24000 Disk Array							
	SPC-2	ASU Capacity		Data			
SPC-2 MBPS™	Price-Performance	(GB)	Total Price	Protection Level			
8,724.67	\$187.45	18,401.385	\$1,635,434	Mirroring			
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)							
	SPC-2 Large File Pro	cessing (LFP) Re	eported Data				
	Data Rate Number of Data Rate						
	(MB/second)	Streams	per Stream	Price-Performance			
LFP Composite	7,656.90			\$213.59			
Write Only:							
1024 KiB Transfer	5,267.71	200	26.34				
256 KiB Transfer	5,277.99	200	26.39				
Read-Write:							
1024 KiB Transfer	7,361.95	200	36.81				
256 KiB Transfer	7,318.51	200	36.59				
Read Only:							
1024 KiB Transfer	11,555.87	200	57.78				
256 KiB Transfer	9,159.40	200	45.80				
The above SPC-2 Data Ra	ite value for LFP Composit	e represents the ag	gregate performan	ce of all three LFP Test			
Phases: (Write Only, Read							
	SPC-2 Large Database	e Query (LDQ) R	eported Data				
	Data Rate Number of Data Rate						
	(MB/second)	Streams	per Stream	Price-Performance			
LDQ Composite	10,652.81			\$153.52			
1024 KiB Transfer Size							
4 I/Os Outstanding	10,506.49	200	52.53				
1 I/O Outstanding	11,372.42	200	56.86				
64 KiB Transfer Size							
4 I/Os Outstanding	9,553.10	200	47.77				
1 I/O Outstanding	11,179.22	200					
The above SPC-2 Data Ra		te represents the ag	ggregate performar	nce of the two LDQ			
Test Phases: (1024 KiB and 64 KiB Transfer Sizes).							
SPC-2 Video On Demand (VOD) Reported Data							
	Data Rate Number of		Data Rate				
	(MB/second)	Streams	per Stream	Price-Performance			
	7,864.31	10,000	0.79	\$207.96			

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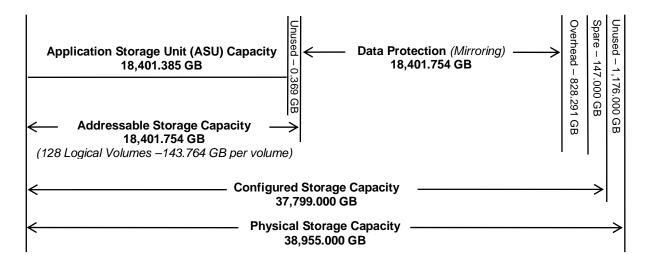
**SPC-2 MBPS™** represents the aggregate data rate, in megabytes per second, of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand (VOD).

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

A **Data Protection Level** of "Mirroring" configures two or more identical copies of user data.

#### **Storage Capacities and Relationships**

The following diagram *(not to scale)* documents the various storage capacities, used in this benchmark, and their relationships.



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## **Tested Storage Configuration Pricing (Priced Storage Configuration)**

Qty.	<u>Description</u>	Product #			st price	_	<u>Total</u>	Discount		ustomer Price
1	HP StorageWorks XP24000 Disk Array	AE130A		\$	-	\$		35%	\$	-
1	HP XP24000 DKC Disk Control Frame	AE131A		\$	95,622	\$	95,622	35%	\$	62,154
1	3P/30A/60Hz 3760PDG/115J-AP8508 2 Cords	AE131A	001	\$	1,850	\$	1,850	35%	\$	1,203
8	HP XP24000/20000 16 Port 4 Gb FC CHA	AE136A		\$	46,137	\$	369,096	35%	\$	239,912
2	HP XP24000 12V DKC Power Supply	AE150A		\$	2,450	\$	4,900	35%	\$	3,185
4	HP XP24000/20000 Cache Memory Adapter	AE151A		\$	1,660	\$	6,640	35%	\$	4,316
16	HP XP24000/20000 8 GB Cache Memory	AE152A		\$	36,918	\$	590,688	35%	\$	383,947
2	HP XP24000 Shared Memory Adapter	AE155A		\$	3,330	\$	6,660	35%	\$	4,329
4	HP XP24000/20000 2 GB Shared Memory	AE156A		\$	6,109	\$	24,436	35%	\$	15,883
2	HP XP24000 DKC 12V Battery	AE160A		\$	2,750	\$	5,500	35%	\$	3,575
3	HP XP24000 Cache Switch	AE162A		\$	22,500	\$	67,500	35%	\$	43,875
4	HP XP24000 DKA Disk Adapter Set	AE164A		\$	60,183	\$	240,732	35%	\$	156,476
1	HP XP24000 DKU R1 Base Cable Set	AE168A		\$	615	\$	615	35%	\$	400
1	HP XP24000 DKU R1 Expansion Cable Set	AE169A		\$	615	\$	615	35%	\$	400
1	HP XP24000 DKU L1 Base Cable Set	AE170A		\$	615	\$	615	35%	\$	400
1	HP XP24000 DKU L1 Expansion Cable Set	AE171A		\$	615	\$	615	35%	\$	400
2	HP XP24000 DKU Disk Unit Frame	AE173A		\$	55,249	\$	110,498	35%	\$	71,824
2	3P/30A/60Hz 3760PDG/115J-AP8508 2 Cords	AE173A	001	\$	1,850	\$	3,700	35%	\$	2,405
2	HP XP24000 DKU Disk Expansion Kit	AE174A		\$	7,650	\$	15,300	35%	\$	9,945
66	HP XP24000 146GB 15k rpm Array Group	AE177A		\$	8,531	\$	563,046	35%	\$	365,980
1	HP XP24000 146GB 15k rpm Spare Disk	AE177AS		\$	2,100	\$	2,100	35%	\$	1,365
1	HP XP Array Manager Base License	T5214AA		\$	16,150	\$	16,150	35%	\$	10,498
38	HP XP Array Manager 1TB 32-63TB LTU	T5214AE		\$	1,750	\$	66,500	35%	\$	43,225
1	HP 3y Support Plus 24 SVC	HA110A3		\$		\$	-	35%	\$	,
1	XP24K DKC Disk Control Frame Supp	HA110A3	7H8	\$	4,264	\$	4,264	35%	\$	2,772
8	XP24K 16 Port 4 Gb FC CHA Supp	HA110A3	7HR	\$	3,179	\$	25,432	35%	\$	16,531
2	XP24K 12V DKC Power Supply Supp	HA110A3	7HX	\$	180	\$	360	35%	\$	234
4	XP24K Cache Memory Adapter Supp	HA110A3	7HZ	\$	120	\$	480	35%	\$	312
16	XP24K 8 GB Cache Memory Supp	HA110A3	711 <u>2</u> 7J1	\$	2,700	\$	43,200	35%	\$	28,080
2	XP24/20K Shared Memory Adapter Supp	HA110A3	7J5	\$	2,700	\$	43,200	35%	\$	312
4				э \$		\$		35%	Ф \$	
2	XP24K 2 GB Shared Memory Supp	HA110A3	7J7	э \$	450	\$	1,800	35%	э \$	1,170
3	XP24/20K DKC 12V Battery Supp	HA110A3	7JB		210	•	420			273
	XP24K Cache Switch Supp	HA110A3	7JF	\$	1,650	\$	4,950	35%	\$	3,218
4	XP24K DKA Disk Adapter Set Supp	HA110A3	7JH	\$	4,139	\$	16,556	35%	\$	10,761
2	XP24K DKU Disk Unit Frame Supp	HA110A3	7JK	\$	4,049	\$	8,098	35%	\$	5,264
2	XP24K DKU Disk Expansion Kit Supp	HA110A3	7JM	\$	670	\$	1,340	35%	\$	871
66	XP 146/300/750GB Array Grp Sup	HA110A3	7JR	\$	960	\$	63,360	35%	\$	41,184
1	XP 146/300/750GB SpDsk Sup	HA110A3	7JW	\$	240	\$	240	35%	\$	156
1	XP Array Manager Base License Supp	HA110A3	88N	\$	4,282	\$	4,282	35%	\$	2,783
38	XP Array Manager 1TB 32-63TB LTU Supp	HA110A3	88S	\$	686	\$	26,068	35%	\$	16,944
									\$	-
	Addition								\$	-
64	Storage Works LC/LC 15m Cable	221692-B2		\$	135		8,640	35%	\$	5,616
32	HP BLc QLogic QMH2462 FC HBA Opt Kit	403619-B2	1	\$	749	\$	23,968	35%	\$	15,579
8	Cisco MDS 9124e 24 port Fabric Switch	AG642A		\$	9,500	\$	76,000	35%	\$	49,400
64	HP 4GB SW Single Pack SFP Transceiver	A7446B		\$	199	\$	12,736	35%	\$	8,278
					Total:	\$	2,516,052		\$	1,635,434

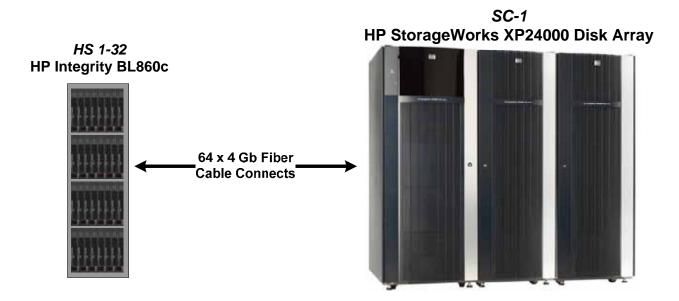
# Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

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

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# **Benchmark Configuration/Tested Storage Configuration Diagram**



#### **Host System(s) and Tested Storage Configuration Components**

Host Systems:	Tested Storage Configuration (TSC):				
UID=HS 1-32	32 – Qlogic QMH2462 4Gb FC HBAs				
32 – HP Integrity BL860c Blade Servers Per server: 2 – Dual-Core Intel Itanium 2 Processors 1600 MHz, 12 MB cache per processor 8192 MiB main memor	UID=SC 1:  HP StorageWorks XP24000  8 – 16 Port 4Gb FC CHAs  8 GB shared memory  128 GB cache  64 – 4Gb FC front-end physical connections				
Microsoft Windows Server 2003 Enterprise Edition, Service Pack 2	(64 used) 64 – 4Gb FC-over-Copper connections (64 used)				
PCle	8 – Cisco MDS 9124e 24-Port Fabric Switches				
WG	265 – 146 GB, 15K RPM disk drives				

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