



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**DATA CORE SOFTWARE CORPORATION
DATA CORE PARALLEL SERVER**

SPC-1 V1.14

Submitted for Review: February 26, 2016

Submission Identifier: A00167

Revised: March 3, 2016

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	DataCore Software Corporation – http://www.datacore.com Ben Treiber – ben.treiber@datacore.com Worldwide Headquarters Corporate Park 6300 NW 5 th Way Ft. Lauderdale, FL 33309 Phone: (954) 377-6000 FAX: (954) 938-7953
Test Sponsor Alternate Contact	DataCore Software Corporation – http://www.datacore.com Roni Putra – roni.putra@datacore.com Worldwide Headquarters Corporate Park 6300 NW 5 th Way Ft. Lauderdale, FL 33309 Phone: (954) 377-6000 FAX: (954) 938-7953
Auditor	Storage Performance Council – http://www.storageperformance.org Walter E. Baker – AuditService@StoragePerformance.org 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	February 26, 2016
Date the FDR was submitted to the SPC	February 26, 2016
Date the revised FDR was submitted to the SPC Revised pricing spreadsheet (page 9) server line item description (IBM->Lenovo) Added reference pricing notes (page 10) Corrected part number (page 14) Samsung 120 GB SSD Revised third-party quotation (page 101 in FDR) server line item description (IBM->Lenovo)	March 3, 2016
Date the Priced Storage Configuration is available for shipment to customers	May 16, 2016
Date the TSC completed audit certification	February 25, 2016

Tested Storage Product (TSP) Description

DataCore Parallel Server is a software product targeted for use when high IOPS and low latency are the primary requirements. This software is focused on improving I/O performance of hyper-converged and storage server systems with multi-processor, multi-core architectures. As this benchmark result on the Lenovo x3650-M5 demonstrates, by employing parallel processing, the software balances load and better utilizes memory, compute and storage resources to accelerate the I/O between the application and the storage subsystem. This parallel I/O architecture further enhances the system's ability to host many virtual machines or process intensive and mixed workloads typical of database and other transaction oriented applications.

DataCore Parallel Server is available to its Server OEM partners today and will be made available to all customers in Q2, 2016.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: DataCore Parallel Server	
Metric	Reported Result
SPC-1 IOPS™	1,510,090.52
SPC-1 Price-Performance™	\$0.09/SPC-1 IOPS™
Total ASU Capacity	2,920,000 GB
Data Protection Level	Protected 1 (<i>Mirroring</i>)
Total Price	\$136,758.88
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 1** using *Mirroring* configures two or more identical copies of user data.

***Protected 1:** The single point of failure of any **storage device** in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.*

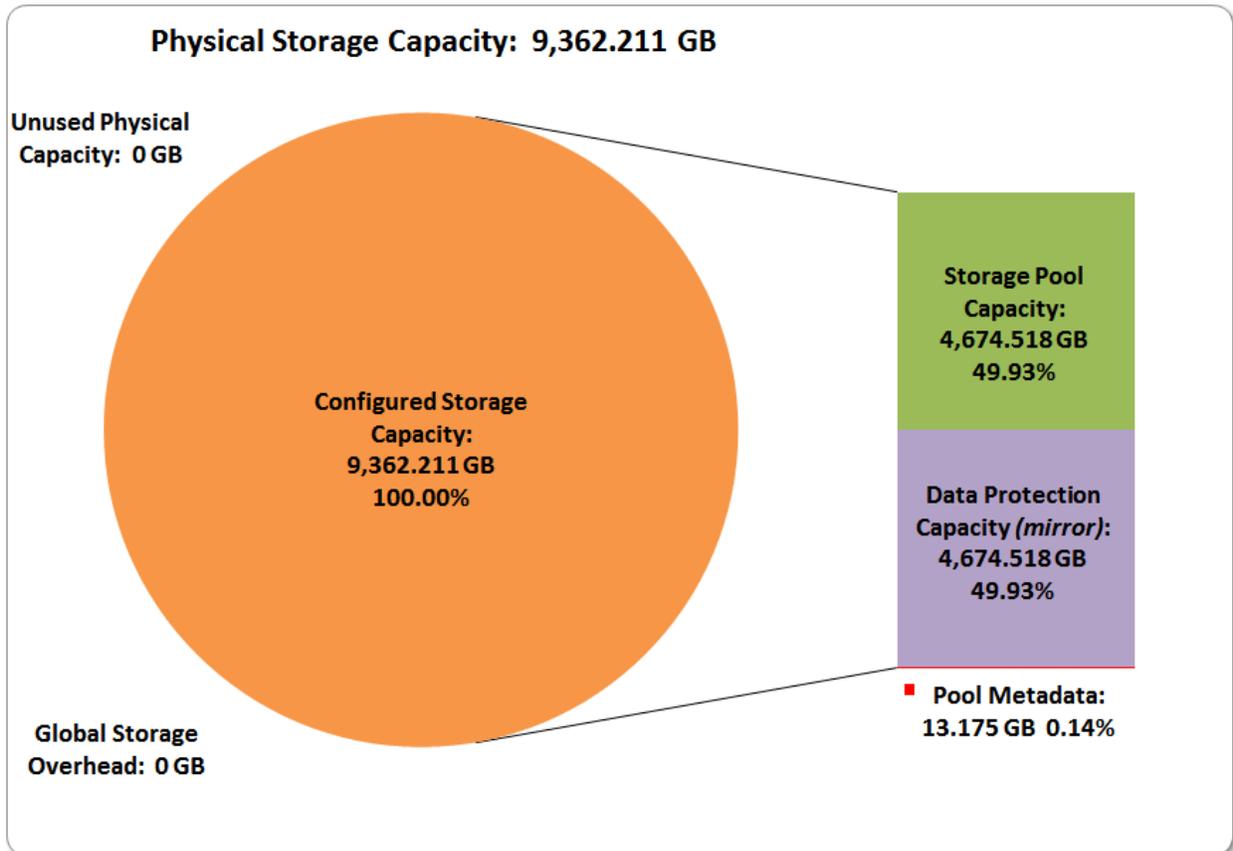
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page [9](#).

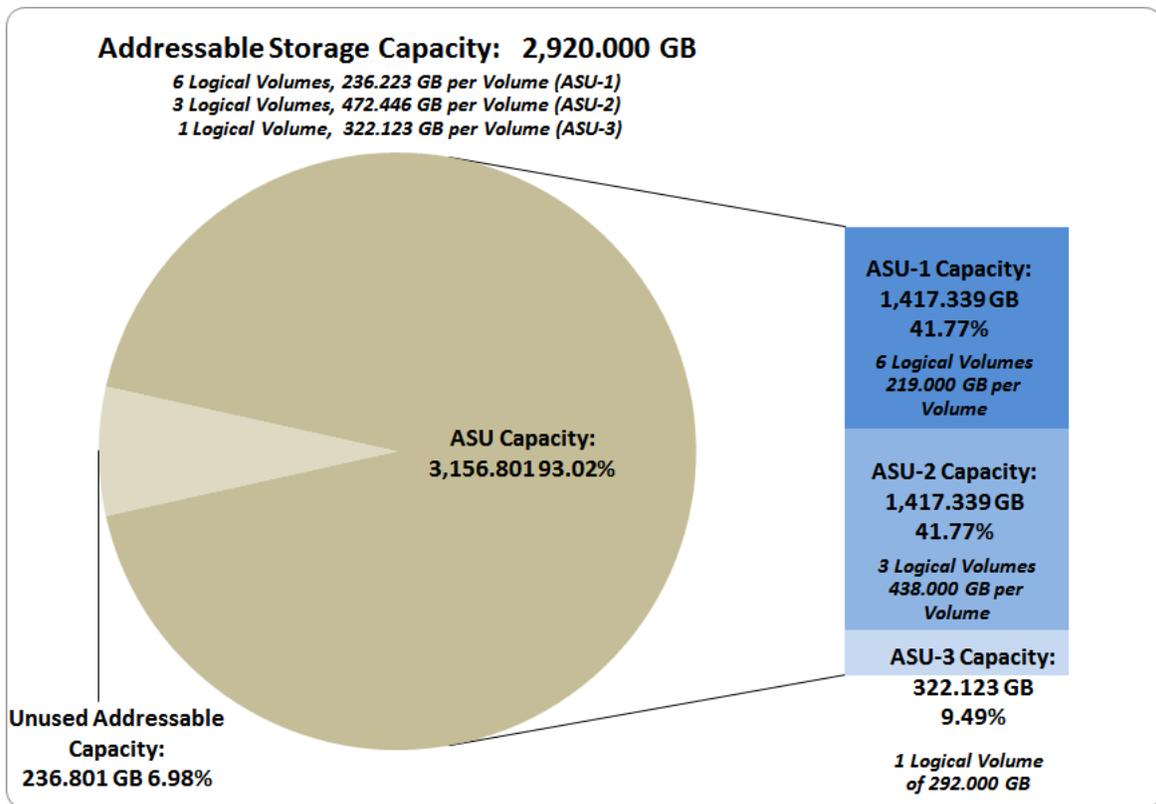
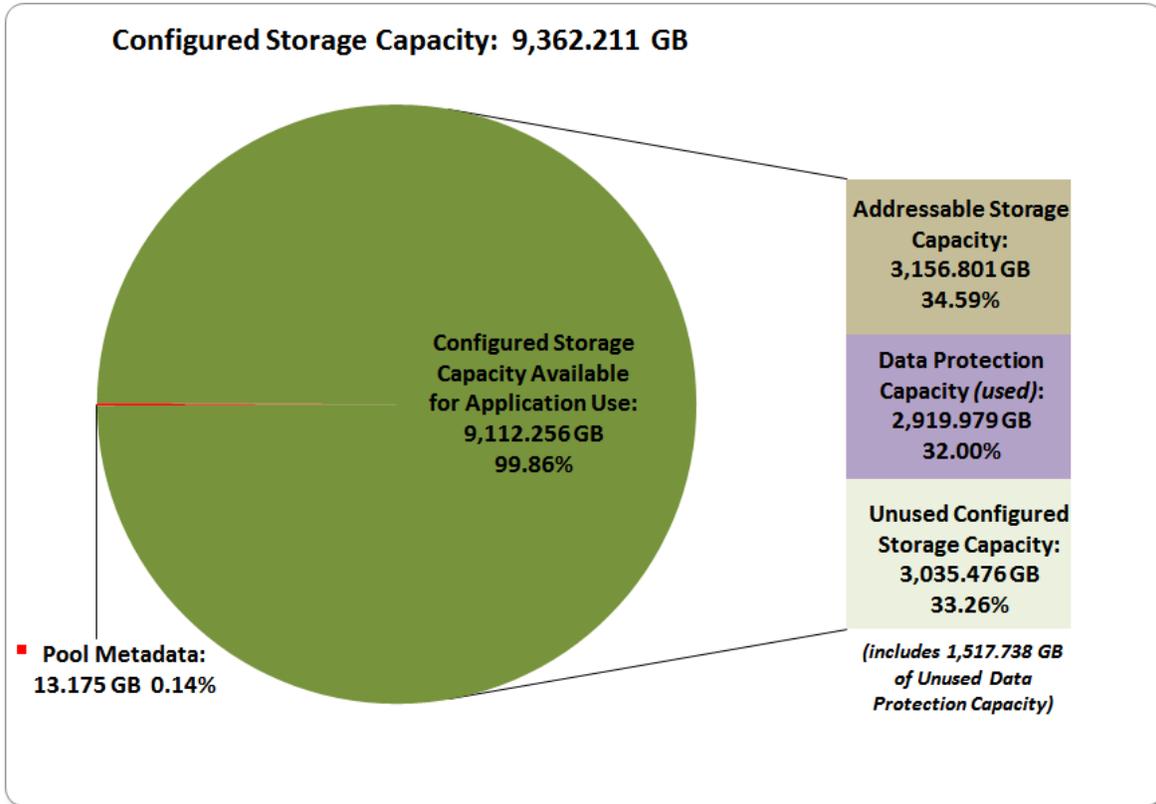
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

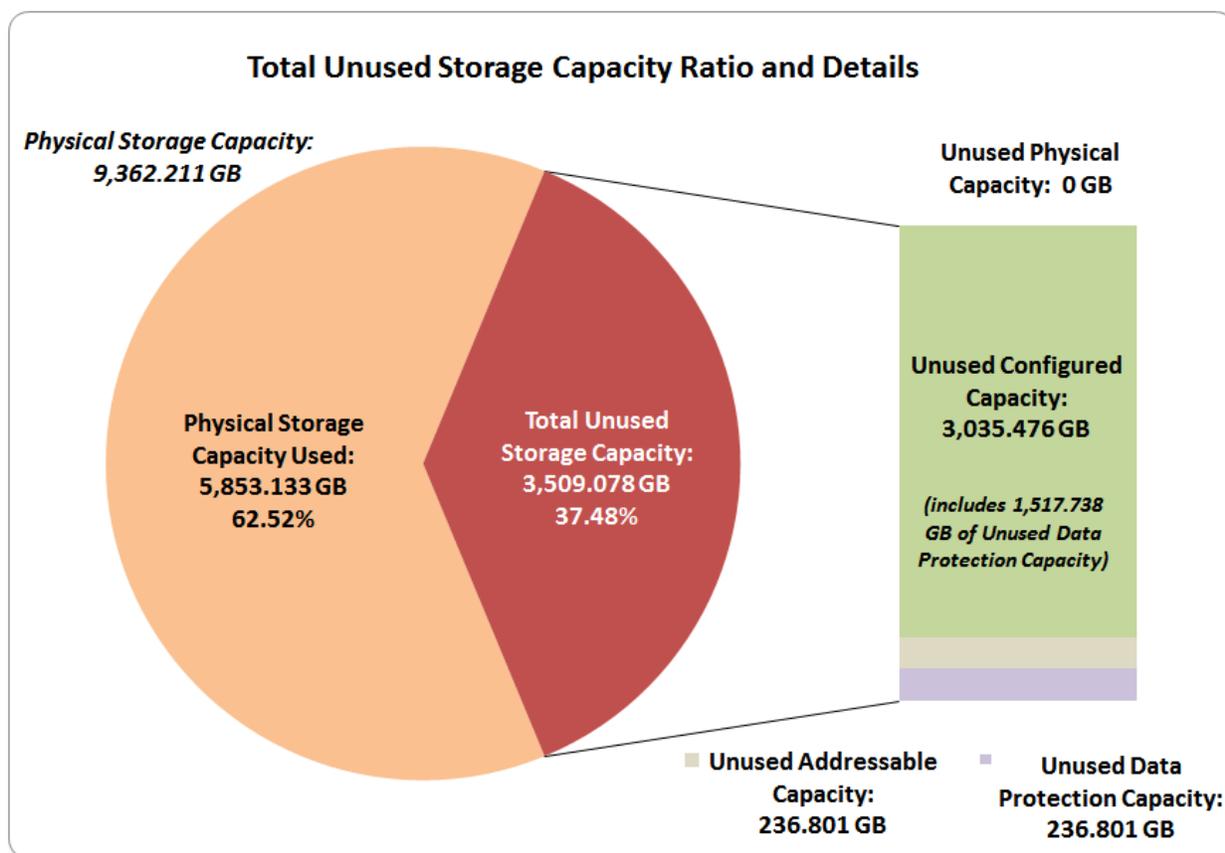
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

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.







SPC-1 Storage Capacity Utilization	
Application Utilization	31.19%
Protected Application Utilization	62.38%
Unused Storage Ratio	37.48%

Application Utilization: Total ASU Capacity (2,920.000 GB) divided by Physical Storage Capacity (9,362.211 GB).

Protected Application Utilization: (Total ASU Capacity (2,920.000 GB) plus total Data Protection Capacity (4,674.518 GB) minus unused Data Protection Capacity (1,754.539 GB)) divided by Physical Storage Capacity (9,362.211 GB).

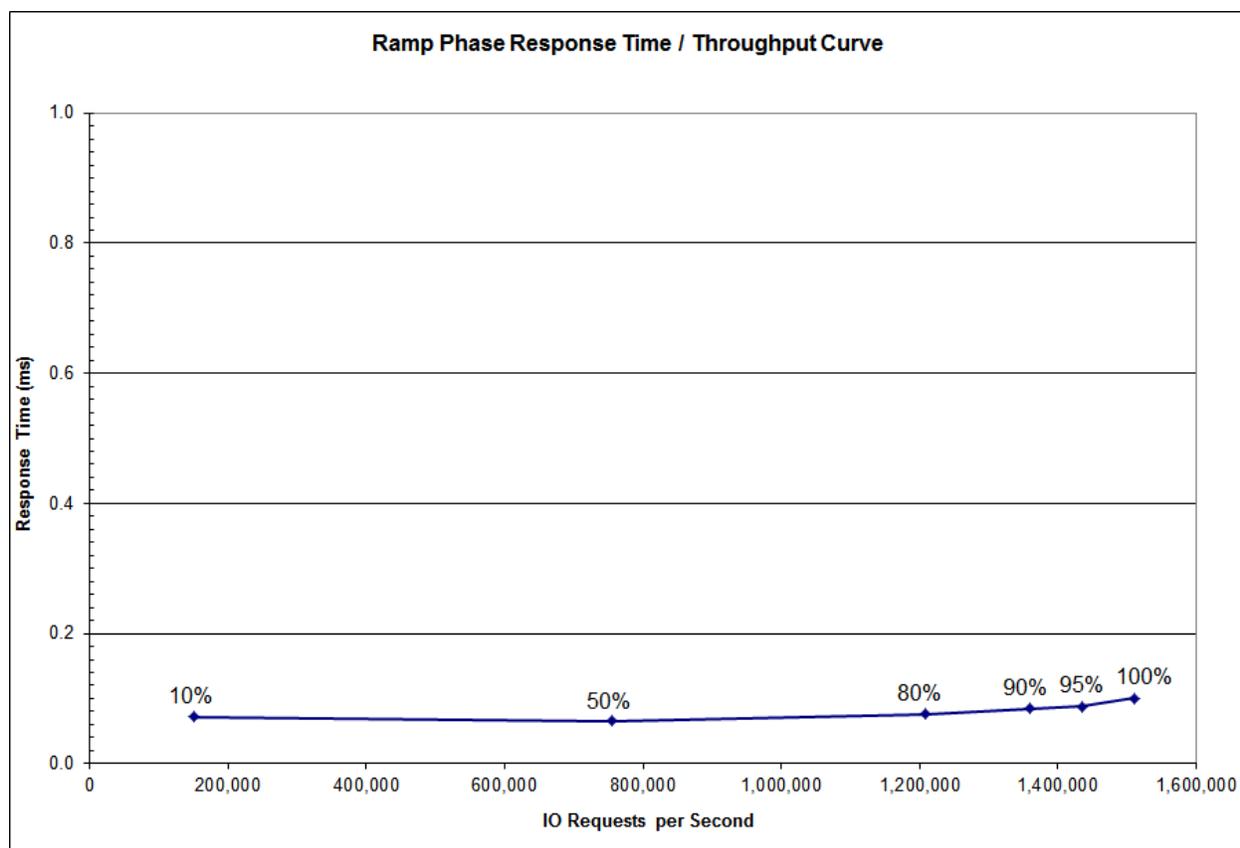
Unused Storage Ratio: Total Unused Capacity (3,509.078 GB) divided by Physical Storage Capacity (9,362.211 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 28-29 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
I/O Request Throughput	151,015.28	755,021.11	1,208,010.08	1,358,971.78	1,434,547.41	1,510,090.52
Average Response Time (ms):						
All ASUs	0.07	0.07	0.08	0.08	0.09	0.10
ASU-1	0.08	0.06	0.08	0.09	0.09	0.11
ASU-2	0.16	0.18	0.19	0.22	0.23	0.24
ASU-3	0.02	0.02	0.02	0.02	0.02	0.02
Reads	0.15	0.15	0.17	0.19	0.20	0.23
Writes	0.02	0.01	0.01	0.01	0.01	0.01

Priced Storage Configuration Pricing

Part ID	Description	Qty	List Price	Total List Price	Curvature Price	Total Price
5462AC1	LENOVO SYSTEM X3650 M5 2.5 SFF 8 BAY HOT SWAP	1	\$ 3,150.00	\$ 3,150.00	\$ 2,205.00	\$ 2,205.00
E5-2699V3	INTEL XEON E5-2699V3 CPU, 2.3GHZ, 18-CORE, 45MB, 2133MHZ, 145W	2	\$ 5,799.00	\$ 11,598.00	\$ 4,059.30	\$ 8,118.60
HEATSINK	LENOVO HEATSINK	2	\$ 150.00	\$ 300.00	\$ 105.00	\$ 210.00
SYSTEM FAN	LENOVO SYSTEM FAN	6	\$ 95.00	\$ 570.00	\$ 66.50	\$ 399.00
46W0800	32GB (1X32GB), PC4-17000, DDR4, 1.2V, LRDIMM	24	\$ 999.00	\$ 23,976.00	\$ 699.30	\$ 16,783.20
ST300MM0006	300GB 10K.6 SAS 2.5" 6G HDD	1	\$ 250.00	\$ 250.00	\$ 175.00	\$ 175.00
MZ-75E250B/AM	SAMSUNG 850 EVO 250 GB 2.5" INTERNAL SOLID STATE DRIVE - SATA	1	\$ 149.99	\$ 149.99	\$ 104.99	\$ 104.99
HUC156030CSS200	HDD, 300GB, 12G, SAS, 15K, SFF, WESTERN DIGITAL	8	\$ 289.75	\$ 2,318.00	\$ 202.83	\$ 1,622.64
46C9114	SERVER RAID M1215 SAS/SATA CONTROLLER	2	\$ 225.00	\$ 450.00	\$ 157.50	\$ 315.00
R18-04281	WINSVRCAL 2012 SNGL OLP NL USRCAL	1	\$ 883.00	\$ 883.00	\$ 794.70	\$ 794.70
P73-06285	OLP SNGL LANG WIN SVR STD 2012R2 NL 2PROC	1	\$ 38.00	\$ 38.00	\$ 34.20	\$ 34.20
DELL-PV-MD1220	DELL POWERSHIELD MD1220 SAS STORAGE ARRAY - (24) 2.5" DRIVE BAYS, INCLUDES (2) 6GB SAS EMM CONTROLLERS (3DJRJ), BEZEL, AND (2) 600W POWER SUPPLIES (T307M). INCL DELL PROSUPPORT 3YR 24X7 4HR WARRANTY	1	\$ 8,711.00	\$ 8,711.00	\$ 6,097.70	\$ 6,097.70
LSI00343	AVAGO SAS 9300-8E HOST BUS ADAPTER	1	\$ 675.00	\$ 675.00	\$ 472.50	\$ 472.50
LSI00407	AVAGO MEGARAID SAS 9341-8I	1	\$ 335.00	\$ 335.00	\$ 234.50	\$ 234.50
2282600-R	ADAPTEC SAS EXTERNAL CABLE 6FT	1	\$ 69.00	\$ 69.00	\$ 48.30	\$ 48.30
00FK936	LENOVO SYSTEM X 900W HIGH EFFICIENCY PLATINUM AC POWER SUPPLY - 900 W - 120 V AC, 230 V AC	2	\$ 399.00	\$ 798.00	\$ 279.30	\$ 558.60
G176J	ASSEMBLY,CARRIER,HARD DRIVE SAS-SATAU,2.5,V2	24	\$ 45.00	\$ 1,080.00	\$ 31.50	\$ 756.00
00NR851	- LENOVO SERVICE/SUPPORT - 3 YEAR EXTENDED SERVICE - SERVICE - 24 X 7 X 4 HOUR - ON-SITE - MAINTENANCE - PARTS & LABOR - PHYSICAL SERVICE (SEE NOTE 3)	1	\$ 810.00	\$ 810.00	\$ 688.50	\$ 688.50
00LW731	LENOVO REMOTE TECHNICAL SUPPORT - 3 YEAR - 24 X 7 X 2 HOUR - TECHNICAL - ELECTRONIC SERVICE (SEE NOTE 3)	1	\$ 1,375.00	\$ 1,375.00	\$ 1,168.75	\$ 1,168.75
MZ-7KM120E	SSD, 120GB, 6Gb/s, SATA, 2.5"/SFF, SAMSUNG	22	\$ 189.99	\$ 4,179.78	\$ 132.99	\$ 2,925.78
00FK676	LENOVO SYSTEM X3650 M5 PLUS 8X2.5' HDD ASSEMBLY KIT	3	\$ 249.00	\$ 747.00	\$ 174.30	\$ 522.90
00FK658	LENOVO SYSTEM X3650 M5 REAR 2X2.5' HDD KIT	1	\$ 379.00	\$ 379.00	\$ 265.30	\$ 265.30
MZ-7KM240E	SSD, 240GB, 6GB, SATA, SFF, SAMSUNG	18	\$ 239.99	\$ 4,319.82	\$ 167.99	\$ 3,023.82
00E7600 L38552	2.5-INCH SFF DRIVE TRAY CADDY FOR IBM/LENOVO X3650 M5 (SEE NOTE 4)	25	\$ 119.00	\$ 2,975.00	\$ 83.30	\$ 2,082.50
			Net List Price:	\$ 70,136.59	Net Cost:	\$ 49,607.48
					Tax:	\$ -
					Freight:	\$ -
					Grand Total 3rd Party:	\$ 49,607.48

Part ID	Description	Qty	List Price	Total List Price	Discounted Price	Total Price
PSS-EWR-100-BSV	DataCore Parallel Server Software	1	\$ 71,144.00	\$ 71,144.00	\$ 56,915.20	\$ 56,915.20
PSS-EWR-TGD-BSV	DataCore Parallel Server Software - 3 year Maintenance (SEE NOTE 6)	1	\$ 35,572.00	\$ 35,572.00	\$ 30,236.20	\$ 30,236.20
			Net List Price:	\$176,852.59	Net Cost:	\$ 87,151.40
					Tax:	\$ -
					Freight:	\$ -
					Grand Total DataCore:	\$ 87,151.40

Grand Total 3rd Party Hardware, Software and DataCore Software: \$ 136,758.88

Priced Storage Configuration Pricing (*continued*)

NOTES:

1. **DISCOUNT CLARIFICATION** - This quote reflects a 10% discount on software, a 30% discount on hardware, and a 15% discount on services and support. These discounts are unconditional.

2. **OPERATING SYSTEM DOWNGRADE** - With the purchase of an Open Business Windows 2012 license, you are eligible for downgrade rights. The Windows 2012 downgrade process is detailed through this link:
https://www.microsoft.com/OEM/en/licensing/sblicensing/Pages/downgrade_rights.aspx#fbid=De_8hM07v15

3. **LENOVO SUPPORT** - Lenovo support covers all hardware components, including hard drives or solid state drives, as long as a Service pack is attached. Service level is determined by selected Service pack. In this case, 4HR on-site repair. The technical warranty refers to the service level of remote technical support. This service is over the phone/internet as it is remote. In this case, the service level is 2HR response. All service is provided directly from Lenovo.

4. **LENOVO DRIVE TRAY** - Lenovo drive trays are typically bundled with hard drives and don't have an individual part number. These are Lenovo OEM trays and will come installed on all hard drives.

5. **DELL WARRANTY** - Dell ProSupport is wholly provided by Dell directly. ProSupport is 4HR response after initial problem diagnosis after basic troubleshooting steps. After diagnosis, a Dell

6. **PARALLEL SERVER SOFTWARE MAINTENANCE** - Maintenance purchase (SKU # PSS-EWR-TGD-BSV) includes the following for 3 years:

- Three years, Web, email, chat and phone access to support.
- Coverage hours are 24 hours a day, 7 days a week, 365 days per year.
- Response goals based on customer indicated severity levels.
 - Critical Severity 1 1 Hour response
 - Medium Severity 2 4 Hour response
 - Low Severity 3 Next business day response
- Product updates and upgrades.

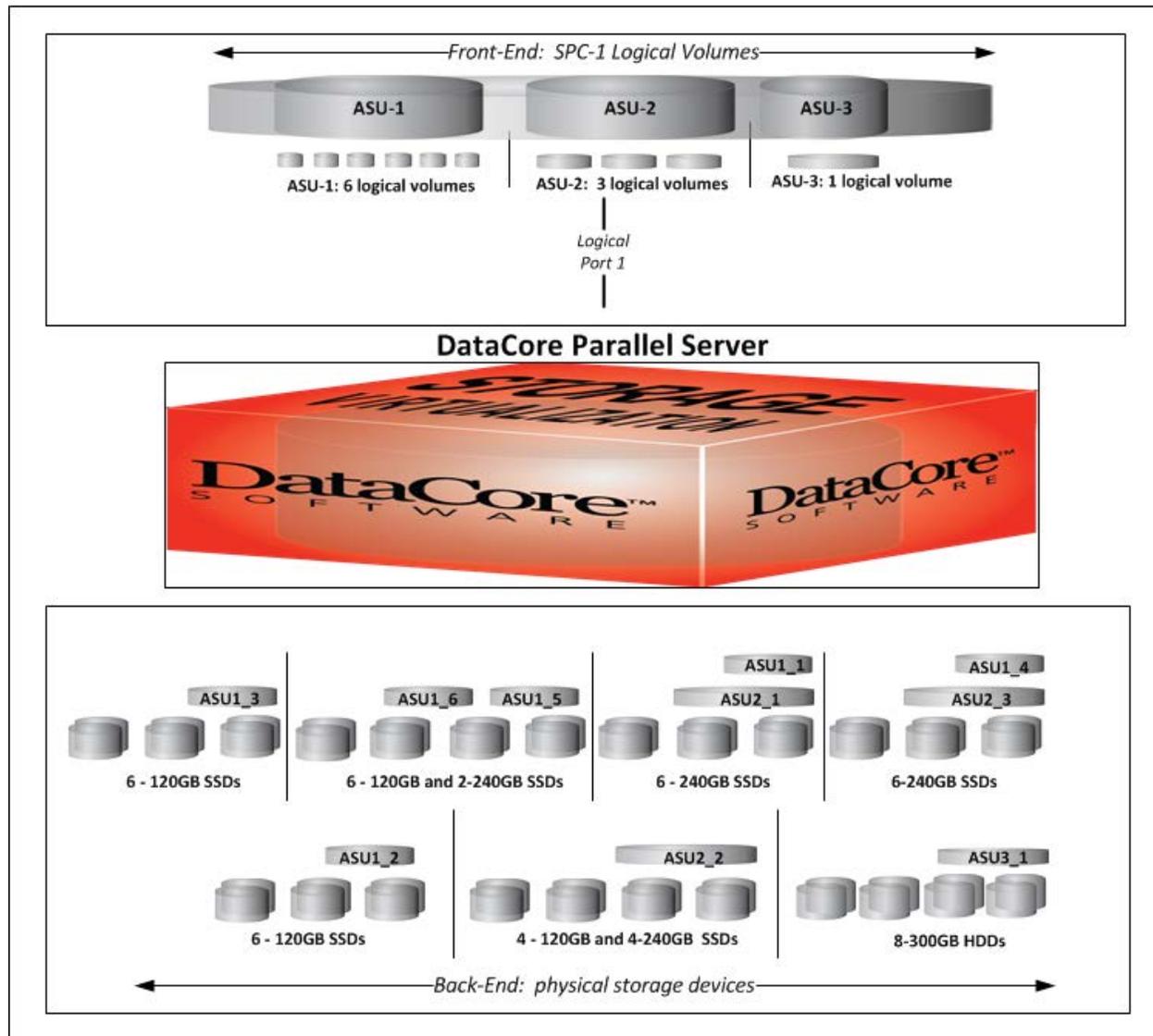
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems within 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 Tested Storage Configuration and the Priced Storage Configuration.

Priced Storage Configuration Diagram (logical)



Key	
Front-End:	ASU-1: 6 logical volumes (ASU1_1-ASU1_6) 236.223 GB per logical volume
SPC-1 Logical Volumes	ASU-2: 3 logical volumes (ASU2_1-ASU2_3) 472.446 GB per logical volume
	ASU-3: 1 logical volume (ASU3_1) 322.123 GB per logical volume
Back-End physical storage devices	SSD Pool 1: 6 SSDs (3 mirrored 120GB SSDs)
	SSD Pool 2: 6 SSDs (3 mirrored 120GB SSDs)
	SSD Pool 3: 8 SSDs (3 mirrored 120GB SSDs and 1 mirrored 240GB SSD)
	SSD Pool 4: 6 SSDs (3 mirrored 240GB SSDs)
	SSD Pool 5: 8 SSDs (2 mirrored 120GB SSDs and 2 mirrored 240GB SSDs)
	SSD Pool 6: 6 SSDs (3 mirrored 240GB SSDs)
	HDD Pool 1: 8 HDDs (4 mirrored 300 GB HDDs)

Priced Storage Configuration Diagram (*physical*)

Server RAID M1215 Controller (*Internal*)
1 – 300 GB 10K SAS HDD (*system HDD*)
1 – 250 GB SSD (*page/swap*)

Server RAID M1215 Controller (*external*)
5 – 240 GB 6 Gb SATA SFF SSDs
3 – 120 GB 6 Gb SATA SFF SSDs

Server RAID M1215 Controller (*external*)
8 – 120 GB 6 Gb SATA SFF SSDs

Avago MegaRAID 9341-91 Controller (*external*)
8 – 300 GB 12Gb 15K SAS SFF HDDs



Avago 9300-BE HBA

6Gb SAS connection



Dell PowerVault MD1220

13 – 240 GB 6 Gb SATA SFF SSDs

11 – 120 GB 6 Gb SATA SFF SSDs

Priced Storage Configuration Components

Priced Storage Configuration
DataCore Parallel Server
1 – Lenovo X3650 M5 Server, with: 2 – Intel® Xeon® 2.30 GHz E5-2699 V3 processors each with 18 cores, 45 MB Intel Smart Cache 768 GB main memory (566,231 MB configured for DataCore Parallel Server) Windows 2008 R2 Enterprise Server w/SP1 PCIe
1 – Server RAID M1215 SAS/SATA Controller (<i>internal</i>)
2 – Server RAID M1215 SAS/SATA Controllers (<i>external</i>)
1 – Avago MegaRAID SAS 9341-8i Controller (<i>external</i>)
1 – Avago 9300-8E HBA
1 – 300 GB 10K SAS 2.5" 6G HDD (<i>system HDD</i>) (<i>connected to the internal M1215 Controller</i>)
1 – 250 GB 2.5" SSD (<i>page/swap</i>) (Samsung 850 EVO MZ-75E250B/AM), (<i>connected to the internal M1215 Controller</i>)
5 – 240 GB, 6 Gb SATA SFF SSDs (SAMSUNG MZ7KM240HAGR-0E005) (<i>connected to external M1215 Controller 1</i>)
3 – 120 GB, 6 Gb SATA SFF SSDs (SAMSUNG MZ7KM120HAFD-0E005) (<i>connected to external M1215 Controller 1</i>)
8 – 120 GB, 6 Gb SATA SFF SSDs (SAMSUNG MZ7KM120HAFD-0E005) (<i>connected to external M1215 Controller 2</i>)
8 – 300 GB 12Gb 15K SAS SFF HDDs (<i>Ultrastar C15K600</i>) (<i>connected to external MegaRAID 9341-8i Controller</i>)
1 – Dell PowerVault MD1220 Storage Array 13 - 240 GB, 6 Gb SATA SFF SSDs (SAMSUNG MZ7KM240HAGR-0E005) 11 - 120 GB, 6 Gb SATA SFF SSDs (SAMSUNG MZ7KM120HAFD-0E005)