SPC BENCHMARK 1™
EXECUTIVE SUMMARY

NEC CORPORATION
NEC STORAGE M500

SPC-1 V1.13

Submitted for Review: February 20, 2013
Submission Identifier: A00126

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-1 Specification revision number	V1.13
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	February 20, 2013
Date the FDR was submitted to the SPC	February 20, 2013
Date the Priced Storage Configuration is available for shipment to customers	March 1, 2013
Date the TSC completed audit certification	February 19, 2013

Tested Storage Product (TSP) Description

NEC's M500 SAN storage arrays are a great choice for very scalable, mission-critical, high performance, primary or tiered storage. These SAN storage arrays are easy to operate, dependable and efficient. They are also well-suited for use in virtualized environments by virtue of their great scalability, LUN lock stability, support for VMware APIs and flexibility.

NEC M500 SAN arrays feature host interfaces: 8 Gbps Fibre Channel, 10Gbps/1Gbps iSCSI. Both interfaces can be deployed concurrently. M500 offers 3.5" and 2.5" drives. 2.5" drives are attractive due to their lower power and space consumption. 3.5" drives by contract offer the best storage density per spindle. M500 simultaneous supports SAS HDD, NearLine SAS HDD, and SSD in the same enclosures, enabling flexible tiered storage architecture.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: NEC Storage M500	
Metric	**Reported Result**
SPC-1 IOPS™	63,051.60
SPC-1 Price-Performance™	$3.98/SPC-1 IOPS™
Total ASU Capacity	34,923.295 GB
Data Protection Level	Protected 1 *(Mirroring)*
Total Price	$251,075.64
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.*

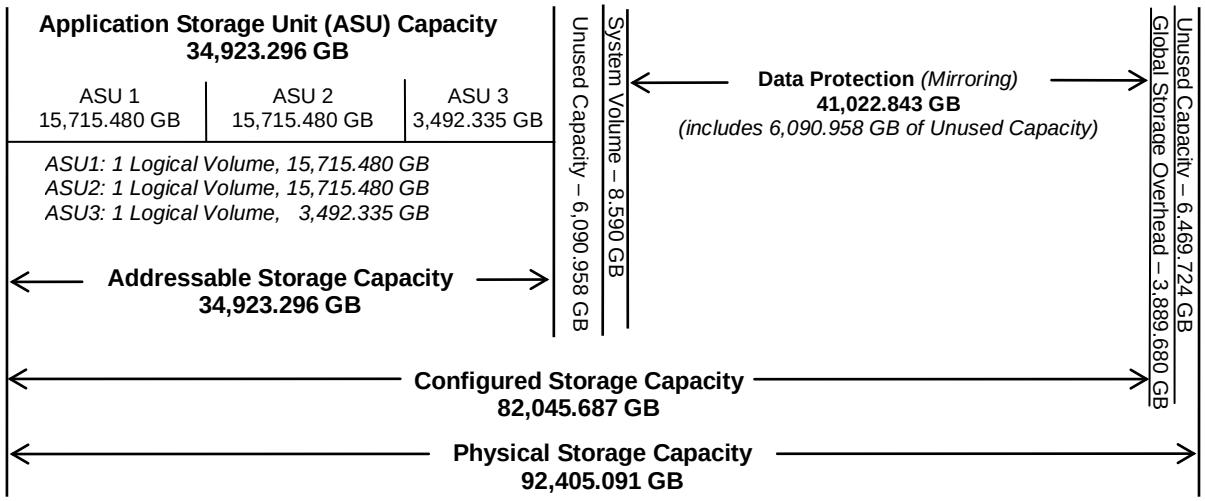
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 7.

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 diagram 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	37.79%
Protected Application Utilization	75.60%
Unused Storage Ratio	20.18%

Application Utilization: Total ASU Capacity *(34,923.296 GB)* divided by Physical Storage Capacity *(92,405.091 GB)*

Protected Application Utilization: Total ASU Capacity *(34,923.296 GB)* plus total Data Protection Capacity *(41,022.843 GB)* minus unused Data Protection Capacity *(6,090.958GB)* divided by Physical Storage Capacity *(92,405.091 GB)*

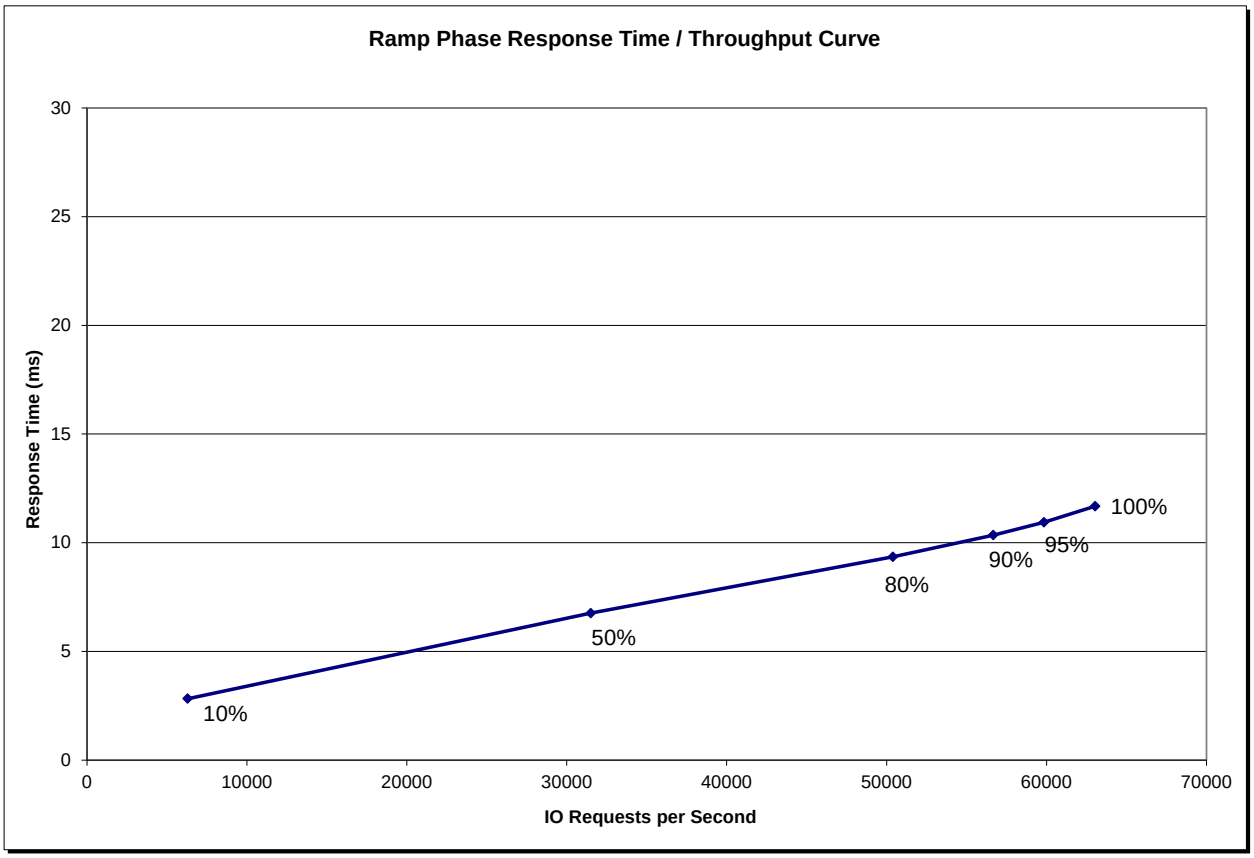
Unused Storage Ratio: Total Unused Capacity *(18,651.640 GB)* divided by Physical Storage Capacity *(92,405.091 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 23-24 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	6,299.46	31,501.83	50,404.57	56,674.18	59,848.47	63,051.60
Average Response Time (ms):						
All ASUs	2.82	6.76	9.35	10.35	10.94	11.68
ASU-1	3.88	9.26	12.73	14.01	14.77	15.64
ASU-2	3.32	8.71	12.33	13.68	14.48	15.40
ASU-3	0.37	0.60	0.89	1.12	1.26	1.66
Reads	6.00	15.25	21.04	23.14	24.34	25.59
Writes	0.75	1.23	1.74	2.02	2.21	2.62

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

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

Priced Storage Configuration Pricing

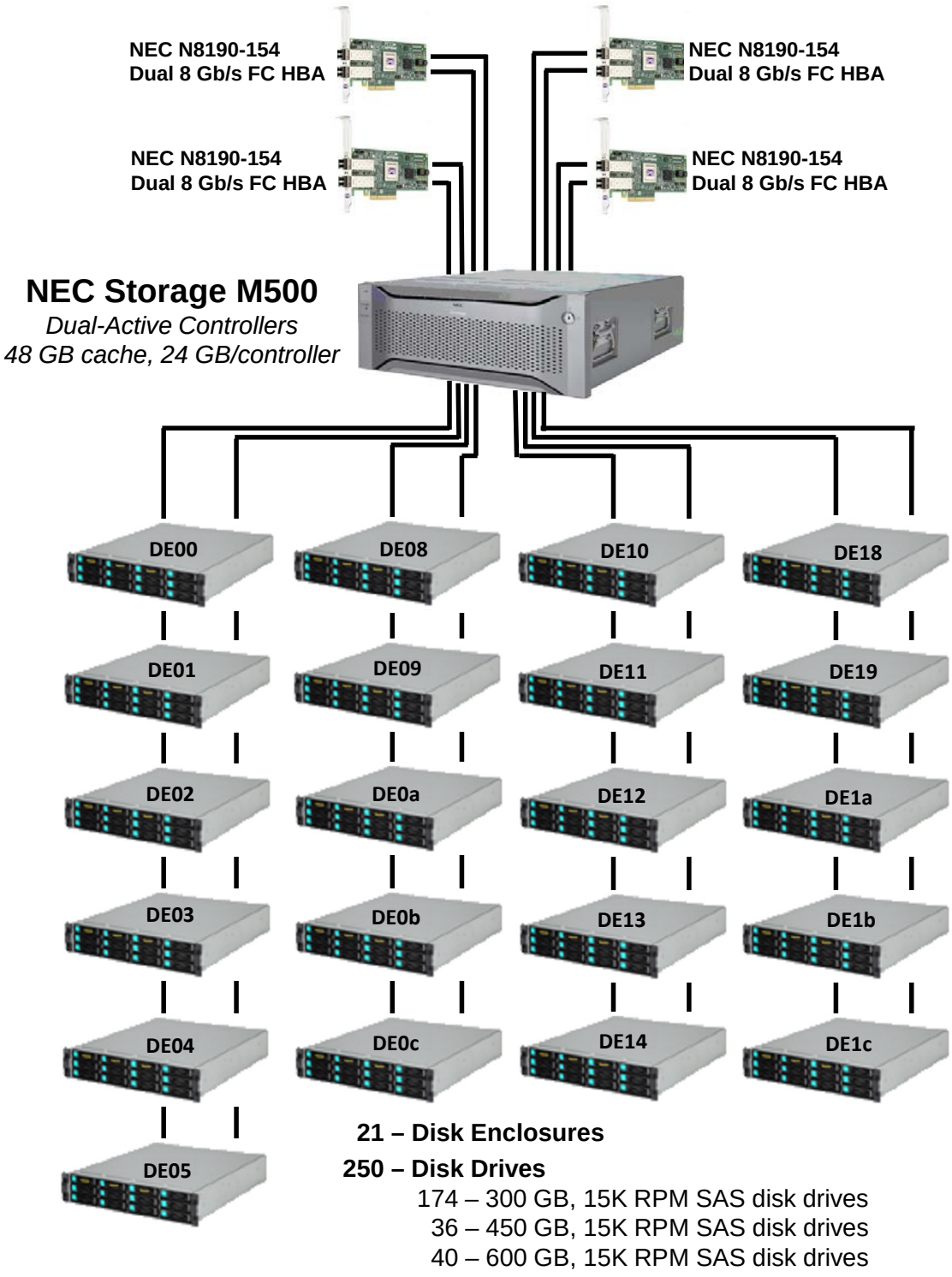
PART#	Product Name	Qty	Unit List Price	Extended LP	Discount	Discounted Price
NF5341-SB00E	M500 Disk Array Unit	1	$53,500.00	$53,500.00	20.0%	$42,800.00
NF5341-SF02WE	Controller Card(8Gb FC 8Port)	2	$4,995.00	$9,990.00	20.0%	$7,992.00
NF5341-SC03E	Standard Cache Memory(48GB)	1	$3,695.00	$3,695.00	20.0%	$2,956.00
NF5321-SE70E	Disk Enclosure(3.5", 6Gbps)	21	$3,288.00	$69,048.00	20.0%	$55,238.40
NF5321-SM725E	SAS Disk Drive(3.5", 15krpm/300GB, 6Gbps)	174	$395.00	$68,730.00	20.0%	$54,984.00
NF5321-SM727E	SAS Disk Drive(3.5", 15krpm/450GB, 6Gbps)	36	$440.00	$15,840.00	20.0%	$12,672.00
NF5321-SM728E	SAS Disk Drive(3.5", 15krpm/600GB, 6Gbps)	40	$540.00	$21,600.00	20.0%	$17,280.00
N8190-154	8Gbps Dual Port Fibre Channel HBA	4	$1,355.00	$5,420.00	10.0%	$4,878.00
FC cable	FC cable	16	$100.00	$1,600.00	10.0%	$1,440.00
Power Cord	Power Cord (10 ft.)	44	$18.20	$800.80	10.0%	$720.72
Power Strips	Power Strips (8 outlets)	6	$78.00	$468.00	10.0%	$421.20
RACK	Rack 42U	4	$1,799.00	$7,196.00	10.0%	$6,476.40
UFSM01-500300AM	M500 Base Product Storage Manager Software including Storage Manager Express, Access Control, Storage Power Conserver and Thin Provisioning.	1	$0.00	$0.00	20.0%	$0.00
UFS206-0050W0AM	Path Manager for Windows	1	$0.00	$0.00	20.0%	$0.00
Q24-DN000000011294	3 Years Upgraded Platinum Warranty M500 M500 Disk Array Unit	1	$14,745.00	$14,745.00	15.0%	$12,533.25
Q24-DN000000011295	3 Years Upgraded Platinum Warranty for Host Port Kit(2x 8Gb FC 4Port)	2	$896.00	$1,792.00	15.0%	$1,523.20
Q24-DN000000011300	3 Years Upgraded Platinum Warranty for Standard Cache Memory(48GB[6x8GB])	1	$800.15	$800.15	15.0%	$680.13
Q24-DN000000006694	3YR Upgraded to Platinum Warranty M100 DiskExp3.5"6Gbps	21	$822.00	$17,262.00	15.0%	$14,672.70
Q24-DN000000006752	3YR Upgraded to Platinum Warranty M100 HDD 3.5" 15K 300GB 6Gbps(per 12Disks)	15	$300.00	$4,500.00	15.0%	$3,825.00
Q24-DN000000006753	3YR Upgraded to Platinum Warranty M100 HDD 3.5" 15K 450GB 6Gbps(per 12Disks)	3	$300.00	$900.00	15.0%	$765.00
Q24-DN000000006754	3YR Upgraded to Platinum Warranty M100 HDD 3.5" 15K 600GB 6Gbps(per 12Disks)	4	$300.00	$1,200.00	15.0%	$1,020.00
Q24-DN000000011346	3 Years Upgraded Platinum SW Maintenance for M500 Base Product	1	$9,293.28	$9,293.28	15.0%	$7,899.29
Q24-DN000000010953	3 Year Platinum PathMgr5.0Win Software Maintenance	1	$351.00	$351.00	15.0%	$298.35
Totals				*$308,731.23*		**$251,075.64**

* M500 Disk Array Unit includes SAS ports for disk enclosure.
* SFP is included in each component.
* Price of M500 Disk Array Unit includes price of Software products (UFSM01-500300AM and UFS206-0050W0AM).

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.

Priced Storage Configuration Diagram



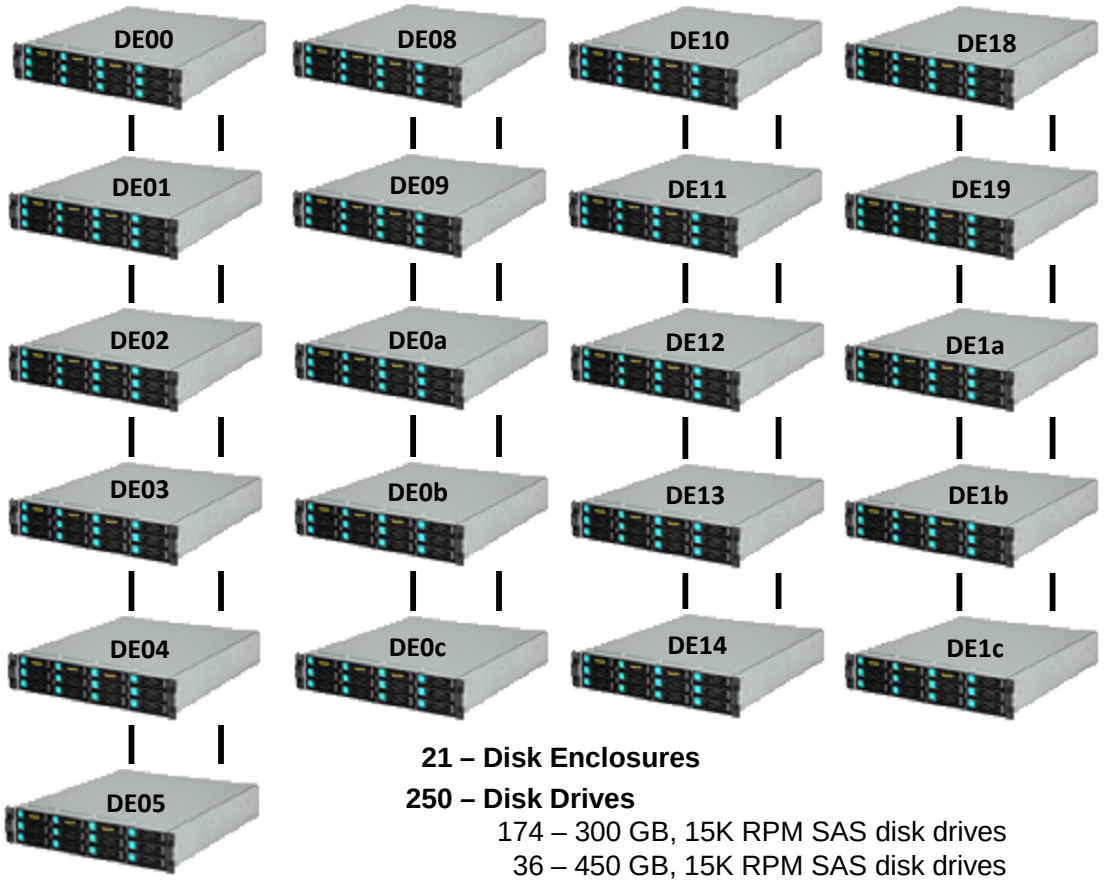
The distribution of disk drives to disk enclosures is documented on page 10.

Priced Storage Configuration Components

Priced Storage Configuration:
4 – N8190-154 dual 8 Gb/s FC HBAs
NEC Storage M500 **dual controllers – Active-Active** 24 GB cache per controller *(48 GB total)* 1 – FC 8-port Controller Card per controller *(8 Gbps, 2 Controller Cards total)* 8 – 8 Gbps front-end connections per controller *(16 total, 8 used)* 4 –6 Gbps SAS backend connections per controller *(8 total, 8 used)*
21 – Disk Enclosures (3.5”, 6 Gbps)
250 – 15K RPM SAS disk drives 164 – 300 GB disk drives 36 – 450 GB disk drives 40 – 600 GB disk drives

Distribution of Disk Drives to Disk Enclosures

DE00: *12 – 300 GB disk drives*	**DE08:** *12 – 300 GB disk drives*	**DE10:** *12 – 600 GB disk drives*	**DE18:** *12 – 300 GB disk drives*
DE01: *12 – 300 GB disk drives*	**DE09:** *12 – 300 GB disk drives*	**DE11:** *12 – 300 GB disk drives*	**DE19:** *8 – 300 GB disk drives* *4 – 450 GB disk drives*
DE02: *12 – 300 GB disk drives*	**DE0a:** *12 – 450 GB disk drives*	**DE12:** *12 – 300 GB disk drives*	**DE1a:** *8 – 450 GB disk drives* *4 – 300 GB disk drives*
DE03: *12 – 300 GB disk drives*	**DE0b**: *12 – 450 GB disk drives*	**DE13:** *12 – 600 GB disk drives*	**DE1b:** *6 – 300 GB disk drives* *4 – 600 GB disk drives* *2 – 300 GB disk drives*
DE04: *12 – 300 GB disk drives*	**DE0c:** *12 – 300 GB disk drives*	**DE14:** *12 – 600 GB disk drives*	**DE1c:**: *12 – 300 GB disk drives*
DE05: *10 – 300 GB disk drives*			



21 – Disk Enclosures

250 – Disk Drives

174 – 300 GB, 15K RPM SAS disk drives
36 – 450 GB, 15K RPM SAS disk drives
40 – 600 GB, 15K RPM SAS disk drives