SPC Benchmark 1™
Executive Summary

NEC Corporation
NEC Storage M310F

SPC-1 V1.14

Submitted for Review: April 12, 2016
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Revised: April 13, 2016

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	April 12, 2016
Date the FDR was submitted to the SPC	April 12, 2016

Date the revised FDR was submitted to the SPC
  Revised Audit Certification letter *(page vii)*
    with the correct SPC-1 Reported Data
	April 13, 2016

Date the Priced Storage Configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	April 12, 2016

Tested Storage Product (TSP) Description

The NEC M310F SAN disk array has the high performance, capacity and availability demanded by data-intensive, mission critical environments.

Best tuning to maximize the performance of SSD realizes fast and stable response. And large amount of cache memory assures high I/O performance to access the data frequently used.

With a straightforward navigational GUI, systems administrators can easily modify settings and capacity, and monitor disk performance.

Ideal for use in any virtualized datacenter with its flexibility for scaling and support with VMware APIs.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: NEC Storage M310F	
Metric	**Reported Result**
SPC-1 IOPS™	300,040.48
SPC-1 Price-Performance™	$0.58/SPC-1 IOPS™
Total ASU Capacity	6,867.552 GB
Data Protection Level	Protected 2 *(Mirroring)*
Total Price	$174,608.20
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 *Mirroring* configures two or more identical copies of user data..

> **Protected 2:** *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.*
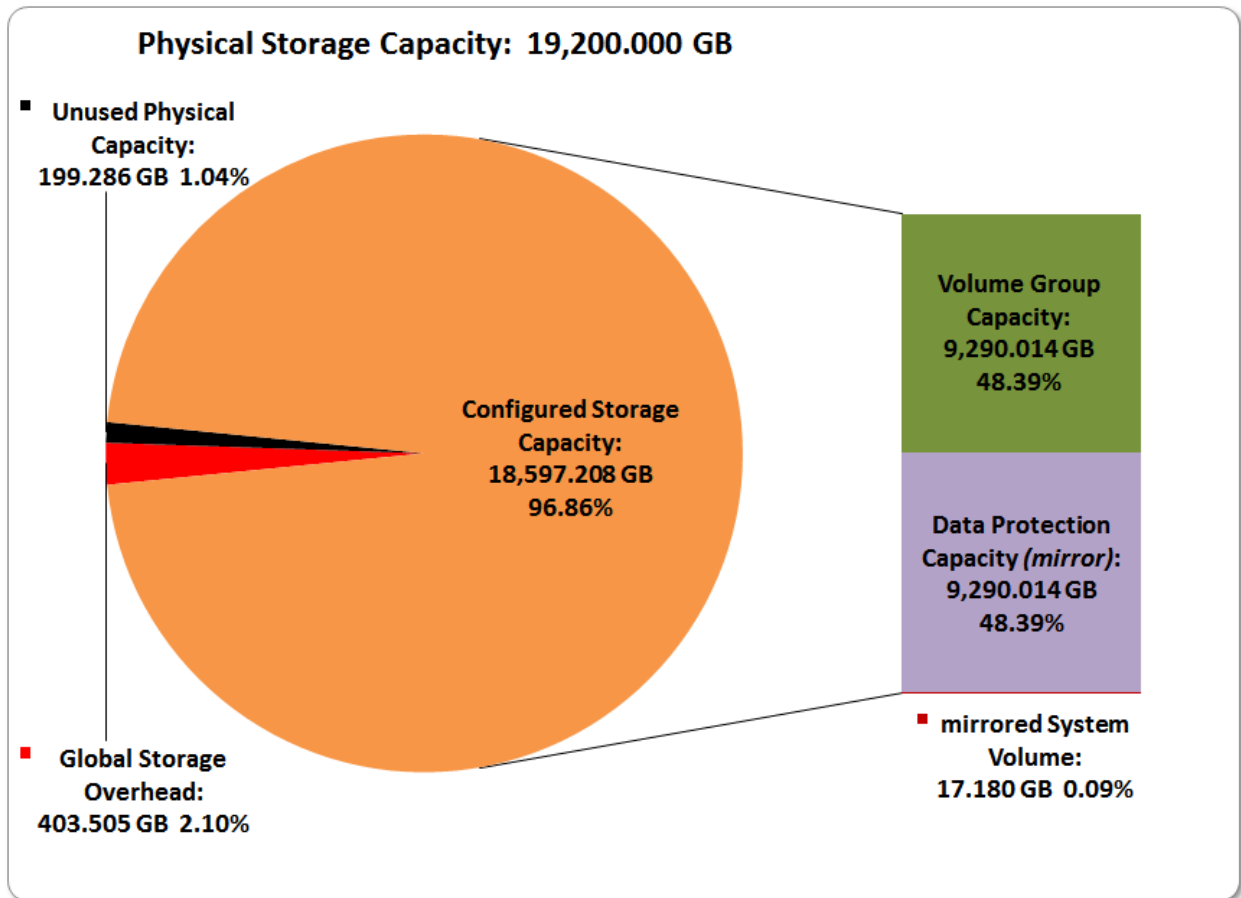
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page .
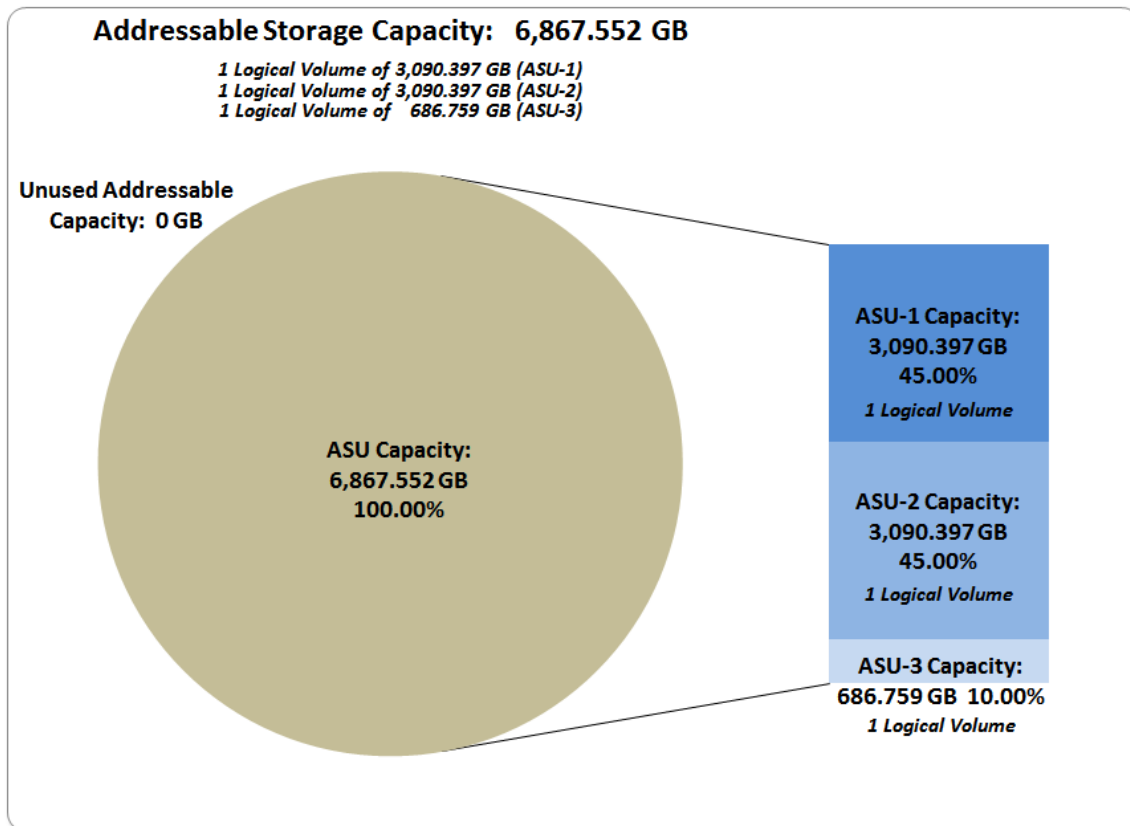
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency)*.

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
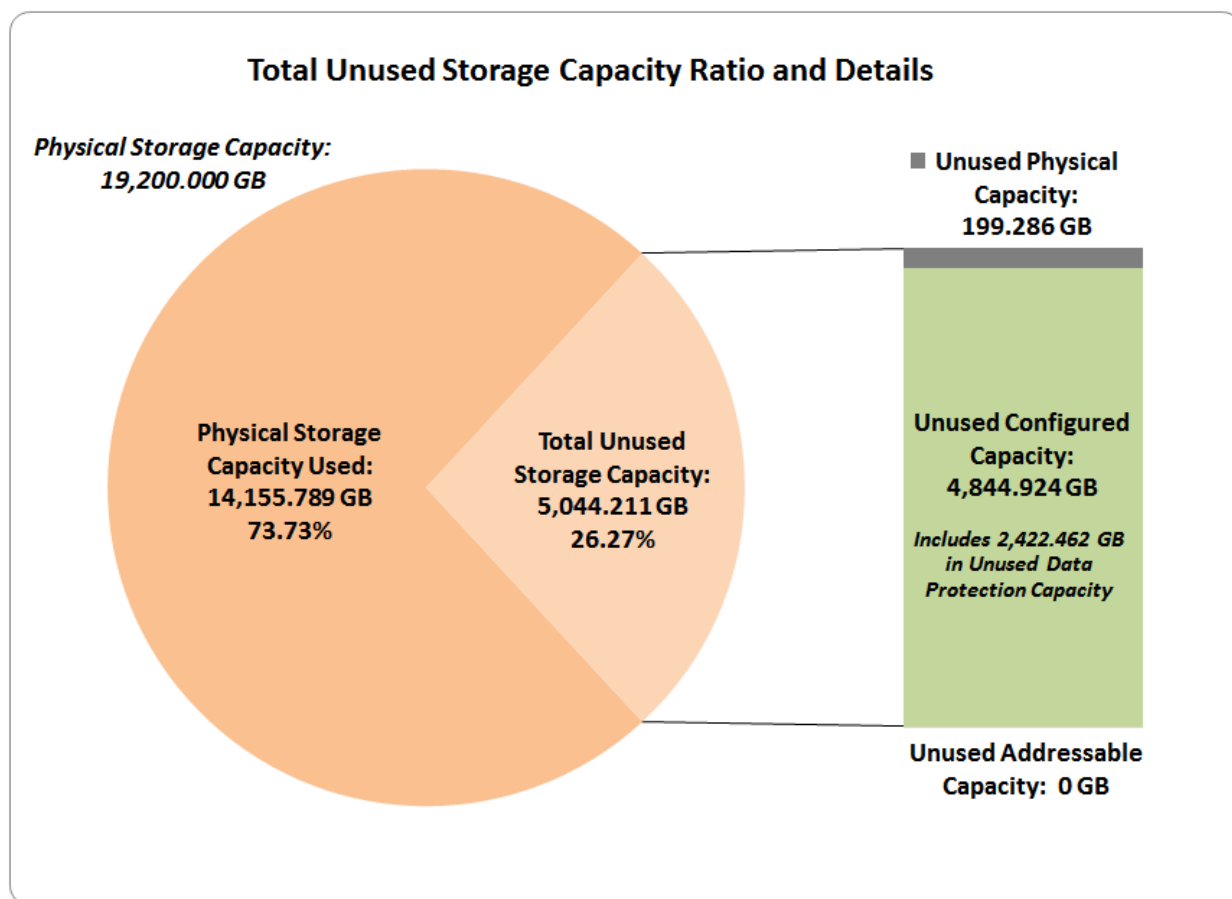
The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.

Physical Storage Capacity: 19,200.000 GB

- **Unused Physical Capacity:** 199.286 GB 1.04%

Configured Storage Capacity: 18,597.208 GB 96.86%

Volume Group Capacity: 9,290.014 GB 48.39%

Data Protection Capacity *(mirror)*: 9,290.014 GB 48.39%

- **mirrored System Volume:** 17.180 GB 0.09%

- **Global Storage Overhead:** 403.505 GB 2.10%

Configured Storage Capacity: 18,597.208 GB

Storage Capacity Available for Application Use: 18,580.029 GB 99.91%

Addressable Storage Capacity: 6,867.552 GB 36.93%

Data Protection Capacity *(used):* 6,867.552 GB 36.93%

Unused Configured Capacity: 4,844.924 GB 26.05%

includes 2,422.462 GB in Unused Data Protection Capacity

■ **mirrored System Volume:** 17.180 GB 0.09%

Addressable Storage Capacity: 6,867.552 GB

1 Logical Volume of 3,090.397 GB (ASU-1)
1 Logical Volume of 3,090.397 GB (ASU-2)
1 Logical Volume of   686.759 GB (ASU-3)

Unused Addressable Capacity: 0 GB

ASU Capacity: 6,867.552 GB 100.00%

ASU-1 Capacity: 3,090.397 GB 45.00% *1 Logical Volume*

ASU-2 Capacity: 3,090.397 GB 45.00% *1 Logical Volume*

ASU-3 Capacity: 686.759 GB 10.00% *1 Logical Volume*

Total Unused Storage Capacity Ratio and Details

Physical Storage Capacity:
19,200.000 GB

■ **Unused Physical Capacity: 199.286 GB**

Physical Storage Capacity Used: 14,155.789 GB 73.73%

Total Unused Storage Capacity: 5,044.211 GB 26.27%

Unused Configured Capacity: 4,844.924 GB

Includes 2,422.462 GB in Unused Data Protection Capacity

Unused Addressable Capacity: 0 GB

SPC-1 Storage Capacity Utilization	
Application Utilization	35.77%
Protected Application Utilization	71.54%
Unused Storage Ratio	26.27%

Application Utilization: Total ASU Capacity *(6,867.552 GB)* divided by Physical Storage Capacity *(19,200.000 GB)*.

Protected Application Utilization: (Total ASU Capacity *(6,867.552 GB)* plus total Data Protection Capacity *(9,290.014 GB)* minus unused Data Protection Capacity *(2,422.462 GB)*) divided by Physical Storage Capacity *(19,200.000 GB)*.

Unused Storage Ratio: Total Unused Capacity *(5,044.211 GB)* divided by Physical Storage Capacity *(19,200.000 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 24-25 of the associated 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.
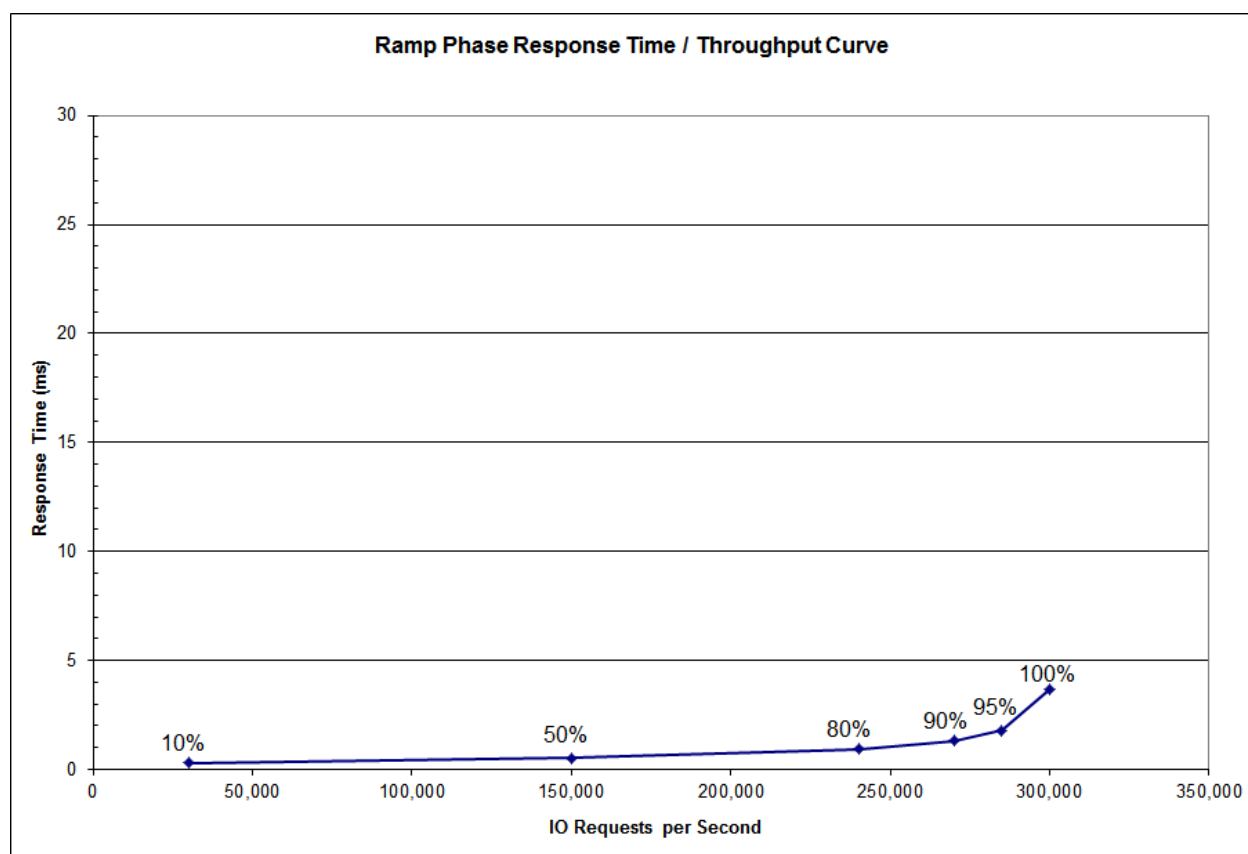
Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	29,996.55	149,959.10	240,010.71	270,008.53	285,014.90	300,040.48
Average Response Time (ms):						
All ASUs	0.28	0.51	0.94	1.31	1.80	3.70
ASU-1	0.28	0.50	0.91	1.25	1.71	3.50
ASU-2	0.30	0.53	0.95	1.30	1.78	3.62
ASU-3	0.29	0.53	1.02	1.44	2.00	4.16
Reads	0.31	0.54	0.90	1.20	1.62	3.23
Writes	0.26	0.50	0.97	1.38	1.92	4.01

Priced Storage Configuration Pricing

SKU	Description	Quantity	Unit List Price	Extended List	Discount	Extended Discount
	Hardware					
Q24-HL000000118979	M310F Dual Controller All Flash Array Unit w/ Base SW, 4 Port SAS Disk port, 48GB Cache Memory (w/o Host Port Card, SFP)	1	$10,842.00	$10,842.00	20%	$8,673.60
NF5322-SF06E	M110/M310 4 port FC Host Port Card w/o SFP	2	$1,665.00	$3,330.00	20%	$2,664.00
NF5322-SFP16E	2 - 16Gb FC SFPs	4	$367.00	$1,468.00	20%	$1,174.40
NF5322-SE81E	Disk Enclosure 2.5" for Mx10	1	$5,427.00	$5,427.00	20%	$4,341.60
NF5322-SSA96E	SAS SSD (2.5" 400GB)	48	$2,739.00	$131,472.00	20%	$105,177.60
Q24-HL000000072705	Localization Kit for M110/M310 Disk Array Unit	1	$0.00	$0.00	20%	$0.00
Q24-HL000000072706	Localization Kit for Mx10 Disk Enclosure	1	$0.00	$0.00	20%	$0.00
N8190-158A	NEC N8190-158A dual-port 16G FC HBAs (w/ SFP)	4	$1,570.00	$6,280.00	20%	$5,024.00
	Software					
Q24-HL000000074242	M310 60 Day Trial License Bundle	1	$0.00	$0.00	20%	$0.00
Q24-HL000000072865	M310 Base Software	1	$0.00	$0.00	20%	$0.00
	Maintenance					
Q24-DN000000119543	3 Years Upgrade to Platinum M310F 2.5" Dual Controller w/ Base SW	1	$3,795.00	$3,795.00	15%	$3,225.75
Q24-DN000000072623	3 Years Upgrade to Platinum M110/M310 4 port FC Host Port Card w/ SFP	2	$583.00	$1,166.00	15%	$991.10
Q24-DN000000072609	3 Years Upgrade to Platinum Disk Enclosure 2.5" for Mx10	1	$1,900.00	$1,900.00	15%	$1,615.00
Q24-DN000000072915	1 Year Upgrade to Platinum SW Maintenance M310 Base Software	3	$941.00	$2,823.00	15%	$2,399.55
Q24-DN000000073181	3 Years Upgrade to Platinum SAS SSD (2.5" 400GB)	48	$959.00	$46,032.00	15%	$39,127.20
	Cables					
FC CABLE	CRU FC CABLE 5M x2 (M#LCLC-5MQ) 5M	4	$54.00	$216.00	10%	$194.40
	Configuration Total			*$214,751.00*		**$174,608.20**

- *Power codes for M310F and Disk Enclosures are included in Localization Kits (Q24-HL000000072705 and Q24-HL000000072706).*

- *Price of M310F Disk Array Unit includes price of M310 Base Software (Q24-HL000000072865).*

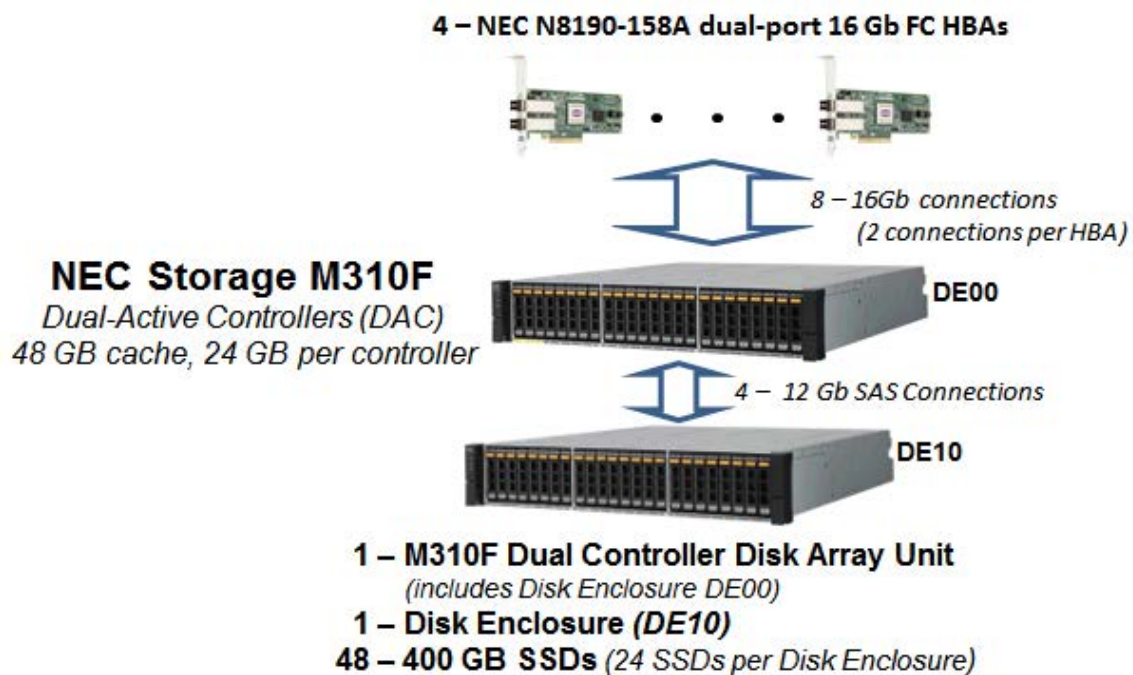- *PathManager for Windows/Linux/VMware is included in M310 Base Software (Q24-HL000000072865).*

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

4 – NEC N8190-158A dual-port 16 Gb FC HBAs

8 – 16Gb connections
(2 connections per HBA)

NEC Storage M310F
Dual-Active Controllers (DAC)
48 GB cache, 24 GB per controller

DE00

4 – 12 Gb SAS Connections

DE10

1 – M310F Dual Controller Disk Array Unit
(includes Disk Enclosure DE00)
1 – Disk Enclosure (DE10)
48 – 400 GB SSDs *(24 SSDs per Disk Enclosure)*

Priced Storage Configuration Components

Priced Storage Configuration
4 – NEC N8190-158A dual-port 16Gb FC HBAs

NEC Storage M310F
Dual-Active Controllers, each with
   24 GB memory *(48 GB total)*
     2 – 12 Gb SAS ports *(built-in)*
     (4 ports total and used)
1 – Disk Enclosure, 2.5" *(DE00)*

2 – 4-port FC Host Port Cards   *(1 card and 4 ports per controller, 8 ports total and used)*
1 – Disk Enclosure, 2.5" *(DE10)*
48 – 400 GB SAS SSDs *(24 SSDs per Disk Enclosure)*