



SPC BENCHMARK 2™

EXECUTIVE SUMMARY

VEXATA INC.

VX100-F SCALABLE NVME FLASH ARRAY

SPC-2™ V1.7.0

SUBMITTED FOR REVIEW: AUGUST 29, 2018

SUBMISSION IDENTIFIER: B12004

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Vexata Inc. – https://www.vexata.com Ganesh Balabharathi – Ganesh@Vexata.com
Auditor	InfoSizing – http://www.sizing.com/ Doug Johnson – doug@sizing.com

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-2 Specification revision number	V1.7.0
SPC-2 Workload Generator revision number	V1.3.4
Date Results were first used publicly	August 29, 2018
Date FDR was submitted to the SPC	August 29, 2018
Date the TSC will be available for shipment to customers	August 29, 2018
Date the TSC completed audit certification	August 22, 2018

Tested Storage Product Description

The VX-100 Scalable NVMe Arrays are a family of high performance, solid state storage arrays that provide in-box scaling, fully utilizing Flash and Memory Class NVMe media for unmatched economics and true business application scaling. See details [here](#).

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™
 - SPC-2 Price Performance™
 - Application Storage Unit (ASU) Capacity
- Supplemental data to the SPC-2 Primary Metrics.
 - Total Price
 - Data Protection Level
 - Currency Used
 - Target Country
- Reported Data for each SPC Test: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand Delivery (VOD) Test.

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).

SPC-2 Price-Performance™ is the ratio of **Total Price** to **SPC-2 MBPS™**.

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

Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support.

Data Protection Level of Protected 1 using RAID 5 (N+1).

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-2 Data Repository.*

Protected 2: *The single point of failure of any **component** in the configuration will not result in permanent loss of access to or integrity of the SPC-2 Data Repository.*

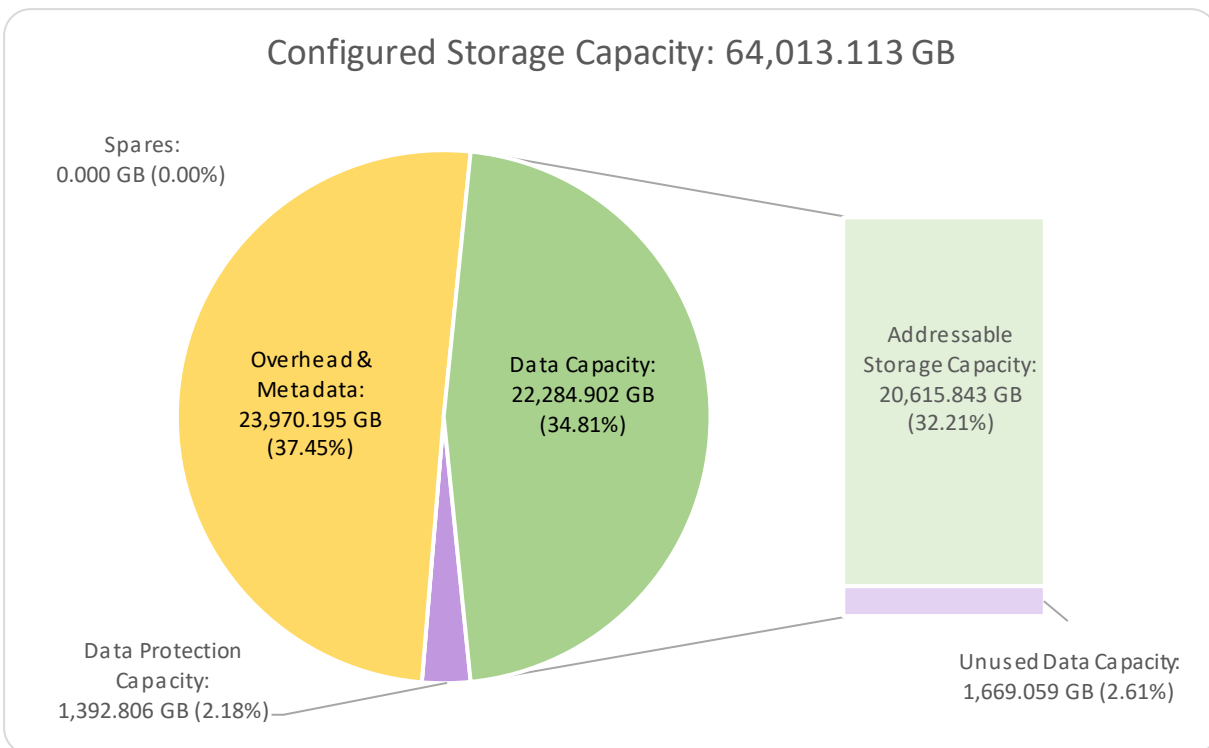
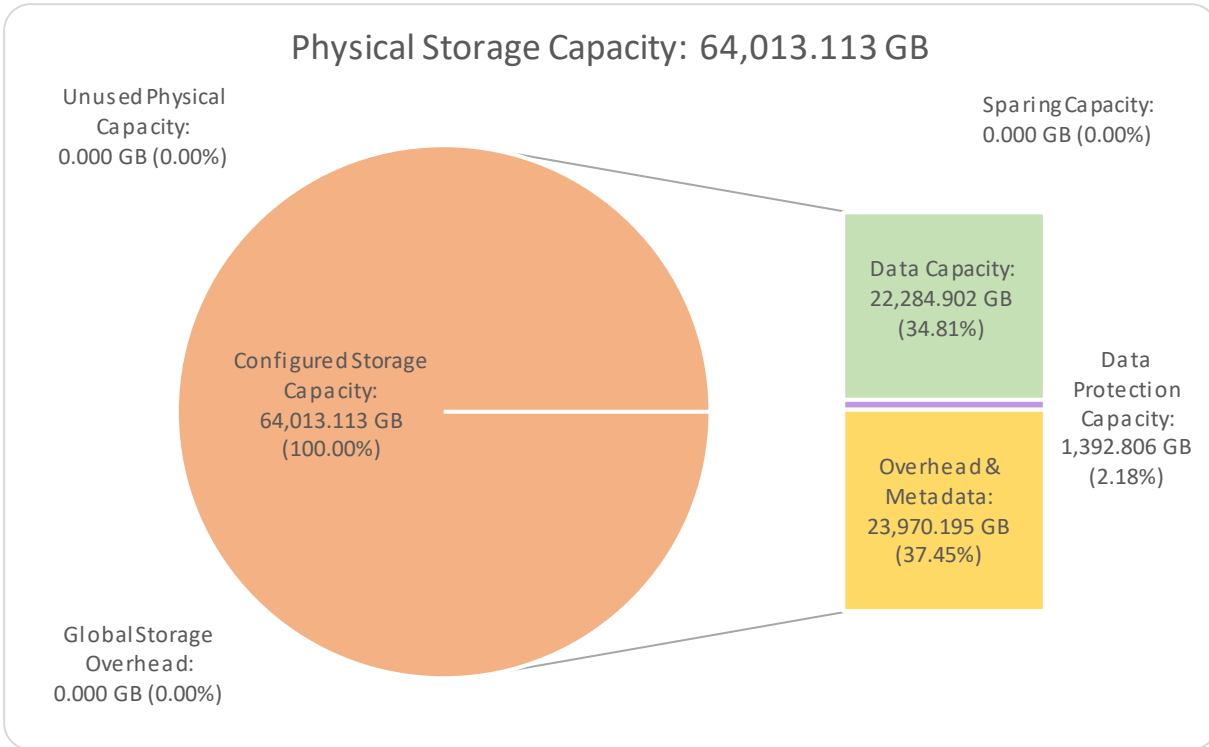
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-2 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

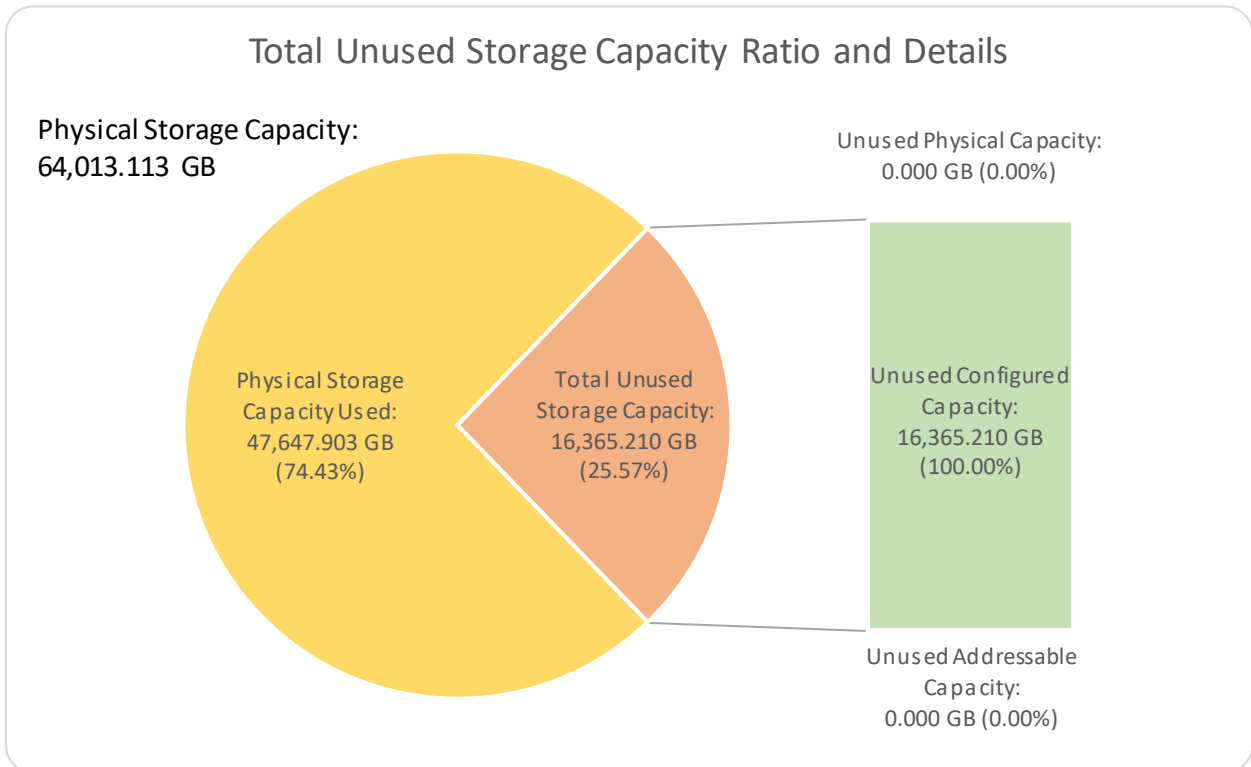
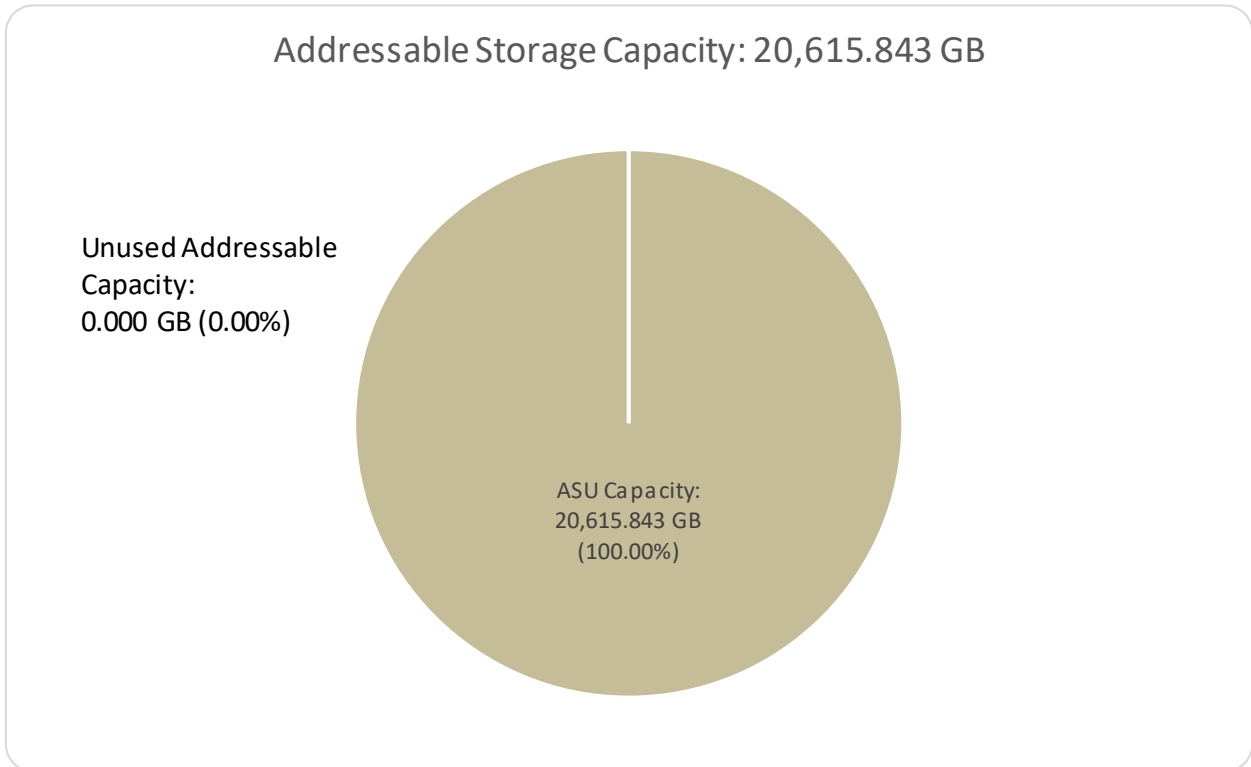
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

SPC-2 Reported Data				
VX100-F Scalable NVMe Flash Array				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
49,042.39	\$5.35	20,615.843	\$262,572.59	Protected 1 (RAID 5 (N+1).)
<i>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).</i>				
Currency Used:		"Target Country":		
U.S. Dollars		USA		
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
LFP Composite	47,554.98			\$5.52
Write Only:				
1024 KiB Transfer	35,532.23	40	888.31	
256 KiB Transfer	34,763.83	80	434.55	
Read-Write:				
1024 KiB Transfer	59,486.68	184	323.30	
256 KiB Transfer	59,810.01	184	325.05	
Read Only:				
1024 KiB Transfer	48,190.46	184	261.90	
256 KiB Transfer	47,546.68	184	258.41	
<i>The above SPC-2 Data Rate value for LFP Composite represents the aggregate performance of all three LFP Test Phases: (Write Only, Read-Write, and Read Only).</i>				
SPC-2 Large Database Query (LDQ) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
LDQ Composite	49,869.23			\$5.27
1024 KiB Transfer Size				
4 I/Os Outstanding	50,425.48	32	1,575.80	
1 I/O Outstanding	50,390.42	96	524.90	
64 KiB Transfer Size				
4 I/Os Outstanding	50,609.64	96	527.18	
1 I/O Outstanding	48,051.39	320	150.16	
<i>The above SPC-2 Data Rate value for LDQ Composite represents the aggregate performance of the two LDQ Test Phases: (1024 KiB and 64 KiB Transfer Sizes).</i>				
SPC-2 Video On Demand (VOD) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
	49,702.97	63,200	0.79	\$5.28

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-2 Storage Capacity Utilization	
Application Utilization	32.21%
Protected Application Utilization	34.22%
Unused Storage Ratio	25.57%

Application Utilization: Total ASU Capacity (20,615.843 GB) divided by Physical Storage Capacity (64,013.113 GB).

Protected Application Utilization: Total ASU Capacity (20,615.843 GB) plus total Data Protection Capacity (1,392.806 GB) minus unused Data Protection Capacity (104.316 GB) divided by Physical Storage Capacity (64,013.113 GB).

Unused Storage Ratio: Total Unused Capacity (16,365.210 GB) divided by Physical Storage Capacity (64,013.113 GB) and may not exceed 45%.

Priced Storage Configuration Pricing

Part No.	Description	Source	Qty	Unit Price	Ext. Price	Disc.	Disc. Price
Hardware & Software							
VX-100F-16x32GFC-16ESM-1TBSSD	VX-100F NVMe Flash Array - 20TB usable (including): 2x Controllers (Active/Active) 16x Enterprise Storage Modules with 4x 1TB drives each 15+1 RAID5 protection 16x 32G FC ports 2x GigE management ports VxOS Operating System GUI and CLI Management Software 3-year Hardware Warranty	1	1	288,000.00	288,000.00	48%	149,760.00
LPE32002-M2	Broadcom dual port 32G FC adapter	1	16	1,335.58	21,369.28	0%	21,369.28
BR-G620-48-32G-F	Brocade 48-port FC switch	1	1	41,678.19	41,678.19	0%	41,678.19
D-L2L2-3R2-003M	3m FC cables	1	48	10.94	525.12	0%	525.12
Hardware & Software Subtotal							213,332.59
Support & Maintenance							
VxSupport-Enterprise-001	3-year Enterprise Support (including): 24X7X365 unlimited access to Technical Support Software Maintenance Releases Call Home Functionality Non-disruptive software minor updates 4 hour onsite hardware delivery and replacement	1	1	87,000.00	87,000.00	48%	45,240.00
VxSupport-Installation-001	On-site install with training	1	1	5,000.00	5,000.00	20%	4,000.00
Support & Maintenance Subtotal							49,240.00
SPC-2 Total System Price							262,572.59
<small>Prices used in SPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflect standard pricing policies for the listed components. For complete details, see the pricing sections of the SPC benchmark specifications. If you find that the stated prices or maintenance levels are not available according to these terms, please inform the SPC at spcadmin@spcresults.org.</small>							

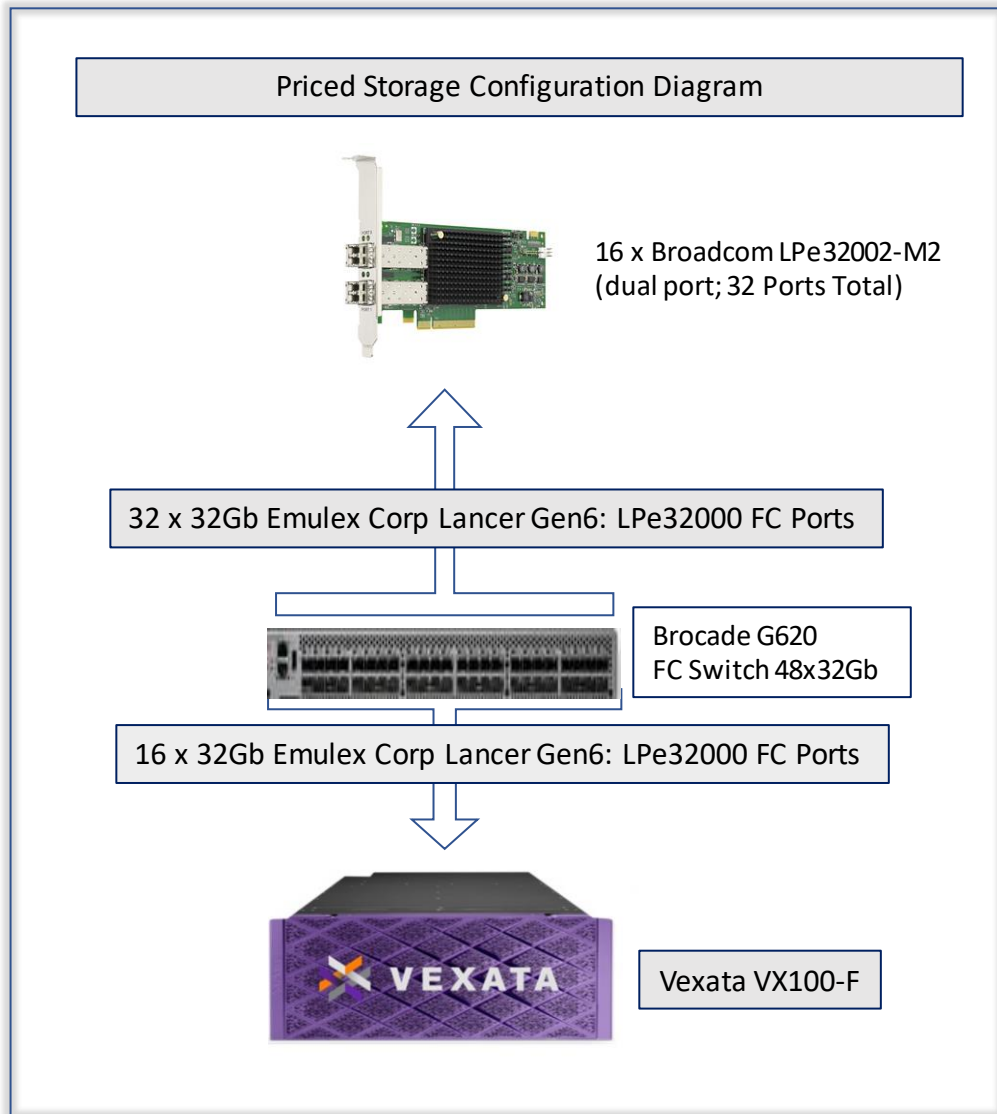
The above pricing includes the following:

- Acknowledgement of new and existing hardware and/or software problems within four hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration component.

Differences between Tested Storage Configuration and Priced Storage Configuration

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

Priced Storage Configuration Diagram



Priced Storage Configuration Components

Priced Storage Configuration
16 – Broadcom LPe32002-M2 dual port HBAs
VX100-F Scalable NVMe Flash Array 2 – IO Controllers, each with: 128 GB Memory 8 x 32 Gb FC Connections 2 Storage Processing Unit (SPU) FPGAs, each with: 32 x 10Gb Lossless Ethernet 16 – Enterprise Storage Modules (ESMs), each with: 32 GB Memory 8 x 10 Gb Lossless Ethernet
64 – 1 TB SSDs (4 drives per ESM)
1 – Brocade G620 FC Switch 48 x 32Gb ports