SPC BENCHMARK 1™

EXECUTIVE SUMMARY

TELECOMMUNICATIONS TECHNOLOGY ASSOCIATION JET-SPEED™ HHS3124F / HHS2112F (7 NODES)

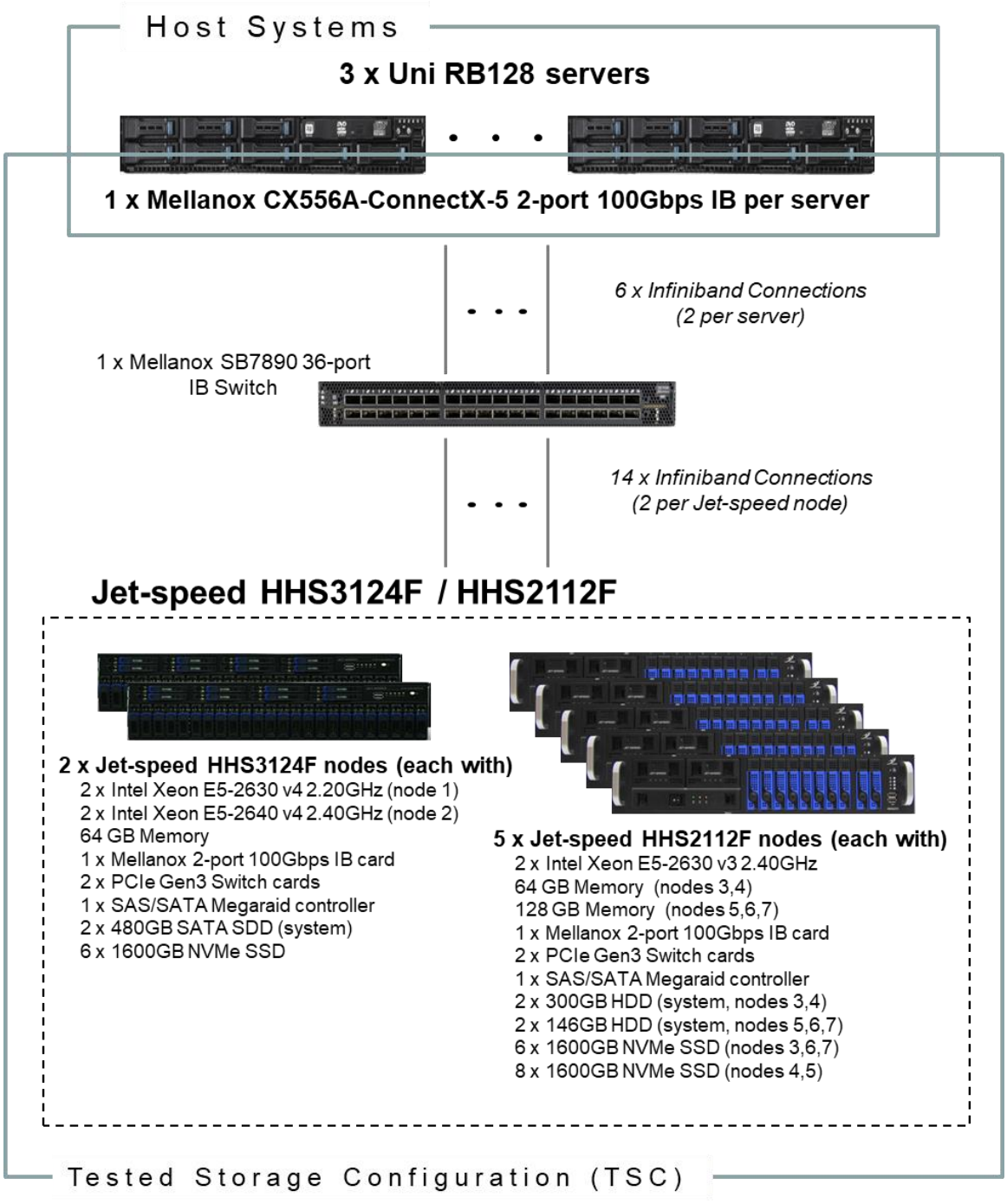
SPC-1 IOPS™	**1,510,150**
SPC-1 Price-Performance™	**$326.75/SPC-1 KIOPS™**
SPC-1 IOPS™ Response Time	0.323 ms
SPC-1 Overall Response Time	0.206 ms
SPC-1 ASU Capacity	27,594 GB
SPC-1 Space Effectiveness Ratio	NA
SPC-1 ASU Price	$17.89/GB
SPC-1 Total System Price	$493,427.86
Data Protection Level	Protected 1 (RAID 1+0)
Physical Storage Capacity	77,593 GB
Pricing Currency / Target Country	U.S. Dollars / Korea

SPC-1 V3.8

SUBMISSION IDENTIFIER: A31018

SUBMITTED FOR REVIEW: DECEMBER 3, 2018

Benchmark Configuration Diagram



Tested Storage Product Description

The intelligent Hyper Hybrid Storage HHS3124F/HHS2112F present an ultra-high speed, all-NVMe RAID storage platform. The systems guarantee stability and performance through its own control system and management system using Intel® Xeon® controller.

Data stability and redundancy is secured by implementing a PCIe RAID architecture. Flash SSD performance degradation and breakdown rates that are caused by frequent write operations are innovatively reduced. Especially, the HHS3124F, which supports concurrent use of NVMe Flash SSDs and Taejin Infotech's NVMe RAM-based SSDs, can activate data cache engine which is configured to improve data I/O performance using the controller's own cache as well as the NVMe RAM-based SSD.

Note: NVMe RAM-based SSDs were not used for this SPC-1 result.

For more details, visit:

http://www.taejin.co.kr/wp/?page_id=11611

Priced Storage Configuration Components

3 x Mellanox CX556A-ConnectX-5 2-port 100Gbps IB cards (1 per host)
2 x Jet-speed HHS3124F storage nodes, each with: 2 x Intel Xeon CPU E5-2630 v4 2.20GHz 10Core (node 1) 2 x Intel Xeon CPU E5-2640 v4 2.40GHz 10Core (node 2) 4 x 16GB DDR4 Memory 1 x Mellanox CX556A-ConnectX-5 2-port 100Gbps IB card 1 x SAS/SATA MegaRAID controller 2 x PCIe Gen3 switch cards 2 x 480GB SATA 6Gbps SSD (System) 6 x 1600GB Intel NVMe SSD 2.5' 5 x Jet-speed HHS2112F storage nodes, each with: 2 x Intel Xeon CPU E5-2630 v3 2.40GHz 8Core 4 x 16GB DDR4 Memory (nodes 3,4) 8 x 16GB DDR4 Memory (nodes 5,6,7) 2 x PCIe Gen3 switch cards 1 x Mellanox CX556A-ConnectX-5 2-port 100Gbps IB card 1 x SAS/SATA MegaRAID controller 2 x 300GB SAS rev3 10K rpm HDD (System, nodes 3,4) 2 x 146GB SAS rev3 10K rpm HDD (System, nodes 5,6,7) 6 x 1600GB NVMe SSD 2.5' (node 3,6,7) 8 x 1600GB NVMe SSD 2.5' (nodes 4,5) Mellanox SB7890 100 Gbps 36-port IB Switch

Storage Configuration Pricing

	Description	Qty	Unit Price	Ext. Price	Disc.	Disc. Price
Hardware & Software						
90102-0001-00A	HHS2112F All NVMe Storage (2U / 12 disk bays Dual Intel Xeon E5-2600v3/v4 Family, 16x DIMM Slots, 800W redundant PSU 80Plus platinum)	5	50,379.73	251,898.64	50%	125,949.32
90102-0002-00A	HHS3124F All NVMe Storage (3U / 24 disk bays Dual Intel Xeon E5-2600v3/v4 Family, 16x DIMM Slots, 1000W redundant PSU 80Plus platinum)	2	91,777.78	183,555.56	50%	91,777.78
20204-0001-00A	DDR4 16GB PC4-17000 ECC/REG (16GB PC4-17000 DDR Rdimm Ecc Reg RX8 CL17 1.2V)	32	179.64	5,748.45	0%	5,748.45
20204-0002-00A	DDR4 16GB PC4-19200 ECC/REG (16GB PC4-19200 DDR Rdimm Ecc Reg RX8 CL17 1.2V)	8	179.64	1,437.11	0%	1,437.11
22209-0001-00A	100G IB EDR HBC CARD CX556A - ConnectX-5 (ConnectX-5 Ex VPI Adapter Card EDR IB and 100GbE Dual-port QSFP28 PCIe4.0 x16 Tall Bracket ROHS R6)	10	951.00	9,510.00	0%	9,510.00
22202-0001-00A	Raid Controller SAS/SATA Megaraid 9361-8i (up to 8 SATA or SAS drives via direct connection or up to 240 drives with SAS expander	7	931.61	6,521.27	0%	6,521.27
22506-0003-00A	SSD 480GB SATA3 2.5" (6Gb, SAMSUNG, MZ7KM480HAHP-00005)	4	281.64	1,126.56	0%	1,126.56
22505-0001-00A	HDD 300GB SAS 2.5" 10KRPM (8Gb, Hitachi, GST Ultrastar C10K300)	4	55.00	220.00	0%	220.00
22505-0002-00A	HDD 146GB SAS 2.5" 10KRPM (Seagate Savvio ST9146803SS)	6	40.07	240.42	0%	240.42
22501-0003-00A	NVMe SSD 1.6TB, HGST, SN200, 2.5" SFF	6	1,306.62	7,839.72	0%	7,839.72
22501-0001-00A	NVMe SSD 1.6TB, SAMSUNG, PM1725A, 2.5" SSF	6	1,306.62	7,839.72	0%	7,839.72
22501-0002-00A	NVMe SSD 1.6TB, Intel, DCP4600 Series, 2.5" SSF	34	1,306.62	44,425.09	0%	44,425.09
31020-0008-00	Board PCI-e Switching GEN3 x8 4Port for HHS2112F,HHS3124F	14	5,038.95	70,545.30	50%	35,272.65
10401-0001-00A	MSB7890ES2F 100G IB SWITCH By Mellanox (36-port Non-blocking Externally-managed EDR)	1	18,423.08	18,423.08	0%	18,423.08
22809-0001-00A	MCP1600-E002 IB EDR CABLE	20	136.76	2,735.19	0%	2,735.19
60304-0002-00A	Gluesys Anystore Enterprise, AnyManager SW (NAS O/S, RAID 0/1/10/5/6, Protocol NFS/CIFS/AFP, NVMe Option, UI Mgt. etc.)	7	20,000.00	140,000.00	50%	70,000.00
				Hardware & Software Subtotal		**429,066.36**
Support & Maintenance						
A0103-0001-00A	Premium Package 3-Year Support & Maintenance	7	18,389.00	128,723.00	50%	64,361.50
				Support & Maintenance Subtotal		**64,361.50**
SPC-1 Total System Price						**493,427.86**
SPC-1 IOPS™						1,510,150
SPC-1 Price-Performance™ ($/SPC-1 KIOPS™)						**326.75**
SPC-1 ASU Capacity (GB)						27,594
SPC-1 ASU Price ($/GB)						**17.89**

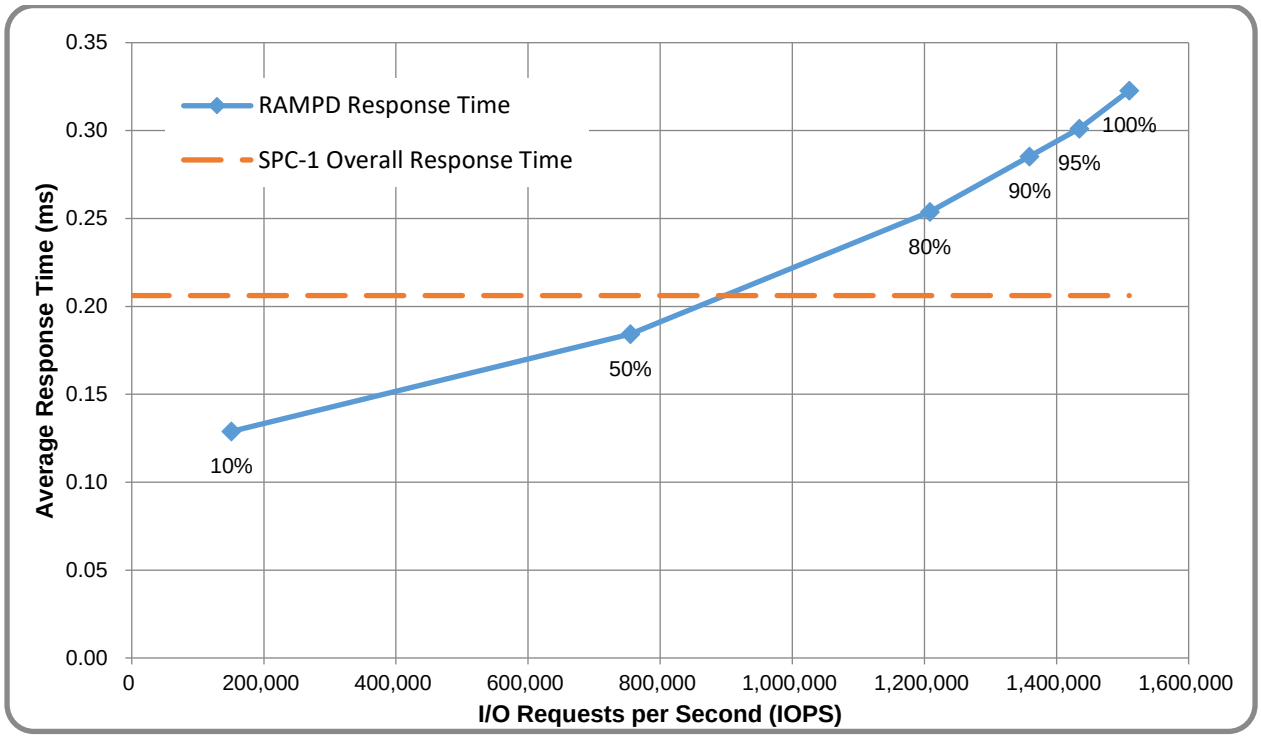
Third-Party Reseller: TTA is the sponsor of tis result but does not directly sell the products and components of the Priced Storage Configuration (PSC). The above reflects the pricing quoted by the vendor and third-party reseller Taejin Infotech Co., Ltd. See Appendix B of the Full Disclosure Report for a copy of the third-party reseller's quotation.

Discount Details: The discounts shown are based on the storage capacity purchased and are generally available.

Warranty: The 3-year maintenance and support included in the above pricing meets or exceeds a 24x7 coverage with a 4-hour response time.

Availability Date: Currently available.

Response Time and Throughput Graph



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Revision Information	
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