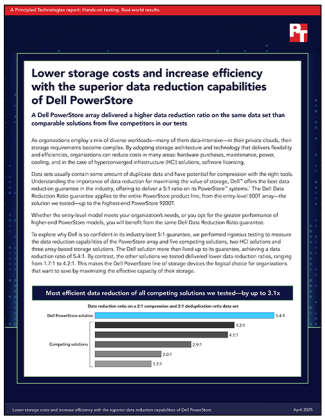

The science behind the report:

Lower storage costs and increase efficiency with the superior data reduction capabilities of Dell PowerStore

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Lower storage costs and increase efficiency with the superior data reduction capabilities of Dell PowerStore.

We concluded our hands-on testing on February 17, 2025. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on February 17, 2025 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to http://facts.pt/calculating-and-highlighting-wins. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 1 shows the physical and effective capacity of the Dell PowerStore solution, the three competing array-based storage solutions, and the two HCI solutions.

Table 1: Logical and effective storage capacity of the Dell PowerStore 500T and the competing array-based storage solutions. Greater effective capacity is better. Source: Principled Technologies.

	Total logical data	Data reduction ratio	Physical space needed to store 6 TB of data	Percentage of physical space saved with PowerStore
		Higher is better	Lower is better	
Dell PowerStore solution	6 TB	5.4:1	1,116.51 GB	N/A
Storage vendor A solution	6 TB	2.9:1	2,071.87 GB	46.11%
Storage vendor C solution	6 TB	4.2:1	1,432.77 GB	22.07%
Storage vendor L solution	6 TB	4.1:1	1,467.51 GB	23.92%
HCI Vendor G solution	6 TB	2.0:1	3,002.00 GB	62.81%
HCI Vendor U solution	6 TB	1.7:1	3,531.11 GB	68.38%

System configuration information

Server

Table 2: Detailed information on the systems we tested.

Dell PowerEdge 740	
BIOS name and version	
BIOS name and version	Dell 2.2.11
Non-default BIOS settings	N/A
Date of last OS updates/patches applied	10/30/24
Power management policy	Balanced
Processor	
Number of processors	2
Vendor and model	Intel® Xeon® Gold 6126
Core count (per processor)	12
Core frequency (GHz)	2.60
Memory module(s)	
Total memory in system (GB)	256
Number of memory modules	8
Vendor and model	Hynix® HMA84GR7JJR4N-VK
Size (GB)	32
Type	DDR4 DDRAM
Speed (MHz)	2,666
Speed running in the server (MHz)	2,666
Local storage	
Number of drives	2
Drive vendor and model	Samsung® MZ7LH960HAJR0D3
Drive size (GB)	960
Drive information (speed, interface, type)	6 Gbps SSD
Network adapter	
Vendor and model	Broadcom® BCM57416
Number and type of ports	2 x 10GbE
Driver version	bnxtnet
Cooling fans	
Vendor and model	Dell high performance cooling fan
Number of cooling fans	6

Dell PowerEdge 740	
Power supplies	
Vendor and model	CMPGM 0CMPGM
Number of power supplies	2
Wattage of each (W)	1,100

Storage

Table 3: Information on the Dell PowerStore™ 500T we tested.

Storage configuration information	Dell PowerStore 500T
Controller firmware revision	4.0.0.1 Release, Build 2334337
Number of storage controllers	2
Number of storage shelves	1 base enclosure
Number of drives per shelf	12 on base enclosure
Drive vendor and model number	Dell 005054042
Number of drives	12
Drive size (TB)	3.8
Drive information (speed, interface, type)	NVMe® SSD TLC

Table 4: Information on the HCI Vendor G solution we tested.

Storage configuration information	HCI Vendor G solution
Number of drives	48
Drive size (TB)	3.2
Drive information (speed, interface, type)	PCIe 4.0 x4, NVMe

Table 5: Information on the HCI Vendor U solution we tested.

Storage configuration information	HCI Vendor U solution
Number of drives	48
Drive size (TB)	3.2
Drive information (speed, interface, type)	PCIe 4.0 x4, NVMe

Table 6: Information on the Storage Vendor A solution we tested.

Storage configuration information	Storage Vendor A solution
Number of storage controllers	2
Number of storage shelves	1 base enclosure
Number of drives per shelf	24 on base enclosure
Number of drives	24
Drive size (TB)	1.92
Drive information (speed, interface, type)	NVMe

Table 7: Information on the Storage Vendor C solution we tested.

Storage configuration information	Storage Vendor C solution
Number of storage controllers	2
Number of storage shelves	1 base enclosure
Number of drives per shelf	10 on base enclosure
Number of drives	10
Drive size (TB)	18.6
Drive information (speed, interface, type)	NVMe

Table 8: Information on the Storage Vendor L solution we tested.

Storage configuration information	Storage Vendor L solution
Number of storage controllers	2
Number of storage shelves	1 base enclosure
Number of drives per shelf	12 on base enclosure
Number of drives	12
Drive size (TB)	4.8
Drive information (speed, interface, type)	NVMe

How we tested

Setting up our test beds

For our Dell PowerStore 500T, competitor arrays, and HCI solution tests, we used one or more Dell PowerEdge servers for housing our load generation VM. Each host was equipped with dual 100GbE uplinks and two dual-port 32GB Emulex Fibre Channel adapters. We conducted all testing for the PowerStore 500T and competitor array solutions using the Fibre Channel storage protocol, configuring the array to use 16 ports connected to a 48-port Fibre Channel switch. We employed 100GbE switches for testbed management and VM traffic. We also ensured that the setups for the Dell PowerStore 500T, competitor arrays, and HCI solution closely followed the best practices published by each storage vendor.

Testing data reduction

For all our tests, we used a CentOS 7 VM with eight vCPUs and 48 GB of RAM running Vdbench 5.04.07. For Dell PowerStore, we provisioned twelve 500GB LUNs to the virtual machine as a raw device mapping (RDM disks). For HCI Vendor U, we created twelve 500GB thin virtual disks on the software-defined storage layer.

We ran write tests with 256KB blocks, filling each 500GB disk with data on both solutions. After completing each test, we analyzed deduplication and compression efficiency by reviewing data reduction ratios reported in each system's management console. This allowed us to assess how well each platform identified and eliminated redundant data, as well as how effectively it compressed stored data.

To evaluate data reduction performance we ran the following test on each solution using Vdbench:

2C/2D (2:1 compression, 2:1 deduplication representing moderately compressible and deduplicable data)

```
compratio=2
dedupratio=2
dedupunit=4096

hd=default,shell=ssh,master=192.168.1.200,user=root,jvms=1
hd=hd1,system=localhost

sd=default,openflags=o_direct
sd=sd1,hd=hd1,lun=/dev/sdb
sd=sd2,hd=hd1,lun=/dev/sdc
sd=sd3,hd=hd1,lun=/dev/sdd
sd=sd4,hd=hd1,lun=/dev/sde
sd=sd5,hd=hd1,lun=/dev/sdf
sd=sd6,hd=hd1,lun=/dev/sdg
sd=sd7,hd=hd1,lun=/dev/sdh
sd=sd8,hd=hd1,lun=/dev/sdi
sd=sd9,hd=hd1,lun=/dev/sdj
sd=sd10,hd=hd1,lun=/dev/sdk
sd=sd11,hd=hd1,lun=/dev/sdl
sd=sd12,hd=hd1,lun=/dev/sdm

wd=default,sd=*
wd=wd_prefill,sd=sd*,xfersize=256k,seekpct=eof,rdpct=0

rd=default
rd=rd_prefill,wd=wd_prefill,elapsed=20h,interval=10,iorate=max,forthreads=(1)
```

Read the report ▶

This project was commissioned by Dell Technologies.

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