



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 ТВ               | 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.

| ze (GB) 32<br>pe DDR4 DDRAM<br>peed (MHz) 2,666   | old 6126            |
|---|---------------------|
| on-default BIOS settings N/A<br>ate of last OS updates/patches applied 10/30/24<br>Balanced<br>occessor<br>umber of processors 2<br>endor and model Intel® Xeon® G<br>ore count (per processor) 12<br>ore frequency (GHz) 2.60<br>emory module(s)<br>otal memory in system (GB) 256<br>umber of memory modules 8<br>endor and model Hynix® HMA84<br>ze (GB) 32<br>pe DDR4 DDRAM<br>peed (MHz) 2,666   | old 6126            |
| ate of last OS updates/patches applied       10/30/24         power management policy       Balanced         occessor       2         umber of processors       2         endor and model       Intel® Xeon® G         pore frequency (GHz)       2.60         emory module(s)       256         umber of memory modules       8         endor and model       Hynix® HMA84         ze (GB)       32         pe       DDR4 DDRAM         peed (MHz)       2,666   | old 6126            |
| ower management policy       Balanced         occessor       2         umber of processors       2         endor and model       Intel® Xeon® G         ore count (per processor)       12         ore frequency (GHz)       2.60         emory module(s)       256         umber of memory modules       8         endor and model       Hynix® HMA84         ze (GB)       32         pe       DDR4 DDRAM         peed (MHz)       2,666  | old 6126            |
| ocessor umber of processors and model Intel® Xeon® G Intel® Xeon® | old 6126            |
| umber of processors2endor and modelIntel® Xeon® Gore count (per processor)12ore frequency (GHz)2.60emory module(s)256otal memory in system (GB)256umber of memory modules8endor and modelHynix® HMA84ze (GB)32peDDR4 DDRANpeed (MHz)2,666   | old 6126            |
| endor and model Intel® Xeon® G<br>ore count (per processor) 12<br>ore frequency (GHz) 2.60<br>emory module(s)<br>otal memory in system (GB) 256<br>umber of memory modules 8<br>endor and model Hynix® HMA84<br>ze (GB) 32<br>pe DDR4 DDRAM<br>peed (MHz) 2,666   | old 6126            |
| bore count (per processor) 12<br>2.60<br>emory module(s)<br>otal memory in system (GB) 256<br>umber of memory modules 8<br>endor and model Hynix® HMA84<br>ze (GB) 32<br>ppe DDR4 DDRAM<br>peed (MHz) 2,666   | old 6126            |
| pore frequency (GHz)       2.60         emory module(s)       256         ontal memory in system (GB)       256         umber of memory modules       8         endor and model       Hynix® HMA84         ze (GB)       32         pe       DDR4 DDRAM         peed (MHz)       2,666  |                     |
| emory module(s)<br>tal memory in system (GB) 256<br>umber of memory modules 8<br>endor and model Hynix® HMA84<br>ze (GB) 32<br>pe DDR4 DDRAM<br>peed (MHz) 2,666  |                     |
| bital memory in system (GB)     256       umber of memory modules     8       endor and model     Hynix® HMA84       ze (GB)     32       pe     DDR4 DDRAM       peed (MHz)     2,666  |                     |
| umber of memory modules     8       endor and model     Hynix® HMA84       ze (GB)     32       pe     DDR4 DDRAM       peed (MHz)     2,666  |                     |
| endor and model Hynix® HMA84<br>ze (GB) 32<br>pe DDR4 DDRAM<br>peed (MHz) 2,666   |                     |
| ze (GB) 32<br>pe DDR4 DDRAM<br>peed (MHz) 2,666   |                     |
| peed (MHz) 2,666  | GR7JJR4N-VK         |
| Deed (MHz) 2,666  |                     |
|   |                     |
|   |                     |
| peed running in the server (MHz) 2,666  |                     |
| ocal storage  |                     |
| umber of drives 2   |                     |
| rive vendor and model Samsung® MZ   | 7LH960HAJR0D3       |
| rive size (GB) 960  |                     |
| rive information (speed, interface, type) 6 Gbps SSD  |                     |
| etwork adapter  |                     |
| endor and model Broadcom® BC  | M57416              |
| umber and type of ports 2 x 10GbE   |                     |
| river version bnxtnet   |                     |
| poling fans   |                     |
| endor and model Dell high perfo   |                     |
| umber of cooling fans 6   | ormance cooling fan |

| 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) | PCle 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=0 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/sd1
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 at https://facts.pt/Z15AnNC

This project was commissioned by Dell Technologies.





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