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

A Dell PowerStore array delivered a higher data reduction ratio on the same data set than comparable solutions from five competitors in our tests

As organizations employ a mix of diverse workloads—many of them data-intensive—in their private clouds, their storage requirements become complex. By adopting storage architecture and technology that delivers flexibility and efficiencies, organizations can reduce costs in many areas: hardware purchases, maintenance, power, cooling, and in the case of hyperconverged infrastructure (HCI) solutions, software licensing.

Data sets usually contain some amount of duplicate data and have potential for compression with the right tools. Understanding the importance of data reduction for maximizing the value of storage, Dell™ offers the best data reduction guarantee in the industry, offering to deliver a 5:1 ratio on its PowerStore™ systems.[1] The Dell Data Reduction Ratio guarantee applies to the entire PowerStore product line, from the entry-level 500T array—the solution we tested—up to the highest-end PowerStore 9200T.

Whether the entry-level model meets your organization's needs, or you opt for the greater performance of higher-end PowerStore models, you will benefit from the same Dell Data Reduction Ratio guarantee.

To explore why Dell is so confident in its industry-best 5:1 guarantee, we performed rigorous testing to measure the data reduction capabilities of the PowerStore array and five competing solutions, two HCI solutions and three array-based storage solutions. The Dell solution more than lived up to its guarantee, achieving a data reduction ratio of 5.4:1. By contrast, the other solutions we tested delivered lower data reduction ratios, ranging from 1.7:1 to 4.2:1. This makes the Dell PowerStore line of storage devices the logical choice for organizations that want to save by maximizing the effective capacity of their storage.

Most efficient data reduction of all competing solutions we tested—by up to 3.1x

Data reduction ratio on a 2:1 compression and 2:1 deduplication ratio data set

Dell PowerStore solution	5.4:1
Competing solutions	4.2:1
	4.1:1
	2.9:1
	2.0:1
	1.7:1
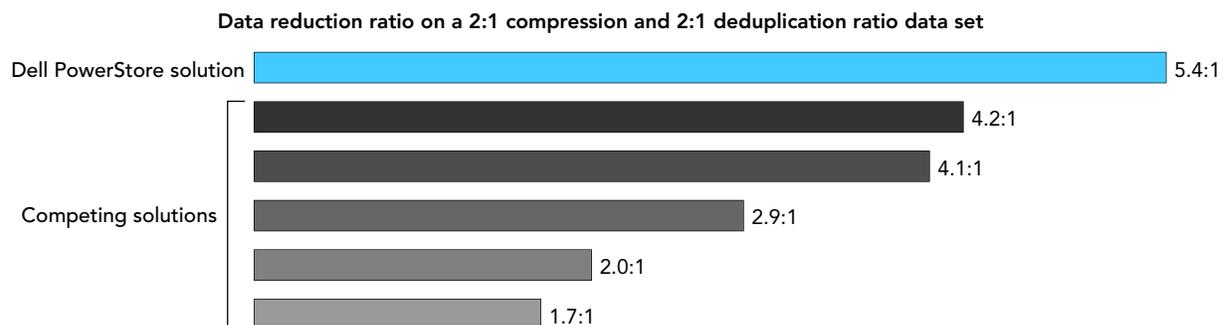
The business value of data reduction

With great data growth comes great opportunity—McKinsey notes that the market holds up to $17.7 trillion in value potential from data and analytics[2]—but the associated costs of storage for that data are increasing IT budgets. A second trend affecting many organizations is the growing adoption of private cloud, with one source projecting the global private cloud market to experience a compound annual growth rate of almost 20 percent from 2025 to 2029.[3] Organizations need data to implement cutting-edge initiatives, but they must also find the most cost-effective solutions for storing that data.

Expanding hardware resources entails various costs, including capital investments for equipment and additional operational expenses such as software licensing, power, cooling, and maintenance. A more effective approach is adopting storage solutions with advanced data reduction technologies. High data reduction ratios maximize storage capacity, minimizing the need for additional hardware and reducing CAPEX and OPEX. This strategy optimizes existing infrastructure, avoids unnecessary licensing costs in HCI environments, and efficiently manages data growth without continuous hardware expansion.

Understanding the customer value of data compression and deduplication technologies, Dell Technologies™ set out to develop the best data reduction capabilities in the industry. PowerStore data reduction is always on across the entire array, which means administrators don't need to toggle or manage it on a per-workload basis. Dell is so confident in its data reduction capabilities that it guarantees that customers purchasing any new Dell PowerStore model will experience a 5:1 data reduction ratio on reducible data.[4] According to Dell, customers achieve 81 percent data savings and exceed the 5:1 Data Reduction Ratio guarantee by an average of 31 percent.[5]

In the unlikely event PowerStore should fail to meet the guaranteed rate, the remediation process isn't just "future discounts or other ambiguous compensation"—instead, Dell offers, among other remedies, to ship drives to organizations to provide additional capacity.[6] (To learn more, visit https://www.delltechnologies.com/asset/en-us/products/storage/briefs-summaries/powerstore-efficiency-infographic.pdf.)

Validating PowerStore data reduction capabilities

Underlying the Dell Data Reduction Ratio guarantee is confidence that PowerStore can consistently deliver a 5:1 or better ratio. To assess the validity of this confidence, Principled Technologies used the Vdbench workload generator to measure the data reduction capabilities of a Dell PowerStore shared storage solution along with three competing array-based storage solutions and two comparable solutions in the HCI space.

On each of our test environments, including the Dell PowerStore 500T array, we provisioned 6 TB of storage (12 volumes or virtual disks of 500 GB each). We used Vdbench to populate the volumes with data that was capable of 2:1 compression (2C) and 2:1 deduplication (2D) ratios. After each solution completed post-processing deduplication and array cleanup tasks, we captured the data reduction information that each solution's management console reported.

As Figure 1 shows, the Dell PowerStore shared storage solution achieved a data reduction ratio of 5.4:1, which exceeds not only the ratios achieved by the five competing solutions we tested, but also the Dell Data Reduction Ratio guarantee of 5:1. We explore these findings in greater detail on the following pages.

Data reduction ratio on a 2:1 compression and 2:1 deduplication ratio data set

Higher ratios are better

Dell PowerStore solution	5.4:1
Storage Vendor C solution	4.2:1
Storage Vendor L solution	4.1:1
Storage Vendor A solution	2.9:1
HCI Vendor G solution	2.0:1
HCI Vendor U solution	1.7:1

Data reduction ratio (DRR)
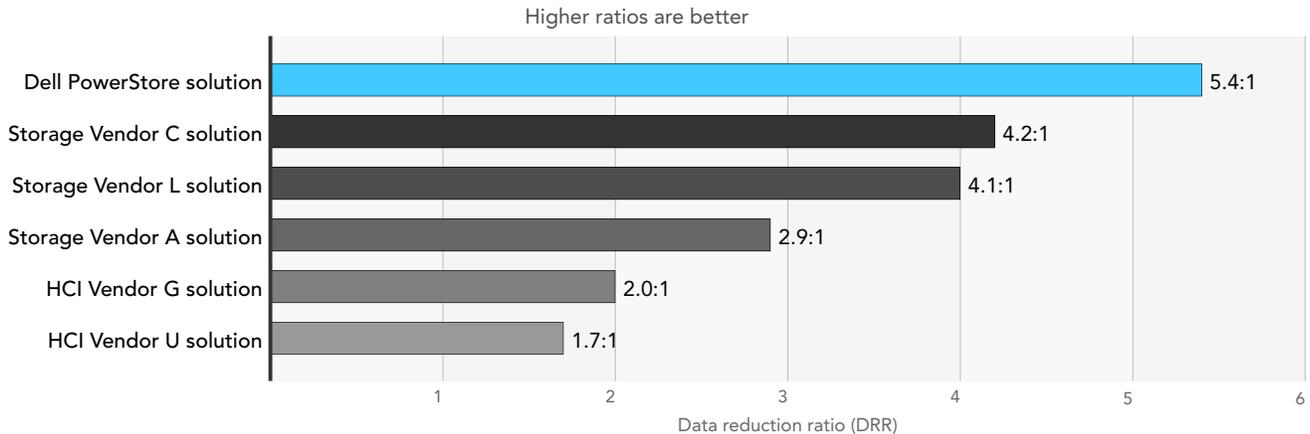
Up to 3.1x more efficient with Dell PowerStore

Figure 1: The data reduction ratio achieved by the Dell PowerStore solution and five competing solutions while running a 256KB write test with a 6TB 2:1 compression/2:1 deduplication data set. **Higher efficiency ratios are better**. Source: Principled Technologies.

What we learned: Save space and cut costs with better data reduction from Dell PowerStore

Dell PowerStore vs. competing array-based storage solutions

First, let's compare the data reduction efficiency of Dell PowerStore to that of storage solutions from three leading storage vendors (see Figure 2). The PowerStore solution achieved the greatest data reduction efficiency, requiring up to 46 percent less space to store the 6 TB of data than the other three solutions. This means that by choosing the Dell PowerStore solution over the three competing storage solutions, a company would need less storage hardware to store a given amount of data, which leads to savings.

Storage capacity needed to store 6 TB of data

2:1 compression and 2:1 deduplication ratio

Usage | Lower is better   **Efficiency** | Higher is better

Usage (Gigabytes)		Efficiency (DRR)
1,116.51	Dell PowerStore solution	5.4:1
1,432.77	Storage Vendor C solution	4.2:1
1,467.51	Storage Vendor L solution	4.1:1
2,071.87	Storage Vendor A solution	2.9:1

Gigabytes   Data reduction ratio (DRR)
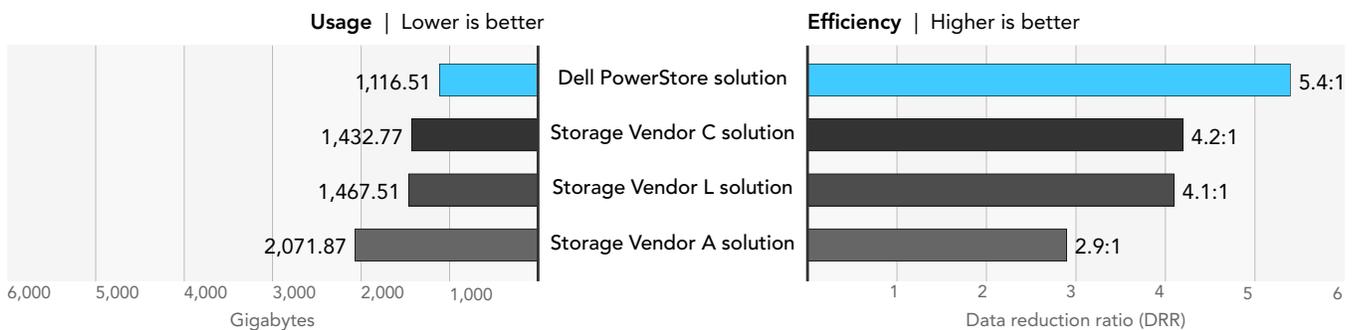
Save by using up to 46% less space   **Up to 1.8x more efficient**

Figure 2: Amount of physical storage used, after data reduction, while running a 256KB write test with a 6TB 2:1 compression/2:1 deduplication data set and resulting data efficiency ratios. **Lower usage and higher efficiency are better.** Source: Principled Technologies..

Dell PowerStore vs. competing HCI solutions

Next, let's see how Dell PowerStore data reduction compared to that of HCI solutions from two leading vendors. One downside to HCI solutions is that they require organizations to increase compute resources symmetrically with storage resources. If your capacity requirements double or triple, but your compute needs remain constant, you would have to add unneeded compute resources simply to support the additional capacity in the HCI solution.

In our Vdbench testing with a 2:1 compression/2:1 deduplication data set, the Dell PowerStore solution achieved a 5.4:1 data reduction ratio compared to the 2.0:1 ratio of the HCI Vendor G solution and the 1.7:1 ratio of the HCI Vendor U solution (see Figure 3). The Dell PowerStore solution required up to 68 percent less space to store 6 TB of data.

Storage capacity needed to store 6 TB of data
2:1 compression and 2:1 deduplication ratio

Usage | Lower is better   Efficiency | Higher is better

	Dell PowerStore solution	
1,116.51		5.4:1
3,002.00	HCI Vendor G solution	2.0:1
3,531.11	HCI Vendor U solution	1.7:1

Gigabytes   Data reduction ratio (DRR)

Save by using up to 68% less space   **Up to 3.1x more efficient**
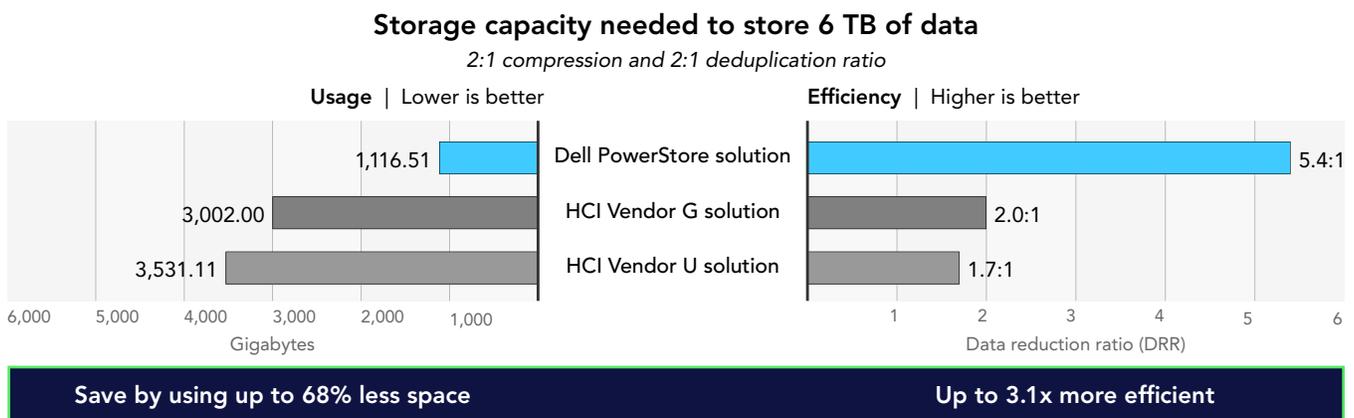
Figure 3: Amount of physical storage used, after data reduction, while running a 256KB write test with a 6TB 2:1 compression/2:1 deduplication data set and resulting data efficiency ratios. **Lower usage and higher efficiency are better.** Source: Principled Technologies.

Genetics company reaps benefits of PowerStore data reduction

When Fulgent Genetics integrated AI into its genetic testing procedures, they sought a server-and-storage solution that would boost the speed and accuracy of results and allow the company to handle the large amount of data every test involves. They choose a solution comprising Dell PowerEdge™ servers and Dell PowerStore storage. According to a case study published by Dell, Fulgent has experienced "impressive data compression rates of 8 and 9 to 1 by using PowerStore. This performance greatly exceeds Dell's 5:1 DRR guarantee."[7] As Mike Lacenere, VP, Applications at Fulgent states, "Dell PowerStore and PowerEdge have both been very important pieces to the puzzle to help us succeed."[8]

To learn more, read the case study "AI-powered diagnostics accelerate test results for Fulgent Genetics," at https://www.delltechnologies.com/asset/en-us/products/storage/customer-stories-case-studies/fulgent-written-case-study.pdf.

Other ways PowerStore can optimize operations to help companies save

In addition to its industry-leading Data Reduction Ratio guarantee, Dell PowerStore has the potential to help companies in several other ways. Below, we draw on research and hands-on experience to address three of these: ease of use, Lifecycle Extension with Dell ProSupport™, and integrated data protection with Storage Direct Protection.

Ease of use

In this section, we address ease of use three ways: (1) by providing screenshots and discussing our direct experience with several beneficial aspects of the PowerStore management interface related to data reduction, (2) by presenting results of our research into other potential ease-of-use advantages we did not test, and (3) by offering a PT team member's personal reflections on this topic in the sidebar "PowerStore ease-of-use: An IT administrator's perspective."

In our testing, we observed several ease-of-use advantages with the PowerStore interface compared to the other solutions we tested. Figure 4 shows the Volumes view of the PowerStore Capacity Dashboard with volume-specific DRR and capacity information, which enables simplified and configurable reporting when using available filter options. This has the potential to help customers by enabling administrators to drill down into specific categories of storage usage, performance levels, protection levels, and other items of interest for storage consumers, which in turn can improve capacity planning. This page also has an export option that allows users to download the contents of this page in .csv or .xlsx formats.

PowerStore   RT-H4011

Dashboard   Monitoring   Compute ▾   Storage ▾   Protection ▾   Migration ▾   Hardware   Settings

Volumes

+ Create | Modify | Provision ▾ | Protect ▾ | Repurpose ▾ | More Actions ▾   12 Volumes
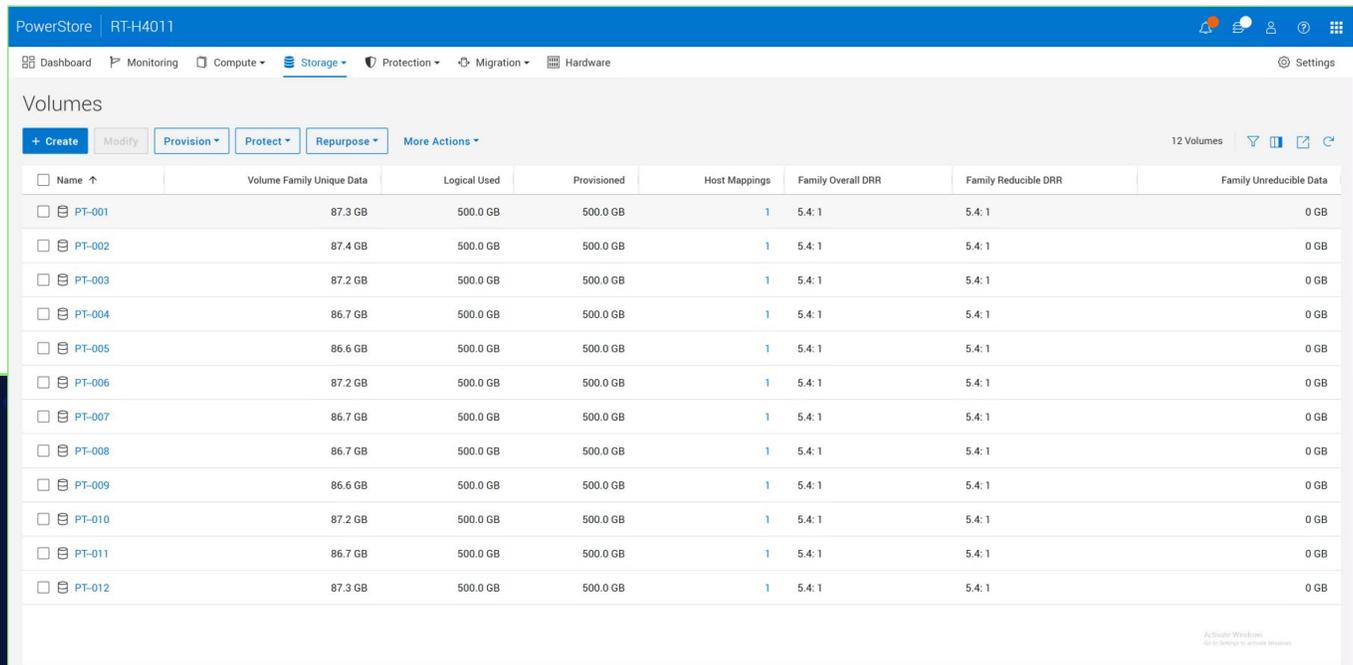
☐ Name ↑	Volume Family Unique Data	Logical Used	Provisioned	Host Mappings	Family Overall DRR	Family Reducible DRR	Family Unreducible Data
☐ 🖴 PT-001	87.3 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-002	87.4 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-003	87.2 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-004	86.7 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-005	86.6 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-006	87.2 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-007	86.7 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-008	86.7 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-009	86.6 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-010	87.2 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-011	86.7 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB
☐ 🖴 PT-012	87.3 GB	500.0 GB	500.0 GB	1	5.4: 1	5.4: 1	0 GB

Activate Windows
Go to Settings to activate Windows.

Figure 4: Screenshot of the Volume view of the PowerStore Capacity Dashboard enables simplified and configurable reporting. Source: Principled Technologies.

Figure 5 presents a screenshot of the PowerStore Capacity Accounting dashboard, which allows the user to view all the data reduction data from a single screen. We found this dashboard to be very clear and helpful. The dashboard provides a comprehensive view of system capacity, including historical usage and data savings metrics. This allows for better capacity planning and forecasting, helping to avoid unexpected storage shortages. The metrics also provide insights on reducibility of the data. In contrast, some of the other solutions we tested required us to either calculate the reduction ratio ourselves or provided less-detailed and less-granular metrics at the volume level.
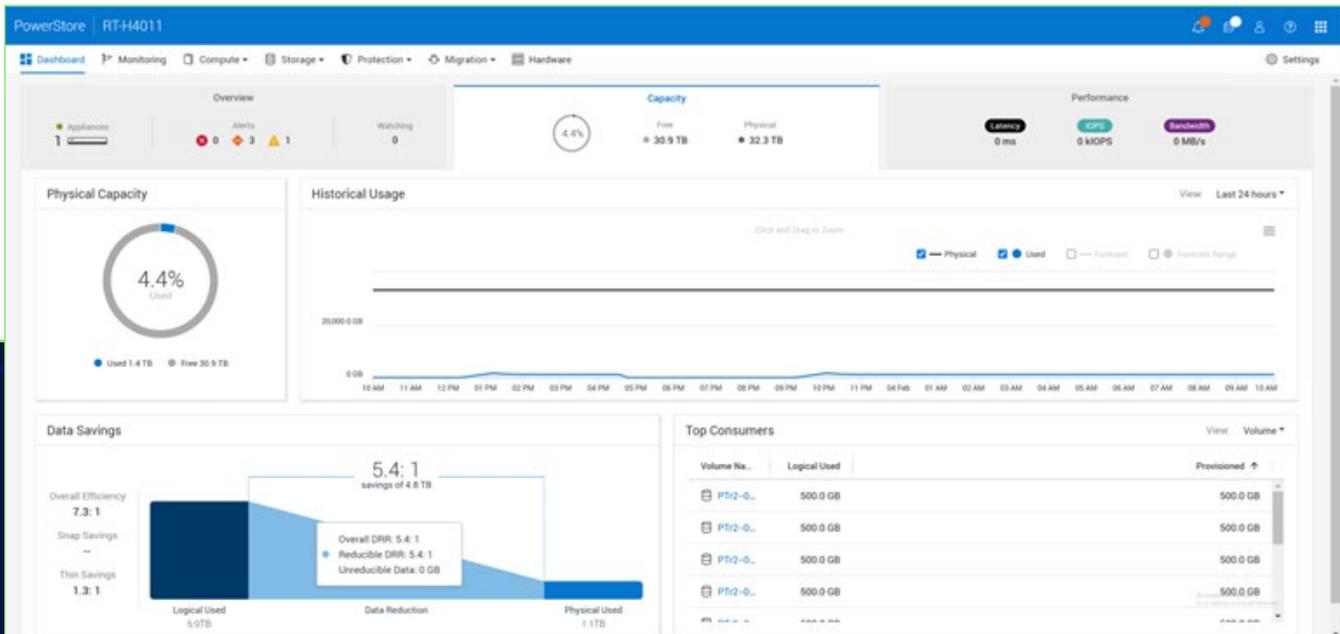
Figure 5: Screenshot of the PowerStore Capacity Dashboard, with the Data Savings details that appear when the user hovers over the graph. Source: Principled Technologies.

In our research, we learned of numerous additional strengths that Dell PowerStore offers in this area.

- Customers have ranked PowerStore #1 in ease of use, with operational efficiency advantages and AI-boosted analytics.[9]

- Built-in machine learning algorithms automate complex tasks, "auto-tun[ing] your environment for peak performance, efficiency and availability" when it comes to load balancing, node optimization, data reduction/efficiency, cybersecurity, and more.[10]

- PowerStore "simplifies expansion planning with industry-leading capacity analytics providing a detailed view from the array level down to individual volumes, giving administrators valuable efficiency insights that allow them to intelligently manage their data storage as cost effectively as possible."[11]

- When your team does need to be hands-on, they can take advantage of Dell APEX AIOps, which delivers "data-driven insights across your entire infrastructure, making it easy to troubleshoot, analyze and accurately predict when to add capacity or upgrade."[12] These tools can help organizations reduce risk, plan ahead, and improve productivity.[13] AIOps Assistant leverages generative AI to help troubleshoot issues with quick, detailed recommendations based on over 133,000 Dell Knowledge Base articles.[14] (To learn more, visit https://www.delltechnologies.com/asset/en-us/products/storage/briefs-summaries/powerstore-ease-of-use-infographic.pdf.)

These features have the potential to reduce the time storage administrators must spend on routine tasks, freeing them to work on more innovative activities.

PowerStore ease-of-use: An IT administrator's perspective

by Craig Boyd

Craig Boyd has spent 27 years in IT. Prior to joining PT in 2012, he worked in the manufacturing, health, education, and government sectors. Craig says, "In over 15 years of product analysis and competitive testing—not to mention my work as a systems administrator before that—I have had the opportunity to work with many management consoles across the data center ecosystem, including those of most major storage vendors. So, I speak from experience when I say that an easy-to-use console can accelerate training and minimize operational issues."

The Dell PowerStore management interface is a great example of how ease of use can create a more positive experience for users. It is one of the easiest consoles I have used, and is great for those who may be new to storage infrastructure management. It's intuitively laid out and has almost all of the information you need at a quick glance contained within the dashboard view. This makes training new users quite easy. The ability to turn over day-to-day management tasks to new storage operators can take the burden off your senior engineers and free them to handle zoning or complex architectural needs.

So what specifically do I find helpful about the Dell PowerStore UI?

- The dashboards and graphs provide helpful answers for quick questions immediately by hovering, reducing clicks and additional navigation.

- The main page of the interface contains tabs with valuable metrics listed straight across the top, giving insights into alerts, capacity, and performance with a quick glance.

- You can select discovered initiators as part of a host configuration, or add hosts' new initiators as part of an automatic pre-provisioning process.

- Provisioning one or multiple volumes at the same time is simple. The volume deletion process is equally easy, letting you bypass the recycle bin with just a checkbox, rather than having to navigate elsewhere to purge items you intended to delete.

While other vendors' management consoles have subsets of these features, the **Dell PowerStore UI has the whole package**.

Expert perspective offers you the opinions of our experts at PT, reflecting our team's years of hands-on experience and deep knowledge of the tech industry. This is an individual's statement, not a statement from PT as a company.

Lifecycle Extension with ProSupport

Our research indicates that Dell has developed the Lifecycle Extension with ProSupport program to give organizations an easy and cost-effective way to accommodate growing needs. As a Storage Review article states, "Lifecycle Extension is an easy way to stay current with the latest PowerStore advancements, from data-in-place upgrades to boost performance to scale-out, capacity refreshes, or next-gen platform upgrades. All subscribers also benefit from Dell's Future-Proof program guarantees."[15] Subscribers also enjoy exclusive benefits such as annual modernization consultations, for detailed advice on which available flexible technology upgrades are best, and a storage capacity allowance, which provides unlimited drive updates with a 25 percent credit (up to 100TB) on qualifying purchases.[16]

To learn more, visit https://www.delltechnologies.com/asset/en-us/services/support/technical-support/lifecycle-extension-datasheet.pdf.

Integrated data protection

To help organizations boost security as cyber threats increase, Dell has developed a unique integration between Dell PowerStore arrays and Dell PowerProtect™ Data Domain appliances: Dell Storage Direct Protection.[17] Storage Direct Protection enables organizations to use the PowerStore user interface to back up PowerStore data to PowerProtect Data Domain appliances or APEX Protection Storage.[18] This combined solution allows for the potential of increased operational efficiency, with an Instant Access feature for fast data recovery, automated snapshots, and more.[19] "Dell PowerProtect Data Domain appliances also bring their own data reduction support of typically up to 65:1;[20] according to Dell, this means just one appliance can deliver up to 42.2 PB of logical backup capacity.[21,22]

We have hands-on experience with PowerProtect: In a 2024 study, we researched PowerProtect Cyber Recovery and found several significant benefits, including that it provides a physical air gap, performs deep scanning (beyond metadata) for ransomware, and can search for malware in more places than a competing solution.[23]

To learn more, visit https://www.dell.com/en-us/blog/streamline-cyber-resiliency-with-storage-direct-protection-for-powerstore/.

Conclusion

Organizations are seeking the most cost-effective storage solutions for running diverse, data-intensive workloads in a private cloud environment. High-efficiency data reduction greatly reduces the amount of physical storage space a data set requires. This increases the maximum effective capacity—the actual storage space available after applying data reduction techniques. Greater effective capacity allows companies to store a given amount of data using fewer drives and less hardware, which leads to both a smaller data center footprint and savings in the areas of hardware, power, cooling, and software licensing.

Understanding the vital role that data reduction plays in cost-effective storage for the data explosion, Dell is committed to data reduction technology and guarantees that all its PowerStore models will deliver data reduction ratios of 5:1. Our rigorous hands-on testing supports the confidence upon which Dell has based this guarantee. The PowerStore 500T—the lowest-cost model in this family of products—achieved a data reduction ratio of 5.4:1, surpassing the Dell 5:1 Data Reduction Ratio guarantee. In contrast, array-based storage solutions from three leading vendors and HCI storage solutions from two leading vendors achieved lower data reduction ratios, which means they required more physical storage space to store a fixed amount of data. To maximize the return on your storage investment with effective data reduction, consider Dell PowerStore.

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Read the science behind this report ▶

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This project was commissioned by Dell Technologies.