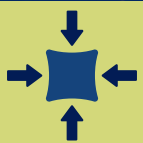
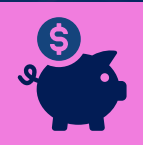




With Dell™
PowerStore™,
you can...



Get greater storage efficiency with up to 3.1x better data reduction than an HCI solution*



Lower five-year costs by 21% compared to an HCI solution to provide a similar amount of effective storage capacity*



Manage storage resources with existing tools using the VSI plugin or do even more with VSI + VxRail™ dynamic nodes

*Dell PowerStore 500T array (data reduction on a 2C/2D data set 5.32:1; average data reduction ratio 5.10:1) vs. an HCI Vendor U solution (data reduction on a 2C/2D data set 1.69:1; average data reduction ratio 2.23:1). Savings based on list prices.

Gain the flexibility that diverse modern workloads demand with Dell PowerStore

A disaggregated infrastructure featuring Dell PowerStore can deliver cost savings compared to an HCI solution thanks to superior data reduction and lower licensing costs

Organizations today rely on both traditional workloads, such as ERP and CRM, and modern workloads that employ containerization, AI/ML, and edge computing. Alongside the data growth these newer workloads are generating is an increase in the private cloud market, with one study predicting a compound annual growth rate of almost 30 percent from 2024 to 2030.¹ To manage a more diverse and complex set of storage requirements, IT teams need capable storage solutions that can support both modern and traditional demands.

As decision-makers explore storage options to meet these requirements, optimize spending, and—for those currently using hyperconverged infrastructure (HCI)—avoid vendor lock-in, they must prioritize architectural flexibility.

This paper explores the advantages of a disaggregated infrastructure featuring Dell PowerStore over HCI, focusing on data reduction, pricing, and lifecycle management. In our testing, a Dell PowerStore solution achieved up to 3.1 times more data reduction than a solution from a vendor we call HCI Vendor U. For the same amount of effective storage, Dell PowerStore would cost 21.9 percent less over five years, while offering familiar lifecycle management tools.

Evolving storage strategies: How a disaggregated infrastructure using Dell PowerStore can support on-premises data growth while offering flexibility and choice

As the volume of data organizations must store and the complexity of the application landscape both increase, so do demands on storage. Organizations can choose how to address these demands by implementing hybrid or private cloud solutions.

Two approaches have been on the scene for some time. The first is a **three-tier model** with separate compute, networking, and storage hardware, often from different vendors. While open, this approach can be complex to set up, manage, and maintain.

The second is **hyperconverged infrastructure (HCI)**, which integrates all three layers into a single system. The advantage of HCI is simplicity, but it has limitations: Expanding storage requires buying additional servers, which increases compute and software licensing costs. Moreover, committing to HCI means risking vendor lock-in and limiting future choices—a concern cited by more than half of CIOs.²

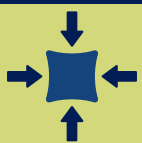
A third alternative is a **disaggregated infrastructure**. Here, independent compute, network, and storage hardware function together as an interoperable ecosystem. A disaggregated infrastructure serves organizations in a number of ways:

- Unlike with HCI, they can avoid server and OS vendor lock-in and extra servers and licensing costs.
- Unlike with HCI, they can scale storage up or down depending on data capacity needs without scaling compute. The ability to scale compute power independently allows them to maximize server efficiency and server utilization. (See “[Scale compute independently from storage](#)” on page 4 to learn more.)
- Unlike with HCI, they can custom-tailor storage characteristics to meet the specific performance requirements of multiple workloads, or provision storage arrays to host data from many different sources and workloads.
- Unlike with a three-tier approach, they can reap the benefits of consistent management and operations across the ecosystem.

A key benefit of disaggregated infrastructure with shared storage is in the area of **advanced data reduction features**, such as compression and deduplication. These features maximize physical storage capacity, with the potential to both lower CapEx, by optimizing server and storage utilization and reducing hardware needs, and cut OpEx through decreased licensing requirements.

In the pages that follow, we illustrate how a unified approach to disaggregated infrastructure with Dell PowerStore advanced data reduction drives five-year cost savings compared to an HCI solution. We also explore some of the advantages of the PowerStore solution in the area of management.

How efficient data reduction helps your bottom line



Multiple copies of the same data within a data set can consume valuable storage space. By using advanced data reduction techniques like deduplication and compression, organizations can reduce physical storage footprint and increase effective capacity—the actual storage space available after data reduction. This approach reduces hardware needs, thereby lowering costs for power, cooling, and rack space.

Hands-on data reduction testing: Store data more efficiently

As part of highlighting the benefits of a disaggregated infrastructure featuring Dell PowerStore, we set out to measure the efficacy of Dell PowerStore compression and deduplication features. Our Dell shared storage solution comprised a Dell PowerEdge™ R760 server and a Dell PowerStore 500T storage appliance. The HCI Vendor U solution we tested used standard dual-socket servers with HCI software. We followed recommendations from each vendor's published best practices.

We used a storage benchmarking tool called Vdbench to measure data reduction on the Dell shared storage and HCI Vendor U solutions. We used newly provisioned 2TB LUNs to ensure storage reclamation and reporting was accurate for each platform. For our Dell PowerStore tests, we used the Fibre Channel storage protocol and added the 2TB LUN to the VM as a raw device mapping (or RDM). For our HCI Vendor U tests, we used a 2TB virtual disk, which we created on the software-defined storage.

To reflect the variety of data in different situations, we tested two different data sets:

- a data set with 2:1 compression and 2:1 deduplication ratios (2C/2D)
- a data set with 4:1 compression and 1:1 deduplication ratios (4C/1D)

Using Vdbench, we performed write tests with 256KB blocks to fill each 2TB disk with data on both solutions. After completing each test, we analyzed the deduplication and compression efficiency of each solution. We did this by examining each management console and determining the reported data reduction ratios. This allowed us to assess how effectively each solution recognized and eliminated redundant data, as well as how much data each solution compressed. For step-by-step details of how we tested, see the [science behind the report](#).

Findings with a 2C/2D data set

With the 2C/2D data set, the Dell PowerStore shared storage solution achieved an overall 5.32:1 data reduction ratio compared to the 1.69:1 ratio of the HCI Vendor U solution. This means the Dell PowerStore solution used only 384.4 GB of physical space to store 2 TB of data and offered 3.1 times better data reduction than the HCI Vendor U solution, which required 1,213.52 GB of physical space (see Figure 1).

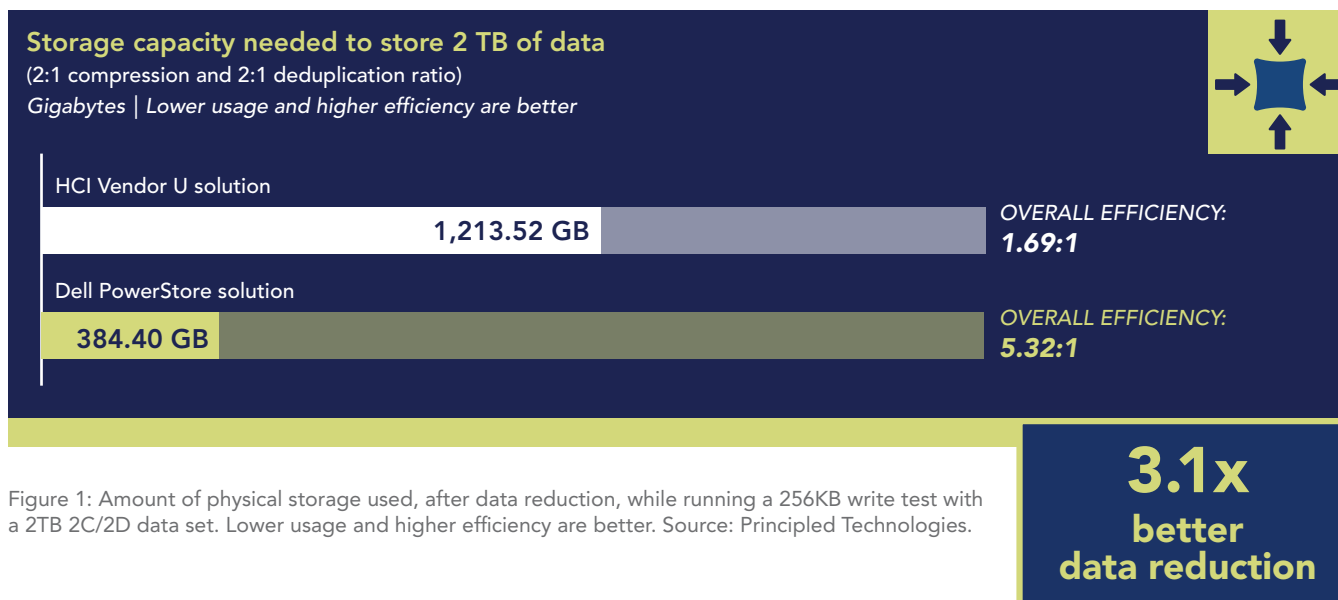
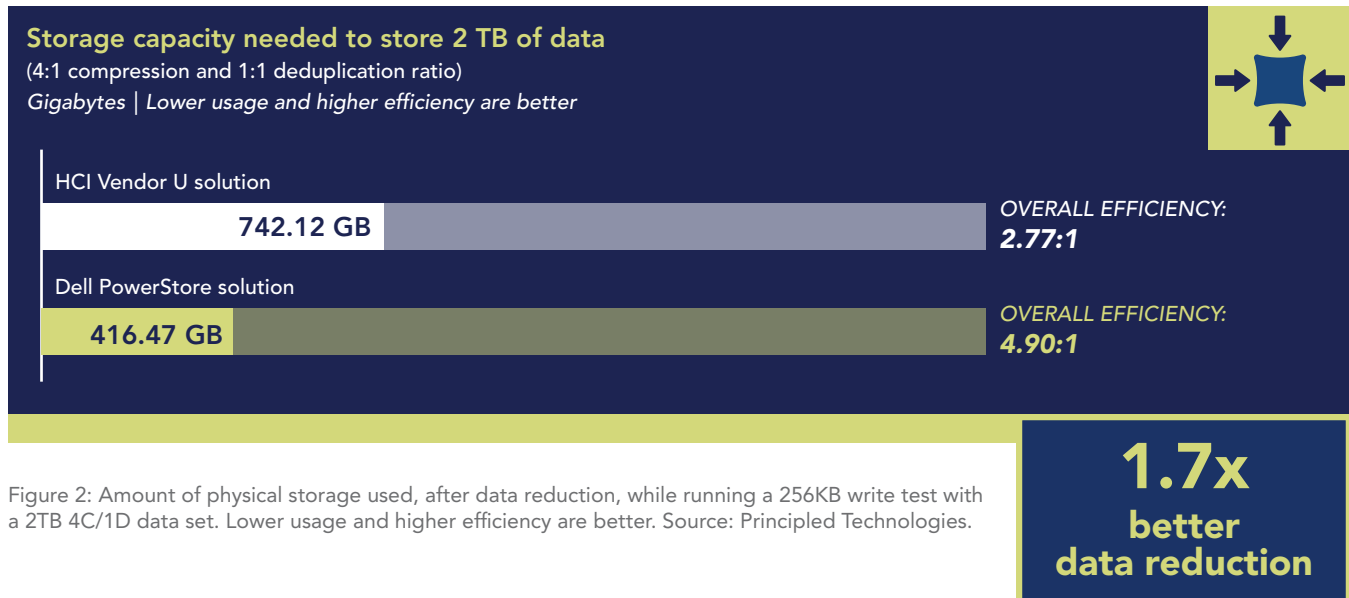


Figure 1: Amount of physical storage used, after data reduction, while running a 256KB write test with a 2TB 2C/2D data set. Lower usage and higher efficiency are better. Source: Principled Technologies.

Findings with a 4C/1D data set

With the 4C/1D data set, the Dell PowerStore shared storage solution achieved an overall 4.9:1 data reduction ratio compared to the 2.7:1 ratio of the HCI Vendor U solution. The Dell PowerStore solution offered 73 percent better data reduction than the HCI Vendor U solution, requiring only 416.47 GB of physical space to store 2 TB of data while the HCI Vendor U solution needed 742.12 GB (see Figure 2).



Overall, the Dell PowerStore storage solution demonstrated a significant advantage in data reduction over the HCI Vendor U solution. The 2C/2D tests highlight the superiority of the PowerStore array in handling data sets that benefit from deduplication and compression, while the 4C/1D tests show that even in scenarios that utilize only data compression, the PowerStore array still provides an advantage.

Scale compute independently from storage

In a hyperconverged infrastructure, your compute and storage resources both come from the same system—but a disaggregated architecture allows you to scale server and storage resources separately, thus maximizing server efficiency and server utilization. While you gain storage resources from Dell PowerStore, latest-generation Dell PowerEdge servers can deliver scalable compute performance. According to Dell, these servers “maximize compute power per rack unit and are optimized for hybrid and multicloud environments.”³ As just one example, we saw very strong performance from a latest-generation Dell PowerEdge R7625 server in a recent PT study, where it performed 7.8 times the data analytics work of a legacy server and thus delivered a 7:1 consolidation ratio.⁴

Learn more about the newest Dell PowerEdge servers at <https://www.dell.com/en-us/shop/data-center-servers/sf/poweredge-datacenter-servers>.

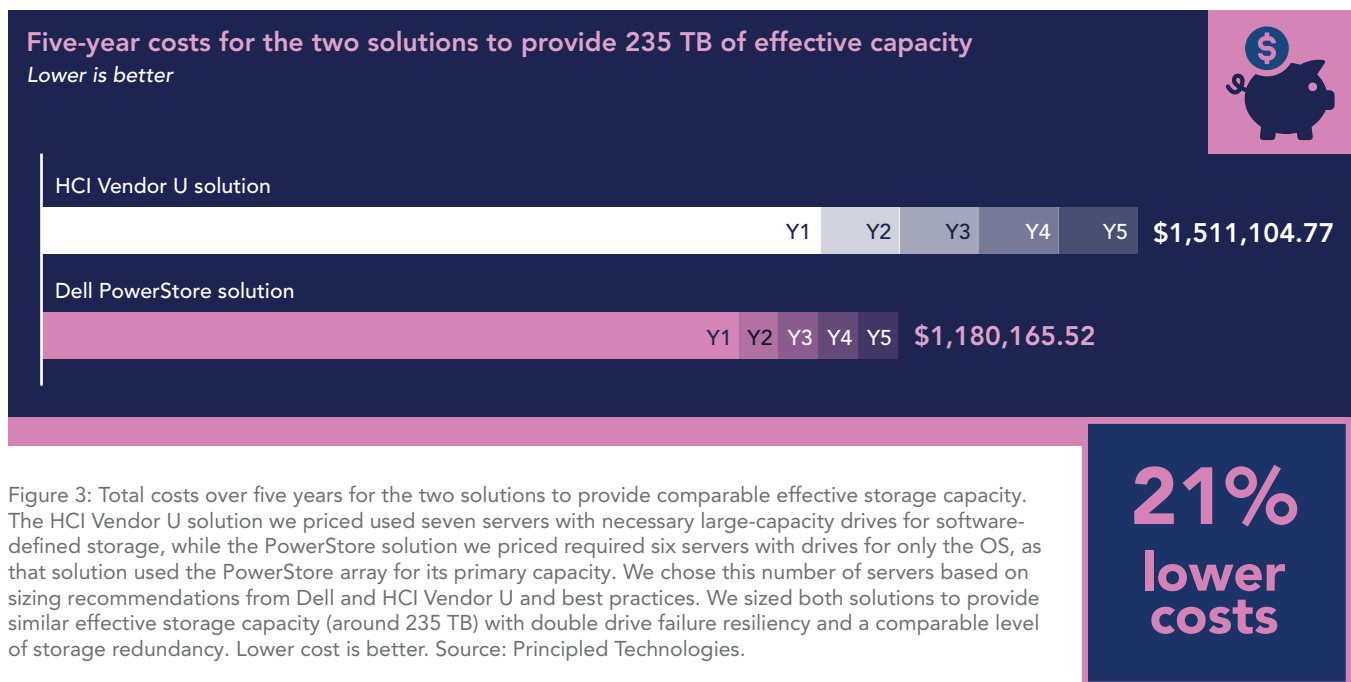
How you save: Efficient data reduction means you need less hardware and fewer licenses

To assess the financial benefits of a shared storage architecture such as Dell PowerStore versus the HCI Vendor U solution, we built and quoted both solutions with similar capabilities, each capable of storing approximately 235 TB of data.

For this cost analysis, we quoted a solution using a PowerStore 500T appliance. We sized the solutions by averaging the data reduction ratios from our test results. Those averages were 5.10:1 for the Dell PowerStore shared storage solution and 2.23:1 for the HCI Vendor U solution. Note that all Dell PowerStore appliances feature always-on data reduction capabilities and should provide the same level of data reduction, with higher-end models offering greater I/O processing power and higher limits for certain data services for environments that need those features. In fact, Dell includes a 5:1 data reduction ratio guarantee with every PowerStore appliance it sells.⁵

Our calculations include the cost of hardware, software, and basic support for both solutions over five years. Due to differences in storage architecture, the hardware requirements for each solution varied.

Please note that solution costs could vary significantly with discounts; we used list prices for this comparison.



Our analysis in Figure 3 shows that over the course of five years, using a combination of six PowerEdge R760 servers and a single PowerStore 500T storage array with seventeen 3.84TB drives would be 21.9 percent less expensive than the HCI Vendor U solution that provided comparable storage capacity, based on hardware and software list prices.

As our analysis shows, the superior data reduction capabilities of the Dell PowerStore solution lead to savings in multiple ways. Not only does an organization need fewer drives, but it also requires fewer servers. This reduces capital expenditures for hardware and, if they are using a per-CPU software licensing structure, decreases ongoing operating expenses as well.

Manage storage resources with existing tools using the VSI plugin, or do even more with VSI + VxRail dynamic nodes

Manageability is a key concern for any team considering a new hardware solution; simple, straightforward end-to-end management is ideal, and it's valuable to be able to use tools with which you're already familiar. Some buyers may turn to HCI architectures for this reason, but HCI isn't necessarily a requirement for easy manageability. Dell offers a Virtual Storage Integrator (VSI) plugin for PowerStore that lets VMware vSphere® admins manage their PowerStore arrays from the vSphere console.

We installed the VSI plugin in a VMware environment managed via VMware vCenter® and assessed its functionality. The plugin worked as we expected, allowing users to complete typical storage and hardware lifecycle management tasks, such as creating and mapping volumes, within the vCenter GUI without needing a different management tool. The VSI plugin also provided other valuable features, such as easy performance tracking and the ability to change the preferred performance profile from the performance monitoring screen (see Figure 4). This can help add flexibility and enhance administrative efficiency, supporting IT with a simplified lifecycle management experience.

If you currently rely on hyperconverged appliances powered by VMware vSphere and VMware vSAN™, you can integrate a Dell PowerStore array into your existing VMware infrastructure using the PowerStore VSI plugin with compute-only Dell VxRail dynamic nodes. By adding VxRail dynamic nodes to PowerStore, customers can take advantage of the simplified and secure lifecycle management experience that an HCI architecture brings, while increasing the flexibility of their infrastructure through independent scaling of compute and storage. One key capability is being able to perform PowerStoreOS upgrades completely through the VMware console (see Figure 5).

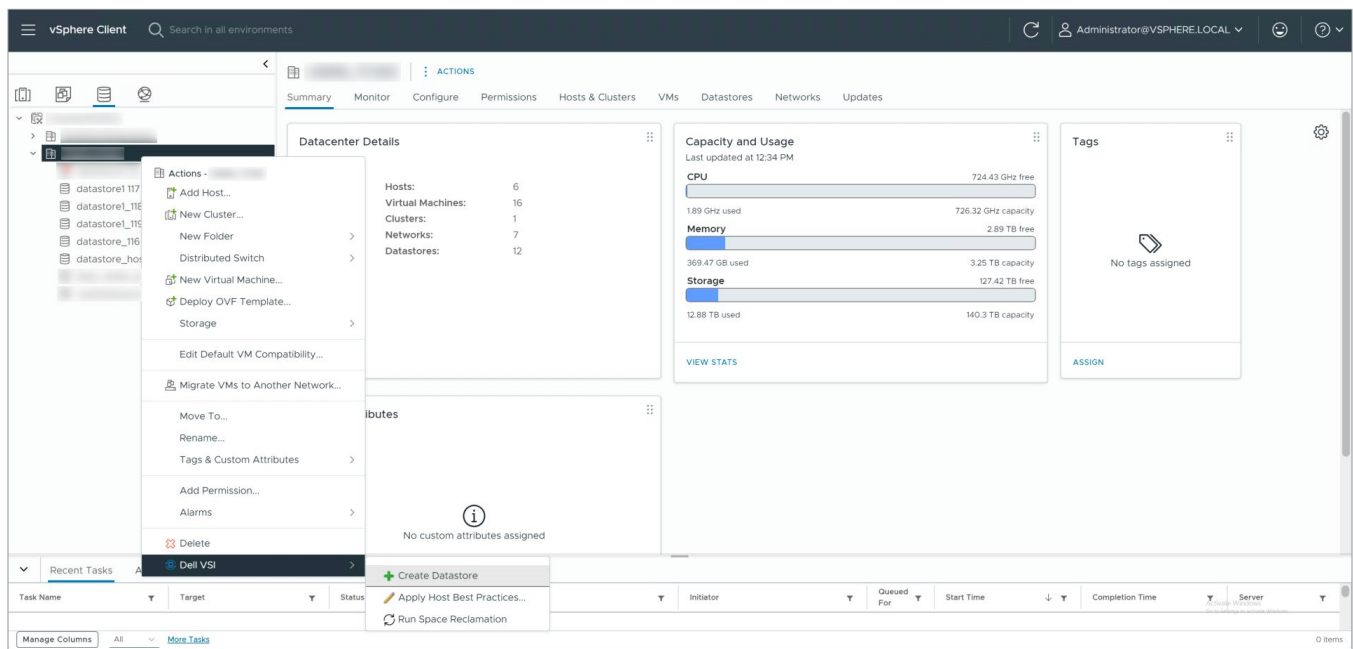


Figure 4: With VSI installed, you can perform basic PowerStore management tasks from a VMware management console. In this screenshot, we use the vSphere client and VSI to create a new datastore from PowerStore. Source: Principled Technologies.

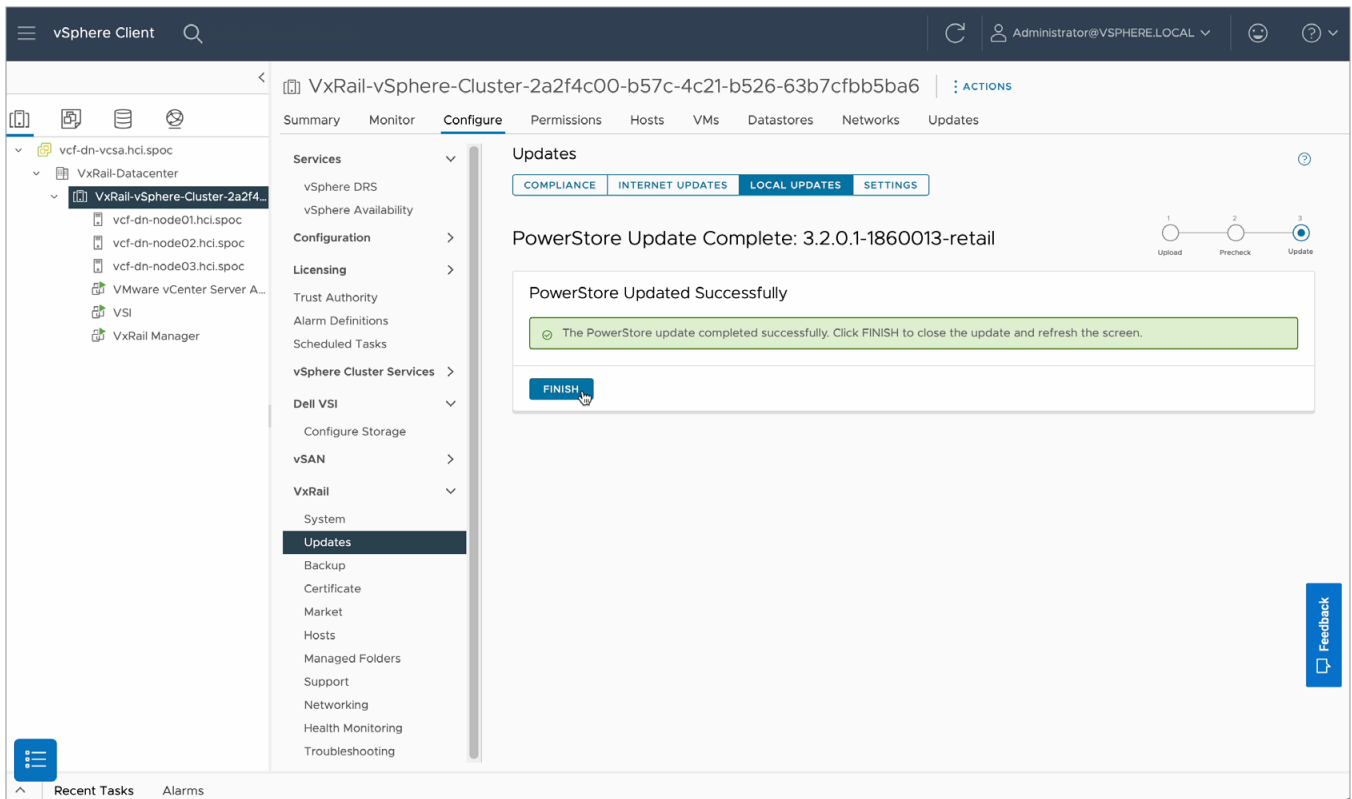


Figure 5: With Dell VxRail dynamic nodes, you have the capability to update PowerStore appliances from within the VxRail management console. Source: [Dell Demo Center](#).



Conclusion

As the popularity of data-intensive, next-generation workloads increases alongside massive data growth, selecting the right storage architecture becomes extremely important. Choosing a disaggregated infrastructure featuring Dell PowerStore can help you optimize costs, maintain flexibility, and avoid overpaying for compute resources. As our testing revealed, the data reduction capabilities of a Dell PowerStore shared storage solution exceeded those of an HCI solution from HCI Vendor U, enabling it to deliver equivalent effective storage capacity with a five-year cost of ownership that is 21.9 percent lower. Furthermore, for organizations relying on a VMware infrastructure, using Dell VxRail dynamic nodes offers straightforward lifecycle management capabilities for the Dell PowerStore array. With advantages in data reduction, cost, and manageability, shared storage can offer significant value for your next-generation workloads.

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Read the science behind this report at <https://facts.pt/jya3bfg> ▶



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This project was commissioned by Dell Technologies.