ESG Lab Review

Platform- and Data-efficient Dell Storage SC Series

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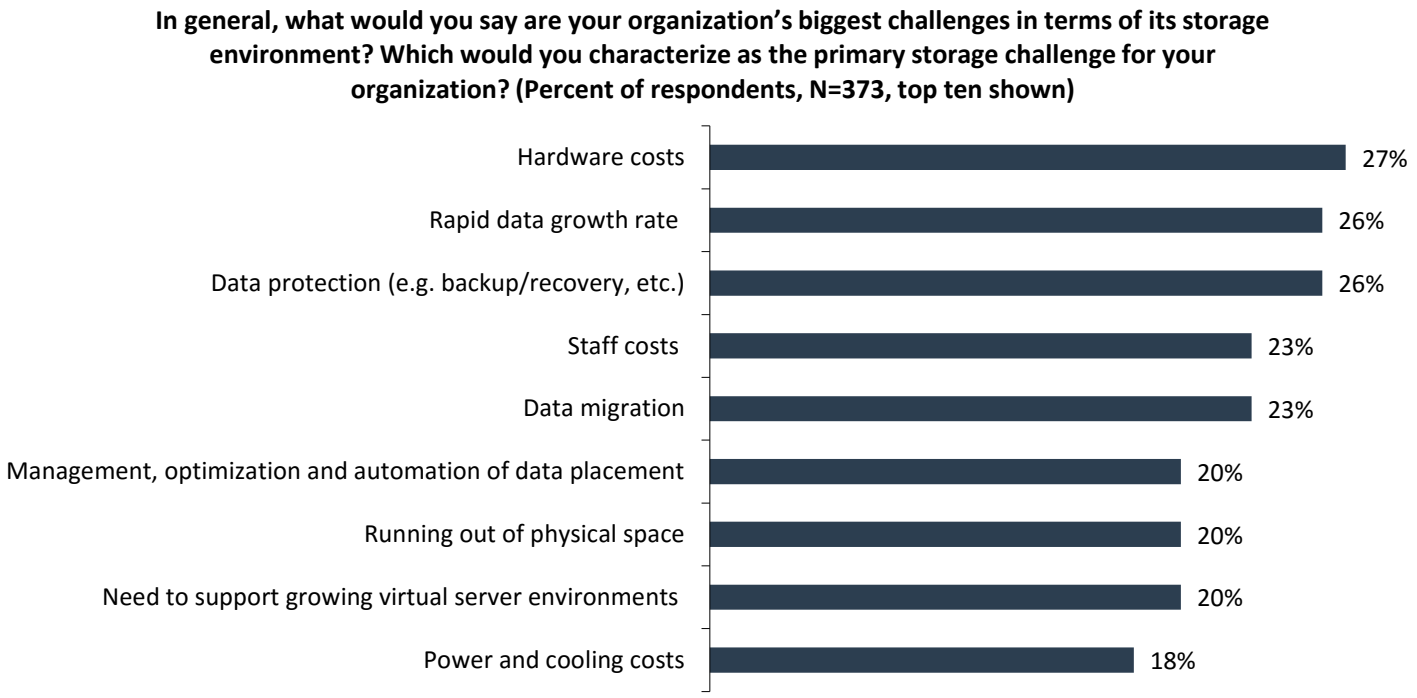
Abstract

This ESG Lab review documents hands-on testing of Dell Storage SC Series running Storage Center OS version 7. Testing focused on how data reduction technologies layer data efficiency on top of the platform efficiency of the SC series to drive even greater value and price/performance for customers.

The Challenges

ESG conducted an in-depth survey of 373 IT and data storage professionals concerning their organizations' current data storage environments, asking about topics such as storage resources, challenges, purchase criteria, and forward-looking data storage plans.[1] ESG asked respondents to identify their organizations' biggest challenges pertaining to their storage environments. As shown in Figure 1, cost is clearly a key consideration for IT organizations, with more than half (53%) citing capital and/or operational expenses—including both staff and power and cooling costs—as a storage challenge.

Figure 1. Top Nine Storage Environment Challenges



Source: Enterprise Strategy Group, 2016

Additionally, 20% of organizations cited the management, optimization, and automation of data placement as a challenge. These responses show that in addition to reducing capital and operational costs, organizations are very interested in simplifying management and maintenance for current and future storage environments. What's needed is a solution that automates data placement and protection on the most efficient tiers of storage while optimizing capacity to minimize costs.

[1] Source: ESG Research Report, *2015 Data Storage Market Trends*, October 2015.

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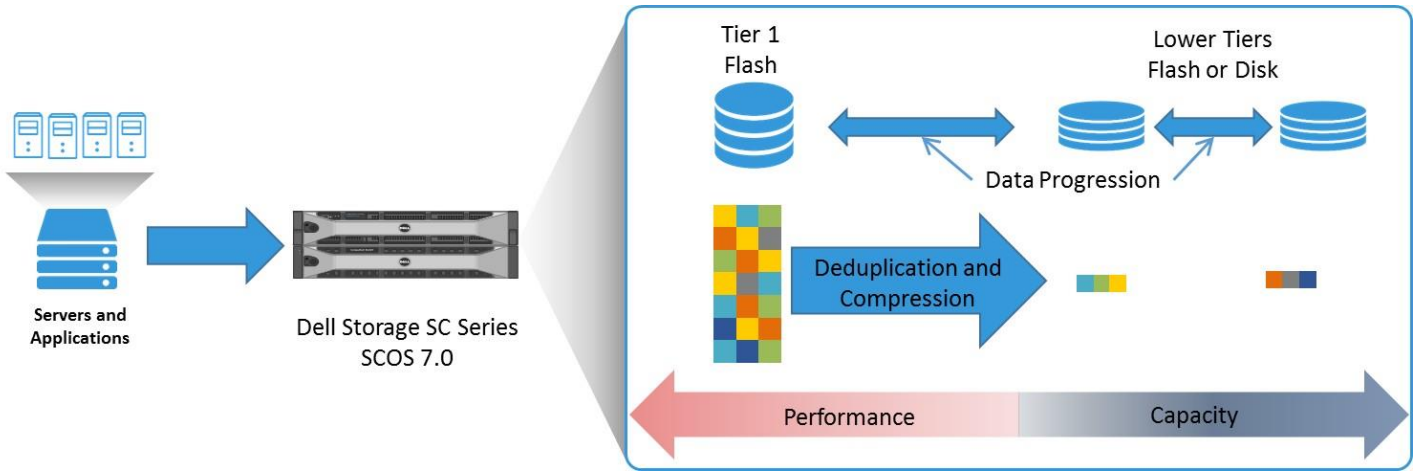
The Solution: Dell Storage SC Series with Storage Center OS 7

Dell Storage Center was architected from the ground up with an architecture that automates the movement and protection of data at the block level by using available space residing on different tiers of storage media. This capability, which Dell refers to as Data Progression, is ideally suited for getting the most out of the latest innovations in storage media technology.

Dell Storage Center is a SAN attached storage solution that uses a combination of intelligent software, a pair of clustered storage controllers built from industry-standard server hardware, host interface controllers (e.g., Fibre Channel and iSCSI), and one or more drive enclosures to store and protect an organization's data. Drive enclosures can be populated with multiple tiers of storage to meet a variety of price and performance requirements (e.g., flash, SAS, and SATA), with the ability to "mix and match" storage technologies and interfaces in a modular fashion.

Dell Storage Center OS (SCOS) 7 is designed to provide comprehensive data reduction by adding block-level deduplication and compression to the SC4020, SC8000, and SC9000 models to layer data efficiency on top of the platform efficiency of the SC series. Deduplication is designed for flash-optimized Dell SC storage. Deduplication and compression are available on the lowest tier each disk type in the system—SSD and HDD.

Figure 2. Data Efficiency with Dell Storage SC Series and SCOS 7.



About Inline Deduplication

Dell Storage Center's implementation of deduplication uses flash in the array for metadata. All writes are placed in metadata before the data reduction algorithms process them. This uses the same process as most vendors that claim to provide inline deduplication: They accept data into a high-speed non-volatile buffer and run their deduplication algorithm against it prior to writing the data to disk. Dell's choice to integrate deduplication and compression into Data Progression is a natural fit and provides the effective benefits of inline deduplication while optimizing performance and data protection. Dell Storage SC Series' deduplication and compression features can offer up to 10:1 capacity savings depending on data and workload.

With SCOS 7, Dell leverages its proven Data Progression technologies to perform capacity reduction. All writes land in the top tier of flash and data reduction techniques are performed on the data, i.e., data is moved, deduplicated, and compressed, as shown in Figure 2. When using deduplication, data will also be compressed by default, but users can choose to perform just compression if deduplication is not conducive to the data set. For example, deduplication might offer a moderate advantage in a VDI environment, but compression can be a better choice in environments where there is little duplicate data, like OLTP, email, and seismic analysis.

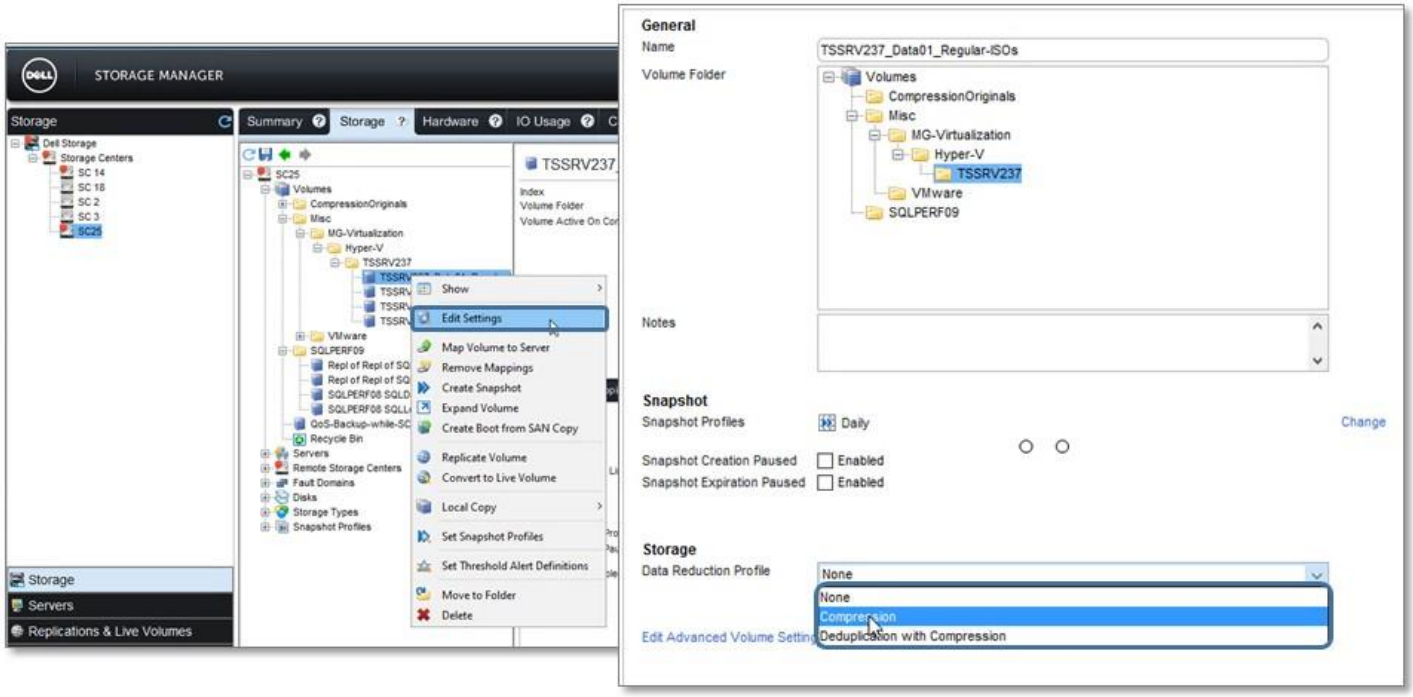
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ESG Lab Tested

ESG Lab examined data reduction in the Dell Storage SC Series using multiple realistic data sets installed on VMware and Hyper-V Virtual machines with a goal of simulating a real-world IT environment. The total data set size was 12 Terabytes and included infrastructure components like Active Directory Servers as well as a Virtual Desktop environment and a multi-terabyte SQL Server database environment.

First, ESG Lab enabled compression on the volumes under test, as seen in Figure 3. Deduplication and compression can be set on a volume-by-volume basis, allowing organizations to optimize data reduction to individual data sets. Once enabled, data reduction can be paused on individual volumes as well.

Figure 3. Enabling Compression and Deduplication in Dell Storage Center

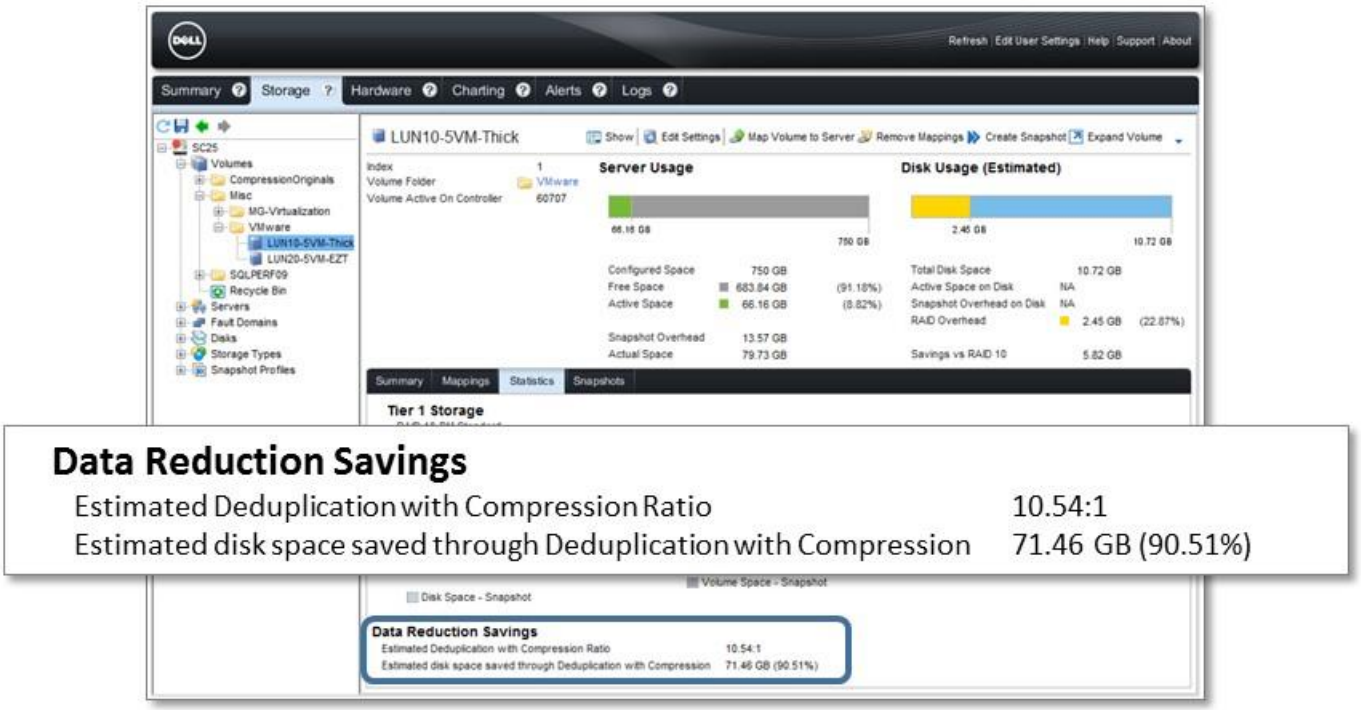


When the compression activity was completed, the results were recorded. Next, ESG Lab enabled deduplication on the volumes. After the deduplication activity completed, the results were recorded.

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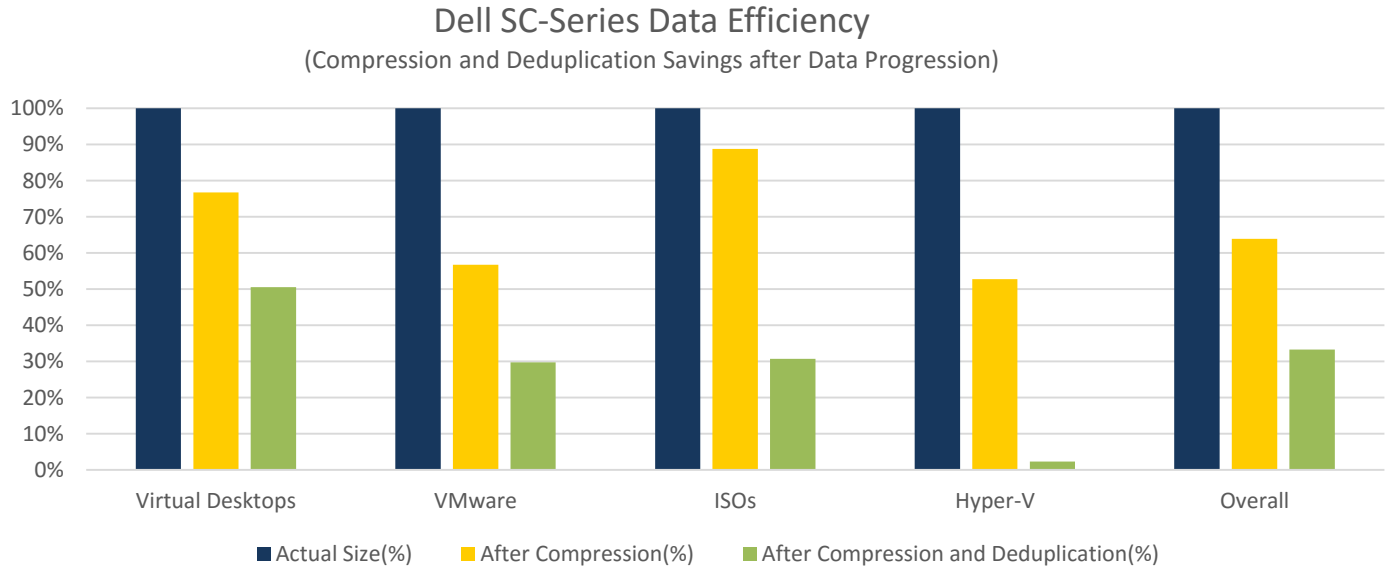
Figure 4 shows the compression and deduplication results for a single volume.

Figure 4. Compression and Deduplication for a Single Volume



A summary of the data reduction for each tested data type and for the overall data set is depicted in Figure 5 and Table 1. The blue bars represent the actual size of the original data, the yellow bars show the data size after compression, and the green bars show the effect of compression and deduplication.

Figure 5. Data Compression and Deduplication with Dell SCOS 7



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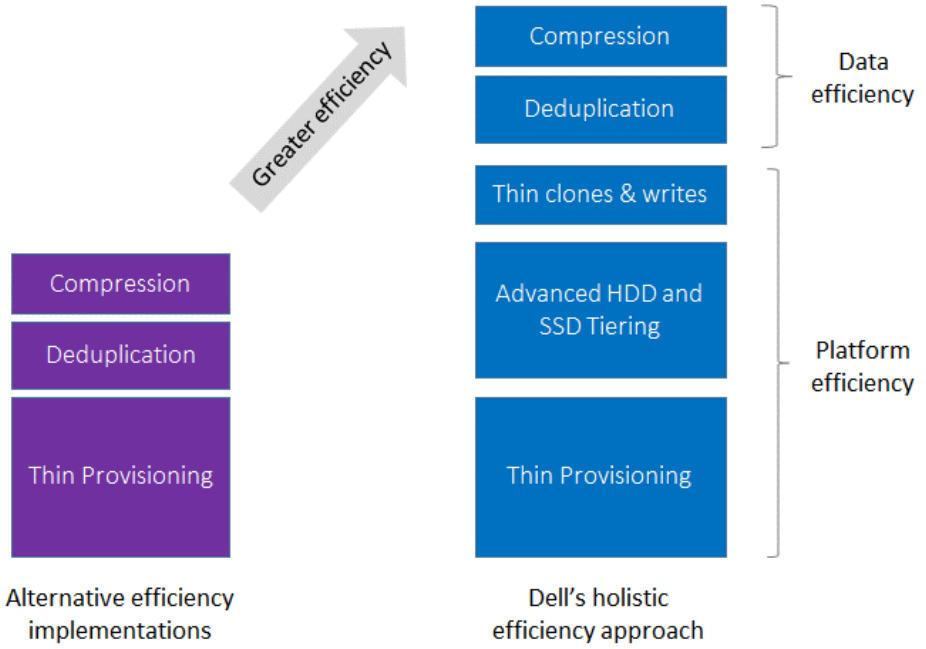
Table 1. Data Compression and Deduplication with Dell SCOS 7

Data Type	Actual Size (GB)	After Compression (GB)	After Compression (%)	After Compression and Deduplication (GB)	After Compression and Deduplication (%)
Virtual Desktops	1,180	905	76.73%	597	50.56%
VMware	3,677	2,086	56.74%	1,093	29.72%
ISOs	541	480	88.79%	166	30.73%
Hyper-V	197	104	52.74%	5	2.34%
Overall	5,594	3,575	63.91%	1,860	33.25%

Source: Enterprise Strategy Group, 2016

Due to the variability of IT ecosystems and data sets across organizations, no one specific capability or feature can provide the best efficiency in every situation. Dell's SC storage is designed with the goal of providing the most user value by taking a holistic approach (see Figure 6). The platform efficiency of the Dell SC Series provides a foundation for greater efficiency due to the low overhead and powerful capabilities of the Data Progression architecture including advanced HDD and SSD tiering, thin clones, and thin writes.[2] The data efficiency technologies that were introduced in SCOS version 7 (data deduplication and compression) can be used to magnify that efficiency for a broad variety of applications and workloads. Data efficiency was improved by 66.75% during ESG Lab testing with a variety of real-world data types, achieving a 3:1 reduction ratio across the entire 12TB data set. This is a good result and comparable to what ESG Lab has seen in previous tests of inline reduction of production data sets.

Figure 6. Holistic Efficiency Stack Approach



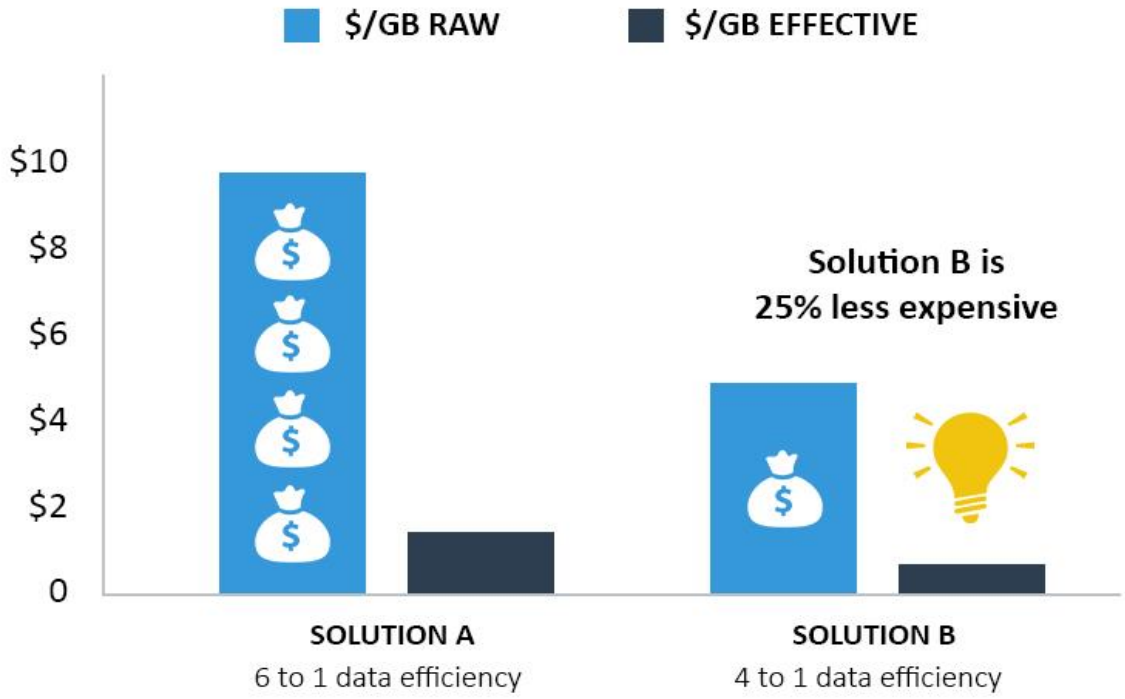
While results vary based on implementation and some workloads such as VDI can see significant efficiency gains with deduplication, it is important to remember that the value of a storage solution is impacted not just by the data efficiency ratio, but also by the cost of the raw capacity. For example, if a solution provides a 6:1 efficiency ratio but costs twice as

[2] Source: ESG White Paper, *Dell SC Storage: Data Efficiency*, June 2015.

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much as a competing solution with a 4:1 ratio, then the technically less-efficient solution is still more affordable thanks to a lower cost of raw capacity (see Figure 7).[3]

Figure 7. Net Cost to Customer



Why This Matters

In the traditional sense, enterprise storage systems are expensive. While many organizations make great use of enterprise-level features and functionality, these features come at too great a cost to smaller businesses and enterprise organizations deploying departmental or branched strategies. At the same time, data growth continues to challenge IT, driving up equipment and management costs. Ever-expanding data volumes consume more network and storage resources while complicating backup and disaster recovery, particularly in consolidated server and storage deployments. Most deduplication and compression solutions are designed for secondary data and applications such as backup and archiving.

ESG Lab has previously validated that the Dell Storage SC platform provides enterprise-level technology, functionality, and support in a cost-effective package. The SC Series' enterprise-grade virtualization technologies help minimize capital and operational expenses, while also providing investment protection for future growth.

In these tests, ESG Lab confirmed that the Dell Storage SC platform effectively uses deduplication and compression in combination with thin provisioning, thin writes and clones, and advanced tiering to significantly reduce the amount of primary storage required in production environments while providing excellent performance. ESG Lab testing also confirmed 66% data reduction for production business applications and services across a simulated small enterprise.

The Bigger Truth

[3] ibid.

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ESG research reveals that return on investment is consistently one of the most important considerations when justifying future IT investments to business management teams.[4] While this is not unique to data efficiency, it is still generally true. When procuring storage technologies, the more efficient utilization of hardware resources translates into an increased value derived from that solution.

Organizations are continually at risk of falling into the trap of over-simplifying data efficiency and addressing it merely by the presence of deduplication. By looking past this single feature, organizations can achieve a more accurate assessment of a storage system's data efficiency by focusing on the net efficiency resulting from multiple innovations working in tandem. While it can be a challenge to gain a holistic understanding of how a storage solution optimizes each unique IT ecosystem, it remains a critical component of comprehending the actual value provided by that storage solution. Dell understands that no one feature can achieve data efficiency by itself, and Dell's SC portfolio is a reflection of that understanding.

Dell Storage Center was architected from the ground up with an architecture that automates the movement and protection of data at the block level using Data Progression to leverage capacity residing on different tiers of storage media. Dell Storage Center OS (SCOS) 7 combines block-level deduplication and compression on both SSD and HDD tiers with the SC Series' thin technologies to add data efficiency to the platform efficiency of the SC series. Deduplication is designed for flash-optimized Dell SC storage; existing arrays with all spinning disk can leverage deduplication with a minimal addition of flash. At the time of this writing, Dell is aggressively pricing both their all-flash arrays (as low as $.45/GB) and their Hybrid/HDD arrays (as low as $.10/GB) to drive even more value with the SC Series.

ESG Lab testing validated that Dell achieves a high level of efficiency through the combination of deduplication and compression with a comprehensive collection of thin technologies, intelligent data placement, the integration of TLC 3D NAND, and efficient migration of data across the various layers of storage.

Using all of these techniques together, Dell is continuing to develop their already strong adaptability and provide greater efficiency, improved cost savings, and wider applicability than the use of deduplication and compression alone could offer. If your organization is looking for ways to provide a flexible and efficient, future-ready storage solution that can optimize a wide variety of workloads for both performance and capacity, ESG Lab recommends taking a close look at Dell Storage SC Series.

[4] Source: ESG Research Report, *2016 IT Spending Intentions Survey*, February 2016.

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