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Scaling Storage at the Speed of Cloud-native Application Development With Dell ObjectScale

Alex Arcilla, Senior Analyst, Validation Services
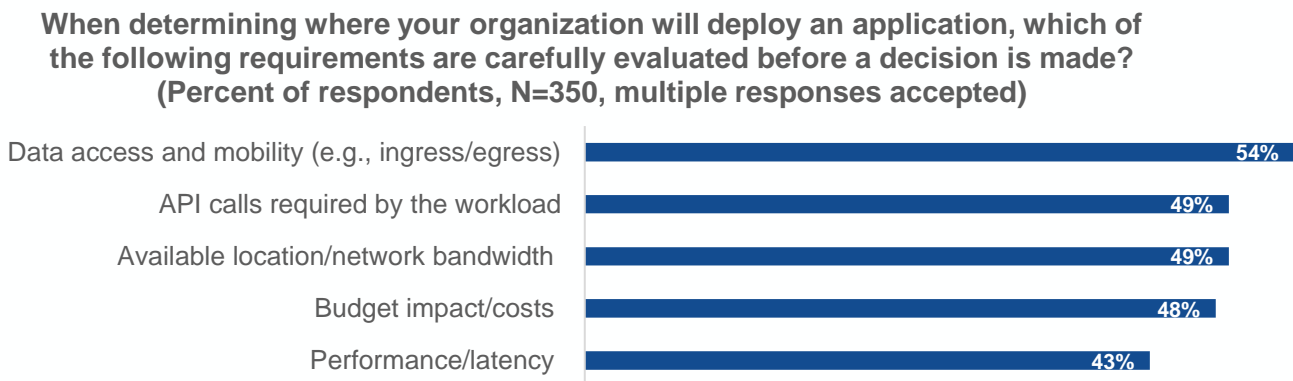
Abstract

This Technical Review evaluated Dell ObjectScale v1.3. TechTarget's Enterprise Strategy Group specifically evaluated how this updated version of Dell ObjectScale enables highly performant object storage to support DevOps methodologies, without being limited to cloud-native storage. We also reviewed how Dell ObjectScale enables organizations to utilize object storage by adhering to developer-friendly practices—namely, those adhering to the S3 standard.

The Challenges

According to recent research from TechTarget's Enterprise Strategy Group, 75% of survey respondents are employing DevOps practices, whether in a limited fashion or extensively, to speed up application development and deployment.[1] This is especially true as more organizations want to deploy modern applications, such as artificial intelligence (AI) and machine learning (ML) tools, more quickly to accelerate time to value and business advantage. However, regardless of whether an organization deploys applications on premises or in the public cloud is primarily determined by the degree of data access and mobility that exists (see Figure 1).[2]

Figure 1. Requirements Evaluated When Deciding Where Applications Are Deployed

When determining where your organization will deploy an application, which of the following requirements are carefully evaluated before a decision is made?
(Percent of respondents, N=350, multiple responses accepted)

Data access and mobility (e.g., ingress/egress)	54%
API calls required by the workload	49%
Available location/network bandwidth	49%
Budget impact/costs	48%
Performance/latency	43%

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

It is no surprise that data access and mobility are of huge concern; ensuring that applications can access the data they need at any given time, while maintaining acceptable performance, is essential. Regardless of how

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applications are developed, they tend to be distributed across hybrid cloud environments consisting of on-premises data centers, public clouds, and edge locations. Such applications also tend to use data distributed across hybrid clouds.

While all cloud-native application data could be centralized in a public cloud, the approach might not make sense for cost, security, or compliance reasons. Yet, maintaining storage platforms for multiple data sources across hybrid clouds presents performance, management, and cost challenges. Deploying and managing storage for distributed applications located on premises or at the edge should be as easy as deploying and managing storage in the public cloud, without incurring any performance hit.

The Solution: Dell ObjectScale

Dell ObjectScale v1.3 has been designed to provide a container-based, software-defined storage architecture, backed by Kubernetes, so that organizations can quickly deploy and scale enterprise-class storage for distributed applications deployed in hybrid cloud environments. With Dell ObjectScale, organizations give developers the same simple experience of deploying and scaling their own on-premises storage as easily and as quickly as deploying public cloud-based storage.

ObjectScale is a natural fit for organizations that employ DevOps methodologies to streamline application development and deployment, as this storage solution is designed with S3 API compatibility to enable on-demand storage provisioning. Increasing storage as needed is also simplified, as ObjectScale is built on a scale-out architecture. Deployed as clusters, ObjectScale can expand from tens of terabytes to petabytes and beyond without limits on the number of object stores, buckets, or objects stored.

Figure 2. Dell ObjectScale XF960 Appliance Advantages
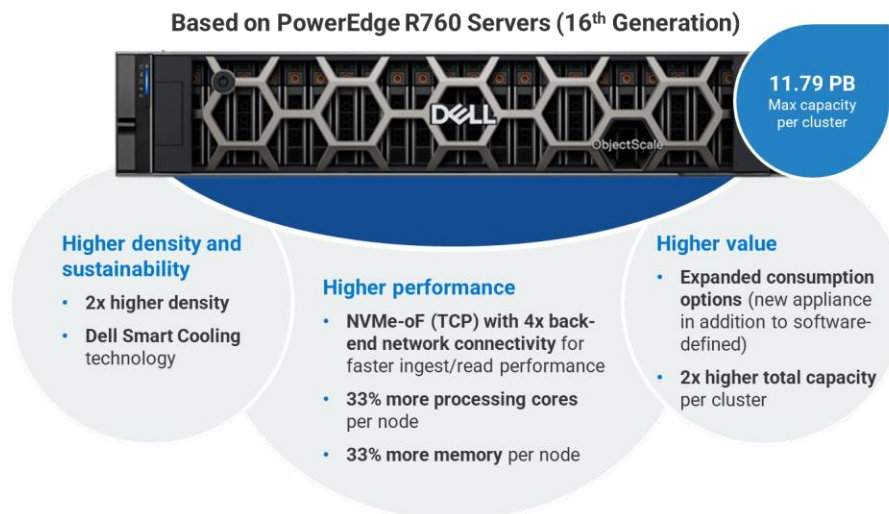
Source: Dell Technologies and Enterprise Strategy Group, a division of TechTarget, Inc.

Organizations can choose from three deployment options:

- **ObjectScale as an Application (with RedHat OpenShift 4.12 and 4.13).** Dell supports the ObjectScale software, while customers manage and support the Kubernetes and OpenShift OS on their own hardware infrastructure.

- **ObjectScale Software Bundle (with SUSE Linux Enterprise Server [SLES] 15 SP4).** Dell manages both the ObjectScale software and Kubernetes OS, while the customer manages and supports the SLES OS on their own hardware infrastructure.
- **ObjectScale XF960 Appliance.** Dell manages and supports the entire hardware and software stack, providing customers with the simplest object storage experience.

Dell ObjectScale XF960, the first release of the ObjectScale X-series appliance family, has been designed as high-performance, all-flash storage optimized to run ObjectScale software. Built on Dell Technologies' PowerEdge R760 server, the XF960 hardware stack includes the servers, back-end switches, rack-mount equipment, and internal network and power cabling.

To maximize performance, the XF960 leverages the NVMe-over-TCP standard to take advantage of the 100 GB back-end network, accelerating node-to-node communication, data access, and data transfer. This appliance is also built with dual 32-core Intel Xeon Gold CPUs and 256 GB registered memory (RDIMM) for additional speed.

Other features supported by the XF960 to provide a cloud storage experience include:

- Global replication to enable data access and fault tolerance from anywhere within the ObjectScale storage pool.
- Enterprise-grade data protection and security, including S3 bucket logging, consensus-based protection, and self-encrypting drives.

Enterprise Strategy Group Tested

Enterprise Strategy Group (ESG) evaluated the performance and usability features of Dell ObjectScale v1.3 to assess how this solution delivers to organizations an experience similar to public cloud storage.

We began by evaluating the performance of the Dell ObjectScale v1.3 operating on a cluster of XF960 appliances against ObjectScale v1.3 operating on a cluster consisting of Dell PowerEdge R740xd2 servers with HDDs, a common and widely adopted Dell server model from a recent generation. Tests were designed to evaluate for higher performance when using all-flash storage arrays for object storage. (All hardware and test configuration details are located in the Appendix.)

Object storage performance metrics were estimated using web services storage API operations, specifically **Get** (for reading data from storage) and **Put** (for writing data to storage). These operations were chosen because these API calls most often operate on full objects rather than on a smaller subset of the entire object. Measuring performance with full objects provides a fair comparison between storage platforms. (To mimic these API calls on the PowerEdge server, we used the **Read** and **Create** commands for read and write operations, respectively.)
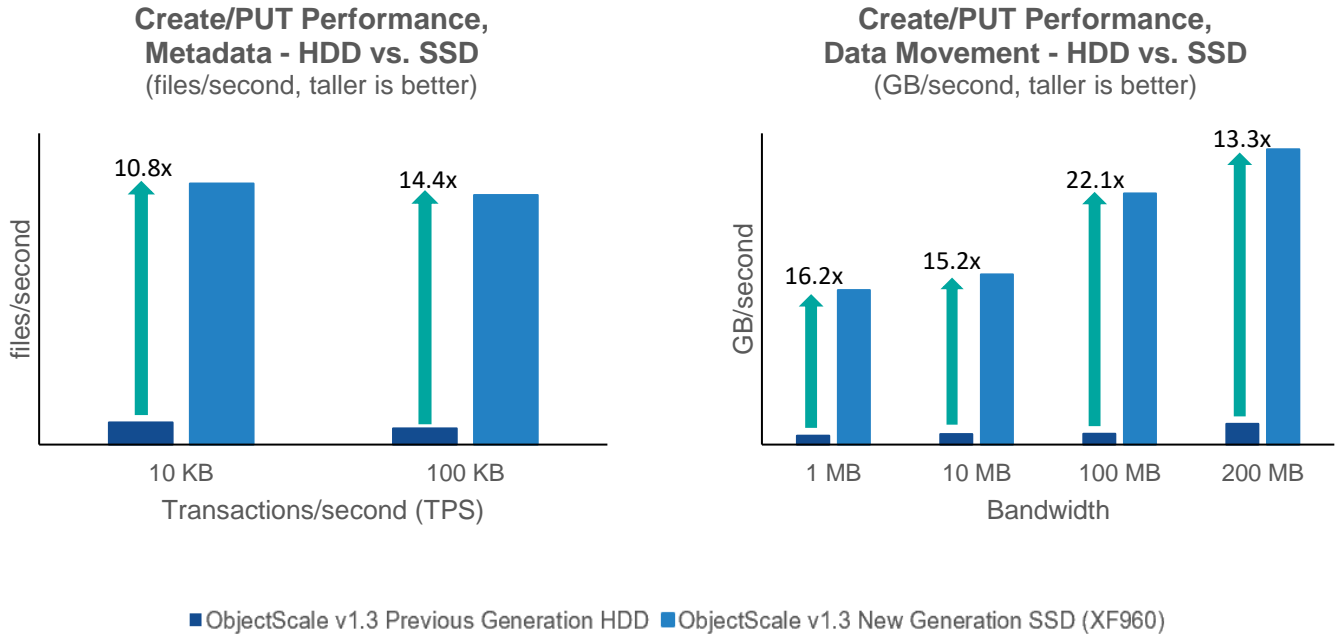
Each read and write operation consisted of two components:

- **Metadata operations.** Also referred to as *transaction overhead*, these operations include both reading and writing or updating the metadata associated with an object. Every transaction on the system has some form of metadata overhead. The size of an object and the transaction type determine the associated level of resource utilization. For metadata operations, throughput of these small objects is quoted in transactions per second (TPS).
- **Data movement.** This operation refers to movement of data between the remote client system and the disks in the ObjectScale cluster. Data movement is proportional to the amount of data moved. For data movement, throughput of these larger objects is quoted in units of bandwidth (i.e., gigabytes per second).

ESG first considered the use case of running at peak throughput while varying object size on both platforms. We first reviewed performance test results measuring **Create/Put** operations for both metadata operations and data

movement, as shown in Figure 3. **Write** operations for metadata were measured at 10 KB TPS and 100 KB TPS. **Write** operations for data movement were measured at 1MB, 10MB, 100MB, and 200MB bandwidth levels.
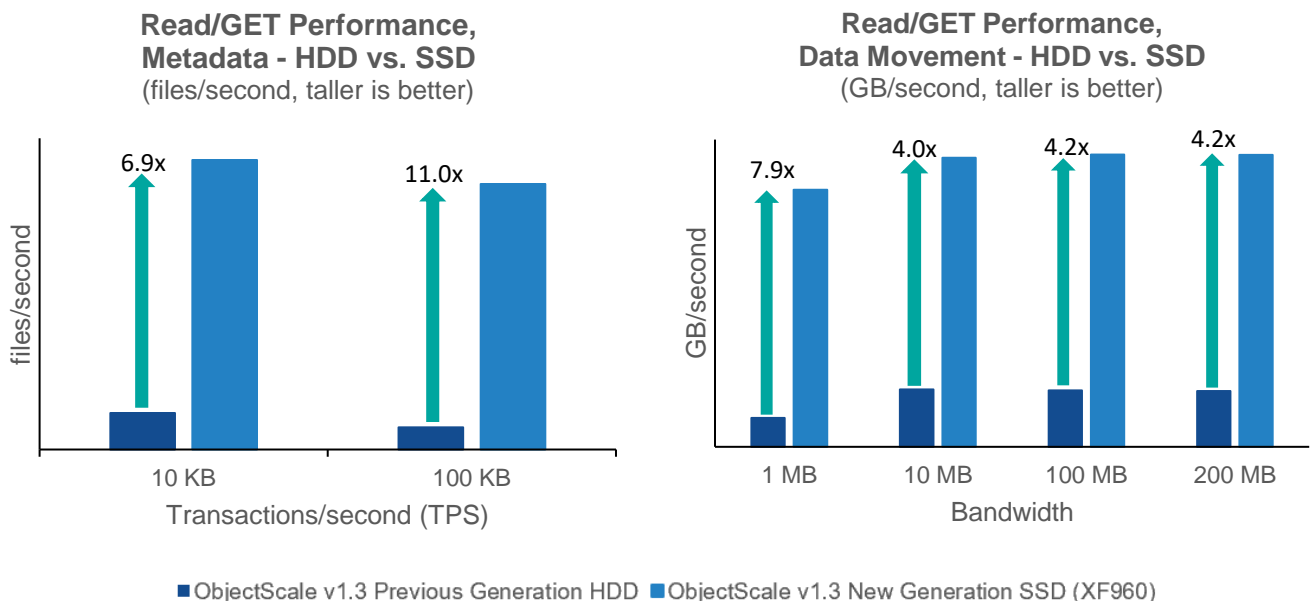
Figure 3. Performance Test Results for Create/Put Operations

Create/PUT Performance, Metadata - HDD vs. SSD
(files/second, taller is better)

Create/PUT Performance, Data Movement - HDD vs. SSD
(GB/second, taller is better)

■ ObjectScale v1.3 Previous Generation HDD   ■ ObjectScale v1.3 New Generation SSD (XF960)

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

We then reviewed performance test results measuring **Read/Get** operations for both metadata and data movement, using increments for TPS and bandwidth from the previous testing (see Figure 4).

Figure 4. Performance Test Results for Read/Get Operations

Read/GET Performance, Metadata - HDD vs. SSD
(files/second, taller is better)

Read/GET Performance, Data Movement - HDD vs. SSD
(GB/second, taller is better)

■ ObjectScale v1.3 Previous Generation HDD   ■ ObjectScale v1.3 New Generation SSD (XF960)

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

What the Numbers Mean

- For **writes of small objects**, ObjectScale v1.3 on a XF960 cluster performs at least **1080% faster** than ObjectScale v1.3 on a PowerEdge R740xd2 cluster. For **writes of large objects**, performance is at least **1330% faster**.

- For **reads of small objects**, ObjectScale v1.3 on a XF960 cluster performs at least **690% faster** than ObjectScale v1.3 on a PowerEdge R740xd2 cluster. For **reads of large objects**, performance is at least **400% faster**.

- Based on these results, it is clear that the all-flash storage supported by Dell ObjectScale XF960 delivers higher performance than an HDD-based storage platform. The higher performance is also supported by the enhanced hardware features, including additional CPU and RDIMM capacity as well as higher back-end network connectivity.

- The results also show that organizations can support the performance needs of applications that need to ingest and process large amounts of data and provide business insights and recommendations quickly, particularly AI/ML applications.

ESG then evaluated the storage management simplicity offered by Dell ObjectScale v1.3, given the software's adherence to the S3 standard. We observed how working with Dell ObjectScale provides a cloud-like experience. First, we observed the simplicity of assigning access permission to authorized users. Once uploading a list of user IDs and associated roles to ObjectScale, we could assign specific user and access policies to individuals or groups of users (see Figure 5). Multiple policies could also be grouped together and assigned simultaneously. Assigning policies in this manner mirrored how this task is performed when working with public cloud storage.

To enhance access security, we also observed that ObjectScale could work with third-party identity providers for user authorization. However, an administrator would still need to assign permissions on how ObjectScale would be used (e.g., only allowed to provision and maintain storage for specific functions in the organization).

**Figure 5.** Assigning Access Permissions to Specific Users

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

We proceeded to view an actual object store, "ostore1," consisting of a minimum of four Kubernetes nodes. An object store in ObjectScale v1.3 can support objects up to 50 TB (see Figure 6). Presenting storage as an object

store is developer-friendly, especially if new data is available. Instead of rewriting code to redirect the application to a new mount point on a server with new data, we could simply scale out the existing object store to include the new data, and the application could still point to the same endpoint defined in ObjectScale. Object stores can scale out to as much storage as needed, regardless of where the physical storage is actually located.

Figure 6. View of Available Object Stores With Related Detail
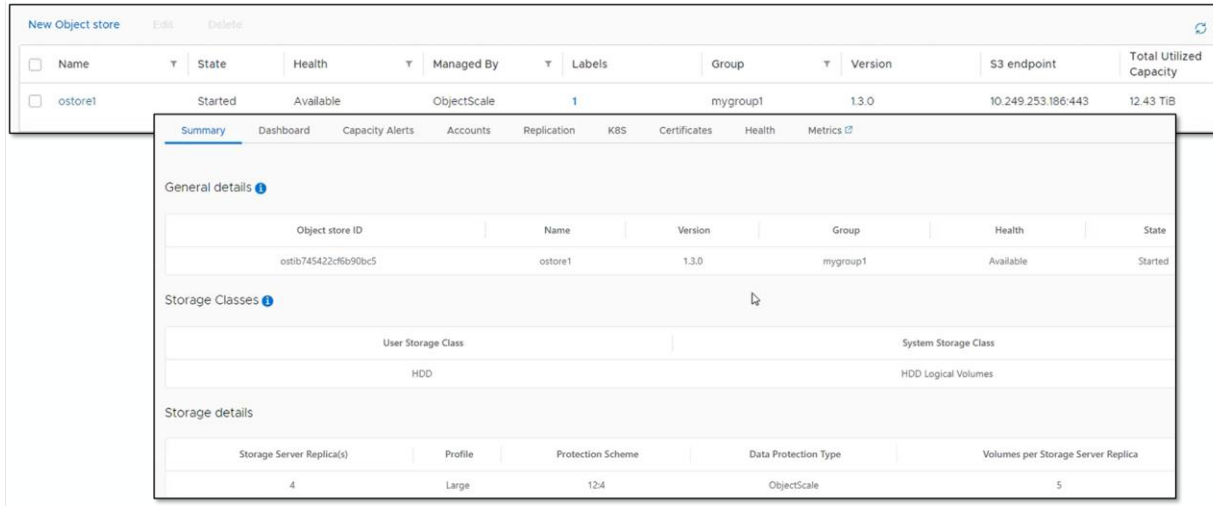
Finally, ESG observed how to enable replication at the bucket level (see Figure 7). We saw that data replication rules could either be assigned to an entire bucket or by prefixes and tags. With prefixes, replication rules could be applied to multiple buckets containing a common prefix. On the other hand, using tags would only apply replication rules to specific objects assigned those specified tags. We should note that ObjectScale supports replication capabilities offered by AWS Cross-Region Replication with its ObjectScale Replication feature. We also noted that eventual consistency would be achieved in any replication scenario, as dictated by the S3 standard.

Figure 7. Bucket Replication
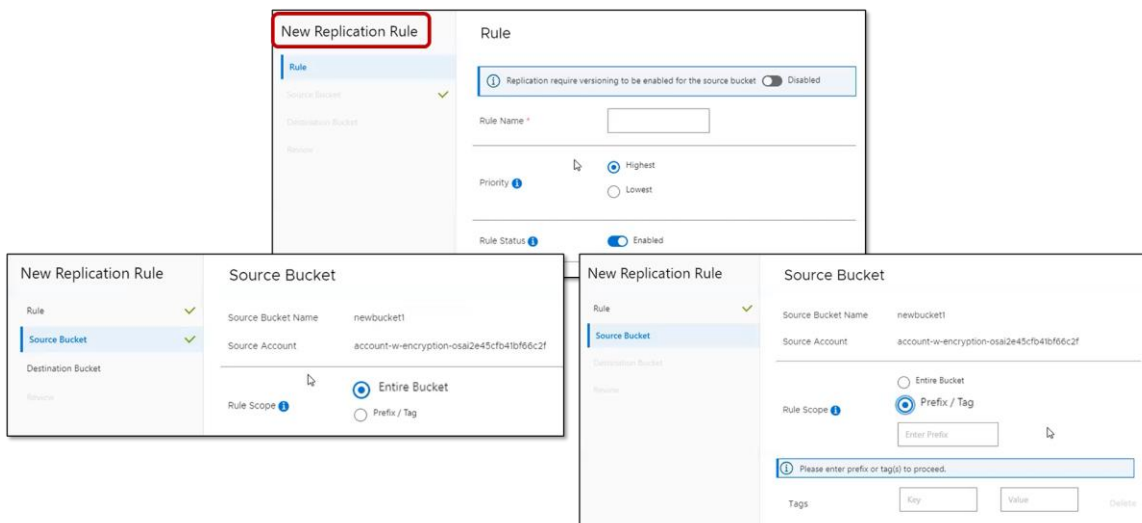
ESG also reviewed how compatible ObjectScale v1.3 is with the S3 standard. Reviewing the ObjectScale API calls that are compliant with the current list of AWS S3 API calls, we found that ObjectScale achieved a strong level of compliance.

Why This Matters

Deploying and managing storage in support of DevOps methodologies is ideally done in a manner similar to the public cloud, yet accomplishing those tasks assumes all data is centralized in the public cloud. Realistically, applications work with data distributed across hybrid clouds, yet developers still need the cloud-like experience of provisioning and scaling storage to ensure faster application development and deployment.

Enterprise Strategy Group validated that Dell ObjectScale v1.3 can deliver highly performant storage that can be deployed and managed as easily as public cloud storage. By evaluating performance test results, we verified that Dell ObjectScale v1.3, operating on the Dell ObjectScale XF960 all-flash appliance, delivers the high performance required by applications that feed off of large amounts of data stored across hybrid clouds—particularly emerging AI/ML applications. We also verified how ObjectScale delivers an experience like the public cloud when deploying and managing storage securely. Given its compatibility with the S3 standard, ObjectScale is user-friendly, as developers do not have to learn new tool sets when employing DevOps.

Conclusion

Organizations are increasing the use of DevOps to accelerate application development and deployment. The challenge lies in ensuring that applications can access the necessary data. Getting the most out of DevOps typically involves the use of the public cloud to deploy compute and storage resources on demand. However, that assumes that all data required by the application lies within the public cloud. For data stored across hybrid clouds, deploying and scaling storage on demand for applications—particularly for applications that must fulfill high performance requirements—is difficult and cumbersome. Also, data could be moved between data centers and public cloud services, as is done regularly or all the time by 53% of respondents to an Enterprise Strategy Group (ESG) survey,[3] making deployment, scaling, and management of data storage harder to accomplish efficiently.

With Dell ObjectScale v1.3, organizations can deploy and easily manage the storage needed to house data located across hybrid clouds. For DevOps, Dell ObjectScale supports fast application development and deployment without relying solely on the on-demand storage provided by the public cloud. Because Dell ObjectScale is highly S3-compatible, developers can save additional time and effort as they reuse their public cloud storage skills; the need to learn a new tool set no longer exists. Dell ObjectScale also supports quick access to data located across hybrid clouds that high-performance applications, such as those employing AI/ML capabilities, require.

During our evaluation, ESG validated that Dell ObjectScale v1.3:

- Delivers superior performance when operating on the Dell ObjectScale XF960 all-flash appliance, compared to operating on a popular, previous-generation Dell server model populated with HDDs.

- Simplifies the deployment, scaling, and management of software-defined storage with the storage solution's strong adherence to the S3 standard.

If your organization seeks to maximize the advantages presented by DevOps with the ability to provision and manage storage of data located across hybrid clouds, particularly for applications requiring high performance, ESG strongly advises a close look at Dell ObjectScale as a viable option.

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[3] Source: Enterprise Strategy Group Research Report, *Application Infrastructure Modernization Trends Across Distributed Cloud Environments*, March 2022.

Appendix

Table 1. Test Equipment Configurations

	ObjectScale XF960	PowerEdge R740XD2
Operating system	Atlantic	OpenShift 4.13
CPU	Dual Xeon Gold 6430 32 core/64 thread-60MB L3, @ 3.4GHz	Dual Xeon Silver 4210 10 core/20 thread, @ 2.2GHz
RAM	256GB RAM	192GB RAM
Drives	24 4TB NVMe Drives	24 8TB HDD Drives
Number of nodes	8	7 nodes total (6 storage nodes)
Number of clients (load driver)	8	4

Source: Dell Technologies and Enterprise Strategy Group, a division of TechTarget, Inc.

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contact@esg-global.com
www.esg-global.com