Technical Review

Dell EMC Unity XT: New Architecture for Performance and Efficiency

Date: August 2019 **Author:** Kerry Dolan, Senior IT Validation Analyst

Abstract

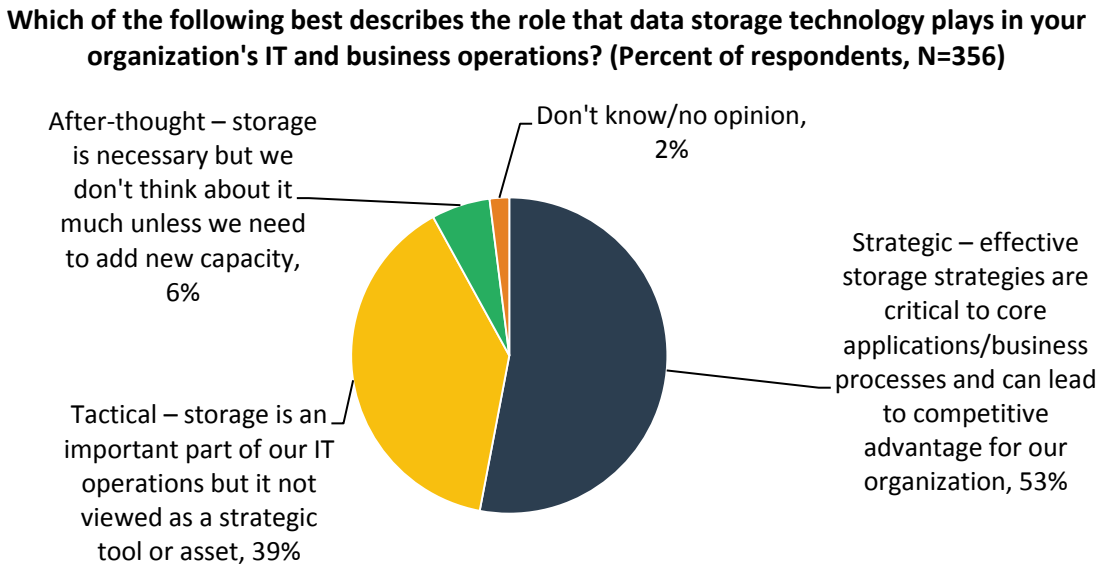
This report documents ESG's audit of performance testing of the Dell EMC Unity XT All-Flash array, whose new hardware platform improves performance and efficiency.

The Challenges

Most organizations depend on data and IT services to function today. They collect growing quantities of data that are not only used in everyday business-driving applications, but also analyzed for customer insight and business trends. Growing business demands and IT complexity make it challenging for IT to design optimized data centers that deliver the levels of performance, scalability, efficiency, and agility required to succeed.

Storage, once considered to be a static, background IT process, today plays a critical role in delivering on business success. The right storage infrastructure can deliver the optimal mix of performance, efficiency, cloud functionality, and cost. When asked what best describes the role that data storage technology plays in their organization's IT and business operations, 53% of ESG survey respondents agreed that storage was strategic, and that effective storage strategies were critical to their core applications and business processes.[1]

Figure 1. Storage Plays Strategic Role



Source: Enterprise Strategy Group

[1] Source: ESG Master Survey Results, *2017 General Storage Trends*, November 2017.

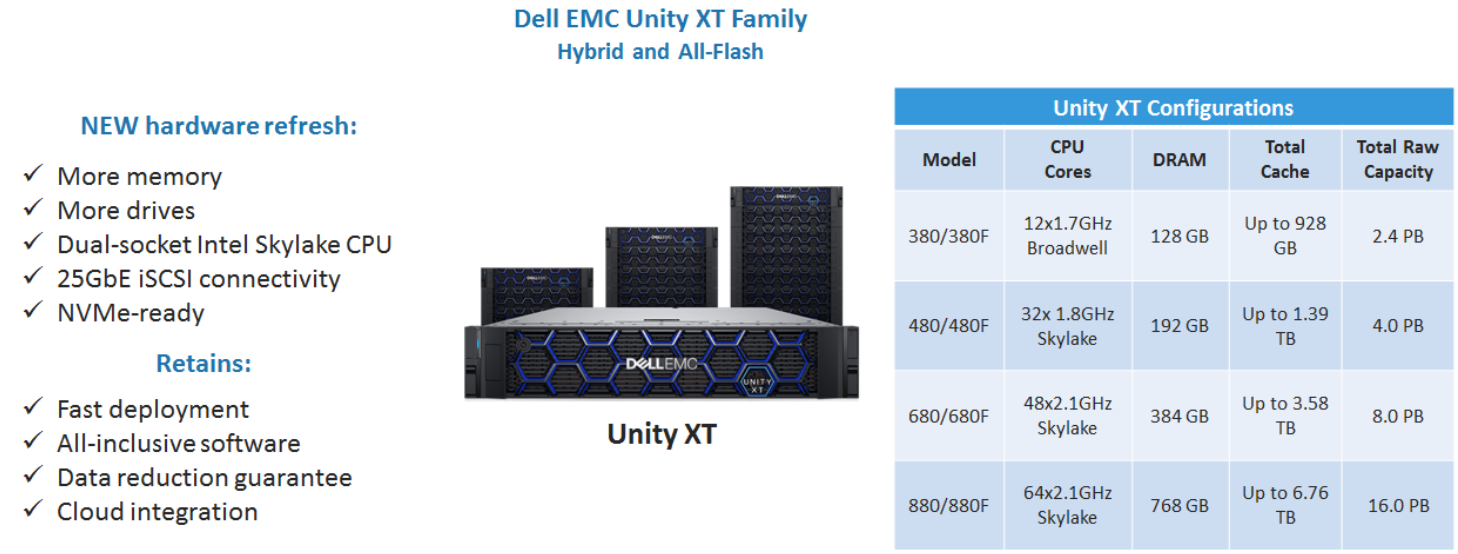
The Solution: Dell EMC Unity XT Arrays

Dell EMC has redesigned its highly successful Unity storage arrays with a new hardware architecture (not just a controller upgrade) that delivers better performance and efficiency. The new Unity XT storage family includes the same option for all-flash or hybrid, the same all-inclusive software, and the same simplicity of operations, but with a new architecture and full multi-cloud functionality.

All Unity XT models offer active/active dual storage processors but add CPU, memory, and drives in a small footprint. Configurations are available as either all-flash models (380F/480F/680F/880F) or as hybrid models (380/480/680/880). The 380/380F models retain the Broadwell chip and single-socket design to ensure optimal cost/performance but add advanced deduplication. The 480/480F, 680/680F, and 880/880F models have been upgraded to dual-socket Intel Skylake CPUs and are NVMe-ready. All models offer expanded asynchronous replication for file data and an option for 25GbE optical connectivity. The hybrid models also now offer 12TB nearline SAS drives.

The Unity XT retains its flagship ease of deployment and management. ESG has previously validated the ability to get Unity installed and configured to full operations in 25 minutes using Unisphere's simple, powerful, intuitive interface, as well as the wide range of included software.[2]

Figure 2. Dell EMC Unity XT Family



Unity XT Configurations				
Model	CPU Cores	DRAM	Total Cache	Total Raw Capacity
380/380F	12x1.7GHz Broadwell	128 GB	Up to 928 GB	2.4 PB
480/480F	32x 1.8GHz Skylake	192 GB	Up to 1.39 TB	4.0 PB
680/680F	48x2.1GHz Skylake	384 GB	Up to 3.58 TB	8.0 PB
880/880F	64x2.1GHz Skylake	768 GB	Up to 6.76 TB	16.0 PB

Source: Enterprise Strategy Group

Unity XT features include:

- *Higher performance* and lower latency across mixed workloads in a compact footprint.
- *More power* with dual-socket Intel Skylake CPUs, dual active/active controllers, 25GbE, and more cores, memory, and drives.
- *Greater efficiency*, with the all-flash models delivering up to 5:1 data reduction and a 3:1 guarantee of inline data reduction based on compression and deduplication. These arrays offer high-density enclosures, including a 2U, 25-drive module and a 3U, 80-drive module. These features, combined with use of space-saving snapshots, thin provisioning, and 85% usable space, create an array that offers a tremendous amount of storage capacity in a small footprint.

[2] For details of deployment, management, and software functionality, please read the ESG Lab Review, *Dell EMC Unity All-Flash Storage*.

- *Consolidation*. File, block, and VMware VVOL data can be stored on the same high-density array for lower floor space and management costs.
- *Simple installation* and operation with the intuitive Unisphere GUI.
- *NVMe-readiness* with eight drive slots that currently support SAS SSDs; a future, non-disruptive software upgrade will enable NVMe drives.
- *All-inclusive software* including CloudIQ storage monitoring, dynamic pools, and other management; encryption, snapshots and thin clones; synchronous and asynchronous remote replication; tiering; and more.
- *Optional software* including AppSync Advanced, Data Protection Suite, RecoverPoint Advanced, PowerPath, and VPLEX.

Cloud-focused

It is important that today's arrays be able to support all the cloud capabilities organizations need. In addition to real-time storage analytics and insights delivered through CloudIQ, Unity XT includes:

- *Dell EMC Cloud Storage Services*: Connect Unity XT to a public cloud and then consume it as a service. This provides economic benefits while maintaining control of data.
- *Dell EMC Unity Cloud Edition*: Software-defined Unity for deployment with VMware Cloud on AWS, particularly useful for VDI, test/dev, and replication services.
- *Dell EMC Cloud Tiering Appliance*: Automated file tiering and block archiving to multiple public clouds.
- *VMware Cloud Foundation (VCF) Validation*: Unity XT is the first external storage validated to easily provision storage for VCF.

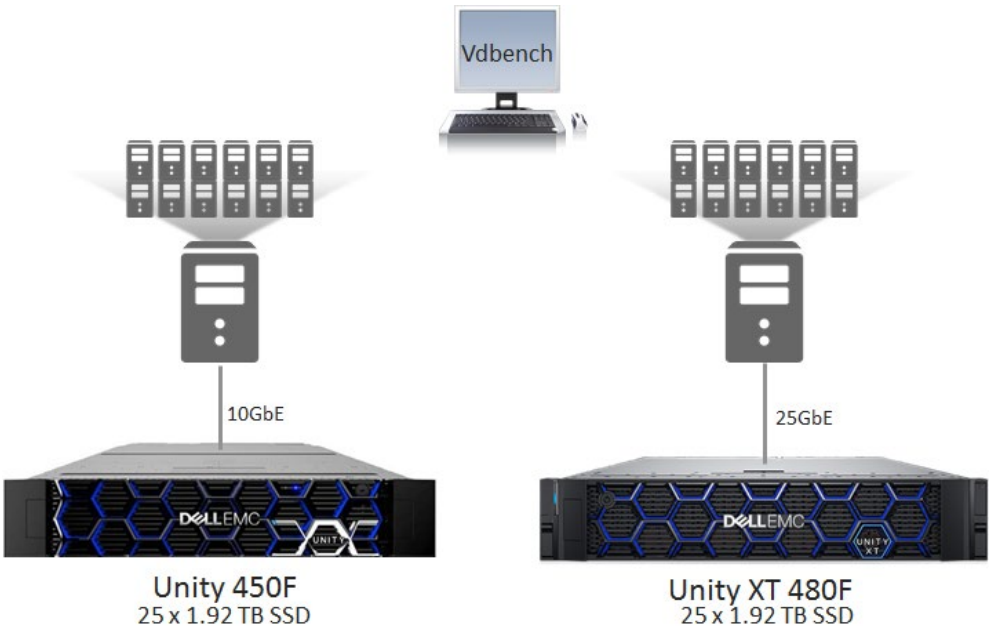
In addition, Dell EMC provides a broad portfolio of services and support, plus a Future Proof Loyalty program for investment protection.

ESG Testing

ESG audited Dell EMC testing conducted in the company's Durham, NC facility. Testing was designed to compare performance between the previous Unity and the new Unity XT with enhanced hardware. Deduplication rates were also noted.

The test bed included two all-flash arrays, a Unity 450F and a Unity XT 480F, one of the smaller models in the portfolio. Both arrays were configured with 25 SSDs. The 480F was connected using 25Gb ethernet to two Dell R740 servers, each running 12 VMs (24 VMs total); the 450F was connected via 10Gb ethernet to six Dell R610 servers each with 4 VMs (24 VMs total).

Figure 3. Test Bed

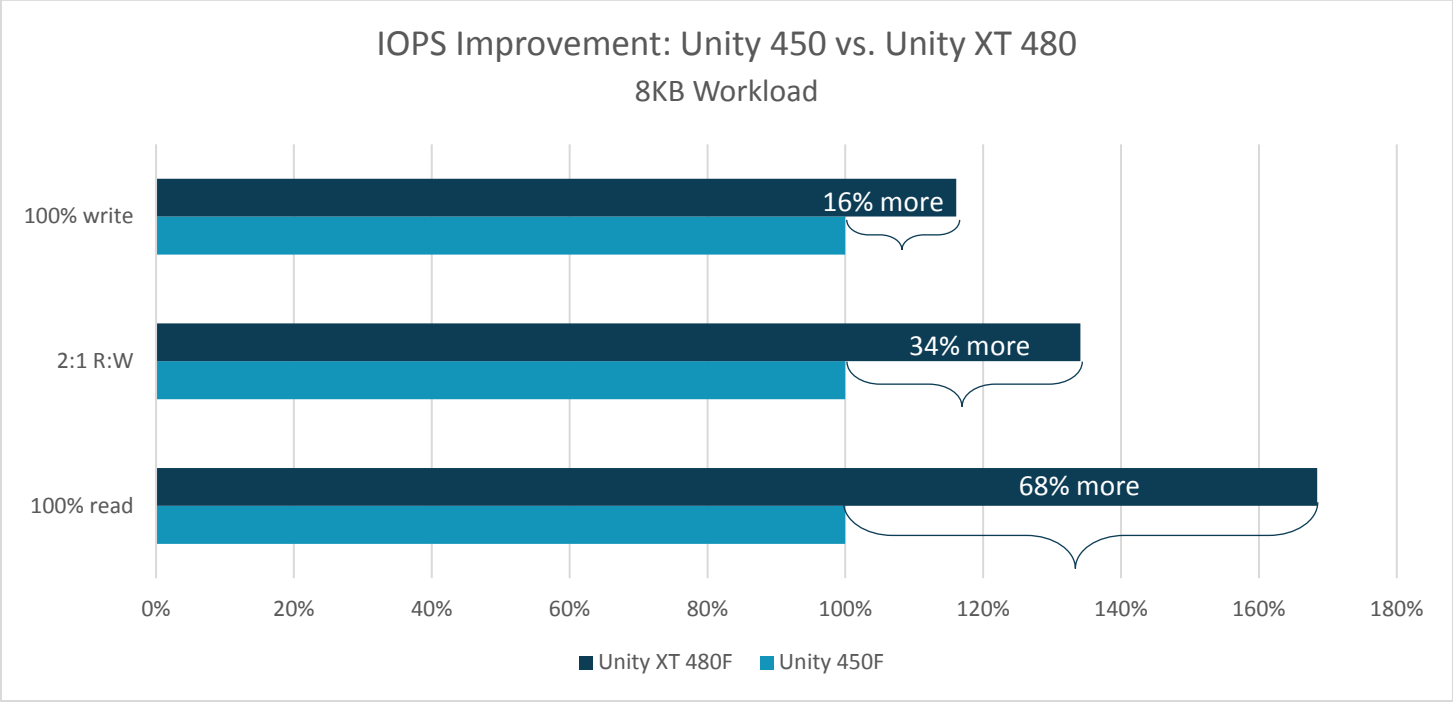


Source: Enterprise Strategy Group

Each array contained 24 x 1TB LUNs configured with compression and advanced deduplication. The testing used a compressible, deduplicate-able data set on both arrays. Each array was prefilled to 50% capacity using large block sequential writes to simulate a typical real-world environment. The VDbench workload generator was used to generate random 8KB and 32KB I/O, as 100% reads, 100% writes, and 67% reads/33% writes (2:1 read/write).

Figure 4 shows the performance improvement for small block random workloads. The Unity XT 480F delivered 16% more IOPS for a 100% write workload; 34% more for IOPS for a 2:1 read/write workload; and 68% more IOPS for a 100% read workload, all without increasing latency. Both 100% read and 100% write workloads generally do not benefit from cache hits, so they are a good measure of how the back-end storage handles the load. The 2:1 read/write emulates more real-world applications such as email, OLTP, and e-commerce. These performance improvements demonstrate that the Unity XT's additional resources can make a significant difference in performance.

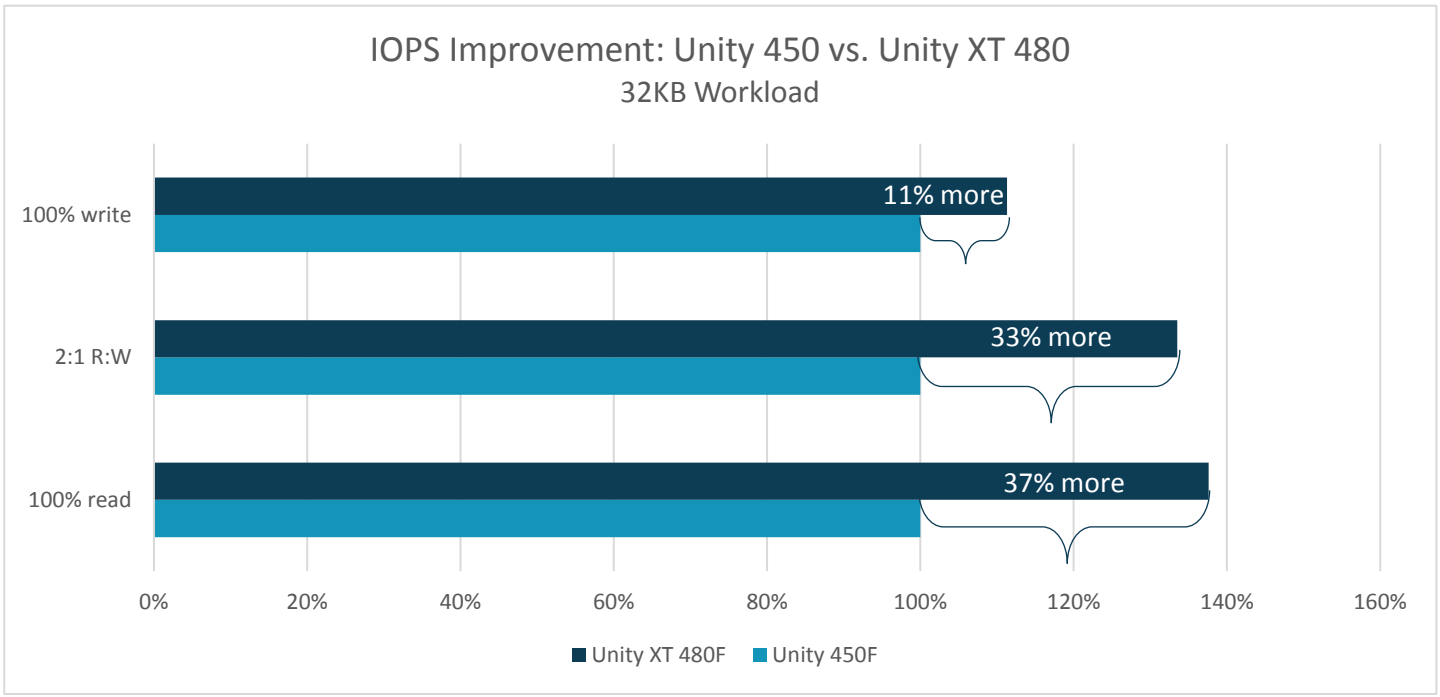
Figure 4. Performance Improvement: 8KB I/O



Source: Enterprise Strategy Group

The 32KB workload testing produced performance improvements as well: 11% more IOPS for 100% write; 33% for 2:1 read/write; and 37% for 100% read (see Figure 5). These larger blocks are more typical of consolidated workloads like virtual servers and VDI.

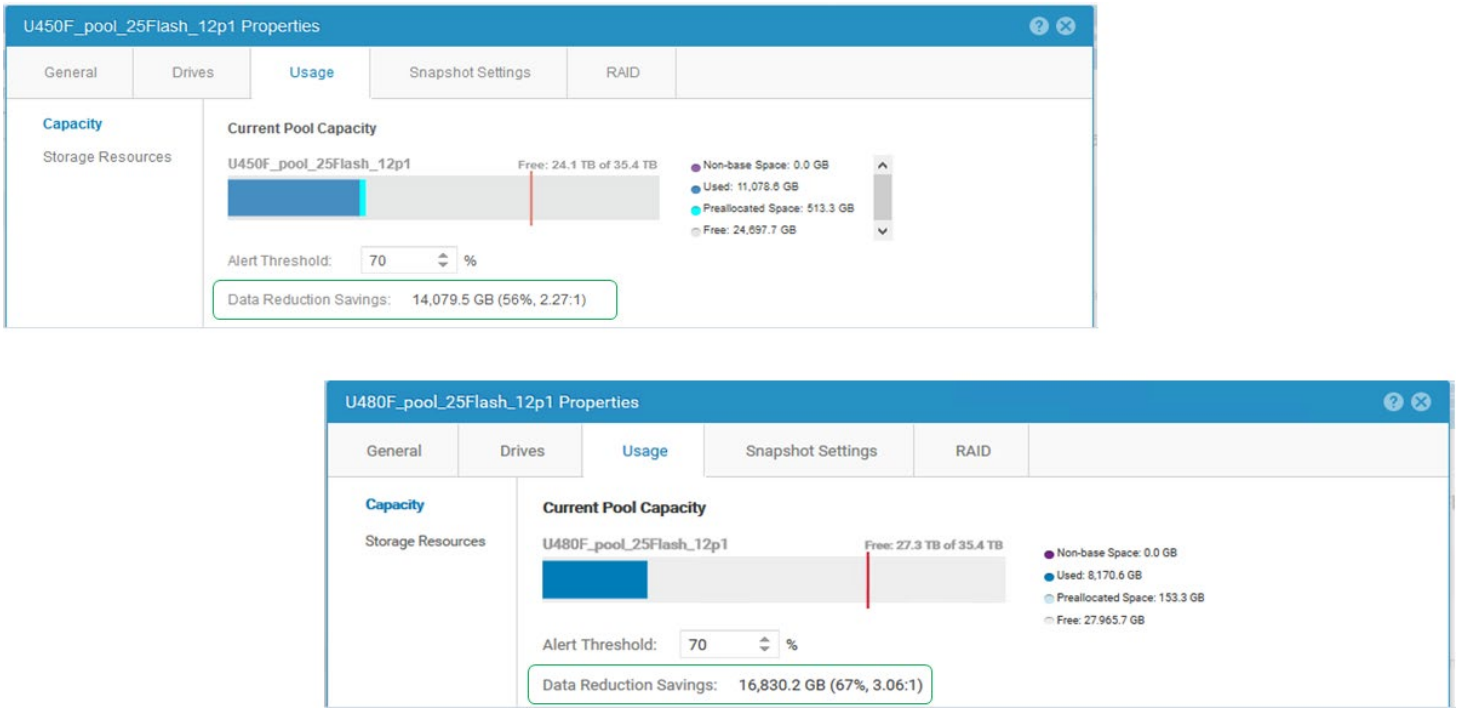
Figure 5. Performance Improvement: 32KB I/O



Source: Enterprise Strategy Group

ESG also reviewed the data reduction rates for the two arrays using the Unisphere GUI. As Figure 6 shows, the Unity 450F array had a data reduction rate of 2.27:1, while the Unity XT 480F reduced data by 3.06:1, a 34% improvement. The Unity XT has more processing power and more memory, enabling it to compare a larger subset of data for deduplication.

Figure 6. Unity XT Increased Data Reduction



Source: Enterprise Strategy Group

Why This Matters

Today's data centers must support diverse physical and virtual applications with a variety of performance and efficiency needs. There is always a tradeoff between efficiency, in the form of data reduction technologies such as compression and deduplication, and performance. With the Unity XT, the additional processor, memory, and storage resources make that much less of a tradeoff and bring higher performance *and* greater efficiency to the applications that drive business.

The Bigger Truth

Data moves business, and data storage plays a strategic role in business operations. Data centers must provide simple, fast, efficient access to data from any location, and must be able to grow organically. Anything less, and your business operations can grind to a halt.

Dell EMC already had a winner with the successful Unity series of midrange all-flash and hybrid storage arrays. The new Unity XT improvements are focused on performance and data reduction. Dell EMC redesigned the array—not a controller upgrade, but a new hardware architecture—to achieve better performance and efficiency. By adding CPU, memory, and drive capacity, Dell EMC brings faster access to data and greater data reduction; the company has also made the Unity XT NVMe-ready. ESG validated Dell EMC testing that showed the Unity XT 480F delivering up to 68% more IOPS than the previous Unity 450F. Testing also revealed 34% greater data reduction with the upgraded hardware.

Importantly, Dell EMC knows what works, and the company has retained the winning features that were already included in the Unity series: fast deployment, simple management, and all-inclusive software for pooling, tiering, security, data protection, cloud-based storage analytics, and more. Another critical feature is the range of cloud capabilities that include cloud-based tiering, integration with public clouds, a software-defined Unity XT for VMware Cloud on AWS, and integration with VMware Cloud Foundation. Also, the Unity XT series includes eight drive slots that currently support SAS SSDs and can accommodate NVMe in a field upgrade in a future release.

With an already large install base and enterprise-class functionality, the Dell EMC Unity storage family has been highly successful in both revenue and market share. Midrange organizations have the same need for speed as large enterprises, and this hardware refresh adds high performance along with greater efficiency for lower TCO. ESG recommends taking a look at the Unity XT for midrange organizations that want simple management, fast deployment, and enterprise-class speed, efficiency, and software functionality.