ESG Lab Review

Dell EMC Unity All-Flash Storage

Focused on Simplicity, Delivering Advanced Functionality

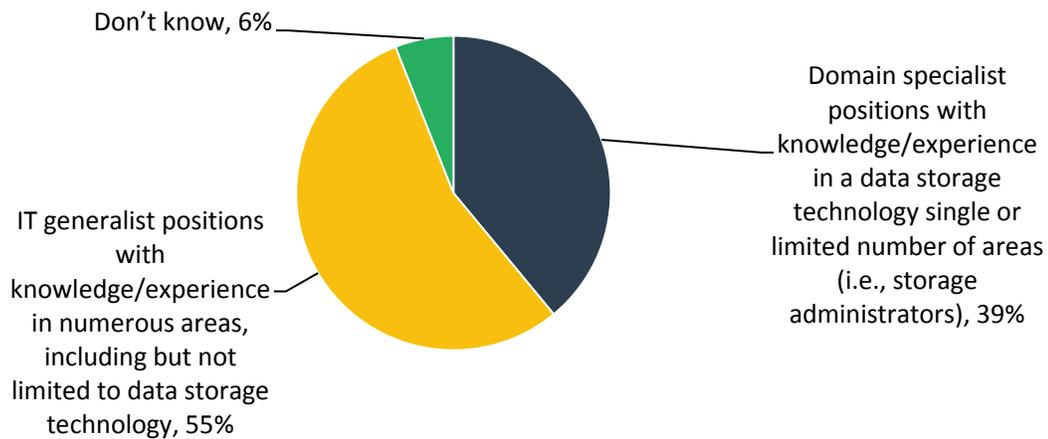**Date:** November 2017 **Author:** Kerry Dolan, Senior IT Validation Analyst

Abstract

This ESG Lab Review documents the results of hands-on testing of the Dell EMC Unity All-Flash storage line with a focus on simplicity, ease of use, and software functionality.

The Challenges

While midmarket organizations have the same needs as enterprise organizations for application performance and data protection as they pursue IT transformation, they often suffer from greater constraints on budgets and staffing. The same goes for remote offices of enterprises organizations. As a result, they may rely on generalist IT administrators to handle storage rather than on those with storage-specific expertise. ESG research confirms this: In a recent survey, 55% of ESG respondents reported that they would be hiring IT generalists for storage management jobs in the next year, while only 39% said they would hire storage-specific administrators.[1]

Figure 1. Expected Storage Management Hiring Practices over the Next 12 Months

Considering your IT organization's expected staff openings and hirings in the area of storage infrastructure management over the next 12 months, which of the following best describes the majority of positions? (Percent of respondents, N=356)

Don't know, 6%

IT generalist positions with knowledge/experience in numerous areas, including but not limited to data storage technology, 55%

Domain specialist positions with knowledge/experience in a data storage technology single or limited number of areas (i.e., storage administrators), 39%

Source: Enterprise Strategy Group, 2017

Unfortunately, many storage technology innovations are complex and hard to manage. There is a clear need for a midrange storage solution, designed for simplicity and ease of use, that offers powerful performance and software features.

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[1] Source: ESG Brief, *A Data Center Revolution in Storage Technology*, October 2017.

The Solution: Dell EMC Unity All-Flash Storage Array

The Dell EMC Unity All-Flash storage array is a midrange, unified block, file, and VMware VVOLs storage array that was designed for simplicity and ease of use. The Unity product family includes all-flash and hybrid arrays. Recent enhancements include increased CPU and memory, an 80-drive expansion enclosure, and software optimizations for all-flash, data mobility, and cloud tiering.
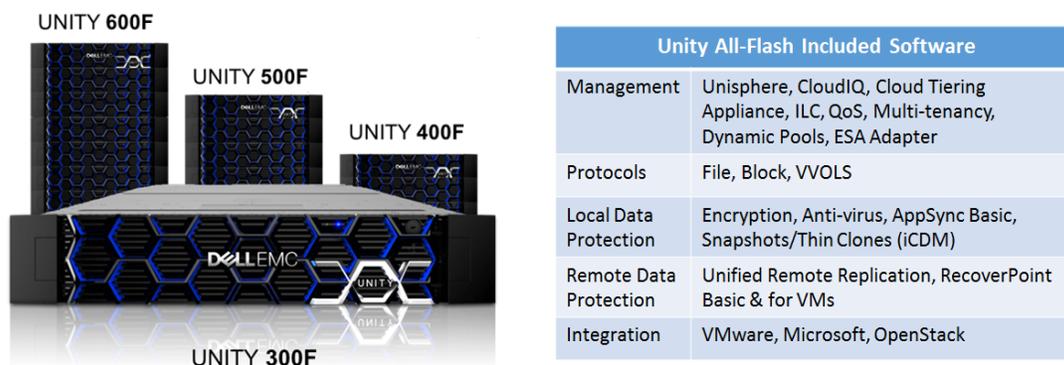
Ease of use is a key focus for the Unity Series. The simple installation process ensures that it takes about 30 minutes for users to unpack, install, and configure the storage array. Administrators can access the intuitive, HTML5-based Unisphere management GUI from traditional or mobile devices to monitor and manage multiple arrays. Additional management capabilities include CLI and REST API interfaces for automation, and cloud-enabled management and analytics.

Unity All-Flash models now include Intel Broadwell multi-core processors for faster performance. All models start with a 2U rack mount Disk Processor Enclosure that supports up to 25 x 2.5-inch drives with 24 front-end Fibre Channel and Ethernet ports for block and file hosts. A 3U, 80-drive expansion chassis provides up to 16 PB raw capacity. System memory has increased (from 96 GB to a maximum of 512 GB on the largest all-flash model) to handle working sets and metadata for data reduction.

The all-inclusive software in the Unity base configuration delivers a wide range of management and integration capabilities that make the array powerful yet simple to use (see Figure 2). In addition to the intuitive Unisphere management GUI, Unity arrays include Dynamic Pools (which dramatically simplify drive management), and Integrated Copy Data Management for snapshots and Thin Clones.

New cloud capabilities include policy-based tiering and archiving. The Cloud Tiering Appliance (CTA) enables Unity to move data to a variety of public cloud services including Virtustream, Microsoft Azure, and Amazon S3, as well as Dell EMC's private cloud, Elastic Cloud Storage (ECS). CloudIQ is a SaaS offering that performs predictive and proactive analytics for Unity arrays.

Figure 2. Dell EMC Unity Base Configuration

Unity All-Flash Included Software	
Management	Unisphere, CloudIQ, Cloud Tiering Appliance, ILC, QoS, Multi-tenancy, Dynamic Pools, ESA Adapter
Protocols	File, Block, VVOLS
Local Data Protection	Encryption, Anti-virus, AppSync Basic, Snapshots/Thin Clones (iCDM)
Remote Data Protection	Unified Remote Replication, RecoverPoint Basic & for VMs
Integration	VMware, Microsoft, OpenStack

Source: Enterprise Strategy Group, 2017

Other features include:

- Maximum file system and LUN size of 256 TB.
- Expanded inline compression to include file data as well as block data, to lower effective cost/GB.
- Configurable set of host I/O limits to apply Quality of Service (QoS), addressing the block storage "noisy neighbor" problem.
- Dynamic Pools, which provide dynamic drive management, and allows higher space utilization, faster rebuild times, and the ability to add capacity to the array-wide pool in increments down to a single drive.
- Integration with Dell EMC software including AppSync, RecoverPoint, PowerPath, and VPLEX, as well as extensive integration with the VMware, Microsoft, and OpenStack ecosystems.

Post-validation Feature Updates

Since ESG completed this validation, Dell EMC has continued to enhance the Unity All-Flash line. Several new features extend the commitment to enterprise-class functionality with entry-level simplicity. These include:

- *Enhanced data reduction*. While Unity arrays already included compression, Dell EMC is adding data deduplication of typical patterns. These are enabled at the LUN and file system levels, and are executed inline before data is written to flash.
- *Synchronous file replication*. Dell EMC is adding bidirectional, synchronous file replication so that mission critical file data can be mirrored at metro distances. Asynchronous file replication was already included.
- *Online data-in-place upgrades*. Data-in-place controller upgrades have been part of the Unity feature set, but now Dell EMC is eliminating the short hardware downtime that was required. Customers will be able to stay online as they upgrade. Since all software licensing is included, capacity and/or performance can be increased cost-effectively.

In addition, Dell EMC has released its Future-Proof Storage Loyalty Program; it includes a three-year Satisfaction Guarantee; a 4:1 Storage Efficiency Guarantee; Never Worry data migrations; hardware investment protection; and built-in Virtustream Storage Cloud. Customers are covered by this program when they purchase a new Unity Series array with a maintenance contract.

ESG Lab Tested

ESG Lab tested Dell EMC Unity systems at EMC's facility in Hopkinton, MA. Testing focused on ease of use, including the out-of-the-box experience, and on new software capabilities, including Dynamic Pools, Thin Clones, Cloud Tiering Appliance, and CloudIQ.

Getting Started: Out-of-the-box Experience

The ESG validation team evaluated the out-of-box-experience with a Dell EMC Unity 350F array. We began by opening a factory-packaged box and locating the few components needed: the array, power cables, and a rail kit. Important pre-installation steps such as creating an Online Support account to enable software licensing and remote support had been done before we arrived. The Quick Start Guide walked us through installation steps, from unpacking to launching the Unisphere Configuration Wizard, and provided instructions for installation with and without Internet access. We found the packaging and components clearly labelled and the Quick Start Guide easy to follow, and could imagine IT generalists handling the job with ease. Many of the installation and configuration documents, procedures, and software tools are available without credentials from the Unity Info Hub URL listed in the Quick Start Guide, enabling additional information as needed.

The installation process from unpacking through powering up took less than 10 minutes. We placed the Dell EMC snap-in rails into the rack, secured them with screws, and slid the array into the rails. Next, we recorded the system serial number from the conveniently located slide-out tag at the front of the array. We connected the two management ports to the top-of-rack Ethernet switch and connected AC power. The array then began its power up and boot process, which it completed in 10 minutes.

Figure 3. Dell EMC Unity 350F Out-of-box-Experience
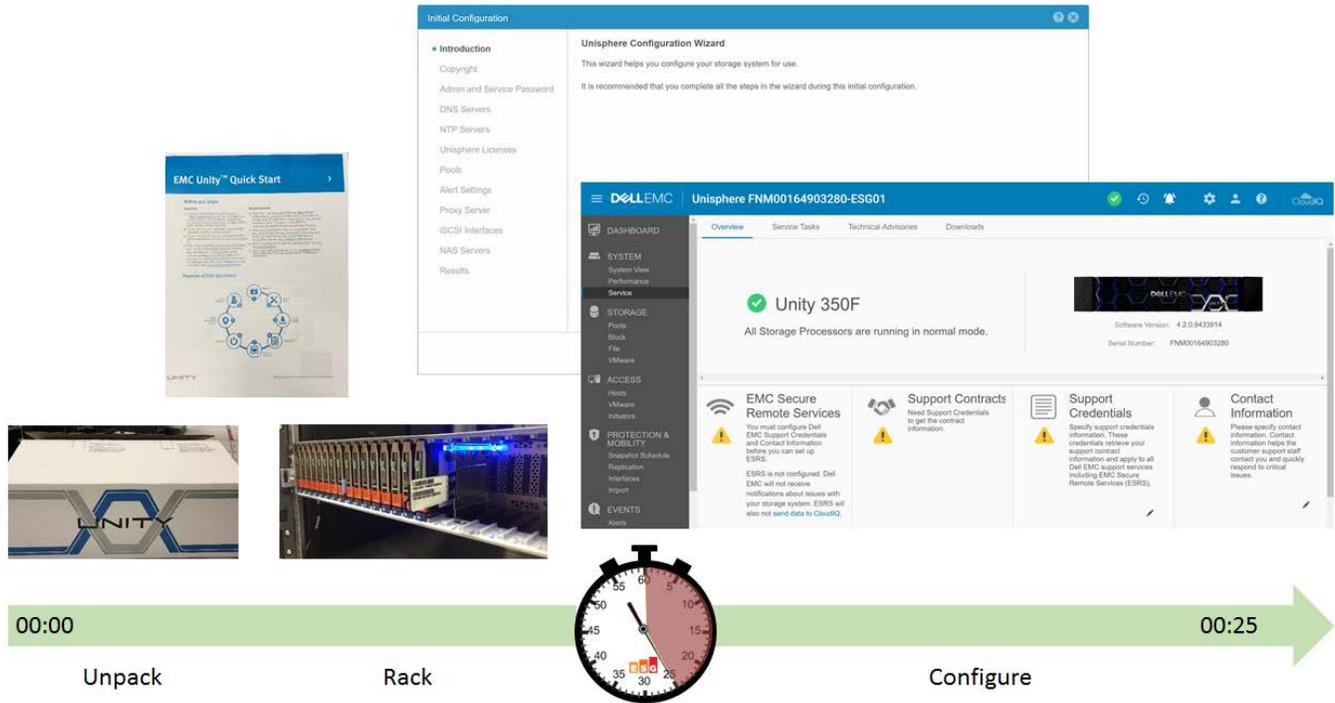
The software portion of the out-of-box experience took five minutes, to initialize the array and get it ready for specific configuration. Using the Unity Connection Utility, we established a network address for the array, enabling the Utility's auto-discovery to locate the array. After assigning an IPv4 static address and creating a user-friendly name, we opened a new browser window and entered the IP address we assigned to the system, which brought us to the Unisphere Configuration Wizard login page to enter the default username and password. We applied the Unisphere license obtained in the pre-installation process, making it ready for storage configuration. The Unisphere dashboard confirmed that the array was functioning properly.

Ease of Management

Ease of management is a key feature of the Unity All-Flash arrays, and the Unisphere GUI provides monitoring and management for all features.

The Unisphere console offers a configurable dashboard for viewing details of system health, performance, capacity, and alerts. The navigation bar on the left enables administrators to focus on specific areas. The *System* tab includes clickable front and back views of the array, so administrators can check on individual ports, disks drives, etc. The *Storage* tab enables a view into storage pools, as well as actions focused on block, file, and VVOL storage. The *Access* tab handles host activities, while the *Data Protection*

tab deals with snapshots and replication. Alerts, job lists, and log files are in the _**Events**_ tab. Finally, the _**Support**_ tab provides fast access to forums, product information, and educational resources, as well as links for ordering parts and purchasing additional products.
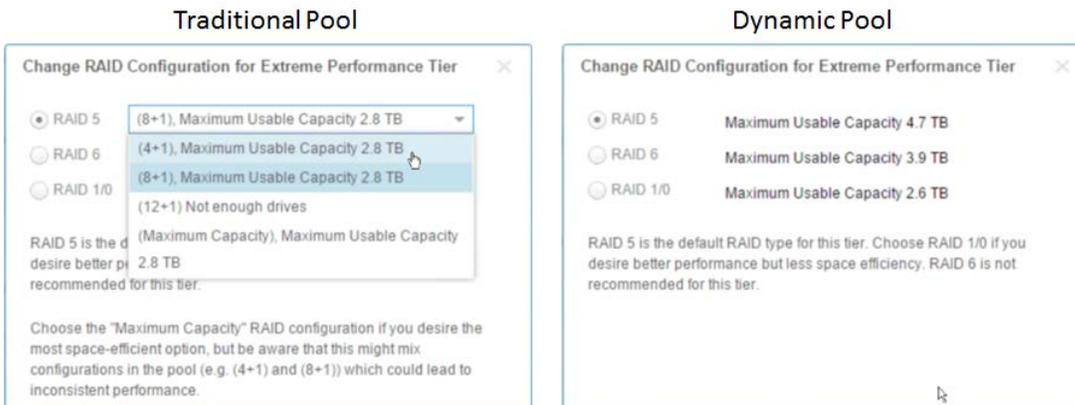
Dynamic Pools

Next, ESG explored the Dynamic Pools feature. Both LUNs and file systems are carved from storage pools. Unity arrays support two pool types: Traditional Pools, which are managed by standard, fixed-drive-width RAID groups, and Dynamic Pools, which spread RAID protection across any number of drives.

- Traditional Pools use active and spare drives, and must expand by the same number of drives as the RAID configuration. For example, in a RAID 5 (4+1) pool, there are four active drives and one parity drive used in the event of a drive failure. Expanding storage capacity must be done by adding another unit of five drives.
- With Dynamic Pools, both data and spare capacity are distributed across all drives, and capacity expansion is not tied to fixed RAID groups.

Dynamic Pools are created using the Unisphere GUI, and deliver several benefits:

- Simpler management. Administrators don't need to be concerned with traditional drive sparing and expansion by drive width. RAID protection schemas are done in the background, as are fencing and data availability tasks, but the complexity is abstracted from the user.
- Drive utilization efficiency. No drives sit idle, waiting for a failure; all drives are used for both data and spare space. This also results in better wear across SSDs for reliability.
- Flexible capacity expansion. Capacity can be expanded by even a single drive, and drives of different sizes can be included in a single pool.
- Faster RAID rebuild. More drives can work simultaneously, and the use of drive extents (i.e., partitions), means large regions of drives can be rebuilt at the same time.

Traditional Pool

Change RAID Configuration for Extreme Performance Tier   ✕

- ⦿ RAID 5   (8+1), Maximum Usable Capacity 2.8 TB ▾
- ◯ RAID 6   (4+1), Maximum Usable Capacity 2.8 TB
- ◯ RAID 1/0   (8+1), Maximum Usable Capacity 2.8 TB
     (12+1) Not enough drives
RAID 5 is the d   (Maximum Capacity), Maximum Usable Capacity
desire better p   2.8 TB
recommended for this tier.

Choose the "Maximum Capacity" RAID configuration if you desire the most space-efficient option, but be aware that this might mix configurations in the pool (e.g. (4+1) and (8+1)) which could lead to inconsistent performance.

Dynamic Pool

Change RAID Configuration for Extreme Performance Tier   ✕

- ⦿ RAID 5   Maximum Usable Capacity 4.7 TB
- ◯ RAID 6   Maximum Usable Capacity 3.9 TB
- ◯ RAID 1/0   Maximum Usable Capacity 2.6 TB

RAID 5 is the default RAID type for this tier. Choose RAID 1/0 if you desire better performance but less space efficiency. RAID 6 is not recommended for this tier.

ESG created a Traditional Pool on a hybrid system and a Dynamic Pool on an all-flash system using the GUI. Both were simple processes that required just a few clicks through screens to name the pool and select a storage tier, drives, and RAID protection. When choosing the RAID configuration for the Traditional Pool, administrators must select from different drive width options, which is not required with Dynamic Pools. RAID options are shown, along with the impact on maximum usable capacity. Unisphere offered a default RAID selection and explanation of other options. We also expanded the pool by one drive with just a click of the mouse; Dell EMC Unity incorporated that extra capacity and rebalanced across all drives behind the scenes.
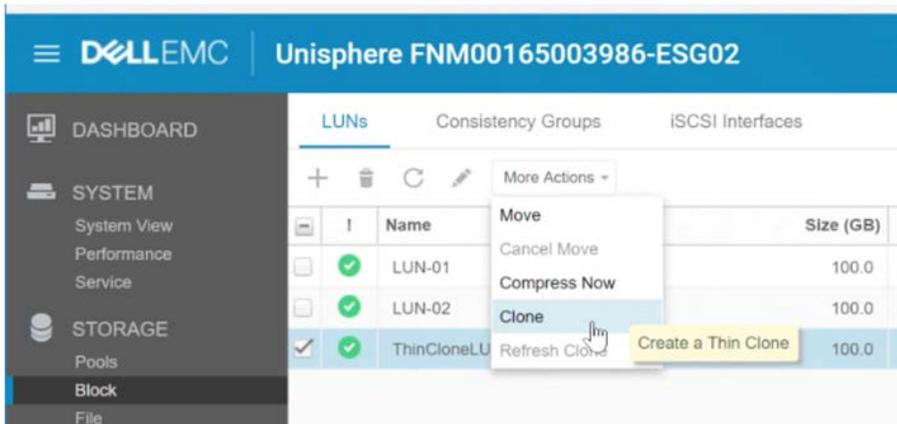
Snapshots and Thin Clones

Dell EMC Unity arrays offer both point-in-time snapshots for data protection and capacity-saving Thin Clones for test/dev, deploying templates, etc. Dell EMC Unity supports a total of 256 snapshots or clones, which are monitored and managed by Unisphere. Both are created using redirect-on-write for space efficiency; writes are redirected to a new location in the pool, and pointers are updated to point to that location. Block snapshots can be attached to hosts, while file snapshots are used to create file shares, and already compressed resources can be used. A basic version of AppSync is included with Dell EMC Unity arrays for automating data copies.

Thin Clones are space-efficient block storage copies that can have QoS through Dell EMC Unity host I/O limits, synchronous or asynchronous replication, and other data services applied to them. They share blocks with the parent, and can be created quickly from LUNs, consistency groups, and VMFS data stores. Thin Clones can be refreshed back to any snapshot or Thin Clone on the tree.
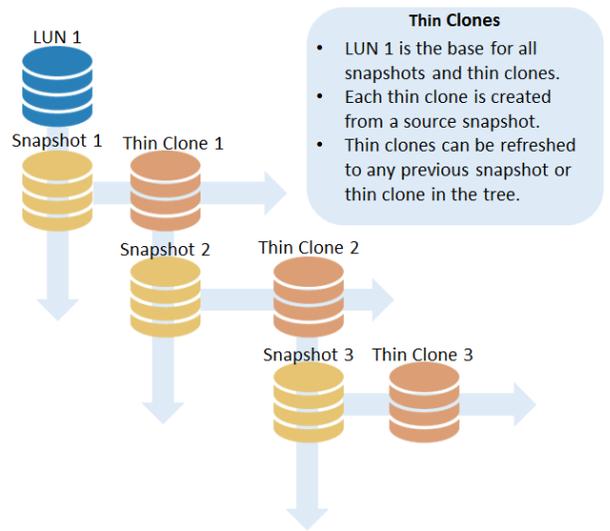
Creating a Thin Clone was easy and fast. After selecting the base LUN, we clicked the *More Actions* button and selected the *Clone* option. If there had been current snapshots available, we could have selected from them, but since there were none,

the Dell EMC Unity array took a snapshot and then created the clone from that. ESG noted the guidelines provided along the way, such as a notification that read/write snapshots and those with auto-deletion and expiration policies are not eligible for Thin Clones, since there must be a consistent base LUN. On the *Configure* screen, we named our clone *ThinClone-ESG* and configured host I/O limits for QoS. We added a snapshot schedule and configured replication with an RPO and destination, again noting the helpful hints along the way, such as explaining the impact of long and short RPOs, and how to leverage RecoverPoint. We reviewed the summary and clicked *Finish*, and watched as the Thin Clone was created in seconds.

> ### ⓘ Why This Matters
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> Today's business landscape continues to pressure IT to do more with less. ESG research confirms this: In a recent survey, cost reduction ranked second behind cybersecurity as the business initiative that respondents expected to have the greatest impact on their organizations' IT spending decisions.[2] Simplifying IT tasks can help reduce costs by reducing the effort required and enabling generalists to manage resources, so the easier it is to manage storage, the better. Storage ease of use makes staff more productive and frees them up for other tasks.
>
> ESG Lab validated that the Dell EMC Unity Series is easy to install and configure, due to a combination of mechanical design, web-based resources, documentation, and wizard-driven tools. ESG Lab performed an out-of-box installation on a Dell EMC Unity 350F All-Flash array that took 25 minutes from opening the packaging until the array was ready to configure host connections and storage. ESG found Dell EMC Unity to be as easy to install as a consumer networked printer, increasing the productivity of anyone doing the installation.
>
> In addition to the intuitive Unisphere GUI, ESG Lab validated the ease of management that Dynamic Pools provide, abstracting complexity from administrators while maintaining protection from drive failures and ensuring high availability. We also confirmed the speed and ease of creating Thin Clones to simplify data copy creation.

Cloud-enabled

Another feature of the Dell EMC Unity All-Flash array is integration with cloud resources for storage tiering and analytics. Licenses for the Cloud Tiering Appliance and CloudIQ are included, and can be deployed in the array setup process with a few clicks.

Cloud Tiering Appliance

Leveraging a cloud storage tier provides cost savings. Being able to store both file and block data in less expensive cloud storage frees up on-premises and data protection resources, and reduces the amount of storage that administrators manage on a regular basis. Dell EMC recently added the ability to back up and restore block snapshots of LUNs and consistency groups to the cloud; first, a full snapshot is archived in the cloud, but thereafter only the changes are stored. For file data, CTA scans the Dell EMC Unity array for files that have a tiering policy, writes those files accordingly, and leaves a small stub on the Dell EMC Unity array. The stub contains metadata with the location of the data, and the data is recalled via CTA transparent to the client. CTA supports Microsoft Azure, Amazon S3, and Dell EMC Virtustream public clouds, as well as Dell EMC Elastic Cloud Storage for private cloud.

ESG viewed a demonstration of the ease of setup for administrators. After using Unisphere to create a snapshot of a LUN named *Videos*, we logged into the CTA and created a Dell EMC Unity block server to add to the CTA configuration (right). Note in the graphic the NAS, cloud, and CAS server options as well. We provided a name and selected the iSCSI initiator paths for both storage

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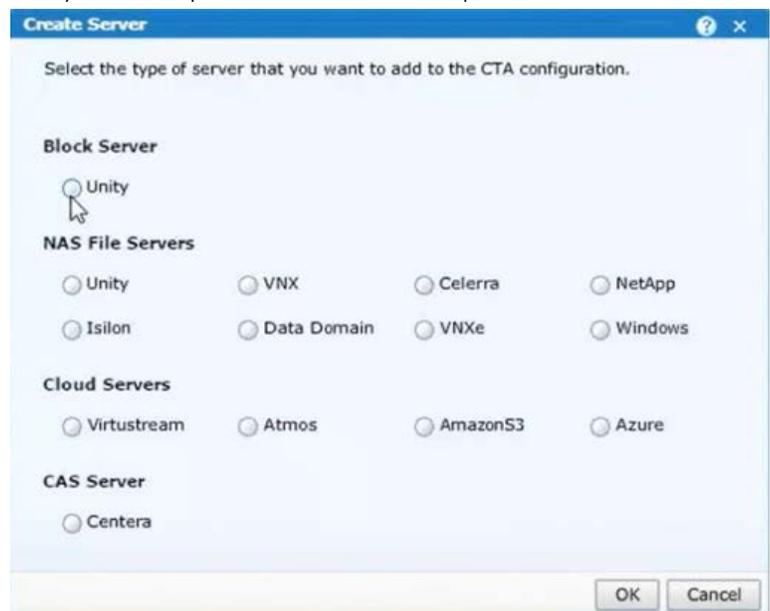
[2] Source: ESG Research Report, *2017 IT Spending Intentions Survey*, March 2017.

processors, and did not assign CHAP credentials. The server then appeared in the list along with a previously created Virtustream server. ESG returned to the CTA homepage, selected the *Policies* tab, and created a block policy to archive any snapshots created in the last day; while our policy used a single attribute, multiple attributes are supported. Next, we selected the Virtustream cloud as the archive destination and saved the policy. We tested the policy using the ***Schedule Wizard***, selecting the *Videos* LUN as the source, plus the snapshot of that LUN and policy just created, and clicked ***Run Now***. After confirming that the snapshot was archived to Virtustream, we confirmed that the stub left on Dell EMC Unity was only 8KB. Next, we deleted the *Videos* LUN from the Dell EMC Unity array, and successfully tested Restore. We created a *Restore_Videos* LUN on the Dell EMC Unity array, then returned to the ***Schedule Wizard*** on CTA, and selected ***Block Restore***. After selecting the CTA snapshot source and the *Restore-Videos* block server on Dell EMC Unity, we completed the restore.

CloudIQ

One of Dell EMC's first SaaS efforts, CloudIQ offers cloud-based, near-real-time storage analytics for Dell EMC Unity arrays. It provides comprehensive monitoring of system health, performance, capacity, configurations, and on-array data protection; predictive analytics to improve capacity planning and fix problems before they disrupt business; and a proactive health score designed to ensure that Dell EMC Unity provides the optimal foundation for business data. CloudIQ maintains up to two years of data about each Dell EMC Unity array.

CloudIQ is available at no charge for all Dell EMC Unity systems. It is enabled simply as the final configuration step with the EMC Secure Remote Services (ESRS) connection between the array and Dell EMC Customer Service. ESRS provides the data collection from the array to CloudIQ.

Because it is cloud-deployed, CloudIQ requires little setup, just a single checkbox after configuring ESRS. It is accessed via browser with no need for VPN. The software's agile development process means that updated features are delivered automatically. It is hosted on Dell EMC's own cloud infrastructure with secure multi-tenancy, so organizations can only view their own metrics.
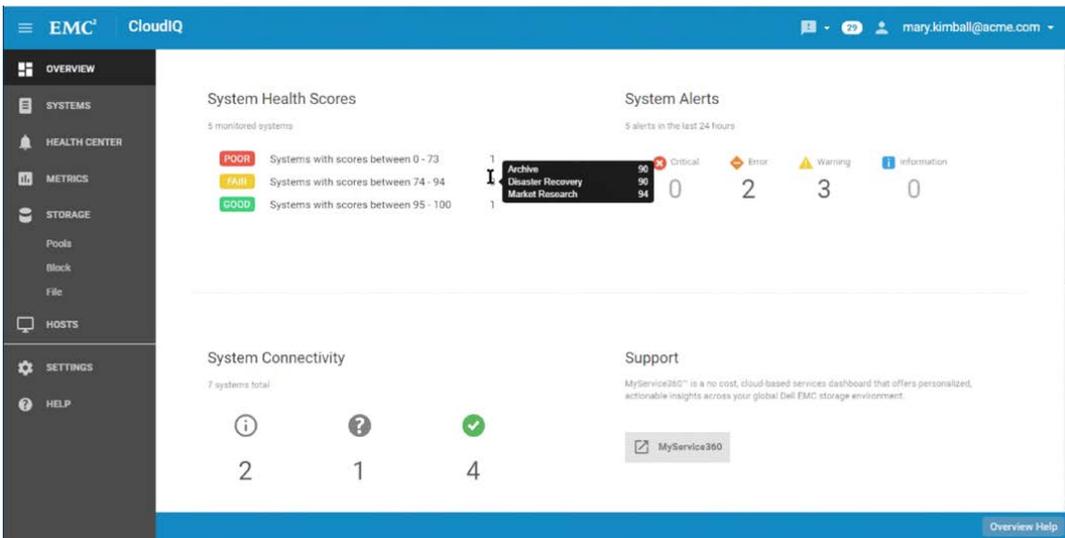

ESG viewed a demonstration using an online simulator to validate CloudIQ's ease of use. It should be noted that CloudIQ includes a wide range of functionality, and a complete description is beyond the scope of this report.

The overview dashboard shows at-a-glance statistics for the systems being monitored, including alerts; health scores; connectivity; storage pools running out of space; capacity usage for block, file, virtual volumes, and snapshots; and performance anomalies. Administrators can drill down to get more detail on each item, and can view complete listings and table views if desired. These more in-depth views provide granular details about storage pools, disk drives, and hosts, and by data type for capacity, performance, and data protection.

The multi-system page displays color-coded overall percentage health scores by array. Each score includes details from five categories: components, configuration, capacity, performance, and data protection. CloudIQ collects information on alerts and performance at five-minute intervals, and on capacity and configuration at one-hour intervals. As a result, it can alert administrators to problems such as faulty cables; host connections not configured for high availability; storage pools that are approaching capacity; storage processor imbalance; and arrays that are not meeting their snapshot policies. Suggestions for resolution are included. These are beyond the typical storage capacity and performance metrics (which are also available) and help administrators proactively manage their Dell EMC Unity arrays for optimal functioning. Details can be exported to CSV files for inclusion with other tools.
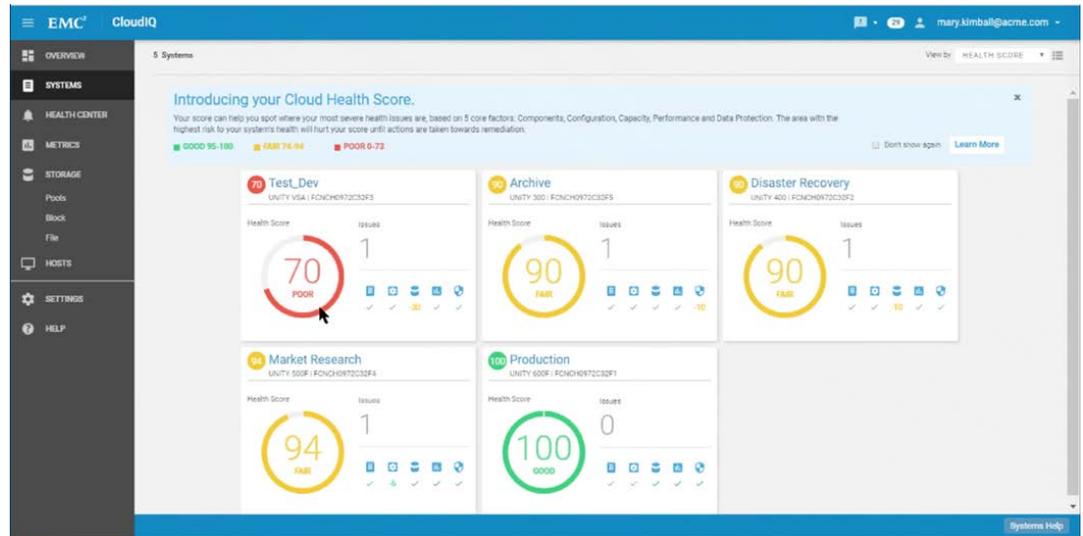
Any organization—small companies, large enterprises, and service providers—can benefit from this type of insight. Each view includes a *Launch Unisphere* button that enables active management. If CloudIQ indicates that a storage pool will be full in a month, administrators simply log into Unisphere and add capacity or move data before it becomes a problem; this cuts down on service calls. Because setup is simple and doesn't require administrators to configure thresholds and policies, CloudIQ provides value immediately. And Dell EMC is committed to continually improving CloudIQ; for example, based on Dell EMC knowledge base information, they proactively add important components to the health score.

Why This Matters

Cost reduction remains a perennial high priority, particularly for midmarket organizations, and the cloud can be an important contributor to those reductions. In recent ESG research, 35% of respondents cited that they expect to take advantage of cloud storage in the next 12-18 months, while 21% expect to use more cloud-based applications.[3]

ESG Lab validated the ease of using the Cloud Tiering Appliance to implement policy-based tiering to leverage public or private cloud resources for block data snapshots. We also tested the CloudIQ analytics application for monitoring, predictive analytics, and proactive health scores that make it much simpler to ensure maximum uptime. Information was easy to view at a high level and with granularity, with helpful hints throughout the GUI.

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[3] Source: ESG Brief, *2017 Storage Trends: Challenges and Spending*, August 2017.

The Bigger Truth

As a colleague of mine commented, "This ain't your parents' CLARiiON." With the latest Dell EMC Unity All-Flash line, Dell EMC has designed an array that brings the extreme ease of use of an entry-level array with the advanced features you might expect in an enterprise-class solution. Simplicity is its hallmark, starting with the unified platform for block, file, and VMware VVOL data; it provides high performance with all-flash drives, with capacities from 2 PB up to 16 PB.

Today's IT landscape may look very different from 10 or 20 years ago, but one thing hasn't changed: senior management asking IT to "do more with less." Thankfully, innovations are making that a lot more possible. Dell EMC has jammed a ton of software and automation into an array that packs a lot of capacity and performance. And while we sometimes overlook the hardware part of storage, the importance of delivering the functionality cannot be overstated.

ESG validated the ease of use, from installation through operation. We installed the array out of the box in less than 30 minutes; explored the management features, including drive-simplifying Dynamic Pools; created Thin Clones; and explored the CTA cloud tiering and CloudIQ storage analytics. The array includes compression for capacity savings, but deduplication won't be available until later this year. And Dell EMC has only scratched the surface of what CloudIQ could deliver in the future, in terms of customization and predictive capabilities. But as one of Dell EMC's first SaaS offerings, we found it valuable and easy to use.

We noticed the many large and small features that make the Dell EMC Unity All-Flash array easy to use, from the one-price, software-included platform that makes purchasing simple, through the advanced drive management features, to something as simple as the conveniently located tab in the front of the array that makes the serial number easily accessible.

Adding new features is nothing new for storage arrays. But sometimes it seems like the reason for constant tinkering is just to drive revenue. That's understandable—vendors are in business to make money. For the ESG Validation team, the Dell EMC Unity All-Flash array doesn't feel like just another array with some new widgets. The array was clearly well thought out and designed to provide advanced functionality, but with the simplicity that IT generalists need.

The team we worked with seemed truly passionate about the ways they are making life easier for IT administrators—and about continuing to innovate to serve that purpose. In fact, after we completed the validation, Dell EMC announced enhancements to Unity's data reduction, file replication, and data-in-place upgrades that extend the enterprise-class features with entry-level simplicity, as well as an expanded storage loyalty program. Any organization looking to do more with their storage with less effort and complication would be wise to evaluate the Dell EMC Unity All-Flash Series.