



Dell EMC PowerMax

Highly Efficient and Resilient Storage for Large, Enterprise-mixed Workload Consolidation

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Executive Summary

IDC tested three scenarios and validated key features/functions for mission-critical usage:

Simplified Management	<ul style="list-style-type: none"> • Simple storage provisioning • Modern automation using REST API and Ansible Playbooks • CloudIQ SaaS monitoring and alerting
High Efficiency	<ul style="list-style-type: none"> • In-line data reduction • Seamless cloud mobility • Policy-driven snapshots at scale
Resilient Storage Operations	<ul style="list-style-type: none"> • Remote RAID with SRDF • SRDF/Metro Smart DR



IDC OPINION

From the validation testing, IDC noted impressive benefits in the speed, ease of use, efficiency, resiliency, and reliability of operations on PowerMax. These benefits clearly help differentiate PowerMax in competitive situations.

Why Customers Choose PowerMax

Performance

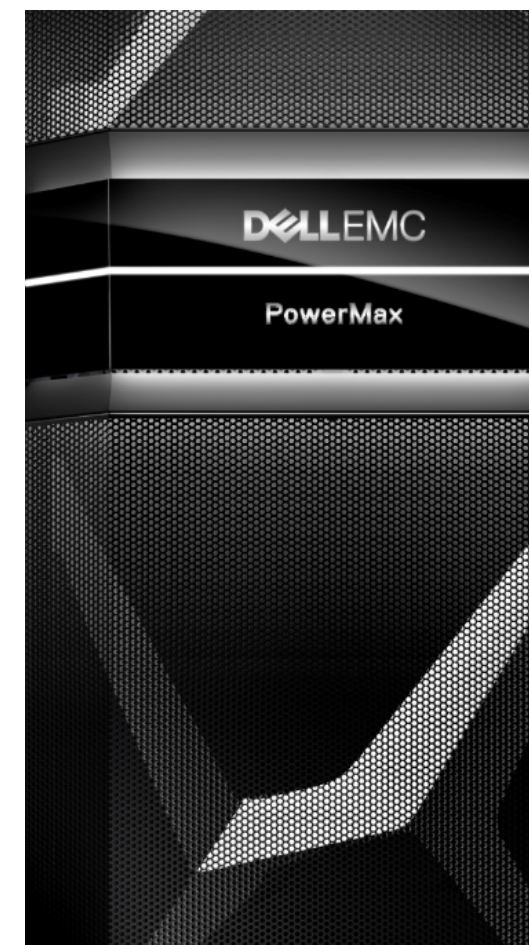
- Easily handles small block / large block / mixed sized workloads
- Massive cache to support thousands of workloads
 - OLTP, Data Analytics, Data Warehousing, Big Data
- Fully redundant end-to-end NVMe scale-out architecture

Mission-Critical High Availability

- Nondisruptive hardware and software upgrades
- Active/active multi-array remote replication

Efficient Workload Consolidation

- Open systems block and file, IBM Z, IBM System i, virtualization/containers
- Over 64,000 storage devices with up to 64 million snapshots per array
- Hardware-based compression, deduplication, and encryption
- Optimized performance through machine learning (ML)



Dell EMC PowerMax Systems at a Glance

Essential Software

SnapVX	NDM & ORS*
Compression	iCDM* Basic
Deduplication	

Pro Software Additions

SRDF	SRM
D@RE*	iCDM Advanced
eNAS	PowerPath + VE



PowerMax 2000

2–4 controllers

4TB cache

64 FC/FC-NVMe/iSCSI Ports

1.2PBe capacity

All in **½** rack

PowerMax 8000

2–16 controllers

16TB cache

256 FC/FC-NVMe/FICON/iSCSI Ports

4.5PBe capacity

All in **1–2** racks

* Non-Disruptive Migration (NDM), Open Replicator Software (ORS), Integrated Copy Data Management (iCDM), Data At Rest Encryption (D@RE)

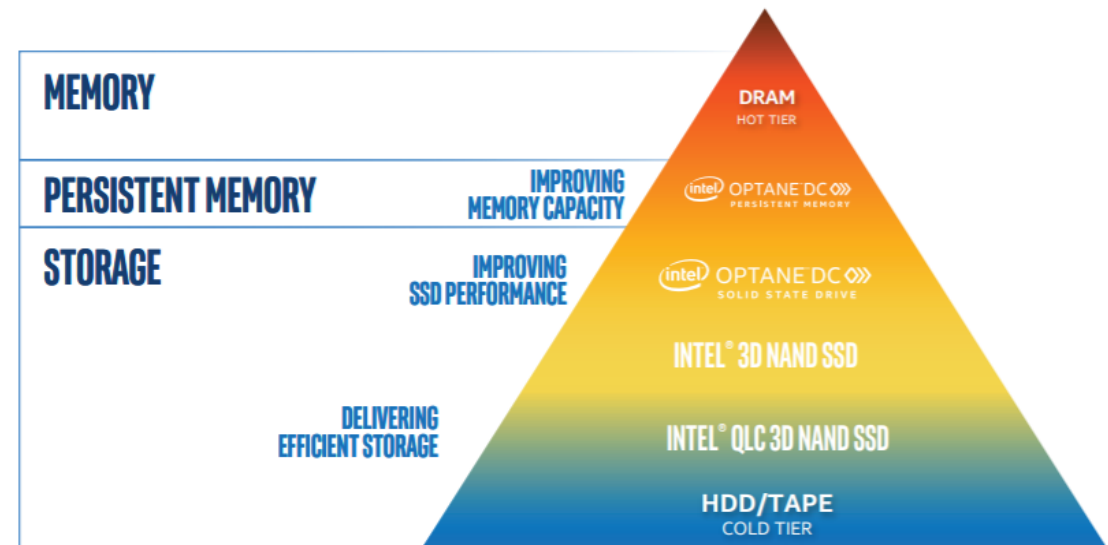
Powerful PowerMax Differentiators

- ✓ End-to-end NVMe scale-out architecture
- ✓ Proven replication technologies
- ✓ Hardware-based, global in-line data reduction without application performance impact
 - Maintains high bandwidth while performing deduplication and compression
- ✓ Enterprise-grade end-to-end data security
- ✓ Automated data placement to attain best performance using Intel Optane SCM SSDs
- ✓ Hybrid cloud integration using cloud mobility
- ✓ Robust IT automation tools using Ansible, CSI, REST API, and PowerShell
- ✓ Remote RAID offers over 1000x less risk of data loss than RAID6 at a lower cost



Intel Optane Storage Class Memory: Bridging the Memory/Storage Gap

- ✓ Intel Optane SCM is a new persistent storage option based on Intel 3D XPoint technology.
- ✓ 3D XPoint-based storage options include Intel Optane Persistent Memory (uses DDR4/5 interface) and Intel Optane SCM SSDs for use with NVMe.
- ✓ PowerMax supports dual-ported Intel Optane SCM SSDs used as a higher-performance persistent storage tier (in conjunction with NAND flash SSDs).
- ✓ Compared to NAND flash SSDs, Intel Optane SSDs deliver lower latencies, higher throughput and media endurance, and increased CPU utilization and infrastructure efficiency.
- ✓ Intel Optane SCM SSDs are well suited for highly random, storage-bound workloads as well as next-generation workloads using artificial (AI), ML, deep learning, and big data analytics.



Support for Mixed Solid State Media



- ✓ The PowerMax Drive Array Enclosure (DAE) has an NVMe-based backplane that can support different types of solid state media.
- ✓ PowerMax uses both Intel Optane SCM and/or NAND flash-based SSDs in the same DAE.
- ✓ Intel Optane SSDs are used as persistent storage for customer data.
- ✓ Random reads from SCM drives achieve sub-250 microsecond latencies for best application response times.

Validation Setup

IDC tested the features and validated the benefits over five web sessions. The control criteria are defined below. Analyst requests for visual confirmation of successful operations varied by feature (with embedded functions often validated through command-line confirmation).

	Feature(s) to be Tested	Benefits/User Outcomes
Simplified Management	<ul style="list-style-type: none"> Storage provisioning Automation using Ansible, CSI, and REST APIs CloudIQ 	<ul style="list-style-type: none"> Faster, easier provisioning Improved reliability and efficiency of operations AI-optimized systems management
High Efficiency	<ul style="list-style-type: none"> In-line compression and deduplication Cloud mobility At-scale SnapVX policy creation 	<ul style="list-style-type: none"> Lower \$ per-gigabyte storage costs driven by high data-reduction ratios Seamless integration with cloud-based environments Higher administrative productivity and performance
Resilient Storage Operations	<ul style="list-style-type: none"> Remote RAID SRDF/Metro Smart DR 	<ul style="list-style-type: none"> Lower cost of data protection in SRDF configurations Simpler, lower cost multisite HA/DR configurations

Notes:

- Lab sessions occurred December 2020 to January 2021.
- The sessions were viewed remotely via Zoom.
- Most lab sessions were prefaced by a general discussion of the material to be viewed.
- The analyst was free to ask questions, confirm what he saw, propose alternate scenarios, and challenge assumptions.
- Each observed lab session ran 60–70 minutes in length.

SIMPLIFIED MANAGEMENT

Feature: Storage Provisioning

Fast, easy-to-use, wizard-driven workflow:

- ✓ Makes provisioning storage that meets governance and compliance requirements fast, easy, and reliable yet still provides the flexibility to customize storage as needed.
- ✓ Simplifies the selection of various attributes (data reduction, encryption, quality of service) as storage is provisioned.
- ✓ Validation process provisioned storage using the wizard then confirmed its creation and mounting on the relevant servers.



IDC OPINION

The entire storage provisioning process takes less than a minute end-to-end and can be easily performed. Enabling data reduction is easy, and the built-in QoS capabilities provide workload congestion protection for not only the array but also the SAN fabric. As an example, a particularly nice PowerMax QoS feature is “host bandwidth limits” which helps protect the storage fabric from device-induced credit latency issues such as Fibre Channel “slow drain.”

SIMPLIFIED MANAGEMENT

Feature: PowerMax REST API

What can I do with the PowerMax REST API?

Storage Provisioning

- Simple workflows with enhanced REST calls leveraging smarts of the Unisphere Server
- Adds/moves/changes
- Service level
- Capacity monitoring

Local and Remote Replication

- Snapshot
 - SnapVX ad hoc and policy
 - Cloud mobility
- SRDF and Metro Smart DR
 - Full setup and control
 - Simplified workflows to add/remove devices

Unisphere
for PowerMax
REST API

Performance Monitoring

- Diagnostic information at 5-minute intervals for over 2,000 metrics
- Real-time monitoring for key performance metrics
 - Array (5-second intervals)
 - Storage group (30-second intervals)

Configuration of Alerting and Monitoring

- Run health checks
 - View array health
- Configure alerting
- Import and export alert settings

REST APIs are built to be used with automation

- Structured responses
- Enforced security and governance
- Easy to scale tasks

PowerMax REST API enables integration with a number of different tools

- Virtual Volumes
- VMware vRealize
- Ansible, Puppet, etc.
- CSI/Kubernetes
- Homegrown scripts

PowerMax REST API allows applications to “use” storage services directly without requiring a storage admin

IDC OPINION

With the increasing use of automation to streamline management, the availability of a REST API is critical. In evaluating the viability of a given API, customers will be looking for ease of use and the kind of comprehensive access to PowerMax functionality provided by the PowerMax REST API. The API improves efficiency, administrative productivity, and the reliability of operations — it’s an important feature!

SIMPLIFIED MANAGEMENT

Feature: Ansible Support

Ansible, an open source orchestration tool enabling infrastructure as code, provides better administrative productivity:

- ✓ Dell provides Ansible collections, which enable automation of common use cases such as storage provisioning, remote replication control and configuration, and snapshot control.
- ✓ Storage administrators can leverage Dell-validated Ansible modules to integrate storage workflows into automated processes.
- ✓ Users can integrate PowerMax modules with other Ansible modules to build and manage workflows in a repeatable and scalable manner.



IDC OPINION

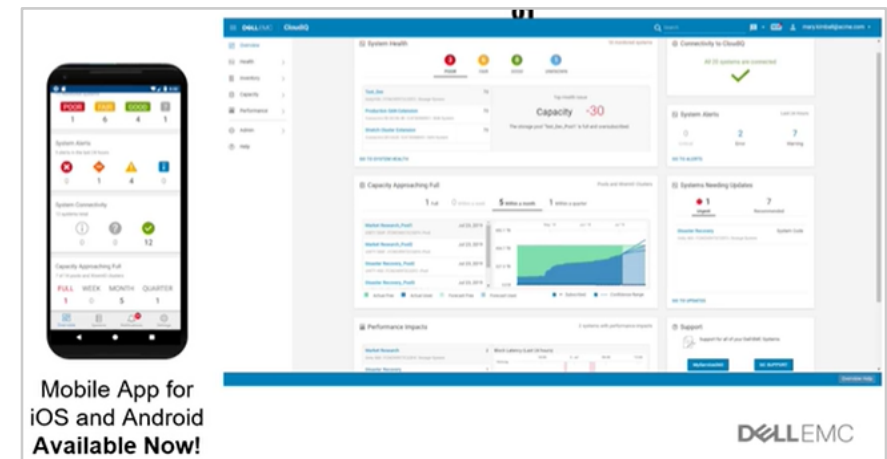
Dell-validated Ansible modules can comprehensively leverage PowerMax storage management functionality and make building and scaling automated workflows easy. This feature supports integration with a variety of external environments (VMware, Kubernetes, etc.) and other automation tools, making administration simpler, more reliable, and easier to scale as necessary.

SIMPLIFIED MANAGEMENT

Feature: CloudIQ

CloudIQ is a no-cost, ML-driven, SaaS-based platform that delivers predictive analytics, centralized insights, and business planning across Dell's storage infrastructure portfolio. Cloud IQ:

- ✔ Provides monitoring and management across a fleet of geographically distributed Dell storage platforms.
- ✔ Allows administrators to view metrics across the entire fleet at the same time, including health status, performance, capacity consumption, snapshot usage, and trends over time.
- ✔ Enables direct launch into Unisphere for additional drilldown on any array.



IDC OPINION

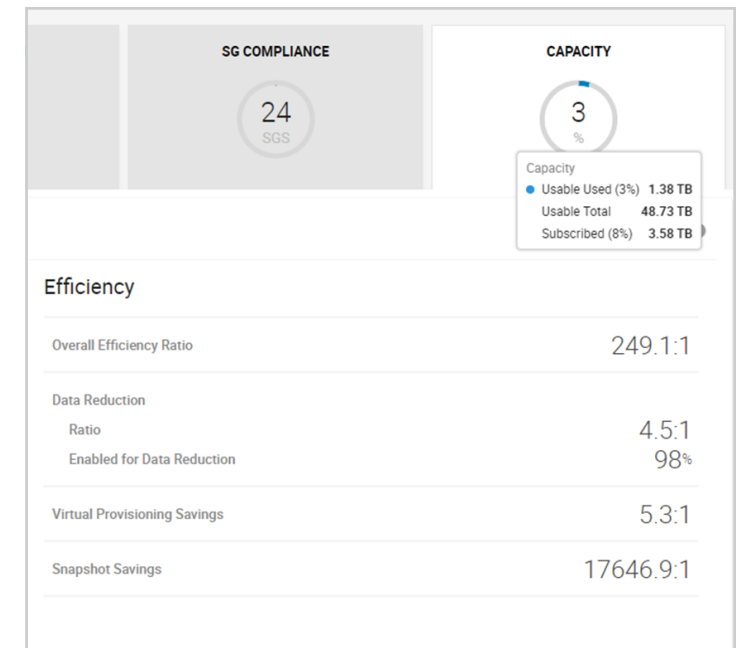
SaaS-based platforms like CloudIQ drive real administrative value for customers, and CloudIQ offers an extensive set of monitoring, management, and trend analysis capabilities that will clearly help administrators efficiently manage and optimize large and growing storage infrastructures. The mobile app for CloudIQ is a particularly nice feature offering increased administrative agility.

HIGH EFFICIENCY

Feature: Global In-Line Data Reduction

In-line data reduction lowers overall storage costs and improves storage efficiency:

- ✓ Hardware-assisted compression, deduplication, and encryption are all performed in-line and in a single pass with no noticeable application performance impact.
 - Maintains high bandwidth while performing deduplication and compression
- ✓ Data reduction is set at the array level and can be enabled/disabled at the application level.
- ✓ Dell Technologies provides a 3.5:1 data-reduction guarantee from the use of compression and deduplication on reducible data, but the overall efficiency ratio will be potentially much greater when thin provisioning and space-efficient snapshots are also taken into account.



IDC OPINION

Global in-line data reduction on the PowerMax is a key feature as it enables customers to get more value through greater efficiency from the storage capacity they purchase. Data reduction is granular, enabled at the application level with no performance impact. It allows for customers to have a fast and easy enablement methodology to get data-reduction storage efficiency benefits.

HIGH EFFICIENCY

Feature: PowerMax Snapshot Policies

At-scale snapshot policy creation includes:

- ✓ Simple wizard-based workflow to ease creating snapshot policies with different types of recovery point objectives (RPO).
- ✓ Snapshots that enable a variety of data protection and data reuse cases.
- ✓ Monitoring and management capabilities associated with snapshot definition, retention, alerting for policy compliance, and deletion.
- ✓ PowerMax REST API that allows snapshot workflows to be leveraged by external automation tools like VMware vRealize and Kubernetes (through its support for the container storage interface).

Create Snapshot Policy | 000197601288

Properties

Name

Location Local Cloud

Type Secure

Recovery Point Objective (RPO)

Create a snapshot By The Minute every 10 mins at :00

Keep 2 Hour(s) Total 12 Snapshots (Max 1024)

Compliance

Show as ⚠ if fewer than 11 (92%) snapshots are created

✖ if fewer than 10 (83%) snapshots are created

IDC OPINION

The Snapshot Policy wizard makes building, executing, and scaling snapshot workflows extremely easy, bringing in policies to help manage creation, retention period, and alerting. Snapshot scalability sets PowerMax apart from the competition with its ability to manage a total of 1,024 snapshots per device (with 64 million snapshots in the array).

HIGH EFFICIENCY

Feature: Cloud Mobility

Ease the storage of snapshot data in the public cloud:

- ✓ Snapshot policy wizard can set policies to easily copy cloud snapshots to on-premises cloud targets such as Dell EMC PowerScale and ECS and public cloud targets that include Amazon Web Services and Microsoft Azure.
- ✓ Data movement to cloud targets is efficient and secure as it is both compressed and encrypted.
- ✓ The first copy of a snapshot to a location is a “full copy” while subsequent copies are all space efficient, and a single snapshot can be migrated to multiple targets.

Create Snapshot Policy | 000197601288

Properties

Name

Location Local Cloud ECS [\(Change\)](#)

Recovery Point Object

Create a snapshot

Select Cloud Provider

Cloud Name	Cloud Provider	State
ECS	ecs	online
PowerScale-S3	ecs	online
Azure	azure	online
AWS-East	amazon	online
AWS-West	amazon	online

IDC OPINION

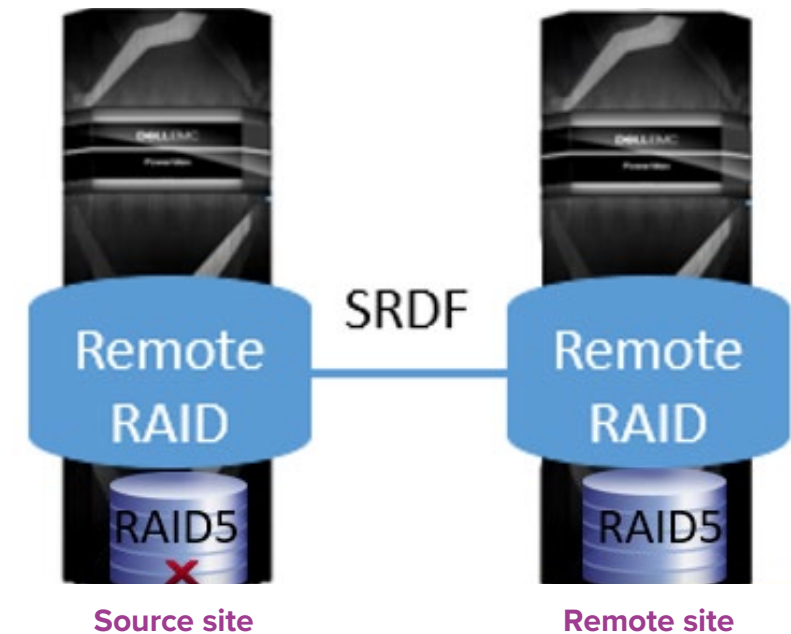
Cloud mobility enables agile, cost-effective storage for archiving and long-term retention in public cloud, helping to make on-premises primary storage infrastructure more efficient. A single wizard click enables this feature, making it exceedingly easy to use. Additionally, cloud snapshots can be recovered back to different storage groups on an array as well as AWS or VMware vSphere block storage for flexible recovery options.

RESILIENT STORAGE OPERATIONS

Feature: Remote RAID

Higher resiliency at lower cost:

- ✓ Remote RAID is a feature inherent in the design of SRDF.
- ✓ In the event of multiple drives failure at the source site within the RAID 5 group, all host reads and writes are serviced from the remote site with a minimal performance impact.
 - Remote RAID offers literally thousands of times less risk of data loss than traditional RAID 6
- ✓ Remote RAID lowers the cost of device-level data protection in remote replication configurations while improving overall resiliency.
- ✓ Both local and remote sites can use lower-cost RAID 5 configurations.
 - Conventional arrays typically require RAID 6 (with its higher cost of redundancy and performance impacts) at both the source and target sites.



IDC OPINION

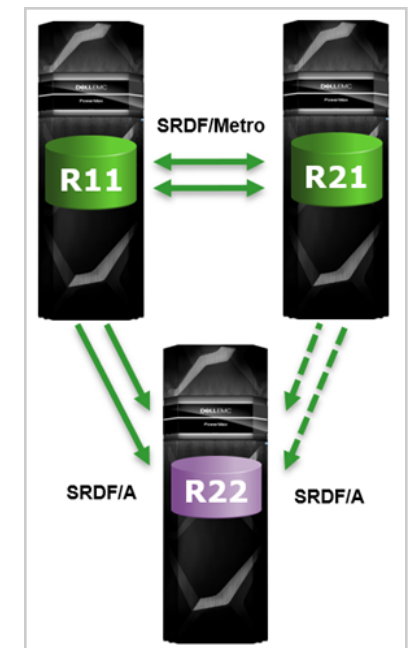
This is an innovative approach to providing better resiliency at lower cost for PowerMax customers who are using SRDF. The implementation provides transparent recovery for multiple simultaneous failures with minimal performance impact. The larger the PowerMax storage capacity, the more cost savings realized by this unique offering.

RESILIENT STORAGE OPERATIONS

Feature: SRDF/Metro Smart DR

Long-distance DR at lower cost. Reduce storage space and bandwidth SRDF/Metro DR requirements by 50%:

- ✔ Smart DR allows a single remote site array to act as a target for either of the two SRDF/Metro arrays, transparently switching between the two as needed based on operational mode (normal or recovery).
- ✔ Smart DR wizard validates configurations prior to enabling SRDF/Metro Smart DR, making configuration extremely simple.
- ✔ Existing SRDF/Metro DR configurations can be converted to SRDF/Metro Smart DR configurations non-disruptively.



IDC OPINION

Although PowerMax is considered an industry leader in high-availability storage, SRDF/Metro Smart DR provides an extra layer of protection for most mission-critical workloads at significantly lower cost. Once the needed arrays are in place, it takes only a few simple steps to enable or disable the SRDF/Metro Smart DR capability.

Key Findings

- ▶ Updated wizards and workflows in the Unisphere GUI and REST API-based automation make administrative tasks faster, easier, and more scalable.
Simplified management validated
- ▶ CloudIQ fleet- and array-level monitoring and management offer admin visibility into system performance.
Functionality validated
- ▶ New high-efficiency operations like in-line, hardware-assisted data reduction drive cost savings and ease of use without application performance impact.
Functionality and ease of use validated
- ▶ Cloud mobility enables multicloud options that are fast and easy to configure.
Functionality and ease of use validated
- ▶ Snapshot policies at scale facilitate data protection and data reuse.
Functionality, ease of use, and scalability validated
- ▶ Remote RAID recovery in dual-drive failure scenario verified with transparent recovery, minimal performance impact, and lower cost than RAID 6.
Transparent recovery and lower cost validated
- ▶ Simple, non-disruptive SRDF/Metro Smart DR enablement/disablement verified.
Simplified management and lower cost validated

IDC Opinion

As PowerMax has evolved, its management capabilities have also, and this Lab Validation looked at several common storage management tasks including provisioning, cloud mobility, snapshot creation, replication, configuring metro clusters, and disaster recovery. With PowerMax, these tasks have become more automated and the workflows have become more streamlined, resulting in faster, easier, and more reliable storage operations. Enterprise storage administrators will really appreciate these features and capabilities.

Key new features like hardware assist for in-line data reduction and encryption make configuring more cost-effective and secure systems automatic during storage provisioning. The same is true with enabling cloud mobility—it just takes a single click and the data transfer does not impact any other operations. The workflow for creating snapshot policies is intuitive, simple, and easy to scale as necessary using the wizard.

Remote RAID is an innovative approach which provides better resiliency using lower cost storage configurations for PowerMax customers who use SRDF.

The new SRDF/Metro Smart DR feature is simple and non-disruptive to configure and provides a much lower cost and much more bandwidth-efficient long-distance DR option for SRDF/Metro customers that is not available from other vendors. These enhancements are a significant step forward in PowerMax's ease of use that increases the attractiveness of the platform for prospective customers and bolsters its market-leading replication technology.

About the Analyst



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Eric Burgener is research vice president within IDC's Enterprise Infrastructure Practice. Eric's core research coverage includes storage systems, software and solutions, quarterly trackers, end-user research as well as advisory services and consulting programs. Based on his background coverage of enterprise storage, Eric's research includes a particular emphasis on flash-optimized arrays, emerging persistent memory technologies, and software-defined storage. He is an active participant in the IT Buyers Research Program at IDC and blogs throughout the year on the topic of infrastructure and data management.

[More about Eric Burgener](#)

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