



Storage Reinvented

Dell EMC PowerMax with Intel® Optane™ Technology

Breaking the Data Bottleneck

“As enterprises plan their long-term IT strategies, including how they’re going to bring cloud into their business, they have to consider how best to modernize their high value traditional applications, that still run the business and still constitute as much as 40 to 50% of spending in many enterprises. Storage class memory in conjunction with NVMe over fabrics and flash-based SSDs will be important features to this modernization.”

—Peter Burris, Chief Research Officer, Wikibon¹

Storage is more than clever technology strategy; it leads to concrete, competitive advantage. Today, the requirement is for consolidated storage to handle mixed workloads efficiently and cost effectively.

Unfortunately, storage infrastructure in the data center is often unable to quickly access the massive data volumes needed for today’s analytics, high-demand financial transactions, online trading, fraud detection, interactive retail, inventory and supply-chain management, etc. These top-priority workloads require high input/output operations per second (IOPS), with the low latency and resiliency that legacy storage systems cannot support. In addition, data is siloed on proprietary storage arrays that are difficult to integrate with new applications for emerging business initiatives.

Finally, storage infrastructure must be ready for exponential growth at any time, all the while consistently maintaining the aforementioned high performance and low latency.



Enterprises need to modernize high value traditional applications and power next gen apps like real time analytics, AI and IoT.

Chasing Data

This is easier said than done. The biggest challenge to consistent performance/latency is the bottleneck. And this is nothing new, says Christopher Murphy, Intel’s Dell EMC Global Account Manager: “In my 20+ years in data center technologies, and in storage in particular, it can feel like a constant game of chasing the data bottleneck. We solve one challenge, just to move to the next bottleneck in line, and then repeat that process over and over again.”²

The situation is getting more extreme. In a recent ESG whitepaper, Lab Analyst Kerry Dolan notes that enterprises are collecting growing quantities of data that are not only used in business-driven applications such as online transaction processing (OLTP), Oracle, and SQL Server, but also for customer insight and business trends: “In ESG research, 48% of IT decision makers reported both primary production data and secondary data growing by more than 30% annually. 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.”³

Storage Reinvented: Dell EMC PowerMax + Intel® Optane™ Technology



Luckily, for the first time in nearly 30 years, a breakthrough technology has arrived. Storage, once considered to be a static, background IT process, today plays a critical role in delivering on business success. The ESG whitepaper puts a fine point on it: “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.”³

Over the last three decades, engineers have been wringing additional performance out of existing technologies. While this has worked historically, there's a growing consensus that there remains little that can be done using these same old tools.

NAND solid-state drives (SSDs) have all but replaced hard drives in mission-critical applications, but their performance has been maxed out—we've met our limit. Murphy notes that “this restrains the ability to take advantage of other technology advancements, such as CPUs or even NVMe, which are outpacing today's storage media technologies. The next step in performance requires a leap to an entirely new storage technology.”⁴

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“It’s a whole new game, representing a fundamental paradigm shift in how storage architectures will be implemented.”

The Dell EMC PowerMax Advantage

Enter Dell EMC PowerMax with Intel® Optane™ SSDs, a solution that will change the design and capabilities of today’s storage systems.

Christopher Murphy says that “Intel® Optane™ technology doesn’t represent simply a game-changing advancement. It’s a whole new game, representing a fundamental paradigm shift in how storage architectures will be implemented. Intel Optane technology is the first major step in the evolution of a new form of memory architecture.”

“For years — decades, really — storage has been a bottleneck to the performance potential of data center architecture,” he continues, “Specifically, the performance delta between DRAM and even the fastest NAND SSD is like comparing taking a cruise ship from New York to Paris vs. flying in a Mach 2.2 supersonic jet. It really is that different. This gap where data access is dependent on storage has been a constant challenge.”⁵

Dell EMC PowerMax is the first array to ship with non-volatile memory express (NVMe) SSDs and dual port Intel® Optane™ SSD DC D4800X resident on the same data plane. The Intel Optane SSD appears as a persistent tier and the dual ports provide redundancy needed by most modern data centers.

The Dell EMC PowerMax storage platform is designed to handle enormous amounts of data quickly and intelligently with end-to-end NVMe, storage-class memory (SCM), and machine learning (ML). Dual port Intel® Optane™ SSDs help provide the exceptional resiliency and performance needed for consolidated, mixed workloads.

Intel Optane SSDs help reduce latency for applications while enabling organizations to consolidate block, file, and mainframe workloads to shrink the hardware footprint, streamline management with consistent data access, and lower total cost of ownership (TCO). The Intel Optane SSDs are based on 3D XPoint non-volatile memory, billed as a cross between dynamic RAM and NVMe flash. Dell was a co-development partner with Intel on the dual port Intel Optane SSDs.

Intel Optane SSDs uniquely enable PowerMax to eliminate bottlenecks, explains ZD Net: “The coupling of NVMe and Intel Optane on dual port give the new PowerMax systems up to 15M IOPs, or 50% better than the previous system, with up to 50% better response times and twice the bandwidth.”⁶

Meanwhile, moving to an NVMe interface means no longer being constrained by input/output (I/O) bottlenecks. Designed for non-volatile, high-speed flash media, NVMe offers a streamlined connection to the host CPU, along with a simpler software stack. That reduces I/O processing time and CPU overhead, which helps improve performance and reduce latency to accelerate existing applications and support new applications that demand real-time processing.

Speed Massive Data Access with Dell EMC PowerMax and Intel® Optane™ SSDs



Dell EMC PowerMax and Intel® Optane™ SSDs help companies access critical data quickly, with greater efficiency.



Breaking the Data Bottleneck

The PowerMax Advantage

Speed, Endurance and Flexibility

A Game Changer for Mission-Critical Applications

Case Study

Innovative Storage for Data Driven Needs

Resources

Bottom line: PowerMax, the world's fastest data storage array just got faster. With end-to-end NVMe, storage class memory for persistent storage⁷, real-time machine learning and up to 350GB⁸ per second, PowerMax features high-speed smarts to power the most critical workloads.⁸

Essentially, this revolutionizes data storage. PowerMax is designed with a multi-controller, active/active scale-out architecture and industry standard, end-to-end NVMe. Inline, global dedupe and compression add extreme efficiency to your data center, even as it scales. With PowerMax you can consolidate your block, file, mainframe, and IBM workloads and modern, real-time analytics apps on a single array. The real-time machine learning engine automatically optimizes performance with no overhead. Plus, PowerMax offers you the gold standard in replication, 6 9's availability, and data at rest encryption that's FIPS 140-2 validated.

This means transformational benefits for digital businesses. The SSD DC D4800X incorporates a unique combination of dual port redundancy, consistent low latency under virtually any load, and high random read/write performance. The combination allows for the high performance and low latency needed for mission-critical enterprise applications.⁹

Benefits Include



Significantly lower system read and write latencies⁹



Consistent, high-performance response times, even under heavy data workloads⁹



Support for near-real-time analytics and high-demand online transaction processing (OLTP)



A built-in ML engine that increases efficiency by automatically placing the most critical and active data into the Intel Optane SSD storage tier



Seamless integration with existing applications and container environments



PowerMax features high-speed smarts to power the most critical workloads.

Speed, Endurance, and Flexibility

Intel® Optane™ technology provides industry-leading capabilities⁹ for breakthrough performance, predictably fast service, responsiveness under load, and high endurance. Combining performance with data-path redundancy gives enterprise storage-array providers multiple options when designing mission-critical solutions.

“Optane was designed as the ultimate storage media,” explains Steve McDowell in Forbes: “It was designed to overcome the limitations of traditional NAND-based SSDs. The technology is also blindingly fast, with near-zero access latencies.”

Intel Optane SSDs, like 3D NAND, provide persistence but, McDowell notes, they take a different approach: “Optane exposes persistence with a byte-level addressability that’s more akin to how memory is used than how traditional SSDs are usually accessed. It’s that byte addressability, coupled with those nearly non-existent latencies, that give Optane its magical powers.”

When NAND SSD performance reaches its limit, Intel Optane SSDs step in. PowerMax, with dual port Intel Optane SSDs as a persistent storage tier, can help significantly reduce system latencies. With the unique ability to read and write simultaneously, Intel Optane SSDs maintain consistent high-performance platform response times—even under heavy loads. PowerMax and Intel Optane SSDs provide a strong solution for near-real-time analytics and high-demand online transactional processing (OLTP).¹⁰

Which means that PowerMax is ideal for situations in which high-priority workloads retain high IOPS and low latency while lower priority workloads can continue to function at consistent and predetermined acceptable performance levels.



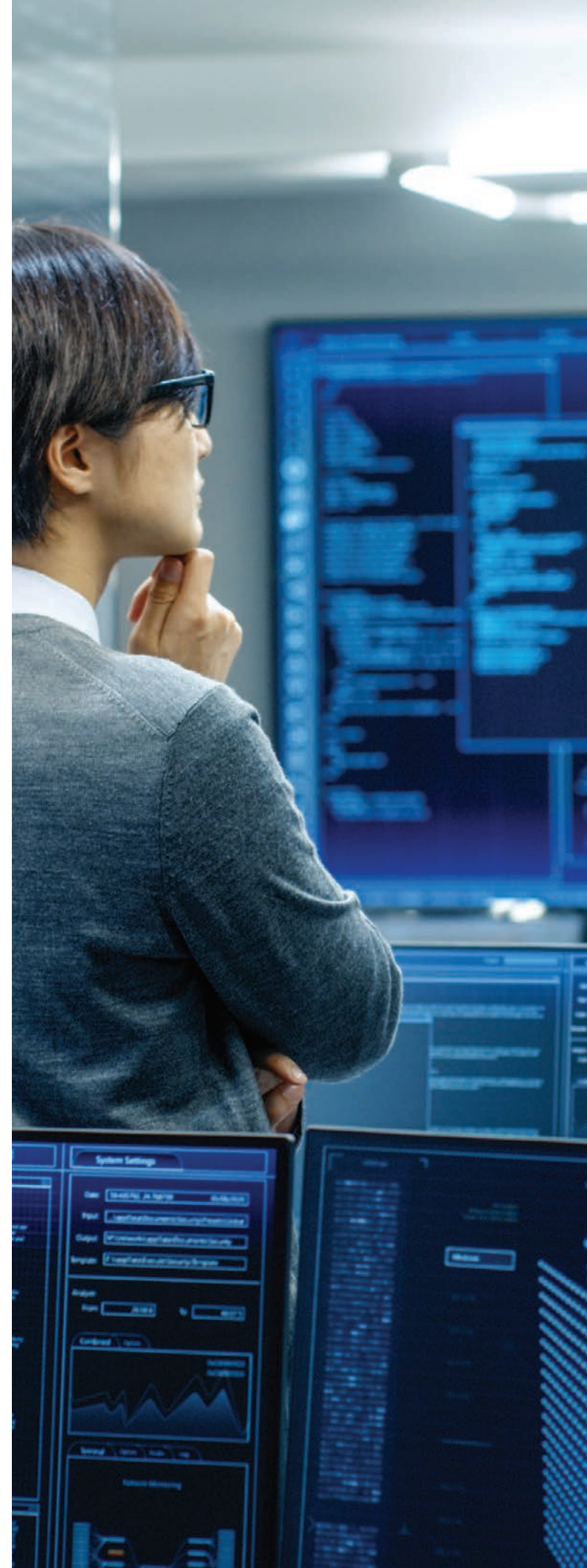
24/7 data availability with redundant paths and a hot-plug capability for continued data access in the event of system upgrades or failure



The ability to scale service levels and performance while balancing overall design costs



Accelerated data delivery and amplified system performance for NVMe or Serial-Attached SCSI (SAS) NAND SSDs



“It’s that byte addressability, coupled with those nearly non-existent latencies, that give Optane its magical powers.”

Another revolutionary PowerMax feature is its built-in machine learning engine that helps automated data placement to the correct storage media automatically based on incoming host I/Os. PowerMax leverages predictive analytics and pattern recognition in enabling truly autonomous storage, with the goal of optimizing storage. The machine learning engine is capable of analyzing and forecasting 40 million data sets in real time, driving 6 billion decisions per day with no additional incurred overhead.¹¹

And for all organizations — and especially for mission-critical applications — the incredible reliability of PowerMax targets an astounding 99.9999% availability of customer data. This is similar to saying that for no more than 34 seconds a year, data may not be accessible.¹³

The AI/ML engine transforms PowerMax, says Forbes: “To unlock the power of Optane, the PowerMax’s artificial intelligence engine watches data patterns and makes decisions about which data belongs in SCM and which belongs on NAND-based SSDs. This is similar to how a hybrid-flash array provides SSD-like

speeds by intelligently placing hot data on SSDs and colder data on spinning drives (but without the spinning drives).

“The machine learning engine in the PowerMax isn’t just about intelligent data placement,” explains McDowell in Forbes: “The software also makes decisions that keep its performance at steady levels by, for example, temporarily disabling in-line deduplication during busy periods. The AI engine will also enforce rules and perform dynamic tuning to meet application SLAs that the storage administrator defines.”

The results have been astonishing, yielding performance numbers that pushed the limits of what was achievable in a storage array: 500% more write IOPS, 100% more bandwidth, 26% lower latency, showing a 0.21 ms response time on a 100K IOPS random read workload. The big win, though, is in write performance. A write-intensive mixed workload showed that Intel Optane SSDs outperformed traditional SSDs by nearly 500% (that’s not a typo).³

Near-Memory Speeds and Performance



500%
more write input/
output operations

100%
more bandwidth

26%
lower latency

The machine learning engine in the PowerMax delivers intelligent data placement and keeps performance at steady levels, yielding performance numbers that pushed the limits of what was achievable in a storage array.³

A write-intensive mixed workload showed that Intel Optane SSDs outperformed traditional SSDs by nearly

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A Game Changer for Mission-Critical Applications

"It's really about changing the way IT operates," notes Caitlin Gordon, Dell EMC VP of Product Marketing. "Customers need systems that can perform more operations simultaneously to allow IT to run more efficiently. What that means for storage is the ability to connect to public cloud, but also the reality that any infrastructure you have can't be stand-alone. It needs more automated management tools and the ability to manage it as part of the overall management framework and automation strategy."

"PowerMax has done very well for us, exceeding our expectations," she notes, "But now the platform has true end-to-end NVMe, and we're the first storage array anywhere to ship the new dual port Intel Optane SCM drives....¹⁴ It lets us take the breadth of Dell Technologies and delivers it in a simple way."¹⁵

"The reliability of PowerMax and the unmatched performance gains of the Intel Optane SSD deliver for mission-critical applications," summarizes Christopher Murphy. "The Dell EMC and Intel partnership is what made this solution a reality. A truly unique collection of talent, vision, experience, and industry leadership focused on fundamentally changing the game."¹⁶

If you're interested in raw numbers and the nitty-gritty of the benchmarks and capabilities of the new PowerMax with Intel Optane SSDs, you can find it on Dell's website.

Enterprises today need **rich insights** from powerful applications.



Online trading



Fraud detection



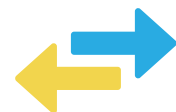
Point-of-sale transactions



Inventory and supply-chain management

Quickly accessing the data from these applications is **paramount**.

Enterprise-level storage systems **must be able** to handle demanding mixed workloads with:



More input/output operations per second (IOPS)



High bandwidth



Extremely low latency



"A truly unique collection of talent, vision, experience, and industry leadership focused on fundamentally changing the game."¹⁴



Revenue =
business intelligence x transactions per second

was also made up of multiple siloes of data storage that hindered the investment firm's ability to run multiparallel database calculations and achieve fast, reliable results. The organization needed to consolidate data resources while maintaining high levels of performance and reliability. It also wanted to remove transaction bottlenecks for high-frequency trading decisions to help stay ahead of the competition.

Solution

The organization implemented a new solution based on the Dell EMC PowerMax storage platform, using Intel Optane SSDs for storage-class memory and cache. With end-to-end NVMe support, the platform delivers the compute, storage, and networking capabilities required, bringing transaction times down from milliseconds to microseconds while maintaining optimal reliability. This accelerates decision-making for the organization (for example where to invest), meaning it can act more quickly and accurately than its competitors.

Results

The enhanced performance and reliability of the new storage platform means the organization's core applications are able to perform significantly more transactions per day. This represents huge potential business and competitive advantages for the company. Meanwhile, the consolidated solution has helped shrink the organization's storage footprint and related costs.

Business Challenge

For organizations operating in the financial services industry, timely action is critical. Thousands of decisions must be made every day, from large-scale strategic directions like which investment funds generate the best returns, to smallscale operational details, such as which offer to promote to a given customer. Each decision impacts overall business performance and customer satisfaction. Each one must be informed by a complex mix of information, and must be made quickly. In the world of high-frequency online trading, it comes down to a simple formula: Revenue = business intelligence x transactions per second. More knowledge and faster action can result in more money made.

Data is therefore essential. But just having the data is not enough. Immediate, reliable access to the right data at precisely the right moment, is the key. The "hot" data that informs decisions and transactions must be available close to the CPU and with very low latency.

One European financial services organization needed to address this challenge. The platform used to manage and store the data upon which its decision-making relied was aging.

Case Study
Leading Investment Firm Takes Decision-Making From Milliseconds to Microseconds

"Guaranteeing performance and reliability to meet the extreme service levels these financial systems demand, is hard to do. There weren't really any all-flash [storage-class memory as persistent storage] options on the market, so we were excited to take on the challenge of delivering the first."

—Marc Royer
senior pre-sales manager, Dell EMC

A large financial organization* removed transaction bottlenecks and accelerated critical decision-making while reducing its storage footprint and related costs. It did this by rethinking the entire storage platform to reduce data siloes, boost performance, and achieve fast, reliable results. With help from Intel and Dell EMC, the organization built an innovative end-to-end non-volatile memory express (NVMe) storage platform to support real-time analytics for mission-critical decision-making applications. The Dell EMC PowerMax solution, with Intel® Optane™ SSDs, has increased reliability while reducing transaction time from milliseconds to microseconds.¹ This translates to faster decision-making for the organization, putting it a step ahead of its competitors.

Challenge

In an industry where making decisions quickly leads to competitive advantage, a large European investment firm needed to enhance and accelerate its core decision-making applications. This meant rethinking the existing data storage platform, which was costly to run and maintain. The platform

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The cost of running the system at the high performance level required to address current business needs was becoming too high. With new business requirements creating added pressure, the organization needed to rethink its entire data platform for high-frequency trading.

Key requirements for the new platform were high reliability and high performance. "Guaranteeing performance and reliability to meet the extreme service levels these financial systems demand, is hard to do," explains Marc Royer, senior pre-sales manager at Dell EMC, which the organization tasked with helping it architect a solution. "There weren't really any all-flash [storage-class memory as persistent storage] options on the market, so we were excited to take on the challenge of delivering the first."

In building the new platform, the financial organization also wanted to take the opportunity to centralize its data estate and address two key pain points. First, it was using siloes of data held on different systems in order to achieve the required high performance and low latency. However, running multiple systems put a heavy burden on the IT team managing the platform, requiring experts in each system to be available 24/7 in case of any issues or outages. This combined to create a high amount of wasted capacity and inefficiency among the team.

The siloes also created a challenge for many of the workloads the organization runs, which use a broad range of multiparallel databases, including SQL, NoSQL and Oracle. By running the same calculation multiple times at once, these programs can build more detailed and nuanced analytics and enable more accurate, reliable decision-making. However, with data siloes running on different systems, each system exhibited slight variations in performance, latency and stability, creating inconsistencies between the calculations that threatened the reliability of the decision made based on each calculation. The organization needed a way to consolidate all this data while supporting a heterogeneous environment of multiple data formats and databases.

Solution Details

The Dell EMC team worked with Intel to deliver the high performance, low latency, consolidated data access the organization needed. The end-to-end NVMe solution is based on the Dell EMC PowerMax storage platform, which uses Intel Optane SSDs for its storage-class memory and capacity tiers (see Figure 1). PowerMax delivers very high levels of performance, with up to 15 million IOPs³, 350 GB/ second bandwidth⁴, and predictable read response times of under 100 microseconds⁵. The platform integrated smoothly with the organization's heterogeneous environment, providing the compute, storage and networking capabilities to support any database types now or in the future.

Intel Optane SSDs were chosen from a number of options due to their consistent high performance compared to 3D NAND storage technology, and strong reliability. "The technology advantages of the combined Dell EMC-Intel solution were not the only reason the organization chose to work with us," says Royer. "It also valued the fact that our companies bring decades of experience and expertise to the table, and that we provide

"A good analogy is to think of a Formula 1 racing team. If they can engineer their cars to go a couple of seconds faster than their competitors', it will help them win. It could give them an advantage for years until the others catch up."

—Marc Royer

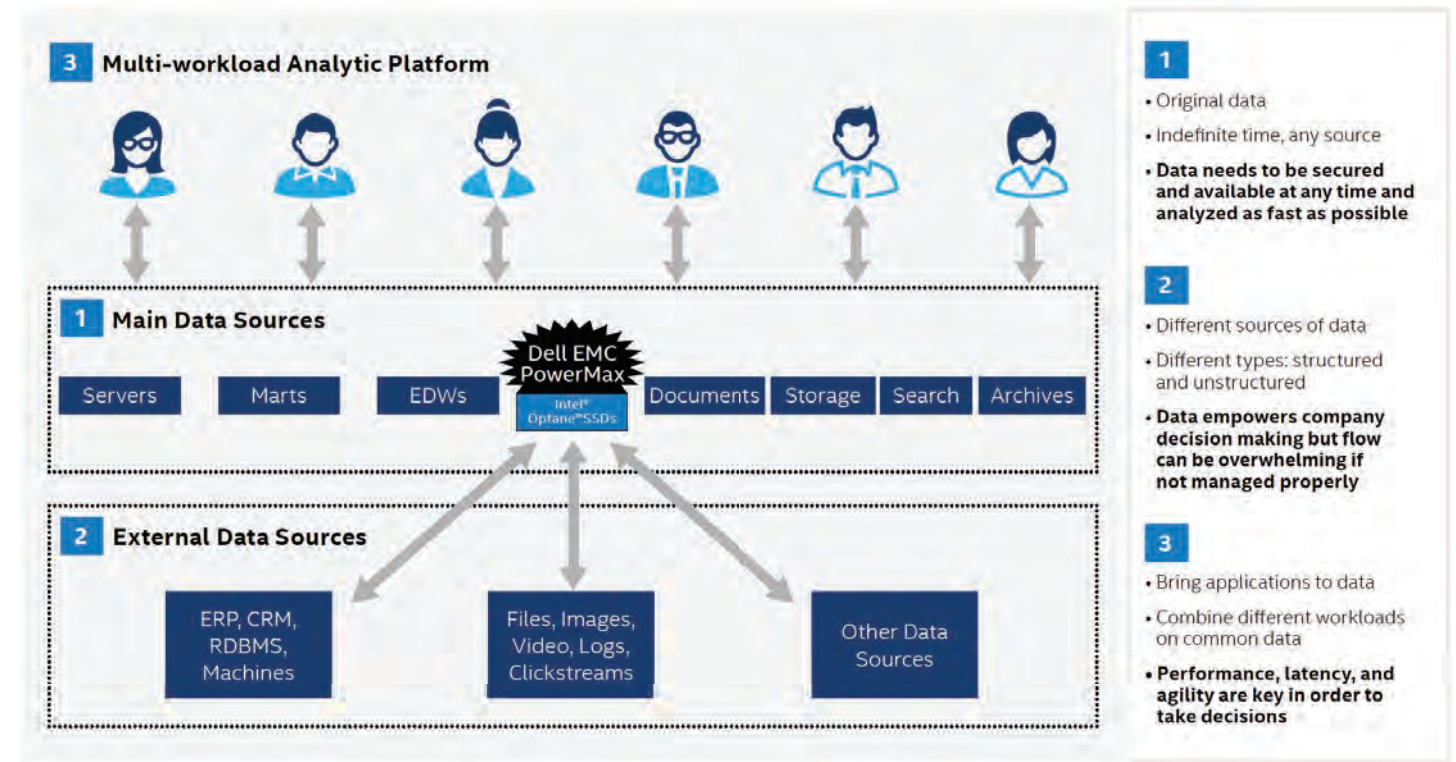


Figure 1. Dell EMC PowerMax with Intel® Optane™ SSDs is a modern scale-out storage system designed for mission-critical workloads. This includes databases and applications as well as real-time analytics that demand uncompromising uptime and extremely low latency

the stable roadmap to ensure we'll be here to support them in the years to come."

The customer carried out its own evaluation of the solution, with the objective of achieving a transaction time of under one millisecond. In fact, after internal testing, the customer reported a time well into microseconds, representing a significant performance improvement.⁶ "A few hundred microseconds might not sound like much of a reduction, but it could represent a huge dollar value in competitive advantage for our customer," explains Royer. "A good analogy is to think of a Formula 1 racing team. If they can engineer their cars to go a couple of seconds faster than their competitors', it will help them win. It could give them an advantage for years until the others catch up."

Business Results

"It was important to the customer that their new data platform be built on a true end-to-end NVMe architecture over fabric. They saw this as the only way to ensure the data consistency they needed with no latency," says Royer. "As the Dell EMC PowerMax platform with Intel Optane SSDs is built for NVMe, it can offer very high performance without compromising reliability, latency or cost. This is unlike many other options on the market today. Crossing from milliseconds to microseconds is a performance gain of a magnitude we haven't seen since the transition from mechanical drives to flash."

With the new platform up and running in production, the organization confirmed it meets all requirements and has been implemented and rolled out with no surprises. When running such mission-critical systems on which millions of dollars depend every hour, this predictable reliability is especially key.



Technical Components of Solution

- **Dell EMC PowerMax storage platform.** Designed to handle enormous amounts of data quickly and intelligently, with end-to-end non-volatile memory express (NVMe) storage-class memory. This helps eliminate I/O bottlenecks and streamline connection to the CPU and optimize Intel® Xeon® E5 processors' high performance.
- **Intel® Xeon® E5 processor.** Deliver the essential performance and advanced security technologies for entry server solutions, professional workstations, and secure cloud services.
- **Intel® Optane™ SSDs.** Reduce application latency while enabling organizations to consolidate block, file and mainframe workloads to shrink hardware footprint, streamline management and lower costs.
- **Dual port access.** Dell EMC adapted its software to take advantage of dual port Intel Optane SSDs in the PowerMax system. This means the solution benefits not just from high performance, but also from greater reliability with redundant data paths and hot-plug capability for continued data access in the

From a business perspective, the improved performance of the new storage platform means the number of decisions made every hour has significantly increased. This in turn makes a large contribution towards enhancing the organization's profitability and competitive position. Consolidating the multiple data siloes and storage systems into a single platform has also helped reduce overall costs. "We estimate that the customer's storage footprint has shrunk significantly, without reducing capacity or performance, or risking bottlenecks," says Royer. "Shrinking the physical footprint helps reduce space, power and cooling costs. Meanwhile eliminating the need for many different vendor specialists to be available at all times means the IT team's human resources can operate much more efficiently."

Find the solution that is right for your organization.

Learn More

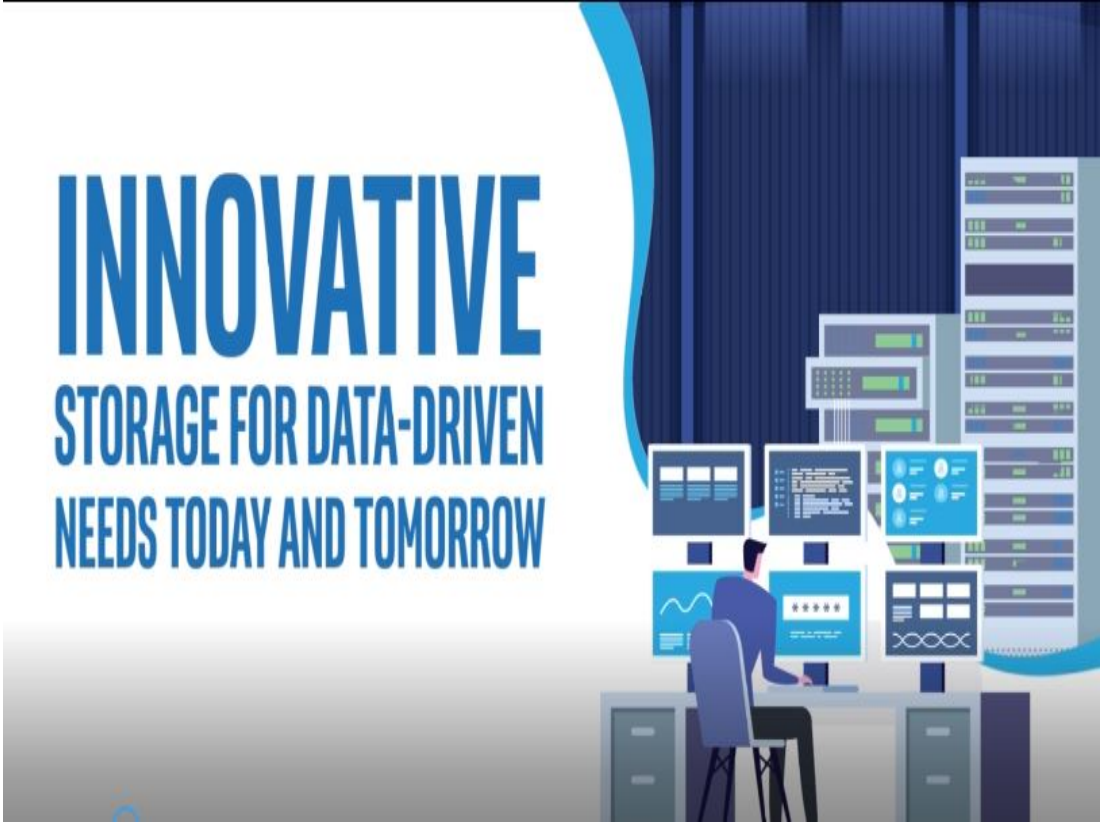
- Solution brief: Dell EMC PowerMax Speeds Data Access with Intel® Optane™ SSDs
- ESG report: Dell EMC PowerMax and SCM Powered by Dual-port Intel Optane Technology Combine to Improve Overall System Performance
- Infographic: Innovative Storage for Data-driven Needs
- Website: Dell EMC PowerMax
- Website: Intel® Optane™ SSDs

Contact your Intel representative or visit www.intel.com/optanedatacenter



Innovative Storage for Data Driven Needs

Enterprises need rich insights and quick access to their data. Dell EMC PowerMax handles enormous amounts of data quickly and intelligently. Combined with Intel® Optane™ SSDs, you can meet your most intensive data needs.



[Click to play the video above.](#)



Resources

- ¹ Peter Burris <https://bit.ly/3i7J7k6>
- ² Christopher Murphy <https://intel.ly/2YDsaGz>
- ³ <https://www.delltechnologies.com/en-us/collaterals/unauth/white-papers/products/storage/dell-emc-powermax-scm-intel-optane-system-performance.pdf>
- ⁴ <https://itpeernetwork.intel.com/intel-optane-technology-and-dell-emc-powermax-the-revolution-in-enterprise-storage/>
- ⁵ Christopher Murphy <https://intel.ly/2YDsaGz>
- ⁶ ZDNet <https://zd.net/3ibt4j>
- ⁷ <https://www.delltechnologies.com/en-us/collaterals/unauth/briefs-handouts/products/storage/powermax-infographic.pdf>
- ⁸ <https://www.delltechnologies.com/ru-am/storage/powermax.htm>
- ⁹ <https://www.intel.com/content/www/us/en/products/docs/memory-storage/solid-state-drives/data-center-ssds/optane-ssd-dc-d4800x-series-brief.html>
- ¹⁰ <https://www.intel.com/content/dam/www/public/us/en/documents/solution-briefs/dell-emc-powermax-optane-ssd-brief.pdf>
- ¹¹ <https://www.delltechnologies.com/en-us/collaterals/unauth/data-sheets/products/storage/h16891-powermax-family-ds.pdf>
- ¹² <https://itpeernetwork.intel.com/intel-optane-technology-and-dell-emc-powermax-the-revolution-in-enterprise-storage/#gs.kiyc43>
- ¹³ <https://moorinsightsstrategy.com/dells-powermax-wears-an-optane-bow-tie/>
- ¹⁴ Channel Futures <https://bit.ly/3i8ZsFm>
- ¹⁵ Channel Buzz <https://bit.ly/3dGlqfi>
- ¹⁶ Christopher Murphy <https://intel.ly/2YDsaGz>

Intel

The Revolution in Enterprise Storage
<https://itpeernetwork.intel.com/intel-optane-technology-and-dell-emc-powermax-the-revolution-in-enterprise-storage/>

Dell EMC PowerMax Speeds Data Access with Intel® Optane™ SSDs
<https://www.intel.com/content/www/us/en/products/docs/storage/dell-emc-powermax-optane-ssd-brief.html>

Revolutionizing Memory and Storage
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Intel: Innovative Storage for Data Driven Needs
<https://www.intel.com/content/www/us/en/products/docs/storage/dell-emc-powermax-optane-ssd-infographic.html>

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EMC PowerMax NVMe Storage
https://www.delltechnologies.com/en-us/storage/powermax.htm?gacd=9650523-1033-5761040-266691960-0&dgc=st&gclid=EAAlaQobChMI6LzpkYmq6wIVsyCtBh2eowqOEAAAYASAAEgJSvfD_BwE&gclsrc=aw.d

ZDNet

Dell EMC upgrades PowerMax storage systems with NVMe over fabric, dual port Intel Optane drives
<https://www.zdnet.com/article/dell-emc-upgrades-powermax-storage-systems-with-nvme-over-fabric-dual-port-intel-optane-drives/>

Enterprise Strategy Group

Technical Validation: Dell EMC PowerMax and SCM Powered by Dual-port Intel Optane Technology Combine to Improve Overall System Performance
<https://www.esg-global.com/validation/esg-technical-validation-dell-emc-powermax-and-scm-powered-by-dual-port-intel-optane-technology>

Video: EMC PowerMax with Storage Class Memory
<https://www.delltechnologies.com/en-us/storage/powermax.htm?mkwid=sUkvPNb04&pclid=266959812189&pkw=dell+powermax&pmt=e&pdv=c&slid=&product=&pgid=58603687841&ptaid=aud-644024522857%253Akwd-634054842232&VEN1=sUkvPNb04%252C266959812189%252C901qz26673%252Cc%252C%252C%252C58603687841%252Caud-644024522857%253Akwd-634054842232&VEN2=e%252Cde+powermax&lid>



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