Enterprise Strategy Group™

TECHNICAL VALIDATION

Huawei New-Gen OceanStor Dorado Converged All-Flash Storage

Redefining Mission-critical Storage for the AI Era

By Tony Palmer, Practice Director
Go-to-market Insights and Advisory
Enterprise Strategy Group (now Omdia)

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Introduction

This Technical Validation from Enterprise Strategy Group (now Omdia) documents our evaluation of Huawei New-Gen OceanStor Dorado converged all-flash storage and explores how the platform provides organizations across diverse industries like finance, government, and healthcare with highly performant, resilient, and intelligent storage to support mission-critical applications and help them achieve digital and intelligent transformation.

Storage Trends and Challenges

AI is profoundly affecting nearly every facet of how businesses operate today. Storage infrastructure is facing heightening requirements for massive data storage capacity to support AI projects while keeping the environment secure and meeting performance demands.

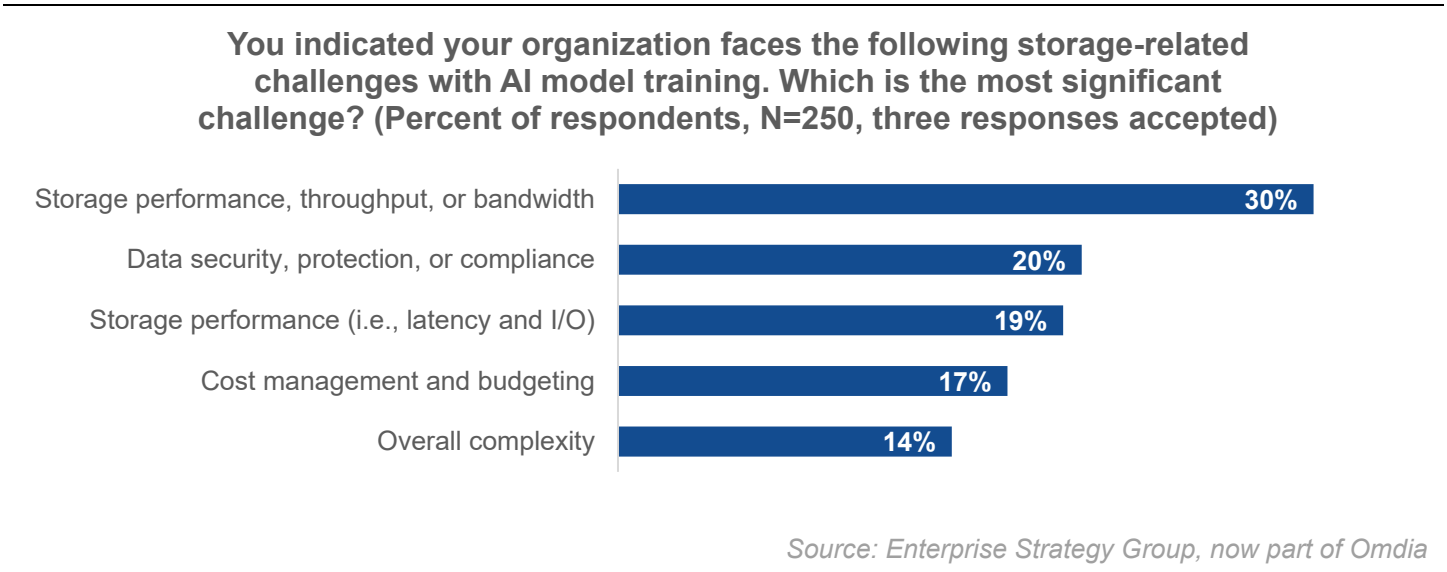
Massive data growth continues and will be even further fueled by comprehensive AI strategies and supporting deployments: A majority of respondents (55%) to Enterprise Strategy Group (now Omdia) research have 1 PB or more of installed capacity across all locations, with almost one in five having 10 PB or more. Additionally, most organizations (75%) anticipate that their data growth rate will be higher or much higher over the next 24 months compared with the growth rate over the previous 12 months.[1]

Enterprise data is roughly evenly split between structured (55%) and unstructured (45%) data types today, highlighting the need for solutions that can support both paradigms. Storage capacity (45%) issues are forefront in the minds of respondents. With high capacity, enterprises need fast storage that can adequately feed the compute layer for mission-critical and AI applications.

Respondents indicated that this remains a major issue, as storage performance in terms of throughput or bandwidth (30%) was most often highlighted as a storage-related challenge. Performance issues from a latency and I/O perspective (19%) were also a top-three challenge in this regard.

Data protection, security, and compliance issues (20%) are often-cited challenges as well, as teams mindfully balance AI ambitions with technology threats and risks.

Figure 1. AI and Data Drive On-premises Data Center Budget Increases



Source: Enterprise Strategy Group, now part of Omdia

[1] Source: Enterprise Strategy Group (now Omdia) Research Report, *The Critical Role of Storage in Building an Enterprise AI Infrastructure*, September 2025. All Enterprise Strategy Group research references and charts in this Technical Validation were taken from this research report.

Organizations are tasked with providing a high-quality, predictable, and productive computing environment for an ever-growing number of internal users and external customers. In addition, enterprise application environments have become increasingly unpredictable as their underlying IT infrastructure grows in complexity and size. Mission-critical business application performance is sensitive to storage performance and latency and is highly dependent on the resilience of the IT environment.

The ability to consolidate critical workloads and functions onto a single all-flash storage system has proven to provide significant total cost of ownership (TCO) benefits if an organization's performance, reliability, and operational requirements can be met. While many storage vendors offer all-flash solutions, the design decisions and tradeoffs made by these vendors can result in quite different system capabilities and, ultimately, tradeoffs in benefits to an organization.

Huawei New-Gen OceanStor Dorado Converged All-Flash Storage

Huawei designed the OceanStor Dorado all-flash storage to handle mission-critical applications and mixed workloads for large enterprises. Enterprise Strategy Group (now Omdia) tested and evaluated the OceanStor Dorado V6 in 2020. The New-Gen OceanStor Dorado leverages a multiple controller, end-to-end non-volatile memory express (NVMe) architecture designed to reduce latency and ensure high resiliency. It can scale up and scale out massively and supports up to 128 controllers.

Figure 2. Huawei New-Gen OceanStor Dorado Converged All-Flash Storage

Ever Fast

- Converged scale-out and scale-up architecture
- Disaggregated data and control flow
- SAN, NAS, and S3 convergence with a shared resource pool

Ever Solid

- SmartMatrix: Full mesh architecture with 99.99999% availability
- Ransomware protection for block and file across all zones
- Integrated SAN&NAS&S3 active-active data center
- Dual active, geo-redundant four data center availability
- FlashEver: Cross-generation storage coexistence, migration, and upgrades

AI-powered

- AI-enhanced intelligent data storage operations and management

Source: Huawei and Enterprise Strategy Group, now part of Omdia

The New-Gen OceanStor Dorado incorporates several new features and capabilities to maximize OceanStor Dorado performance, resilience, and efficiency, while minimizing overall TCO:

- **Performance.** The Huawei OceanStor Dorado all-flash storage system has an NVMe-based architecture, which supports direct communication between the CPU and NVMe solid-state drives (SSDs) using NVMe over RoCE for Smart Enclosures, lowering end-to-end latency. The converged scale-up and scale-out architecture offers flexible compute and capacity expansion. Disaggregated data flow and control flow improve performance with FlashLink 3.0. Multiprotocol convergence for diverse applications supports SAN (block), NAS (file), and S3 (object) protocols from a single resource pool to lower cost of ownership, increase performance, and provide a unified experience.

- **Resilience.** The Huawei SmartMatrix full-mesh architecture supports 32 controllers across eight engines and can tolerate failure of up to seven out of eight engines. Huawei employs multiple layers of software to provide high availability in its platform. RAID-TP, Huawei's implementation of triple-parity RAID, allows for up to three simultaneous disk failures across enclosures.
  - SmartMatrix architecture supports full interconnection between front-end interface cards, controllers, and back-end disk enclosures; combined with the software technology of cache triple copy and continuous mirroring, hardware fault tolerance is extremely high. OceanStor Dorado tolerates failure of seven out of eight engines and ensures uninterrupted business continuity.
  - Cross Enclosure RAID supports enclosure redundancy. The failure of any disk enclosure does not affect the continuity of services, and Huawei RAID-TP ensures that an additional disk failure would be tolerated before the enclosure recovers. RAID 2.0 also enables fast rebuild of data, with hot spare space spread across all disk modules.
  - HyperSnap snapshots provide point-in-time redirect-on-write (ROW) snapshots for fast recovery of data with minimal impact on performance. ROW snapshots are optimized for performance, requiring one-third of the I/O operations of copy-on-write snapshots with no computational overhead when reading snapshots.
  - HyperMetro provides a gateway-free integrated SAN, NAS, and S3 active-active solution. The two data centers provide services at the same time, providing resource access and service load balancing across both sites. Data is synchronized between two storage systems before host response and protocol locks prevent conflicts during simultaneous read/write access to the same file or object.
  - HyperReplication provides remote replication to standby data centers, and working with HyperMetro can provide a four data center dual-active, geo-redundant configuration, resulting in continuous data access for the most critical business applications.
  - Huawei combines multiple technologies across the network and OceanStor Dorado storage system to provide ransomware detection and protection for block and file across all zones.
  - FlashEver, an upgrade service that allows organizations to independently replace controllers or scale out new engines with no data migration or service disruption, also provides access to New-Gen hardware.[2]
- **AI-powered data infrastructure management.** Huawei's New-Gen OceanStor Dorado converged all-flash storage system provides a multi-layer AI architecture to help organizations automate data management. DeviceManager simplifies configuration, operations, and maintenance at the system and component level. iMaster DME is a platform that can be deployed on physical or virtual machines (VMs), enabling automated, service-based storage to be easily provisioned and managed. iMasterCloud DME IQ Intelligent Operations and Maintenance (O&M) platform in the cloud leverages technologies like big data analytics and AI to deliver streamlined management of Huawei storage devices. It ensures the stability of services and boosts O&M efficiency for customers through a dedicated mobile app and intelligent capabilities.
  - The iMaster DME Data Center Management platform is an intelligent management platform designed for all data center scenarios. Unifying O&M, iMaster DME brings with it two major capabilities: intelligent IT infrastructure O&M and intelligent data management. iMaster DME offer solutions like AI-powered industrial quality inspection based on storage. Online inspections provide proactive defense against high-risk threats in real time. AI algorithms and knowledge graphs help demarcate and locate faults and restore services in minutes.
  - The iMasterCloud DME IQ Intelligent Cloud O&M Platform can remotely monitor device information and health status, including alarms, performance, capacity, and risk prediction anytime and anywhere. In addition, iMasterCloud DME IQ can evaluate the health status of devices to ensure high system availability. These operations can be performed in the cloud, reducing maintenance costs and improving operational efficiency.
  - DataMaster dialog-based O&M can be used to query the health of storage devices, predict CPU usage and bandwidth performance, and perform intelligent analysis for faults like increased latency.

[2] Contact your local Huawei supplier for more details.

- **Cost of ownership:** Huawei employs its implementation of smart deduplication and compression to provide significant data reduction in New-Gen OceanStor Dorado Converged All-Flash Storage. Huawei offers real-world, guaranteed storage capacity leveraging built-in data deduplication and compression to reduce the storage space of application data while ensuring performance. This can offer customers enhanced return on investment with the subsequent reduction in data center footprints, power, and cooling resources. SmartThin provisioning enables organizations to provision only what they need at that time, growing capacity on demand and non-disruptively.

Enterprise Strategy Group Technical Validation

We performed analysis and validation of the Huawei New-Gen OceanStor Dorado converged all-flash storage to validate the performance, resilience, data management, and TCO capabilities of the New-Gen OceanStor Dorado, with a focus on delivering high levels of predictable performance. The ability to sustain these performance levels through various storage hardware failures was also tested. Finally, we looked at the automated data management capabilities of the platform, and a five-year TCO analysis was performed.

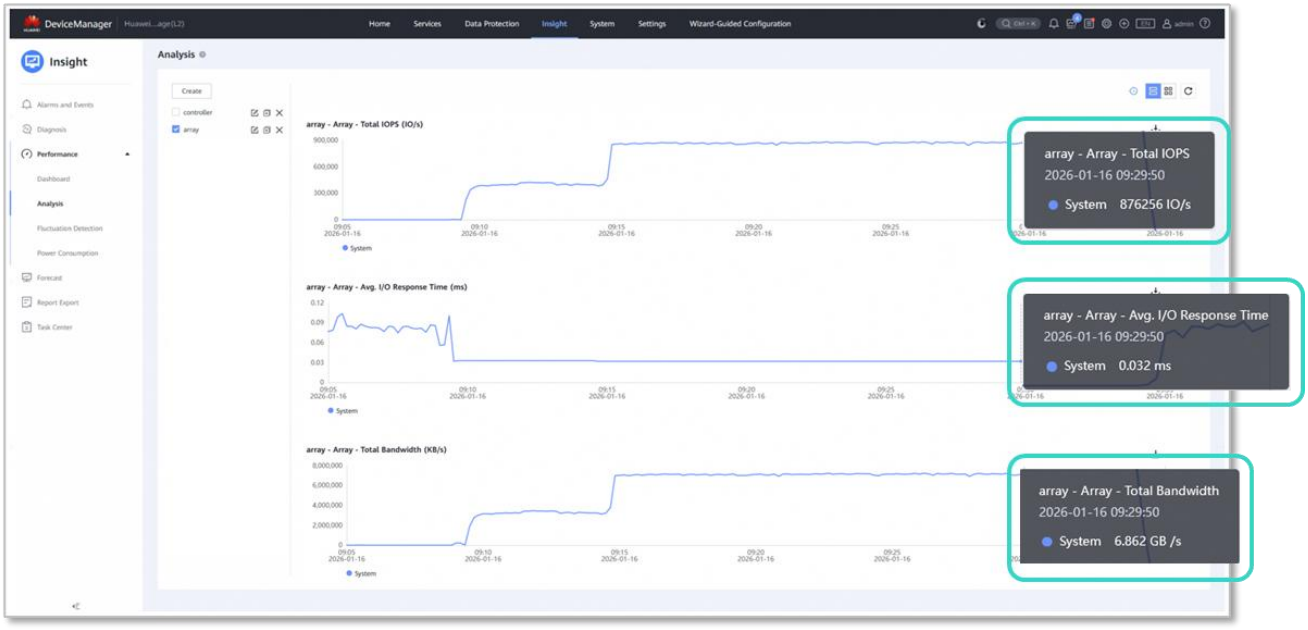
Performance

The performance test bed we utilized consisted of 20 servers, each leveraging dual 24-core processors with 128GB of RAM. The servers were attached to 16GFC for SAN and 25GbE IP for NAS and S3 object connectivity. The switches were then connected to one Huawei OceanStor Dorado 18000 storage system with one controller enclosure containing a total of four controllers and four disk enclosures, populated with a total of 118 7.68TB NVMe SSD modules.

Enterprise Strategy Group (now Omdia) Analysis

An Oracle RAC 19c Enterprise Edition cluster was deployed on 20 physical servers with 6.8TB of capacity allocated across 20 volumes. OLTP testing was performed using Swingbench version 2.6. SLOB version 2.5.0 was used with one instance of Oracle RAC 19c Enterprise Edition to run an OLTP workload, testing for IOPS, throughput, and latency. Enterprise Strategy Group (now Omdia) leveraged the Huawei OceanStor DeviceManager interface (shown in Figure 3) to manage the environment and monitor the tests. Test results were verified using output files and logs from the tested applications. First, we started an OLTP workload using SLOB on a two-host cluster in active-active mode. The workload was configured for 80% reads and 20% updates. After the workload was running for 30 minutes, the system was servicing 876, 256 sustained IOPS at an average response time of just 32 µs. This result is nearly four times the performance of the OceanStor Dorado V6 we tested with the same parameters.

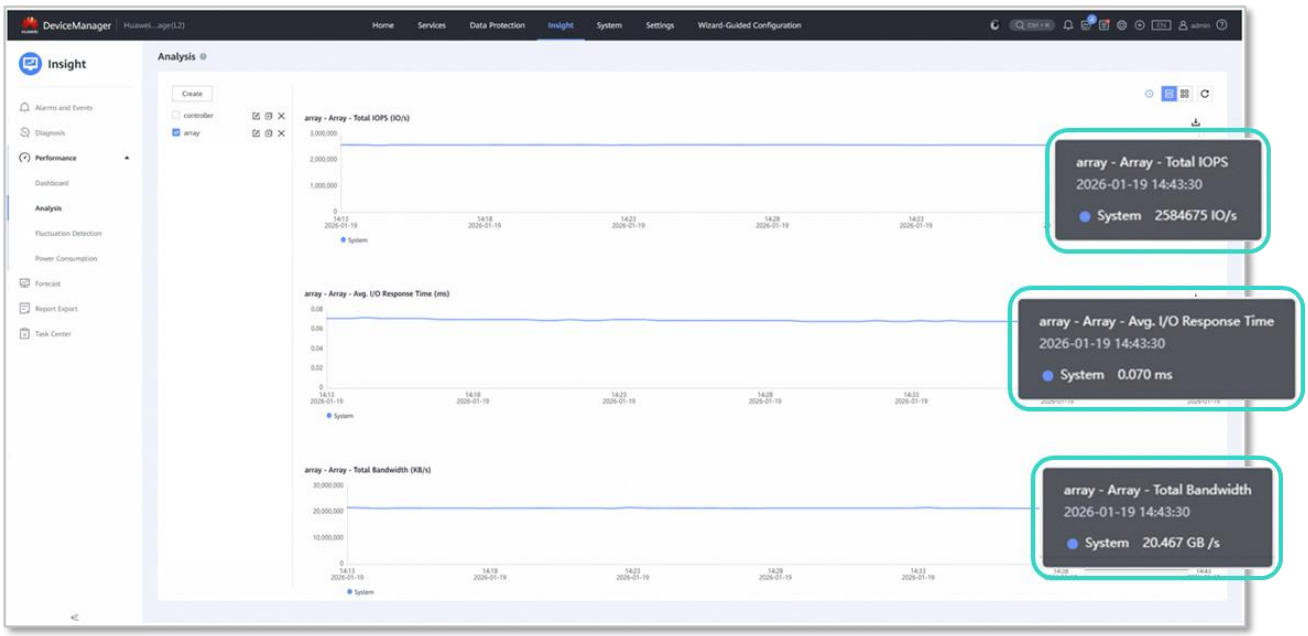
Figure 3. Huawei OceanStor Dorado Performance: High IOPS and Extremely Low Latency



Source: Huawei and Enterprise Strategy Group, now part of Omdia

Next, we tested a 20 node Oracle RAC cluster using Swingbench. Once the warmup phase was complete and the workload was stabilized, we let the test run for 30 minutes. As seen in Figure 4, the New-Gen OceanStor Dorado 18000 was servicing 2,584,675 IOPS at just 70 µs. This is nearly three times the performance we measured in the OceanStor Dorado V6 system using the same test at much lower latency.

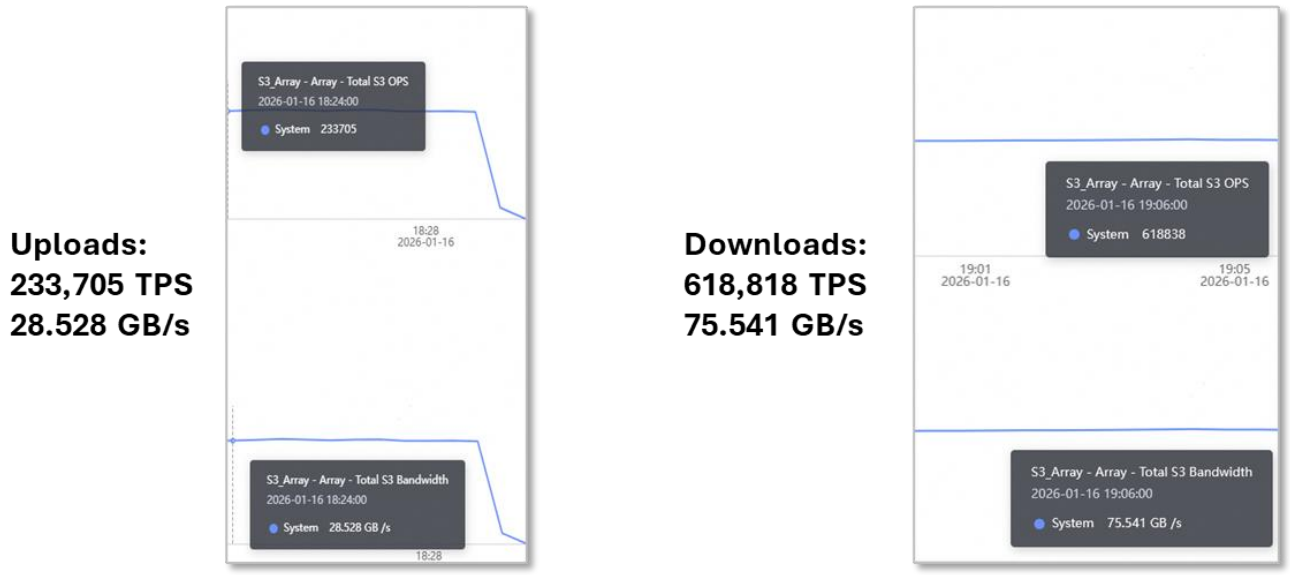
Figure 4. Huawei OceanStor Dorado Performance: Large Scale Database



Source: Huawei and Enterprise Strategy Group, now part of Omdia

Next, we tested S3 object performance in a document imaging scenario using Warp version 1.3.0. The goal was to verify the performance of the system as it uploaded and then retrieved 128KB images using the S3 object protocol. We used the Warp object performance test client to continuously upload and download the images to and from the OceanStor Dorado storage system. As seen in Figure 5, upload performance was 223,705 TPS, with 28.528 GB/s of throughput, and download performance was 618,818 TPS, with 75.541 GB/s of throughput.

Figure 5. Huawei OceanStor Dorado S3 Document Imaging Performance



Source: Huawei and Enterprise Strategy Group, now part of Omdia

Next, we tested NAS performance in an electronic design automation (EDA) scenario. EDA requires the ability to handle massive amounts of both file ops and throughput, with shared access and low latency. We used multiple Linux clients running NFSv3 to mount and use the file system. The workload was 100% read IOs with a 16KB file size. As seen in Figure 6, performance was measured at 2,012,784 read OPS, with 30.7 GB/s of throughput. This is more than three times the performance seen in Huawei-commissioned testing of the previous generation OceanStor Dorado V6.

Figure 6. Huawei OceanStor Dorado NAS EDA Performance

Source: Huawei and Enterprise Strategy Group, now part of Omdia

Why This Matters

With the number of tools and technologies that exist in a traditional enterprise environment, the cost and complexity related to maintaining the infrastructure, ensuring constant uptime, and guaranteeing performance levels can easily get out of hand.

Enterprise Strategy Group (now Omdia) validated that a single Huawei New-Gen OceanStor NVMe storage system was able to deliver higher performance with lower latency than the previously tested OceanStor Dorado V6. As the simulated database workload ramped up on one server, response time remained extremely low. Omdia confirmed that the New-Gen OceanStor sustained more than 876,256 IOPS with an average response time of just 32 µs. When we scaled the workload up to a 20 node Oracle RAC cluster, we confirmed 2,584,675 IOPS with an average response time of 70 µs. Object and file performance were equally impressive, S3 upload performance was 223,705 TPS, with 28.528 GB/s of throughput, and download performance was 618,818 TPS, with 75.541 GB/s of throughput. NAS performance was measured at 2,012,784 read OPS, with 30.7 GB/s of throughput. This translates directly to lower upfront and ongoing costs because a given workload can potentially be serviced by a smaller OceanStor Dorado configuration.

Resilience

The Huawei New-Gen OceanStor converged all-flash storage platform is designed to ensure high availability and sustain performance through both planned maintenance and unplanned outages. Omdia validated resilience testing of the system across multiple scenarios: multiprotocol integrated active-active services and DR, NAS, and SAN ransomware protection, cross-enclosure RAID protection, and non-disruptive FlashEver controller and enclosure upgrades.

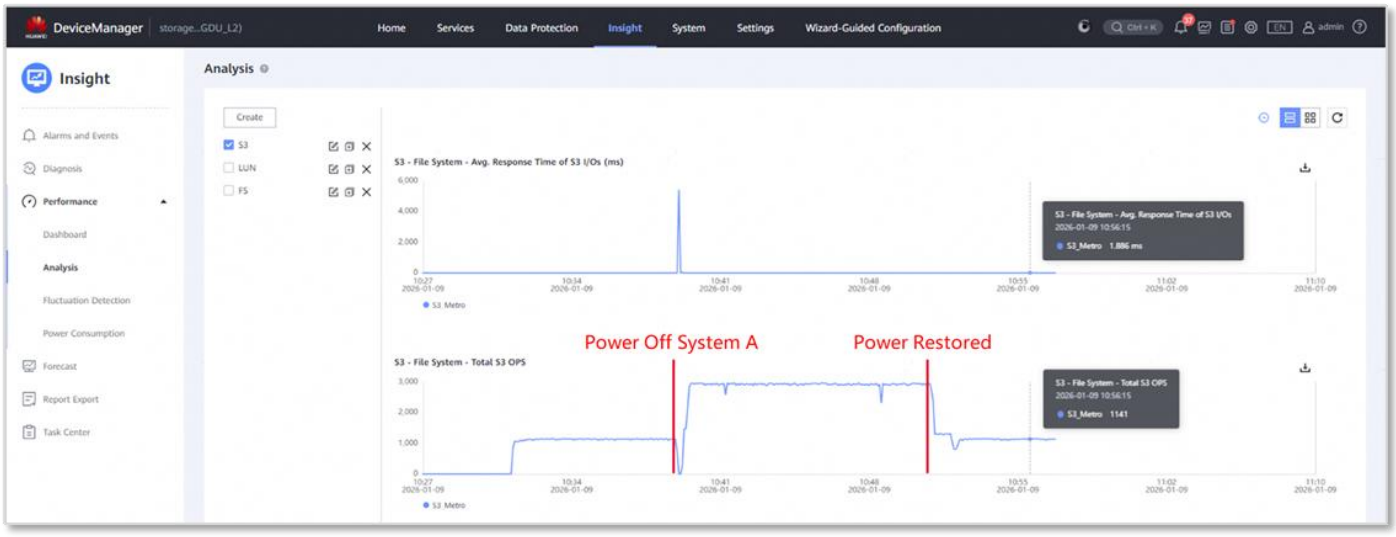
Multiprotocol HyperMetro and Failover

Enterprise Strategy Group (now Omdia) validated multiprotocol HyperMetro and DR using multiple hosts attached to two New-Gen OceanStor Dorado systems via 16GFC links. The storage systems were designated A and B for testing. A HyperMetro domain was configured, and the systems were set up in active-active mode. An NFS file system, an S3 object store, and LUNs for block access were created in one storage pool, then configured in HyperMetro pairs across both systems. Vdbench was used to generate continuous NFS traffic to the NFS file system, the Cosbench client issued continuous commands to the S3 object store, and another Vdbench client performed continuous read and write operations on the LUNs. Finally, we verified that all three workloads were being distributed across both storage systems.

Next, non-disruptive failover was tested. With a Linux client running a continuous workload on the HyperMetro NFS file system using Vdbench, we verified that the NFS traffic was evenly distributed across both systems. We then rebooted system B while observing the running status of Vdbench. I/O dropped to zero, then resumed in 20 seconds. System B finished rebooting, recovered successfully. HyperMetro status returned to normal, resynchronized data and restored active-active status of the file system automatically, with no intervention needed and no further disruption to client I/O.

The complete disruption of one data center was tested next. With the Cosbench client issuing continuous commands to the S3 object store, we verified that the S3 traffic was evenly distributed across both systems servicing 1,106 IOPS on System A and 1,149 IOPS on System B. We then disconnected all power supplies from system A while observing the running status of the S3 client. Again, I/O dropped to zero, then resumed in less than 15 seconds. The power supplies were reconnected, and the controllers of system A were rebooted. When they finished rebooting, they recovered successfully. HyperMetro status returned to normal, resynchronized data and restored active-active status of the file system automatically, with no intervention needed and no further disruption to client I/O.

Figure 7. Huawei OceanStor Dorado S3 Performance During HyperMetro Switchover

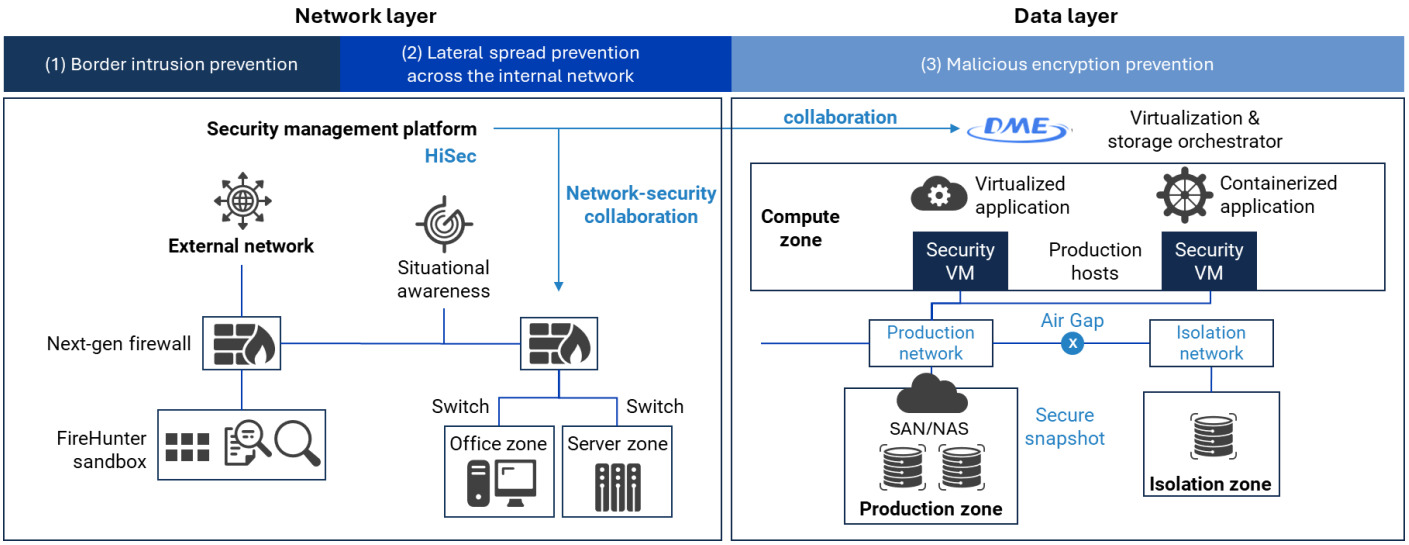


Source: Huawei and Enterprise Strategy Group, now part of Omdia

Anti-ransomware for NAS and SAN

Huawei provides multilayer ransomware protection through coordinated defense across network, compute, and storage layers. The network layer integrates firewalls, security sandboxes, Anti-DDoS services, and Huawei's HiSec Insight platform for comprehensive security. At the compute layer, anti-virus software detects ransomware on VMs and enables rapid response. OceanStor Dorado secures VM snapshot data with tamper-proof snapshots and air-gapped replication, periodically copying production data to isolated storage while disconnecting replication links during non-replication windows to prevent infection. Using the iMaster DME unified management platform, ransomware detection is coordinated across all layers with configurable policies. Upon detection, iMaster DME creates secure snapshots, isolates risky VMs, and resolves issues, enabling VMs to be restored to a safe historical state.

Figure 8. Huawei End-to-end Ransomware Protection



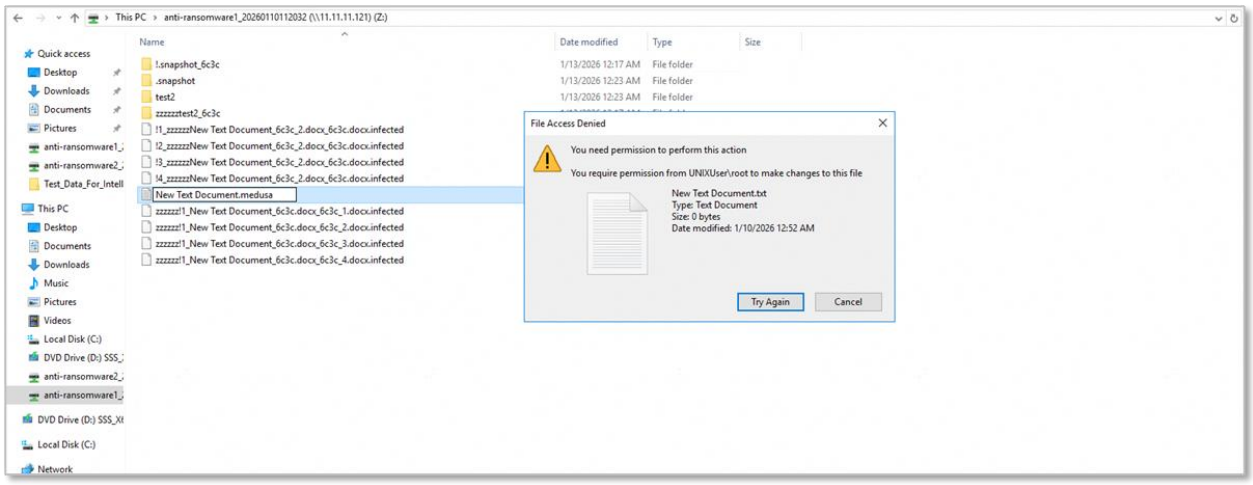
Source: Huawei and Enterprise Strategy Group, now part of Omdia

We looked at Huawei's built-in anti-ransomware capabilities for NAS and SAN on the New-Gen OceanStor Dorado. For NAS volumes, Huawei can block ransomware pre-event. For NAS and SAN volumes, Huawei detects ransomware in-event by analyzing IO behaviors and content in depth using AI and creates a secure snapshot to enable recovery and send an alarm in real time. For NAS and SAN volumes post-event, Huawei can analyze the change characteristics of snapshots and use AI to identify whether the filesystem is infected, then mark the infected and uninfected copies.

For the NAS test, two 100 GB file systems named anti-ransomware1 and anti-ransomware2 were created in the system vStore and NAS and CIFS shares were created for the file systems. A Windows test server was connected to the storage network and mounted the anti-ransomware1 and anti-ransomware2 file systems. Test text files were placed in the mounted file systems anti-ransomware1 and anti-ransomware2. Ransomware file interception, real-time ransomware detection, and intelligent ransomware detection were enabled in the system vStore. A file interception rule was created and associated with the vStore, a honeypot was created, an SLA was defined, and snapshot locking was enabled.

To test file interception pre-event, we attempted to create a file with a forbidden suffix, and it was blocked. This prevents known attacks from performing actions on files.

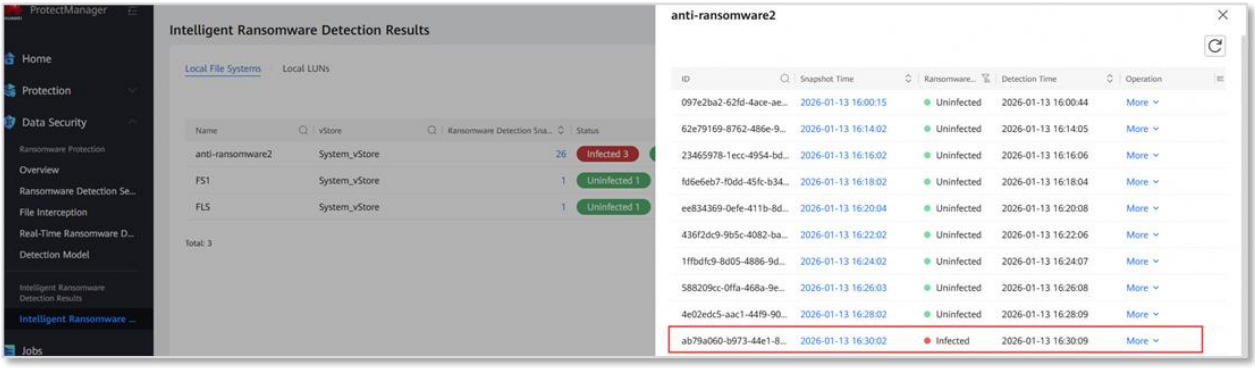
Figure 9. File Interception Function



Source: Huawei and Enterprise Strategy Group, now part of Omdia

Next, we simulated a zero day attack where encryption was successful. As files were encrypted, the SLA-scheduled task triggered a ransomware detection for the file system. The system generated snapshot copies periodically, and ransomware detection was performed on the snapshot copies. The uninfected copies were then identified and marked before being converted to secure snapshots. Because an infection was indicated, an alarm was reported, and the infected copy was marked simultaneously.

Figure 10. Post-event Ransomware Detection



Source: Huawei and Enterprise Strategy Group, now part of Omdia

The system identified the latest clean pre-infection snapshot, and the file system was recovered from that copy.

We also validated ransomware recovery for SAN volumes and confirmed that ransomware was successfully detected using AI during events, secure snapshots and alarms were generated in real time, a clean snapshot copy was identified, a secure snapshot for recovery was created during a simulated event, and recovery was successful.

Air gap functionality was also confirmed with a simple test. We verified that, with the appropriate protection policy in place and replication set to execute every 5 minutes, the ports are physically disabled until the protection policy executes when they are enabled. When replication completes, the ports are physically disabled until the next replication policy event.

Figure 11. Huawei OceanStor Dorado Air Gap

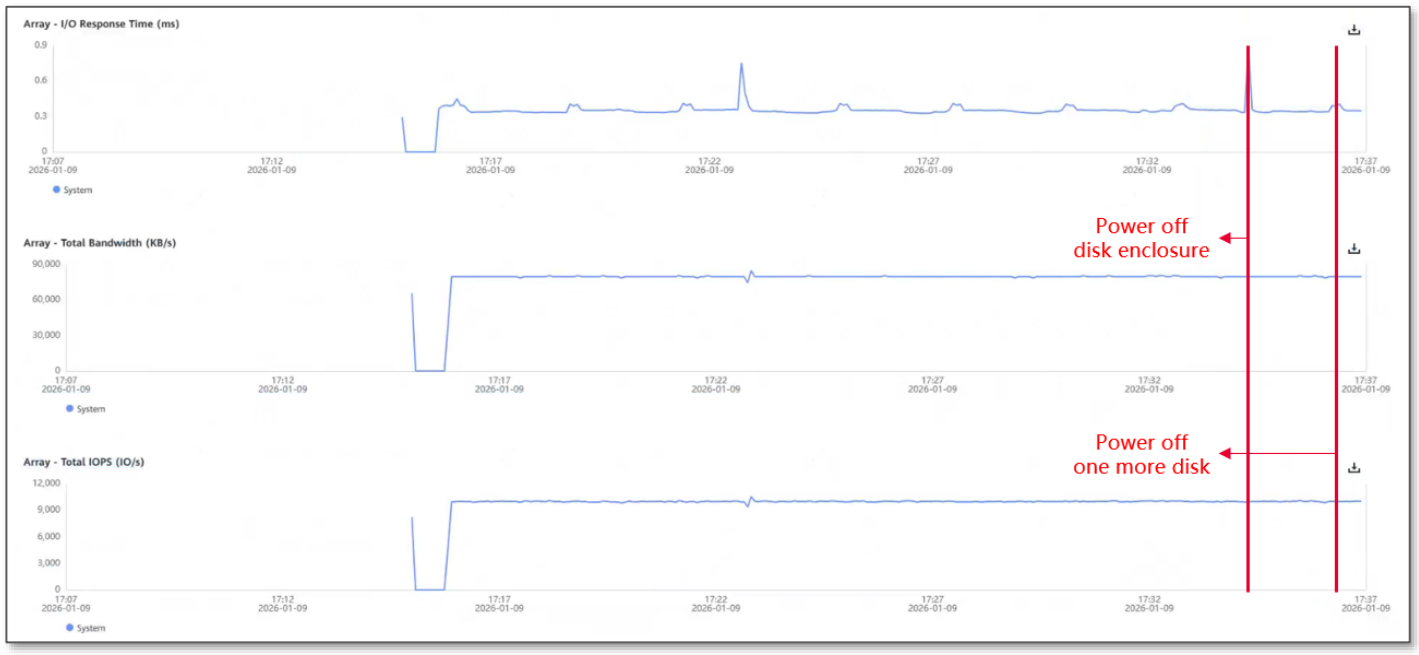
Source: Huawei and Enterprise Strategy Group, now part of Omdia

Cross Enclosure RAID

In this test, we verified that the RAID-TP storage pool with frame-level redundancy supports a full disk enclosure and an additional single disk power failure without interrupting services.

Four disk enclosures with five disks each were used to create a storage pool with enclosure-level redundancy and RAID-TP, then five 200GB LUNs were created from the pool and mapped to a Linux server. We used Vdbench to issue random read and write I/O to the LUNs and confirmed that all disks in all enclosures were actively servicing the workload. Once IOPS stabilized, one enclosure was powered off. I/O continued without interruption. Next, one disk in another enclosure was physically removed. I/O continued without interruption.

Figure 12. Huawei OceanStor Dorado Cross-enclosure RAID



Source: Huawei and Enterprise Strategy Group, now part of Omdia

FlashEver

Finally, we looked at non-disruptive planned maintenance. Specifically, we replaced a V6 controller with a New-Gen OceanStor Dorado controller while the system was running and expanded a V6 system with a New-Gen OceanStor Dorado controller enclosure—in the same storage pool with existing V6 controller enclosures—simulating a customer's experience with Huawei's FlashEver upgrade service.

With a workload running similarly to the one used in the HyperMetro test, we recorded IOPS—1,250,315 and CPU utilization— at 88%. First, we selected *SmartKit,* clicked *FlashEver Hardware Upgrade,* set the upgrade policy to FlashEver controller replacement, and followed the wizard to replace and inspect FlashEver controllers. With a couple of clicks, we took a controller out of service and initiated the replacement. The system ran through a number of checks as it brought the new controller online. I/O continued without interruption, and with the new controller, we recorded IOPS of 1,630,169, an increase of 30% at a lower CPU utilization of 80%. Services were never interrupted during the entire process.

Figure 13. Huawei OceanStor Dorado FlashEver

Source: Huawei and Enterprise Strategy Group, now part of Omdia

We also validated Controller Enclosure FlashEver and added a New-Gen OceanStor Dorado engine to an OceanStor Dorado V6. We confirmed after the addition that the storage pool was shared across both the old and the new engines. Again, services were never interrupted during the entire process.

Why This Matters

Customers considering solid-state storage deployment are looking not just for performance but to increase data availability so that users have continuous data access for mission-critical business applications. If the underlying storage is not highly available, the risk of downtime and, subsequently, lost productivity and revenue become real. In today's business climate, IT professionals must ensure business continuity for data-intensive applications, from traditional CRM to real-time analytics, online transactions, and AI, to help their users respond to customer needs quickly.

Enterprise Strategy Group (now Omdia) validated that the SmartMatrix fully interconnected architecture of the New-Gen OceanStor Dorado provides extremely high availability and provides extremely low-latency performance during planned and unplanned outages. We verified that the Huawei New-Gen OceanStor Dorado and HyperMetro protected SAN, NAS, and S3 Data while providing consistent, evenly balanced performance in an active-active configuration. OceanStor Dorado was able to effectively block ransomware pre-event for NAS files and detect and recover from a successful attack quickly and efficiently for both SAN and NAS. OceanStor Dorado seamlessly kept services 100% online, even when multiple disk failures spanned multiple enclosures. With FlashEver a controller was upgraded from V6 to New-Gen, and a New-Gen enclosure was added to an existing system online.

We were particularly impressed with the ability of the system to sustain high levels of performance with sub-millisecond response times throughout all these tests.

AI-powered

Huawei AI architecture is designed to help organizations automate management from configuration, operations, and maintenance at the system and component level with the iMaster DME Data Center Management platform to intelligent lifecycle management, as well as from resource provisioning to fault fingerprinting to intelligent, predictive analytics and optimization with Huawei iMaster DME DataMaster dialog-based O&M.

iMaster DME is an intelligent management platform designed for all data center scenarios. It integrates O&M with two key features: intelligent IT infrastructure management and smart data handling. The platform offers solutions like AI-powered industrial quality inspections based on storage, enabling real-time threat detection and proactive defense against high-risk issues. Advanced AI algorithms and knowledge graphs quickly identify and resolve faults, restoring services within minutes.

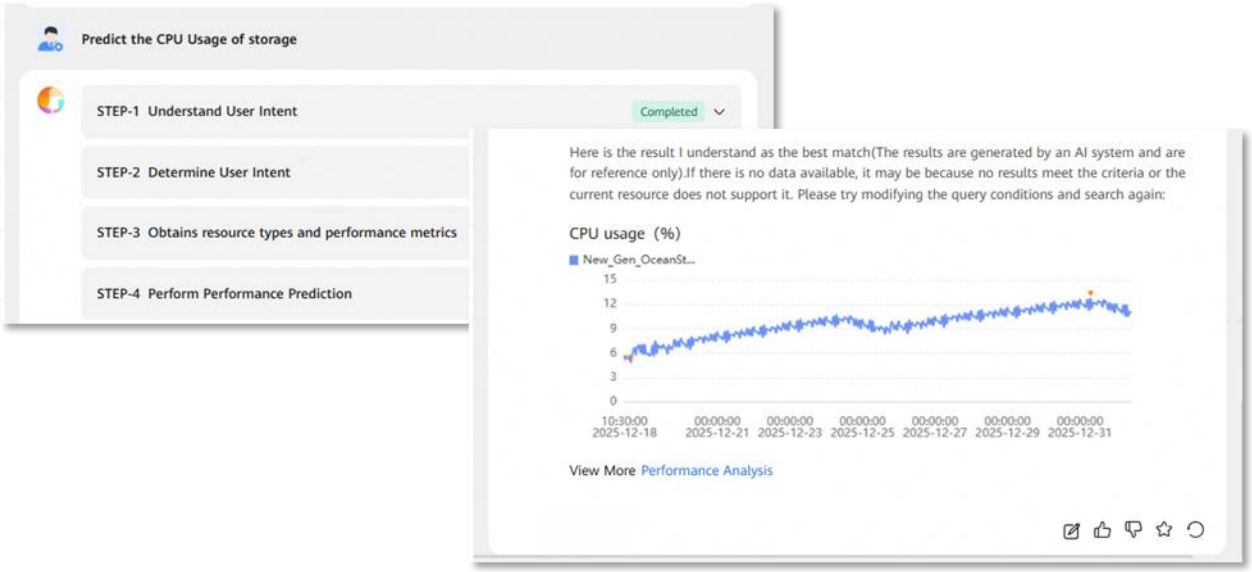
Enterprise Strategy Group (now Omdia) Analysis

Enterprise Strategy Group (now Omdia) testing verified iMaster DME's AI capabilities, including health management, performance prediction, intelligent analysis, and its DataMaster dialog-based O&M.

First, we accessed the iMaster DME interface, clicked on the DataMaster icon, and queried the system on the storage health scores lower than 80. We were presented with a list of devices with health scores below 80. Selecting the device with the lowest score, we confirmed that the DataMaster results matched the storage device health details interface.

Next, we looked at iMaster DME's ability to predict performance. We asked the system to predict the CPU usage and bandwidth utilization of a specific storage system by IP address. Once the analyses were complete, we manually confirmed that iMaster DME used the correct methodology to query performance data from the system and made a reasonable prediction of trends.

Figure 14. iMaster DME Performance Prediction

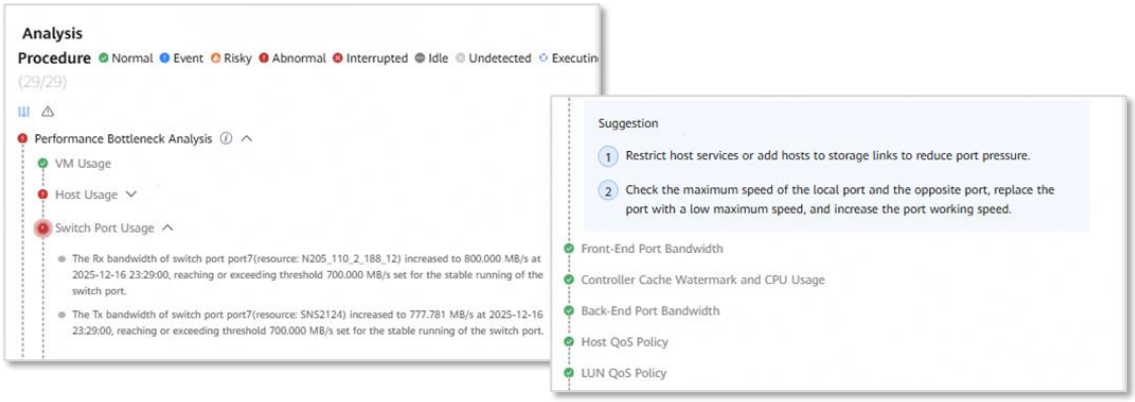


Source: Huawei and Enterprise Strategy Group, now part of Omdia

Next, we examined intelligent analysis, the ability to accurately analyze a performance issue and recommend the correct solution quickly. A LUN performance bottleneck fault was created to trigger an exception in the check policy and send an alarm. When the alarm was received, iMaster DME was asked to perform a read latency analysis on the affected LUN.

In less than 10 seconds, iMaster DME responded with a full analysis, accurately identifying the fault and recommending the correct solution.

Figure 15. iMaster DME Intelligent Analysis



Source: Huawei and Enterprise Strategy Group, now part of Omdia

We also examined iMasterCloud DME IQ Aico, an all-in-one service assistant, driven by a Huawei-trained LLM and connected to Huawei Storage's official knowledge sources. Aico aggregates more than 11 million storage-related materials.

We verified that Aico can accurately understand questions, quickly locate knowledge, and provide professional suggestions to help handle customer inquiries.

We clicked the Aico icon and asked Aico how to provision a LUN on OceanStor Dorado. The first token was displayed in less than three seconds, and the complete answer was populated in less than 20 seconds. We verified that the answer was accurate by comparing it to the detailed procedures in Huawei's documentation.

Cost of Ownership

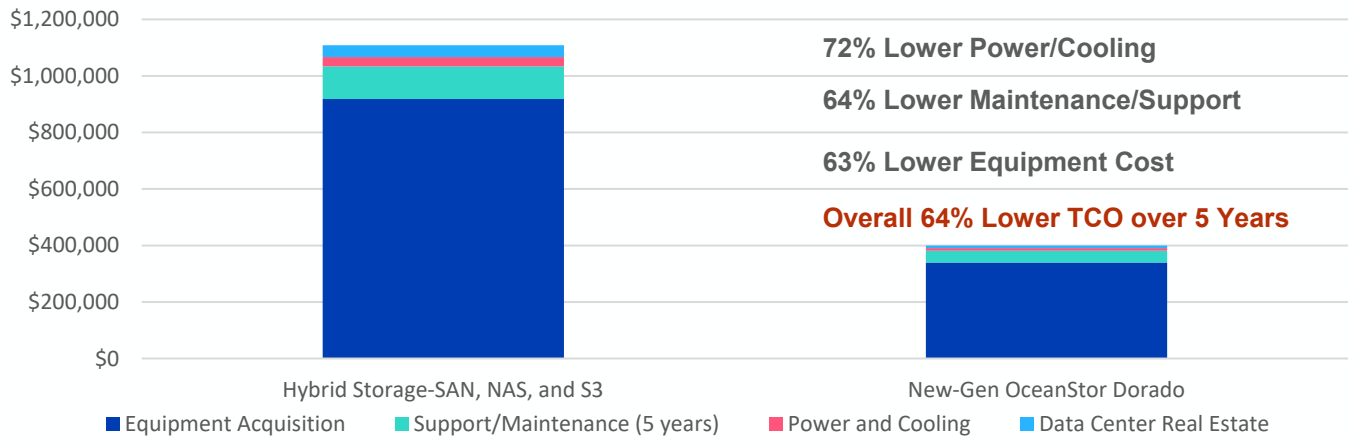
Omdia modeled and compared the storage-related costs that could be expected when deploying traditional hybrid storage with SAS SSD, NL-SAS HDD, and a Huawei OceanStor Dorado 5000 with NVMe SSDs. The costs associated with purchasing, maintaining, housing, powering, and cooling the storage systems were calculated in US dollars, and the average cost for electricity in the United States, as reported by the US Energy Information Administration,[3] was used to calculate power and cooling New-Gen OceanStor costs. Omdia modeled the expected storage TCO for a company that needed to support a highly available mixed-workload production environment. All workloads were assumed to require sub-millisecond response times:

- An 80TB Oracle RAC OLTP environment (SAN) able to support 352,000 IOPS and sub-millisecond response times.
- A 40TB test and development environment (S3) for heavy users (8,000 IOPS).
- An 80TB Microsoft Exchange environment (NAS) to support 10,000 heavy users at four IOPS per user.

The Huawei OceanStor Dorado 5000 was populated with 31-3.84TB NVMe SSDs configured in a single RAID-TP group, providing SAN, NAS, S3 objects in one system. We compared that with a hybrid storage system from a major vendor populated with 16-7.68TB 2.5" SAS SSDs and 57-8TB 3.5" NL-SAS HDDs configured in RAID5 groups to provide SAN and NAS services, as well as another hybrid storage system populated with 5-7.68TB 2.5" SAS SSDs and 8-8TB 3.5" NL-SAS HDDs, providing S3 services. All systems were modeled with equivalent software, power supplies, racks, and accessories according to each manufacturer's best practices.

TCO was calculated using a simplified model based on costs that would be incurred over a five-year period without taking into consideration capacity and performance growth requirements or IT operational costs. Maintenance and support contracts, along with typical customer discounts for hardware, software, and maintenance were factored into the estimated costs. Figure 16 shows the TCO cost comparison between hybrid storage and the Huawei New-Gen OceanStor Dorado 5000.

Figure 16. TCO Comparison Between the New-Gen OceanStor Dorado 5000 and Hybrid Storage



Source: Huawei and Enterprise Strategy Group, now part of Omdia

[3] Source: U.S. Energy Information Administration.

Over five years, TCO for the hybrid storage systems totals $1,120,467, while the costs for the New-Gen OceanStor Dorado 5000 are $399,926, just 36% of the hybrid storage total cost. Significant cost savings were realized across all measured categories—equipment acquisition, support/maintenance, power/cooling, and data center real estate costs.

It's worth noting that, given the availability and AI-driven automation features of the Huawei New-Gen OceanStor Dorado, IT operational costs should be lower as well. Also, based on our research and experience, SSDs encounter fewer storage failures in the field, which translates into less time and resources spent replacing disks.

Why This Matters

Organizations understand the advantages to be gained by selecting a next-generation purpose-built all-flash array designed to take advantage of the benefits of flash technology over simply adding flash drives to a traditional storage system with traditional limitations. While IT professionals seek high storage performance and availability, they still need to minimize both initial capital outlays and related operational costs over time. Solid-state storage has become a more economical option, as SSD prices have declined while their reliability has increased. Simultaneously, the costs for operating and maintaining a hybrid SSD+HDD environment tend to increase over time, especially as HDD reliability degrades with continuous use.

Enterprise Strategy Group (now Omdia) compared the five-year TCO of the New-Gen Huawei OceanStor Dorado 5000, populated with NVMe SSDs, against that of a hybrid storage system with a mixed SAS SSD/HDD environment. The results showed that the five-year TCO of the New-Gen OceanStor Dorado is 64% lower than that of the hybrid array, with savings spread across capital outlay for equipment, support/maintenance contracts, data center real estate, and power and cooling. We also expect that the IT operational costs will decrease as well due to the increased reliability of SSDs and the automation and availability features that Huawei has built into its all-flash array, enabling IT professionals to spend more time and resources on strategic activities, rather than maintaining storage.

Conclusion

Research from Enterprise Strategy Group (now Omdia) reveals that massive data growth continues and will be even further fueled by comprehensive AI strategies and deployments, so it's no surprise that storage capacity (45%) issues are forefront in the minds of IT leaders. With high capacity, enterprises need fast storage that can adequately feed the compute layer for mission-critical and AI applications. This is a significant challenge for organizations surveyed by Enterprise Strategy Group (now Omdia): storage performance—in terms of throughput or bandwidth (30%) and latency and I/O (19%), along with data protection, security, and compliance issues (20%)—were highlighted as the top three storage-related challenges.

Data growth is accelerating, and the resulting infrastructure required to store and protect that data is costly and complex. Organizations are tasked with providing a high-quality, predictable, and productive computing environment for an ever-growing number of internal users and external customers, while enterprise application environments have become increasingly unpredictable as their underlying IT infrastructure grows in complexity and size. Mission-critical business application performance is sensitive to storage performance and latency while also highly dependent on the resilience of the IT environment.

The New-Gen OceanStor Dorado all-flash storage system is designed to handle mission-critical applications and workloads, both internal and customer-facing. It leverages an active-active multi-controller, NVMe architecture, and

enterprise-class availability features implemented in software, along with AI capabilities like health management, performance prediction, intelligent analysis, and dialog-based O&M, to provide a platform engineered for consolidating mission- and business-critical workloads at extremely low latencies.

Our testing validated New-Gen OceanStor Dorado's ability to consolidate the most challenging business- and mission-critical workloads onto a single, high-performance, highly available platform. The environment we tested serviced an Oracle RAC 19c database environment with 24TB of live data onto a single New-Gen OceanStor Dorado 18000 system. The New-Gen OceanStor Dorado serviced 876,256 IOPS at just 32 µs average response time and scaled to more than 2,584,675 IOPS with 70 µs average response time, all while providing continuous access through multiple planned and unplanned outage tests. It's important to note that the performance described in this report was accomplished with adaptive data reduction and snapshots enabled and in use.

The results that are presented in this Technical Validation are based on testing in a controlled environment. Due to the many variables in each production data center, it is important to perform planning and testing in your own environment to validate the viability and efficacy of any solution.

Enterprise Strategy Group (now Omdia) is pleased to validate that the Huawei New-Gen OceanStor Dorado delivers consistently high performance at extremely low response times and is clearly well suited to support demanding real-world business applications running in a performance-critical highly virtualized environment. New-Gen all-flash storage systems are designed with a goal of making the best possible use of flash technology while avoiding many of the limiting factors of traditional storage systems. Huawei designed its all-flash array around the dual goal of solving both business and storage problems.

It is no surprise that our five-year analysis demonstrated that by deploying a New-Gen OceanStor Dorado rather than an alternative hybrid storage system, organizations can lower their storage TCO by 64% while improving availability and reducing operational effort. If your organization is looking to lower its storage TCO while increasing performance, we recommend investing in an all-flash array, and Huawei New-Gen OceanStor Dorado is worth a closer look.

About Enterprise Strategy Group
Enterprise Strategy Group, now part of Omdia, provides focused and actionable market intelligence, demand-side research, analyst advisory services, GTM strategy guidance, solution validations, and custom content supporting enterprise technology buying and selling.

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