OceanStor Dorado 8000/18000
High-End All-Flash Storage Systems

HUAWEI

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Leading Performance with Innovative Hardware

21,000,000 SPC-1 IOPS

E2E NVMe for 0.05 ms of ultra-low latency

FlashLink® intelligent algorithms

SCM intelligent cache acceleration for 60% lower latency

Distributed file system with 30% higher performance

Always-On Applications with 5-Layer Reliability

Component reliability: Wear leveling and anti-wear leveling

Architecture and product reliability: 0 data loss in the event of single, dual, and multiple failures (7/8 controllers, 3/4 controllers, or disk enclosures), as well as three disk failures

Solution and cloud reliability: The industry's only A-A solution for SAN and NAS, geo-redundant 3DC solution, and gateway-free cloud backup

Efficient O&M with Intelligent Edge-Cloud Synergy

3-layer intelligent management:

• 365-day capacity trends prediction

• 60-day performance bottleneck prediction

• 14-day disk fault prediction

• Solutions immediately provided for 93% of problems

SAN&NAS convergence, storage and computing convergence, and cross-gen device convergence for efficient resource utilization

FlashEver: No data migration over 10 years for 3-gen hardware systems

OceanStor Dorado 8000/18000 high-end all-flash storage systems set new benchmarks of storage performance and reliability for critical business of enterprises, providing excellent data service experience. The storage systems leverage innovative hardware platform, FlashLink® intelligent algorithms, and full-series E2E NVMe architecture, to deliver the latency of 0.05 ms and the proven 21,000,000 SPC-1 IOPS, with performance almost twice that of the next-best player in the industry. Their full-mesh SmartMatrix architecture ensures always-on services. Intelligent and elastic architecture supports online hardware update of three generations for 10 years without any migration.

Excelling in scenarios such as databases and virtualization, OceanStor Dorado 8000/18000 high-end all-flash storage systems are best suited to the carrier, finance, government, manufacturing, and other fields.

Product Features
Ever Fast Performance with Innovative Hardware

Innovative hardware platform: Huawei storage uses an innovative hardware platform for E2E data acceleration, delivering the proven 21,000,000 SPC-1 IOPS, almost twice that of the second player.

✓ The intelligent multi-protocol interface module hosts the protocol parsing previously performed by the general-purpose CPU, expediting the front-end access performance by 20%.

✓ The computing platform offers industry-leading performance with 25% higher computing power than the industry average.

✓ The intelligent accelerator module analyzes and understands I/O rules of multiple application models based on machine learning frameworks to implement intelligent prefetching of memory space. This improves the read cache hit ratio by 50%.

FlashLink®

Controller

Smart SSD enclosure

SSD
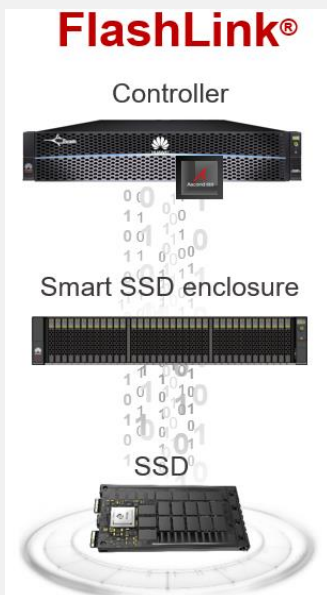
✓ SmartCache + SCM intelligent multi-tier caching identify whether or not the data is hot and uses different media to store it, reducing the latency by 60% in OLTP (100% reads) scenarios.

✓ The intelligent SSD hosts the core Flash Translation Layer (FTL) algorithm, accelerating data access in SSDs and shortening the write latency by half.

✓ The intelligent hardware has a built-in Huawei storage fault library that accelerates component fault location and diagnosis, and shortens the fault recovery time from 2 hours to just 10 minutes.

Intelligent algorithms: Most flash vendors lack E2E innate capabilities to ensure full performance from their SSDs. OceanStor Dorado 8000/18000 run industry-leading FlashLink® intelligent algorithms based on self-developed controllers, disk enclosures, and operating systems.

✓ Many-core balancing algorithm: Taps into the many-core computing power of a controller to maximize the data processing capability.

✓ Service splitting algorithm: Offloads reconstruction services from the controller enclosure to the smart SSD enclosure to ease the load pressure of the controller enclosure for more efficient I/O processing.

✓ Cache acceleration algorithm: Accelerates batch processing with the intelligent module to bring intelligence to storage systems during application operations.

The data layout between SSDs and controllers is coordinated synchronously.

✓ Large-block sequential write algorithm: Aggregates multiple discrete data blocks into a unified big data block for disk flushing, reducing write amplification and ensuring stable performance.

✓ Independent metadata partitioning algorithm: Effectively controls the performance compromise caused by garbage collection for stable performance.

✓ I/O priority adjustment algorithm: Ensures that read and write I/Os are always prioritized, shortening the access latency.

FlashLink® intelligent algorithms give full play to all flash memory and help Huawei OceanStor Dorado achieve unparalleled performance for a smoother service experience.

E2E NVMe architecture for full series: All-flash storage has been widely adopted by enterprises to upgrade existing IT systems, but always-on service models continue to push IT system performance boundaries to a new level. Conventional SAS-based all-flash storage cannot break the bottleneck of 0.5 ms latency. NVMe all-flash storage, on the other hand, is a
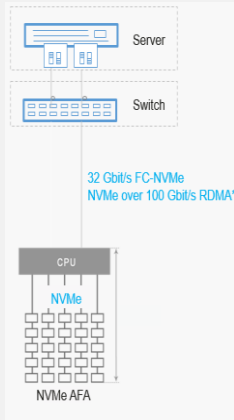
future-proof architecture that implements direct communication between the CPU and SSDs, shortening the transmission path. In addition, the quantity of concurrencies is increased by 65,536 times, and the protocol interaction is reduced from four times to two, which doubles the write request processing. Huawei is a pioneer in adopting end-to-end NVMe architecture across the entire series. OceanStor Dorado all-flash systems use the industry-leading 32 Gb FC-NVMe/100 Gb RoCE protocols at the front end and adopt Huawei-developed link-layer protocols to implement failover within seconds and plug-and-play, thus improving the reliability and O&M. It also uses a 100 Gb RDMA protocol at the back end for E2E data acceleration. This enables latency as low as 0.05 ms and 10x faster transmission than SAS all-flash storage.

Globally shared distributed file system: The OceanStor Dorado 8000/18000 high-end all-flash storage systems support the NAS function and use the globally shared distributed file systems to ensure ever-fast NAS performance. To make full use of computing power, the many-core processors in a controller process services concurrently. In addition, intelligent data prefetching and layout further shorten the access latency, achieving over 30% higher NAS performance than the industry benchmark.

Linear increase of performance and capacity: Unpredictable business growth requires storage to provide simple linear increases in performance as more capacity is added to keep up with ever-changing business needs. OceanStor Dorado 8000/18000 support the scale-out up to 32 controllers, and IOPS increases up to 21,000,000 linearly as the quantity of controller enclosures increases, matching the performance needs of the future business development.

Always-On Applications with 5-Layer Reliability

Industries such as finance, manufacturing, and carriers are upgrading to intelligent service systems to meet the strategy of sustainable development. This will likely lead to diverse services and data types that require better IT architecture. OceanStor Dorado 8000/18000 high-end all-flash storage systems are an ideal choice for customers who need robust IT systems that consolidate multiple types of services for stable, always on services. They ensure end-to-end reliability at all levels, from component, architecture, product, solution, all the way to cloud, supporting data consolidation scenarios with 99.99999% availability.

Benchmark-Setting 5-Layer Reliability

Component – SSDs: Reliability has always been a top concern in the development of SSDs, and Huawei SSDs are a prime example of this. Leveraging global wear-leveling technology, Huawei SSDs can balance their loads for a longer lifespan of each SSD. In addition, Huawei's patented anti-wear leveling
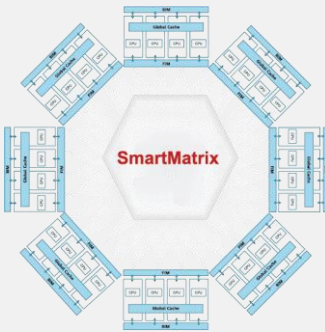
technology prevents simultaneous multi-SSD failures and improves the reliability of the entire system.

Architecture – fully interconnected design: Huawei OceanStor Dorado 8000/18000 use full-interconnection design at front and back-ends and intelligent multi-protocol interface modules to build the SmartMatrix architecture with ultra-high reliability. High-speed interconnection of multiple controllers is supported via the 100 Gb/s RDMA protocol, and the unique full-interconnection design tolerates failures for 3 out of 4 and even 7 out of 8 controllers and failure for 1 out of 2 controller enclosures to ensure zero service interruption, setting a new benchmark for storage reliability. The front-end interface modules connect to 4 controllers simultaneously. If a controller fails, services can be switched to an operational controller in seconds, without any host link interruption or any impact on upper-layer services. Application servers can access LUNs through any controller, instead of just a single controller. Multiple controllers share workload pressure using the load balancing algorithm. If a controller fails, other controllers take over services smoothly without any service interruption.

Product – enhanced hardware and software: Product design is a systematic process. Before a stable storage system is commercially released, it must ensure that it meets the demands from both software and hardware, and can faultlessly host key enterprise applications. The OceanStor Dorado 8000/18000 are equipped with hardware that adopts a fully redundant architecture and supports dual-port NVMe and hot swap, preventing single points of failure. The innovative 9.5 mm palm-sized SSDs and biplanar orthogonal backplane design provide 44% higher capacity density and 25% improved heat dissipation capability, and ensure stable operations of 2U 36-slot SSD enclosures. The smart SSD enclosure is the first ever to feature built-in intelligent hardware that offloads reconstruction from the controller to the smart SSD enclosure. Backed up by RAID-TP technology, the smart SSD enclosure can tolerate simultaneous failures of three SSDs and reconstruct 1 TB of data within 15 minutes. In addition, the storage systems offer comprehensive enterprise-grade features, such as 3-second periodic snapshots, that set a new standard for storage product reliability.

Solution – gateway-free active-active solution: Flash storage is designed for enterprise applications that require zero data loss or zero application interruption. OceanStor Dorado 8000/18000 use a gateway-free A-A solution for SAN and NAS to prevent node failures, simplify deployment, and improve system reliability. In addition, the A-A solution implements A-A mirroring for load balancing and cross-site takeover without service interruption, ensuring that core applications are not affected by system breakdown. The all-flash systems provide the industry's only A-A solution for NAS, ensuring efficient, reliable NAS performance. They also offer the industry's first all-IP active-active solution for SAN, which uses long-distance
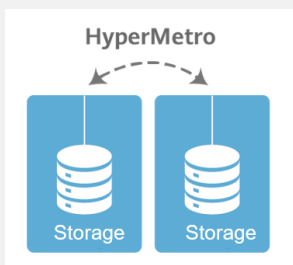
RoCE transmission to improve performance by 50% compared with traditional IP solutions. In addition, the solution can be smoothly upgraded to the geo-redundant 3DC solution for high-level data protection.

Cloud – gateway-free cloud DR*: Traditional backup solutions are slow, expensive, and the backup data cannot be directly used. Huawei OceanStor Dorado 8000/18000 high-end all-flash systems provide a converged data management solution. It improves the backup frequency 30-fold using industry-leading I/O-level backup technology, and allows backup copies to be directly used for development and testing. The disaster recovery (DR) and backup are integrated in the storage array, slashing TCO of DR construction by 50%. Working with HUAWEI CLOUD and Huawei jointly-operated clouds, the solution achieves gateway-free DR and DR in minutes on the cloud.

Efficient O&M with Intelligent Edge-Cloud Synergy

Intelligence throughout service lifecycle: Intelligent management covers resource planning, provisioning, system tuning, risk prediction, and fault location, and enables 60-day and 14-day predictions of performance bottleneck and disk faults respectively, and immediate solutions for 93% of problems detected.

On and off-cloud synergy: Huawei OceanStor Dorado 8000/18000 high-end all-flash systems combine general-purpose cloud intelligence with customized edge intelligence over a built-in intelligent hardware platform, providing incremental training and deep learning for a personalized customer experience. The eService intelligent O&M and management platform collects and analyzes over 190,000 device patterns on the live network in real time, extracts general rules, and enhances basic O&M.

Extreme convergence: Huawei OceanStor Dorado 8000/18000 high-end all-flash storage systems provide multiple functions to meet diversified service requirements, improve storage resource utilization, and effectively reduce the TCO. The storage systems provide both SAN and NAS services and support parallel access, ensuring the optimal path for dual-service access. Built-in containers support storage and compute convergence, reducing IT construction costs, eliminating the latency between servers and storage, and improving performance. The convergence of cross-generation devices allows data to flow freely, simplifying O&M and reducing IT purchasing costs.

FlashEver: The intelligent flexible architecture implements component-based upgrades without the need for data migration within 10 years. Users can enjoy latest-generation software and hardware capabilities without investing again in the related storage software features.

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Technical Specifications

Model	OceanStor Dorado 8000	OceanStor Dorado 18000
Hardware Specifications		
Maximum Number of Controllers	32	32
Maximum Cache (Dual Controllers, Expanding with the Number of Controllers)	512 GB-32 TB	512 GB-32 TB
Supported Storage Protocols	FC, iSCSI, NFS*, CIFS*	
Front-End Port Types	8/16/32 Gbit/s FC/FC-NVMe*, 10/25/40/100 GbE, 25 Gb NVMe over RoCE*	
Back-End Port Types	SAS 3.0/100 Gb RDMA	
Maximum Number of Hot-Swappable I/O Modules per Controller Enclosure	28	
Maximum Number of Front-End Ports per Controller Enclosure	96	
Maximum Number of SSDs	6,400	6,400
SSDs	1.92 TB/3.84 TB/7.68 TB palm-sized NVMe SSD, 960 GB/1.92 TB/3.84 TB/7.68 TB/15.36 TB SAS SSD	
SCM Supported	800 GB SCM*	
Software Specifications		
Supported RAID Levels	RAID 5, RAID 6, RAID 10*, and RAID-TP (tolerates simultaneous failures of 3 SSDs)	
Number of LUNs	65,536	
Value-Added Features	SmartDedupe, SmartVirtualization, SmartCompression, SmartMigration, SmartThin, SmartQoS(SAN&NAS), HyperSnap(SAN&NAS), HyperReplication(SAN&NAS), HyperClone(SAN&NAS), HyperMetro(SAN&NAS), HyperCDP(SAN&NAS), CloudBackup*, SmartCache*, SmartQuota(NAS)*, SmartTier*, SmartMulti-Tenant(NAS)*, HyperMetro-Inner(SAN&NAS), SmartContainer*	
Storage Management Software	DeviceManager UltraPath eService	
Physical Specifications		
Power Supply	SAS SSD enclosure: 100V–240V AC ± 10%, 192V–288V DC Controller enclosure/Smart SAS SSD enclosure/Smart NVMe SSD enclosure: 200V–240V AC ± 10%, 192V–288V DC	

*For further details on specifications with an asterisk for a specific project, please contact Huawei sales.

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Technical Specifications

Model	OceanStor Dorado 8000	OceanStor Dorado 18000
Physical Specifications		
Dimensions (H x W x D)	Controller enclosure: 175 mm × 447 mm × 865 mm SAS SSD enclosure: 86.1 mm × 447 mm × 410 mm Smart SAS SSD enclosure: 86.1 mm x 447 mm x 520 mm Smart NVMe SSD enclosure: 86.1 mm x 447 mm x 620 mm	Max. bay dimensions: 2000 mm × 600 mm × 1200 mm
Weight	Controller enclosure: ≤ 90 kg SAS SSD enclosure: ≤ 20 kg Smart SAS SSD enclosure: ≤ 30 kg Smart NVMe SSD enclosure: ≤ 35 kg	System bay: ≤ 700 kg Disk bay: ≤ 600 kg
Operating Temperature	–60 m to +1800 m altitude: 5°C to 35°C (bay) or 40°C (enclosure) 1800 m to 3000 m altitude: The max. temperature threshold decreases by 1°C for every altitude increase of 220 m	
Operating Humidity	10% RH to 90% RH	

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To learn more about Huawei storage, please contact your local Huawei office
or visit the Huawei Enterprise website: http://e.huawei.com.

Huawei Enterprise APP

Huawei IT

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