IBM System Storage DS5000 series

Workload-optimized storage for today's demanding applications

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Highlights

- Provide balanced performance—up to 700,000 input/output operations per second (IOPS) and 6,400 MB/s—that is well-suited for virtualization and consolidation

- Scale up to 448 drives (1.34 PB) using the EXP5000 enclosure and up to 480 drives (1.44 PB) of high-density storage with the EXP5060 enclosure

- Allow for intermixing drive types (Fibre Channel, FC-SAS, FC-SAS nearline, self-encrypting drives [SEDs], SATA and solid-state drives [SSDs]) and host interfaces (Fibre Channel and iSCSI) for investment protection and cost-effective tiered storage

- Support high availability with hot-swappable components and nondisruptive firmware upgrades

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The IBM® System Storage® DS5000 series is designed to meet the demanding open-systems requirements of today—and tomorrow—while establishing a new standard for lifecycle longevity. Building on many decades of design expertise, the DS5000 storage system's architecture delivers industry-leading performance, real reliability, multidimensional scalability and unprecedented investment protection. DS5000 supports IBM AIX® and IBM Power Systems™ T10-PI Data Integrity Initiative.

DS5000 storage systems are equally adept at supporting transactional applications such as databases and online transaction processing (OLTP), throughput-intensive applications such as high-performance computing (HPC) and rich media, and concurrent workloads for consolidation and virtualization. With relentless performance and superior reliability and availability, DS5000 series storage systems can support the most demanding service level agreements (SLAs) for the most common operating systems, including Microsoft Windows, UNIX, Linux and Apple Macintosh. When requirements change, you can add or replace host interfaces, grow capacity, add cache and reconfigure the system on the fly—ensuring that it will keep pace with your growing organization.

This multidimensional scalability allows the DS5000 series storage system to extend beyond the normal three- to four-year lifecycle, protecting your storage investment by delaying, or even eliminating,

the expense of migrating data to a new system and allowing you to amortize acquisition costs over extended periods of time. This lifecycle longevity enables DS5000 storage systems to continue delivering value long after other systems have been retired. With drive-level encryption, DS5000 series storage systems support affordable data security with no performance penalty. The DS5000 storage system's multiple replication options, drive-level encryption, and persistent cache backup can help ensure that any data in cache is captured and safe in the event of a power outage.

IBM System Storage EXP5000 drive enclosure

The EXP5000 drive enclosure is more than "just a bunch of disks." The enclosure is designed to optimize performance, availability and serviceability by offering:

- 4 Gbps Fibre Channel interfaces for connectivity
- Up to 16 dual-ported Fibre Channel, FC-SAS, FC-SAS nearline, SED, SSDs or SATA disk drives that are intermixable in the same enclosure
- An environmental service module (ESM)-embedded "loop switch"
- Redundant 4 Gbps Fibre Channel drive loops to ensure complete accessibility to all drives in the event of a loop or cable failure
- Redundant power supplies, cooling fans and ESMs
- A 24×7 four-hour response warranty

All primary components are hot-swappable and can be easily accessed, removed or replaced.

IBM System Storage EXP5060 drive enclosure

The IBM System Storage EXP5060 High Density Disk Drive Enclosure is designed to accommodate up to 60 disk drive modules (DDM) in a 4U rack-mount enclosure.

The EXP5060 enclosure can be populated with SATA DDMs. The EXP5060 enclosure has a physical storage capacity of up to 180 TB per enclosure, using 3 TB nearline SAS drives.

IBM System Storage DS5100 and IBM System Storage DS5300 controllers support attachment of up to eight EXP5060 enclosures. A DS5100 or DS5300 controller attached to eight EXP5060 disk enclosures provides up to 1.44 PB of physical storage, all of which can be housed in a single 2101-200 rack system.

Designed to seamlessly adapt to change

With industry-leading performance, reliability and robust storage management, DS5000 storage systems can add or replace host interfaces, increase performance, grow capacity and add cache to deliver unprecedented lifecycle longevity and investment protection as your business grows.

Relentless performance

DS5000 storage systems deliver unprecedented performance in a family of industry-leading technology. With a seventh-generation architecture, the systems are optimized to power

faster, more responsive applications—increasing productivity, improving customer satisfaction and meeting SLAs. And with linear scalability, DS5000 series storage systems are designed to meet the most demanding application and growth requirements.

Trusted storage to protect and deliver your data

Built with a goal of the highest reliability and availability, DS5000 series storage systems offer redundant components, automated input/output (I/O) path failover, and extensive online configuration, reconfiguration and maintenance capabilities to help ensure that your data is available virtually 24×7. In addition to the ability of DS5000 storage systems to help protect stored data:

- DACstore technology stores configuration metadata on each drive.
- Proactive drive health monitoring technology identifies faulty drives before they create problems.
- RAID 6 technology guards against concurrent drive failures and errors.
- Persistent cache backup ensures that data in the cache is captured and safe in the event of a power outage.
- Full disk encryption ensures that data is protected throughout the drive's lifecycle.

Address a wide range of storage needs

IBM System Storage DS® Storage Manager software provides unparalleled configuration flexibility to ensure that your DS5000 series storage system is configured to meet your application's logical unit number (LUN) requirements. DACstore technology allows drives to be relocated with data

intact as requirements change. Support for intermixing high-performance and high-capacity drives creates tiered storage in a single system. The balanced performance offered by the DS5000 series storage system excels at both IOPS and MB/s. This extensive flexibility makes DS5000 series storage systems a great choice for storage consolidation implementations where an individual storage system supports concurrent and diverse workloads and application requirements.

Maximize utilization and minimize TCO

As data volume continues to grow, organizations must be able to efficiently manage their storage while minimizing total cost of ownership (TCO). The unparalleled configuration flexibility of System Storage DS Storage Manager software creates superior utilization—getting the most usable capacity out of the purchased capacity, while maximizing performance efficiency. System Storage DS Storage Manager software offers centralized administration of all System Storage DS Storage Manager-based systems, providing a common interface across all products and platforms. System Storage DS Storage Manager software also offers a unique blend of robust functionality with an intuitive graphical user interface and wizards to ensure that storage is easily and optimally configured.

Efficiencies to cut purchase and operational IT costs

DS5000 series storage systems offer a modular design, giving you an affordable entry point with seamless "pay-as-you-grow" scalability as your requirements change. Efficient storage utilization lowers raw capacity requirements and supports intermixing high-performance and high-capacity drives to enable tiered storage. Like all IBM storage systems, the DS5000 series

storage system's exceptional per-drive performance creates value by getting the most performance out of the fewest drives. This reduces the number of drives needed to meet performance and capacity demands—supporting the IBM commitment to green technologies.

Highest performance member of the proven IBM System Storage family

DS5000 series storage systems are driven by field-proven firmware, enabling common features, functionality and management interface across all System Storage DS Storage Manager-based systems. This commonality enables lower TCO by reducing management complexity and offering centralized administration. What's more, the DS5000 series storage system continues the long-standing IBM tradition of unparalleled investment protection.

DACstore technology consistently stores configuration metadata on every configured drive. This unique design creates data-intact drive portability—supporting drive-level reconfigurations and controller-level upgrades as system requirements change. Drives can be relocated within the storage system to improve channel utilization and protection, or even migrated as a complete volume group into another DS5000 series storage system.

Additional tools to help manage storage

DS5000 series storage systems are supported by a variety of IBM Tivoli® software products. IBM Tivoli Storage Manager, IBM Tivoli Storage Resource Manager and many other third-party hardware and software products can add to the capabilities of your system by enabling backup and storage reporting.

Support for the new IBM Tivoli Storage Productivity Center for Disk Select v4.2.2 is designed to provide storage device configuration, performance monitoring and management of storage area network (SAN)-attached devices from a single console.

Tivoli Storage Productivity Center for Disk Select v4.2.2:

- Offers continuous real-time monitoring and fault identification to help improve SAN availability
- Provides performance reporting across multiple arrays from a single console
- Helps monitor metrics such as throughput, I/O and data rates and cache utilization
- Receives timely alerts that can enable event actions based on your policies when thresholds are exceeded
- Helps improve storage return on investment by helping keep SANs reliably and dependably operational
- Can reduce storage administration costs by helping simplify the management of complex SANs

IBM funds IT

With fair market value leases for hardware products such as System Storage, the residual value position of IBM Global Financing helps lower acquisition cost, so you effectively pay only for your use of the asset. Financing can convert up-front costs into a stream of monthly payments that make budgeting easier and predictable.

IBM System Storage DS5000 series at a glance

Model	DS5100-1818-51A, DS5300-1818-53A
RAID controller	Dual active
Cache	Up to a total of 64 GB cache • Options include 4 GB, 8 GB, 16 GB and 32 GB of cache per controller • Dedicated cache mirroring channels • Persistent cache backup in the event of a power outage • Field-upgradable

Host interface	DS5100:
	• 8 × 4/8 Gbps Fibre Channel host interface cards (4 Gbps cards auto-negotiate to 1 Gbps,
	  2 Gbps and 4 Gbps speeds; 8 Gbps cards auto-negotiate 2 Gbps, 4 Gbps and 8 Gbps speeds)
	• 1 Gbps iSCSI—dual ported (sixteen total host ports)
	• 10 Gbps iSCSI—dual ported (eight total host ports)
	
	DS5300:
	• Up to 16 × 4/8 Gbps host interface cards (4 Gbps cards auto-negotiate to 1 Gbps, 2 Gbps and 4 Gbps speeds;
	  8 Gbps cards auto-negotiate 2 Gbps, 4 Gbps and 8 Gbps speeds)
	• 1 Gbps iSCSI—dual ported (16 total host ports)
	• 10 Gbps iSCSI—dual ported (8 total host ports)

Drive interface	Sixteen 4 Gbps Fibre Channel drive interfaces support up to: • 28 EXP5000 drive enclosures • or 8 EXP5060 drive enclosures
Supported drives with EXP5000 expansion	4 Gbps Fibre Channel full disk encryption (FDE): 300 GB, 450 GB and 600 GB 15k rpm 6 Gbps FC-SAS: 300 GB, 600 GB and 900 GB 10k rpm 6 Gbps FC-SAS FDE: 300 GB and 900 GB 10k rpm FC-SAS: 300 GB 15k rpm FC-SAS FDE: 300 GB 15k rpm SSD*: 200 GB and 400 GB 4 Gbps SATA: 1 TB and 2 TB 7.2k rpm 6 Gbps FC-SAS nearline: 3 TB 7.2k rpm 6 Gbps FC-SAS nearline FDE: 3 TB 7.2k rpm
Supported drives with EXP5060 expansion	SATA: 1 TB and 2 TB 7.2k rpm FC-SAS nearline: 3 TB 7.2k rpm
RAID levels	RAID 0, 1, 3, 5, 6 and 10
Storage partitions	8, 16, 32, 128, 256 or 512 storage partitions
Maximum drives supported*	• 448 drives maximum with use of 28 EXP5000 drive enclosures • 480 drives with 8 EXP5060 drive enclosures
Fans and power supplies	Dual-redundant, hot-swappable
Rack support	19-inch industry standard rack
SAN support	Supported SAN fabric and gateways are available online at: http://www-03.ibm.com/systems/support/storage/ssic

IBM System Storage DS5100/DS5300/EXP5000 at a glance

Physical specifications:		
Height	17.4 cm (6.87 in.)	
Width	45.1 cm (17.75 in.)	
Depth	61.6 cm (24.25 in.)	
Weight	36.8 kg (81.1 lb)	
Relative humidity (no condensation)	**DS5000 series Controller Enclosure**	**EXP5000 Drive Enclosure**
Operating range	8% – 80%	8% – 80%
Storage range	5% – 80%	5% – 80%
Maximum dew point	26°C (79°F)	26°C (79°F)
Maximum gradient	10% per hour	10% per hour
Altitude ranges	**DS5000 series Controller Enclosure**	**EXP5000 Drive Enclosure**
Operating	30.5 m (100 ft) below sea level to 3,048 m (10,000 ft) above sea level	30.5 m (100 ft) below sea level to 3,000 m (9,842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3,048 m (10,000 ft) above sea level	30.5 m (100 ft) below sea level to 3,000 m (9,842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level
Heat dissipation	**DS5000 series Controller Enclosure**	**EXP5000 Drive Enclosure**
BTU/hr.	1,905	1,570
kVA	0.562	0.462
Watts (AC)	557	580
Amps (240 V ac)	3	2.25

The tabulated power and heat dissipation values are the maximum measured operating power.

Acoustic noise	DS5000 series Controller Enclosure	EXP5000 Drive Enclosure
Sound power	6.8 bels	6.75 bels
Sound pressure	68 dBA	67.5 dBA
Power input	**DS5000 series Controller Enclosure**	**EXP5000 Drive Enclosure**
Nominal voltage range	100 – 240 V ac	100 – 240 V ac
Frequency range	50 – 60 Hz	50 – 60 Hz
Max operating current	7.0 A at 100 V ac 3.0 A at 240 V ac	5.4 A at 100 V ac 2.25 A at 240 V ac

IBM System Storage EXP5060 High Density Enclosure (1818-G1A)

Physical specifications:	
Height	177.8 mm (7.0 in.)
Width	482.6 mm (19.0 in.)
Depth	825.5 mm (32.5 in.)
Weight	Drive-ready (without drive modules installed): 56.7 kg (125 lb) Fully configured (60 drive modules installed): 102.1 kg (225 lb)
Operating environment:	
Temperature (operating)	10°C – 35°C (50°F – 95°F) at 0 m to 914 m (0 ft – 3,000 ft) 10°C – 32°C (50°F – 90°F) at 914 m – 2,133 m (3,000 – 7,000 ft)
Relative humidity (operating)	8% – 80%
Relative humidity (storage)	5% – 80%
Electrical power (per power supply, system rating)	
Voltage range	200 – 240 V ac
Operating current	8.62 – 7.19 amperes
Power	1,450 watts
Frequency	50/60 Hz
Heat dissipation	4,884 BTU/hr.
Noise level (normal operation)	6.8 bels

For more information

To learn more about the IBM System Storage DS5000 series, please contact your IBM marketing representative or IBM Business Partner, or visit: **ibm.com**/systems/storage/disk

Additionally, IBM Global Financing can help you acquire the IT solutions that your business needs in the most cost-effective and strategic way possible. We'll partner with credit-qualified clients to customize an IT financing solution to suit your business goals, enable effective cash management, and improve your total cost of ownership. IBM Global Financing is your smartest choice to fund critical IT investments and propel your business forward. For more information, visit: **ibm.com**/financing

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