IBM System Storage DS3500 Express

Affordable performance and flexibility with greater scalability, efficiency and ease of use

Highlights

- Includes 6 gigabits per second (Gbps) serial attached SCSI (SAS) systems to deliver mid-range performance and scalability at entry-level prices

- Offers built-in management expertise in intuitive and powerful storage management software

- Delivers continuous data security with full disk encryption (FDE) and supports high performing solid state drives (SSDs)

- Offers Network Equipment Building System (NEBS) and European Telecommunication Standards Institute (ETSI) compliance and support for 48 V DC power supplies.

IBM System Storage DS3500 Express combines best-of-breed development with leading 6 Gbps host interface and drive technology. With its simple, efficient and flexible approach to storage, the DS3500 Express is a cost-effective, fully integrated complement to IBM System x servers, IBM BladeCenter and IBM Power Systems. By offering substantial improvements at a price that fits most budgets, the DS3500 Express delivers superb price/performance ratios, functionality, scalability and ease of use for the entry-level storage user.

The DS3500 Express offers:

- Scalability to mid-range performance and features starting at entry-level prices
- Efficiency to help reduce annual energy expenditures and environmental footprints
- Simplicity that does not sacrifice control with the perfect combination of robustness and ease of use.

Delivers mid-range performance and scalability

6 Gbps SAS is the enterprise version of SAS that builds on the solid foundation of 3 Gbps SAS technology. 6 Gbps SAS offers increased performance, scalability and reliability enhancements to support the ever-increasing reliance on information, while delivering the outstanding value that organisations demand.

Delivering solid input/output operations per second (IOPS) and throughput, the DS3500 Express controllers offer balanced and sustainable performance. With up to 4,000 megabytes per second (MBps) and 40,000 IOPS in sustained drive reads, the DS3500 Express is equally adept at delivering throughput to bandwidth-intensive applications and IOPS to databases and Microsoft® Exchange.

The DS3500 Express has enhanced scalability of up to 576 terabytes (TB) when fully expanded up to 192 drives. By dynamically adding drive enclosures (up to 15 EXP3512, seven EXP3524 expansion enclosures or a mix of the two) with virtually no downtime, you can quickly and seamlessly respond to growing capacity demands. This scalability also improves overall system performance by distributing the server's input/output (I/O) requests across a greater number of drives.

Enables energy-saving implementations

With rising energy expenses and IT space constraints, efforts to reduce power consumption in a small IT footprint have quickly come to the forefront as hot-button IT issues for many organisations. To respond to these challenges, IBM has made great strides in energy-efficient implementations with the DS3500 Express, which introduces power-saving features designed to have virtually no impact on performance, scalability or functionality.

Smaller form-factor 2.5 in. SAS drives, one of multiple drives supported by the DS3500 Express, provide up to three times the IOPS per watt in power consumption than 3.5 in. drives and enable twice as many drives to reside in the same 2U of rack space. These drives also deliver impressive IOPS performance in a small form factor (SFF) with minimal impact on power consumption or heat dissipation.

Energy-efficient power supplies help ensure just that – energy efficiency. By efficiently converting AC power from electric utilities into DC power used by the storage system, the DS3500 Express power supplies ensure that overall annual expenditures are lower than other, less-efficient implementations. And with low heat dissipation, the DS3500 Express serves a key role in an overall energy-saving and green solution.

With a DC-powered model for 24-drive enclosures with NEBS and ETSI compliance, the DS3500 Express offers savings in energy expenses, meets standard telecommunications requirements and minimises risk in harsh environments.

The DS3500 Express continues the tradition of superb disk use that enables users to achieve maximum return on investment (ROI) on their storage investments. The DS series can deliver up to nearly two times the disk use of some leading competitors, enabling organisations to achieve maximum performance with fewer drives and less energy consumption.

Simplifies storage management

The new IBM System Storage DS Storage Manager for the DS3500 Express blends the ease of use and intuitive nature of the IBM System Storage DS3000 Storage Manager with the robustness and functionality previously only available on the IBM System Storage DS5000 and DS4000. The result is a simple storage management interface that provides great control while maintaining simplicity. The DS3500 Express now offers dynamic and other high-functionality capabilities which, in the previous generation of management software, were only available through the command line interface (CLI). This capability allows administrators to make changes to their configurations concurrently with no downtime. The new DS Storage Manager graphical user interface (GUI) was designed for both experienced full-time storage administrators who want complete control over their storage configuration, as well as part-time system administrators who desire an intuitive interface that ensures optimal storage use with the least amount of effort.

Provides a singular DS Storage Manager

The DS3500 Express DS Storage Manager is the same management software offered with the DS5000 and DS4000 series. Now, any of these storage systems can be viewed and managed from a single interface. This allows for consolidated management of these various storage systems as well as a reduced learning curve. The DS3500 Express also supports enhanced remote mirroring over Fibre Channel (FC) host ports, which is also compatible with the DS5000 and DS4000 series. This allows for low-cost backup and recovery with a DS5000 and DS4000 at a production site and a DS3500 Express at the secondary site.

Enables DB2 Administration Server and storage area network (SAN) tiering

Administrators can now benefit from tiered IBM DB2 Administration Server and SAN implementations with multiprotocol host connectivity. The DS3500 Express supports intermixing four 1 Gbps internet small computer systems interface (iSCSI), two 10 Gbps iSCSI – dual-ported – or four 8 Gbps FC host ports with its native 6 Gbps SAS interfaces. This flexible and multipurpose dual-protocol approach enables organisations to implement a single storage system to support all of their shared storage requirements and helps improve productivity, reliability and cost savings. These implementations offer additional benefits, as well:

- Low cost, high speed SAS delivers the best value and performance for direct attach storage (DAS) implementations
- Data centres with existing iSCSI or FC SAN infrastructures can cost effectively implement these additional host interfaces as required; 1 Gbps iSCSI is ideal for low cost implementations for secondary servers and FC is well positioned for high performance and robust deployments
- Future-proof storage provides seamless integration to an existing 1 Gbps iSCSI infrastructure and is ready for the inevitable move to 10 Gbps iSCSI.

Offers continuous data security

In the lifecycle of a hard drive, it will, at some point, be out of the user's control either through theft, off-site service, repair or disposal. The DS3500 Express combines local key management and drive-level encryption for comprehensive data security designed to protect data throughout the life of the drive without sacrificing storage system performance or ease of use.

FDE provides data security at the most basic level – the hard drive. FDE protects against many exposures and vulnerabilities all at once. This drive-level encryption helps ensure data security in the event of a drive loss, theft or retirement. The FDE engine performs encryption without a performance penalty, which gives you the highest levels of data security while retaining optimal performance.

Fully integrated into the DS Storage Manager as a premium feature upgrade, local key management provides the necessary management and protection of self-encrypting disk (SED) drives by using a single authorisation scheme, or lock key, which can be set and applied to all SED drives in the DS3500 Express. The DS Storage Manager maintains and controls the key linkage and communications with the SED drives, secures user-selected logical drive groups and initiates the instant secure erase feature for users desiring even more peace of mind when servicing, decommissioning or repurposing drives. With local encryption services, FDE key management is transparent to day-to-day storage administration, making SED drives as easy to manage as traditional drives.

Supports capacity needs with tiered storage

The DS3500 Express, similar to the DS3000, DS4000 and DS5000 storage systems, can cost-effectively support an organisation's complete range of data capacity requirements – from nearline (NL) static data to highly used applications – through support for mixed drive types in a single storage system. The DS3500 Express accomplishes this with support for high performance SAS drives, SAS-NL drives, SSDs and SED drives. SAS-NL drives are also the clear replacement of Serial Advanced Technology Attachment (SATA) drives. Competitively priced to SATA drives, SAS-NL drives significantly outperform SATA and do so with greater reliability.

Now you can address even more granular and specific requirements for your application needs, whether they include security for data at rest, leading performance or energy efficiency. This exciting capability maximises storage density and provides a more efficient use of enclosures when implementing a tiered storage solution.

Centralises storage device management

IBM Tivoli Storage Productivity Centre for Disk Select V4.2.2 is designed to provide storage device configuration, performance monitoring and management of SAN-attached devices from a single console. In addition, it includes performance-monitoring capabilities for the DS3500 Express.

Tivoli Storage Productivity Centre for Disk Select
V4.2.2 provides the following features:

- Continuous real time monitoring and fault identification to improve SAN availability
- Performance reporting across multiple arrays from a single console
- Monitoring of metrics such as throughput, I/O, data rates and cache use
- Reception of timely alerts that can enable event action based on policies when thresholds are exceeded
- Improved storage ROI by helping to keep SANs up and running
- Reduced storage administration costs by simplifying the management of complex SANs.

Handles key applications and workloads

The DS3500 Express offers these additional capabilities:

- Consolidation and virtualisation: Balanced performance, low cost consolidation and extreme configuration flexibility make the DS3500 Express ideally suited for smaller consolidation and virtualisation implementations where an individual storage system supports diverse workloads and application requirements
- Departmental and remote sites: The DS3500 Express offers the right amount of performance, simplicity and functionality that a part-time administrator can use at a price that won't break an organisation's budget, allowing multiple sites to be self-sufficient
- Transactional workloads: Efficient IOPS make the DS3500 Express well suited for transactional workloads, including online transaction processing (OLTP), databases and email that are the core of every organisation's critical applications
- Data warehousing: Solid throughput, 6 Gbps SAS and 8 Gbps FC interfaces make the DS3500 Express well suited for data warehousing environments where an individual storage system must process large amounts of data

- Business-critical applications: With bullet-proof reliability, support for SED drives and exceptional uptime, the DS3500 Express supports business-critical applications where data must be protected and available when needed
- Secondary storage: Support for redundant array of independent disks (RAID) 6 and native language SAS drives means the DS3500 Express can store large amounts of data cost effectively, with confidence that it is fully protected
- Clustered topologies: SAS-based shared storage and FC or iSCSI SAN implementations are ideal for clustering solutions such as Microsoft Cluster Server and Oracle Real Application Clusters when transitioning from a DAS implementation
- Streaming video: Large-block I/O applications, such as world-class broadcasting, rich-media storage networks, content creation, modelling and publishing benefit from the additional bandwidth that the DS3500 Express series offers
- Data mining: With FC and SAS host connectivity, organisations can accelerate and scale simulation, visualisation, modelling and rendering applications easily to accelerate large dataset I/O rates, as well as cost-effectively scale and share information across the organisation for high-level collaboration
- Backup and restore: With the ability to mirror data between storage systems over FC, the DS3500 Express can support short backup windows and recovery times for high productivity
- Storage solution: The DS3500 Express offers enhanced Tivoli Storage FlashCopy services, thin provisioning and advanced software features for small and mid-sized businesses (SMBs)
- Data protection: The DS3500 Express offers simplified provisioning, improved rebuild times and more consistent performance under failure via selectable disk pooling
- Campus area replication: When replicating data across a high speed FC SAN, data can be mirrored synchronously, ensuring that remote sites have the exact same data as the local site at all times.

IBM System Storage DS3500 Express at a glance

Characteristics	
Part number	1746A2S DS3512 Express Single Controller Storage System 1746A2D DS3512 Express Dual Controller Storage System 1746A4S DS3524 Express Single Controller Storage System 1746A4D DS3524 Express Dual Controller Storage System 1746T4D DS3524 Express DC Dual Controller Storage System
Redundant Array of Independent Disk (RAID) controller	Dual active, hot-swappable controllers
Cache	1 gigabyte (GB) cache per controller with 2 GB upgrade (battery-backed)
Host interface	Four options: • Four or eight 6 Gbps SAS ports • Eight 8 Gbps FC ports and four 6 Gbps SAS ports • Eight 1 Gbps iSCSI ports and four 6 Gbps SAS ports • Four 10 Gbps iSCSI ports and four 6 Gbps SAS ports
Drive interface	Two 6 Gb SAS drive ports
Supported drives	**6 Gbps SAS 3.5 in. drives:** • 300 GB , 450 GB, 600 GB 15k revolutions per minute (rpm) • 2 TB 7.2k, 3 TB 7.2k rpm NL • 600 GB 15k rpm SED **6 Gbps SAS 2.5 in. drives:** • 146 GB 15k rpm • 300 GB 15k rpm • 300 GB 10k rpm • 600 GB 10k rpm • 900 GB 10k rpm • 500 GB 7.2k rpm NL • 300 GB 10k rpm SED • 1 TB 7.2k rpm **Solid-state SAS 2.5 in. drives*:** • 200 GB and 400 GB SSD
RAID levels	0, 1, 3, 5, 6, 10
Storage partitions	Support for up to 128 storage partitions (levels: 4 standard with upgrades to 8, 16, 32, 64 and 128)
Maximum drives supported	• Up to 192 drives – high performance SAS drives, SAS-NL drives, SSDs and SED SAS drives • EXP3512 (2U 12 3.5 in. drives) and EXP3524 (2U 24 2.5 in. drive) enclosures, which can be intermixed behind a DS3500 Express enclosure
Fans and power supplies	Dual redundant, hot-swappable
Rack support	2U, 19 in., industry-standard rack
Management software	IBM System Storage DS Storage Manager
SAN support	Supported IBM FC switches and directors and internet protocol (IP) switches
Warranty	Three years parts and labour warranty, nine a.m. to five p.m. next business day, upgradable to around-the-clock with six hour response

IBM System Storage DS3500 Express at a glance

Physical characteristics			
Dimensions	DS3512: Height: 3.39 in./86.16 mm, Width: 18.99 in./482.47 mm, Depth: 21.72 in./551.60 mm DS3524: Height: 3.47 in./88.07 mm, Width: 18.98 in./482.10 mm, Depth: 19.60 in./497.93 mm		
Supported systems	For a list of currently supported servers, operating systems, host bus adapters (HBA), clustering applications and SAN switches and directors, refer to the DS3500 Express Interoperability Matrix		
Model	Model description	Interface	Model includes
1746-E2A/EXP3512 1746-E4A/EXP3524	Drive enclosure	6 Gb SAS	External security manager-embedded
Relative humidity (no condensation)	EXP3512/EXP3524 drive enclosure		
Operating range	20 to 80 percent		
Storage range	10 to 90 percent		
Maximum dew point	79°F (26°C)		
Maximum gradient	10 percent per hour		
Altitude ranges			
Operating	100 ft. (30.5 m) below sea level to 10,000 ft. (3048 m) above sea level		
Storage	100 ft. (30.5 m) below sea level to 10,000 ft. (3048 m) above sea level		
Transit	100 ft. (30.5 m) below sea level to 40,000 ft. (12,000 m) above sea level		
The tabulated power and heat dissipation values are the maximum measured operating power			
Acoustic noise	EXP3512/EXP3524 drive enclosure		
Sound power	6.5 bel		
Sound pressure	65 dBA		
Power input	EXP3512/EXP3524 drive enclosure		
Nominal voltage range	90 V ac to 264 V ac		
Frequency range	50 to 60 Hz		
Maximum operating current	3.90 A at 115 V ac 2.06 A at 230 V ac		

For more information

To learn more about the IBM System Storage DS3500 Express, please contact your IBM representative or IBM Business Partner (BP), or visit **ibm.com**/systems/storage/disk/ds3500

For a list of currently supported servers, operating systems, HBAs, clustering applications and SAN switches and directors, refer to the DS3500 Express Interoperability Matrix available at **ibm.com**/systems/support/storage/config/ssic

For availability dates, configuration options and attachment capabilities, refer to **ibm.com**/systems/storage/disk

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