IBM System Storage DS3500 Express

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

Highlights

- Deliver mid-range performance and scalability at entry-level prices with 6 Gbps SAS systems
- Leverage built-in management expertise in intuitive and powerful storage management software
- Deliver simplified data protection management and automated recovery with Dynamic Disk Pooling
- Support Enhanced Global Mirroring over IP and/or Fibre Channel
- Deliver continuous data security with full disk encryption and support high-performing solid-state drives (SSDs)
- Comply with Network Equipment Building System (NEBS) and European Telecommunication Standards Institute (ETSI) and support 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 superior 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

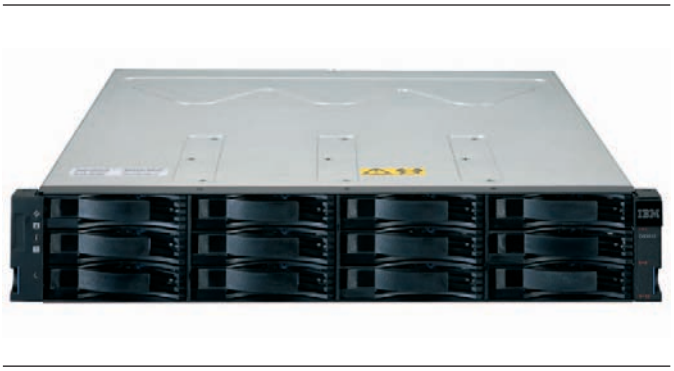
Building on the solid foundation of 3 Gbps SAS technology, 6 Gbps SAS is the enterprise version of SAS. This 6 Gbps SAS offers increased performance, scalability and reliability enhancements to support the ever-increasing reliance on information, while delivering the outstanding value that organizations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

Delivering solid input and output per second (IOPS) and throughput, the DS3500 Express controllers offer balanced and sustainable performance. With up to 4,000 megabytes (MB) per second 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, 7 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 I/O requests across a greater number of drives.

Provides intuitive storage management without sacrificing control

IBM System Storage DS Storage Manager software has combined robustness with ease-of-use—two attributes not commonly found together in entry to mid-range storage systems. The graphical user interface used by DS Storage Manager is ideally suited for full-time storage administrators who want complete control over their storage configurations as well as part-time system administrators who need an intuitive interface that helps them ensure optimal storage utilization. And with its industry-unique dynamic capabilities, administrators can support on-the-fly reconfigurations without interrupting storage system input/output (I/O). New Dynamic Disk Pooling (DDP) technology dramatically simplifies data-protection setup and can virtually eliminate the need for unscheduled drive maintenance. DDP is a self-healing data-protection technology that negates the need for complex RAID calculations, fully utilizes all of the disk drives in the array and delivers consistent system performance.



In addition to DDP, DS Storage Manager has fully integrated features that allow administrators to choose the method that best meets their data utilization and protection requirements:

- IBM Enhanced FlashCopy® creates near-instantaneous, capacity-efficient, point-in-time volume images that provide logical volume for uses such as file restoration and backup
- Volume Copy creates a complete physical copy—or clone—of a volume within a storage system; this unique entity can be assigned to any host and used for application testing or development, information analysis or data mining
- Thin provisioning with DDP helps to create the appearance of more disk space than is actually available, which helps to consume less space; it also offers the flexibility to increase space as data grows

Optional premium features deliver enhanced capabilities for the DS3500 Express system.

- **Disaster Recovery option**—Provides 16 Enhanced Remote Mirrors and 32 Enhanced Global Mirrors; also offers multiple options for disaster-recovery deployment and supports replication over Fibre Channel or IP for the DS3500 system

- **Backup and Restore option**—Allows 512 Enhanced FlashCopy images on the DS3500 system; Enhanced FlashCopy technology delivers easier setup of shared versus dedicated repositories and reduces capacity requirements and copy-on-write capacity consumption
- **Performance Read Cache option**—Utilizes SSDs as a level-two data cache, significantly improving read performance from spinning media; Performance Read Cache is extremely easy to set up and, once implemented, it automatically identifies the data that is read most frequently and copies it into cache for fast access
- **Super Key option**—Combines all of the features into one single key for easy deployment and management

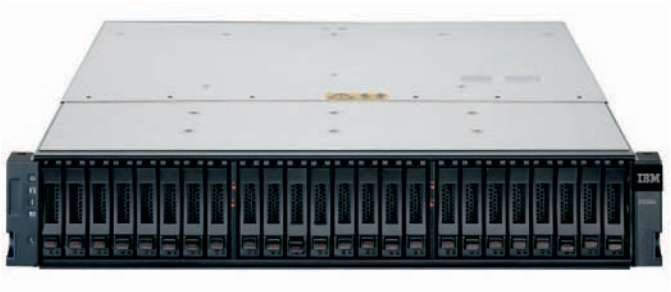
Supports VMware and heterogeneous operating systems

The DCS3500 Express offers the scalability, availability and integration necessary to power VMware implementations of all sizes. Its heterogeneous operating system support provides flexibility to manage a wide range of storage needs. It also includes support for VMware vSphere application programming interface (API) for Array Integration. And two application-aware plug-ins enable vCenter and Storage Replication Adapter (SRA) for efficient management.

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 organizations. 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-inch SAS drives, one of multiple drives supported by the DS3500 Express, provide up to three times more IOPS per watt in power consumption than 3.5-inch



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 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 minimizes risk in harsh environments.

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

Enables IBM DB2 Administration Server and SAN tiering

Administrators can now benefit from tiered IBM DB2® Administration Server and storage area network (SAN) implementations with multiprotocol host connectivity. The DS3500 Express supports intermixing four 1 Gbps iSCSI, two 10 Gbps iSCSI—dual-ported—or four 8 Gbps Fibre Channel host ports with its native 6 Gbps SAS interfaces. This flexible and multipurpose dual-protocol approach enables organizations 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-attached storage implementations.
- Data centers with existing IP networks or Fibre Channel 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 Fibre Channel 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, offsite 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.

Full disk encryption (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 authorization 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.

Enables uptime all the time

The DS3500 Express ensures continuous access to data. It carries on the IBM legacy of high-availability system design with redundant components, automated path failover and extensive online administration capabilities that maximize computational efficiency and productivity, ensuring there is virtually no single point of failure. This design helps keep these environments universally productive. New DDP technology is standard on the DS3500 Express and virtually eliminates maintenance worries by self tuning, rebalancing data and maintaining consistent performance even during drive failures.

Supports capacity needs with tiered storage

The DS3500 Express can cost-effectively support an organization's complete range of data capacity requirements—from nearline 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, nearline SAS drives, SSDs and SED drives. Nearline SAS drives are also the clear replacement of SATA drives. Competitively priced to SATA drives, nearline SAS 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 maximizes storage density and provides a more efficient use of enclosures when implementing a tiered storage solution.

Centralizes storage device management

IBM Tivoli® Storage Productivity Center 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 Center 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 virtualization: Balanced performance, low-cost consolidation and unparalleled configuration flexibility make the DS3500 Express ideally suited for smaller consolidation and virtualization implementations in which 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 organization'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, databases and email—that are the core of every organization's critical applications.
- Data warehousing: Solid throughput, 6 Gbps SAS, 8 Gbps Fibre Channel and 10 Gbps iSCSI interfaces make the DS3500 Express well suited for data-warehousing environments in which 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, DDP 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 Fibre Channel or iSCSI SAN implementations are ideal for clustering solutions such as Microsoft Cluster Server and Oracle Real Application Clusters when transitioning from a direct-attached storage implementation.
- Streaming video: Large-block I/O applications, such as world-class broadcasting, rich-media storage networks, content creation, modeling and publishing benefit from the additional bandwidth that the DS3500 Express series offers.
- Data mining: With Fibre Channel and SAS host connectivity, organizations can accelerate and scale simulation, visualization, modeling and rendering applications easily to accelerate large dataset I/O rates, as well as cost-effectively scale and share information across the organization for high-level collaboration.

- Backup and restore: With the ability to mirror data between storage systems over IP and/or Fibre Channel host ports, 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-size businesses.
- 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 Fibre Channel SAN or IP networks, 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
RAID controller	Single or 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 Fibre Channel 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	Single controller subsystem: One 6 Gb SAS drive port Dual controller subsystem: Two 6 Gb SAS drive ports
Supported drives	**6 Gbps SAS 3.5-inch drives:** • 300 GB 15k rpm • 450 GB 15k rpm • 600 GB 15k rpm • 2 TB 7.2k rpm nearline • 3 TB 7.2k rpm nearline • 600 GB 15k rpm SED **6 Gbps SAS 2.5-inch drives:** • 300 GB 10k rpm • 600 GB 10k rpm • 900 GB 10k rpm • 500 GB 7.2k rpm nearline • 300 GB 10k rpm SED • 1 TB 7.2k rpm nearline **Solid-state SAS 2.5-inch drives:*** • 200 GB SSD • 400 GB SSD

IBM System Storage DS3500 Express at a glance			
Data protection levels	RAID levels 0, 1, 3, 5, 6, 10 and/or DDP		
Software features	Thin provisioning with DDP, 128 storage partitions, 32 Enhanced FlashCopy images, host-attachment support for Microsoft Windows and Linux on Intel with firmware 7.84 and higher		
Maximum drives supported	• Up to 192 drives—high-performance SAS drives, nearline SAS drives, SSDs and SED SAS drives • EXP3512 (2U 12 3.5-inch drives) and EXP3524 (2U 24 2.5-inch drives) enclosures, which can be intermixed behind a DS3500 Express enclosure		
Fans and power supplies	Dual redundant, hot-swappable		
Rack support	2U, 19-inch, industry-standard rack		
Management software	IBM System Storage DS Storage Manager		
SAN support	Supported Fibre Channel switches and directors, and IP switches		
Warranty	Three-year parts and labor warranty, 9x5 next business day, upgradable to 24x7 with four-hour response		
Physical characteristics			
Dimensions (H × W × D)	DS3512: 86.16 mm × 482.47 mm × 551.60 mm (3.39 in. × 18.99 in. × 21.72 in.) DS3524: 88.07 mm × 482.10 mm × 497.93 mm (3.47 in. × 18.98 in. × 19.60 in.)		
Supported systems	For a list of currently supported servers, operating systems, host bus adapters, 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% – 80%		
Storage range	10% – 90%		
Maximum dew point	26°C (79°F)		
Maximum gradient	10% per hour		
Altitude ranges			
Operating	30.5 m below sea level to 3,048 m above sea level (100 ft below to 10,000 ft above)		
Storage	30.5 m below sea level to 3,048 m above sea level (100 ft below to 10,000 ft above)		
Transit	30.5 m below sea level to 12,000 m above sea level (100 ft below to 40,000 ft above)		
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 – 264 V ac		
Frequency range	50 – 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, or visit **ibm.com**/systems/storage/disk/ds3500

For a list of currently supported servers, operating systems, host bus adapters, 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

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

IBM Corporation
Systems and Technology Group
Route 100
Somers, NY 10589

Produced in the United States of America
February 2013

Actual available storage capacity may be reported for both uncompressed and compressed data and will vary and may be less than stated.

* Limitation: Maximum of 24 SSDs per system (a system is defined as the DS3500 Express storage controller and all attached EXP3524 expansion units)

Please Recycle

TSD03097-USEN-11