IBM System Storage DS3500 Express

Affordable performance and flexibility without sacrificing scalability, efficiency or ease of use

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

DS3500 Express is designed to offer:

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

Six Gbps SAS—midrange performance and scalability at entry-level prices

Six Gbps SAS is the enterprise version of SAS building on the solid foundation of 3 Gbps SAS technology. Six 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 controllers offer balanced and sustainable performance. The DS3500 can effectively double the performance of the current DS3000 series of storage systems in both throughput and IOPS. With up to 4,000 MBps and 40,000 IOPS in sustained drive reads, the DS3500 is equally adept at delivering throughput to bandwidth-intensive applications and IOPS to databases and Microsoft® Exchange.

And with support for up to 192 drives, scalability has doubled from the previous-generation systems. By dynamically adding drive enclosures—up to fifteen 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.

**Energy saving implementations for cost savings today and tomorrow**

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 by introducing new power saving features designed to have no impact on performance, scalability or functionality.

Smaller form-factor 2.5-inch SAS drives, one of multiple drives supported by the DS3500, provide up to three times the 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. 2.5-inch 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 power supplies ensure that overall annual expenditures are lower than other, less efficient implementations. And with low heat dissipation, the DS3500 can become a key component of an overall energy-saving and green solution.

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

The DS3500 continues in the tradition of superior disk utilization that enables IBM customers to achieve maximum return on investment (ROI) on their storage investment. The DS series can deliver up to nearly two times the disk utilization of leading competitors allowing organizations to achieve maximum performance with fewer drives and less energy consumption.
Intuitive, simple storage management that doesn’t sacrifice control
Blending the ease of use and intuitive nature of the DS3000 Storage Manager as well as the robustness and functionality previously only available on the DS5000 and DS4000®, the new DS Storage Manager for the DS3500 delivers a simple storage management interface that provides great control while maintaining its simplicity. The DS3500 now offers dynamic and other high-functionality capabilities which, in the previous generation of management software, were only available through the command line interface. This capability allows administrators to make changes to their configurations on the fly 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 utilization with the least amount of effort.

A singular DS Storage Manager with remote mirroring
The DS3500 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 also supports enhanced remote mirroring over Fibre Channel 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 at the secondary site.

Mixed host interfaces support enables DAS and SAN tiering
Administrators can now benefit from tiered DAS and SAN implementations with multi-protocol host connectivity. The DS3500 supports intermixing four 1 Gbps iSCSI, 2 10 Gbps iSCSI—dual ported or four 8 Gbps Fibre Channel host ports with its native 6 Gbps SAS interfaces. This flexible and multi-purpose dual protocol approach allows organizations to implement a single storage system to support all of their shared storage requirements, to help improve productivity, reliability, and cost.

Multiprotocol host connectivity offers a number of advantages for the system administrator:

- Low cost high speed SAS delivers the best value and performance for direct attach storage implementations.
- Data centers with existing iSCSI 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 1Gb iSCSI infrastructure and is ready for the inevitable move to 10 Gb iSCSI.
Relentless data security with local key management and full drive encryption

In the life cycle 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 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 drive 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 utilizing a single authorization scheme, or lock key, which can be set and applied to all SED drives within a DS3500. 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 customers 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.

Tiered storage with drive intermix of SAS, nearline-SAS and SED drives

The DS3500, similar to the DS3000, DS4000 and DS5000 storage systems, can cost-effectively support an organization's complete range of data capacity requirements—from near-line static data to highly utilized applications, through support for mixed drive types within a single storage system. The DS3500 accomplishes this with the additional support for near-line SAS drives, SAS SED drives and 2.5-inch SAS drives to its traditional 3.5-in drives. Near-line SAS drives are also the clear replacement of SATA drives. Competitively priced to SATA drives, near-line SAS drives significantly outperform SATA and do so with greater reliability at a comparable price.

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

Storage and application monitors now available with IBM Tivoli Storage

IBM Tivoli® Storage Productivity Center for Disk Midrange Edition V4.1 is designed to provide storage device configuration, performance monitoring and management of storage area network (SAN)-attached devices from a single console. In addition, it includes performance monitoring capabilities for the DS3500.
Tivoli Storage Productivity Center for Disk Midrange Edition V4.1:

- Offers continuous real-time monitoring and fault identification to help improve SAN availability.
- Provides performance reporting across multiple arrays from a single console.
- Monitors metrics such as throughput, input and output (I/O), data rates and cache utilization.
- Receives timely alerts that can enable event action based on your policies when thresholds are exceeded.
- Improves storage return on investment by helping to keep your SANs up and running.
- Reduces storage administration costs by simplifying the management of complex SANs.

**Key applications and workloads**

- Consolidation and virtualization: Balanced performance, low-cost consolidation and unparalleled configuration flexibility make the DS3500 ideally suited for smaller consolidation and virtualization implementations where an individual storage system supports diverse workloads and application requirements.
- Departmental and remote sites: Simple enough for a part-time administrator and at a price that won’t break a corporation’s budget to support its departmental and remote sites, the DS3500 offers the right amount of performance, simplicity and functionality that will allow these locations to be self-sufficient.
- Transactional workloads: Efficient IOPS make the DS3500 well suited for transactional workloads, including OLTP, databases and email, that are the core of every company’s critical applications.
- Data warehousing: Solid throughput and 6 Gbps SAS and 8 Gbps Fibre Channel interfaces make the DS3500 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 supports business-critical applications where data must be protected and available when needed.
- Secondary storage: With support for RAID 6 and NL SAS drives, the DS3500 can store large amounts of data cost-effectively with confidence that it's fully protected.
- Clustered topologies: SAS-based shared storage and Fibre Channel or iSCSI SAN implementations are ideal for clustering solutions such as MSCS and Oracle Real Application Clusters (RAC) when transitioning from a DAS implementation.
- Streaming video: Large-block I/O applications, such as world-class broadcasting, rich media storage networks, content creation, modeling and publishing, will benefit from the additional bandwidth that the DS3500 series offers.
- Data mining: With Fibre Channel and SAS host connectivity, companies 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 Fibre Channel, the DS3500 can support short backup windows and recovery time for high productivity.
- Campus area replication: When replicating data across a high-speed Fibre Channel 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 Numbers | 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  
1746A2E EXP3512 Express Storage Expansion Unit  
1746A4E EXP3524 Express Storage Expansion  
1746T4E EXP3524 Express DC Storage Expansion Unit |
| RAID controller | Dual active, hot-swappable controllers |
| Cache | 1 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 | Two 6 Gb SAS drive ports |
| Supported drives | 6 Gbps SAS 3.5” drives:  
- 300 GB 15k rpm, 450 GB 15k rpm, 600 GB 15k rpm  
- 1 TB 7.2k rpm Nearline, 2 TB 7.2k rpm Nearline  
- 600 GB 15k rpm SED  
6 Gbps SAS 2.5” drives:  
- 146 GB 15k rpm  
- 300 GB 10k rpm  
- 600 GB 10k rpm  
- 500 GB 7.2k rpm Nearline  
- 300 GB 10k rpm SED  
- 1 TB 7.2k rpm |
| 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, 128) |
| Maximum drives supported | - Up to 192 drives—high performance SAS drives, nearline SAS drives, 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 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 IBM FC switches and directors, and IP switches |
| Warranty | Three-year parts and labor warranty, 9x5 next business day, upgradeable to 24x7 with four-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 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported systems</td>
<td>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.</td>
</tr>
<tr>
<td>Model</td>
<td>Model description</td>
</tr>
<tr>
<td>1746-E2A/EXP3512</td>
<td>Drive enclosure</td>
</tr>
<tr>
<td>1746-E4A/EXP3524</td>
<td>Drive enclosure</td>
</tr>
</tbody>
</table>

### Relative Humidity (no condensation)

- Operating range: 20% to 80%
- Storage range: 10% to 90%
- Maximum dew point: 79° F (26° C)
- Maximum gradient: 10% 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
- Max 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 marketing 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

IBM offers tailored financing solutions to credit-qualified clients that can be customized to address your specific IT needs from great rates to flexible payment plans and loans. Our asset management services include certified used equipment, online asset management, buyback, asset disposal and disk overwrite. For more information on IBM Global Financing, visit:

ibm.com/financing

© Copyright IBM Corporation 2011

IBM Systems and Technology Group
Route 100
Somers, NY 10589

Produced in the United States of America
May 2011
All Rights Reserved

IBM, the IBM logo, ibm.com, System Storage, System x, BladeCenter, Power Systems, DS4000 and Tivoli are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked terms are marked on their first occurrence in this information with a trademark symbol (® or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the web at “Copyright and trademark information” at ibm.com/legal/copytrade.shtml

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

This document could include technical inaccuracies or typographical errors. IBM may make changes, improvements or alterations to the products, programs and services described in this document, including termination of such products, programs and services, at any time and without notice. Any statements regarding IBM’s future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only. The information contained in this document is current as of the initial date of publication only and is subject to change without notice. IBM shall have no responsibility to update such information.

IBM is not responsible for the performance or interoperability of any non-IBM products discussed herein. Performance data for IBM and non-IBM products and services contained in this document was derived under specific operating and environmental conditions. The actual results obtained by any party implementing such products or services will depend on a large number of factors specific to such party’s operating environment and may vary significantly. IBM makes no representation that these results can be expected or obtained in any implementation of any such products or services.

Please Recycle