

IBM System Storage DS8000 Turbo series



Highlights

- **Support continuous operations for cross-platform, mission-critical workloads with leading performance, flexibility, high availability, security, and cost effectiveness**
- **Manage growth and reduce operational complexity through consolidation with high-performance solid-state drives, high-capacity Serial ATA (SATA) drives, support for advanced IBM de-duplication technology, flexible system logical partitions (LPARs), and advanced management capabilities**
- **Protect sensitive information from internal and external threats with innovative self-encrypting disk drives**
- **Realize greater efficiencies for IBM server environments through unique support for innovative IBM server platforms, such as High Performance FICON® for System z®, z/OS® Metro/Global Mirror Incremental Resync, Extended Address Volumes, HyperPAV, Extended Distance FICON, and Cooperative Caching**
- **Exceptional acquisition costs and total cost of ownership with enterprise choice warranties of one, two, three or four years on both hardware and advanced functions**
- **Additional enhancements to improve overall business continuity, management, and security capabilities**

Scalable, resilient, high-performance storage for mission-critical workloads

The IBM System Storage™ DS8000™ Turbo series is designed to support the most demanding business applications with its exceptional performance and superior data throughput. This, combined with its world-class resiliency features and five-nines availability¹, make it an ideal storage platform for supporting today's round-the-clock, global business environment. Moreover, with its tremendous scalability, flexible tiered storage options, broad server support, and support for advanced IBM de-duplication technology, the DS8000 Turbo can help simplify the storage environment by consolidating multiple storage systems onto a single DS8000 system.

Reduce cost and complexity through consolidation and virtualization

The DS8000 can help lower total cost of ownership and reduce the complexity of managing storage environments. Physical capacity can range from

1.1 Terabyte (TB) to over 1 Petabyte (PB) on a single system, providing scalability on which to grow and consolidate data from multiple storage systems. Consolidating disk platforms in this way can help customers address their performance and capacity requirements more effectively, while simplifying their storage environments and reducing costs related to data center floor space, energy, and cooling. Add to that the tremendous capacity optimization and performance benefits when combining the DS8000 series and the world-class data de-duplication technology of the IBM System Storage TS7650g ProtecTIER® De-duplication Gateway, and you've got an enterprise disk system that scales like no other. What's more, the IBM System Storage SAN Volume Controller can extend the DS8000's powerful capabilities to offer additional advanced functions, such as thin provisioning, heterogeneous storage virtualization, and online data migration.

To help simplify the storage environment further, the DS8300 recently enhanced its virtualization capabilities. Innovative IBM Virtualization Engine™ logical partitioning (LPAR) is available in select configurations of the DS8300 series and is designed to enable the creation of two completely separate virtual storage subsystems within a single DS8300 system. With Variable LPAR, customers can allocate resources in a more flexible manner with each partition exploiting 25%, 50% or 75% of system resources to support the specific performance requirements of separate workloads. As such, these variable LPARs can be assigned to separate production, test and/or other heterogeneous workloads. What's more, the hardware-based partitioning design of the DS8000 also helps isolate and protect the LPARs so an outage in one LPAR will not necessarily affect another LPAR. This variable LPAR capability is designed to help improve management efficiency through higher levels of system flexibility and cost effectiveness.

World-class performance to maximize responsiveness in today's on-demand world

The DS8000 series is designed to deliver the utmost in high performance—helping organizations process, store and retrieve data at astounding speeds. Its innovative design incorporates a high-bandwidth and fault-tolerant internal component interconnect, switched connections to internal disks, innovative cache optimization algorithms from IBM Research, and now lightning fast solid-state drives.

In addition to the embedded high-performance processors within its host and device adapters, the DS8000 provides two shared pools of processors that can be applied to various tasks inside the system, all of which add to the tremendous performance of the DS8000 system. The DS8000 Turbo series uses 64-bit IBM POWER5+™

¹ Five-nines is a term used to denote that a piece of equipment is functioning with 99.999% reliability

microprocessors in dual 2-way (for the DS8100) or dual 4-way (for the DS8300) shared symmetric multi-processor (SMP) complexes.

With the introduction of solid-state drives on the DS8000, customers can see a dramatic decrease in back-end drive response times to around 0.8 milliseconds. Compare this with base response times of 6 milliseconds for a typical 15,000 RPM (revolutions per minute) enterprise fibre channel drive, and it's clear that solid-state drives offer a tremendous benefit for distinct application workloads. What's more, solid-state drives have no moving parts, so they consume less energy to operate than spinning drives, which can help reign in data center operational costs. This combination offers a compelling story for organizations looking to manage their storage environment more effectively by matching specific application needs with the appropriate storage tier.

Along with the performance gain from these solid-state drives, the DS8000 series continues to offer superior overall throughput with enterprise fibre channel

drives. With front-end, single-port performance of up to 400 MBps (with up to four ports per host adapter), and blazing back-end performance, the DS8000 series is designed to deliver superior total throughput for typical production workloads, such as those defined in the SPC-1 benchmark from the Storage Performance Council. In fact, research firm Enterprise Strategy Group verified that, with 4 Gbps fibre channel adapters transmitting 154,000 Input/Output operations per second (IOPs) per adapter, a single IBM DS8300 can be used to sustain up to 4.9 million IOPs!² Moreover, the DS8000 system can stripe data across multiple RAID arrays to help minimize disk "hot spots" and reduce the need for manual tuning.

When selecting a particular drive class, customers need to consider the application workloads the drives will be supporting. Some workloads require superior overall system throughput, while others might only need to optimize response times to and from the disk arrays on the backend. Much of this depends on which volumes of data are accessed more frequently, the value of the data on those volumes, and the

system's use of cache memory. Placing data volumes on an inappropriate drive class can lead to a misalignment of performance requirements and drive capabilities. For this reason, IBM offers analysis tools that can help them align the appropriate application workloads to the appropriate drive class, which can help balance the organization's service levels and storage costs more effectively.

The efficiency of a storage systems' cache can also help to greatly improve I/O performance, as well as reduce the overall cache requirements. The DS8000 series systems can be equipped with up to 256 GB of cache to help support high-capacity workloads. The caching algorithms in the DS8000 series are designed to intelligently and dynamically adapt system caching to the specific needs of the current workload. This is intended to help the system deliver an unimpeded flow of information for outstanding throughput. The latest cache advancement from IBM's vaunted research labs is the new Intelligent Write Caching algorithm, which combines and balances the benefits of the most effective

² The IBM DS8000 Enterprise Class Performance and Functionality, Enterprise Strategy Group, February 2008

read and write caching algorithms to determine how the write cache should be managed for optimal throughput in the DS8000. The DS8000 also incorporates Adaptive Multistream Pre-fetching (AMP), another breakthrough caching technology that is designed to dramatically improve performance for sequential and batch processing applications, such as data backup, business intelligence and data warehouse workloads. Moreover, the Cooperative Caching and I/O Priority functions of the DS8000 can help enable even greater cache efficiency and performance for higher priority DB2® applications running on IBM System p® servers with the IBM AIX® operating system.

The DS8000 series includes a variety of features designed to extend the performance of IBM System z environments. The most recent innovations include support for High Performance FICON for System z and z/OS Metro/Global Mirror Incremental Resync. The new High Performance FICON for System z offers the ability to double the throughput of System z implementations by using standard fibre channel ports to transfer FICON commands and data. What's more,

combining the new solid-state drives with High Performance FICON® (zHPF) can improve access to data by as much as 20%. For its part, z/OS Metro/Global Mirror Incremental Resync improves the DS8000's business resiliency in a three-site Metro/Global Mirror implementation. As part of System z's Hyperswap™ high availability solution, Incremental Resync can greatly reduce resynchronization time needed after a Hyperswap from hours to minutes, which not only improves data consistency between mirrored sites but also reduces bandwidth requirements to help reduce the potential risk of information loss should another outage occur.

The DS8000 series also offers many other special IBM System z capabilities, such as Extended Address Volumes (EAV) for z/OS, IBM z/OS Global Mirror Multiple Reader, IBM Basic Hyperswap, Extended Distance FICON, Parallel Access Volumes (PAV), HyperPAV, priority I/O queuing, Multiple Allegiance and support for the IBM System z MIDAW facility. Furthermore, to facilitate rapid data transfer to and from the System z server, the DS8000 can also support up to 128 4 Gbps fibre channel/FICON ports or up to 64 IBM ESCON® ports.

With more than 50 years of experience in disk storage and a rich heritage in providing storage solutions for IBM mainframe systems, the DS8000 is uniquely positioned to address the needs of the most demanding System z workloads.

Increase security and reduce cost and complexity of drive retirement with innovative self-encrypting drives

It's no secret that strong security helps build the trust needed for collaboration, innovation, and superior customer relationships. Data breaches have fueled an immense interest in IBM self-encrypting storage, which secures all information on a tape cartridge or disk drive when they are physically removed from a storage system. By having the entire tape cartridge or disk drive encrypted, customers can be assured that should the cartridge or drive get lost or stolen, the information can't be read by unauthorized parties...anywhere.

After almost three years of enabling IBM clients to successfully secure their backup tapes with self-encrypting tape drives, the DS8000 series now extends this exciting technology to the disk

system. By combining IBM full-disk encrypting drives and the market-proven key manager used with IBM's tape encrypting solution, the DS8000 solution not only secures data at rest but also offers a simple, cost-effective solution for "securely erasing" any disk drive that is being retired or repurposed.

Whether a single drive is being returned for warranty or an entire disk system is being returned at the end of its lease, customers are fearful that the data on them isn't adequately protected from unauthorized parties, internal or external. By changing the embedded encryption key in each drive through a few simple key strokes, the storage administrator can securely repurpose, retire, or return a drive when its lease expires or when under warranty. This not only greatly simplifies the process of drive retirement, but it can also significantly lower the costs associated with expensive data elimination services. Moreover, instead of destroying the many drives retired and contributing to the toxic waste in our landfills, customers can recoup some of the value of these retired drives.

By leveraging innovative Seagate Secure™ technology, each disk drive includes its own encryption engine that encrypts and decrypts at native drive speeds. This, combined with the DS8000's performance-optimized architecture, allows for no discernable performance degradation compared to traditional non-encrypting drives. What's more, unlike traditional encryption models that feed data to be encrypted through a single engine, the high performance of IBM's self-encrypting drive model scales linearly as more drives are added!

For its part, the Tivoli® Key Lifecycle Manager is a Java™-based application, so it can run on a variety of server platforms customers already have in their environments, which can eliminate the need to insert new appliances or hardware accelerators to compensate for the extra processing power to perform the encryption operations. As a software-based key manager, TKLM can also leverage the host server's existing access control and high availability/disaster recovery configurations, which greatly simplifies

implementation. TKLM also includes backup and synchronization features for high availability and long-term retention, as well as auditing capabilities for both internal and external compliance purposes. As with the IBM self-encrypting tape solution, the self-encrypting disk solution will be largely transparent to the server's operating environment and applications, which makes deployment much simpler than other encryption models. Encryption has never been easier!

Adapt to a changing world with exceptional flexibility and scalability

Savvy businesses are looking for innovative ways to manage and adapt in today's increasingly competitive, global business environment with a highly scalable and flexible information infrastructure. The DS8000 series is designed to excel in such an environment with multi-vendor interoperability and broad support for open industry standards. Customers and industry observers praise the DS8000 series for its unique combination of flexibility, resiliency, performance, and scalability that helps address the many challenges stemming from the exponential growth of data within an enterprise.

One example of the flexibility and modularity of the DS8000 series is the ability to increase physical storage capacity within a frame without system disruption by adding modular drive packages of 16 disk drives per package. Drive packages can house 73 GB or 146 GB solid-state drives, 73 GB, 146 GB, 300 GB, or 450 GB fibre channel disk drives, or 1 TB high-capacity SATA drives. In most cases, drive packages of different capacities and/or performance characteristics can be intermixed within a system, which offers additional flexibility for customers looking to deploy a tiered storage environment within the DS8000 system.

The uncommon adaptability of the DS8000 series is further demonstrated by the ability to extend and upgrade from one model to another on-site, helping organizations quickly respond to changing business requirements. Unlike high-end disk platforms from some competitors, customers with an older IBM POWER5™ model, for instance, can upgrade to an IBM POWER5+ model without purchasing an entirely new system. To help accommodate real-time workload fluctuations, the DS8000 series also supports the addition, deletion and dynamic expansion of volumes on the

fly to help meet sudden spikes in demand or to react to other environmental changes. This not only reduces the need for customers to disrupt their applications to add capacity, but it also can significantly lower the amount of time administrators spend provisioning new storage.

To help further meet the changing storage needs of growing businesses, clients can use the IBM's standby Capacity-on-Demand option, which is designed to allow access to extra capacity quickly whenever the need arises. For customers looking for even more advanced space saving capabilities, the DS8000 has been tested with the world-class data de-duplication technology of the IBM System Storage TS7650g ProtecTIER De-duplication Gateway, which has allowed customers to substantially decrease the capacity needed to perform disk-to-disk backups. For its part, IBM SAN Volume Controller (SVC) can extend the DS8000's powerful capabilities with thin provisioning, heterogeneous storage virtualization and online data migration. As a result, customers can use SVC to extend and centralize these innovative virtualization capabilities across their

heterogeneous storage environments. With all these capabilities, IBM can help customers quickly respond to changing business needs, so they can thrive in a world where the only constant is change.

Make business continuance a reality with high-availability architecture

The DS8000 series is designed to help address the needs of dynamic environments requiring the highest levels of availability. It is designed to support dynamic system changes, such as online system microcode updates and online hardware upgrades. The DS8000 also features redundant, hot-swappable components to help support continuous operations. This highly resilient design and its five-nines availability make the DS8000 series an ideal storage platform for supporting today's round-the-clock, global business environment.

All disks are RAID-protected, such that multiple spare disks are configured in a RAID group to allow a failed, RAID-protected disk to be rebuilt quickly and automatically to maintain access to information. The DS8000 series supports RAID-5, RAID-6 and RAID-10 configurations for increased flexibility. Furthermore, each DS8000 system is

built to monitor its own internal functions, so it can “call home” automatically to alert service personnel if it detects a potential problem arising. Sophisticated Light Path Diagnostics also facilitate system maintenance, and the DS8000 series also offers an audit log security function designed to log changes made by administrators to aid in root cause analysis.

In addition to its exceptionally resilient architecture, the DS8000 series offers an array of advanced functions for data backup, remote mirroring and disaster recovery. The DS8000's advanced two-site and three-site business continuity capabilities give customers the peace of mind of knowing their mission-critical applications will be available when they need them during both planned and unplanned system outages. With this type of resiliency and high availability, it's no wonder customers turn to the DS8000 to support their most important business applications.

Local data copies

The IBM FlashCopy® feature addresses a key requirement for continuous data availability by quickly and efficiently creating asynchronous point-in-time copies without impeding the related application server. That is, when a copy of data is requested, both the source data and its copy are available for use almost immediately, so the business can continue operating with minimal delays. These copies can be used for backup, application or quality assurance testing or other purposes.

In addition to being able to make a full physical copy as a background service, FlashCopy also has a no-copy feature that is designed to reduce internal data movement overhead, which can enable quicker reuse of disk capacity that might otherwise be dedicated to copy operations for an extended period of time. With its copy-on-write capability, the only data copied is that which is about to be changed or overlaid. Copies can be made quickly, after which data can be backed up and capacity reallocated.

The IBM FlashCopy SE feature provides a space-efficient snapshot capability that can greatly reduce the storage capacity needed for point-in-time copies. The most important difference between FlashCopy SE and standard FlashCopy is space efficiency. With a FlashCopy SE relation, disk space will only be consumed for the target copy when data is written to the source volume or when a write is directed to the target. For a source volume without much write activity, the target volume can consume significantly less physical space than the source. In addition to the benefit of more efficient storage utilization, less capacity can mean fewer disk drives and lower power and cooling requirements. FlashCopy SE may be especially useful in the creation of temporary copies for tape backup, online application checkpoints or copies for disaster recovery testing.

Remote mirroring

In today's highly competitive and dynamic business climate, supporting the highest level of application availability can be vital to an organization's success. The DS8000 series remote mirroring and copy functions are designed to create mirrors of application data at remote sites that are cities or continents away, enabling synchronous copies between sites of up to 300 km apart and asynchronous copies over virtually unlimited distances. These advanced functions include IBM System Storage Metro Mirror, Global Mirror and Global Copy.

Metro Mirror provides real-time mirroring of logical volumes between two DS8000s that can be located up to 300 km from each other. Greater distances are supported on special request. It is a synchronous copy solution where write operations are completed on both copies (local and remote site) before they are considered to be complete, which maintains data consistency for outstanding information availability.

Global Mirror is designed to help maintain data currency at a remote site within a few seconds of the production site, regardless of distance. It includes exceptional capabilities, such as self-managed, cross-system data consistency groups, which help protect data integrity for large applications across a wide variety of flexible system configurations. In addition, Global Mirror configurations incorporate comprehensive data integrity protection at the remote site, which helps reduce risk during resynchronization of data between sites after temporary link disruptions or other outages. The DS8000 also supports advanced three-site business continuity solutions, IBM Metro Mirror/Global Mirror and z/OS Metro/Global Mirror, to help enable even greater protection from unexpected site outages.

To help simplify the management, automation and monitoring of these advanced mirroring services, customers can license IBM TotalStorage® Productivity Center for Replication. This advanced offering can help automate administration and configuration of these services, control copy services

tasks (starting, suspending and resuming) and monitor and manage the copy services sessions. TotalStorage Productivity Center for Replication also can monitor the performance of the copy services and provide a measurement of the amount of replication and the amount of time that is required to complete the replication operations.

Simplified systems management

The DS8000 series can help simplify system deployment by supporting major server platforms, including IBM z/OS, z/VM®, OS/400®, i5/OS® and AIX operating systems, as well as Linux®, HP-UX, Sun Solaris™, Novell NetWare, VMware and Microsoft® Windows® environments, among others. With such broad platform support, the DS8000 series can easily accommodate a wide array of applications.

The DS8000 series includes powerful management capabilities that can help IT administrators regain control of their storage environments as their capacity grows. The DS8000 uses the

IBM System Storage Productivity Center (SSPC), an advanced management console that can provide a view of both IBM and non-IBM storage elements across the storage network. SSPC can enable a greater degree of simplification for organizations grappling with the growing number of disparate element managers in their environment.

Utilizing IBM TotalStorage Productivity Center Basic Edition software, the SSPC console extends the capabilities available through the IBM DS Storage Manager while offering the ability to manage a variety of storage devices connected across the storage area network (SAN). With its single sign-on capability for the various devices it manages, and its rich, user-friendly graphical interface, SSPC provides a comprehensive view of the storage topology from which storage administrators can inspect the real-time health

of the environment at an aggregate or in-depth view. Moreover, IBM TotalStorage Productivity Center Standard Edition, which is also pre-installed on the SSPC console, can be licensed for more in-depth performance analysis, asset and capacity reporting, and automation of the DS8000, as well as other resources, such as server file systems, tape drives and libraries.

Adding to its management flexible, the DS8000 series also supports a command line interface (CLI) and an SMI-S-conformant application programming interface (API). Furthermore, dynamic volume creation/deletion and LUN masking for RAID-5, RAID-6 and RAID-10 configuration capabilities can be performed by storage administrators themselves without requiring special assistance from the vendor. Logical configuration changes, such as these, can be made dynamically while the system remains online, a real benefit when supporting tier one applications.

Completing the solution

Whatever the requirements, IBM can help with a complete information infrastructure solution that includes storage hardware, servers, software, services, support and equipment financing. The DS8000 series also offers the Enterprise Choice Warranty, which allows customers to select one-, two-, three- and four-year support options with world-class IBM support. Additionally, IBM Global Services can offer comprehensive assistance, including planning and design, as well as implementation and migration support services. IBM also collaborates with a variety of IBM business partners and leading technology companies to deliver the right solutions for your business. For a hands-on test drive or for access to IBM storage solutions for proof-of-concepts and benchmarking, customers can visit an IBM briefing center or an IBM solution center.

IBM System Storage DS8000 Turbo models at a glance

| Models | DS8100 (931) | DS8300 (932, 9B2) |
|--|--|--|
| Shared SMP processor configuration | POWER5+ dual 2-way | POWER5+ dual 4-way |
| Other major processors | PowerPC®, Asics | PowerPC, Asics |
| IBM Virtualization Engine (LPAR) capability | Not available | Optional |
| Processor memory for cache and NVS (min/max) | 16 GB/128 GB | 32 GB/256 GB |
| Host adapter interfaces | 4-port 4 Gbps or 2 Gbps Fibre Channel/FICON, 2-port ESCON | 4-port 4 Gbps or 2 Gbps Fibre Channel/FICON, 2-port ESCON |
| Host adapters (min/max) | 2/16 | 2/32 |
| Host ports (min/max) | 4/64 | 4/128 |
| Drive interface | FC-AL | FC-AL |
| Number of disk drives (min/max) | 16/384 | 16/1024 |
| Device adapters | Up to eight 4-port FC-AL | Up to 16 4-port FC-AL |
| Maximum physical storage capacity** | 384 TB | 1024 TB |
| Disk sizes | 73 GB solid-state drives 146 GB solid-state drives 73 GB (15,000 rpm) 146 GB (15,000 rpm) 300 GB (15,000 rpm) 450 GB (15,000 rpm) 1 TB (7,200 rpm) | 73 GB solid-state drives 146 GB solid-state drives 73 GB (15,000 rpm) 146 GB (15,000 rpm) 300 GB (15,000 rpm) 450 GB (15,000 rpm) 1 TB (7,200 rpm) |
| RAID levels | 5, 6, 10 | 5, 6, 10 |
| Dimensions (height x width x depth) | 193 x 84.7 x 118.3 cm With one expansion frame: 193 x 169.4 x 118.3 cm | 193 x 84.7 x 118.3 cm With one expansion frame: 193 x 169.4 x 118.3 cm With two expansion frames: 193 x 254.1 x 118.3 cm |
| Maximum weight | 1189 kg (2620 lb) Add per expansion frame: 1089 kg (2400 lb) | 1307 kg (2880 lb) Add per expansion frame: 1089 kg (2400 lb) |

Operating environment:

| | | |
|-------------------------------|--|--|
| Dry bulb temperature | 16 - 32°C (60 - 90°F) | 16 - 32°C (60 - 90°F) |
| Relative humidity | 20 - 80% | 20 - 80% |
| Thermal load BTU/hr | 18,772 | 23,891 |
| Power supply | Single-phase or three-phase 50/60 Hz | Three-phase 50/60 Hz |
| Caloric value BTU/hr min/max | 13,400/19,800 (for 93E: 7,540/22,200) | 17,500/24,000 (for 9AE 7,540/22,200) |
| Electrical power kava min/max | 3.9/5.8 (for 93E: 2.2/6.5) | 5.1/7.0 (for 9AE: 2.2/6.5) |
| Warranty | 4 years on type 2424 models 3 years on type 2423 models 2 years on type 2422 models 1 years on type 2421 models | 4 years on type 2424 models 3 years on type 2423 models 2 years on type 2422 models 1 years on type 2421 models |

Supported systems

For more details on supported servers, visit ibm.com/systems/storage/disk.

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For more information

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MB, GB and TB equal 1,000,000, 1,000,000,000 and 1,000,000,000,000 bytes, respectively, where referring to storage capacity. Actual storage capacity will vary based upon many factors and may be less than stated. Support for concurrent microcode updates may not be available for all updates.

IBM's customer is responsible for ensuring its own compliance with legal requirements. It is the customer's sole responsibility to obtain advice of competent legal counsel as to the identification and interpretation of any relevant laws and regulatory requirements that may affect the customer's business and any actions the customer may need to take to comply with such laws. IBM does not provide legal advice or represent or warrant that its services or products will ensure that the customer is in compliance with any law.

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** Usable capacity depends on factors such as data format, RAID level and spare disks configured.

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