



# IBM Storwize V7000 and Storwize V7000 Unified Disk Systems

*Powerful and easy-to-use innovative disk systems*

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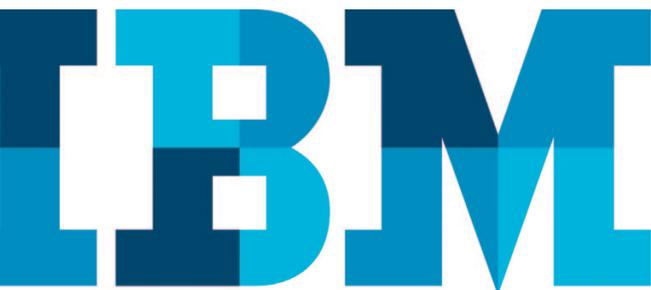
## Highlights

- Deliver sophisticated, enterprise-class storage functionality for businesses
  - Support your growing business requirements while controlling costs
  - Provide up to three times performance improvement by moving as little as five percent of data to flash storage<sup>1</sup>
  - Enable storing up to five times more active primary data in the same physical disk space using IBM® Real-time Compression™<sup>2</sup>
  - Improve network utilization for remote mirroring with innovative replication technology
  - Consolidate block and file storage for simplicity, greater efficiency and ease of management
  - Enable near-continuous availability of applications
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On today's smarter planet, organizations are faced with massive amounts of data created by an array of new sources, including sensors, social media, mobile platforms and more. And while the sheer volume of this new data may seem overwhelming, the value of information is stronger than ever—some even consider it the new currency of business. To help maximize the benefits of this flood of data, businesses are turning to software-defined environments, which can provide flexibility and responsiveness to business demands—along with higher scalability and greater efficiency.

Designed for software-defined storage environments, the IBM Storwize® family has been delivering availability, reliability, flexibility and efficiency for more than ten years. The family began with the introduction of IBM System Storage® SAN Volume Controller, an industry-leading solution for storage virtualization. Storwize family systems have evolved to include the latest technologies that both complement and enhance virtual servers, as well as built-in storage functions—such as Real-time Compression and IBM Easy Tier® technology—that enable extraordinary levels of efficiency.

In addition, as the pace of innovation continues to accelerate, the Storwize platform enables rapid integration of new technologies from both IBM and third-party vendors. For example, Storwize family systems now include Bridgewater's SANSlide technology to help optimize the use of network bandwidth.





IBM Storwize V7000 and IBM Storwize V7000 Unified are virtualized storage systems that allow businesses to respond to the demands of the rapidly changing marketplace. To complement virtualized server environments, the IBM solutions provide extraordinary performance, availability, advanced functions and highly-scalable capacity never seen before in midrange disk systems.

In particular, Storwize V7000 and Storwize V7000 Unified enable IT organizations to overcome the complex challenges of:

- Disruptive migrations
- Difficulty deploying tiered storage
- Concern about growth in storage and storage management costs
- Inability to share storage among servers
- Reduced productivity and increased cost caused by isolated server and storage management tools
- Inability to use virtualized storage in the way they use virtual servers, as a tool for optimizing expenditures, resources and capabilities

As members of the Storwize family, Storwize V7000 and Storwize V7000 Unified are powerful midrange disk systems that have been designed to be easy to use and to enable rapid

deployment without additional resources. Storwize V7000 supports block workloads, whereas Storwize V7000 Unified consolidates block and file workloads into a single storage system for simplicity of management and reduced cost.

Storwize V7000 and Storwize V7000 Unified offer greater efficiency and flexibility through built-in flash storage optimization, thin-provisioning technologies, and integrated Bridgeworks SANSlide technology that helps optimize network bandwidth for remote mirroring. Integrated Real-time Compression enhances efficiency even further by enabling organizations to store up to five times as much active primary data in the same physical disk space.<sup>2</sup> Storwize V7000 and Storwize V7000 Unified advanced functions also enable non-disruptive migration of data from existing storage, simplifying implementation and minimizing disruption to users. Finally, these systems also enable you to virtualize and reuse existing disk systems, supporting a greater potential return on investment (ROI).

### **Managing the information infrastructure**

The need to increase storage efficiency has led many IT organizations to turn to consolidation, virtualization and automated data tiering to reduce capital and operational expenses. IBM offers solutions today that can become part of your highly-efficient, highly-capable, next-generation information infrastructure, whether your storage environment supports a small or mid-sized organization or a large, complex data center.

#### **Consolidation**

Optimizing resources through consolidation can reduce costs and improve productivity. Consolidation can also lead to more efficient maintenance and management of your information infrastructure. By enabling you to scale storage efficiently, consolidation can deliver the capacity you need within the budget you have for the performance you want.



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### Virtualization

Virtualizing your storage infrastructure can optimize your expenditures, resources and capabilities. It allows you to scale system capacity and performance more easily to meet your growing information infrastructure needs, reduce the complexity of management and reduce the risk to your business of system failure.

In server environments, virtualization technologies are often used to improve server utilization, reduce complexity, speed provisioning, consolidate application migration and provide

improved flexibility in disaster recovery plans. Storage virtualization is designed to provide similar advantages for your storage environment. Combining storage and server virtualization can build a more powerful virtualized infrastructure for your business and provide greater benefits than either virtualization solution deployed alone.

### Tiering

Tiering optimizes storage by enabling data to be located in a way that can improve system performance, reduce costs and simplify information management. Tiering can enhance performance and reduce operating expenses by automating data movement. And tiering allows you to scale storage performance based upon your business needs.

### Introducing Storwize V7000

Storwize V7000 is a powerful block storage system that combines hardware and software components to provide a single point of control to help support improved storage efficiency. It is designed to improve application availability and resource utilization by enabling virtualization, consolidation and tiering in businesses of all sizes. The system offers easy-to-use, efficient and cost-effective management capabilities for both new and existing storage resources in your IT infrastructure.

### Delivering extraordinary efficiency

Storwize V7000 combines a variety of IBM technologies including thin provisioning, automated tiering, storage virtualization, Real-time Compression, clustering, replication, multi-protocol support and a next-generation graphical user interface (GUI). It also includes leading third-party technologies, such as Bridgeworks SANSlide network optimization. Together, these technologies are designed to enable Storwize V7000 to deliver extraordinary levels of storage efficiency. Users deploying Storwize V7000 report a 50 percent reduction in disk space required and a 30 percent reduction in storage growth.<sup>3</sup>

Real-time Compression is designed to enable storing up to five times<sup>2</sup> as much data in the same physical disk space by compressing data as much as 80 percent. Unlike other approaches to compression, Real-time Compression is designed to be used with active primary data such as production databases and email systems, which dramatically expands the range of candidate data that can benefit from compression. Real-time Compression operates immediately as data is written to disk, meaning that no space is wasted storing uncompressed data awaiting post-processing.

The benefits of using Real-time Compression together with other efficiency technologies are very significant and include reduced acquisition cost (because less hardware is required), reduced rack space, and lower power and cooling costs throughout the lifetime of the system. When combined with external storage virtualization, Real-time Compression can significantly enhance the usable capacity of your existing storage systems, extending their useful life even further.

### **Enhancing access with Easy Tier**

Easy Tier provides automatic migration of frequently accessed data to high-performing flash storage, enhancing usage efficiencies.

Easy Tier is designed to help improve performance at lower cost through more efficient use of flash storage. Easy Tier automatically identifies highly-active data and moves only that data to flash storage, which targets use of flash storage to the data that will benefit the most, helping deliver the maximum benefit even from small amounts of flash storage capacity. Easy Tier can deliver up to three times performance improvement with only five percent flash storage capacity.<sup>1</sup>

Once enabled, Easy Tier operates automatically with no further administrative involvement. Using Easy Tier, you can deploy flash storage confidently, effectively and economically. Easy Tier enables users to enjoy the performance benefits of flash storage without requiring administrators to create and manage storage tier policies. Using Easy Tier together with Real-time Compression delivers elevated performance at a lower cost. With a wide range of disk drives and solid-state drives (SSDs), Storwize V7000 and Storwize V7000 Unified provide the ability to optimize a tiered storage configuration to meet diverse application requirements.

### **Using thin provisioning to optimize efficiency**

Using thin provisioning, applications consume only the space they are actually using, not the total space that has been allocated to them. Designed to keep business overhead low, thin provisioning optimizes efficiency by allocating disk storage space in a flexible manner among multiple users based on the space required by each user at any given time. This reduces use of storage hardware but also can save electrical energy use, lower heat generation and reduce hardware space requirements.

This approach minimizes the amount of physical capacity consumed and helps enable a more efficient approach to storage purchases while also minimizing future configuration changes as workloads grow. Administrators are freed from tedious provisioning tasks and can focus on more strategic goals.

### **Avoiding disruptions with dynamic migration**

Storwize V7000 and Storwize V7000 Unified use virtualization technology to help insulate host applications from physical storage changes. This ability can help enable applications to run without disruption while you make changes to your storage infrastructure. Your applications keep running so you can stay open for business.

Moving data is one of the most common causes of planned downtime. Storwize V7000 and Storwize V7000 Unified include a dynamic data migration function that is designed to move data from existing block storage into the new system or between arrays in a Storwize V7000 or Storwize V7000 Unified system, while maintaining access to the data. The data migration function might be used, for example, when replacing older storage with newer storage, as part of load balancing work or when moving data in a tiered storage infrastructure.

Using the dynamic migration capabilities can provide efficiency and business value. Dynamic migration can speed time-to-value from weeks or months to days, minimize downtime for migration, eliminate the cost of add-on migration tools, and may help avoid penalties and additional maintenance charges for lease extensions. The result can be real cost savings to your business. Users who have deployed Storwize V7000 report a 29 percent improvement in application availability.<sup>3</sup>

### **Deploying next-generation networking**

As organizations evolve toward a dynamic infrastructure, they need new ways to reduce the complexity of their environments. To address this challenge, clients are turning to Converged Enhanced Ethernet (CEE) networks, which help enable them to combine storage, messaging traffic, VoIP, video, and other data on a common data center Ethernet infrastructure.

Storwize V7000 and Storwize V7000 Unified systems with 10 Gbps Ethernet ports support attachment to next-generation CEE networks using Fibre Channel over Ethernet (FCoE). This support enables you to connect the systems to servers and to other Storwize V7000 or Storwize V7000 Unified systems for clustering or mirroring using Fibre Channel or FCoE interfaces. The same ports may also be used for iSCSI server connections.

### **Consolidating data for efficiency and simplicity**

Many users have deployed storage area network (SAN) storage for their applications requiring the highest levels of performance while separately deploying network-attached storage (NAS) for its ease of use and lower-cost networking. This divided approach adds complexity by introducing multiple management points and also creates islands of storage that reduce efficiency.

Storwize V7000 Unified provides the ability to combine both block and file storage into a single system. By consolidating storage systems, multiple management points can be eliminated and storage capacity can be shared across both types of access, helping to improve overall storage utilization. Storwize V7000 Unified also presents a single, easy-to-use management interface that supports both block and file storage, helping to simplify administration further.

Storwize V7000 Unified builds on the functions and high-performance design of Storwize V7000 and integrates proven IBM software capabilities to deliver new levels of efficiency. The system includes IBM Active Cloud Engine™, which is designed to deliver policy-based management of files to reduce costs through use of tiered storage and to improve data governance. Storwize V7000 Unified integration with antivirus tools is designed to provide the ability to isolate or delete compromised files and leverage the most commonly deployed independent software vendor (ISV) antivirus applications.

### **Gaining a flexible foundation for cloud deployments**

Improving efficiency and delivering a flexible, responsive IT infrastructure are essential requirements for any cloud deployment. Key technologies for delivering this infrastructure include virtualization, consolidation and automation.

With their virtualized storage design and tight affinity with technologies such as IBM PowerVM® and VMware, Storwize V7000 and Storwize V7000 Unified are the ideal complement for virtualized servers that are at the heart of cloud deployments. Storwize V7000 and Storwize V7000 Unified help enable consolidation of multiple storage systems for greater efficiency. Clustered systems drive the value of consolidation even further, and IBM Real-time Compression helps improve cost effectiveness even further. Automated tiering technologies such as Easy Tier, Active Cloud Engine and IBM Tivoli® software help make the best use of the storage resources available.

Storwize family OpenStack Cinder driver support helps automate storage provisioning and volume management for enterprises that combine the efficiency of Storwize V7000 with the OpenStack compute cloud platform.

### **Protecting data with replication services**

Storwize V7000 supports block data while Storwize V7000 Unified supports both file and block data in the same system with replication functions optimized for the specific needs of each type of data.

#### **For block data**

Storwize V7000 and Storwize V7000 Unified include a rich IBM FlashCopy® function that is designed to create an almost instant copy (or “snapshot”) of active data, which can be used for backup purposes or for parallel processing activities. Up to 256 copies of each volume may be created.

IBM Tivoli Storage FlashCopy Manager is designed for today’s business world, where application servers are operational 24 hours a day—yet data must remain fully protected. If you have a 24x7 environment, you can’t afford to lose any data. You also can’t afford to stop critical systems for hours so you can protect the data adequately. FlashCopy Manager exploits the

Storwize V7000 snapshot capabilities to provide high-speed backup and restore functionality with low impact to applications. FlashCopy Manager includes support for mission-critical IBM DB2®, SAP, Oracle, VMware, Microsoft Exchange and Microsoft SQL Server applications through integrated application-aware snapshot backup and restore capabilities. In addition, organizations can customize FlashCopy Manager capabilities for applications on IBM AIX®, Linux and Solaris.

Storwize V7000 also supports remote mirroring to enable organizations to create copies of data at remote locations for disaster recovery. Metro Mirror supports synchronous replication at distances up to 300 km, whereas Global Mirror supports asynchronous replication up to 8,000 km. Replication can occur between any Storwize family systems, and can include any supported virtualized storage. Remote mirroring works with Fibre Channel, FCoE and IP (Ethernet) networking between sites.

With IP networking, Storwize family systems support both 1 GbE and 10 GbE connections and use innovative Bridgeworks SANSlide technology to optimize use of network bandwidth. As a result, the networking infrastructure may require lower speeds (and thus, lower costs), or users may be able to improve the accuracy of remote data through shorter replication cycles. The remote mirroring functions also support VMware vCenter Site Recovery Manager to help speed disaster recovery.

#### **For file data**

Storwize V7000 Unified offers data protection through a space-efficient file system and file set-level snapshots (up to 256 per file system). Snapshots of a file set provide a way to partition the namespace into smaller, more manageable units. File snapshots protect against accidental deletion or modification of files, and that enables you to restore at the file level. The system also provides asynchronous replication for disaster recovery and business continuity. In addition, asynchronous replication offers

encrypted file replication over extended distances between two sites. This function is integrated with Active Cloud Engine, which can provide a high-speed scan of the source file system to determine files and directories that have been created, modified or deleted.

Storwize V7000 Unified has specific exploitation and integration with Tivoli Storage Manager to provide efficient and extremely fast backup and restore processes, and the movement of files to external disk or tape. In addition, Storwize V7000 Unified provides support for the Network Data Management Protocol (NDMP) to provide full and incremental backup of files as well as restoring of these files and related file system data. Support for NDMP allows for backing up Storwize V7000 Unified with third-party backup applications over the LAN.

### **Leveraging proven ISV solutions**

IBM is committed to continuous improvement and seamless application integration to optimize your business results and minimize time-to-value. Our commitment is visible through ongoing work and enduring partnerships with ISVs such as Microsoft, Oracle, SAP, Symantec and VMware.

Combining Storwize V7000 and Storwize V7000 Unified with leading ISV applications can provide increased flexibility and deliver a more robust information infrastructure for your business. Solutions have been qualified for select applications that focus on key solution areas, including backup/restore, disaster recovery, clustering, server virtualization, and database and performance optimization. IBM is also committed to certifications with key ISVs aligned with various industries including healthcare, financial services, telecommunications and the public sector.

### **Integrating management**

Storwize V7000 and Storwize V7000 Unified provide a tiered approach to management designed to meet the diverse needs of different organizations. The system's management interface is

designed to give administrators intuitive control of the system and provides a single, integrated approach for managing both block and file storage requirements in the same system. A recent study proved the effectiveness of the user interface, finding that tasks are 47 percent less time-consuming and 31 percent less complex than managing a competitor's system.<sup>4</sup> A mobile dashboard provides basic monitoring capabilities to securely check the health and performance of the system.

For organizations looking to manage both physical and virtual server infrastructures and the storage they consume (including provisioning and monitoring for higher availability, operational efficiency and infrastructure planning), Storwize V7000 and Storwize V7000 Unified are integrated with IBM Systems Director Storage Control and IBM Flex System Manager™. A single administrator can manage and operate IBM servers (IBM System x®, IBM Power Systems™, IBM BladeCenter® and IBM PureFlex™ System) along with networking infrastructure and IBM storage from a single management screen.

For organizations looking to improve the operational efficiency of storage specialists, IBM Tivoli Storage Productivity Center is designed to provide a SAN-wide perspective of storage health, I/O path performance analytics and capacity use for Storwize V7000, Storwize V7000 Unified and the surrounding storage infrastructure. Plug-ins support Microsoft System Center Operations Manager (SCOM) and VMware vCenter to help enable more efficient consolidated management in these environments. Support for VMware vStorage application programming interfaces (VAAI and VASA) enables Storwize V7000 and Storwize V7000 Unified to take on some storage-related tasks that were previously performed by VMware, which helps improve efficiency and frees up server resources for other, more mission-critical tasks.

The built-in performance dashboard provides at-a-glance access to key high-level real-time system performance information, which helps monitor and optimize the virtualized environment. Tivoli Storage Productivity Center provides access to—and analysis of—historical performance data.

## Using high-performance flash storage

For applications that demand high disk speed and quick access to data, IBM provides support for flash storage in 200, 400 or 800 GB 2.5-inch enterprise-grade multilevel cell (E-MLC) solid-state devices (SSDs). For ultra-high-performance requirements, Storwize V7000 may be configured with only flash storage for up to 192 TB of physical capacity in a single system (768 TB in a clustered system), enabling scale-out, high-performance flash storage support. In an industry-standard Storage Performance Council benchmark, an all-flash Storwize V7000 configuration delivered over 120,000 input/output operations per second (IOPS),<sup>5</sup> with clustered systems expected to deliver close to four times this number.

## Virtualizing external storage

External storage virtualization is the ability of Storwize V7000 and Storwize V7000 Unified to manage capacity in other disk systems. When Storwize V7000 or Storwize V7000 Unified virtualizes a disk system, its capacity becomes part of the Storwize system and is managed in the same way as capacity on internal drives. Capacity in external disk systems inherits all the functional richness and ease-of-use of Storwize V7000 or Storwize V7000 Unified including advanced replication, high-performance thin provisioning, Real-time Compression and Easy Tier. Virtualizing external storage helps improve administrator productivity and boost storage utilization while also enhancing and extending the value of an existing storage asset.

## Understanding the system specifications

Storwize V7000 and Storwize V7000 Unified are packaged in 2U rack-mountable enclosures that house up to twenty-four 2.5-inch drives or up to twelve 3.5-inch drives.

Control enclosures contain drives, redundant dual-active intelligent controllers, and dual power supplies, batteries and cooling components. Expansion enclosures contain drives, switches,

power supplies and cooling components. Control enclosures support up to nine expansion enclosures and so up to 240 drives. Up to four control enclosures (each with up to nine expansion enclosures) may be clustered together in a single system for even greater capacity and performance growth potential.

For Storwize V7000 Unified, a redundant pair of file modules supports NAS connectivity.

Other components and characteristics of the system include:

- Internal storage capacity: Up to 48 TB of physical storage per enclosure using 12 x 4 TB nearline SAS disk drives or up to 28.8 TB of physical storage per enclosure using 24 x 2.5-inch 1.2 TB SAS disk drives
- Disk drives: SAS disk drives, nearline SAS disk drives and SSDs; intermix of these drive types within the Storwize V7000 control and expansion enclosures adds flexibility
- Cache memory: 16 GB cache memory (8 GB per internal controller)
- Ports per control enclosure: 8 x 8 Gbps Fibre Channel host ports (4 x 8 Gbps Fibre Channel ports per controller), 4 x 1 Gbps and optionally 4 x 10 Gbps iSCSI/FCoE host ports (2 x 1 Gbps and optionally 2 x 10 Gbps iSCSI/FCoE host ports per controller)
- File module: 4 x 1 Gbps and 2 x 10 Gbps ports provide connectivity to NAS environments; 2 Fibre Channel ports connect to Storwize V7000 control enclosures

## Electrical power

- 12-bay and 24-bay control enclosures: 120 - 240 V ac, 3.8 - 9.0 A, 50/60 Hz
- 12-bay and 24-bay expansion enclosures: 100 - 240 V ac, 3.2 - 8.0 A, 50/60 Hz
- File modules: 100 - 240 V ac, 3.8 - 7.8 A, 50/60 Hz

## Power and cooling (typical environments)

	Power consumption	Cooling
12-bay control enclosure	380 W	1,300 BTU/hr.
24-bay control enclosure	410 W	1,400 BTU/hr.
12-bay expansion enclosure	175 W	600 BTU/hr.
24-bay expansion enclosure	205 W	700 BTU/hr.
File module	150 W	520 BTU/hr.

### IBM Storwize V7000 and Storwize V7000 Unified Disk Systems at a glance

<b>Host interface</b>	SAN-attached 8 Gbps Fibre Channel, 1 Gbps iSCSI and optional 10 Gbps iSCSI/FCoE NAS-attached 1 Gbps and 10 Gbps Ethernet
<b>User interface</b>	Graphical user interface (GUI)
<b>Supported drives</b>	3.5-inch disk drives: <ul style="list-style-type: none"> <li>• 2 TB, 3 TB, 4 TB 7.2k nearline SAS disk</li> </ul> 2.5-inch disk drives: <ul style="list-style-type: none"> <li>• 146 GB, 300 GB 15k SAS disk</li> <li>• 300 GB, 600 GB, 900 GB, 1.2 TB 10k SAS disk</li> <li>• 200 GB, 400 GB, 800 GB E-MLC SSD</li> <li>• 1 TB 7.2k nearline SAS disk</li> </ul>
<b>RAID levels</b>	RAID 0, 1, 5, 6 and 10
<b>Maximum drives supported</b>	240 per control enclosure; 960 per clustered system
<b>Fans and power supplies</b>	Fully redundant, hot-swappable
<b>Rack support</b>	Standard 19 inch
<b>Management software</b>	Storwize V7000 and Storwize V7000 Unified software
<b>Cache per controller/control enclosure/clustered system</b>	8 GB/16 GB/64 GB
<b>Advanced features included with each system</b>	Easy Tier, FlashCopy, thin provisioning, Active Cloud Engine (Storwize V7000 Unified only)
<b>Additional available advanced features</b>	Remote mirroring, external virtualization unified storage, FlashCopy Manager, IBM Tivoli Storage Productivity Center Select, Tivoli Storage Manager, Tivoli Storage Manager FastBack, IBM Systems Director, Flex System Manager, IBM Real-time Compression

<b>IBM Storwize V7000 and Storwize V7000 Unified Disk Systems at a glance</b>	
<b>Warranty</b>	<p>Hardware:</p> <ul style="list-style-type: none"> <li>• 3-year limited warranty</li> <li>• Customer-replaceable units</li> <li>• On-site service</li> <li>• Next business day 9x5</li> <li>• Service upgrades available</li> </ul> <p>Software:</p> <ul style="list-style-type: none"> <li>• Software maintenance agreement available</li> </ul>
<b>Replication services</b>	FlashCopy, FlashCopy Manager, Metro Mirror (synchronous), Global Mirror (asynchronous), local and asynchronous remote file-based replication
<b>Dimensions</b>	<p>Control and expansion enclosures</p> <ul style="list-style-type: none"> <li>• Width: 483 mm (19.0 in.)</li> <li>• Depth: 630 mm (24.8 in.)</li> <li>• Height: 87.9 mm (3.46 in.)</li> </ul> <p>File modules</p> <ul style="list-style-type: none"> <li>• Width: 443 mm (17.5 in.)</li> <li>• Depth: 698 mm (27.5 in.)</li> <li>• Height: 85 mm (3.36 in.)</li> </ul>
<b>Weight</b>	<p>12-bay enclosures:</p> <ul style="list-style-type: none"> <li>• Drive-ready (without drive modules installed): 17.7 kg (37.6 lb)</li> <li>• Fully configured (12 drive modules installed): 27.2 kg (59.8 lb)</li> </ul> <p>24-bay enclosures:</p> <ul style="list-style-type: none"> <li>• Drive-ready (without drive modules installed): 17.7 kg (37.6 lb)</li> <li>• Fully configured (24 drive modules installed): 25.2 kg (55.4 lb)</li> </ul> <p>File modules</p> <ul style="list-style-type: none"> <li>• Maximum configuration: 29.6 kg (65 lb)</li> </ul>
<b>Supported systems</b>	For a list of currently supported servers, operating systems, host bus adapters, clustering applications and SAN switches and directors, refer to the System Storage Interoperation Center.
<b>ISV solutions</b>	For a list of high quality solutions with our partner ISVs, including access to solution briefs and white papers, refer to the ISV Solutions Resource Library.

**Environment: all systems**

- Temperature (operating)
  - 10°C – 35°C (50°F – 95°F) at 0 m – 914 m (0 ft – 3,000 ft)
  - 10°C – 32°C (50°F – 90°F) at 914 m – 2,133 m (3,000 ft – 7,000 ft)
- Temperature (powered off):
  - 10°C – 43°C (50°F – 109°F)
- Temperature (storage):
  - 1°C – 60°C (34°F – 140°F) at 0 m – 2,133 m (0 ft – 7,000 ft)
- Temperature (shipping):
  - 20°C – 60°C (–4°F – 140°F) at 0 m – 10,668 m (0 ft – 35,000 ft)
- Relative humidity (operating and powered off): 8% – 80%
- Relative humidity (storage): 5% – 80%
- Relative humidity (shipping): 5% – 100% (including condensation but excluding rain)
- Wet bulb
  - Wet bulb (operating temp): 23°C (73°F)
  - Wet bulb (powered off temp): 27°C (82°F)
  - Wet bulb (storage and shipping temp): 29°C (84°F)
- Noise level: 6.5 decibels LwAd—when operating in a 2146 system rack

Note: The noise emission level stated is the declared (upper limit) sound power level, in decibels, for a random sample of machines. All measurements are made in accordance with ISO 7779 and reported in conformance with ISO 9296.

**Why IBM?**

The performance and availability of your storage environment can either enhance or hamper your business processes. That's where IBM comes in. As a market leader in the storage industry, we can help you handle the challenges, whether you are a small to mid-sized company or a large enterprise.

Innovative technology, open standards, excellent performance, and a broad portfolio of proven storage software, hardware and solutions offerings—all backed by IBM with its recognized industry leadership—are just a few of the reasons you should consider storage solutions from IBM, including Storwize V7000 and Storwize V7000 Unified.

With IBM, you get some of the best storage products, technologies, services and solutions in the industry without the complexity of dealing with different hardware and software vendors and system integrators.

IBM Maintenance and Technical Support solutions can help you get the most out of your IT investment by reducing support costs, increasing availability and simplifying management with integrated support for your multiproduct, multivendor hardware and software environment.

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.

## For more information

To learn more about IBM Storwize V7000 and Storwize V7000 Unified, please contact your IBM representative or IBM Business Partner, or visit the following website:  
[ibm.com/storage/storwizev7000](http://ibm.com/storage/storwizev7000)

For a list of currently supported servers, operating systems, host bus adapters, clustering applications and SAN switches and directors, refer to the System Storage Interoperation Center at:  
[ibm.com/systems/support/storage/config/ssic](http://ibm.com/systems/support/storage/config/ssic)

For a list of high quality solutions with our partner ISVs, including access to solution briefs and white papers, refer to:  
[ibm.com/systems/storage/solutions/isv](http://ibm.com/systems/storage/solutions/isv)

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](http://ibm.com/financing)



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



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<sup>1</sup> IBM lab measurements – August 2010

<sup>2</sup> IBM lab measurements – April 2012

<sup>3</sup> Forrester Consulting, Total Economic Impact Study of IBM Storwize V7000 – April 2012. The paper is available from our website, including on [ibm.com/systems/storage/disk/storwize\\_v7000/resources.html](http://ibm.com/systems/storage/disk/storwize_v7000/resources.html)

<sup>4</sup> Edison Group, Competitive Management Cost Study: IBM Storwize V7000 vs. EMC VNX5500 Storage Systems – April 2012

<sup>5</sup> See Storage Performance Benchmark details at [storageperformance.org/results/benchmark\\_results\\_spc1](http://storageperformance.org/results/benchmark_results_spc1)

