IBM: The Storage Innovation Leader

IBM

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Executive summary

IBM has been a trusted leader in storage for decades, ever since the first computer storage technologies were introduced. IBM has consistently invested more, invented more and spent more time developing solutions for the storage industry we recognize today.[1,2]

As IBM celebrates its centennial in 2011, businesses and governments around the world continue to rely on IBM for innovative storage technology, expertise, and a commitment to client value. IBM can significantly improve storage efficiency and effectiveness with a deep understanding of storage management processes and innovative technology. IBM can help clients gain an advantage by deploying solutions that safely protect data for as long as you need, improve access to your data and manage total costs—even while the volume of data is growing astronomically.

Of course, managing rapid information growth requires more than technology. IBM offers a complete portfolio of storage services that can help with every step, from assessment and planning, to migration and implementation. IBM also offers innovative managed services and cloud storage solutions. Our real-world experience plus our people have an unmatched history of delivering real business results. IBM brings a tremendous amount of business, technology and research knowledge to every client partnership.

IBM can help clients embrace new computing models, such as cloud computing, that can save money while still protecting important business information. Organizations can trust IBM to help reduce the risks of cloud computing, managed infrastructure services and other new concepts.

Why choose IBM for storage?

Unmatched Experience: IBM has decades of experience helping clients manage traditional transaction processing and data protection storage workloads. IBM also has experience with new workloads. For example, IBM runs the world's largest business analytics storage clouds and supports some of the world's largest file systems.[3] IBM helps clients evolve to new global business models that drive IT changes, such as cloud computing. IBM's business and IT leadership can help organizations of any size become more nimble, as described in The Economist in November 2010.[4]

Technology Leadership: IBM enables clients to adapt to new workloads, such as analytics and cloud computing, by offering innovative solutions that can manage more capacity without complexity. High-performance storage tier optimization, storage virtualization, real-time compression and inline deduplication are just a few examples of IBM technology that can help manage rapid data growth more effectively.

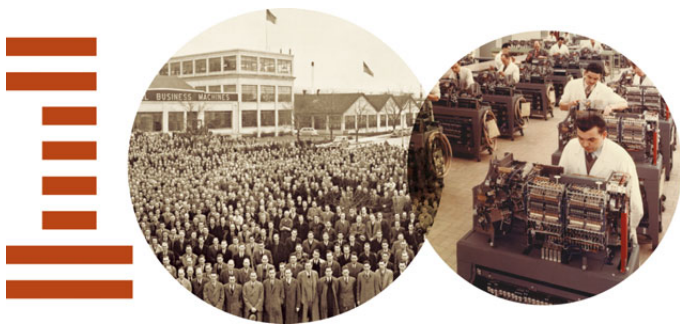## Unmatched storage experience

Figure 1: Since 1911, IBM has been dedicated to every client's success, to trust and personal responsibility in all relationships and to innovation that matters—for our company and for the world. Our core values help IBM deliver more than technology to our clients.

When it comes to protecting your vital business information, experience matters. No company has more years of electronic data storage experience than IBM. Our employees perform primary storage research, develop storage industry standards, implement storage solutions with clients, manage cloud storage services and operate client storage infrastructures. IBM's breadth and depth of storage experience can deliver more client value than technology providers or system integrators with a narrower perspective.

IBM has extensive experience delivering optimized storage products and services for every major server platform, from small Windows® servers to large mainframes; using every type of storage media, from tape to solid state. This broad experience helps IBM apply technologies to business problems on their merits, with the goal of maximizing client value.

IBM continues to gain valuable experience by collaborating with governments, universities and other clients to create the next generation of innovative storage solutions. For example,

IBM Scale Out Network Attached Storage (SONAS) can support over a billion files in a single name space.[5] IBM experience with large scale file systems can provide a technology safety net for more typical requirements.

IBM's business leadership provides IBM researchers a unique view of how IT workloads are apt to change to support the next generation of systems (please see sidebars: "IBM's global business leadership" on page 5 and "IBM's journey to the storage cloud and beyond" on page 7). IBM® Storage Systems products are then designed with an understanding of the workloads they may encounter during a long service life.

IBM investments in technologies like global file systems, storage virtualization, encryption and very high density storage may seem hard to justify at first glance, but the next generation of smarter business systems will require this type of infrastructure. With IBM, you have a partner who understands how your systems may need to adapt and grow to support your future business needs.
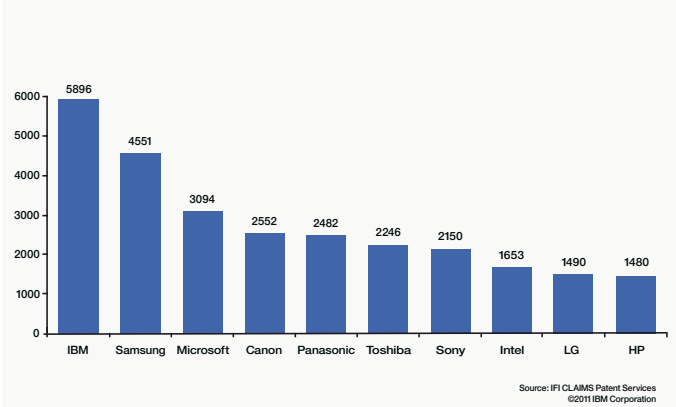

2010 US Patent Leaders

Source: IFI CLAIMS Patent Services
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Figure 2: In 2010, IBM was granted the most US patents for the 18th consecutive year.[1] By IBM estimates, approximately 10 percent of US patents in 2010 were storage innovations.

Storage technology leadership

Figure 3: The magnetic disk was invented by IBM and announced in 1956, enabling computers to expand from card-based number crunching to modern information processing. IBM celebrates its centennial in 2011.

Almost every organization relies on technology developed by IBM to protect and store their vital information. Whether or not your storage equipment has an IBM label, it probably includes IBM inventions and licensed technology inside.[2] This technology leadership helps set direction for the entire storage industry.

A culture of technological innovation has helped IBM create a broad portfolio of storage products and services that can help clients manage rapid data growth more effectively. Compared to typical disk arrays, IBM solutions can help deliver meaningful business results: up to 200 percent more application throughput, up to 70 percent savings in tier-1 capacity costs, up to 35 percent energy reduction and more. If you're tired of premium prices for capacity upgrades to the same inefficient storage systems, we invite you to take another look at IBM.[6,7,8]

Whether the next storage upgrade is driven by growth in primary data, backup systems, archives, or a combination of workloads, storage solutions can be compared against three core criteria:

- Price/performance
- Storage efficiency
- Data protection and retention

The best solution is usually the one that meets performance and data protection/retention requirements at the lowest total cost. Spending more than necessary can rob funds from revenue generating projects. Spending too little can result in a storage infrastructure that disrupts revenue generating applications. Therefore, balance is critical.

Raw performance and price/performance

Raw performance and price/performance are distinct metrics—and IBM is a leader in both. Storage performance is a core requirement of new smarter systems and other information-driven environments. Raw performance is important because it demonstrates the capability of an architecture or solution design. IBM built a storage solution, Project Quicksilver, to explore the raw performance potential of solid-state storage technology. A single storage system recorded over one million I/O Operations Per Second (IOPS) in internal tests.[9] IBM offers mid-range and enterprise storage systems today with solid-state storage, which can deliver significant performance improvements compared to standard disk solutions.

In the more practical metric of price/performance, IBM offers solutions that exploit solid-state storage and automated storage tiering to optimize price and performance. IBM Easy Tier has workload learning algorithms that can deliver up to 200 percent increase in application throughput by using as little as 2 percent

solid-state storage.[10] IBM® Easy Tier™ is available for IBM mid-range and enterprise storage systems, and IBM's storage virtualization appliance, SAN Volume Controller.

For less frequently accessed information, IBM offers storage systems that integrate disk and tape, with policy-based migration that can help clients manage long-term price performance. IBM Linear Tape Open (LTO) tape systems now include file system interfaces and improved access times so ordinary applications can access tape archive files in just about a minute. With a broad range of solutions, IBM can help clients select the right price/performance options.

Storage efficiency

IBM helps clients implement essential storage efficiency technologies that can improve competitiveness and agility. Technology used by top cloud computing providers is available to IBM clients as individual storage systems or Smart Business private cloud solutions.

Top strategies you can use to improve storage efficiency:

- Stop storing so much by shrinking the data you have to store.
- Get more from what you have on the floor by increasing storage utilization.
- Move data to the right place to balance costs and performance.

Stop storing so much

A good first step in a storage efficiency strategy is shrinking the data you have to store. Compression and deduplication are popular techniques. IBM offers solutions for both, which can reduce physical storage requirements by up to 80 percent for primary data and even more for backups. Shrinking data is just as effective as increasing utilization—both are better than getting more disk for free, because you get more usable capacity without increasing operating expenses for power, cooling and floor space.[11]

IBM's global business leadership
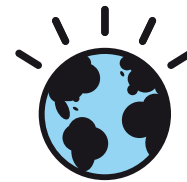
IBM is one of the world's premier technology companies, but its value to clients can be much more than the value of technology alone. IBM helps to develop new business models and IT delivery models that help transform businesses and governments. IBM leads by example, often testing new ideas internally years before they become hot topics. By working with IBM, clients can get a better view of emerging business trends, as well as emerging technology, creating a compelling competitive advantage.

IBM's business leadership can be seen in the way it is developing a new corporate model called the Globally Integrated Enterprise, recently described in The Economist magazine.[4] Unlike the multinational business model, a Globally Integrated Enterprise enables virtual teams to work together to solve bigger problems faster. IBM's efforts to implement this new corporate model have encouraged governments to expand their infrastructures and accelerate social change.

Business model evolution helps encourage more computing activity by global teams, leading directly to demands for IT modernization. IBM's business leadership has helped develop new IT models, such as cloud computing and managed services, that are fueled by businesses with a global perspective.

As Globally Integrated Enterprises learn to harness the power of their high-speed global information networks, new types of systems emerge. Integrated teams tend to design global systems that are more intelligent and interconnected than earlier versions. This new generation of smarter systems is already beginning to make the world a better place.

Get more from what's on the floor

Getting more utilization from the equipment you already have is one of the best ways to manage rapid information growth more effectively. Improving the utilization of existing storage is better than getting free capacity, because there is no corresponding increase in energy or data center floor space requirements. IBM Storage Virtualization can improve utilization up to 30 percent across IBM and non-IBM storage, while improving administrator productivity.[12] Thin provisioning results vary, but clients report up to 35 percent better utilization, according to industry analysts.[13]

Move data to the right place

Moving data to the right place is an important best practice for balancing storage efficiency and performance. Aggressively moving data to the right tier helps keep costs under control, while delivering the right performance for active data. IBM was the first company to demonstrate automated storage tiering for solid-state storage, and the first to market with a solution. Easy Tier can deliver up to a 200 percent increase in application throughput by using as little as 2 percent solid-state storage.[6] IBM data protection and retention solutions support transparent data migration over time, so long term costs can be controlled without impacting the way information is accessed. IBM offers a broad range of hardware, software and service products that simplify data and application migration—even complex migrations across platforms.

Advanced data protection and retention

Line of business managers and application owners typically want as many snapshots and backups as they can afford, to maximize data protection and application availability. Dynamic applications and new smarter systems have little or no tolerance for downtime, so multisite continuous operations can become a requirement. Storage system managers must address the cost and complexity of managing frequent snapshots, remote mirroring, and other advanced data protection capabilities.

IBM offers a broad range of solutions to help clients deploy advanced data protection and retention solutions without complexity. Along with traditional ownership models, IBM offers innovative service products such as managed resiliency services and secure cloud storage to give clients additional flexibility.

Mirroring and snapshots

IBM offers multisite mirroring, which enables near-instant failover, for mid-range and enterprise disk systems. IBM also offers space-efficient snapshots with rapid restore capability for both mid-range and enterprise disk systems.

Backup

Backup systems are also affected by rapid data growth since data is copied three to five times in the backup environment. Symptoms of an overloaded backup system can include growing backup windows, lengthy restores and regular backup errors. IBM solutions support advanced technologies, such as deduplication and compression, which can help shrink backup windows, speed up restore requests, reduce backup errors and free staff to work on other projects.

Archive

Long-term data retention systems typically have to preserve data longer than the expected life of the storage media, which means information must be able to migrate to new storage without impacting the ability to retrieve it. IBM offers policy-based archiving solutions for files, email, databases and applications that enable easy data migration and support multiple storage tiers for cost optimization.

Cloud computing

Backup and archive cloud computing solutions offer new business models. Cloud computing creates an opportunity to de-capitalize the data center or, with private clouds, to enable pay-per-use measured services from the data center. IBM offers workload optimized backup and archive solutions for cloud computing environments.

IBM's journey to the storage cloud and beyond

In 2005, before cloud computing was popular, IBM began a major transformation of internal storage systems. A methodical process of consolidating, sharing and virtualizing storage proved that highly available critical systems can use technology and best practices to increase average disk utilization from 50 percent to 90 percent. IBM's block storage costs for the consolidated systems dropped by an amazing 50 percent by 2007.

In 2008, the transformed storage infrastructure was updated to form one of the world's first large scale private cloud applications. The new solution called, "IBM Storage Cloud", was funded with savings from the storage transformation project. IBM CTO for Cloud Computing, Kristof Kloeckner, reports the cloud computing model can improve capital utilization by up to 75 percent, reduce IT labor costs by up to 50 percent and reduce provisioning time from weeks to minutes.[14]

In 2010, a project called, "IBM Blue Insight" became the world's largest private cloud for business analytics, with over 100,000 users.[3]

Today, IBM offers a number of public and private cloud solutions with skilled consultants to guide the way. IBM established 11 global cloud computing laboratories around the world to help local businesses, governments and research institutions design, adopt and reap the benefits of cloud technologies.

Summary

IBM offers both technology leadership and a deep understanding of storage management issues, which helps IBM deliver significantly greater value to our clients. IBM has helped thousands of clients improve the effectiveness and efficiency of their business and IT infrastructures, even as requirements change and data grows.

If you haven't considered IBM Storage Systems recently, we invite you to take another look.

We're ready to help your organization tame the explosion of information and build a smarter planet.

For more information

To learn more about IBM Storage Systems, please contact your IBM sales representative or IBM Business Partner, or visit the following website: **ibm.com**/storage

Additionally, financing solutions from IBM Global Financing can enable effective cash management, protection from technology obsolescence, improved total cost of ownership and return on investment. Also, our Global Asset Recovery Services help address environmental concerns with new, more energy-efficient solutions. For more information on IBM Global Financing, visit: **ibm.com**/financing

3 Is IBM's Blue Insight a model for your private BI cloud?, news.cnet.com/8301-21546_3-10400435-10253464.html

4 Leaders: Multinationimbles, The Economist, Nov 22nd, 2010, www.economist.com/node/17492958

5 IBM announces new offering to access billions of files in a cloud, **ibm.com**/systems/storage/news/press/20100211.html

6 IBM Expands Enterprise Storage Offerings with Introduction of New High-End Storage Array, www-03.ibm.com/press/us/en/pressrelease/28657.wss

7 Enterprise Storage Total Cost of Ownership (TCO) with IBM XIV, public.dhe.ibm.com/storage/disk/xiv/ibm_xiv_tco_paper.pdf

8 IBM Announces New Storage Systems Designed to Increase Efficiency; Optimized for Workloads such as Transaction Processing & Analytics, **ibm.com**/press/us/en/pressrelease/32662.wss

9 IBM Quicksilver SSD passes 1 million IO operations per second mark, www.memristor.org/electronics/flash-storage/29/ibm-quicksilver-ssd-passes-1-million-io-operations-per-second-mark

10 Storage Performance Council, April 2010: www.storageperformance.org/results/benchmark_results_spc1#a00092.

11 Storage efficiency data collected from installed IBM Real-time Compression Appliances. Compression rates vary by file type and content. Generally expected results cannot be provided as each client's results will depend entirely on the client's systems and services ordered. The client examples cited are presented as an illustration of the manner in which these clients have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual client configurations and conditions.

12 Total Economic Impact Study for IBM SAN Volume Controller, 2006, Jon Erickson, Forrester Research. See. www-03.ibm.com/systems/resources/systems_storage_software_virtualization_wpapers_forrester_svc.pdf

13 What are the Benefits of Thin Provisioning, David Vellante, Wikibon, Aug 19, 2010, wikibon.org/wiki/v/What_are_the_Benefits_of_Thin_Provisioning; and, "We have examples from customers who say Thin Provisioning took their capacity utilization from 40 percent to 80 percent, without impact on application performance." Arun Taneja, Founder and Consulting Analyst, Taneja Group

14 IBM CTO on financial impacts of cloud computing **ibm.com**/smarterplanet/us/en/cloud_computing/ideas/index.html?re=CS1

1 IBM Earns Most U.S. Patents for 18th Consecutive Year, **ibm.com**/press/us/en/pressrelease/33341.wss

2 IBM storage inventions include such basics as the computer hard disk and floppy disk. RAID was co-developed by IBM and The University of California. IBM also developed the personal computer, wireless networking, and the data center model for IT Operations. **ibm.com**/ibm/history

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