The IBM logo, consisting of the letters 'IBM' in a bold, blue, sans-serif font with horizontal stripes.

+



---

**Why**

**IBM and IBM TotalStorage Enterprise Storage Server  
are the Increasingly Preferred  
Vendor + High-End Storage Combination**

When businesses make disk storage decisions, they are really making two decisions: which product and which vendor.

There are many reasons why more and more customers are choosing the combination of the IBM® Corporation and the IBM TotalStorage® Enterprise Storage Server® (ESS, code-named "Shark") to satisfy their large-scale online storage requirements.

## Notices

Copyright © 2004 by International Business Machines Corporation.

No part of this document may be reproduced or transmitted in any form without written permission from IBM Corporation.

Product data has been reviewed for accuracy as of the date of initial publication. Product data is subject to change without notice. This information could include technical inaccuracies or typographical errors. IBM may make improvements and/or changes in the product(s) and/or program(s) at any time without notice.

References in this document to IBM products, programs, or services does not imply that IBM intends to make such products, programs or services available in all countries in which IBM operates or does business. Any reference to an IBM Program Product in this document is not intended to state or imply that only that program product may be used. Any functionally equivalent program, that does not infringe IBM's intellectual property rights, may be used instead. It is the user's responsibility to evaluate and verify the operation of any non-IBM product, program or service.

THE INFORMATION PROVIDED IN THIS DOCUMENT IS DISTRIBUTED "AS IS" WITHOUT ANY WARRANTY, EITHER EXPRESS OR IMPLIED. IBM EXPRESSLY DISCLAIMS ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR INFRINGEMENT. IBM shall have no responsibility to update this information. IBM products are warranted according to the terms and conditions of the agreements (e.g., IBM Customer Agreement, Statement of Limited Warranty, International Program License Agreement, etc.) under which they are provided. IBM is not responsible for the performance or interoperability of any non-IBM products discussed herein.

The provision of the information contained herein is not intended to, and does not, grant any right or license under any IBM patents or copyrights. Inquiries regarding patent or copyright licenses should be made, in writing, to:

IBM Director of Licensing  
IBM Corporation  
North Castle Drive  
Armonk, NY 10504-1785  
U.S.A.

*The performance data contained herein was obtained in a controlled, isolated environment. Actual results that may be obtained in other operating environments may vary significantly. While IBM has reviewed each item for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere.*

*Any statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.*

### Trademarks

Enterprise Storage Server, Enterprise Storage Server Specialist, ESCON, FICON, FlashCopy, IBM, iSeries, OS/390, Seascape, System/390, S/390, Tivoli, TotalStorage, z/OS, and zSeries are trademarks or registered trademarks of International Business Machines Corporation or Tivoli Systems Inc. or both.

Other company, product, and service names may be trademarks or registered trademarks of their respective companies.

Published June 7, 2004.

Please send any comments on this publication to [djsacks@us.ibm.com](mailto:djsacks@us.ibm.com).

# The IBM Company

IBM has an intense focus on storage solutions, amplified by its intense focus on system solutions. And IBM is widely recognized as a company people admire and are comfortable doing business with.

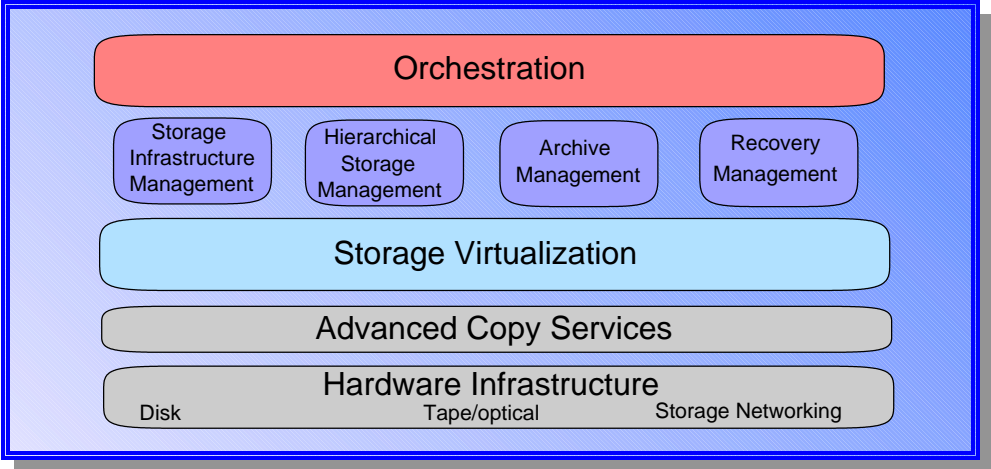
Let's begin with storage. **IBM's TotalStorage strategy** can be summarized as focusing on three areas of particular concern to IT organizations - areas that can help these organizations implement an on demand storage environment.

Infrastructure simplification focuses on reducing complexity, on reducing people time and effort to manage storage hardware resources, and on reducing costs. Strategic IBM initiatives range from physical consolidation, to highly scalable and interoperable offerings, to management simplification via virtualization technologies and customizable policy-based controls.

Business continuity focuses on keeping applications online at all times. Strategic IBM initiatives include high availability through fault tolerant/failure resistant product designs, continuous operations facilities that support nondisruptive activities ranging from backups to hardware upgrades to data migration, and flexible approaches to disaster recovery to help minimize any impact to applications due to unplanned site outages.

Information Lifecycle Management (ILM) focuses on managing business data from conception until disposal in a manner that optimizes storage and access at the lowest cost. Strategic IBM initiatives include the ability to help optimize data placement, the ability to help enforce data retention policies to meet business and regulatory requirements, and the ability to automatically delete data when it is no longer needed.

Ultimately, a strategy is only as valuable as the actual offerings -- products, programs, and services -- that can make it real. IBM's goal is to provide offerings that are modular, that are based on industry standards, that support heterogeneous environments, that are built on industry-leading technology, and that enable comprehensive end-to-end solutions. Consider the range of IBM's portfolio of storage product offerings:



**Hardware infrastructure.** It's about options - a selection of products so you can choose those that best address your particular needs. IBM disk offerings range from the flagship Enterprise Storage Server, to the FASTT mid-tier family, to low-end "JBOD" products, to disk storage integrated into server frames, to NAS gateways providing network-based file sharing and LAN/SAN integration. A broad range of SAN components are offered, from HBAs through hubs, switches, and directors. Tape storage continues to efficiently address vital storage requirements including attractive price/performance and portability; IBM's tape offerings range from DLT and LTO technology to the high-end/high-function Virtual Tape Server. And IBM offers a selection of optical storage libraries to address requirements for low cost random access storage.

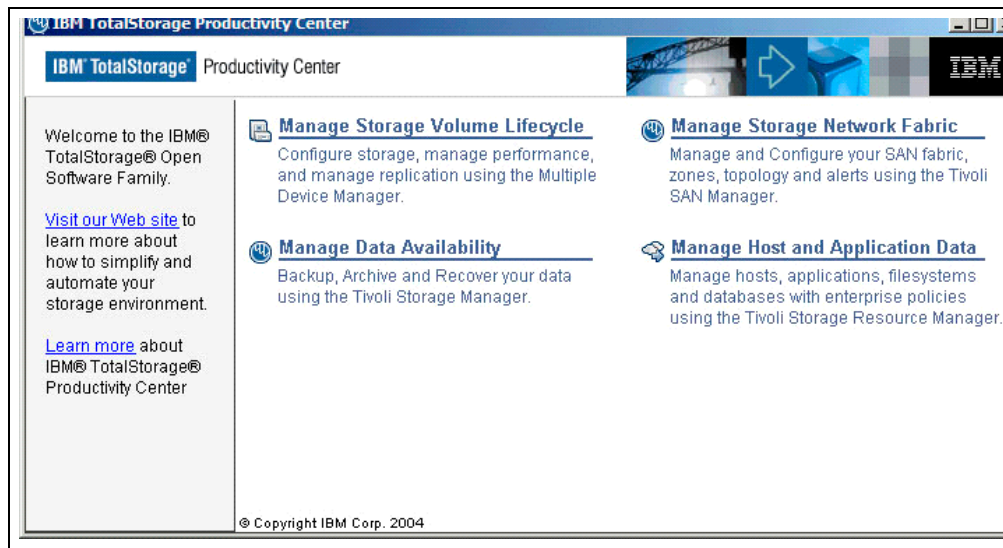
Many IBM infrastructure products and features are well-positioned to address ILM needs. Consider, for example, products ranging from high-end high-function disk systems, to cost-saving ATA-based disk systems, to a variety of tape systems

including some with WORM (write once read many) support. Data retention requirements in particular are addressed by the IBM TotalStorage Data Retention 450, a preconfigured hardware+software solution to help store, retrieve, manage, share, and secure regulated and nonregulated data. The Data Retention 450 offers a comprehensive suite of software tools for policy- and event-based data management.

**Advanced Copy Services.** IBM's **TotalStorage Resiliency Family** consists of data copy functions that add value to IBM's basic storage hardware infrastructure. Disk system copy-over-distance offerings include synchronous remote mirroring designed to address zero data loss requirements, point-in-time asynchronous remote mirroring designed to address requirements for periodic remote copies of disk volumes, and continuous asynchronous remote mirroring designed to address data loss requirements measured in mere seconds over virtually unlimited distances. Advanced remote mirroring cascading techniques are designed to provide zero data loss solutions at any distance. In addition, because of the continued significance of high-end tape operations in many organizations, IBM offers Virtual Tape System Peer-to-Peer Remote Copy.

**Storage management.** IBM offers storage management products for both the open and mainframe server environments. The **IBM TotalStorage Open Software Family** of products in particular includes sophisticated management capabilities that help you realize the maximum value of your hardware investment. As you'll see, these capabilities provide comprehensive storage management at multiple levels of the storage environment.

**Hardware infrastructure management** is provided by the **TotalStorage Productivity Center** that includes hardware management (e.g., configuration, replication, and performance management), SAN management, and storage resource management (SRM). A single user interface simplifies and integrates storage infrastructure administration tasks.



Console screen image for the IBM TotalStorage Productivity Center

**Storage virtualization.** Storage virtualization is technology that can help simplify management of the storage infrastructure by separating the logical aspects of storage from constraints inherent in physical storage hardware. For example, virtualization can help improve achievable storage capacity utilization by logically consolidating isolated pockets of unused space; it can also keep applications online through otherwise disruptive activities such as moving volumes of data from one disk system to another. Virtualization can also provide data copy functions that work across like and unlike disk systems. IBM delivers disk storage virtualization through products such as the TotalStorage SAN Volume Controller. IBM also offers the innovative TotalStorage SAN File System, providing a shared SAN-wide file system that reduces complexity compared to separately managed, incompatible server-dependent file systems.

**Data management.** The next level of storage management beyond managing the hardware infrastructure is managing the data stored in that infrastructure. *Hierarchical storage management* can automatically move inactive data to less-expensive offline or near-line storage, freeing online disk space for more important active data. *Archive management* is designed to help enterprises archive, retain, and manage data, including e-mail, to help satisfy regulatory, legal, and other business requirements. And *recovery management* is designed to quickly and reliably recover enterprise data when

needed, utilizing centralized Web-based management, intelligent backup and archiving (with minimal or no impact on application availability), and automated policy-based data migration copy services.

**Storage Orchestration.** Orchestration raises management to an even higher level. Storage orchestration is based on programmatic interfaces designed to enable storage management tasks to be integrated into enterprise *workflows* that help simplify and automate complex management processes. Workflows can combine best practices with autonomic, sense-and-respond technologies to adapt to changing conditions and help prevent human errors. The TotalStorage Productivity Center with Advanced Provisioning product uses workflow technology to help automate the numerous steps involved in taking "raw" storage and making it accessible to applications in a secure manner.

**Storage Services** range from storage health assessment to design, implementation, testing, and outsourcing. The quality of IBM's services and consulting business is well known. IBM has been recognized as a leader in storage services by multiple industry analysts. In addition, IBM Business Recovery Services has been inducted into the Contingency Planning & Management Hall of Fame (<http://www.contingencyplanning.com/>).

**TotalStorage Proven.** This special IBM program pre-tests combinations of IBM and non-IBM products for interoperability. TotalStorage Proven means integrated solutions are more than just hardware and software - they are validated together for specific applications and configurations.

It is the strength of IBM's storage strategy coupled with the breadth and depth of its storage offering portfolio that makes IBM the ideal company to partner with to help meet your storage requirements.

IBM brings considerable value to its customers well beyond its storage portfolio alone:

**Vision.** IBM has been a technology innovator in the storage industry for decades, and that leadership continues. IBM's leadership in autonomic computing, an initiative to increase system self-management, has already delivered benefits to IBM's customers. IBM has shown clear leadership in focusing on the On-Demand Era — a new, advanced phase of e-business that is intended to integrate processes across organizations and transform the use of IT; IBM's storage management vision and execution are leading the way for customers to evolve into on demand businesses. One way to describe IBM's storage and system management vision is: exploiting technology to eliminate problems rather than to merely trying to manage problems better.

**Systems perspective.** As an IT systems and services vendor with decades of experience in servers, operating systems, databases, middleware, applications, and systems management, IBM has a broader view of customer problems and solutions than would be expected from companies with limited product and services focus. As just one storage-related example, IBM sometimes recommends host-based remote mirroring D/R solutions, rather than disk system-based solutions, when that best addresses customer requirements. The breadth of IBM's offerings provides the potential for vendor consolidation, while maintaining the flexibility of implementing solutions that best address your particular needs.

**R&D.** Through 2003, IBM led the industry in U.S. patents for eleven straight years. The industry - and customer - return on IBM's multi-billion dollar yearly investment in its renown worldwide R&D labs is widely recognized. The press has published numerous articles about IBM's inventive "Ice Cube" project, a dense 3D cubic array of disk storage and switches that may revolutionize the way storage is packaged. No wonder that in 2000 the United States Department of Commerce awarded IBM the National Medal of Technology for IBM's decades of achievements in storage.

**Commitment to openness.** Being open is more than just making the claim of being open. IBM has an intense focus on storage interoperability based on open industry standards. Consider these examples: IBM worked with other vendors to create the "Bluefin" specification that is now endorsed by SNIA (the Storage Networking Industry Association) as the Storage Management Initiative Specification (SMI-S); most major storage industry players are rallying around this CIM/XML-based standard for open storage management. IBM participates in all eight SNIA Supported Solutions Forum registered solutions for SAN interoperability. And, IBM has licensed specifications for its popular PPRC and XRC remote copy offerings to other disk system manufacturers.

**Alliances and Partnerships.** IBM has what may be the broadest array of alliances in the IT industry. Whether standards committees, joint projects, or "coopetition" relationships, IBM continues to be a company other companies want to work with.

**One-stop shopping.** Whether your needs include hardware, software, services, or a combination, IBM has provided systems solutions for customers around the world. In addition, IBM Global Financing, with over \$35 billion in assets, is the world's premier single-source provider of multivendor financing solutions, helping businesses in more than 40 countries realize tremendous savings on their systems, software and services.

**Vendor quality.** IBM's reputation as a quality company to do business with continues to be an important consideration for customers. IBM was the winner of the 1999 Better Business Bureau National Torch Award for Marketplace Ethics. IBM was rated #1 in Giga Group's 1999 Most Trusted I/T Vendor survey results. IBM was ranked the "Best Corporate Citizen" for 2002 by the Business Ethics Corporate Social Responsibility Report. In 2003, IBM won the TSANet 2003 Award of Excellence.<sup>1</sup> Through 2004, IBM has been on Business Ethics magazine's list of 100 Best Corporate Citizens for all five years this list has been published. And, IBM was rated in the top ten of Fortune magazine's 2004 World's Most Admired Companies.

---

<sup>1</sup> TSANet is an organization to foster vendor cooperation in multi-vendor customer environments. See [www.tsanet.org](http://www.tsanet.org).

"IBM has stressed its commitment to bringing about the computing utility, and specifically in storage, it has laid out concrete plans to deliver on the storage component...The oneness of IBM storage provides one-stop shopping without one-size-fits-all...IBM *gets it* -- for computing, in general, and for storage, in particular."

- The Clipper Group, Inc., *E Pluribus Unum — The Oneness of IBM Storage*, by Mike Fisch, Mike Kahn, and Anne MacFarland, December 13, 2002.

The storage industry is extremely dynamic. On any given day, one company or another may announce a product that temporarily provides some benefits over competitive offerings - for a while. Rather than dealing with the disruption of jumping from product to product and vendor to vendor, many customers prefer a more stable IT strategy, partnering with a vendor who can be trusted to provide solid value over time. A proven history of ongoing commitment to innovation, quality, and support continues to make IBM the storage vendor of choice to team with today - and for the long-term.

"Overall, we believe that IBM's experience and expertise, the scope of its end-to-end offerings, and its future product roadmap makes the company a natural candidate for customers seeking robust, dependable whole system solutions."

- The Sageza Group, *Competitive Snapshot Painting the Big Picture: Data Storage and the Benefits of End-to-End IT Solutions*, by Charles King, February 3, 2003.

## The Enterprise Storage Server Disk System

Thousands of customers have discovered that the sophisticated technology of the high-end Enterprise Storage Server disk system can make a positive difference in their business. The ESS is designed to deliver value in multiple ways, including dependability, self-optimizing performance, advanced functions, large-scale storage consolidation, ease-of-management, and an attractive total cost of ownership. All provided on a foundation that may be the most advanced storage architecture in the industry.

IBM considers the ESS to be the flagship of its strong portfolio of disk system offerings, and has extensive plans to further enhance the power and capabilities of the ESS over time.

### Advanced Architecture Foundation



The initial and enduring quality of a disk system depends heavily on the quality of its basic foundation: its architectural principles and how well the system design adheres to them.

Seascope is IBM's name for the fundamental architectural principles behind the ESS and other high-end IBM storage systems. A central element of the Seascope strategy is **integration of best of breed technologies**: those from IBM (including its research labs, product development labs, and valued intellectual property portfolio), as well as from the general industry (such as interoperability standards and component parts from OEM suppliers). IBM resources are heavily invested in key ESS elements while commodity parts that meet IBM's rigorous quality standards are sourced from IBM plants and non-IBM vendors. The bottom line: **a solid platform with high quality at an attractive cost.**

"Server" is part of the ESS product name because one of the most significant facets of the Seascope architectural strategy is the use of **server technology** within the storage system. The integration of actual server computers into the ESS helps reduce the need for expensive custom components found in many other disk systems, while **increasing overall dependability** through the use of proven server and operating system (OS) technologies. OS-based intelligence, in marked contrast to conventional microcode-based disk systems, delivers benefits today such as **performance gains** through support for internal tightly-coupled symmetric multiprocessors (SMPs) and **flexible interactive management** via an integrated internal Web server. Further, this OS foundation provides a powerful enabler for **future ESS capabilities.**

IBM's Seascope is a carefully thought-out, sophisticated, and successful architectural strategy that helps the ESS continually demonstrate technology leadership at very competitive prices. It is the strength of Seascope that provides the solid foundation on which advanced functions - and ultimately the customer values of **business continuance and business efficiency** - are delivered.

## Business Continuance

Business today increasingly depends on timely access to electronically stored information. That information is often needed on demand by both external customers and internal users. The ESS is designed to provide round-the-clock access to information by helping to eliminate both planned and unplanned system down time.

**Self-healing facilities.** It isn't possible today to create individual disk system components that can never fail, but it is possible to design a disk system to help mitigate the effect such failures have on your business. The ESS incorporates a **fault tolerant hardware design** where major hardware elements - such as disk drives, data paths, logic components, power supplies, and cache - are redundant. (It is worth noting that redundant components in the data path are active-active, so your applications receive all the power the system is capable of delivering.) Comprehensive error detection and correction facilities **continuously help protect the integrity of your data**. **All disk drives are RAID-protected**, and multiple spare disks are used to **quickly and automatically restore fault tolerance** in the event a disk drive fails. ESS Predictive Failure Analysis can even determine when a disk drive is likely to fail in the near future so that dynamic disk sparing can be invoked proactively. Disk and cache bit "scrubbing" **further helps protect data integrity**. And, **mirrored write cache** helps protect information not only against cache component failures but also against bit errors accumulating beyond the capability of scrubbing and error correction facilities to repair. With **attention to detail** beyond conventional system designs, the ESS provides both system-wide and cache-specific batteries to help **preserve information in case of loss of external power**. Finally, should a problem occur in the ESS, built-in "call home" facilities provide both **reactive IBM support center response as well as periodic proactive verification of ESS operational status**.

**Online changes.** In the ESS, maintaining access to data goes well beyond hardware fault tolerance alone. System upgrades to add disk capacity, increase cache size, or add host attachments can all be made **concurrently with ESS online operation**. Many repairs can be carried out while **application access to data continues**. Internal software can typically be changed while **the ESS remains online**. Changes to the customized configuration, such as defining logical disk volumes and assigning and reassigning them to various host computers, can be made **dynamically by the customer at any time** and usually without vendor involvement. Both its self-healing facilities as well as support for online changes are ESS capabilities that are standard at **no extra cost**.

**Operational assists.** A comprehensive approach to delivering continuous access to data requires more than just redundancy and support for concurrent system changes. **Advanced features** in the ESS can help boost data availability during day to day operations, as well as during unanticipated events.

The FlashCopy data replication feature can help **reduce or eliminate application down time for making copies of data** "under the covers" of the ESS. Using FlashCopy, copies of disk volumes, and even copies of individual files in the z/OS environment, can be created within seconds. While production applications continue to access the original volumes, other applications can access the copies at the same time. Options allow the user to create full byte-for-byte copies, or to use specialized optimizations that reduce the overhead of making and maintaining copies.<sup>2</sup> FlashCopy *consistency groups* can **eliminate application downtime** normally needed to make time-consistent multivolume copies.

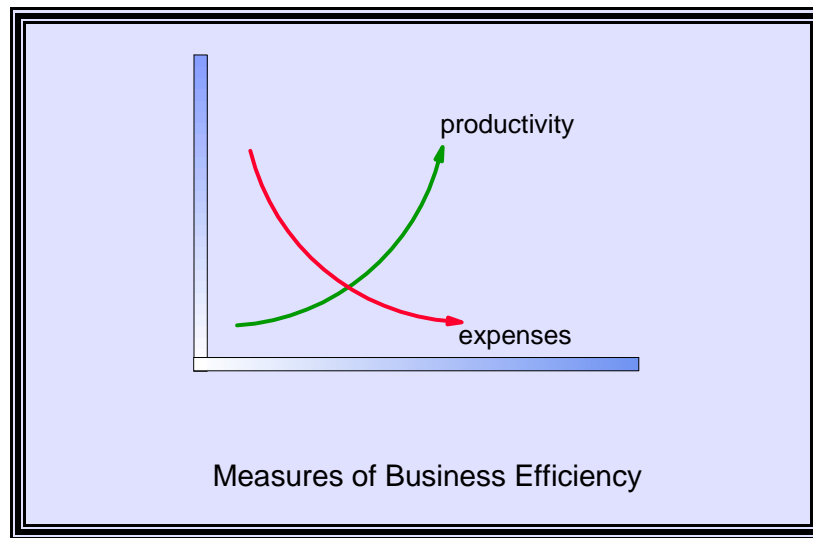
The ESS supports **multiple remote copy features** to help address needs ranging from business continuance following a physical disaster to planned data center migrations. Both synchronous and asynchronous remote copy techniques are supported. PPRC (Peer-to-Peer Remote Copy) **Metro Mirror** synchronously maintains a current copy of data at a remote site. PPRC **Global Mirror** asynchronously maintains copies at any distance with typically no more than 3-5 seconds of lag in data currency. PPRC **Global Copy** supports making asynchronous point-in-time copies at any distance. And, **Extended Remote Copy (XRC)** provides an asynchronous near-current remote copy implementation optimized for IBM z/OS (mainframe) servers. Moreover, Metro Mirror and Global Copy can work together in **cascading configurations** to support advanced capabilities such as maintaining data currency at a remote site regardless of distance.

---

<sup>2</sup> For short-term copies such as used for backup procedures, the copy-on-first-write optimization dramatically lowers the amount of data that needs to move under-the-covers. For long-term copies such as volume clones, the incremental (a.k.a. refresh or resync) optimization lowers the amount of work needed to periodically update those copies.

## Business Efficiency

As a business' acquisition of storage capacity grows to hold the ever increasing amount of information stored online, the cost for that storage, as well as the usually higher cost to manage and operate that storage, can increase dramatically. The challenge is to manage more storage without needing more skilled people. The ESS helps address the business efficiency imperative of controlling costs by delivering its capabilities through a design that can help lower the expense of product acquisition as well as lower the expense of ongoing product operation.



**Platform for consolidation.** The ESS provides an attractive platform not only for large applications, but for large-scale storage consolidation encompassing multiple hosts and applications. The ESS **attaches directly to a wide variety of popular IBM and non-IBM servers**, using Fibre Channel, UltraSCSI, FICON and ESCON without needing specialized protocol converters. With up to more than 55TB of raw capacity, and a high-performance design behind it, the ESS is **well positioned to handle demanding application I/O workloads**. Because the ESS offers one of the broadest selections of disk sizes in the industry, including 18.2GB, 36.4GB, 72.8GB, and 145.6GB disk capacities, most at either 10K and 15K RPM, ESS customers can flexibly select and intermix disk capacities and speeds to **customize system price/performance**. These attributes make the ESS an **attractive platform for storage consolidation** with associated benefits such as **centralized management and shared capacity**.

**Design for high application performance.** Some vendors try to draw attention to the performance attributes of isolated disk system elements such as internal bandwidth. The ESS, to be sure, includes multiple noteworthy components such as a hybrid bus + switch internal data path design and an optional Turbo performance accelerator feature to help address the needs of the most demanding I/O workloads. But, component specifications do not readily translate to application productivity. What is important is that **the ESS is designed to deliver high performance from the application point-of-view**. The proof of this pudding really is in the eating. IBM has put the ESS through its paces and published the performance results achieved by the ESS model 800 as measured by the industry-standard SPC-1 benchmark. (See [www.storageperformance.org](http://www.storageperformance.org) for details.) The results not only demonstrate the high performance that can be experienced by real I/O workloads, but demonstrate that high-performance can be achieved using ESS's space-efficient RAID-5 configuration option without resorting to more costly disk mirroring used by most other vendors in their SPC-1 benchmarks.

**Ease-of-management.** Management of disk systems has multiple considerations:

**Flexible, open interfaces.** The ESS can be managed using a selection of interfaces. Interactive, online control and monitoring are available through **convenient Web-based interfaces** for configuration and performance management. A **Command Line Interface (CLI)** is supported as well to help users **customize and automate** ESS operations. The ESS supports a set of **SNIA SMI-S-compliant application programming interfaces (API)**, allowing both IBM and non-IBM storage management products to control the ESS using this open industry standard.

**Capacity on demand.** Additional storage capacity can be pre-installed and accessed when needed **on demand** through the **Standby Capacity on Demand program**; this helps **control costs while avoiding delays** in acquiring storage that can result when the timing of capacity growth cannot be accurately predicted.

**Self-optimization.** Having the potential for high-performance is not the same as actually delivering that performance. The ESS is designed to make it easier to proactively sustain **consistently high performance** without having to rely on ongoing, after-the-fact performance management (i.e., tuning). The ESS incorporates **multiple dynamic self-tuning facilities** that can significantly reduce the effort needed to manually manage performance, especially compared to systems lacking these facilities.

A large read-write cache **improves performance** for almost all workloads. A small 4KB cache space "slot" size can dramatically **reduce wasted cache space** and help **maximize cache hit ratios** compared to less efficient large slot sizes in competitive disk systems. Sophisticated cache management algorithms optimize both random and sequential data access. For random access, ESS algorithms determine an optimum amount of data to load into cache, **helping to avoid unproductive overhead**. For sequential access, ESS algorithms *preload* soon-to-be-read data into cache to **streamline application performance**. A **stripe-all design** automatically and efficiently stores application data across multiple physical disks to help **balance disk utilization and reduce after-the-fact tuning**. The ESS also incorporates a particularly **efficient internal disk path design**. There are up to 64 built-in internal paths to disks, each supporting pipelined I/O traffic without arbitration protocol overhead. These attributes compare favorably to the arbitrated, one-transfer-at-a-time FC-AL or parallel SCSI paths found in other disk systems. The ESS offers both RAID-5 and RAID-10, but its highly optimized RAID-5 design allows the vast majority of customers to not have to tolerate the cost and scalability drawbacks of mirroring. The FlashCopy internal data replication feature supports an **optimization for short-term copies such as used in backup operations** which (compared to conventional resynchronization schemes) **can reduce overhead by 95% or more**.

**Attractive Total Cost of Ownership (TCO).** Total cost is more than price/MB. The ESS includes a number of **TCO benefits** including **no one-time charges for many essential features** such as basic configuration management and multi-pathing host I/O drivers. For those advanced features that are priced, a 3-year warranty helps **keep ongoing monthly charges to a minimum**. Tiered charges help **align costs with value received**. A selection of 10K and 15K RPM disks of different capacities helps you **optimize system price/performance and price/capacity**. The ESS's high-performance RAID-5 configuration option allows you to achieve the **cost and scalability benefits of RAID-5** that are not possible with conventional mirroring designs. For SANs, each Fibre Channel port can be shared by multiple heterogeneous hosts and HBAs, potentially **reducing the number of ports needed**; **LUN masking is included at no extra charge** to support SAN security. A smaller ESS model, the ESS 750, can be **upgraded nondisruptively in-place** to the full power of the high-end ESS 800 even including the optional Turbo performance feature. It is IBM's attention to these kinds of ESS details that help keep expenses for system "incidentals" from adding up or surprising you *after* the system is installed.

ESS attributes -- consolidation platform, self-healing and self-optimizing facilities, comprehensive data availability features, ease-of-management, attractive TCO, and more -- all contribute to a system designed to help reduce the complexity of using storage technology, increasing the value of the system to your business.

## In Summary

When it comes down to it, you want a strong, dependable, quality disk system and a strong, dependable quality vendor to stand behind it. A system with solid credentials to help protect your critical information assets, backed by a vendor with the proven resources to support that system so you can focus on your business rather than on technology. One without the other is really one half a solution. With IBM and the ESS, you can have both.

