

# IBM Storage

Business Partner Guidebook

A Seller's Roadmap  
to IBM Storage  
Solutions



Edited by Jim Hoskins

# **IBM Storage Business Partner Guidebook**

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# IBM Storage Business Partner Guidebook

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Fourteenth Edition

*A Seller's Roadmap to IBM  
Storage Solutions*

Edited by Jim Hoskins

(version 14.0e)



Clear Horizon

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# What's New in This Edition?

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This edition of the guidebook has been updated to include IBM Storage products announced through June 2012.

Here are some of the offerings that have been introduced or enhanced since the last edition:

[DS3500 enhancements](#)

[Storwize V7000 enhancements](#)

[DCS3700 enhancements](#)

[SAN Volume Controller enhancements](#)

[N3000 series enhancements](#)

[N6000 series enhancements](#)

[Crossroads ReadVerify Appliance \(RVA\) enhancements](#)

[TS2900 Tape Autoloader Express enhancements](#)

[TS3200 Tape Library enhancements](#)

[TS3310 Tape Library enhancements](#)

[TS3500 Tape Library enhancements](#)

[TS7620 ProtecTIER Deduplication Appliance Express](#)

[TS7650 ProtecTIER Deduplication Appliance enhancements](#)

[TS7650G ProtecTIER Deduplication Gateway enhancements](#)

[TS7700 Virtualization Engine enhancements](#)

[Brocade VDX 6730 Converged Switch](#)



# Your 8-Step Quick Start

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If you are a new IBM Business Partner, take these eight steps to “hit the ground running.”

## 1. Check for Updated Editions of This Guidebook

This guidebook has the ability to check for more current editions which are released periodically. Simply click on the “More on the Web” link provided here (or the link on the cover) and this guidebook will automatically check to see if you have the most current edition. If you don’t, you will be able to download the latest edition immediately.

### MORE ON THE WEB

- [Check for updates now](#)

## 2. Apply for Your IBM PartnerWorld Membership

The IBM PartnerWorld Web site is your source for information for all things related to being an IBM Business Partner (e.g., Business Partner relationships, guidelines, support, product info, etc.). You will need a user ID and a password to gain access to some areas of the site. If you have any ques-

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- [Get your PartnerWorld user ID](#)
- [Explore PartnerWorld](#)
- [PartnerWorld contact phone numbers by country](#)





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### 3. Plug in to IBM Product and Program Communications

Staying informed is one key to success. IBM has a special page on PartnerWorld that helps you do just that. Here you will find new product announcements, letters to Business Partners, customer success stories, educational opportunities, and more.

#### MORE ON THE WEB

- [IBM Systems Storage Partner Portal](#)
- [Get plugged in to IBM product and program communications](#)
- [Barry Whyte \(Storage Virtualization\) blog](#)
- [Tony Pearson \(Inside IBM Storage\) blog](#)

### 4. Understand the Express Seller Program

Express Seller is designed to help IBM Business Partners accelerate sales of IBM products and services to small and medium businesses. IBM provides key offerings that meet your clients’ business needs at competitive prices and provides extensive marketing support including “air cover” advertising and customizable materials to help you generate leads.

#### MORE ON THE WEB

- [Express Seller Toolkit](#)





## 5. Learn to Quickly Find IBM Product Information

IBM maintains a search page that allows you to quickly find detailed product information from IBM announcement letters (one of these is released for every product IBM announces), the IBM Sales Manual (a comprehensive collection of detailed info on all IBM products), and much more. Give it a try so you will know how to find what you need when you need it. Of course you can also find product details on the System Storage section of IBM.com. This is a key resource for you and your customers.

### MORE ON THE WEB

- [IBM product information search page](#)
- [System Storage section of IBM.com](#)

## 6. Learn to Find Competitive Information

IBM consistently updates information about the competitors you will encounter and their products. Two good sources of competitive information are the IBM COMP Web site and PartnerWorld. Explore these valuable tools so you will learn how to find competitive marketing information when you need it. You will need your user ID and password.

### MORE ON THE WEB

- [Competitive info on COMP](#)
- [Competitive info on PartnerWorld](#)

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quick-learn modules featuring content specifically written to help you understand the customer benefits and

value propositions of IBM products and solutions. You can get points by completing these modules which can be redeemed for merchandise at participating retailers. You can earn additional points for reporting sales through KYI.

#### MORE ON THE WEB

- [“Know Your IBM” training modules](#)

## 8. Make Your Training and Certification Plan

Knowledge is power. IBM offers many opportunities to learn and to demonstrate your knowledge through certification. These certifications are regularly updated to include the roles most critical to successfully selling and technically supporting the storage product portfolio. Now is

a good time to make your plans. Select your role from the list

of certifications. Follow the links to complete descriptions of each role, skills, recommended education, and more. You can select courses and build tailored enablement roadmaps with the help of Systems College (formerly the STG SMART Zone). This is your one stop for all learning on IBM Systems offerings for servers and storage.

#### MORE ON THE WEB

- [Explore training and certification opportunities](#)
- [Systems College](#)

# Introduction

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## About This Guidebook

This MaxFacts™ interactive guidebook brings together—all in one place—the resources you need to be successful as an IBM System Storage Business Partner. It contains information gathered and adapted with permission from multiple IBM and non-IBM sources. There are embedded links to more detailed and fast-changing information maintained on the Web so you can have the most current information at your fingertips. We are confident you will find this a useful tool. As we are always working to better help you succeed, please forward any suggested improvements to this guidebook to [info@maxpress.com](mailto:info@maxpress.com).

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- Click on the table of contents links shown on the left side of your screen to go directly to that part of the guidebook,



- Search for keywords in the document using the Acrobat Reader “Find” function (the binoculars icon on the toolbar).

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- [Maximum Press Web site](#)

# 1

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## You and IBM System Storage Offerings

In this chapter we take a look at some business basics about IBM and our System Storage Information Infrastructure offerings to consider as you move forward with your own business.

### Why Team with IBM?

If you are seeking to truly differentiate yourself in the marketplace by extending your market reach with more profitable end-to-end solution offerings, IBM is uniquely positioned to help you make this happen. IBM provides you with an integrated portfolio of hardware, software, services, and channel programs that can take your business wherever you want it to go. IBM is committed to helping your clients realize business innovation through industry leading technology, open standards support, and proven best practices.

IBM collaborates across a worldwide ecosystem of business partners to deliver industry leading and cost efficient business solutions. By providing innovative technology that delivers flexibility and high performance, easy to administer programs, and flexible financing options, IBM has an unmatched understanding and appreciation of channel importance that translates into success and prosperity for our partners.






Consider these facts about IBM:

- One of the world's top 10 most valuable brands
- A market leader in the storage and server industries
- Second largest software business in the world
- In each year for over a decade, IBM has earned more patents than any competitor, according to the U.S. Patent Office.

It is an exciting time to be involved with information technology. The worlds of business and computer systems are blending in ways that will result in productivity breakthroughs greater than the sum of their parts. Teaming with IBM will allow you to provide the insight, solutions, and innovation that matter to help your customers succeed.

**MORE ON THE WEB**



The video player thumbnail shows a woman, Jeanette Horan, Chief Information Officer at IBM, speaking. A play button icon is overlaid on the video, and the text 'Play video' is displayed below it. The video title 'IBM Journey to Smarter Computing (5:16)' is shown at the bottom of the player.

*IBM Journey to Smarter Computing (5:16)*

## A Smarter Planet

On today's smarter planet, intelligence is being built into the world around us. Trillions of instrumented devices, structures and objects—homes, cars, soft drink machines, smart phones, household appliances, clothes, highways, bridges, waterways and more are creating a literal torrent of data. Powerful computers and analytical software are enabling us to capture that raw data and transform it into insight that can





help predict weather patterns, ease traffic congestion, reduce energy consumption, and improve healthcare, to name just a few. In just about every industry, every country around the world, the idea of a smarter planet is moving from metaphor to reality.

Smarter planet success stories are practically everywhere. Consider the success of these IBM clients. One of the largest cities in the United States is using data analysis to predict crime rather than just react to it. An Italian bank is

#### MORE ON THE WEB

- [A Smarter Planet info on IBM.com](#)

upgrading its storage infrastructure to reduce online banking response times by 10 percent. A water utility in the United Kingdom is reducing operational costs by implementing a high-performance shared-storage platform. A European confectioner is using smarter technologies to eliminate a nine-hour backup window and provide 24x7 systems availability. The opportunities are virtually limitless.

But the reality is that these new opportunities and this burgeoning wealth of data require organizations to adopt a new IT model if they want to take advantage of new revenue streams and create smarter business models.

## Smarter Computing from IBM: IT Infrastructure That Enables a Smarter Planet

To take advantage of the opportunities a smarter planet offers, IT organizations need to be able to roll out higher quality services quickly and efficiently. And they need to respond quickly to shifts in today's volatile marketplace, dramatic



increases in demand, and new, data-intensive workloads. By optimizing systems for new, smarter workloads, by using federation technologies to create a unified interface to enterprise-wide data, and by addressing changing user expectations of service quality and delivery, organizations can create a more efficient computing model that builds in efficiency and enables innovation. It's what we call "smarter computing."

Smarter computing is a new way of thinking about how information technology is accessed by the organization, how it's applied to the objectives of the business and how it's architected to align with those goals. It's a new approach that is designed to optimize specific workloads and improve service delivery. By integrating IT systems to break down informational silos, automating workloads to lower costs and increase productivity, and establishing new levels of security, organizations can take advantage of new technologies and operational models such as cloud computing. They can begin to leverage what we call "big data"—the federated data that resides in the enterprise and can be unlocked to provide insight that can inform and improve decision making.

#### MORE ON THE WEB

- [Smarter computing overview on IBM.com](#)

Take healthcare, for example. One of our clients operates a cancer center. A new gene sequencer for DNA analysis at the center can generate one terabyte of data in just five hours, creating more data in a day than its older machines created in a whole month. The center's new computed tomography (CT) and positron emission tomography (PET) scanners deliver 16 times the resolution of earlier technology, and more power-



ful computers there are rendering 3-D magnetic resonance imaging (MRI) scans in minutes rather than hours. The issue is compounded by regulatory mandates that require health-care organizations to save records for a patient's life span plus seven years—putting increased pressure on the center to address long-term storage and regulatory requirements.

It's clear. Insatiable demand coupled with unsustainable economics and the adoption of new delivery models mean that IT organizations have to transform the way they access IT, apply it to business objectives, and architect it to improve service delivery. The smarter computing initiative from IBM can transform the economics of IT and free up teams to focus on innovation.

## Why IBM System Storage?

Information has been growing rapidly in most organizations, doubling every 18 to 24 months. In the era of Smarter Computing, however, big data projects can quickly double or triple the amount of information. Information is becoming more valuable, and the ability to analyze it is becoming a competitive advantage. To stay ahead, organizations need faster access to more of their data. Another trend, cloud computing, will be adopted or deployed by up to 90 percent of organizations within the next three years, saving U.S. businesses an estimated \$625 billion over five years. This growth and transformation is happening at a time when IT budgets are flat. Inflexible infrastructures and increasing complexity can create significant obstacles for organizations trying to take advantage of these tremendous opportunities.



These growing demands require a new approach to storage—a more intelligent, more efficient, more automated approach that fundamentally changes the way we think about storage. IBM has introduced a new approach to the design and deployment of storage called Smarter Storage. IBM Smarter Storage enables organizations to take control of their storage so they can focus on gaining more valuable insights from their information and delivering more value to the business. IBM Smarter Storage is:

- **Efficient by Design.** Efficiency features are designed into IBM storage systems from the beginning. Advanced features are pre-installed, ready to deploy, and operate consistently. Storage efficiency technologies like real-time data compression can significantly reduce the amount of data that has to be stored because they support all data, including active primary data.
- **Self-optimizing.** Self-optimizing storage operates at the speed of business—much faster and more accurately than manual performance tuning. Self-optimizing storage can increase throughput for critical applications while reducing the cost of storing less active data.
- **Cloud Agile.** Cloud Agile storage has virtualization built in. Virtualization, for IBM and non-IBM storage, increases agility by enabling online data migration and simplified storage provisioning. Cloud Agile storage enables immediate self-service and automates most manual storage administration tasks, improving the ability to manage larger, unpredictable workloads.



IBM's storage leadership and ongoing product innovation supports organizations in significantly improving storage efficiency and information access with solutions that are easy to use and powerful enough to bring the most massive storage growth under control.

## Storage At the Speed of Business

In addition to delivering new levels of storage efficiency, today's organizations are under extreme pressure to increase their agility and speed to stay competitive in a changing global marketplace:

- To be successful, businesses must do things **faster** than their competitors: Find new customers **faster**, bring products to market **faster**, and identify new revenue streams **faster**.
- Similarly, CIOs and IT organizations are successful only if they enable the business to run **faster**, enabling **faster** access to information, bringing applications online **faster** and meeting user needs **faster**.
- And in today's environment, both IT and business units have to operate **faster** without increasing operating costs.

As expectations of the business and of CIOs are rising, so should expectations of storage systems. Companies should expect more from both their storage systems and their storage provider—efficiency by design, self-optimizing, and cloud agile. By building these three pillars into our storage systems, IBM can help organizations meet higher expectations for both speed and efficiency.



Whether your next destination is cloud, business analytics, big data, or somewhere else, you'll be more successful when your storage works with you to help your organization adapt to change.

Learn more about IBM Smarter Storage at: [ibm.com/storage](https://ibm.com/storage).

## IBM Storage Cloud

Both IT and business executives are attracted to cloud computing because they share a common requirement for speed and efficiency. Within a company, the internal organizations are considering cloud computing to help them meet their customers' expectations and generate profitable new revenue streams. In support of their users, IT is considering private cloud implementations to deliver higher service levels and better utilization of their assets to keep costs down.

Cloud has the potential to provide these advantages, but fulfilling that potential is all about being prepared—and controlling storage costs is critical. Without the proper foundation in place, the promise of cloud storage will likely go unrealized, putting organizations in the unenviable position of having invested in cloud solutions without being prepared to fully benefit from them.

IBM understands that success with cloud storage is a step-by-step process that begins by first establishing a virtualized, efficient data storage infrastructure. This “hyper-efficient” stor-

### MORE ON THE WEB

- [Cloud Storage Sales Kit on PartnerWorld](#)
- [IBM Cloud Storage info on IBM.com](#)



age environment can enable you to move to more automated storage for example, with policy-driven management—and leverage modernization of backup and recovery to address issues such as disruption or disaster avoidance. IBM can help organizations on their path to private cloud by providing them with the storage building blocks that enable hyper-efficiency, automation, and management. Companies should expect storage systems to support cloud workloads without extensive tuning and customization. Cloud storage systems should be ready for common cloud workloads, such as:

- General purpose storage optimized for performance or capacity
- Data archiving and records retention
- Data protection and disaster recovery.

As a leader in cloud computing, IBM can enable all aspects of private clouds. From IBM's own internal experience, and from hundreds of cloud engagements with clients, we know there are three key steps to deploying private cloud storage:

- Establish an efficient storage environment by leveraging virtualization, deduplication, compression, and tiering; to reduce costs and increase speed
- Automate storage management including key operational processes such as backup, recovery, metering, and billing; to improve service levels
- Optimize the environment by adding self-service and pay-per-use capability, to enable users to directly access cloud capabilities.



IBM offers essential storage technologies to enable successful private cloud deployments including:

- IBM Active Cloud Engine gives IT administrators the ability to manage files efficiently whether they are in a single data center or dispersed throughout multiple data centers across geographic locations. It enables collaboration among users around the globe, distributes files to multiple locations quickly, and localizes data to reduce network costs.
- Storage virtualization enables automated provisioning and online quality-of-service tuning without disrupting users or applications.
- Easy Tier automated tiering maintains performance levels without manual storage tuning.
- Real-time compression increases usable storage capacity up to five times without impacting application performance.
- Thin provisioning eliminates the need to pre-allocate storage, so costs can match the pay for use payment model.

## **IBM Core Technologies to Drive Your Information Infrastructure**

IBM solutions are optimized for the unique needs of mid-size organizations, large enterprises, cloud computing providers, and others. Clients can get just what they need, saving time and money. A key benefit of selecting IBM for your next information infrastructure project is access to a broad portfolio





of outstanding products and services. IBM offers highly rated, patented technology that delivers unique value.

Some IBM differentiating capabilities include:

- Storage virtualization—Reduce SAN disk costs by increasing utilization up to 30 percent or more.
- Data deduplication—Lower storage acquisition costs by up to 70 percent or more while reducing energy, cooling, floor space, management requirements, and maintenance costs.
- Solid-state storage architectures—Improve drive access response time up to 800 percent without application tuning.
- Mainframe storage—Mainframe optimized tiered storage. First-to-market drive level encryption. Up to 300 percent increase in transaction throughput with only 5 percent solid-state storage.
- Self-encrypting storage and security management—Encryption at the drive level improves security with little or no performance impact.
- Information archiving—Optimize application performance and simplify application administration, while lowering total costs.
- Business intelligence platform integration—Correlate disparate information across the value chain up to 600 percent faster.
- Continuous data protection—Get applications and users up and running within minutes following a data loss.



- Storage infrastructure management—Improve storage utilization up to 20 percent and simplify administration.
- Real-time compression—Achieve up to 80 percent more storage utilization in the same footprint

No other major vendor can match IBM's breadth of information infrastructure capabilities. IBM offers integrated solutions for consolidation, data protection, storage management simplification, compliance support, and more. IBM technology includes SAN and NAS disk systems, tape systems, SAN switches, storage management software, services, self-encrypting storage with key management, non-erasable non-rewriteable storage for regulatory compliance, and flexible financing for large and mid-size organizations.

#### MORE ON THE WEB

- [Data Protection and Retention Sales Kit for Business Partners](#)
- [Storage Efficiency Sales Kit for Business Partners](#)

# 2

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## Information Infrastructure Basics

In this chapter, we will quickly review the core capabilities of the IBM information infrastructure offerings.

### **IBM Core Technology Capabilities**

IBM has developed significant capabilities in a number of critical technology areas that give clients the ability to manage their information more effectively. IBM investments in information infrastructure technology, both internal development and acquisitions, have exceeded \$3 billion in the past three years. Clients are now benefiting from the results.

### **Storage Virtualization: Reduce Costs, Control Storage Sprawl, Improve Utilization, and Simplify Management**

In many IT departments, increased user demand has led to haphazard storage growth, resulting in sprawling, heterogeneous storage environments. These environments make it difficult to achieve optimal utilization and to provision storage capacity for new users and applications. So storage sprawl is exacerbated, creating a larger storage footprint and increasing energy requirements. Such heterogeneous environments are difficult to manage, requiring administrators to develop





and maintain multiple skills to support these heterogeneous environments.

Storage virtualization can put an end to these problems. It enables companies to logically aggregate disk storage so capacity can be efficiently allocated across

applications and users. Pooling these resources in a logical way using virtualization helps remove the physical barriers between resources and improve utilization. Done right, virtualization also masks the complexity associated with all the various storage components, simplifying management. All of these capabilities can result in increased utilization, better protection of existing investments, reduced administrative costs and more effective monitoring of the infrastructure.

IBM storage virtualization is unique in the industry for the following reasons:

- SAN Volume Controller is a proven storage virtualization system with over 19,000 engines sold to date running in more than 6000 SVC systems.
- SVC is the first storage virtualization system to offer integrated support for solid-state disks delivered in a highly-scalable manner to suit both entry and large enterprise requirements.

*“Virtualizing storage makes a lot of sense, if you want to increase flexibility of managing the storage allocation process without worrying about a lot of physical details and the potential for errors that virtualization eliminates. As an additional benefit, it makes data mobility transparent and easy. Thus, the benefits are focused on administrative costs, which continue to rise.”*

*— Mike Kahn, managing director,  
The Clipper Group, Inc.*



- SAN Volume Controller delivers a common approach to storage virtualization for a wide range of virtualized server environments including IBM PowerVM, VMware, Hyper-V, and XEN.
- IBM has a comprehensive solution for storage virtualization. Virtualization offerings are available for all IBM server and storage platforms, and even non-IBM disks. Storage virtualization is available for disk, tape, storage networks, and file systems.

IBM has decades of experience developing innovative products and supporting clients with virtualized storage and servers. Benefits can include:

- Better application and information availability
  - Move applications without disruption to users
  - Deploy applications faster
  - Move data safely without disruption to applications
  - Simplify use of tiered storage
  - More flexible disaster recovery
- Remove limitations of physical infrastructure
  - Enable information management without concern about information location
  - Increase flexibility and responsiveness to business requirements
  - Ease deployment of multi-vendor environments



- Simpler infrastructure and management
  - Logically consolidate without physical consolidation
  - Physically consolidate while keeping workloads separate
  - Simplify and standardize management
  - Improve administrator productivity
  - Improve resource utilization.

Storage virtualization solutions from IBM are available for several parts of the information infrastructure stack, including disk, tape, network, files, and file systems. Clients can implement 100 percent virtualized environments, or focus on one layer at a time, as needed, to relieve bottlenecks.

- Disk virtualization—SAN Volume Controller supports over 130 IBM and non-IBM storage systems
  - New SVC hardware delivers up to 2x better price/performance for most applications and can support up to 800,000 read IOPS at less than 1 ms response time with new SSD option.
  - SVC software extends storage virtualization to other IBM and even non-IBM disk systems.
  - New IBM Tivoli Storage FlashCopy Manager provides tight integration between SVC replication and server software to speed backups and improve availability.



- New IBM Storwize V7000 helps to increase administrator’s productivity as result of easier storage provisioning, load balaning, and data migration.
- Tape virtualization—IBM Virtualization Engines TS7600, TS7700, and VTFM
  - Accelerate backups and recalls by using a tiered hierarchy of disk and tape, making more efficient use of tape drives.
- Network virtualization—IBM converged switches and adapters
  - Manage service levels with virtualized 10 Gb Fibre Channel over Ethernet (FCoE) switches and adapters. Larger SAN Directors also offer virtualization.
- File and file system virtualization
  - IBM Scale Out Network Attached Storage (SONAS) is a petabyte-age system that can grow with unprecedented scale and deliver computing services that make the technology underlying user devices almost invisible.
  - Virtual File Manager delivers a simple user interface for multiple network file systems.

## MORE ON THE WEB

- [White paper: Deploying IBM Storwize V7000 in VMware Environments](#)



- Virtualized server support
  - SAN Volume Controller supports a very wide range of virtualized server environments.
  - N series offers integrated VMware support, including deduplication.
  - IBM Proventia Virtualized Network Security Platform integrates security processes into the VMware provisioning process.

## Deduplication: Reduce Costs and Enhance Agility

As companies continue to create more and more information, backups become more difficult and more costly. Most information that is backed up isn't unique but rather a copy of the original. For example, businesses on average store more than 10 copies of every single email and its associated attachments. As weekly and monthly backups are performed, that email can be stored more than a hundred times, consuming more and more storage space.

Data deduplication can help ensure that information is stored only once. This technology is especially critical for companies that have growing volumes of backup data. Data in backup environments changes at an average rate of 2 percent per day by volume, implying that an average of 85 percent of weekly full backups are duplicate objects. By eliminating redundant data, organizations can ultimately increase agility and improve responsiveness to changing marketplace conditions.





IBM data deduplication solutions are unique in the industry for the following reasons:

- IBM ProtecTIER software provides advanced deduplication technology that can deliver performance, scalability, and proven enterprise-level data integrity to address the needs of enterprise data centers as well as mid-size business environments—all while helping to reduce infrastructure costs.
- ProtecTIER Gateways and Appliances can deliver over 1000 MB/sec throughput, with 25:1 reduction in storage, up to 9x faster than competitors!
- N series offers primary storage deduplication, which reduces physical storage 50 percent, on average.
- TSM version 6 delivers powerful deduplication capabilities for disk storage pools with a simple software upgrade.
- IBM has the broadest portfolio of deduplication solutions in the industry to solve customer issues with the most effective technology. Whether it's source or target, inline or post, hardware or software, disk or tape, IBM has a solution with the technology that best solves the problem.

Benefits of data deduplication can include:

- Reduced storage capacity required for a given amount of data
- Ability to store significantly more data on the same size disk
- Restore from disk rather than tape may improve ability to meet recovery time objective (RTO)

- Lower storage-management cost resulting from reduced storage resource requirements.

IBM ProtecTIER deduplication solutions include high-throughput, inline deduplication virtual tape libraries, gateways, IBM System Storage TS7680 ProtecTIER Deduplication Gateway for System z technology with native IBM z/OS operating system support, and the new IBM System Storage TS7610 ProtecTIER Deduplication Appliance Express device, which is packaged for simplified deployment in mid-size environments.

## Data Deduplication and Data Reduction

Data deduplication is a method of reducing storage needs by eliminating redundant data. Only one unique instance of the data is actually retained on storage media, such as disk or tape. Redundant data is replaced with a pointer to the unique data copy.

Data reduction is the removal of old, stale, or orphaned data from an active disk AND removing duplicate data to save time and space, thus improving the ROI and TCO for an existing investment.

Data deduplication and data reduction solutions from IBM are available for several parts of the information infrastructure stack, including virtual tape, backup disk storage pools, email archives, and primary disk storage. IBM clients can launch a centralized deduplication project, or migrate to products that include deduplication over time, to reduce operating expenses.



- High throughput in-line deduplication— ProtecTIER gateways and appliances
  - Independently measured at over 1000 MB/sec, with 20:1 reduction in storage
  - Appliances are available in multiple sizes for simpler implementation in mid-size data centers.
- Primary NAS storage— N series Deduplication
  - Primary storage deduplication reduces physical storage 50 percent, on average.
- Backup and file archive— Tivoli Storage Manager
  - Deduplication in disk pools means more restores and retrievals happen from disk rather than tape. Included in TSM v6.
- Email archive— IBM Content Collector
  - Duplicate emails and attachments can be eliminated from archive storage.
- Data reduction— Tivoli Storage Productivity Center, Storage Enterprise Resource Planning (SERP), DB2
  - Reduce physical storage by up to 20 percent by identifying duplicate objects and potential wasted space in file systems and databases.

## MORE ON THE WEB

- [Red Paper: N series A-SIS Deduplication Deployment and Implementation Guide](#)



- Reduce database storage requirements by over 50 percent with DB2 compression.
- IBM Tivoli Storage Manager
  - Automate data backup, restore, and archive functions. Centralize storage management operations. Includes deduplication for storage pools.
- N series Deduplication
  - Support deduplication for primary storage on easy-to-operate NAS storage.
- Content Collector
  - Better manage the growth of email and file systems, while mitigating information risks.

## **Real-time Data Compression: Deliver Better Customer Service by Improving Efficiency and Throughput of Primary Storage**

Companies are currently challenged to reduce the storage footprint of their primary, active storage. Addressing this challenge is essential because efficiency improvements in primary storage can improve efficiency for downstream data copies and backups too. Real-time data compression is the latest innovation in primary storage optimization technology. According to initial IBM findings, this capability can shrink data up to 80 percent before it is written to the storage system, improving efficiency for both the disks and storage system cache. So the result is that the amount of storage required is reduced throughout the entire storage life cycle



because the compression occurs at the point of origin. Compression can help organizations slow the growth of storage acquisition and related storage life-cycle costs, including reducing the amount of storage to be managed, powered, cooled, and housed.

Real-time data compression can also enable organizations to gain enhanced throughput and response time because it ultimately reduces the amount of data that the storage infrastructure is processing. In other words, real-time data compression improves storage efficiency so organizations can deliver better service to internal and external customers.

## Real-time Data Compression Technology

IBM offers real-time data compression appliances that can improve online storage optimization, helping to dramatically lower costs without causing performance degradation. The IBM Storwize STN6500 and IBM Storwize STN6800 appliances sit in front of network-attached storage (NAS) or NAS gateways and, according to IBM experience, transparently compress primary storage up to 80 percent.

## Solid-State Storage Architectures

Solid-state storage devices (SSDs) use memory-type devices for mass storage rather than spinning disk drives or tape drives. First-to-market SSDs are the same size as standard hard disks, so they plug easily into existing disk drive systems.

Solid-state storage is available for all IBM server platforms, DS8000, V7000, and DS5000 platforms, the IBM stor-



age virtualization system, and SAN Volume Controller. IBM is developing techniques for applications to exploit solid-state storage more efficiently, starting with DB2.

Solid-state storage technology can have the following immediate benefits:

- Significantly improved performance for hard-to-tune, I/O bound applications
- Less floor space required
- SSDs can be filled to nearly 100 percent without performance degradation
- Faster access times
- More input/output operations per second
- Reduced energy use
- No code changes required.

IBM solid-state storage architectures are unique in the industry for the following reasons:

- IBM performs primary research to develop solid-state storage technology, resulting in several patents already.
- IBM is first to market with a storage virtualization system that
  - Includes solid-state storage
  - Builds on IBM Quicksilver technology demonstration—Up to 800,000 read IOPS with no application tuning.



## MORE ON THE WEB

- [White paper: Easy Tier Enables IBM Storwize V7000 Users to Get the Most Out of Solid-State Drives](#)
- [Press Release: Solid-State Drive Sets Speed Record, September 2008](#)
- [White paper: IBM System z and System Storage DS8000: Accelerating the SAP Deposits Management Workload With Solid-State Drives, 2009](#)
- [White paper: Driving Business Value on Power Systems with Solid-State Drives, April 2009](#)
- [Redpaper: Ready to Access DB2 for z/OS Data on Solid-State Drives, 2009](#)
- [Redpaper: DS8000: Introducing Solid-State Drives, 2009](#)
- [Techdoc: IBM System Storage DS8000 with SSDs: An In-Depth Look at SSD Performance in the DS8000](#)
- [Press Release: IBM Helps Companies Gain Control of Their Information with Solid-State Flash Technology, May 2009](#)

- Moves data to solid-state storage without application disruption
- Supports non-IBM storage as well.
- IBM System Storage Easy Tier optimizes solid-state storage deployments simply, automatically, and economically. Easy Tier enables clients to deploy solid-state storage confidently, effectively, and economically by automatically and dynamically moving only the appropriate data to the SSDs in the system, based on ongoing performance monitoring. Such effective storage tiering will help clients enjoy the performance benefits of SSDs without requiring administrators to create and manage storage tier policies and without the excessive



costs associated with placing too much of the wrong data on these relatively expensive drives. With less than 10 percent solid-state storage, smart data placement can deliver over 90 percent of the throughput increase of an all solid-state arrays infrastructure, substantially reducing capital expenses for high performance storage solutions.

Solid-state storage continues to be expensive relative to hard disks, putting it out of reach for all but the most important applications. IBM is making solid-state storage affordable, with innovative architectures, system and application integration, and management tools that enable effective use of solid-state storage.

Solid-state technologies will continue to evolve. IBM researchers have been making significant breakthroughs and will continue to bring the best implementations to IBM customers. Extensive work and innovation is still required to bring the full value of this technology to market.

## **Automated Storage Tiering: Speed Searches and Reduce Access Times**

Automated tiering can help reduce costs and improve access times by storing information more intelligently. Information that is searched for and accessed more frequently can be automatically moved to faster solid-state drives (SSDs) while information that is seldom used is moved to less expensive disks. This technique helps produce faster search results, minimize management overhead, and reduce the cost of storing information.





A published Storage Performance Council (SPC) benchmark of a storage system using IBM System Storage Easy Tier software reports a performance improvement of more than 200 percent by using the application to automatically migrate only 2 percent of the data from hard disk to SSDs. The IBM system with the System Storage Easy Tier software delivered 32,998.24 SPC-1 benchmark input/output operations per second (IOPS) at a price per IOPS of \$47.92.

Another published benchmark demonstrates that the System Storage Easy Tier application can be competitively priced as well as fast. An IBM enterprise-class configuration with IBM Power Systems servers and a System Storage DS8000 device with the System Storage Easy Tier feature was included in the “Top 10 price/performance” report published by the Transaction Processing Performance Council (TPC), a list dominated by departmental servers such as Dell PowerEdge and HP ProLiant.

## Automated Storage Tiering Technology

IBM System Storage Easy Tier automated storage tiering was first developed for the System Storage DS8000 enterprise storage system and is now available for SAN Volume Controller software and the Storwize V7000.

## Thin Provisioning: Allocate Just the Right Amount of Storage

Companies need more flexibility than ever before. They must be able to react to changes in the marketplace, customer behavior, and their business processes. To maintain this level



of flexibility, organizations must be able to deploy new applications as quickly as possible and also provide the necessary storage for these applications, which can place a great burden on storage infrastructures. To minimize this burden, it's essential to allocate just the right amount of storage for each application. No more, no less.

In the past, companies relied on “thick provisioning” which involved creating reserve pools of storage capacity for each database and file system. Reserve storage was difficult or impossible to share between applications, so fast-growing applications often needed more new storage, while other applications might have hoarded unneeded reserve storage. Storage systems provisioned in this manner typically consumed more storage capacity than they actually required, which contributed to low storage utilization and storage sprawl.

Thin provisioning provides a way for organizations to optimize the utilization of available storage. By allocating storage space as needed from a shared pool, thin provisioning can improve storage utilization rates significantly, potentially without adding administrative costs. Thin provisioning can help organizations reduce capital costs because they reduce

*“The benefits of thin provisioning are obvious—no space wasted today sitting around for future use and a lot less attention to storage administration. Additionally, and very important, is the reduced worry about an application running out of allocated space. Thin provisioning is a no-brainer.”*

*— Mike Kahn, managing director,  
The Clipper Group, Inc.*



the need for new storage devices, and it can also help cut floor space needs and overall energy costs.

## Thin Provisioning Technology

Thin provisioning technology is available in a number of IBM storage systems, including the IBM System Storage DS8000 device, the XIV Storage System device, Storwize V7000, and SAN Volume Controller software.

## Next Generation Scalable Storage

Next generation applications need next generation storage. Many new applications manage rich data, need always-on availability, and have the potential for rapid scale up and scale down. Next generation applications often start as ideas in a lab, but have the potential to grow very large. Traditional storage systems are optimized for entry, midrange, or enterprise workloads. While there is overlap, most traditional storage systems have a price/performance sweet spot in one of the three categories. Next generation applications are challenged by traditional storage because of the high entry cost of enterprise storage and the impracticality of changing from entry to enterprise storage in the middle of a growth spurt. IBM's Next Generation Storage Systems, including XIV and Scale Out File Services (SOFS), enable clients to leverage grid-based storage architectures to address critical "next generation" requirements such as the need for massive scalability, simplified operation complexity, improved administrator productivity, and lower overall IT costs and energy costs per



TB of data. IBM's Next Generation Storage Systems solutions are unique in the industry for the following reasons:

- XIV can rebuild data from a 1 TB drive in 40 minutes or less for most workloads with minimal performance impact, compared to hours of degraded performance with other solutions.
- XIV has over 50 patents files.
- Scale-out File Services can manage 500 billion files with fast file retrieval and integrated data protection.
- Scale-out File Services leverages GPFS, a file system proven to scale with daily use in some of the largest supercomputer environments.

Next generation scalable storage solutions from IBM use grid architectures. The inherent benefits of grid storage address the inherent requirements of next generation applications:

- Ease of use
- Start small and grow
- Use standard hardware for lower acquisition and upgrade costs
- Scalability
- Non-disruptive upgrades.

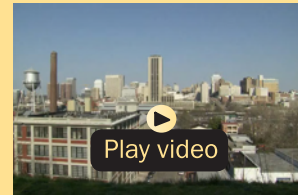
The benefits are real. Some examples include:



*Iowa Health (3:29)*



*Spectrum Health (3:41)*



*Virginia Commonwealth University (3:49)*

- IBM was able to reduce costs by managing more than 92,000 worldwide users with one storage cloud and one management team.
- Iowa Health System saw a 90 percent lower cost for data management due to simplified operations and the use of standard high capacity hardware.
- HDMS, a subsidiary of Aetna, experienced a 70 percent performance increase in core SAS applications, while reducing floor space and energy and administrative expenses.
- Virginia Commonwealth University noticed an immediate 6°F drop in data center temperature after migration to IBM Next Generation scalable storage.

Grid solutions deliver near linear scalability because they allow the addition of new nodes. Nodes include CPUs, memory, network interfaces, and storage; connected to other nodes by a fast interface bus. IBM capabilities include:

- Scalable block storage—IBM XIV Storage System



- Automated and virtualized data management and dramatically simplified systems management help tame your dynamic workloads.
- Scalable file storage—IBM Scale-out File Services
  - Simplify operations with one global namespace and one point of management for up to 500 billion files.
- Medical image management—IBM Grid Medical Archive Solution
  - Multi-node architecture and advanced replication enable high availability. Efficient components reduce operating expenses.

## Mainframe Storage

Large applications that depend on high availability and short recovery time objectives can often improve efficiency and effectiveness with IBM Storage solutions. IBM offers comprehensive data protection capabilities, scalability, and reliability. IBM offers optimized enterprise storage solutions for Linux, UNIX, Windows, and z/OS environments. IBM solutions include disk, tape, virtualization, management software, and consulting services.

IBM enterprise storage solutions are unique in the industry for the following reasons:

- As the owner of System z architecture, IBM is in a unique position to leverage the strong synergy between System z hardware, software, and storage. The result is a number of



first-to-market capabilities that drive additional client value. Examples include:

- Solid-state disk tooling for DB/2 for breakthrough price/performance
  - Extraordinary performance for mainframe workloads
  - Leading business resiliency solutions
  - Multiple readers for improved z/OS Global Mirror throughput
  - Extended address volumes for very large data sets—Multitrack support for high performance FICON for increased channel utilization and higher data throughput.
- As the owner of POWER architecture, IBM is in a unique position to leverage CPU technology to drive storage array performance. The result is a number of capabilities that deliver improved price/performance, including:
    - Optimized use of cache
    - Improved recovery time objectives (RTO)
    - Optimized use of POWER and ASIC technology
    - Faster upgrades to new chip technology
    - IBM has been the market share leader for enterprise branded tape for several years in a row.
    - Media encryption at the drive level, for both disk and tape, enables a new way to improve data security with little or no performance impact.



## Storage Encryption and Security Management

IT security is complex, but can be summed up very simply: Let the good guys in, keep the bad guys out... and be able to prove it. For many organizations, information privacy is an IT challenge that continues to defy simple answers and generate negative publicity. Because of mandatory disclosure laws in many countries, more data security breaches must be reported. In some countries, victims are entitled to compensation.

Companies are at risk from external hackers, accidental loss, and internal theft. Since 84 percent of security breaches are internal, we can't simply install better locks on the doors. The total cost of security breaches can include:

- Loss of customer information
- Loss of customer confidence
- Loss of intellectual property
- Legal and regulatory exposures
- Loss of brand equity
- Cost of remediation
- Business disruption.

The cost of losing data and searching for it has skyrocketed:

- We saw the first US HIPPA (Health Insurance Portability and Accountability Act) fines levied in 2011:
  - \$1 million dollars for losing patient records





- \$4.3 millions for failing to provide medical records upon request.
- Organizations in the U.S. report that searching electronic records for lawsuits can cost millions of dollars each.
- The average cost of downtime in manufacturing is \$1.6M per hour.

Think it can't happen to you? In 2008, the UK Royal Air Force lost three unencrypted hard disks in a secure data center, on a secure military base. Failure to fully disclose the security breach for several months compounded the costs to the RAF and elected officials.

IBM drive level encryption for both disk and tape addresses a security exposure at little or no cost, with little or no performance impact. The benefits of storage encryption and key management include:

- Enables secure sharing of information with employees, customers, and suppliers
- Less cost and risk from lost or stolen media
- Simple disk sanitization
- Simplified auditing and reporting
- Helps implement best practices and policies consistently.

IBM encryption and key management solutions are unique in the industry for the following reasons:

- IBM was first to market with drive level encryption for disk and tape, both enterprise and midrange.



- Drive level encryption and centralized key management is proven to be fast, scalable, and efficient:
  - Fast: Encryption has little or no performance impact
  - Scalable: Able to encrypt many devices in parallel
  - Efficient: Able to compress before encryption, reducing media expenses. Other external encryption designs create data streams that can't benefit from drive-level compression.
- IBM storage encryption can address PCI (payment card industry) data security standard requirements.

IBM Information Infrastructure offers a variety of information security solutions designed to help organizations address virtually any dimension of a secure infrastructure. IBM has the knowledge and expertise to help customers deploy tactical security solutions, as well as design and implement full end-to-end security across the extended enterprise.

IBM is committed to providing the right technologies and expertise to deliver leading edge information security solutions to both large and small businesses, including identity and access management, intrusion protection, compliance monitoring, and professional services that customers can use to design and implement holistic solutions across the enterprise.

IBM Security Management solutions are unique in the industry for the following reasons:



- IBM Internet Security Systems (ISS) offers the industry's only security guarantee with managed security services providing up to 55 percent savings in IT security management costs.
- ISS was ranked number one in Managed Security Services and Vulnerability Assessment by Frost & Sullivan.
- IBM Tivoli was ranked number one for Identity Management by Frost & Sullivan.
- Tivoli is the market share leader in identity and access management, according to top analysts.
- IBM is the market share leader in application security vulnerability scanning, according to top analysts.
- In April 2009, NSS Labs, a leading global independent testing lab that focuses on security product testing and certification, awarded IBM Proventia Network Intrusion Prevention System (IPS) appliance GX6116 the highly coveted "Gold" award.
- IBM has the unmatched global and local expertise to deliver complete solutions—and manage the cost and complexity of security.

## Self-Encrypting Storage

Self-encrypting storage is a design, pioneered by IBM, where an encryption chip is built into the storage device, rather than an external component. Self-encrypting storage has important advantages over other media encryption designs:

- Fast: Encryption has little or no performance impact



- Scalable: Able to encrypt many devices in parallel
- Efficient: Able to compress before encryption, reducing media expenses. Other external encryption designs create data streams that can't benefit from drive-level compression.

On May 9, 2008, the U.S. National Security Agency (NSA) reported that it evaluated the drive-level encryption used by IBM and determined it to be "acceptable for the protection of sensitive but unclassified information in national security system solutions, and acceptable for use with other approved assurance mechanisms in classified national security systems."

The benefits of storage encryption and security management are:

- Enables secure sharing of information with employees, customers, and suppliers
- Less cost and risk from lost or stolen media
- Simple disk sanitization
- Simplified auditing and reporting
- Helps implement best practices and policies consistently
- Helps address security compliance standards.

IBM capabilities in self-encrypting storage and security management include:

- Drive level media encryption (Disk: DS8000, DS5000, DS3500; Tape: LTO, TS1130)



- Drive level media encryption has little or no performance impact, so clients can implement 100 percent encryption. Encryption means one less worry for risk managers.
  - IBM was first to market with drive level encryption for disk and tape, enterprise and midrange.
- Security management (Tivoli Key Lifecycle Manager, Tivoli Identity Manager, Tivoli Access Manager, Tivoli Security Information & Event Manager)
  - Open standards, ease of integration, simplified operations, and automated reporting help mitigate information risks efficiently and effectively.
  - Tivoli Key Lifecycle Manager generates keys for self-encrypting disk and tape drives.
- Security services and appliances (Internet security systems)
  - Comprehensive, flexible, and adaptable security solutions that provide visibility and control over the entire realm of IT security.
  - The industry's only security guarantee with managed security services offering up to 55 percent savings in IT security management costs.
  - IBM has the unmatched global and local expertise to deliver complete solutions—and manage the cost and complexity of security.



## Business Intelligence Platform Integration

Organizations must tap into the intelligence of the entire value chain, correlating insights and anticipating opportunities and threats. IBM Business Intelligence platform integration solutions are unique in the industry for the following reasons:

- IBM is singularly able to address this need based on its ability to integrate a deep understanding of IT systems, cutting-edge technologies, the capabilities of partners, and meaningful business insights to drive better optimization.
- They offer improved performance and reduced storage requirements: Performance improvements up to 600 percent and reduced storage requirements up to 70 percent.
- They offer proven scalability that supports thousands of users and petabytes of data.
- IBM is both a Business Intelligence platform provider, with DB2 and Cognos, and a partner with other BI platform providers including Oracle, SAP, and Sybase.

There is no bigger problem facing individuals and organizations today than the reality that they can't keep pace with the information explosion. Organizations must tap into the intelligence of the entire value chain, correlating insights and anticipating opportunities and threats. IBM is singularly able to address this need based on its ability to integrate a deep understanding of IT systems, cutting-edge technologies, the capabilities of partners, and meaningful

### MORE ON THE WEB

- [Business Intelligence info on IBM.com](#)



business insights to drive better optimization. IBM provides the tightly integrated information infrastructure that clients require as a foundation for implementing this new intelligence.

IBM provides business intelligence platforms that allow companies to optimize their business processes, delivering:

- End-to-end solutions: IBM and ISV solutions that are pre-tested, preconfigured, easy to install and maintain, and right-sized for clients' environments
- Improved performance and reduced storage requirements: Performance improvements up to 600 percent and reduced storage requirements up to 70 percent
- Proven scalability that supports thousands of users and petabytes of data
- Improved decision-making, business insight, and time-to-business results.

## Storage Infrastructure Management

Controlling the complexity of information infrastructures is critical for maintaining high availability at a reasonable cost.

Monitoring and reporting tools typically have a rapid ROI because they

automate tasks previously performed by specialists. With proper tools in place, specialists spend more time performing analysis, provisioning, and other more valuable tasks.

### MORE ON THE WEB

- [White paper: Simplify Remote Office Data Recovery](#)



IBM Storage Infrastructure Management solutions are unique in the industry for the following reasons:

- End-to-end performance reporting across the storage stack can simplify problem determination and performance tuning.
- Management of both standard and virtualized storage, including non-IBM storage, means improved effectiveness and efficiency for administrators.
- Powerful storage resource management can identify up to 20 percent of storage for reclamation by identifying duplicate files across the enterprise.
- New continuous data protection solutions eliminate the need for traditional backups, and provide near-instant access to data in an emergency.

The benefits of storage infrastructure management can include:

- Simpler administration
- Improved performance; fewer bottlenecks
- More consistent configurations; fewer configuration errors
- Faster deployment
- Faster repairs
- Data reduction of up to 20 percent.

IBM Storage Infrastructure Management solutions support IBM and non-IBM storage, giving administrators fewer monitors and reports to manage. The results can be simpler infra-





structure management, more automation, better service, and lower total costs. IBM capabilities include:

- Disk management—SAN Volume Controller, Tivoli Storage software, XIV, N series
  - Virtualized storage—SVC can increase utilization by 30 percent or more with block virtualization, online copy services, and thin provisioning.
  - Monitoring and management—Tivoli Storage Productivity Center can improve SAN disk utilization up to 20 percent with a powerful management console and reporting interface for virtualized, non-IBM, and IBM disks. The new performance management module from IBM Research generates heat maps to illustrate end-to-end storage throughput.
  - Block storage—XIV includes provisioning, virtualization, self-healing, and an easy-to-use GUI to simplify management of dynamic environments.
  - NAS storage—N series includes a consistent GUI that simplifies operations for part-time or inexperienced administrators.
- Data protection—Tivoli Storage Manager and TSM FastBack
  - Comprehensive data protection with customizable operational reporting.
  - Tivoli Storage Manager enables policy-based backup and retention and includes leading capabilities such as simple



disk-tape migration, point-in-time recovery, disaster recovery management, and operational reporting.

- TSM Fastback shadows disk writes to a recovery system, which enables near instant recovery of Windows files without the burden of performing Windows backups.
- Data migration—Data Mobility Services, Transparent Data Migration Facility
  - Transparent Data Migration Facility helps clients move application data across platforms with little or no downtime. TDMF runs on Windows, Unix/Linux, and mainframe z/OS.

## The New Information Life Cycle

Traditionally, organizational data was viewed as having value early in its life cycle, but that value was seen to decrease fairly rapidly after being created or ingested. Today's smarter systems are analyzing historical information using business analytics such as automated trend analysis to improve decision making, forecasting, and prediction. This stretching of the active archive period is a key enabler of our smarter systems but has created new challenges for IT organizations.

For example, businesses face a never-ending struggle to manage capital expenditures and reduce operational costs. At the same time there is a drive to accelerate business velocity by providing increasingly faster access to data while increasing throughput and to ensure the continued availability of that data by eliminating downtime, speeding data recovery in the event of an unplanned loss, and providing disaster recovery and business continuity planning for the entire data



infrastructure. Increased government regulations around retaining, auditing, and reporting on data only compound the challenge.

As this new life cycle of information continues to evolve and become more complex, data will need to be efficiently managed and protected yet effectively retained and archived. This optimization is achieved when software and hardware products are approached in an integrated manner, providing IT professionals with solutions that work to address their specific needs. This life cycle also helps companies remain more competitive by speeding access to aging and disconnected data. With smarter archiving solutions from IBM, companies can perform deeper trending activities, improve decision making with data-based business analytics, and optimize enterprise content management.

## Data Protection and Retention Solutions from IBM: Preserving and Managing Data for the Long Term

Creating a more efficient storage environment starts with storing less data and making better use of existing assets, but at the right time and in the right place for better use of aging data over time. Data protection and retention solutions from IBM extend storage efficiency and help organizations move their data to the right place—over time. IBM can help businesses reduce the complexity of data retention, security, backup and recovery while simplifying data management and reducing the need for bandwidth.

- **IBM ProtecTIER Deduplication solutions**—Reducing the amount of data that needs to be stored by the process of



data deduplication is a key step in simplifying enterprise data management. IBM ProtecTIER Deduplication solutions can help meet disk-based data protection needs while enabling significant infrastructure cost reductions. IBM ProtecTIER Deduplication solutions include high-throughput, in-line deduplication virtual tape libraries (VTLs); gateways; IBM System Storage TS7680 ProtecTIER Deduplication Gateway for System z technology with native IBM z/OS operating system support; and the new IBM System Storage TS7610 ProtecTIER Deduplication Appliance Express device, which is packaged for simplified deployment in mid-size environments. IBM ProtecTIER Deduplication solutions can help meet disk-based data protection needs while enabling significant infrastructure cost reductions and are designed to offer the following benefits:

- Improved scalability—IBM ProtecTIER Deduplication solutions provide enhanced scalability and can store more data than competitors' systems.
- Shortened backup windows—By enabling a deduplicated virtual tape library, ProtecTIER can shorten backup windows. Also, IBM disk-to-disk backups and disk-to-disk restores are faster and produce fewer errors.
- Reduced storage space requirements—In-line data deduplication can dramatically lower storage space requirements.
- Diminished costs and improved safety—Replicate deduplicated data to remote recovery sites for a more affordable, safer alternative to sending tapes off site.



- **IBM Tivoli storage management software**—When coupled with IBM Tivoli software, data protection and retention storage services from IBM can help organizations improve data backup and reduce their data storage footprints. Less data to manage typically means less storage and less downtime. For example, Tivoli storage management software solutions scale to address the most demanding environments, both in terms of capacity and across the distributed, heterogeneous enterprise. Companies cannot afford to lose data or access to data for extended periods. IBM Tivoli Storage Manager and IBM Tivoli Storage FlashCopy Manager software help clients virtually eliminate backup windows, reduce the amount of data at risk between backups to almost zero, and reduce the time to recover from practically any data loss. This helps organizations ensure that their data is protected and easily recoverable to help keep the business operational.
- **Tape solutions from IBM**—Tape storage continues to figure prominently in the modern data center environment. Tape is removable and portable, enabling it to be protected from corruption, viruses, or sabotage or to be relocated in the event of an unplanned disaster, and offline tape is completely protected from network attacks. Tape scales easily by simply adding more cartridges. It is reliable, dependable, and fast. It is cost-effective, in many cases costing up to 10 times less than disk storage. Clearly tape is one of the most efficient ways to store data for many years—and for many decades—to come. And IBM offers one of the broadest ranges of tape solutions in the marketplace today. EMC doesn't sell tape solutions. And when Oracle customers purchase new tape



drives they may have to replace their existing cartridges, costing money and creating waste. IBM allows its older tape cartridges to work in its newer drives, reducing our clients' valuable operating expenditures. The next evolution of tape file systems involves a central directory that lives on the tape library—meaning organizations can store file entries for virtually unlimited numbers of tape cartridges and see what's on them without ever mounting a tape.

As the proliferation of data increases; as regulatory requirements demand that more and more data be stored for longer periods of time; and as large file exchanges require ease of use, durability, and openness, tape storage solutions, such as those using IBM Linear Tape-Open (LTO) technology, can help organizations meet these challenges while providing a cost-effective alternative to all-disk drives. The latest IBM LTO drives can dramatically reduce the number of cartridges needed and save space for backups with much greater capacity than the previous generation. They offer faster throughput, expanded speed matching, and increased data buffer size while delivering virtually unprecedented energy efficiency. IBM LTO drives offer the ability to address compliance requirements with continued write-once, read-many (WORM) and encryption capabilities as well as the ability to read and write LTO Ultrium 4 data cartridges and read LTO Ultrium 3 cartridges. IBM LTO solutions tackle competitors head-on.

IBM Long Term File System is virtually the first file system that works in conjunction with LTO Generation 5 tape and brings a new level of use and portability to open systems



tape storage. This storage software helps reduce complexity in data management and shorten access time through the enablement of a self-describing tape that includes a simple file index. It helps decrease tape, file management, and archive costs while improving response time for new business needs.

IBM also offers the IBM System Storage TS1140 Tape Drive, an enterprise class drive that supports System z servers as well as open systems servers. The TS1140 tape drive preserves media investments by enabling read as well as rewrite of existing tapes at higher capacity and significantly higher performance, while many competitors can only read existing tapes. TS1140 tape drives may offer a faster interface transfer rate than competitive drives with dual eight gigabit (Gb) fiber interfaces.

- The IBM TS1140 tape drives perform at 650 MBps maximum sustained throughput.
- The IBM drive provides significantly faster data recalls and searches than many competitors, enabling faster access to data.
- The entire cartridge is recorded in fewer end-to-end passes than competitive tape, resulting in decreased media and head wear when recording large amounts of data.
- The IBM drive, at 51 watts maximum power, including cooling, and 21 watts standby, is far more energy efficient than those of many competitors.



## Data Protection and Retention from IBM: Enhanced Solutions and Services

There are many options today for clients in the data protection and retention space. IBM offers enhanced solutions designed to help you retrieve data as rapidly as you need, store it for as long as you need, and recover it quickly in case of data loss.

Intelligent data storage solutions from IBM enable the storage of twice as many volumes on a single IBM Virtualization Engine TS7700 virtual tape library, reducing hardware and floor space requirements. The IBM System Storage TS3500 Tape Library shuttle connector allows access to more than 2.7 exabytes in a single library image. IBM Real-time Compression Appliances are designed to reduce the amount of storage you need on file servers by 80 percent, and now enterprise content management (ECM) file servers are supported.

## IBM Smart Archive Strategy: A Hardware, Software, and Services Approach

The traditional models for storing and retaining an organization's information are simply no longer practical. The IBM Smart Archive Strategy is a comprehensive approach that combines software, systems, and services to help better collect, organize, analyze, and leverage data to increase its value. This approach delivers a comprehensive set of solutions, products, and services in a unified and integrated strategy that can help drive down costs and risks and help ensure that critical business content is properly retained and protected.





The IBM Smart Archive Strategy can help organizations speed time to value by simplifying their storage environment through a set of modular yet integrated solutions that offer businesses a choice of management and delivery models based on their unique information life span, policies, and regulatory compliance mandates.

The IBM Smart Archive Strategy includes specific solutions designed to meet critical storage needs.

- Optimized and unified ingest capabilities
  - IBM Content Analytics for Assessment software
  - The IBM Content Collector family of offerings, which supports multiple information types including email, files, and Microsoft SharePoint content as well as SAP data and document archiving, SAP content-enabling, and complementary process management for SAP in a modular, extensible platform
  - IBM InfoSphere Optim Data Growth solutions, together with the IBM Content Collector family, which provide expanded capabilities to unify structured and unstructured data archiving with IBM Classification Module software
  - IBM InfoSphere Discovery with InfoSphere Optim Data Growth solutions.
- Flexible and security-rich infrastructure
  - Enterprise content management repositories from IBM
  - IBM Information Archive software



- IBM Information Archive for Email, Files and eDiscovery software
- IBM and IBM Business Partner cloud offerings
- Storage and archive services from IBM Global Technology Services.
- Integrated compliance, records, analytics, and electronic discovery (eDiscovery)
  - IBM Enterprise Records software
  - IBM eDiscovery Manager and IBM eDiscovery Analyzer software
  - PSS Atlas solutions (from PSS Systems, an IBM Company) for legal and information life-cycle governance
  - IBM Content Collector Discovery Analytics software.

# 3

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## General System Storage Resources

This chapter provides you with general information and valuable resources that will help you as you sell IBM products.

### How to Sell IBM System Storage Products

In this section, we offer ideas that will help you identify and explore opportunities for selling IBM System Storage.

### Identifying Storage Sales Opportunities

Following are some “triggers” that tell you there is a sales opportunity for IBM Storage.

#### *General*

- Is the customer buying servers? Server buyers tend to buy storage within three months of their server purchase.
- Is the number of users of the application increasing? Adding employees or upgrading applications generally leads to additional storage needs.
- Are existing storage assets coming off lease or nearing the end of the depreciation cycle? The data on multiple older storage controllers can often be consolidated onto a single newer, faster system with cost savings.





- Does the customer already have IBM external storage installed but is running out of capacity? This is an opportunity to upgrade the storage.

### ***Storage Efficiency***

- Is your data growing and are the costs of managing your storage infrastructure growing?
- Are you concerned about how well utilized your storage is or your staff's ability to support this growth?
- How satisfied are you with the cost effectiveness of your current storage?
- Is the management of your storage infrastructure complex?
- Are you looking for new functionality or help to manage your storage growth and costs?

### ***Data Protection***

- Are your data storage needs growing?
- How will this growth impact your ability to adequately protect critical data? With the data growth you're experiencing, what impact have you seen in your backup & recovery?
- Can you electronically locate critical business information, documents, email, attachments, and messages when required?



- Are you looking for help to improve your company's backup and recovery time and reliability?
- Do you need to store all types of information (structured and unstructured) in a single repository which can be configured to archive information with compliance and non-compliance retention needs?
- Do you have needs to keep data for long periods of time?

## How to Facilitate a Storage Efficiency and Data Protection Discussion

Here are some pointers on how to start conversations with your clients and discover sales opportunities.

### *General Questions*

- Are your data storage needs growing?
- Are you spending money on distributed storage capacity attached to your servers that is not being fully utilized?
- Do you have storage systems coming off lease or nearing the end of their depreciation cycle?
- Who is your current storage vendor and are you happy with the TCO that your current storage vendor is providing you?
- Can you benefit from storage virtualization?
  - Storage virtualization can reduce administrative costs by up to 50 percent and increase disk utilization by up to 30 percent.



- Storage virtualization can improve throughput and help resolve bottlenecks.
- Can you benefit from storage consolidation?
  - IBM Storwize V7000 can increase disk utilization up to 30 percent.
  - IBM System Storage XIV can decrease storage requirements by up to 90 percent and reduce power, cooling, and space costs by up to 59 percent.
  - IBM System Storage DS8000 can consolidate storage across platforms: Windows, Unix, and System z.
- Can you benefit from data migration and storage tiering?
  - Moving 4–5 percent of data to a solid-state disk can gain 70+ percent improvement in average response time.
  - IBM offers integrated multi-tier storage systems with simplified management, helping clients optimize price and performance.
- Can you benefit from data compression and deduplication?
  - IBM ProtecTIER deduplication can reduce store 25 TB of data onto 1 TB of storage capacity with in-line throughput over 1000 MB/sec.
  - IBM Real-Time Compression appliances can shrink NAS data up to 80 percent with no performance degradation.



- Tivoli Storage Manager's integrated deduplication can store more backup data on disk for faster restores, without a separate deduplication solution.
- Can you benefit from improving your backup and restore processes?
  - Reduce the amount of data at risk of loss, and shrink restore times.
  - IBM ProtecTIER virtual tape solutions reduce backup infrastructure costs up to 45 percent over standard non-deduplicated virtual tape library systems.
- Can you benefit from implementing a smarter archive strategy?
  - Blended disk and tape solutions cut TCO by 50 percent.
  - Archiving is a Best Practice that makes most applications run better.

### ***Typical Findings After Asking the Above Questions***

- Multiple islands of storage are becoming hard to manage and are driving up costs.
- Performance is not always sufficient to meet users' needs.
- Reliability is not at desirable levels. Even a small outage is a big deal when it happens in a remote location.
- Storage capacity is not being used efficiently. Some users and servers need more storage, while capacity on other servers sits idle.



- Data backup is becoming hard to manage.
- Total storage costs are getting out of control as storage needs rise.
- Information is exposed to security risks that are not understood, or not managed.
- Regulatory requirements cannot consistently be met at the desired level.
- Personnel costs to manage storage are rising rapidly, or there is a shortage of manpower to complete all of the management work in a timely fashion.

### *Key Storage Efficiency Offerings*

Here are some of the key offerings (all covered later in this guidebook) that are in the realm of storage efficiency.

- **SAN Volume Controller:** A storage virtualization system that enables a single point of control for storage resources to help support improved business application availability and greater resource utilization.
- **IBM Storwize V7000:** A powerful midrange disk system that has been designed to be easy to use and enable rapid deployment without additional resources. Storwize V7000 offers IBM storage virtualization, SSD optimization, and “thin provisioning” technologies built in to improve storage utilization and to enable the system to be reconfigured to meet changing business needs quickly and easily.





- **IBM XIV Storage System:** Helps deliver consistently high performance through the elimination of hot spots and the full exploitation of system resources. Outstanding availability and reliability are delivered through a revolutionary redundancy scheme, enabling automated self-healing with exceptionally fast rebuild times.
- **IBM System Storage DS8000 Turbo series:** Helps 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 availability, make it an ideal storage platform for supporting today's 24x7 global business environment.
- **IBM System Storage DS5000 series:** Delivers industry-leading performance, real reliability, multi-dimensional scalability, and unprecedented investment protection.
- **IBM System Storage DS3500 Express:** Entry-level disk systems delivering midrange performance, scalability, and features such as Turbo performance, Remote Mirroring, Disk Encryption, mixed host interface, and tiered storage.
- **IBM Smart Business Storage Cloud:** A storage-virtualization solution designed to support your storage optimization efforts. It can help alleviate your data storage challenges by enabling quick implementation of a scalable, global file storage system with flexibility in deployment and management options.
- **IBM Tivoli Storage Productivity Center:** Helps customers reduce the complexity of managing their storage environ-



ments by centralizing, simplifying, and automating storage tasks associated with storage systems, storage networks, replication services, and capacity management.

- **IBM Storage Optimization and Integration Services:** Helps to reduce complexity, optimize performance, and manage growth by creating a cost-effective, scalable, and resilient storage infrastructure.
- **IBM Scale Out Network Attached Storage:** Centralize and virtualize your data in a single storage environment. SOFS are designed to eliminate your information sharing challenges through swift implementation of a highly scalable, global, clustered NAS system.
- **IBM Real-time Compression:** Shrink NAS data up to 80 percent with no performance degradation and can keep up to 5x more data online to improve business analytics and reduce the amount of data stored.

### *Key Data Protection Offerings*

Here are some of the key offerings (all covered later in this guidebook) that are in the realm of data protection.

- **IBM Information Archive:** A policy-driven, cloud-ready, next generation information retention solution that provides immediate archiving of all business information. Built-in deduplication, compression, and automated data migration to tape offer efficiency. Its scalable and flexible architecture is simple to use, manage, and expand. It offers tiered storage (disk and tape) archiving capability with built-in HSM for per-



formance and longevity. Its enhanced security features allow for retaining information to support regulatory compliance.

- **IBM Tape portfolio:** A broad portfolio of tape products to help your clients achieve efficiency and better TCO for the long term.
- **IBM Grid Medical Archive Solution:** integrates software, storage, and server products to deliver a flexible and scalable virtualized storage solution for mid-size to large healthcare organizations and hospital networks.
- **IBM ProtecTIER data deduplication solutions:** Employs an advanced form of data compression that identifies and eliminates redundant data across the data landscape, making it possible to significantly reduce the amount of data that needs to be protected.
- **IBM Information Lifecycle Management Services:** ILM Assessment, Enterprise Archive services, and Enterprise Content Management services assess a client's existing environment and help design a comprehensive strategy aligned with their business goals and performance needs.
- **IBM Content Collection and Archiving:** Enables a deeper understanding of what information to archive through discovery and analytics-based assessment technologies. Reduce point solution complexity and costs by unifying data and content archiving through common collection and classification technologies.



## Qualifying Questions

Here are questions you can use to gauge a possible sales opportunity:

- Are you under pressure to control costs and IT expenditures?
- How many servers and what operating systems do you have?
- What are the key applications that drive your storage demand?
- Can your storage scale easily to meet growth and new application needs?
- Are you unable to add additional storage capacity because of budget constraints?
- Are you concerned that you can't predict future growth? Do you need a storage system that can be upgraded to higher capacity and performance without losing your initial investment?
- Do you often find that you are adding additional servers and associated storage to keep pace with your growth?
- Do you need more capacity and performance—at a better price?
- Does storage management cost you money for staffing, education, and time?
- How much benefit would you see from having a single interface—fewer tools to learn and use—for server and storage management?



- Are your storage needs satisfied by the internal storage in the server?
- Do you need to lower IT costs and complexity while still providing a computing infrastructure with high levels of server and storage performance typical for database and online transaction processing?
- Do you have a large number of server/storage platforms and/or operating environments?
- What competitive storage or server hardware is installed and which competitor(s) are bidding for the business (EMC, HP, Dell, Sun)?
- Do you need to run test applications against live data?
- Do you need the ability to set up a disaster recovery plan?
- Do you understand the risks and costs associated with data access delay or data unavailability? Do you have the skills to complete an analysis? (IBM does—storage study.)
- Are your backup windows getting shorter?
- Are you confronted with significant complexities of storage management and looking to simplify the environment?
- Do you need to improve the security of your information?

## **IBM PartnerWorld Web Site**

IBM maintains a Web site called PartnerWorld, which has a great deal of information of use to all IBM Business Partners



worldwide. On the site you will find the latest presentations and marketing materials (such as brochures, data sheets, and case studies) as well as competitive information, consultant reports, IBM white papers, education and events, tools, technical support, and much more.

In this ebook, we have summarized and provided direct links to much of the PartnerWorld information that is most important to IBM

System Storage Business Partners. As such, this ebook is your personal

“guide” to the PartnerWorld Web site. Just the same, we encourage you to spend some time just browsing the PartnerWorld site so you can get a feel for the full scope of resources available to you.

You will need your IBM-assigned user ID and password to access some areas of PartnerWorld. If you don’t have your user ID and password, you can contact IBM PartnerWorld help. (Follow the link in the “More on the Web” box.)

#### MORE ON THE WEB

- [IBM PartnerWorld Web site](#)
- [IBM PartnerWorld news and newsletters](#)
- [Help with your IBM PartnerWorld user ID and password](#)

## Storage News and Events

You can keep current with the fast paced world of IBM System Storage by frequently checking the link shown in the “More on the Web” box.

#### MORE ON THE WEB

- [IBM Storage news and events](#)



## Incentives and Promotions

IBM offers many incentives and promotions for both business partners and your clients to help drive sales. You can find a list of the most current incentives and promotions by following the “More on the Web” links.

### MORE ON THE WEB

- [Incentives and promotions for storage](#)
- [Cross brand incentives and promotions](#)

## System Storage Education

As with almost any endeavor, time spent educating yourself and your team on appropriate topics such as selling techniques and storage product offerings will help you succeed. In this chapter we discuss two ways you can get the education you need to succeed in selling IBM System Storage products.

## PartnerWorld University

The IBM PartnerWorld University is a Web-based repository of information in many different formats. It provides technical and sales information to help you succeed as a storage business partner. You will need your PartnerWorld user ID and password to access these resources.

### MORE ON THE WEB

- [PartnerWorld University](#)

## IBM Training

IBM Training provides an array of education offerings including instructor-led training in traditional classrooms, customized training services at client locations, and IBM technical conferences built around IBM Systems platforms and solutions.



In addition, IBM also provides technical training offerings that build integration skills around the IBM Systems portfolio and complementary solutions from other strategic partners, such as Cisco, Linux, ISC(2), and VMware.

#### MORE ON THE WEB

- [IBM Training](#)

## Systems College

IBM Systems College is a key education resource offering sales and technical training, education roadmaps, certification information, tools, resources, and much more. Take advantage of on-demand learning opportunities to help you become more successful today and over the long term.

Within Systems College are the job role roadmaps, designed to build strong selling and product knowledge skills. The job role roadmaps categorize training under basic, intermediate, and advanced levels. Course and roadmap completion are automatically tracked to demonstrate progression through the various training paths.

#### MORE ON THE WEB

- [Systems College](#)

## IBM Professional Certification Program

The IBM Professional Certification program offers a business solution for skilled IT professionals who seek to develop and demonstrate their expertise to the world. It's designed to validate your skills and demonstrate your proficiency in the latest IBM technology and solutions, as well as to perform role-related tasks and activities at a specified level of competence. It is also beneficial for companies that wish to ensure minimum skill levels for their employees. Skills attainment is





a key element for business partner firms to move from Member to Advanced and Premier levels in PartnerWorld.

Certifications may be required to meet business partner authorization requirements, may be listed as options to meet program qualifications for programs such as Storage Specialty or Systems Connect for Storage, or may be pursued for personal achievement. Consult the latest authorization and program documentation for the current list of accepted certifications.

**MORE ON THE WEB**

- [IBM Professional Certification info](#)

## IBM System Storage Specialty

The IBM System Storage Specialty Offering is designed to reward IBM Business Partners who make a significant investment in skills and certifications, customer references, and have the ability to successfully sell and deploy IBM Storage solutions. The program is open to IBM resellers and solution providers who acquire products from IBM and authorized IBM Distributors and who meet the criteria outlined on the specialty Web site, and determined by the local channel partner channel organization. Storage has two levels of specialty:



- Specialty: Advanced demonstration of skills and market success consistent with strategy.
- Specialty Elite: Superior/Market leadership demonstration of skills and market success consistent with strategy.



IBM is committed to continue to support and develop this specialty and to provide additional resources to our top partners as we pursue an aggressive program of growth through 2012 and beyond. In addition, IBM will continue to simplify our business processes and align resources and benefits to those partners who actively demonstrate a willingness to invest in IBM focused skills and resources. By achieving the Storage specialty designation, Business Partners will be able to play a greater role in helping clients meet the challenges of rapidly growing data, reduced budgets, and greater customer expectations.

#### MORE ON THE WEB

- [System Storage Specialty info on PartnerWorld](#)

The benefits of participating include:

- Support resources—Accredited System Storage Specialty Business Partners will receive an assigned storage growth team representative to help them plan for future growth and proactively work with them to find the resources and support they need to extend their storage practice and drive additional revenue with IBM.
- Financial rewards—Additional incentives may be available for accredited System Storage Specialty Business Partners to invest in education, marketing, and offering development.
- Training benefits—Receive education and certification vouchers to assist in funding the education and training of your employees.
- Specialty mark—Accredited Business Partners get to raise the visibility of their leadership and capabilities in the mar-



ketplace using the System Storage Specialty mark in their advertising and collateral. The mark is evidence that their firm has acquired the skills and experience in System Storage solutions and is recognized by IBM as an expert having met the specialty criteria.

- Additional benefits are provided for those Partners achieving the “Elite” level.

You must apply for the specialty to participate, and your company must meet the specified criteria through eligible certifications and verified customer references, and achieve and maintain the minimum annual IBM System Storage revenue requirements. Higher levels of certification and revenue contribution are required for Specialty Elite.

## **System Storage Sales Certifications**

Several certifications are offered to test an individual’s knowledge and skills in a given market segment ([Figure C.1](#)). The candidate must have general experience in disk, tape, and other products in the segment. There are also several product-specific tests that provide candidates with an opportunity to demonstrate their depth of technical expertise through certification.

Follow the path to certification:

- Select the role that most closely represents your daily tasks.
- Review the job role/target audience description and test objectives which describe the skills tested.



*(When ready, schedule an appointment to take the test at a Prometric Test Center by registering at: [2test.com](http://2test.com))*

### **General storage tests:**

[IBM Certified Specialist—Storage Sales](#): This certification is intended for sellers who sell mid-range storage and associated products primarily into midrange accounts.

[IBM Certified Specialist—Midrange Storage Technical Support](#): This certification is designed for pre-sales technical representatives who assist in the sale of midrange storage and associated products primarily into midrange accounts.

[IBM Certified Specialist—Storage Sales](#): This sales certification is intended for sellers who sell primarily enterprise storage and associated products.

[IBM Certified Specialist—Enterprise Storage Technical Support](#): This certification is designed for pre-sales technical representatives who assist in the sale of enterprise storage and associated products.

[IBM Certified Specialist—High Volume Storage Fundamentals](#): This pre-sales technical certification covers entry disk and tape storage and associated products.

### **Product-specific tests:**

[IBM Certified Specialist—Storwize V7000 Technical Solutions](#): This pre-sales technical certification focuses on specific technical aspects of the Storwize V7000, including solution design and basic understanding of system implementation.

[IBM Certified Specialist—High-End Disk for Open Systems](#): This pre-sales technical specialist has extensive experience with the IBM DS8000 and associated products in an open systems environment.

[IBM Certified Specialist—High-End Tape](#): This certification is designed for pre-sales technical specialists supporting enterprise tape solutions including some solution design and basic installation support.

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**Figure C.1.** System storage sales certifications (and links to more info).



- Review the recommended training and study aids for the selected test, with a focus on areas where you need to improve your skills.
- Check your readiness to sit for the test by reviewing the sample test or taking the assessment test provided on the certification Web site. Use the results of the assessment test to identify areas where you may still need more preparation.

## Sources for Competitive Marketing Information

IBM maintains information about competing products on the IBM COMP Web site and in the sales kits found on PartnerWorld. You can access a searchable set of reports/presentations/quick reference cards about the marketplace, competitors, and competitive products. You will find materials developed by IBM as well as outside sources such as Gartner, IDC, DH Brown, IDEAS International, etc.

### MORE ON THE WEB

- [IBM "COMP" Web site](#)
- [IBM PartnerWorld](#)

You can also sometimes find "product-to-product comparison" information. Explore the links in the "More on the Web" box for competitive information.

## Sales Kits for System Storage

Sales kits provide business partners with a package of key client-ready sales and marketing enablement resources. You'll find client-ready presentations and brochures, education resources and opportunities, seller guides, client references, and more, all to help you unleash your selling potential and



the power of our unique technologies (see the “More on Web” box).

#### MORE ON THE WEB

- [Listing of all System Storage Sales Kits](#)

## Sales Plays

Sales plays are designed to help you generate new selling opportunities. Each play focuses on a set of common client pain points and recommends specific solutions to address them.

Find everything you need to know about the latest System Storage sales plays and initiatives—with a special focus on the small and mid-size market. Download the “reasons of call,” proposal letters, presentations, benchmarks, and sales tools to help you identify, progress, and close deals. Find tips for increasing deal size with services and relevant financing to improve your odds of winning the sale.

#### MORE ON THE WEB

- [Storage selling tools](#)

## IBM Web Content Syndication (For Your Web Site)

IBM Web Content Syndication automatically delivers IBM product and marketing content to your Web site. It combines the power of content syndication, automatically sending and updating content, with built-in lead tracking capabilities. The Web Content Syndication Center provides simple, fast, on-line registration, implementation, and support. The Partner Console allows you to view the latest news and content, manage your company’s profile, and view and manage leads. Syndicated content is available for IBM Hardware, Software



and Services in 11 local languages. Syndicating IBM content enables you to save time and money, and with its customization features, is an easy fit into every Business Partner's Web marketing strategy.

This PartnerWorld benefit is available at no cost to all registered PartnerWorld members.

#### **MORE ON THE WEB**

- [Web content syndication info on PartnerWorld](#)
- [Web content syndication registration](#)

## **Tivoli Opportunity Maximizer (TOM) Tool**

The IBM Tivoli Opportunity Maximizer (TOM) tool provides another easy way to uncover and identify new opportunities to cross-sell Tivoli products and maximize revenue from your new and existing customer base. This tool walks you through the process of identifying complementary products based on your customer's current needs and provides a sales scenario for each recommended cross-sell opportunity.

#### **MORE ON THE WEB**

- [Tivoli Opportunity Maximizer tool](#)

## **IBM System Clothing Pointers**

Whenever you are proposing the sale of a server, it only makes sense to include the needed storage devices in the original proposal. Selling storage solutions with servers is known as "clothing." Clothing the servers with storage solutions is a proven key to selling success. Follow the links in the "More on the Web" box to see what storage devices to propose with each type of server.



## MORE ON THE WEB

- [Compatibility/interoperability info for IBM storage products](#)
- [Storage products for Power Systems](#)
- [Storage products for System x and BladeCenter servers](#)
- [Storage products for System z servers](#)
- [Storage products for Sun](#)
- [Storage products for HP](#)
- [Storage software for managing the information infrastructure](#)

## IBM Global Financing

IBM Global Financing (IGF) continues to focus on meeting customer needs by concentrating on key business areas: leasing and lending, remarketing and refurbishing, and asset management. IGF conducts business in more than 40 countries, financing IBM and non-IBM hardware, software, and services, with a full range of flexible, low-rate offerings. IGF's customers find that financing their information technology solutions offers many advantages in both robust and difficult economic climates, because financing frees up their capital for other investments.

Many information technology installations, including those for customer relationship management, data mining, and e-business require a substantial investment. IGF financing enables customers to pay for their new technology in affordable monthly payments during the life of the project. Our customers run the gamut from the smallest, family-owned business purchasing a single server and software to the larg-





est, multinational corporation, acquiring tens of thousands of PCs for offices on several continents.

In addition to working directly with customers, we work with IBM Business Partners to provide financing for their clients and to help them build their own businesses. This includes a full suite of commercial financing offerings to support inventory and accounts payable and receivable financing needs, and state-of-the-art online tools, such as Rapid Online Financing, which allows partners to request quotes and deliver ready-to-sign financing contracts in under one hour.

#### MORE ON THE WEB

- [IBM Global Financing](#)
- [Rapid Online Financing](#)

Why should business partners offer financing? Offering financing enhances your selling efforts and allows you to:

- Facilitate closing the entire solution without scaling back
- Close deals faster by overcoming budget issues
- Decrease discounting by making payments more affordable
- Differentiate your solutions from the competition
- Lock in future sales with upgrades and end-of-lease options.

Financing can be beneficial to a partner's overall business in the following ways:

- Receive payment from IBM Global Financing faster than you would with a cash purchase (free up cash to fund your growth)
- Create an opportunity to receive an incentive for selling financing



- Eliminate client credit risk—IBM Global Financing assumes the risk
- Your firm can use our “rate buy-down” capability to offer below-market financing rates on your own solutions to avoid discounting, keeping your “street price” whole.

## Systems Advisor Tool

Follow the links in the “More on the Web” box to explore the IBM Systems Advisor tool. This is invaluable in helping you define specific solutions that include servers and storage products.

### MORE ON THE WEB

- [Systems Advisor tool](#)
- [More sizing guides and configuration tools](#)

## IBM Business Value Analyst Tool

The IBM Business Value Analyst tool enables IBM Business Partners to articulate the return on investment of IBM solutions. The tool can be used with CIOs, IT leads, and LOB executives to make financial business cases for IBM products, both as individual products and/or solutions.

### MORE ON THE WEB

- [IBM Business Value Analyst tool](#)

## What Are “IBM Express Advantage” Offerings?

IBM Express Advantage offerings are a key component of IBM’s strategy for serving the IT opportunity in the mid-market sector. These easy-to-run and scalable hardware, mid-



dleware, services, and financing solutions are designed and priced for midsize businesses (less than 1000 employees).

Each IBM Express Advantage offering must meet a stringent set of technical and go-to-market criteria in order to qualify. Business partners can be confident in selling or building solutions with IBM products that are easy to acquire, easy to implement, and easy to maintain.

#### **MORE ON THE WEB**

- [Express Seller Toolkit info on PartnerWorld](#)

You can already benefit from the features and functions of Express Advantage offerings to build solutions that meet the real-life, specific needs of your clients at a price they can afford.

## **What Is Storage Virtualization?**

Storage virtualization is technology used to insulate the details of a storage infrastructure (hardware and software) from the applications and users who use that storage infrastructure. By doing so, storage virtualization reduces cost and complexity.

IBM has a broad range of storage virtualization offerings including the SAN Volume Controller, Virtualization Engines, Virtual File Manager software, and more. Follow the “More on the Web” links for more specifics on storage virtualization.

#### **MORE ON THE WEB**

- [IBM storage virtualization info on IBM.com](#)
- [Storage virtualization concepts on Wikipedia](#)



## Technical Support for Business Partners

Technical Sales Support from IBM provides business partners with extensive pre-sales support through the PartnerWorld program online via the Web and by voice. Voice support can be accessed via PartnerWorld Contact Services, the single

point of entry to all key support organizations. PartnerWorld Contact Services provides access to Techline for hardware and software technical sales support, and to

### MORE ON THE WEB

- [Contact Techline](#)
- [Technical Sales Library](#)
- [PartnerWorld technical resources & support](#)
- [PartnerWorld contact services](#)
- [CompeteCenter](#)

Competeline (Americas only) for win strategies and competitive information. CompeteCenter (Europe only) is accessed through the CompeteCenter Web site. Systems business partners entitled through the PartnerWorld program have access to IBM System x and IBM System Storage solutions and selected major competitive platform support including:

- Remote solution design assistance/review
- Technical marketing assistance
- Product and promotion information
- Configuration assistance
- Competitive product information
- Sales strategy information
- Solution assurance assistance.



Follow the links in the “More on the Web” box to access Technical Sales Support online (region selectable).

## Hardware Configurator

The IBM Hardware Configurator is an integral part of IBM’s Web-based shopping (e-commerce) offering. It enables on-line configuration of IBM products and services, provides detailed compatibility checking, provides key information such as price and availability that can affect selection decisions, and provides intelligent feedback and assistance related to configuration selections. It also serves as the aftermarket engine for identifying upgrade accessories and parts. The IBM Hardware Configurator can translate configuration results from type model features (TMFs) to the “best match” configuration in part numbers. In addition, you can start a TMF configuration from a part number.

### MORE ON THE WEB

- [Hardware Configurator](#)

## Social Media Resources for IBM Business Partners

Social media is quickly growing in importance for businesses of all sizes. Whether you are already involved in social media or just getting interested, the “More on the Web” box provides some links that will be of interest to you.



## MORE ON THE WEB

- [IBM PartnerWorld communities](#)
- [Twitter search results for IBM Storage](#)
- [Search Twitter for mentions of your business or competitors](#)
- [Google blog search results for IBM Storage](#)
- [Search blogs for mentions of your business or competitors](#)
- [LinkedIn social network \(has an IBM Business Partner Group\)](#)
- [Use Twitter to Grow Your Business \(IBM Software Business Partner Blog\)](#)

# 4

## System Storage Quick Reference

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In this chapter, we explore the IBM System Storage hardware, software, and packaged solutions you will be selling and offer some resources that will help you succeed.

### MORE ON THE WEB

- [System Storage product guide](#)

### Disk Storage

The IBM System Storage family includes a variety of disk storage products ranging from direct-attached disk drives to complete enterprise storage systems. In this section, we look at the product offerings in the disk storage arena.

### Disk Storage Cross Reference by Workload Size

It is often a mistake to associate entry-level, midrange, and enterprise-class storage products with small, medium, and large size businesses respectively. For example, did you know that 30 percent of DS8000s are used by small and medium businesses? Did you know that 70 percent of SAN Volume Controllers are used by small and medium businesses?

Conversely, did you know that nearly every large enterprise uses entry-level and midrange storage products in addition to enterprise-class devices? For example, some large





enterprises have branch offices or remote areas where smaller storage systems are more appropriate. Measurements often used to classify business size, such as the number of employees or sales revenue, do not always correlate with the amount of information those businesses store. For this reason, product recommendations based on workloads often make more sense, though they still should be considered only as general guidelines. In this section, you will find a list of disk storage products organized by workload size (entry, mid-size, and enterprise) to help you find the best solution for your client.

### ***Disk Storage for Entry-Level Workloads***

Here is a list of disk storage products designed for businesses with entry-level workloads. Click on the links and you will jump to the section of this ebook that describes the product (you can click on the back arrow to jump back to this page).

[DS3500 Express](#)

[EXP3500 Express](#)

[EXP2500 Express](#)

[N3000 Express](#)

#### **MORE ON THE WEB**

- [Disk storage for entry-level workloads](#)

### ***Disk Storage for Mid-size Workloads***

Here is a list of disk storage products designed for mid-size workloads. Click on the links and you will jump to the section of this ebook that describes the product (you can click on the back arrow to jump back to this page).





## [Storwize V7000 Unified](#)

[DS5000](#)

[EXP5060](#)

[DS5020 Express](#)

[EXP520](#)

[DCS3700](#)

[N6000](#)

[N7000](#)

### MORE ON THE WEB

- [Disk storage for mid-size workloads](#)

## *Disk Storage for Enterprise Workloads*

Here is a list of disk storage products designed for large enterprise workloads. Click on the links and you will jump to the section of this ebook that describes the product (you can click on the back arrow to jump back to this page).

[DS8000](#)

[XIV Storage System](#)

[SONAS](#)

### MORE ON THE WEB

- [Disk storage for enterprise workloads](#)

## **DS3500 Express**

IBM System Storage DS3500 Express ([Figure D.1](#)) combines best-of-breed development with leading 6 Gbps host interface and drive technology. With its simple, efficient, and flexible approach to storage, the DS3500 Express is a cost-effective, fully integrated complement to IBM System x servers, IBM BladeCenter, and IBM Power Systems. By offering substantial improvements at a price that fits most budgets, the DS3500



## Specifications

Part numbers	1746A2S DS3512 Express Single Controller Storage System 1746A2D DS3512 Express Dual Controller Storage System 1746A4S DS3524 Express Single Controller Storage System 1746A4D DS3524 Express Dual Controller Storage System 1746T4D DS3524 Express DC Dual Controller Storage System
RAID controller	Dual active, hot-swappable controllers
Cache per controller	1 GB cache per controller with 2 GB upgrade (battery-backed)
Host interface	Four options: Four or eight 6 Gbps SAS ports; Eight 8 Gbps Fibre Channel ports and four 6 Gbps SAS ports; Eight 1 Gbps iSCSI ports and four 6 Gbps SAS ports; Four 10 Gbps iSCSI ports and four 6 Gbps SAS ports
Drive interface	Two 6 Gb SAS drive ports
Supported drives	6 Gbps SAS 3.5" drives: 300 GB 15k rpm, 450 GB 15k rpm, 600 GB 15k rpm; 2 TB 7.2k, 3 TB 7.2k rpm Nearline; 600 GB 15k rpm SED 6 Gbps SAS 2.5" drives: 146 GB 15k rpm; 300 GB 150k rpm; 300 GB 10k rpm; 600 GB 10k rpm; 900 GB 10k rpm; 500 GB 7.2k rpm Nearline; 300 GB 10k rpm SED; 1 TB 7.2k rpm Solid-state SAS 2.5" drives: 200 GB and 400 GB SSD.
RAID levels	0, 1, 3, 5, 6, 10
Storage partitions	Support for up to 128 storage partitions (levels: 4 standard with upgrades to 8, 16, 32, 64, 128)
Maximum drives supported	-Up to 192 drives—high performance SAS drives, nearline SAS drives, SSDs and SED SAS drives -EXP3512 (2U 12 3.5" drives) and EXP3524 (2U 24 2.5" drive) enclosures, which can be intermixed behind a DS3500 Express enclosure
Fans & power supplies	Dual-redundant, hot-swappable
Rack support	2U 19" industry-standard rack
Management software	IBM System Storage DS Storage Manager

- [DS3500 Express details on PartnerWorld](#)
- [DS3500 Express details on IBM.com](#)
- [DS3500 Express competitive info on COMP](#)
- [DS3500 blog search](#)
- [DS3500 Twitter search](#)



DS3512  
Product Tour



DS3524  
Product Tour

**Figure D.1.** IBM System Storage DS3500 Express at a glance (and links to more detail).



Express delivers superior price/performance ratios, functionality, scalability, and ease of use for the entry-level storage user.

Six Gbps SAS is the enterprise version of SAS that builds on the solid foundation of 3 Gbps SAS technology. Six Gbps SAS offers increased performance, scalability and reliability enhancements to support the ever-increasing reliance on information, while delivering the outstanding value that organizations demand.

Here are some quick DS3500 Express facts:

- Includes 6 gigabits per second (Gbps) serial-attached SCSI (SAS) systems to deliver mid-range performance and scalability at entry-level prices
- Offers built-in management expertise in intuitive and powerful storage management software
- Delivers continuous data security with full disk encryption and supports high-performing solid-state drives (SSDs)
- Offers simplified provisioning, improved rebuild times, and more consistent performance under failure via selectable disk pooling
- Offers Network Equipment Building System (NEBS) and European Telecommunication Standards Institute (ETSI) compliance and support for 48 V DC power supplies.

## **EXP3500 Express Expansion Unit**

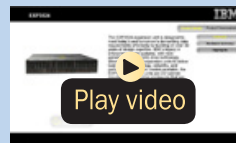
The IBM System Storage EXP3500 Express ([Figure D.2](#)) consists of two models—EXP3512 and EXP3524 expansion units, designed to affordably meet the demanding data require-



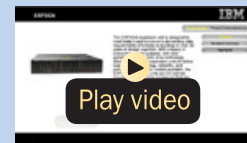
## Specifications

Part numbers	1746A2E—EXP3512 Express - Storage Expansion Unit 1746A4E—EXP3524 Express - Storage Expansion Unit
Drive interface	6 Gbps SAS
Supported drives	6 Gbps SAS 3.5" drives: <ul style="list-style-type: none"> <li>• 300 GB 15k rpm, 450 GB 15k rpm, 600 GB 15k rpm</li> <li>• 1 TB 7.2k rpm Nearline, 2 TB 7.2k rpm Nearline, 3 TB 7.2k Nearline</li> <li>• 600 GB 15k rpm SED</li> </ul> 6 Gbps SAS 2.5" drives: <ul style="list-style-type: none"> <li>• 46 GB 15k rpm</li> <li>• 300 GB 10k rpm</li> <li>• 600 GB 10k rpm</li> <li>• 900 GB 10k rpm</li> <li>• 500 GB 7.2k rpm Nearline</li> <li>• 1 TB 7.2k rpm Nearline</li> <li>• 300 GB 10k rpm SED</li> <li>• 200 GB and 400 GB SSD</li> </ul>
Maximum drives supported	EXP3512—12 3.5" drives; EXP3524—24 2.5" drives Scalability up to 192 drives (optional mix of expansion enclosures)
Fans & power supplies	Dual
Rack support	Standard 2U
Warranty	3 year limited warranty, CRU and on-site service, next business day 9x5, service upgrades available

- [EXP3500 info on PartnerWorld](#)
- [EXP3500 info on IBM.com](#)



*EXP3512  
Product Tour*



*EXP3524  
Product Tour*

**Figure D.2.** IBM System Storage EXP3500 Expansion Unit at a glance (and links to more detail).



ments of today and tomorrow by building on over 30 years of design expertise. IBM's legacy in enterprise storage systems, with next-generation 6 Gbps SAS drive technology, enables the System Storage EXP3500 expansion units to deliver best-of-breed technology, reliability, and performance. The EXP3500 expansion units are 2U cabinet-mountable 6 Gbps drive enclosures that are designed to support either a total of 12 3.5-inch SAS drives (EXP3512) or 24 2.5-inch SAS drives (EXP3524) for optimal flexibility and efficiency. The EXP3500 expansion units can be a key component of a high-performance storage solution. With each external SAS port on the environmental service module (ESM) supporting a 6 Gbps x4-wide connection, the EXP3500 can achieve excellent throughput to the host.

With global commerce and 24×7 information available on-demand, businesses require continuous access to information in order to be productive, competitive, and to ensure customer satisfaction. The EXP3500 expansion units offer the assurance of high availability with redundant power supplies and ESMs which help ensure that contact with the drives continues even in the rare instance of a component failure. With hot-swappable components, you can remove and replace ESMs, power supplies, and drives with minimal or no downtime. The struggle to manage escalating data volumes also will not stop, even in a slow-growth economy. The EXP3500 expansion units, with next generation 6 Gbps SAS back-end technology, provide organizations with a seamless path to external storage—improving performance and scalability, while lowering power consumption—all within a small footprint.

Here are some quick EXP3500 facts:

- Provides a highly available storage system by supporting attachment to the IBM DS3500 Express storage system
- Next-generation SAS expansion enclosure supports high bandwidth and random I/O applications with 6 Gbps x4-wide SAS ports
- Can support up to 36 TB of SAS disk storage in a single enclosure and up to 576 TB when fully expanded up to 192 drives
- High-performance SAS, capacity-optimized SAS hard disk drives, self-encrypting drives (SEDs) and solid-state drives (SSDs) intermix support
- Redundant components help support continuous access to data for data availability 24×7.

## EXP2500 Express Expansion Unit

IBM has combined best-of-breed development with leading 6 Gbps host interface and drive technology in the IBM System Storage EXP2500 Express ([Figure D.3](#)), a cost-effective, fully integrated complement to IBM System x and IBM BladeCenter servers. Offering substantial improvements at a price that will fit most budgets, the EXP2500 Express delivers superior price-to performance ratios, functionality, scalability, and ease-of-use for the entry-level storage user.

Easy to manage, flexible, and extendable, the EXP2500 Express is designed to work as a direct-attach external disk solution for System x and BladeCenter servers using ServerRAID



### Specifications

Part numbers	1747-HC1 (PN 174712X)—System Storage EXP2512 Express Storage Enclosure 1747-HC2 (PN 174724X)—System Storage EXP2524 Express Storage Enclosure
RAID controller	EXP2500 Express external disk provides: —Direct attachment to selected System x servers using the IBM ServeRAID M5025 SAS/SATA Controller (part number 46M0830) —Direct attachment to selected BladeCenter servers using the BladeCenter SAS Connectivity Module (part number 39Y9195) and IBM ServeRAID MR10ie (CIOv) Controller (part number 46C7167)
Drive interface	SAS
Supported drives	EXP2512: 300 GB 15,000 rpm 6 Gb SAS 3.5" HDD 450 GB 15,000 rpm 6 Gb SAS 3.5" HDD 600 GB 15,000 rpm 6 Gb SAS 3.5" HDD 1 TB 7200 rpm 6 Gb SAS NL 3.5" HDD 2 TB 7200 rpm 6 Gb SAS NL 3.5" HDD 3 TB 7,200 rpm 6 Gb SAS NL 3.5 in. HDD (not supported in BladeCenter configurations) EXP2524: 146 GB 15,000 rpm 6 Gb SAS 2.5" HDD 300 GB 10,000 rpm 6 Gb SAS 2.5" HDD 600 GB 10,000 rpm 6 Gb SAS 2.5" HDD 500 GB 7200 rpm 6 Gb SAS NL 2.5" HDD 1 TB 7200 rpm 6 Gb SAS NL 2.5" HDD
RAID levels	Supports RAID levels supported by ServeRAID Controllers: Standard 0, 1, 10, 5, 50; Optional 6, 6
Maximum drives supported	12 in the EXP2512 enclosure 24 in the EXP2524 enclosure
Fans & power supplies	Two hot-swappable 515 watt (115–230 V ac) power supplies
Rack support	19" industry-standard rack
Management software	Mega RAID storage manager
Warranty	3 year parts and labor warranty

- [EXP2500 info on PartnerWorld](#)
- [EXP2500 info on IBM.com](#)

**Figure D.3.** IBM System Storage EXP2500 Express at a glance (and links to more detail).

controllers. The EXP2500 Express helps organizations enhance capacity seamlessly to address their current and future data needs.

The new EXP2500 Express is a performance-oriented SAS platform designed to increase both bandwidth and throughput with next-generation storage technology.

Here are some quick EXP2500 facts:

- Based on 6 Gbps SAS interface connectivity, the IBM System Storage EXP2500 Express provides an affordable external disk solution for direct attachment to IBM System x and IBM BladeCenter servers via ServeRAID controllers
- Support for flexible, high-performance, and near-line disk drive options as well as high performing solid-state drives (SSDs)
- High-density 2U enclosure designed for supporting up to 12 3.5-inch disk drives on model EXP2512 Express and 24 2.5-inch disk drives on model EXP2524 Express
- High availability and reliability, with dual AC power supplies and fans.

## DS3950 Express

IBM offers the IBM System Storage DS3950 Express ([Figure D.4](#)), designed to provide lower total cost of ownership, high performance, robust functionality, and unparalleled ease of use. As part of the IBM DS series, the DS3950 Express supports high-performance 8 Gbps capable Fibre Channel connection, 1 Gbps iSCSI interface, and up to 224 TB of raw





## Specifications

Models	1814-94H and 1814-98H
RAID controller	Dual active
Cache	Model 94H: 2 GB; Model 98H: 4 GB battery-backed
Host interface	Model 94H: Four 8 Gb/s FC, Model 98H: Four 8 Gb/s FC and four 1 Gb/s iSCSI
Drive interface	4 drive ports—Fibre Channel (FC) Switched and FC Arbitrated Loop (FC-AL) standard, Auto-sensing 2 Gbps/4 Gbps
Supported drives	Supports 4 Gbps FC: 15k rpm—300 GB, 450 GB, 600 GB; Supports 4 Gbps SATA: 7.2k rpm—1 TB, 2 TB GB; Supports 6 Gbps FC-SAS: 10k rpm—600 GB
RAID levels	RAID-0, -1, -3, -5, -6, -10
Storage partitions	4, 8, 16, 64, or 128 storage partitions
Maximum drives supported	112 FC, FC-SAS or SATA drives (using six EXP395 Expansion Units)
Fans & power supplies	Dual redundant, hot-swappable
Rack support	19" industry-standard rack
Systems management software	IBM System Storage DS Storage Manager version 10.xx
SAN support	Supported IBM FC switches and directors (product numbers 2005, 2006, 2109, 2026, 2027, 2031, 2032, 2034, 2042, 2054, 2061, and 2062, and IBM BladeCenter)
Warranty	Three year parts and labor warranty, 9x5 next business day, upgradeable to 24x7 with four hour response

- [DS3950 Express details on PartnerWorld](#)
- [DS3950 Express details on IBM.com](#)
- [DS3950 Express competitive info on COMP](#)
- [DS3950 Sales Kit on PartnerWorld](#)
- [DS3950 blog search](#)
- [DS3950 Twitter search](#)

**Figure D.4.** IBM System Storage DS3950 Express at a glance (and links to more detail).

physical capacity using 112 SATA 3.5-inch drives (2 TB) disk drives.

Facing relentless data growth and shrinking budgets, companies continue to look for ways to reduce costs through efficiencies. The advent of 8 Gbps Fibre Channel allows companies to reduce the number of host bus adapters (HBAs) per server and the number of overall ports in their Fibre Channel SAN infrastructure without sacrificing performance, thus saving on both acquisition and operational costs.

Here are some quick DS3950 facts:

- Next-generation 8 Gbps Fibre Channel interfaces enable infrastructure simplification
- Mixed host interfaces support (FC/iSCSI) enables SAN tiering
- Balanced performance well-suited for virtualization and consolidation
- Support for intermixing FC/SATA/SAS drives enables cost effective tiered storage
- Support up to 112 disk drive modules using up to six EXP395 expansion units.

## DS5020 Express

The IBM System Storage DS5020 Express ([Figure D.5](#)) is designed to provide low total cost of ownership, high performance, robust functionality, and unparalleled ease of use. As part of the System Storage DS5000 series storage system, the DS5020 Express supports high-performance 8 Gbps-capable Fibre Channel connections, an optional 1 Gbps iSCSI



### Specifications

Model	1814-20A
RAID controller	Dual active
Cache	4 GB battery-backed
Host interface	Four 8 Gb/s FC; or eight 8 Gb/s FC; or four 8 Gb/s FC and four 1 Gb/s iSCSI
Drive interface	4 drive ports—Fibre Channel (FC) Switched and FC Arbitrated Loop (FC-AL) standard, Auto-sensing 2 Gbps/4 Gbps
Supported drives with expansion units	4 Gbps FC/SED: 15k rpm—300 GB, 450 GB, 600 GB; 4 Gbps SATA: 7.2k—1 TB and 2 TB; 6 Gbps FC-SAS: 10k rpm—600 GB; SSD: 73 GB and 300 GB
RAID levels	RAID-0, -1, -3, -5, -6, -10
Storage partitions	4, 8, 16, 64, or 128 storage partitions
Maximum disk drives	112 FC, SED, FC-SAS, SSD or SATA drives (using six EXP520 Expansion Units)
Fans & power supplies	Dual redundant, hot-swappable
Rack support	19" industry-standard rack
Management software	IBM System Storage DS Storage Manager version 10.xx
SAN support	Supported IBM FC switches and directors (product numbers 2005, 2006, 2109, 2026, 2027, 2031, 2032, 2034, 2042, 2054, 2061, 2062, and IBM BladeCenter)
Warranty	Three year parts and labor warranty, 9x5 next business day, upgradeable to 24x7 with four hour response

- [DS5020 Express details on PartnerWorld](#)
- [DS5020 Express details on IBM.com](#)
- [DS5020 Express competitive info on COMP](#)
- [DS5020 enhancements announced](#)
- [DS5020 blog search](#)
- [DS5020 Twitter search](#)

**Figure D.5.** IBM System Storage DS5020 Express at a glance (and links to more detail).



interface, and up to 336 TB of physical storage capacity with 112 SAS-NL (3 TB) disk drives.

Facing relentless data growth and shrinking budgets, companies continue to look for ways to improve efficiency and reduce costs. Eight Gbps Fibre Channel allows companies to reduce the number of host bus adapters per server and the number of overall ports in their Fibre Channel storage area network (SAN) infrastructure without sacrificing performance, thus saving acquisition and operational costs.

Here are some quick DS5020 Express facts:

- Mixed host interfaces support (Fibre Channel/iSCSI) enables SAN tiering
- Balanced performance well-suited for virtualization/consolidation
- Support for low power, fast solid-state disks (SSDs)
- Self-encrypting drives secure data throughout your drive's lifecycle
- Support for intermixing Fibre Channel, SED, SATA, SAS, SAS-NL, and SSD drives enables cost-effective tiered storage
- Feature-rich management software designed to maximize use and minimize storage TCO
- Key application certifications ensure confidence
- Supports IBM AIX and Power Systems T10-PI Data Integrity Initiative.



## DS5000 series

The IBM System Storage DS5000 series ([Figure D.6](#)) is designed to meet the demanding open-systems requirements of today—and tomorrow—while establishing a new standard for life cycle longevity. Building on many decades of design expertise, the DS5000 storage system's architecture delivers industry-leading performance, real reliability, multidimensional scalability, and unprecedented investment protection. DS5000 supports IBM AIX and IBM Power Systems T10-PI Data Integrity Initiative.

The DS5000 storage systems are equally adept at supporting transactional applications such as databases and On Line Transaction Processing (OLTP), throughput-intensive applications such as high-performance computing (HPC) and rich media, and concurrent workloads for consolidation and virtualization. With relentless performance and superior reliability and availability, DS5000 series storage systems can support the most demanding service level agreements (SLAs) for the most common operating systems, including Microsoft Windows, UNIX, Linux, and Apple Macintosh. When requirements change, you can add or replace host interfaces, grow capacity, add cache, and reconfigure the system on the fly—ensuring that it will keep pace with your growing company.

Here are some quick DS5000 facts:

- Provides balanced performance—up to 700,000 IOPs and 6400 MB/s—is well-suited for virtualization and consolidation
- Scales up to 448 drives (1.34 PB) using the EXP5000 enclosure and up to 480 drives (1.44 PB) of high-density storage with the EXP5060 enclosure



## Specifications

Machine/Model	DS5100 -1818-51A, DS5300 -1818-53A
RAID Controller	Dual active
Cache	<p>Up to a total of 64 GB cache</p> <ul style="list-style-type: none"> <li>Options include 4, 8, 16, 32 GB of cache per controller</li> <li>Dedicated cache mirroring channels</li> <li>Persistent cache backup in the event of a power outage</li> <li>Field-upgradeable</li> </ul>
Host interface	<p>DS5100: 8 × 4/8 Gbps Fibre Channel host interface cards (4 Gbps cards auto-negotiate to 1, 2, and 4 Gbps speeds; 8 Gbps cards auto-negotiate 2, 4 and 8 Gbps speeds); 1 Gbps iSCSI—dual ported (sixteen total host ports); 10 Gbps iSCSI—dual ported (eight total host ports)</p> <p>DS5300: Up to 16 × 4/8 Gbps host interface cards (4 Gbps cards auto-negotiate to 1, 2, and 4 Gbps speeds; 8 Gbps cards auto-negotiate 2, 4 and 8 Gbps speeds); 1 Gbps iSCSI—dual ported (16 total host ports); 10 Gbps iSCSI—dual ported (8 total host ports)</p>
Drive interface	16 4 Gbs Fibre Channel drive interfaces support up to 28 EXP5000/EXP810 or 8 EXP5060s
RAID levels	0, 1, 3, 5, 6, 10
Storage partitions	8, 16, 32, 128, 256, or 512 storage partitions
Maximum drives supported	448 drives maximum with use of 28 EXP5000s or EXP810s, or a mixture of both (not to exceed 28); 480 drives with EXP5060
Fans & power supplies	Dual redundant, hot-swappable
Rack support	19" industry standard rack mountable

- [DS5000 details on PartnerWorld](#)
- [DS5000 details on IBM.com](#)
- [DS5000 Sales Kit on PartnerWorld](#)
- [DS5000 competitive info on COMP](#)
- [DS5000 blog search](#)
- [DS5000 Twitter search](#)

**Figure D.6.** IBM System Storage DS5000 series at a glance (and links to more detail).



- Allows for intermixing drive types—Fibre Channel, SAS, SAS NL, SED, SATA and SSD—and host interfaces—Fibre Channel and iSCSI—for investment protection and cost-effective tiered storage
- Supports high availability with hot-swappable components and non-disruptive firmware upgrades.

### **EXP5000 Drive Enclosure**

The EXP5000 drive enclosure is more than “just a bunch of disks.” The enclosure is designed to optimize performance, availability, and serviceability by offering:

#### **MORE ON THE WEB**

- [EXP5000 details on PartnerWorld](#)

- 4 Gbps Fibre Channel interfaces for connectivity
- Up to 16 dual-ported Fibre Channel, SAS, SAS NL, self-encrypting drives (SED), solid-state drives (SSDs), or SATA disk drives that are intermixable in the same enclosure
- An Environmental Service Module (ESM)-embedded “loop switch”
- Redundant 4 Gbps Fibre Channel drive loops to ensure complete accessibility to all drives in the event of a loop or cable failure
- Redundant power supplies, cooling fans, and ESMs.
- A 24×7×4 hour warranty.

All primary components are hot-swappable and can be easily accessed, removed, or replaced.

## ***EXP5060 Storage Expansion Unit***

The IBM System Storage EXP5060 Expansion Unit ([Figure D.7](#)) offers tremendous storage density and significant operational savings for data-intensive applications and other environments that store vast amounts of data.

The 60-drive EXP5060 expansion unit provides up to three times greater storage density than traditional drive enclosures, which means a 1.44 PB DS5000 series system can now reside in a standard 19-inch rack. The highly efficient power supplies and cooling fans enable the EXP5060 to reduce power consumption and increased density reduces floor space requirements by up to 50 percent when compared to previous generation enclosures.

Here are some quick EXP5060 facts:

- Designed to expand the capacity of the DS5000 series storage systems and supports up to 60 SATA drives in just 4U of rack space—reducing the physical footprint by up to 50 percent
- Reduces power consumption with an intelligent design and high-efficiency power supplies
- Offers uninterrupted data availability, with online serviceability of individual drives
- Eliminates excessive front weight on the rack, with individual extension of 12-drive drawers.

## ***EXP520/EXP395 Storage Expansion Unit***

The EXP520 and EXP395 ([Figure D.8](#)) are the disk drive enclosures for the DS5020 and DS3950 disk systems respec-





### Specifications

Models	1818G1A
Supported drives	SATA: 1 TB, 2 TB, 3 TB
Maximum drives supported	60 SATA drives
Fans & power supplies	Dual redundant
Rack support	Yes
Size	4U
Supported systems	DS5300/DS5100
Capacity	Up to 180 TB per 4U 60-drive enclosure
High-availability	Supports individual drive replacement while others remain active
Operational efficiency	Reduces rack space by up to 50 percent
Serviceability	Individual extension of 12-drive drawers eliminates excessive weight on the front of the rack
Supported disk systems	DS5300 and DS5100
Warranty	One year limited warranty; CRU and on-site service, 24 hours per day, 7 days a week, 6 hour average

- [EXP5060 details on PartnerWorld](#)
- [EXP5060 details on IBM.com](#)

**Figure D.7.** IBM System Storage EXP5060 Expansion Unit at a glance (and links to more detail).



## Specifications

Drives supported  
by EXP520

4 Gbps Fibre Channel/SED: 15k RPM—300 GB, 450 GB, 600 GB  
4 Gbps SATA: 7.2k RPM—1 TB and 2 TB  
6 Gbps FC-SAS: 10k RPM—600 GB  
SSD: 73 GB and 300 GB

Drives supported  
by EXP395

4 Gbps FC: 15k RPM—300 GB, 450 GB, 600 GB  
4 Gbps SATA: 7.2k RPM—1 TB, 2 TB  
6 Gbps FC-SAS: 10k RPM—600 GB

- [EXP520 details on PartnerWorld](#)
- [EXP520 enhancements announced](#)
- [EXP395 details on PartnerWorld](#)
- [EXP395 enhancements announced](#)

**Figure D.8.** IBM System Storage EXP520/EXP395 Storage Expansion Units at a glance (and links to more detail).

tively. These 3U enclosures have 4 Gbps Fibre Channel (FC) interfaces and supports up to 16 disk drives. The EXP520 and EXP395 Storage Expansion Units are designed to accommodate 4 Gbps Fibre Channel Enhanced Disk Drive Modules (E-DDM), and 4 Gbps Serial ATA Enhanced Disk Drive Modules (E-DDM). It support redundant AC power and cooling modules and ESM interfaces, and are available in a 19-inch rack mount package.



## Storwize V7000 Disk System

IBM Storwize V7000 and Storwize V7000 Unified ([Figure D.9](#)) are virtualized storage systems to complement virtualized server environments that provide unmatched performance, availability, advanced functions and highly-scalable capacity never seen before in midrange disk systems. Storwize V7000 and Storwize V7000 Unified are powerful midrange disk systems that have been designed to be easy-to-use and 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 are virtual storage systems that offer greater efficiency and flexibility through built-in solid-state drive (SSD) optimization and thin-provisioning technologies. For Storwize V7000, integrated IBM Real-time Compression enhances efficiency even further by enabling storing up to five times as much active primary data in the same physical disk space. 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).

Here are some quick Storwize V7000 facts:

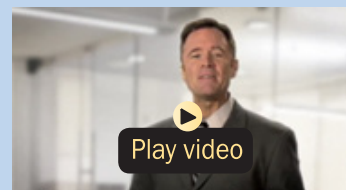
- Deliver sophisticated enterprise-class storage functionality for businesses



## Specifications

Host interface	SAN-attached 8 Gbps Fiber Channel (FC) , 1 Gbps iSCSI and optional 10 Gbps iSCSI/FCoE, NAS-attached 1 Gbps and 10 Gbps Ethernet
User interface	Graphical User Interface (GUI)
Supported drives	<p>3.5" disk drives:</p> <ul style="list-style-type: none"> <li>• 2 TB, 3 TB 7.2k Nearline SAS disk</li> </ul> <p>2.5" disk drives:</p> <ul style="list-style-type: none"> <li>• 146 GB, 300 GB 15k SAS disk</li> <li>• 300 GB, 450 GB, 600 GB, 900 GB 10k SAS disk</li> <li>• 200 GB, 300 GB, 400 GB 2.5" E-MLC (enterprise-grade multilevel cell)</li> <li>• 1 TB 7.2k Nearline SAS disk</li> </ul>
RAID levels	RAID-0, -1, -5, -6, -10
Maximum drives supported	240 per control enclosure; 960 per clustered system
Fans & power supplies	Fully redundant, hot-swappable
Rack support	19" industry standard
Management software	IBM Storwize V7000 and Storwize V7000 Unified Software
Cache per controller/ control enclosure/clustered system	8 GB/16 GB/32 GB
Advanced features included with each system	IBM System Storage Easy Tier, IBM FlashCopy, Thin Provisioning, IBM Active Cloud Engine (Stowize V7000 Unified only)

- [Storwize V7000 portal on PartnerWorld](#)
- [Storwize V7000 Express details on IBM.com](#)
- [Storwize V7000 competitive info on COMP](#)
- [Storwize V7000 blog search](#)
- [Storwize V7000 Twitter search](#)
- [FastBack for Storwize V7000](#)



*IBM Storwize V7000 overview (6:27)*

**Figure D.9.** IBM Storwize V7000 Midrange Disk System at a glance (and links to more detail).



- Support your growing business requirements while controlling costs
- Provide up to 200 percent performance improvement with automatic migration to high-performing SSDs
- Enable storing up to five times more active data in the same physical disk space using IBM Real-time Compression with Storwize V7000 (Block)
- Consolidate block and file storage for simplicity and greater efficiency with Storwize V7000 Unified
- Enable near-continuous availability of applications through dynamic migration.

## **DS8000 series (DS8700, DS8800)**

The IBM System Storage DS8000 series ([Figure D.10](#)) offers a unique combination of high scalability, exceptional resiliency, tremendous performance, and security that can help address the many challenges stemming from a sprawling and heterogeneous infrastructure. Imagine how much simpler life for your IT staff could be if they could manage much more data with considerable less effort. Many organizations are doing this today by consolidating a variety of disparate disk systems onto a highly-scalable and flexible one, such as the IBM System Storage DS8000.

The DS8000 series offers a range of features that provide tremendous performance, outstanding scalability, broad server support, and easy and automated storage tiering. The I/O Priority Manager feature can also help you more effec-

**Specifications**

Models	DS8700 (941, 94E)	DS8800 (951, 95E)
Shared SMP processor configuration	POWER6+ dual 2-way or 4-way	POWER6+ dual 2-way or 4-way
Other major processors	PowerPC, ASICs	PowerPC, ASICs
Processor memory for cache and NVS (min/max)	32 GB/384 GB	16 GB/384 GB
Host adapter interfaces	4-port 4 Gbps and 4-port 8 Gbps Fibre Channel/FICON	4- and 8-port 8 Gbps Fibre Channel/FICON
Host adapters (min/max)	2/32	2/16
Host ports (min/max)	8/128	8/128
Drive interface	4 Gbps point-to-point switched Fibre Channel connection	6 Gbps point-to-point switched SAS-2 connection to an 8 Gbps Fibre Channel backbone
Number of disk drives (min/max)	8/1024	8/1536 (small form factor) 8/768 (large form factor)
Device adapters	Up to 16 4-port, 2 Gbps Fibre Channel	Up to 16 4-port, 8 Gbps Fibre Channel
Maximum physical storage capacity	2048 TB	2304 TB
Disk sizes	300 GB solid-state drives 450 GB (15,000 rpm) 600 GB (15,000 rpm) 2 TB (7200 rpm)	300 GB solid-state drives 400 GB solid-state drives 146 GB (15,000 rpm) 300 GB (15,000 rpm) 450 GB (10,000 rpm) 600 GB (10,000 rpm) 900 GB (10,000 rpm) 3 TB (7200 rpm and 3.5 in. form factor)
RAID levels	RAID-5, -6, -10	RAID-5, -6, -10

- [DS8000 Sales Kit on PartnerWorld](#)
- [DS8000 details on IBM.com](#)
- [DS8000 blog search](#)
- [DS8000 Twitter search](#)
- [DS8000 Easy Tier product tour](#)

**Figure D.10.** IBM System Storage DS8700 and DS8800 series at a glance (and links to more detail).



tively manage different qualities of service for each application running on the system with a very easy approach. This is essential when you are consolidating more workloads on the system and need to ensure system resources are aligned to match the priority of your applications. Together, these capabilities can help simplify your storage environment and lower acquisition and operating costs, while providing the flexibility to support a variety of application workloads with minimal administrative effort. Additionally, the DS8000 series exemplifies the legendary IBM quality and world-class engineering that continues to set the standard for satisfying the world's most demanding customers.

Here are some quick DS8000 facts:

- **Performance:** Exceptional, scalable performance with the latest hardware advancements and innovative software functionality
- **Availability and resiliency:** Extraordinary system availability with full hardware redundancy, built on the market-proven IBM Power Systems architecture
- **Optimized storage tiering:** Optimize performance by automating placement of data across the appropriate drive tiers dynamically
- **Scalability:** Systems can scale up to over 1500 drives with a combination of different drive tiers
- **Flexibility:** Address the broad scope of storage workloads that exist in today's complex data center.



Recent enhancements of the DS8000 series include:

- Smarter tiering to optimize storage performance and system resources across multiple tiers or within a single tier
- Automatic workload management to align system resources to the various applications the system supports
- Advanced caching algorithms that automatically optimize workload performance based on workload type.

## DS8000 series Warranty, Maintenance, and Service

The IBM System Storage DS8000 series offers leading Enterprise Choice warranties with one, two, three, or four years with IBM installation and 24x7 IBM on-site, same-day response on both hardware and advanced function software. Additional services for maintenance, configuration, data migration, and other storage management needs are available to help organizations optimize their storage infrastructure and choose the length of service and support that is right for their needs.

### MORE ON THE WEB

- [DS8000 warranty options](#)

## DCS3700

The IBM System Storage DCS3700 ([Figure D.11](#)) meets an organization's need for more capacity within its given space constraints. Designed for applications with high-performance streaming data requirements, the DCS3700 offers optimal space utilization, low power consumption, and high performance. Organizations can now have a storage solution to





## Specifications

Models	DCS3700 Storage System and DCS3700 Expansion Unit
RAID controller	Dual-active, intelligent controllers
Cache	4 GB cache (2 GB per controller) with field or plant upgrades to 8 GB (4 GB per controller)
Host interface	Two 6 Gbps SAS host ports per controller standard with the option to add a daughter card with additional connectivity Four 8 Gbps FC ports per card (includes eight 8 Gb shortwave SFP transceivers)
Drive interface	One 6 Gbps SAS drive interface
Supported drives	6 Gbps SAS 3.5" drives: <ul style="list-style-type: none"> <li>• 2 TB 7.2k rpm NL</li> <li>• 3 TB 7.2k rpm NL</li> </ul> 6 Gbps SAS 2.5" drives: <ul style="list-style-type: none"> <li>• 300 GB 15k rpm</li> </ul> Solid state SAS: <ul style="list-style-type: none"> <li>• 200 GB SSD</li> <li>• 400 GB SSD</li> </ul>
RAID levels	0, 1, 3, 5, 6 and 10
Storage partitions	Eight partitions standard with upgrade options (16, 32, 64, and 128)
Maximum drives supported	Up to 180 drives per system with the attachment of two DCS3700 Expansion Units; (60 drives per enclosure); 20 drives minimum drive quantity
Fans & power supplies	Two each per enclosure
Rack support	Slim 4U, 19" rack mount enclosure
Management software	DS Storage Manager
Warranty	One year warranty; on-site service 24 hours per day, 7 days a week, 4 hour average, same day response

- [DCS3700 info on PartnerWorld](#)
- [DCS3700 info on IBM.com](#)
- [DCS3700 competitive info on COMP](#)
- [DCS3700 blog search](#)
- [DCS3700 Twitter search](#)

**Figure D.11.** IBM System Storage DCS3700 at a glance (and links to more detail).



maximize storage density, reduce operational expenditures, and ensure high productivity.

IBM has combined highly available, dense storage capabilities and the proven System Storage disk controllers in the DCS3700. With up to 60 SAS drives in just 4U of rack space, it can reduce operational costs for capacity-intensive applications. With up to 4000 megabytes per second (MBps) in sustained drive reads, the DCS3700 storage system is equally adept at delivering throughput to bandwidth-intensive applications and input and output per second (IOPS) to databases, Microsoft Exchange, and other applications. With its simple, efficient, and flexible approach to storage, the DCS3700 is a cost-effective, fully integrated complement to IBM System x servers, IBM BladeCenter, and IBM Power Systems.

Here are some quick DCS3700 facts:

- Provides 6 gigabits per second (Gbps) serial-attached SCSI (SAS) high-density storage system that delivers scalable capacity at an affordable price point
- Supports high-performance streaming applications that have rigorous bandwidth requirements, such as rich media, financial markets, telecommunications, and weather modeling
- Helps optimize the flow and management of large, file-based data while retaining ease-of-data access
- Enables intermixing of solid-state drives (SSDs), high-performance SAS drives, and nearline SAS drives.
- Offers simplified provisioning, improved rebuild times, and more consistent performance under failure via selectable disk pooling



## XIV Storage System

The IBM XIV Storage System series ([Figure X.1](#)) is a proven, high-end disk storage used by thousands of enterprise organizations worldwide. The XIV design is the result of listening to customers and addressing their storage challenges across the broadest spectrum of business applications. The XIV series offers highly affordable storage suitable for even the most demanding workloads, providing consistent tier 1 high performance and high reliability at tier 2 costs. Never compromising performance for reliability, the XIV grid architecture deploys massive parallelism to allocate system resources evenly at all times and scale seamlessly, without the need for complex, time-consuming tuning and configuration.

A recognized leader in storage manageability, the XIV Storage System sets a new standard for ease of use by automating most tasks and providing an exceptionally intuitive user interface. It also offers “anytime, anywhere” monitoring via the IBM XIV Mobile Dashboard, supporting the Apple iPhone and Apple iPad. The XIV architecture enables performance to grow with capacity and tightly meshes with cloud technologies for even greater agility in meeting business needs.

Here are some quick XIV Storage System highlights:

- A revolutionary, proven high-end disk storage system designed for data growth and unmatched ease of use
- Consistent high performance without hot spots, enabled through massive parallelism and self-tuning
- Extra performance boost option through up to 6 TB of management-free solid state drive (SSD) caching



- [XIV details on PartnerWorld](#)
- [XIV Sales Kit on PartnerWorld](#)
- [XIV details on IBM.com](#)
- [XIV competitive info on COMP](#)
- [XIV configuration and functionality table](#)
- [XIV blog search](#)
- [XIV Twitter search](#)

**Figure X.1.** IBM XIV Storage System (and links to more detail).

- High reliability and availability via full redundancy, self-healing, and unprecedented rebuild speed
- Low TCO enabled by high-density storage, simplified planning, cost-free features, and low-touch management
- Virtualized storage, easy provisioning, and flexibility for optimized virtual environments and cloud services.

## SAN Volume Controller

IBM System Storage SAN Volume Controller (SVC) ([Figure V.1](#)) is a storage virtualization system designed to enable a single



### Specifications

Shared SMP processor	Intel Xeon 5600 Series quad-core
Processor memory for cache	24 GB per engine
Host adapter interfaces	Four 8 Gbps Fibre Channel Two 1 Gbps iSCSI Two 10 Gbps iSCSI (optional)
Number of disk drives	Up to four SSD devices per SVC node
Maximum storage capacity	Internal: Up to 1.2 TB raw SSD capacity per I/O group or up to 4.8 TB in an 8-node cluster External: Up to 32 PB usable capacity
Internal SSD sizes	146 GB
RAID levels for internal SSD	0, 1, 5, 6, and 10

- [SAN Volume Controller Sales Kit on PartnerWorld](#)
- [SAN Volume Controller info on PartnerWorld](#)
- [SAN Volume Controller info on IBM.com](#)
- [SAN Volume Controller Interactive Demo](#)
- [Analyst White Paper: Forrester: The Total Economic Impact of IBM System Storage SAN Volume Controller](#)
- [SAN Volume Controller competitive info on COMP](#)
- [SAN Volume Controller blog search](#)
- [SAN Volume Controller Twitter search](#)

**Figure V.1.** IBM System Storage SAN Volume Controller at a glance (and links to more detail).



point of control for storage resources to help support improved business application availability and greater resource utilization. The objective is to manage storage resources in your IT infrastructure and to make sure they're used to the advantage of your business—and do it quickly, efficiently, and in real time, while avoiding increases in administrative costs.

SAN Volume Controller supports attachment to servers using iSCSI protocols over IP networks at 1 Gbps or 10 Gbps speeds, which can help reduce costs and simplify server configuration. SAN Volume Controller also supports FCoE protocol, enabling use of converged data center infrastructures; this new capability simplifies data center management by using the same network for storage, WAN, and LAN.

Here are some quick SAN Volume Controller facts:

- Manages heterogeneous storage from a single point of control
- Moves data among virtualized storage systems without disruptions
- Stores up to five times<sup>1</sup> as much active data in the same physical disk space using IBM Real-time Compression
- Simplifies storage infrastructure with support for Fibre Channel over Ethernet (FCoE) protocol
- Reduces storage costs, improve space and power requirements
- Optimizes solid-state storage deployments automatically with IBM System Storage Easy Tier

<sup>1</sup>Compression data based on IBM measurements. Compression rates vary by data type and content.



- Allows for non-disruptive scalability from the smallest configuration to the largest
- Implements stretched configurations for high availability and data mobility between data centers.

## N series

IBM System Storage N series multiprotocol storage products provide a wide range of network attachment capabilities to a broad range of host systems, and are designed to integrate network attached storage (NAS) and storage area network (SAN) storage within a single platform by supporting NFS, CIFS, Fibre Channel, iSCSI, HTTP, and FTP protocols.

### MORE ON THE WEB

- [N series software info on IBM.com](#)

## N3000 Express series

The IBM System Storage N3000 Express systems ([Figure N.1](#)) are designed to provide primary and secondary storage for mid-size enterprises, consolidating all of their fragmented application-based storage and unstructured data into one single-code system. Easily managed and expandable, this platform can help IT generalists increase their effectiveness. N3000 Express systems offer integrated data access, intelligent management software, and data protection capabilities—such as those found in higher-end IBM System Storage N series systems—all in a cost-effective package. N3000 Express series innovations include internal controller support for serial-attached SCSI (SAS) or serial advanced technology

**Specifications**

Product	N3220	N3220	N3240	N3240	N3400	N3400
Machine type-model	2857-A12	2857-A22	2857-A14	2857-A24	2859-A11	2859-A21
Controller configuration	Single	Dual (active/active)	Single	Dual (active/active)	Single	Dual (active/active)
Random access memory	6 GB	12 GB	6 GB	12 GB	4 GB	8 GB
Fibre Channel ports (speed)	2 (4 Gbps)	4 (4 Gbps)	2 (8 Gbps)	4 (8 Gbps)	2 (4 Gbps)	4 (4 Gbps)
Ethernet ports (speed)	4 (1 Gbps) onboard 2 (10 Gbps)*	8 (1 Gbps) onboard 4 (10 Gbps)*	4 (1 Gbps) onboard 2 (10 Gbps)*	8 (1 Gbps) onboard 4 (10 Gbps)*	4 (1 Gbps)	8 (1 Gbps)
Maximum raw capacity	374 TB	374 TB	432 TB	432 TB	368 TB	368 TB
Maximum number of disk drives	144 24 internal	144 24 internal	144 24 internal	144 24 internal	136 12 internal	136 12 internal
Disk drives supported in controller (size, type, speed)	SAS: 450 GB, 600 GB; (10k RPM)	SAS: 450 GB, 600 GB; (10k RPM)	SATA: 1 TB, 2 TB, 3 TB; (7.2k RPM)	SATA: 1 TB, 2 TB, 3 TB; (7.2k RPM)	SAS: 300 GB, 450 GB, 600 GB, 600 GB FDE (15k RPM) SATA: 1 TB, 2 TB, (7.2k RPM)	SAS: 300 GB, 450 GB, 600 GB, 600 GB FDE (15k RPM) SATA: 1 TB, 2 TB, (7.2k RPM)
Warranty	3 years for hardware and licensed software. CRU and on-site service, next business day 9x5, service upgrade available					

- [N3000 details on PartnerWorld](#)
- [N3000 details on IBM.com](#)
- [N3000 competitive info on COMP](#)
- [N3000 blog search](#)
- [N3000 Twitter search](#)

**Figure N.1.** IBM System Storage N3000 Express series at a glance (and links to more detail).





attachment (SATA) drives, expandable I/O connectivity, and onboard remote management.

The N3000 Express series is compatible with the entire family of N series storage systems, which feature a comprehensive line-up of hardware and software designed to address a variety of possible deployment environments.

Here are some quick N3000 facts:

- Takes advantage of proven features, including a high-performing and flexible operating system, data management software, and redundancy features for continuous operations
- Supports disk-based backup, with file or application-level recovery using SnapMirror, Snapshot, and SnapRestore software features through a simplified replication, backup, and recovery system for better data protection and retention
- Enables on-the-fly provisioning with self-diagnosing systems to simplify management
- Supports concurrent file and I/O block serving over Ethernet and Fibre Channel storage area network infrastructures using a single, integrated architecture for improved versatility.

## **N6000 series**

The IBM N6000 series systems ([Figure N.2](#)) meet your Network Attached Storage (NAS) needs and provide high levels of application availability for everything from critical business operations to technical applications. You can also address NAS and Storage Area Network (SAN) as primary and secondary storage requirements. In addition, you get outstanding



## Specifications

Product	N6210	N6240	N6270
Machine type/model	2858-C10, 2658-C20	2858-C21, 2858-E11, 2858-E21	2858-C22, 2858-E12, 2858-E22
Controller configuration	Single C (2858-C10), Dual active/active CC (2858-C20)	Dual active/active CC (2858-C21), Single + IO Exp CI (2858-E11), Dual + IO Exp active/active CI-HA (2858-E21)	Dual active/active CC (2858-C22), Single CI (2858-E12), Dual active/active CI-HA (2858-E22)
Processor speed and type	2.3 GHz Intel (dual-core)	2.3 GHz Intel (quad-core)	3.0 GHz Intel (quad-core)
Number of processors	2 (2858-C10), 4 (2858-C20)	8 (2858-C21), 4 (2858-E11), 8 (2858-E21)	8 (2858-C22), 4 (2858-E12), 8 (2858-E22)
Random access memory	4 GB (2858-C10), 8 GB (2858-C20)	16 GB (2858-C21), 8 GB (2858-E11), 16 GB (2858-E21)	32 GB (2858-C22), 16 GB (2858-E12), 32 GB (2858-E22)
Nonvolatile memory	512 MB (2858-C10), 1 GB (2858-C20)	2 GB (2858-C21), 1 GB (2858-E11), 2 GB (2858-E21)	4 GB (2858-C22), 2 GB (2858-E12), 4 GB (2858-E22)
Fibre Channel ports (speed)	2 Gbps (2858-C10), 4 Gbps (2858-C20)	4 Gbps (2858-C21), 2 Gbps (2858-E11), 4 Gbps (2858-E21)	4 Gbps (2858-C22), 2 Gbps (2858-E12), 4 Gbps (2858-E22)
Ethernet ports (1 Gbps)	2 (2858-C10), 4 (2858-C20)	4 (2858-C21), 2 (2858-E11), 4 (2858-E21)	4 (2858-C22), 2 (2858-E12), 4 (2858-E22)
SAS Ports (6 Gbps)	2 (2858-C10), 4 (2858-C20)	4 (2858-C21), 2 (2858-E11), 4 (2858-E21)	4 (2858-C22), 2 (2858-E12), 4 (2858-E22)

- [N6000 details on PartnerWorld](#)
- [N6000 details on IBM.com](#)
- [N6000 competitive info on COMP](#)
- [N6000 blog search](#)
- [N6000 Twitter search](#)

**Figure N.2.** IBM System Storage N6000 series at a glance (and links to more detail).



value—our flexible systems offer excellent performance and impressive expandability at a low total cost of ownership.

N series systems enable easy provisioning, managing, and upgrading so you can quickly adapt your storage infrastructure to meet your changing business and technical needs. To help you maximize staff productivity, all N series systems use the Data ONTAP operating system and the same suite of application-aware management software. Also, OnCommand enables the consolidation and simplification of shared IT storage management.

Here are some quick N6000 facts:

- Increase NAS storage flexibility and expansion capabilities by consolidating block and file data sets onto a single multi-protocol storage platform
- Get performance when your applications need it most with high bandwidth, 64-bit architecture, and the latest I/O technologies
- Maximize storage efficiency and growth and preserve investments in staff expertise and capital equipment with data-in-place upgrades to more powerful IBM System Storage N series
- Improve your business efficiency by taking advantage of the N6000 series capabilities, also available with a Gateway feature, to reduce data management complexity in heterogeneous storage environments for data protection and retention.



## N7000 series

IBM System Storage N7000 series systems ([Figure N.3](#)) are designed to help you tackle the challenge of effective data management using virtualization technology and a multiprotocol storage architecture. The N7000 series is designed to deliver high-end enterprise storage and data management capabilities with midrange affordability. Built-in serviceability and manageability features help support your efforts to increase reliability, simplify and merge in a single code storage infrastructure and maintenance, and deliver exceptional economy.

The N7000 series, like all N series systems, provides powerful virtualization and thin provisioning capabilities to help you maximize storage utilization while minimizing the use of power, cooling, and floor space. At the same time, you can improve staff productivity with an integrated suite of application-aware manageability software offering policy-based automation to otherwise manual tasks, improving storage efficiency.

Here are some quick N7000 facts:

- More robust and expandable infrastructure: keeps pace with companies' growing business; designed for non-disruptive expansion to more than 4.3 PB (4320 TB) storage capacity
- Management versatility: supports file serving and block I/O over Ethernet and Fibre Channel SAN infrastructures simultaneously
- Efficient consolidation: FlexShare helps ensure that critical workloads get priority service



### Specifications

Product	N7950T
Machine type model	2867-E22
Gateway machine type model	2867-E22 (w/FC 9551)
Controller configuration	Dual (active/active)
Processor speed and type	2.93 GHz Intel 6-core
Number of processors	24
Random access memory	192 GB
Nonvolatile memory	8 GB
Fibre Channel ports (speed)	8 (8-Gbps)
Ethernet ports (speed)	8 (10-Gbps), 4 (1-Gbps)
Maximum number of Fibre Channel loops	14
Maximum raw capacity	4320 TB
Maximum number of disk drives	1440
Maximum volume size	100 TB
Maximum size of volumes/LUNs	4096

- [N7000 details on PartnerWorld](#)
- [N7000 details on IBM.com](#)
- [N7000 competitive info on COMP](#)
- [N7000 blog search](#)
- [N7000 Twitter search](#)

**Figure N.3.** IBM System Storage N7000 at a glance (and links to more detail).



- Allows continuous operations: supports application-level recovery in minutes, not hours
- Better results with better performance: delivers high, consistent performance for mission-critical applications in storage and data protection.

## N series Gateway

IBM System Storage N series Gateway ([Figure N.4](#)) product line is a network-based integrated storage solution designed to provide IP and FCP access to SAN-attached heterogeneous storage arrays. The IBM System Storage N6000 and IBM System Storage N7000 series systems ordered with a Gateway



- [N series Gateway details on PartnerWorld](#)
- [N series Gateway details on IBM.com](#)
- [N series Gateway competitive info on COMP](#)
- [N series Gateway blog search](#)
- [N series Gateway Twitter search](#)

**Figure N.4.** IBM System Storage N series (and links to more detail).



feature code helps make the most of your dynamic provisioning capabilities of Data ONTAP software across your existing Fibre Channel SAN infrastructure to support an expanded set of business applications. The N series Gateway is based on the Data ONTAP microkernel operating system, which is designed to integrate block and file storage networking paradigms under a common architecture. The N series Gateway offers a comprehensive suite of advanced data management capabilities designed to help you consolidate, protect, and recover mission-critical data for enterprise applications and users.

N series Gateway systems are designed to deliver the performance and capacity to meet access requirements for enterprises of all sizes. They are intended to deliver industry leading performance, offer terabytes of managed capacity, and be configured for simultaneous active/active access with secure failover across two independent systems in a cluster.

Here are some quick N series Gateway facts:

- Multiprotocol storage environment provides single access for network attached storage and storage area network storage environments
- Versatile, integrated architecture supports concurrent block I/O and file serving over Ethernet and Fibre Channel storage area network infrastructures and optimizes investment protection and return on investment
- Storage consolidation is designed to enable organizations to consolidate UNIX, Linux, Microsoft Windows and web-based workloads with your existing storage area network

- Comprehensive software suite provides robust system management, copy services, virtualization technologies, and disaster recovery and backup capabilities across all storage area network resources.

## N series Software

The IBM System Storage N series also provides a selection of features and functions delivered through software offerings which are designed to provide a comprehensive set of robust management and operational tools as well as high availability features, disaster recover, and data copy services that help the system administration provide a high level of support for environments requiring IP attached storage solutions.

Here are a few examples of the many different N series software offerings:

- Deduplication
  - Performs block level data de-duplication on NearStore data volumes
  - Volume data is automatically scanned and deduplicated, resulting in immediate space savings with minimal impact on operations.
- Data ONTAP
  - N series storage operating system provides full-featured data management for both block and file serving environments

### MORE ON THE WEB

- [N series software info on IBM.com](#)





- Single architecture and user interface simplify data management and reduce costs for NAS deployments that support SAN environments.
- Disk sanitization
  - The process of physically obliterating data by overwriting disks with specified byte patterns or random data
  - Helps prevent recovery of current data by any known recovery methods.
- FlexClone
  - Instantaneously creates LUN and volume clones without requiring additional storage
  - Accelerated test and development and storage capacity savings.
- FlexShare
  - Prioritizes storage resource allocation to highest value workloads on a heavily loaded system
  - Ensures that best performance is provided to designated high-priority applications.
- FlexVol
  - Creates flexibly sized LUNs and volumes across a large pool of disks and one or more RAID groups
  - Fast, simple, and flexible storage provisioning and high-capacity utilization

- Regulatory compliance solution for spreadsheets, presentations, and other unstructured application data.
- MetroCluster
  - An integrated high-availability/disaster recovery solution for campus and metro-area deployments
  - Ensures high data availability when a site failure occurs.
- MultiStore
  - Securely partitions a storage system into multiple virtual storage appliances
  - Enables secure consolidation of multiple domains and file servers.
- NearStore (near-line)
  - Increases the maximum number of concurrent data streams (per storage controller)
  - Enhances backup, data protection, and disaster preparedness by increasing the number of concurrent data streams between two N series systems.
- Operations manager
  - Manages multiple N series systems from a single administrative console
  - Faster deployment and consolidated management of multiple N series systems.



- Protection manager
  - Backup and replication management software for N series disk-to-disk environment
  - Improves productivity through automation of data protection tasks; delivers higher assurance of data protection than with manual execution of tasks by reducing human errors.
- RAID-DP
  - Double parity bit, RAID protection (N series RAID 6 implementation)
  - Protects against data loss due to double disk failures and media bit errors occurring during drive rebuild processes.
- SecureAdmin
  - Authenticates both the administrative user and the N series system, creating a secure, direct communication link to the N series system
  - Helps protect administrative logins, passwords, and session commands from “cleartext” snooping by replacing rsh and telnet with the strongly encrypted SSH protocol.
- Single Mailbox Recovery for Exchange (SMBR)
  - Enables the recovery of a single mailbox from a Microsoft Exchange Information Store
  - Can extract a single mailbox or email directly in minutes compared to hours with traditional methods

- Helps eliminate the need for IT staff.
- SnapDrive
  - Provides host-based data management of N series storage from Windows, UNIX, and Linux servers
  - Simplifies host-consistent Snapshot copy creation and automates error-free restores.
- SnapLock
  - Write-protects structured application data files within a volume to provide non-erasable, non-rewriteable disk storage
  - Provides storage enabling compliance with government records retention regulations.
- SnapManager
  - Provides host-based data management of N series storage for databases and business applications (MS Exchange, SAP, Oracle, MS Sharepoint, VMware, and MS Hyper-V)
  - Simplifies application-consistent Snapshot copies, automates error-free data restores, and enables application-aware disaster recovery.
- SnapMirror
  - Enables automatic, incremental data replication between systems: synchronous or asynchronous



- Provides flexible, space- and network-efficient site-to-site mirroring for disaster recovery and data distribution.
- SnapMover
  - Enables rapid reassignment of disks between controllers within a system without disruption
  - Enables fast, non-disruptive load balancing within an active-active controller system.
- SnapRestore
  - Rapidly restores single files, directories, or entire LUNs and volumes from any Snapshot backup
  - Enables near-instantaneous recovery of files, databases, and complete volumes.
- Snapshot
  - Makes incremental, data-in-place, point-in-time copies of a LUN or volume with minimal performance impact
  - Enables frequent, non-disruptive, space-efficient, and quickly restorable backups.
- SnapValidator
  - Maximizes data integrity for Oracle databases
  - Enhances Oracle database resiliency in compliance with Oracle HARD initiative.
- SnapVault
  - Exports Snapshot copies to another N series system, providing an incremental block-level backup solution



- Enables cost-effective, long-term retention of rapidly restorable disk-based backups.
- SyncMirror
  - Maintains two online copies of data with RAID-DP protection on each side of the mirror
  - Protects against all types of hardware outages, including triple disk failure.

## Scale Out Network Attached Storage (SONAS)

IBM Scale Out Network Attached Storage (SONAS) is designed to embrace and deliver cloud storage in the petabyte age. SONAS can meet today's storage challenges with quick and cost effective IT-enabled business enhancements designed to grow with unprecedented scale ([Figure N.5](#)).

SONAS can also deliver storage services that make the supporting technology almost invisible. It allows applications and services to be uncoupled from the underlying infrastructure, enabling businesses to adjust to change quickly. As a result, SONAS can easily integrate with your organization's strategies to develop a more dynamic enterprise.

Organizations with fast-growing, rapidly multiplying file systems are beginning to discover that traditional network attached storage (NAS)—even clustered NAS—has serious problems. Managing and supporting storage as it scales to millions, then billions, of active files is extremely complex. When such massive numbers of files require separate file systems connected with many separate servers, operational complexity grows exponentially. Consolidating tens, even



### Specifications

Maximum raw capacity	21 PB
Host interface	CIFS, NFS, FTP, HTTP
Supported drives	SAS: 600 GB (15k RPM), 900 GB (10K rpm) Nearline SAS: 2 TB, 3 TB (7200 RPM)
RAID levels	RAID 6
Maximum drives supported	7200
Fans & power supplies	Fully redundant, hot-swappable
Rack support	42 Electronics Industries Alliance EIA units
Management software	SONAS software
Warranty	One year 9 × 5 next business day, upgrade to 24 hour × 7 days a week × 4 hour response

- [SONAS details on PartnerWorld](#)
- [SONAS details on IBM.com](#)
- [SONAS competitive info on COMP](#)
- [SONAS blog search](#)
- [SONAS Twitter search](#)

**Figure N.5.** IBM Scale Out Network Attached Storage (SONAS) at a glance (and links to more detail).



hundreds, of these file servers into high-end scale-out NAS becomes a necessity. This is where SONAS helps. SONAS is designed to scale out to store millions to billions of active files in a single namespace. SONAS offers operational efficiency and administrative savings, combining massive scalability with automated file management to quickly deliver information around the world.

SONAS is an ideal solution for cloud storage implementations as well. It is designed to consolidate files that are scattered in multiple storage locations and allow them to be efficiently shared and managed. The IBM Active Cloud Engine is a unique capability of SONAS (offered at no charge) that enables this and many more management abilities. The IBM Active Cloud Engine is a suite of capabilities specifically designed to manage files in an automated, scalable manner. It creates the appearance of a single system despite geographic, physical, media, or other discrepancies that may exist in the physical world. It is designed to put the right file in the right place at the right time, and to give users the fastest possible access with the same view of their data no matter where they are. It enables ubiquitous access to files from across the globe quickly and cost effectively. The IBM Active Cloud Engine offers clients not only a high-performance file serving function, but also reduced network costs. It localizes file data where it is needed. It can prepopulate files to remote sites in advance of that file request coming in, which allows for high availability and very fast access of those files at remote sites. This capability allows for file sharing and content distribution while it shields applications from fluctuating wide area network (WAN) latencies (performance fluctuations and





outages during data access across a WAN). In addition, it eliminates unnecessary file replication to remote sites, thereby significantly lowering network and storage costs.

Here are some quick IBM SONAS facts:

- Provide extreme scalability to accommodate capacity growth, satisfying bandwidth-hungry applications with scale out performance for both random access and streaming workloads
- Enable ubiquitous access to files from across the globe quickly and cost effectively with IBM Active Cloud Engine, leveraging its disaster recovery and business continuity capacity
- Lower TCO by up to 40 percent with automated life cycle management and migration to tape
- Provide gateway option for IBM XIV and IBM Storwize V7000 disk systems
- Offers CLI and browser-based, simple, intuitive GUI.

## **Real-time Compression Appliance STN6500**

IBM Real-time Compression Appliance STN6500 ([Figure N.6](#)) shrinks primary, online NAS data in real time, without performance degradation. By significantly reducing storage requirements, you can keep up to five times more information online for analytics, use the improved efficiency to reduce storage costs, or achieve a combination of greater capacity and reduced cost. IBM Realtime Compression can deliver improved user response time and overall throughput, because applications spend less time waiting for disk requests.



## Specifications

Models	2452-650
1 GbE ports	16
10 GbE ports	None. See STN6800 for 10 GbE connectivity
Processor	Two 2.4 GHz four-core Intel Xeon processors with QuickPath Interconnect technology
ECC Memory (GB)	72
Storage interface	NAS: Microsoft SMBv1 and SMBv2, CIFS and NFS version
Connectivity	1 GbE
Hot swap components	Power supplies, fan modules, disk
Rack support	2 rack unit form factor
Management software	<ul style="list-style-type: none"> <li>• Intuitive web GUI</li> <li>• Command line interface (CLI) for management tasks</li> <li>• Comprehensive SNMP MIB providing statistics information and alerts</li> <li>• Active Directory integration supports external Syslog server for sending notifications and audit information</li> </ul>
High Availability	<ul style="list-style-type: none"> <li>• Transparent path failover, when deployed in pairs</li> <li>• Predictive Failure Analysis for hardware components</li> <li>• Link Aggregation (IEEE 802.3ad)</li> <li>• Ethernet Trunking (Cisco EtherChannel)</li> </ul>
Warranty	1 year

- [Real-time Compression details on PartnerWorld](#)
- [Real-time Compression details on IBM.com](#)

**Figure N.6** IBM Real-time Compression Appliance STN6500 at a glance (and links to more detail).



IBM Real-time Compression Appliance STN6500 effectively increases the capacity of the existing storage infrastructure to help you meet the demands of rapid data growth while also enhancing storage performance and utilization. All IBM Real-time Compression Appliances apply IBM's patented real-time data compression techniques to primary and existing storage, delivering optimization and savings throughout the entire storage life cycle. The result is unprecedented cost savings and return on investment, along with operational and environmental efficiencies.

Here are some quick STN6500 facts:

- Shrink primary NAS data in real time, without performance degradation
- Deploy and administer quickly and easily
- Leverage automated failover option for high-availability environments
- Support 16 1 GbE ports between NAS systems and network switches.

## **Real-time Compression Appliance STN6800**

IBM Real-time Compression Appliance STN6800 ([Figure N.7](#)) effectively increases the capacity of the existing storage infrastructure to help you meet the demands of rapid data growth while also enhancing storage performance and utilization. All IBM Real-time Compression Appliances apply IBM's patented real-time data compression techniques to primary and existing storage, delivering optimization and savings throughout



## Specifications

Models	2452-680
1 GbE ports	Up to 8
10 GbE ports	8, or 4 with mixed 1 GbE and 10 GbE option
Processor	Two 2.4 GHz six-core Intel Xeon processors with QuickPath Interconnect technology
ECC Memory (GB)	72
Storage interface	NAS: Microsoft SMBv1 and SMBv2, CIFS and NFS version 3
Connectivity	10 GbE and 1 GbE options
Hot swap components	Power supplies, fan modules, disk
Rack support	2 rack unit form factor
Management software	<ul style="list-style-type: none"> <li>• Intuitive web GUI</li> <li>• Command line interface (CLI) for management tasks</li> <li>• Comprehensive SNMP MIB providing statistics information and alerts</li> <li>• Active Directory integration supports external Syslog server for sending notifications and audit information</li> </ul>
High Availability	<ul style="list-style-type: none"> <li>• Transparent path failover, when deployed in pairs</li> <li>• Predictive Failure Analysis for hardware components</li> <li>• Link Aggregation (IEEE 802.3ad)</li> <li>• Ethernet Trunking (Cisco EtherChannel)</li> </ul>
Warranty	1 year

- [Real-time Compression details on PartnerWorld](#)
- [Real-time Compression details on IBM.com](#)

**Figure N.7** IBM Real-time Compression Appliance STN6800 at a glance (and links to more detail).



the entire storage life cycle. The result is unprecedented cost savings and return on investment, along with operational and environmental efficiencies.

IBM Real-time Compression's patented Random Access Compression Engine (RACE) technology is based on proven Lempel-Ziv (LZ) data compression algorithms. RACE enables IBM Real-time Compression Appliances to deliver real-time, random access, deterministic, and lossless data compression, maintaining reliable and consistent performance and data integrity.

Here are some quick STN6800 facts:

- Shrink primary NAS data in real time, without performance degradation
- Deploy and administer quickly and easily
- Support mixed 10 GbE and 1 GbE environments with flexible port configurations
- Support eight 10 GbE NAS ports for maximum throughput, or four 10 GbE and eight 1 GbE NAS ports for maximum flexibility
- Leverage automated failover option for high-availability environments.

## **Tape Storage**

Server systems are woven deeply into today's business processes and are at the core of day-to-day operations. This information is thus a valuable corporate asset that must be protected. Tape storage provides a cost-effective and efficient means of backing up and archiving the information held on disk storage. Tape storage plays a vital role in reduc-



ing storage costs, maintaining data availability in the event of hardware failures, restoring data files accidentally or maliciously erased, restoring operations after a disaster, and so forth. In this section, we examine IBM's tape storage offerings.

#### MORE ON THE WEB

- [All tape offerings on IBM.com](#)

## Tape Storage Cross Reference by Workload Size

It is often a mistake to associate entry-level, midrange, and enterprise-class storage products with small, medium, and large size businesses, respectively. The amount of data stored often does not correlate with the number of employees or revenue metrics often cited in determining size.

For this reason, recommendations on products based on actual workloads often makes more sense, though still should be considered only a general guideline. In this section, you will find a list of tape storage products organized by workload size (entry, mid-size, and enterprise) to help you find the best solution for your client.

### *Tape Storage for Entry-level Workloads*

Here is a list of tape storage products designed for entry-level workloads. Click on the links and you will jump to the section of this ebook that describes the product.

[TS2240 Express](#)

[TS2250 Express](#)

[TS2340 Express](#)

[TS2350 Express](#)



[TS2900 Tape Autoloader](#)

[TS3100 Express](#)

[TS3200 Express](#)

[Linear Tape File System](#)

**MORE ON THE WEB**

- [Tape for entry-level workloads](#)

### ***Tape Storage for Mid-size Workloads***

Here is a list of tape storage products designed for mid-size workloads. Click on the links and you will jump to the section of this ebook that describes the product (you can click on the back arrow to jump back to this page).

[TS3100 Express](#)

[TS3200 Express](#)

[TS3310 Tape Library](#)

[TS3500 Tape Library](#)

[Crossroads ReadVerify Appliance \(RVA\)](#)

[Linear Tape File System](#)

**MORE ON THE WEB**

- [Tape for mid-size business workloads](#)

### ***Tape Storage for Enterprise Workloads***

Here is a list of tape storage products designed for large enterprise workloads. Click on the links and you will jump to the section of this ebook that describes the product (you can click on the back arrow to jump back to this page).

[TS1130 Tape Drive](#)

[TS1140 Tape Drive](#)

[TS3500 Tape Library](#)

**MORE ON THE WEB**

- [Tape for enterprise workloads](#)



[TS7700 Virtual Engine](#)

[Crossroads ReadVerify Appliance \(RVA\)](#)

[Linear Tape File System](#)

## Crossroads ReadVerify Appliance (RVA)

Crossroads ReadVerify Appliance ([Figure T.1](#)) provides full visibility into the utilization, performance, and health of the tape drives and media in a tape library environment. The detailed insight provided by ReadVerify Appliance can lead to operational improvements by helping to complete backup jobs on time, minimize purchases of unnecessary resources, and prevent premature wear of overused resources. ReadVerify Appliance collects data directly from the tape drives and library during data transactions, without impacting the storage applications.

ReadVerify Appliance also supports two advanced features. ArchiveVerify (optional feature) offers the fully automated ability to verify readability of long-idle or suspicious media, providing an audit trail for regulatory compliance policies. The ReadVerify Advanced Reporting integrated feature gives customers the dynamic ability to generate fully customized, multivariable reports for identifying hidden patterns and relationships between the different components of their tape environment.

Here are some quick RVA facts:

- Helps reduce data risk by monitoring library activity and providing alerts on the health and integrity of the tape drives and media





### Specifications

#### Physical characteristics

SAN connectivity	1, 2, 4 GB FC Support
AC power	100–240 V ac autosensing 50/60 Hz, 4.0 A
Dimensions	Height: 43.1 mm, 1U (1.72", 1U) Width: 426 mm (16.8") Depth: 358 mm (14.1")
Weight	10.4 kg (23 lbs)

#### Operating environment

Temperature	10° to 40°C (50° to 104°F)
Relative humidity	20% to 80% noncondensing
Heat output	564 BTUs
Energy consumption efficiency	NA
Warranty	One year limited warranty

- [Crossroads ReadVerify Appliance details on PartnerWorld](#)
- [Crossroads ReadVerify Appliance details on IBM.com](#)
- [Crossroads ReadVerity competitive info on COMP](#)
- [Crossroads ReadVerify blog search](#)
- [Crossroads ReadVerify Appliance Twitter search](#)

**Figure T.1** Crossroads ReadVerify Appliance at a glance (and links to more detail).



- Optimizes tape resources by providing visibility into the root cause of incomplete backups, unbalanced drive usage, and low performing assets
- Helps meet regulatory compliance and reduce long-term data risk through fully automated, policy-driven validation of tape media readability (requires ArchiveVerify optional feature)
- Provides dynamic, multi-variable user-managed reporting for understanding complex system interactions and projecting future budget and system needs.

## Linear Tape File System

The IBM Linear Tape File System ([Figure T.2](#)) provides direct, intuitive, and graphical access to data stored in IBM tape drives and libraries using Linear Tape-Open (LTO) generation 6 or 5 tape cartridges, as well as 3592 cartridges. It eliminates the need for additional tape management and software to access data.

The Linear Tape File System is the first file system that works in conjunction with LTO tape technology to set a new standard for ease of use and portability for open systems tape storage. With this system, accessing data stored on an IBM tape cartridge is as easy and intuitive as using a USB flash drive. And with the operating system's graphical file manager, reading data on a tape cartridge is as easy as dragging and dropping. Users can run any application designed for disk files against tape data without concern for the fact that the data is physically stored on tape.



### Specifications

#### IBM Linear Tape File System Single Drive Edition - Hardware requirements

Tape systems	IBM System Storage TS2250 Tape Drive (3580S5E) IBM System Storage TS2260 Tape Drive (3580S6E) IBM System Storage TS2350 Tape Drive (3580S5X) IBM System Storage TS2360 Tape Drive (3580S6X[TI1])
Tape media	LTO-5, LTO-6, IBM 3592 JB, JC and JK Linux: RHEL 5.5, 5.6, 5.7, 5.8, 6.1 and 6.2 SLES 11 SP1 and SP2
Supported operating systems	Apple Mac OS X: Mac OS X 10.5 Leopard (32-bit), 10.6 Snow Leopard (32-bit), and 10.7 Lion (32-bit or 64-bit) Microsoft Windows: Windows 7 SP1(32-bit or 64-bit) Windows Server 2008 R2 SP1

#### IBM Linear Tape File System Library Edition - Hardware requirements

Tape systems	IBM System Storage TS2900 Tape Autoloader Express IBM System Storage TS3100 Tape Library Express IBM System Storage TS3200 Tape Library Express IBM System Storage TS3310 Tape Library IBM System Storage TS3500 Tape Library* IBM System Storage TS1140 Tape Drive support on IBM System Storage TS3500 Tape Library
Tape media	LTO-6, LTO-5, IBM 3592 JB, JC and JK
Supported operating systems	Linux: Red Hat Enterprise Linux (RHEL) 5.5, 5.6, 5.7, 5.8, 6.1 and 6.2; SUSE Linux Enterprise Server (SLES) 11 SP1 and SP2 Microsoft Windows: Windows Server 2008 R2 SP1

- [Linear Tape File System info on PartnerWorld](#)
- [Linear Tape File System info on IBM.com](#)
- [Linear Tape File System competitive info on COMP](#)
- [Linear Tape File System blog search](#)
- [Linear Tape File System Twitter search](#)

**Figure T.2.** IBM Linear Tape File System at a glance (and links to more detail).



The Linear Tape File System offers two different editions. The Single Drive Edition allows access to all data in a cartridge loaded on a single drive as if it were on disk. The Library Edition adds support for multiple cartridges in a tape library, and it automatically loads the cartridge per file access. Both editions use the file system's format and resources of the operating system (OS) on which it is running to graphically display the contents of a tape library in the OS's graphical user interface (GUI) format, typically a folder/tree structure. Both editions support LTO generation 6 and 5 as well as an IBM TS1140 System Storage Tape Drive

The metadata of each cartridge, once mounted, is cached in server memory. Metadata operations, such as browse directory and filename search, do not require tape movement.

The Linear Tape File System provides a software solution—IBM Linear Tape File System Storage Manager—to manage and monitor archive and restore files. This software solution provides storage life-cycle management of multimedia files to reduce the cost of digital content archive software licensing while also reducing video tape cartridge costs.

Here are some quick LTFS facts:

- Simplifies direct access and management of selected tape drives and tape libraries and their data
- Incorporates the IBM Linear Tape File System format standard for reading, writing, and exchanging descriptive metadata on certified tape cartridges
- Enables tagging of files with any text, allowing for more intuitive searches of cartridge, drive, and library content.



## TS1130 Tape Drive

The IBM System Storage TS1130 Tape Drive ([Figure T.3](#)) features storage capability to help you establish easy access to data, better security, long-term retention and data governance, and regulatory compliance. The TS1130 tape drive offers high-performance flexible data storage with support for data encryption. It can help protect your investments in tape automation by offering compatibility with existing automation. To further protect your investment, an upgrade model is available for your existing IBM System Storage TS1120 Tape Drives. And to support a heterogeneous server environment, the TS1130 offers multiplatform support.

The TS1130 Tape Drive supports IBM System Storage TS3400 and TS3500 Tape Libraries, IBM TotalStorage 3494 Tape Libraries, IBM Virtualization Engine TS7700, IBM racks that enable standalone installation, and IBM 3952 Tape Frames Model C20 (3952C20 frame) attached to a Sun 9310 library.

Here are some quick TS1130 facts:

- Provides information security with support for encryption and key management
- Optimizes information retention with support for existing IBM tape automation
- Supports write once read many (WORM) cartridges to help satisfy compliance requirements
- Offers high performance and high capacity for storage consolidation.



### Specifications

Recording technique	Linear Serpentine
Number of tracks	1152
Native capacity	1 TB (using JB/JX media), 640 GB (using JA/JW media), or 128 GB (using JJ/JR media)
Native sustained data rate	160 MBps (uncompressed)
Adaptive instantaneous data rates	163, 134, 109, 83, 56, 43 MBps for 3592 JB cartridges initialized in Gen 3 format; 150, 127, 104, 78, 52, 40 MBps for 3592 JB cartridges initialized in Gen 2 format; 71, 59, 47, 36, 24, 19, 13 MBps for 3592 JA cartridges initialized in Gen 1 format
Burst data rate	400 MBps
High-speed search (max)	12.4 mps
Warranty	One year

- [TS1130 details on PartnerWorld](#)
- [TS1130 details on IBM.com](#)
- [TS1130 competitive info on COMP](#)
- [TS1130 blog search](#)
- [TS1130 Twitter search](#)

**Figure T.3.** IBM System Storage TS1130 at a glance (and links to more detail).



## TS1140 Tape Drive

The IBM System Storage TS1140 Tape Drive ([Figure T.4](#)) features storage capabilities to help you establish easy, rapid access to data, better security, long-term retention and data governance and regulatory compliance. The TS1140 tape drive offers high-performance flexible data storage with support for data encryption. It can help protect your investments in tape automation by offering compatibility with existing automation. To further protect your investment, an upgrade model is available for your existing IBM System Storage TS1130 Tape Drives. And to support a heterogeneous server environment, the TS1140 offers multiplatform support.

The TS1140 tape drive supports the IBM System Storage TS3500 Tape Library and IBM racks that enable stand-alone installation. The TS1140 features three options for Type C media. The 3592 Advanced data tape cartridge, JC, provides up to 4.0 TB native capacity, and up to 4.0 TB are provided by the 3592 Advanced WORM cartridge, JY. A limited capacity of up to 500 GB Economy cartridge, JK, offers fast access to data. The TS1140 tape drive can also read and write on previous media, type B (JB and JX), and read only on type A (JA, JW, JJ and JR).

To help optimize drive utilization and reduce infrastructure requirements, the TS1140 tape drives can be shared among supported open system hosts on a Storage Area Network (SAN).

Here are some quick TS1140 facts:

- Offers best-in-class high performance and high capacity tape processing for storage consolidation



## Specifications

Recording technique	Linear Serpentine
Number of tracks	2560
Native capacity	4 TB (using JC/JY media), 1.6 TB (using JB/JX media), or 500 GB (using JK media)
Native sustained data rate	250 MBps
Adaptive data rates	<p>13 speeds, from 76 MBps to 251 MBps for 3592 JC/JK/JY cartridges initialized in Gen 4 format</p> <p>13 speeds, from 74 MBps to 203 MBps for 3592 JB/JX cartridges initialized in Gen 4 format</p> <p>13 speeds, from 41 MBps to 163 MBps for 3592 JB/JX cartridges initialized in Gen 3 format</p> <p>13 speeds, from 39 MBps to 151 MBps for 3592 JB/JX cartridges initialized in Gen 2 format</p> <p>13 speeds, from 18 MBps to 72 MBps for 3592 JA/JJ/JR/JW cartridges initialized in Gen 1 format</p> <p>13 speeds, from 36 MBps to 144 MBps for 3592 JA/JJ/JR/JW cartridges initialized in Gen 2 or Gen 3 format</p>
Burst data rate	800 MBps
High-speed search	12.4 mps
Warranty	One year

- [TS1140 details on PartnerWorld](#)
- [TS1140 details on IBM.com](#)
- [TS1140 competitive info on COMP](#)
- [TS1140 blog search](#)
- [TS1140 Twitter search](#)

**Figure T.4** IBM System Storage TS1140 Tape Drive at a glance (and links to more detail).





- Helps enhance information security with support for encryption and key management
- Improves information retention with support for existing IBM tape automation
- Supports Write Once Read Many (WORM) cartridges to help satisfy compliance requirements.

## TS2240 Tape Drive Express

The IBM System Storage TS2240 Tape Drive Express Model H4V ([Figure T.5](#))—one of the entry-level IBM System Storage tape product family offerings—is the answer to growing storage requirements and shrinking backup windows. Incorporating the fourth generation of advanced Linear Tape-Open (LTO) technology, the TS2240 Tape Drive is suited for handling the backup, save and restore, and archival data storage needs of a wide range of small systems. In addition, the TS2240 provides up to 6 Gbps Serial Attached SCSI (SAS) connectivity and the security of LTO-based data encryption.

The System Storage TS2240 Tape Drive is an excellent tape storage solution for businesses requiring backup or low-cost, real-time archival storage of their data. The TS2240, with a half-height form factor, offers the same high capacity of full-height LTO-4 tape drives. The TS2240 has a physical storage capacity of up to 1.6 TB (with 2:1 compression) in conjunction with the IBM System Storage LTO Ultrium 800 GB data cartridge, which provides up to twice the capacity of Ultrium 3 cartridges. The native data transfer performance of the TS2240 Tape Drive has increased over the previous LTO



## Specifications

Model and part number	Model Number; 3580 H4V, Part Number: 3580S4V
Tape drive type	IBM LTO Ultrium 4 half-height SAS tape drive V2
Physical capacity	Up to 1.6 TB per cartridge with 2:1 compression; 800 GB native
Number of tape drives	1
Number of tape cartridges	1
Data transfer rate	Up to 120 MB/sec native
Tape cartridges	IBM System Storage LTO Ultrium 800 GB Data Cartridge (95P4436), IBM System Storage LTO Ultrium 800 GB WORM Cartridge (95P4450)
Cleaning cartridge	IBM System Storage LTO Cleaning Cartridge (P/N 35L2086)
Warranty	Three-year customer replaceable unit (CRU) in most countries

- [TS2240 Express details on PartnerWorld](#)
- [TS2240 Express details on IBM.com](#)
- [TS2240 Express competitive info on COMP](#)
- [TS2240 blog search](#)
- [TS2240 Twitter search](#)

**Figure T.5.** IBM System Storage TS2240 Tape Drive Express at a glance (and links to more detail).

half-height generation to up to 120 MB/sec. The TS2240 Tape Drive continues to provide an excellent alternative to slower and smaller capacity 1/4-inch, 4 mm, and 8 mm digital linear tape (DLT or SDLT) drives.



Here are some quick TS2240 facts:

- Provides high-capacity tape storage in a small, half-height form factor to address backup and archiving requirements
- Offers highly secure data storage using available hardware encryption
- Provides a native data transfer rate of up to 120 MB/sec
- Designed for the midrange open systems environment
- Supports two TS2240 Model H4Vs side by side in a standard 19-inch rack using the optional rack mount shelf.

## TS2250 Tape Drive Express

The IBM System Storage TS2250 Tape Drive Express ([Figure T.6](#)) is the entry-level tape product family offering. Incorporating the latest generation of the industry-leading linear tape-open (LTO) technology, the TS2250 Tape Drive is suited for handling backup, save and restore, and archival data storage needs with higher capacity and higher data transfer rates than the previous generation. In addition, the IBM Ultrium 5 technology is designed to support media partitioning and the new IBM Linear Tape File System technology. It also continues to support encryption of data and WORM media.

The IBM System Storage TS2250 Tape Drive is an excellent tape storage solution for businesses requiring backup and low-cost, archival storage of their data. The TS2250, with a half height form factor, offers more capacity than the full height LTO 4 tape drive in less space. The TS2250 provides a physical storage capacity of up to 3.0 TB (with 2:1 compres-



## Specifications

Available configurations	Model 3580 H5S—One IBM Ultrium 5 Tape Drive, 6 Gbps SAS interface PN 3580S5E
Tape drive type	IBM LTO Ultrium 5
Physical capacity	1.5 TB native; 3.0 TB with 2:1 compression
Number of tape drives	1
Number of tape cartridges	1
Data transfer rate	Up to 140 MBps native
Media type	IBM LTO 5 Data Cartridge IBM LTO Cleaning Cartridge
Warranty	Three-year, customer replaceable unit (CRU) in most countries

- [TS2250 Express details on PartnerWorld](#)
- [TS2250 Express details on IBM.com](#)
- [TS2250 Express competitive info on COMP](#)
- [TS2250 blog search](#)
- [TS2250 Twitter search](#)

**Figure T.6.** IBM System Storage TS2250 Tape Drive Express at a glance (and links to more detail).

sion) in conjunction with the new IBM Ultrium 1.5 TB data cartridge, nearly double the capacity of previous Ultrium 4 cartridges. The data transfer performance of the TS2250 Tape Drive has increased over the previous LTO half height genera-



tion with a transfer rate of up to 140 MBps with 6 Gbps SAS interface connectivity. It also now offers two SAS and one Ethernet port per drive to improve availability.

Here are some quick TS2250 facts:

- Helps reduce costs with lower power consumption, consolidation, and space reduction
- Supports media partitioning on LTO Ultrium 5 Media and new IBM Linear Tape File System technology
- Nearly doubles the cartridge capacity of the previous generation in a small half height form factor
- Designed to address backup and archiving requirements with lower cost implementation.

## TS2340 Tape Drive Express

The IBM System Storage TS2340 Tape Drive ([Figure T.7](#))—the entry-level IBM System Storage tape product family offering—is the answer to growing storage requirements and shrinking backup windows. Incorporating the fourth generation of advanced linear tape-open (LTO) technology, the TS2340 Tape Drive is suited for handling the backup, save and restore, and archival data storage needs of a wide range of small systems. In addition, the TS2340 provides added security features by supporting encryption of data with 3 Gbps SAS connectivity.

The IBM System Storage TS2340 Tape Drive is an excellent tape storage solution for businesses requiring backup or low-cost, real-time archival storage of their data within a small



## Specifications

Available configurations	Model L43—One IBM Ultrium 4 Tape Drive, LVD Ultra160 SCSI attach Model S43—One IBM Ultrium 4 Tape Drive, 3 Gbps SAS attach
Tape drive type	IBM LTO Ultrium 4
Physical capacity	Up to 1.6 TB per cartridge with 2:1 compression; 800 GB native
Number of tape drives	1
Number of tape cartridges	1
Data transfer rate	Up to 120 MB/sec native
Media type	IBM LTO Ultrium 4 IBM TotalStorage LTO Ultrium 800 GB Data Cartridge (PN TBD) IBM TotalStorage LTO Cleaning Cartridge (PN TBD)
Warranty	Three-year, customer replaceable unit (CRU) in most countries

- [TS2340 Express details on PartnerWorld](#)
- [TS2340 Express details on IBM.com](#)
- [TS2340 Express competitive info on COMP](#)
- [TS2340 blog search](#)
- [TS2340 Twitter search](#)

**Figure T.7.** IBM System Storage TS2340 Tape Drive Express at a glance (and links to more detail).

window of time—it offers high-capacity and performance to help address the most demanding requirements. The TS2340 has a physical storage capacity of up to 1.6 TB (with 2:1



compression) in conjunction with the new IBM Ultrium 800 GB data cartridge, which provides up to double the capacity of previous Ultrium 3 technology. Along with its higher capacity, the data transfer performance of the TS2340 Tape Drive has increased over the previous generation for a native data transfer rate of up to 120 MBps. The TS2340 Tape Drive continues to provide an excellent alternative to slower and smaller capacity 1/4-inch, 4 mm, and 8 mm DLT/SDLT tape drives.

Here are some quick TS2340 facts:

- Designed to provide high-capacity and performance to address the most demanding backup and archiving requirements
- Double the cartridge capacity of previous generation LTO drives
- Available hardware encryption designed to offer highly secure data storage along with high performance
- Native data transfer rate of up to 120 MBps
- Choice of SCSI or SAS interfaces.

## TS2350 Tape Drive Express

The IBM System Storage TS2350 Tape Drive Express ([Figure T.8](#))—part of the entry-level IBM System Storage tape product family—supports these needs by leveraging the newest generation of Linear Tape-Open (LTO) technology to help cost-effectively handle growing storage requirements.

The TS2350 Tape Drive is suited for handling backup, save and restore, and archival data storage needs with higher capacity and higher data transfer rate than previous genera-



## Specifications

Available configurations	Model 3580 S53—One IBM Ultrium 5 Tape Drive, 6 Gbps SAS interface PN 3580S5
Tape drive type	IBM LTO Ultrium
Physical capacity	1.5 TB native; 3.0 TB with 2:1 compression
Number of tape drives	1
Number of tape cartridges	1
Data transfer rate	Up to 140 MBps native
Media type	IBM LTO 5 Data Cartridge IBM LTO Cleaning Cartridge
Warranty	Three-year, customer replaceable unit (CRU) in most countries

- [TS2350 Express details on PartnerWorld](#)
- [TS2350 Express details on IBM.com](#)
- [TS2350 Express competitive info on COMP](#)
- [TS2350 blog search](#)
- [TS2350 Twitter search](#)

**Figure T.8.** IBM System Storage TS2350 Tape Drive Express at a glance (and links to more detail).

tion. In addition, the IBM Ultrium 5 technology is designed to support media partitioning, and the new IBM Linear Tape File System technology. It also continues to support encryption of data and WORM media.





The TS2350 Tape Drive is an excellent tape storage solution for businesses requiring backup and archival storage of their data. The TS2350 offers high physical storage capacity of up to 3.0 TB (with 2:1 compression) in conjunction with the new IBM Ultrium 1.5 TB data cartridge, which provides nearly double the capacity of previous Ultrium 4 cartridges. The data transfer rate of the TS2350 Tape Drive has increased over the previous LTO generation to up to 140 MBps with 6 Gbps SAS interface connectivity. It also offers two SAS and one Ethernet port per drive to improve availability.

Here are some quick TS2350 facts:

- Helps reduce costs with lower power consumption, consolidation, and space reduction
- Supports media partitioning on LTO Ultrium 5 Media and new IBM Linear Tape File System technology
- Nearly doubles the cartridge capacity of previous-generation LTO Ultrium 4 drives
- Designed to provide greater capacity and performance to address the most demanding backup and archiving requirement.

## **TS2900 Tape Autoloader Express**

The IBM System Storage TS2900 Tape Autoloader Express ([Figure T.9](#)) is designed for entry-level automated backup for rack system and small-to-medium business environments. With a low profile, high-density storage capacity, the TS2900 is ideally suited for backup and archival operations.



## Specifications

Drive options	<ul style="list-style-type: none"> <li>Ultrium 3 half height: 3 Gbps SAS</li> <li>Ultrium 5 half height: 6 Gbps SAS</li> <li>Ultrium 4 half height: 6 Gbps SAS</li> </ul>
Available models	<ul style="list-style-type: none"> <li>LTO-3 <ul style="list-style-type: none"> <li>3572 S3H (AAS - WW)</li> <li>3572S3R (HVEC - WW)</li> </ul> </li> <li>LTO-4 <ul style="list-style-type: none"> <li>3572 S4H (AAS - WW)</li> <li>3572S4R (HVEC - WW)</li> </ul> </li> <li>LTO-5 <ul style="list-style-type: none"> <li>3572 S5H (AAS - AP, LA)</li> <li>3572S5R (HVEC - WW)</li> </ul> </li> </ul>
Deskside cover kit	PN 45E3789
Additional tape magazine	PN 45E3793
Rack mount kit	PN 45E3785
Number of tape drives	1
Tape cartridge capacity	9
I/O stations	1
Physical capacity	<ul style="list-style-type: none"> <li>LTO 3: Up to 3.6 TB (7.2 TB with 2:1 compression)</li> <li>LTO 4: Up to 7.2 TB (14.4 TB with 2:1 compression)</li> <li>LTO 5: Up to 13.5 TB (27 TB with 2:1 compression)</li> </ul>
Data transfer rate	<ul style="list-style-type: none"> <li>LTO 3: Up to 60 MBps</li> <li>LTO 4: Up to 120 MBps</li> <li>LTO 5: Up to 140 MBps</li> </ul>

- [TS2900 Tape Autoloader Express details on PartnerWorld](#)
- [TS2900 Tape Autoloader Express details on IBM.com](#)
- [TS2900 Tape Autoloader Express competitive info on COMP](#)
- [TS2900 blog search](#)
- [TS2900 Twitter search](#)

**Figure T.9.** IBM System Storage TS2900 Tape Autoloader Express at a glance (and links to more detail).



The TS2900 is available with IBM HH LTO-5, HH LTO-4, or HH LTO-3 tape technology for a high-capacity, entry-priced tape storage solution.

The TS2900 is equipped with standard features designed to provide ease-of-use and secured data backup. Web-based remote management, a barcode reader, and a removable tape magazine help provide ease of use. The TS2900 can be used in a rack system or on a desktop next to a server in an office. These types of features help reduce the requirements of IT personnel staff, as well as help centralize backup in the data center. The TS2900 is also designed to support the encryption of sensitive user data in combination with HH LTO-5 or LTO-4 tape technology from IBM. With 6 Gbps SAS attach, the TS2900 is supported on IBM Power Systems, IBM System x, Intel, and other competitive open system server platforms.

Here are some quick TS2900 facts:

- 1U slim profile designed for rack system environments for automated, high-capacity tape storage
- Features the newest generation of LTO with IBM Ultrium 5 half-height (HH) technology designed for reliable performance in small-to-medium open system environments
- Lowest entry price of any IBM tape automation offering IBM HH tape technology.

## **TS3100 Tape Library Express**

The IBM System Storage TS3100 Tape Library Express model ([Figure T.10](#)) and its storage management applications are designed to address capacity, performance, data protection,



## Specifications

Drive Options	<p>Ultrium 5 Full-Height: 6 Gbps SAS (FC #8245 or 46X2683); 8 Gbps Fibre Channel (FC #8244 or 46X2682)</p> <p>Ultrium 5 Half-Height: 6 Gbps SAS (FC #8247 or 46X2685); 8 Gbps Fibre Channel (FC #8248 or 46X2684)</p> <p>Ultrium 4 Full Height: LVD SCSI (FC #8143 or 95P5002), 3 Gbps SAS (FC #8145 or 95P5006); Fibre Channel (#8144 or 95P5004)</p> <p>Ultrium 4 Half-Height: 3 Gbps SAS (FC #8147 or 45E2243)</p> <p>Ultrium 3 Half-Height: 3 Gbps SAS (FC #8047 or 95P5000)</p>
Available models	TS3100 Tape Library Model L2U Driveless; 3573 L2U (MTM); 35732UL (HVEC)
Ultrium tape cartridges	Ultrium 5 media: 46C2084 or FC #8505; Ultrium 4 media: 95P4278 or FC #8405; Ultrium 3 media: 95P2020 or FC #8305
Ultrium cleaning cartridge	23R7008 or FC #8002
Tape drive type	IBM LTO Ultrium 5 Half-Height and Full-Height; IBM LTO Ultrium 4 Half-Height and Full-Height; IBM LTO Ultrium 3 Half-Height
Number of drives	1–2
Number of tape cartridges	24
Physical capacity	<p>Up to 3.0 TB per cartridge compressed; 1.5 TB native with LTO 5</p> <p>Up to 1.6 TB per cartridge compressed; 800 GB native with LTO 4</p> <p>Up to 800 GB per cartridge compressed; 400 GB native with LTO 3</p> <p>Up to 72 TB per tape library compressed; 36 TB native with LTO 5</p> <p>Up to 38.4 TB per tape library compressed; 19.2 TB native with LTO 4</p> <p>Up to 19.2 TB per tape library compressed; 9.6 TB native with LTO 3</p>
Data transfer rate	<p>Up to 140 MBps native with LTO 5 Full-Height and Half-Height</p> <p>Up to 120 MBps native with LTO 4 Full-Height and Half-Height</p> <p>Up to 80 MBps native with LTO 3 Half Height</p>

- [TS3100 Express details on PartnerWorld](#)
- [TS3100 Express details on IBM.com](#)
- [TS3100 Express competitive info on COMP](#)
- [TS3100 blog search](#)
- [TS3100 Twitter search](#)

**Figure T.10.** IBM System Storage TS3100 Tape Library Express at a glance (and links to more detail).



reliability, availability, affordability, and application requirements. It is designed as a functionally rich, entry tape-storage solution incorporating LTO tape technology. The IBM TS3100 Express model is an excellent solution for large-capacity or high-performance tape backup with or without random access. The TS3100 is also an excellent choice for tape automation for IBM Power Systems, IBM System x, and other open systems.

The IBM TS3100 Tape Library Express is well-suited for handling backup, save and restore, and archival data-storage needs for small to mid-size environments. With the use of one LTO full height tape drive or up to two LTO half-height tape drives and 24 tape cartridge capacity, the IBM TS3100 is designed to take advantage of LTO technology to cost-effectively handle growing storage requirements.

Here are some quick TS3100 facts:

- Designed to support the newest generation of LTO with one IBM Ultrium 5 Full Height Tape Drive or up to two IBM Ultrium 5 Half Height Tape Drives, to help increase capacity and performance
- Designed to support cost-effective backup, save and restore, and archival storage in sequential or random access mode with a standard bar-code reader
- Designed to offer outstanding capacity, performance, and reliability for midrange and network tape-storage environments in a 2U form factor with 24 data cartridge slots and a mail slot



- Remote library management through a standard Web interface supports flexibility and greater administrative control of storage operations.

## TS3200 Tape Library Express

The IBM System Storage TS3200 Tape Library Express Model ([Figure T.11](#)) leverages the newest generation of LTO technology to help cost-effectively handle growing storage requirements. The TS3200 Express Model and its storage management applications are designed to address capacity, performance, data protection, reliability, affordability, and application requirements. It is designed as a functionally rich, high-capacity, entry-level tape-storage solution incorporating LTO Ultrium tape technology. The IBM TS3200 Express model is an excellent solution for large-capacity or high-performance tape backup with or without random access. The TS3200 is also an excellent choice for tape automation for IBM Power Systems, IBM System x, and other open systems.

The IBM TS3200 Tape Library Express is well-suited for handling the backup, restore, and archive data-storage needs for small to mid-size environments. With the use of up to two LTO full-height tape drives or up to four LTO half-height tape drives and 48 tape cartridge capacity, the IBM TS3200 model is designed to use LTO technology to cost-effectively handle growing storage requirements. The TS3200 Tape Library is configured with four removable cartridge magazines, two on the left side (24 data cartridge slots) and two on the right (24 data cartridge slots). Additionally, the lower left magazine includes a three-slot I/O station to help support continuous



### Specifications

Drive Options	Ultrium 5 Full Height: 6 Gbps SAS (FC # 8245 or 46X2683); 8 Gbps Fibre Channel (FC # 8244 or 46X2682) Ultrium 5 Half Height: 6 Gbps SAS (FC # 8247 or 46X2685); 8 Gbps Fibre Channel (FC # 8248 or 46X2684) Ultrium 4 Full Height: LVD SCSI (FC # 8143 or 95P5002), 3 Gbps SAS (FC # 8145 or 95P5006); 4 Gbps Fibre Channel (8144 or 95P5004) Ultrium 4 Half Height: 6 Gbps SAS (FC # 8149 or 46X7117), 8 Gbps FC (FC # 8148 or 46X6912) Ultrium 3 Half Height: 6 Gbps SAS (FC # 8049 or 46X7122)
Available models	TS3200 Tape Library Model L2U Driveless; 3573 L2U (MTM); 35734UL (HVEC)
Ultrium tape cartridges	Ultrium 5 media: 46C2084 or FC #8505; Ultrium 4 media: 95P4278 or FC #8405; Ultrium 3 media: 95P2020 or FC #8305
Ultrium cleaning cartridge	23R7008 or FC #8002
Tape drive type	IBM LTO 5 Full Height and Half-Height; IBM LTO 4 Full Height and Half-Height; IBM LTO 3 Half-Height
Number of drives	1–4
Number of tape cartridges	48
Physical capacity	Up to 3.0 TB per cartridge compressed; 1.5 TB native with LTO 5 Up to 1.6 TB per cartridge compressed; 800 GB native with LTO 4 Up to 800 GB per cartridge compressed; 400 GB native with LTO 3 Up to 144 TB per tape library compressed; 72 TB native with LTO Ultrium 5 Up to 76.8 TB per tape library compressed; 38.4 TB native with LTO Ultrium 4 Up to 38.4 TB per tape Library compressed; 19.2 TB native with LTO Ultrium 3
Data transfer rate	Up to 140 MBps native with LTO 5 Up to 120 MBps native with LTO 4 Up to 80 MBps native with LTO 3

- [TS3200 Express details on PartnerWorld](#)
- [TS3200 Express details on IBM.com](#)
- [TS3200 Express competitive info on COMP](#)
- [TS3200 blog search](#)
- [TS3200 Twitter search](#)

**Figure T.11.** IBM System Storage TS3200 Tape Library Express at a glance (and links to more detail).



library operation while importing and exporting media. A barcode reader is standard in the library, supporting the library's operation in sequential or random access mode. The TS3200 also comes standard with remote management capabilities to allow for remote administration of the tape library through a Web interface. Path Failover, an optional feature, is designed to provide automatic control path failover to a preconfigured redundant control path in the event that a host adapter or control path drive is lost without aborting the current job in process.

Here are some quick TS3200 facts:

- Designed to support the newest generation of LTO with up to two IBM Ultrium 5 full-height tape drives or up to four IBM Ultrium 5 half-height tape drives, as well as LTO generations 3 and 4 tape drives using a 4U form factor
- Designed to offer outstanding capacity, performance, and reliability for cost-effective backup, restore and archive for midrange storage environments
- Remote library management through a standard web interface supports flexibility and greater administrative control of storage operations.

## TS3310 Tape Library

The IBM System Storage TS3310 Tape Library ([Figure T.12](#)) is a modular scalable tape library designed to address the tape storage needs of rapidly growing companies who find themselves space- and resource-constrained with tape backup and other tape applications.





### Specifications

Model	3576 Model L5B	3576 Model L5B and four E9U Models
Configuration	Base library	Base library and four expansion units
LTO storage slots (max)	41	409
LTO storage slots (max)	6	54
Maximum tape drives	2	18
Total physical capacity (2:1 compression)	123 TB	Up to 1.2 PB
Capacity on demand increments	n/a	46 cartridges
Maximum logical libraries	2	18

- [TS3310 details on PartnerWorld](#)
- [TS3310 details on IBM.com](#)
- [TS3310 competitive info on COMP](#)
- [TS3310 blog search](#)
- [TS3310 Twitter search](#)

**Figure T.12.** IBM System Storage TS3310 Tape Library at a glance (and links to more detail).



Designed around a 5U high modular base library unit, the TS3310 can scale vertically with expansion for Linear Tape-Open (LTO) cartridges, drives, and redundant power supplies.

The base library module, model L5B, is the entry point for the product family. It contains all of the necessary robotics and intelligence to manage the 5U high library system, which houses up to 41 cartridges—35 storage slots and six input/output (I/O) slots; and two LTO generation 5, generation 4, and generation 3 tape drives.

The TS3310 model L5B can be expanded with the addition of expansion units, the model E9U.

Here are some quick TS3310 facts:

- Provides a modular, scalable tape library designed to grow as your needs grow
- Features desktop, desk-side, and rack-mounted configurations
- Delivers optimal data storage efficiency with high cartridge density using standard or WORM LTO data cartridges
- Offers hot-swap tape drives and power supplies
- Includes redundant power and host path connectivity failover options
- Enables remote web-based management and Storage Management Initiative Specification (SMI-S) interface capabilities.



## TS3500 Tape Library

The IBM System Storage TS3500 Tape Library ([Figure T.13](#)) continues to lead the industry in tape drive integration with features such as persistent World Wide Name, multipath architecture, drive/media exception reporting, remote drive/media management and host-based path failover. The L23 and D23 frames support the TS1140, TS1130, TS1120, or 3592 J1A Tape Drives. The L53 and D53 frames support IBM System Storage TS1050 Tape Drives as well as previous generation IBM LTO Ultrium Tape Drives. L-frame models support improved cartridge handling, hot-swap drive packaging, and the option of an additional 16-slot I/O station. The TS3500 Model D23 and D53 frames can be attached to existing model L22 or D52 frames. Mixed media is supported by combining LTO Ultrium Tape Drives and the TS1140, TS1130, TS1120, or 3592 J1A Tape Drives within the TS3500 library frame by frame.

Here are some quick TS3500 facts:

- Supports highly-scalable, automated data retention on tape utilizing Linear Tape-Open (LTO) Ultrium, IBM 3592, and IBM System Storage TS1100 families of tape drives
- Delivers extreme scalability and capacity, growing from one to 16 frames per library and from one to 15 libraries per library complex using the TS3500 shuttle connector
- Provides up to 900 petabytes (PBs) of automated, low-cost storage under a single library image, improving floor space utilization and reducing storage cost per terabyte (TB)



## Specifications

Frame	L23—base frame for TS1140, TS1130, TS1120 or 3592 D23—drive-capable and storage expansion frame for TS1140, TS1130, TS1120 or 3592, S24—storage-only expansion frame for 3592 cartridges L53—base frame for LTO, D53—drive-capable and storage expansion frame for LTO, S54—storage-only expansion frame for LTO cartridges HA1—high availability service bay frame for use with the dual-accessor feature SC1—library strings shuttle connector
Library shuttle connector	IBM System Storage Tape Library Connector Model SC1
Tape drive types	TS1140, TS1130, TS1120 or 3592 Tape Drives or IBM LTO Ultrium 5, 4, 3, 2, or 1 Tape Drives
Number of frames per library	One base frame, up to 15 expansion frames The TS3500 Model HA1 installation provides one of the two additional frames required as service bays in a dual-accessor library
Number of libraries per complex	Up to 15 libraries
Number of drives	Up to 12 per frame; Up to 192 per library string; Up to 2700 per library complex
Number of tape cartridges	L23—up to 260; D23—up to 400; S24—up to 1000 Total supported per library: >15,000 Total supported per complex: >225,000 L53—up to 287; D53—up to 440; S54—up to 1320 Total supported per library: >20,000 Total supported per complex: >300,000
Number of I/O slots	Up to 224 per library (16 I/O slots standard) Up to 3360 per complex
Number of logical libraries	Maximum of 192 per library (up to number of drives installed); Maximum of 2700 per complex

- [TS3500 details on PartnerWorld](#)
- [TS3500 details on IBM.com](#)
- [TS3500 competitive info on COMP](#)
- [TS3500 blog search](#)
- [TS3500 Twitter search](#)

**Figure T.13.** IBM System Storage TS3500 Tape Library at a glance (and links to more detail).



- Enables data security and regulatory compliance via support for tape drive encryption and Write Once, Read Many (WORM) cartridges.

## **TS7610 ProtecTIER Deduplication Appliance Express**

Designed for mid-size companies needing a more holistic approach to data protection, the IBM System Storage TS7610 ProtecTIER Deduplication Appliance Express ([Figure T.14](#)) leverages unique data deduplication technology to help solve critical backup and recovery challenges.

Available in two configuration options, the TS7610 ProtecTIER Deduplication Appliance Express is an integrated server and storage hardware platform that ships with IBM ProtecTIER deduplication software preinstalled. This solution has a preconfigured repository and can be configured with either a Virtual Tape Library (VTL) or Symantec OpenStorage (OST) interface. The TS7610 ProtecTIER Deduplication Appliance Express provides capacity, price/performance and reliability/availability/scalability features your business demands.

Here are some quick TS7610 facts:

- Improves backup and recovery performance with high-speed disk-based data protection
- Accelerates recovery of mission-critical data
- Optimizes storage infrastructure and reduce TCO
- Achieves business resilience objectives without changing existing backup procedures and practices.



- [TS7610 details on PartnerWorld](#)
- [TS7610 details on IBM.com](#)
- [TS7610 competitive info on COMP](#)
- [TS7610 blog search](#)
- [TS7610 Twitter search](#)

**Figure T.14.** IBM System Storage TS7610 ProtecTIER Deduplication Appliance Express (and links to more detail).

- Simple-to-install, manage, and maintain data protection for mid-size IT environment.

## TS7620 ProtecTIER Deduplication Appliance Express

Designed for mid-size companies needing a more holistic approach to data protection, the IBM System Storage TS7620 ProtecTIER Deduplication Appliance Express ([Figure T.15](#)) leverages unique data deduplication technology to help solve critical backup and recovery challenges.

Available in two configuration options, the TS7620 ProtecTIER Deduplication Appliance Express is an integrated server and storage hardware platform that ships with IBM Protec-



- [TS7620 details on PartnerWorld](#)
- [TS7620 details on IBM.com](#)
- [TS7620 competitive info on COMP](#)
- [TS7620 blog search](#)
- [TS7620 Twitter search](#)

**Figure T.15.** IBM System Storage TS7620 ProtecTIER Deduplication (and links to more detail).

TIER deduplication software preinstalled. This solution has a preconfigured repository and can be configured with either a Virtual Tape Library or Symantec OpenStorage interface. The TS7620 ProtecTIER Deduplication Appliance Express provides the essential capacity, price/performance, reliability, availability, and scalability features your business demands.

Here are some quick TS7620 facts:

- Improves backup and recovery performance with high-speed, disk-based data protection
- Accelerates recovery of critical data
- Optimizes storage infrastructure and helps reduce total cost of ownership (TCO)



- Helps achieve business resilience objectives without changing existing backup procedures and practices
- Leverages data deduplication technology to help solve backup and recovery challenges in mid-size environments.

## TS7650 ProtecTIER Deduplication Appliance

The IBM System Storage TS7650 ProtecTIER Deduplication Appliance ([Figure T.16](#)) is a preconfigured solution of IBM storage and server technologies with ProtecTIER data deduplication software. This solution is designed to improve backup and recovery operations by offering not just a bundle of



- [TS7650 details on PartnerWorld](#)
- [ProtecTIER Sales Kits on PartnerWorld](#)
- [TS7650 details on IBM.com](#)
- [ProtecTIER competitive info on COMP](#)
- [TS7650 blog search](#)
- [TS7650 Twitter search](#)

**Figure T.16.** IBM System Storage TS7650 ProtecTIER Deduplication (and links to more detail).





components, but a truly integrated solution that can harness the power of deduplication without making radical changes to the existing environment. The solution is available in four configurations designed to meet the disk-based data protection needs of a wide variety of organizations, from mid-size IT environments to enterprise data centers.

Here are some quick TS7650 Appliance facts:

- Helps improve backup and recovery operations
- Enables more efficient, reliable protection of valuable data
- Helps reduce operational costs and energy usage to save money.

## **TS7650G ProtecTIER Deduplication Gateway**

The IBM System Storage TS7650G ProtecTIER Deduplication Gateway ([Figure T.17](#)) is designed to meet the disk-based data protection needs of the enterprise data center while enabling significant infrastructure cost reductions. The solution offers industry-leading inline deduplication performance and scalability up to 1 petabyte (PB) of physical storage capacity per system that can provide up to 25 PB or more backup storage capacity. Combined with IBM or third-party storage, the TS7650G ProtecTIER Deduplication Gateway provides a powerful disk-based repository to improve the performance, retention, and availability of backup and archive data.

Here are some quick TS7650G facts:

- Improves backup and recovery and simplifies disaster recovery operations



- [TS7650G details on PartnerWorld](#)
- [ProtecTIER Sales Kits on PartnerWorld](#)
- [TS7650G details on IBM.com](#)
- [ProtecTIER competitive info on COMP](#)
- [TS7650G blog search](#)
- [TS7650G Twitter search](#)

**Figure T.17.** IBM System Storage TS7650G ProtecTIER Deduplication Gateway (and links to more detail).

- Lowers operational costs and energy usage
- Manages more data with less infrastructure.

## TS7680 ProtecTIER Deduplication Gateway for System z

The IBM System Storage TS7680 ProtecTIER Deduplication Gateway for System z ([Figure T.18](#)) combines a virtual tape library solution with IBM's unique and patented HyperFactor deduplication technology and integrated native replication technology to provide users an optimal disk-based target for System z applications that traditionally use tape.



Designed to simplify and improve the performance and reliability of tape processing operations while reducing infrastructure costs, the TS7680 offers high-performance inline deduplication, highly available two node clustering and scalability to store up to 25 petabytes (PB) of tape data on high-speed disk capacity per system.

Here are some quick TS7680 facts:

- Manages more data with less infrastructure
- Simplifies and accelerates information protection
- Helps reduce operational costs and energy usage.



- [TS7680 info on PartnerWorld](#)
- [ProtecTIER Sales Kits on PartnerWorld](#)
- [TS7680 info on IBM.com](#)
- [ProtecTIER competitive info on COMP](#)
- [TS7680 blog search](#)
- [TS7680 Twitter search](#)

**Figure T.18.** IBM System Storage TS7680 ProtecTIER Deduplication Gateway (and links to more detail).



## TS7700 Virtualization Engine

The IBM Virtualization Engine TS7700 ([Figure T.19](#)) is a family of mainframe virtual tape solutions that optimize tape processing and business continuance. Through the use of virtualization and disk cache, the TS7700 is able to operate at disk speeds while maintaining compatibility with existing tape operations. One of the TS7700 configurations completely eliminates physical tape through the use of a deep disk cache repository. The other offers a fully integrated tiered storage hierarchy of disk and tape which takes advantage of both technologies to deliver performance for active data and best economics for inactive data. Lastly, the two technologies can be combined to provide a flexible policy-managed configuration that offers the benefits of both configurations. Deploying this innovative subsystem can help reduce batch processing time, total cost of ownership, and management overhead.

IBM offers two models of the TS7700 Virtualization Engine. The TS7740 Virtualization Engine supports attachment to and exploits the performance and capacity of the IBM System Storage TS1140, TS1130, and TS1120 Tape Drives or the IBM TotalStorage 3592 Model J1A Tape Drive installed in an IBM System Storage TS3500 Tape Library. Support for the TS1140 Tape Drive can reduce the number of cartridges and the size of the library by allowing the storage of up to 12 TB on a single 3592 JC cartridge, assuming 3:1 compression.

Here are some quick TS7700 facts:

- Helps reduce the cost of data protection, including power, maintenance, operations, and support staff



### Specifications

	<b>TS7720</b>	<b>TS7740</b>
<b>SINGLE NODE</b>		
Usable RAID Array cache (TB)	Up to 444	Up to 28.2
Virtual drives	256	256
TS1100 or 3592 tape drive	-	4 to 16
Virtual volumes	2,000,000	2,000,000
FICON channels	4	4
<b>2 CLUSTER GRID</b>		
Usable RAID Array cache (TB)	Up to 888	Up to 57.6
Virtual drives	512	512
TS1100 or 3592 tape drive	-	8 to 32
Virtual volumes	2,000,000	2,000,000
FICON channels	8	8
<b>3 CLUSTER GRID</b>		
Usable RAID Array cache (TB)	Up to 1332	Up to 86.4
Virtual drives	768	768
TS1100 or 3592 tape drive	-	12 to 48
Virtual volumes	2,000,000	2,000,000
FICON channels	12	12
<b>4 CLUSTER GRID</b>		
Usable RAID Array cache (TB)	Up to 1776	Up to 115.2
Virtual drives	1024	1024
TS1100 or 3592 tape drive	-	16 to 64
Virtual volumes	2,000,000	2,000,000
FICON channels	16	16

- [TS7700 details on PartnerWorld](#)
- [TS7700 details on IBM.com](#)
- [TS7700 competitive info on COMP](#)
- [TS7720 blog search](#)
- [TS7720 Twitter search](#)
- [TS7740 blog search](#)
- [TS7740 Twitter search](#)

**Figure T.19.** IBM Virtualization Engine TS7720 and TS7740 at a glance (and links to more detail).

- Helps automate and reduce the complexity of IT operations using advanced policy management
- Supports business continuity through grid connectivity and automated replication
- TS7740 can help accelerate backups and restores by using a tiered hierarchy of disk and tape to make more efficient use of tape drives
- TS7720 provides a cache-centric solution for frequently accessed data.

## 7216 Multimedia Storage Enclosure

If you have rack-mount servers and need a reliable enclosure for data backup options, the IBM 7216 Multimedia Storage Enclosure ([Figure E.1](#)) offers the flexibility and features you need. With high-speed serial attached SCSI (SAS) and USB interface options, as well as compatibility with a range of storage devices, the 7216 enclosure can help protect the data on critical IBM Power Systems.

The 7216 is a rack-mounted enclosure that features two drive bays that can hold one or two tape drives, one or two RDX removable disk drives, and up to four slim design DVD-RAM drives. These drives may be mixed in any combination in a single 7216 storage enclosure.

Here are some quick 7216 enclosure facts:

- Features a low-profile design that can be configured with up to four storage devices and mounted in a 1U space in a 19-inch rack



- Offers DAT160 and half-height LTO Ultrium 5 tape drives, DVD-RAM, or RDX removable disk drives (DAT160 available with either serial attached SCSI (SAS) or USB electronic bus)
- Connects to high-performance IBM POWER7, IBM POWER6, and IBM POWER Blade systems—attach options available
- Provides the performance and capacity enhancements of DAT160 and HHLTO5 tape drives, with the additional versatility of RDX removable disk drives and DVD-RAM options.



### Specifications

Number of storage devices	4 maximum (assumes four DVD drives)
Electronics	Optional Serial Attached SCSI (SAS) or USB electronic bus
Typical compression	2:1 for tape drives and 3:1 for DVD optical drives. Compression on RDX disk drives is typically 2:1 and is supported by a POWER system
Color	Black
Warranty options	One year

- [7216 Enclosure details on PartnerWorld](#)
- [7216 Enclosure details on IBM.com](#)
- [7216 Enclosure competitive info on COMP](#)
- [7216 blog search](#)
- [7216 Twitter search](#)

**Figure E.1.** IBM System Storage 7216 Storage Device Enclosure at a glance (and links to more detail).



## Archive and Retention

In this section, we explore IBM System Storage products that employ a combination of disk and tape storage to address business needs.

### IBM Information Archive

The explosive growth of information and the increased focus on regulatory compliance are compounding the need to retain and protect business-critical information. Clients need an archiving and retention solution that is secure, scalable, and cost-effective. IBM Information Archive ([Figure A.1](#)) is a simple and flexible archiving solution to help organizations of all sizes address their complete information retention needs—business, legal, or regulatory. It is designed to help you reduce cost, improve operational efficiency, and manage risk.

Examples of ways the Information Archive reduces costs include reducing disk capacity requirements with built-in data deduplication, compression, and hierarchical storage management features. It also eliminates the need to maintain two separate platforms for structured and unstructured information and reduces tier-one storage requirements by moving information to lower-cost storage tiers, including tape.

Information Archive improves operational efficiency in various ways such as providing the flexibility to configure up to three separate information collections (virtual archives) within one Information Archive, reducing the need for additional storage to archive information with different retention needs. In addition, users and administrators can locate archived data quickly, saving labor time and costs.





## Specifications

Store and Manage	<ul style="list-style-type: none"><li>• Up to three collections, each customizable with indexing choices, information protection levels and retention policies</li><li>• Highly available system with dual clustered disk controllers</li><li>• GUI-based centralized management</li><li>• Remote replication option</li><li>• Stores information using multiple access methods:<ul style="list-style-type: none"><li>- Industry-standard interfaces (NFS, CIFS)</li><li>- IBM TSM API</li><li>- Tiered storage repository</li></ul></li><li>• Patent-pending enhanced tamper protection</li><li>• Standard 36U 19" rack with lock</li><li>• Call home, remote support via IBM Remote Support Manager (RSM) server</li></ul>
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Storage repository	<ul style="list-style-type: none"><li>• Up to 608 TB of raw disk capacity (224 TB of raw capacity in the main rack, 2x192 TB raw capacity in the expansion rack)</li><li>• Up to petabytes with external tape (optional)</li><li>• RAID 6 data protection</li><li>• Deduplication</li><li>• Compression</li></ul>
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- [Information Archive details on PartnerWorld](#)
- [Information Archive details on IBM.com](#)
- [Information Archive competitive info on COMP](#)
- [Information Archive blog search](#)
- [Information Archive Twitter search](#)

**Figure A.1.** IBM Information Archive at a glance (and links to more detail).



Information Archive reduces risk by helping your business meet the most stringent information retention requirements. It provides a compliant storage repository that offers protection against inadvertent deletion or alteration.

Here are some quick Information Archive facts:

- A storage repository for all types of content
- Enables customers to index and search archived information
- Offers flexibility in retaining information through its unique “collections” architecture and choice of protection options
- Offers up to 608 TB of raw disk capacity and petabytes with external tape
- Helps optimize storage capacity with data deduplication and compression features
- Offers low total cost of ownership by allowing use of mixed media (disk, tape, and virtual tape)
- Maintains information integrity and authenticity and increases its security through a patent-pending enhanced tamper protection feature.

## **IBM Information Archive for Email, Files and eDiscovery**

As part of the its Smart Archive strategy, IBM delivers Information Archive for Email, Files and eDiscovery—a specific solution that helps to simplify and accelerate the implementation of an end-to-end archiving and eDiscovery solution from weeks to days. With Information Archive for Email, Files and eDiscovery, IBM is delivering a specific Smart Archive strat-



egy solution that will ensure the success of information archiving projects.

Components of Information Archive for Email, Files and eDiscovery include:

- Content Collector Discovery Analytics Starter Pack, which includes Content Collector for Email, Content Collector for File Systems, eDiscovery Manager, eDiscovery Analyzer
- IBM Information Archive
- Content Manager Enterprise Edition
- System x servers already sized and configured to run the software
- Implementation Services on site
- Business Partner Maintenance Packages (optional).

The solution consists of pre-configured software, hardware, and implementation services from a single vendor. The total solution configuration leverages IBM experience in customer archiving deployments, simplifying implementation and providing quick time to value. Additionally, proven services packages are available to manage ongoing administration and maintenance. This solution is ideal for organizations—with up to 1400 employees—that have:

- A requirement to capture and retain email and file system content
- To demonstrate compliance with retention mandates



## MORE ON THE WEB

- [Information Archive for Email, Files and Ediscovery info on PartnerWorld](#)
- [Information Archive for Email, Files and Ediscovery info on IBM.com](#)

- Experienced soaring storage costs and need to bring those costs under control, and/or have
- Requirements to quickly and efficiently respond to ediscovery requests.

## SAN Fabric

The growing importance of storage is fueling a model for storage infrastructures in which storage devices are not attached to a specific server but rather make up an independent storage area network, or SAN.

The storage devices (disk arrays, tape drives, SVC, etc.) residing in a SAN are shared among a group of servers that reside on the same network.

In addition to storage devices and servers, IBM sells switches, directors, and routers used to build SAN fabrics. In this section, we look at these SAN fabric products. IBM SAN products and solutions provide integrated SMB and enterprise SAN solutions with multiple local, campus, metropolitan, and global storage networking options.

## MORE ON THE WEB

- [SAN Fabric info on IBM.com](#)



## SAN Fabric Cross Reference by Business Size

In this section, you will find a list of SAN products organized by workload size (entry, mid-size, and enterprise) to help you find the best solution for your client.

### *SAN Fabric for Entry-level Workloads*

Here is a list of SAN fabric products designed for entry-level workloads. Click on the links and you will jump to the section of this ebook that describes the product.

[SAN24B-5](#)

[SAN24B-4 Express](#)

[Cisco MDS 9124 Express](#)

[Cisco 9148](#)

#### **MORE ON THE WEB**

- [SAN fabric for entry-level workloads](#)

### *SAN Fabric for Mid-size Workloads*

Here is a list of SAN fabric products designed for mid-size workloads. Click on the links and you will jump to the section of this ebook that describes the product.

[SAN32B-E4](#)

[SAN40B-4](#)

[SAN48B-5](#)

[SAN80B-4](#)

[Cisco MDS 9148](#)

#### **MORE ON THE WEB**

- [SAN fabric for mid-size workloads](#)



## ***SAN Fabric for Enterprise Workloads***

Here is a list of SAN fabric products designed for large enterprise workloads. Click on the links and you will jump to the section of this ebook that describes the product.

### **MORE ON THE WEB**

- [SAN fabric for enterprise workloads](#)

[SAN384B and SAN768B](#)

[Cisco MDS 9500 series Multilayer Directors](#)

## **SAN Fabric Multiprotocol Routers**

We also offer the following SAN Multiprotocol routers. Click on the links and you will jump to the section of this ebook that describes the product.

[SAN06B-R](#)

[Cisco MDS 9222i](#)

## ***SAN b-type Switches***

The IBM System Storage SAN b-type family provides entry and midrange switches and enterprise directors.

### ***SAN06B-R***

The IBM System Storage SAN06B-R extension switch ([Figure S.1](#)) accelerates and optimizes replication, backup, and migration over any distance using next-generation Fibre Channel and Fibre Channel over IP (FCIP) networking technology. It combines industry leading performance and reliability, “pay-as-you-grow” scalability, and flexible deployment options to address the most demanding disaster recovery, compliance, and data mobility requirements.



A wide range of IBM System Storage mid-range and enterprise storage area network (SAN) infrastructure simplification and business continuity solutions can be created with the IBM System Storage SAN06B-R extension switch. Infrastructure simplification solutions for the IBM Power Systems and System x families include disaster tolerance over metropolitan and global IP networks with IBM System Storage disk arrays, tape libraries, and IBM Tivoli Storage Manager data protection software. Support for System z servers is provided via the optional 8 Gbps Advanced Extension, IBM FICON Accelerator and FICON CUP Activation features.

Here are some quick SAN06B-R facts:

- Designed for high performance to maximize replication with up to 16 8 Gbps Fibre Channel (FC) ports and six 1 Gigabit Ethernet (GbE) ports for faster data replication, backup and recovery
- Utilizes existing IP-based Metropolitan Area Network (MAN) or Wide Area Network (WAN) infrastructures for cost-effective replication, backup, and recovery



- [SAN06B-R info on PartnerWorld](#)
- [SAN06B-R info on IBM.com](#)

**Figure S.1.** IBM System Storage SAN06B-R Extension Switch (and links to more detail).



- “Pay-as-you-grow” scalability
- FCIP trunking enables logical high-bandwidth FCIP tunnels spanning multiple physical ports to maximize bandwidth and WAN link resiliency
- Enhanced Compression Architecture provides multiple modes to optimize compression ratios for various throughput requirements
- Adaptive Rate Limiting dynamically adjusts bandwidth between minimum and maximum rate limits to optimize bandwidth utilization and sharing
- FCIP Quality of Service (QoS) is available on all b-type platforms that support 8 Gbps link speeds, provides high-, medium-, and low-priority handling of initiator-target flows within the same FCIP tunnel for transmission over the WAN\
- FICON Accelerator uses advanced networking technologies, data management techniques, and protocol intelligence to accelerate FICON Global Mirror, formerly XRC and tape read/write operations over distances well beyond 300 Km
- Storage-optimized TCP optimizes TCP window size and flow control, accelerating TCP transport for storage applications
- Integrated IBM System Storage SAN b-type switch management helps simplify installation and administration and helps provide fabric investment protection
- Integration with IBM System Storage Data Center Fabric Manager (DCFM) simplifies configuration.



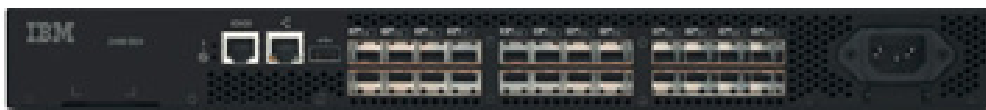


## SAN24B-4 Express

The IBM System Storage SAN24B-4 Express fabric switch ([Figure S.2](#)) is designed specifically to address the needs of small to mid-size SAN environments. It can be used to create a wide range of high-performance SAN solutions, from simple, single-switch configurations to larger, multi-switch configurations which support fabric connectivity and advanced business continuity capabilities. Infrastructure simplification solutions for IBM System x, BladeCenter, and IBM Power Systems servers include storage consolidation and high-availability server clustering with IBM System Storage disk storage arrays. Business continuity solutions include data protection with IBM System Storage tape libraries and devices and IBM Tivoli Storage Manager data protection software.

Here are some quick SAN24B-4 Express facts:

- Simple-to-use SAN switch with easy-to-install and easy-to-use features designed specifically for the needs of small to mid-size environments
- New levels of performance with 8 Gbps Fibre Channel (FC) technology



- [SAN24B-4 Express info on PartnerWorld](#)
- [SAN24B-4 Express info on IBM.com](#)

**Figure S.2.** IBM System Storage SAN24B-4 Express (and links to more detail).

- Ports on Demand scalability from 8 to 16 to 24 ports
- Protection for existing 4, 2, and 1 Gbps infrastructure investment while positioning for future technologies
- Foundation for new infrastructure simplification and business continuity solutions for servers running Microsoft Windows, UNIX, Linux, and IBM AIX and OS/400 operating systems.

### [SAN24B-5](#)

The IBM System Networking SAN24B-5 switch ([Figure S.3](#)) is designed to provide outstanding price and performance value, combining flexibility, simplicity, 16 Gbps Fibre Channel technology and enterprise-class functionality in an entry-level switch. The SAN24B-5 is configurable in 12 or 24 ports and supports 2, 4, 8, or 16 Gbps speeds in an efficiently designed 1U form factor. Base unit includes one (249824G/2498-X24) or two (2498-F24) integrated power supplies and fans. A second power supply provides additional redundancy for increased resiliency.



- [SAN24B-5 Express info on PartnerWorld](#)
- [SAN24B-5 Express info on IBM.com](#)

**Figure S.3.** IBM System Storage SAN24B-5 Express (and links to more detail).



Here are some quick SAN24B-5 facts:

- Gain flexibility, simplicity and enterprise-class functionality in a 24-port, 1U form factor, entry-level switch
- Scale from 12 to 24 ports using ports-on-demand capabilities
- Maximize resiliency with non-disruptive software upgrades and redundant power supply
- Streamline deployment and troubleshooting time with dynamic fabric provisioning, critical monitoring, and advanced diagnostic features
- Simplify server connectivity and SAN scalability with dual functionality as either a full-fabric SAN switch or an N\_Port ID virtualization (NPIV)-enabled access gateway.

### [SAN32B-E4](#)

The IBM System Storage SAN32B-E4 Encryption Switch ([Figure S.4](#)) is a high-performance stand-alone device designed for protecting data-at-rest in mission-critical environments. In addition to helping IT organizations achieve compliance with regulatory mandates and meet industry standards for data confidentiality, the SAN32B-E4 Encryption Switch also protects them against potential litigation and liability following a reported breach.

Data is one of the most highly valued resources in a competitive business environment. Protecting that data, controlling access to it, and verifying its authenticity while maintaining its availability are priorities in our security-conscious world. Increasing regulatory requirements are also



helping to drive the need for the adequate security of data. Encryption is a powerful and widely used technology that helps protect data from loss and inadvertent or deliberate compromise.

In the context of data center fabric security, IBM provides advanced encryption services for storage area networks (SANs) with the IBM System Storage SAN32B-E4 Encryption Switch. The switch is a high-speed, highly reliable hardware device that delivers fabric-based encryption services to protect data assets either selectively or on a comprehensive basis. The 8 Gbps SAN32B-E4 Fibre Channel Encryption Switch scales non-disruptively, providing from 48 up to 96 Gbps of encryption processing power to meet the needs of the most demanding environments with flexible, on-demand performance. It also provides compression services at speeds of up to 48 Gbps for tape storage systems. Moreover, it is tightly integrated with one of the industry-leading, enterprise-class key management systems, the IBM Tivoli Key Lifecycle Man-



- [SAN32B-E4 info on PartnerWorld](#)
- [SAN32B-E4 info on IBM.com](#)

**Figure S.4.** IBM System Storage SAN32B-E4 Encryption Switch (and links to more detail).



ager (TKLM), which can scale to support key life-cycle services across distributed environments.

Here are some quick SAN32B-E4 facts:

- Enforce data confidentiality and privacy requirements using high-performance, scalable fabric-based encryption
- Centralize administration of data-at-rest encryption services to ensure data protection on both disk and tape
- Reduce operational costs and simplify management through the IBM Tivoli Key Lifecycle Manager solution
- Meet regulatory mandates for securing data while maintaining application performance with on-demand encryption and compression processing power
- Industry-standard AES-256 encryption algorithms for both disk and tape in a centralized security platform for SAN environments
- High-performance encryption processing at up to 96 Gbps to support heterogeneous enterprise data centers
- Plug-in encryption services available to all host servers, including virtual machines, attached to data center fabrics
- Frame redirection technology to enable easy, non-intrusive deployment of fabric-based security services.

#### [SAN40B-4](#)

The IBM System Storage SAN40B-4 SAN fabric switch ([Figure S.5](#)) provides 24, 32, or 40 active ports and is designed for high performance with 8 Gbps link speeds and backward



- [SAN40B-4 info on PartnerWorld](#)
- [SAN40B-4 info on IBM.com](#)

**Figure S.5.** IBM System Storage SAN40B-4 fabric switch (and links to more detail).

compatibility to support links running at 4, 2, and 1 Gbps link speeds. High availability features make it suitable for use as a core switch in midrange environments or as an edge switch in enterprise environments where a wide range of SAN infrastructure simplification and business continuity configurations are possible. IBM POWER Systems, System x, System z, and many non-IBM disk and tape devices are supported in many common operating system environments. Optional features provide specialized distance extension, dynamic routing between separate or heterogeneous fabrics, link trunking, FICON, Server Application Optimization (SAO), performance monitoring, and advanced security capabilities.

Here are some quick SAN40B-4 facts:

- High port density design with up to 40 ports in an efficient, space saving 1U height
- Simple-to-use midrange and enterprise SAN fabric switch for IBM POWER Systems, System x, System z, and other server environments



- New levels of performance with 8 Gbps Fibre Channel (FC) technology
- Non-disruptive capacity activation from 24 to 32 to 40 ports with Ports on Demand scalability
- High availability with redundant, hot-swappable fans and power supplies, and non-disruptive software upgrades.

### [SAN48B-5](#)

The IBM System Storage SAN48B-5 SAN switch ([Figure S.6](#)) is designed to meet the demands of hyper-scale, private cloud storage environments by delivering 16 Gbps Fibre Channel technology and capabilities that support highly virtualized environments. To enable greater flexibility and investment protection, the SAN48B-5 is configurable in 24, 36, or 48 ports and supports 2, 4, 8, 10, or 16 Gbps speeds in an efficiently designed 1U package.

Here are some quick SAN48B-5 facts:

- Delivers 16 Gbps performance with up to 48 ports in an energy-efficient, 1U form factor, providing great flexibility for diverse deployment and cooling strategies
- Features Ports on Demand capabilities designed for fast, easy and cost-effective scaling from 24 to 48 ports in 12-port increments
- Designed to provide a flexible, simple, and easy-to-use SAN solution with enhanced technology
- Supports highly virtualized, private cloud storage with multi-tenancy and nonstop operations



- [SAN48B-5 info on PartnerWorld](#)
- [SAN48B-5 info on IBM.com](#)

**Figure S.6.** IBM System Storage SAN48B-5 16 Gbps SAN fabric switch (and links to more detail).

- Offers higher port density and scalability for midrange enterprise SAN switches, along with redundant, hot-pluggable components and non-disruptive software upgrades
- Yields outstanding price/performance value when compared to Ethernet storage-based alternatives.

### [SAN80B-4](#)

The IBM System Storage SAN80B-4 SAN fabric switch ([Figure S.7](#)) provides 48, 64, or 80 active ports and is designed for high performance with 8 Gbps link speeds and backward compatibility to support links running at 4, 2, and 1 Gbps link speeds. High availability features make it suitable for use as a core switch in midrange environments or as an edge switch in enterprise environments where a wide range of SAN infrastructure simplification and business continuity configurations are possible. IBM POWER Systems, System x, System z, and many non-IBM disk and tape devices are supported in many common operating system environments. Optional features provide specialized distance extension, dynamic routing be-





tween separate or heterogeneous fabrics, link trunking, FICON, Server Application Optimization (SAO), performance monitoring, and advanced security capabilities.

Here are some quick SAN80B-4 facts:

- High port density design with up to 80 ports in an efficient, compact 2U height helps save rack space
- Robust midrange and enterprise SAN fabric switch for IBM POWER Systems, System x, System z, and other server environments
- Provides new levels of performance with 8 Gbps Fibre Channel (FC) technology
- Ports-on-Demand scalability supports non-disruptive capacity activation from 48 to 64 to 80 ports
- Designed to support high availability with redundant, hot-swappable fans and power supplies and non-disruptive software upgrades.



- [SAN80B-4 info on PartnerWorld](#)
- [SAN80B-4 info on IBM.com](#)

**Figure S.7.** IBM System Storage SAN80B-4 fabric switch (and links to more detail).



## SAN b-type Directors

In this section, we will explore SAN b-type directors.

### *SAN384B-2 and SAN768B-2*

The IBM System Storage SAN384B-2 and SAN768B-2 fabric backbones ([Figure S.8](#)) are among the industry's newest Fibre Channel switching infrastructure, providing reliable, scalable, high-performance foundations for private cloud storage and highly virtualized environments.

These fabric backbones are designed to increase business agility while providing nonstop access to information and reducing infrastructure and administrative costs. The SAN384B-2 and SAN768B-2 fabric backbones with 16 Gbps Fibre Channel capabilities support the growing demands of highly virtualized environments and private cloud architectures, extending the life of this robust, reliable, and high-performance technology.

Here are some quick SAN384B-2 and SAN768B-2 facts:

- Supports 2, 4, 8, and 16 Gbps Fibre Channel, 10 Gbps ISL-connections, 64 (4x16) Gbps Inter-Chassis Link (ICL) connections, and 1/10 Gbps Fibre Channel over IP (FCIP), as well as advanced fabric services and management tools.
- Delivers backward compatibility with the 8 and 4 Gbps System Storage b-type SAN director, switch and router models.
- Enable simpler, flatter, low-latency chassis connectivity to reduce network complexity, management, and costs



- [SAN384B-2 info on PartnerWorld](#)
- [SAN768B-2 info on PartnerWorld](#)
- [SAN384B-2/SAN768B-2 info on IBM.com](#)

**Figure S.8.** IBM System Storage SAN384B and SAN768B (and links to more detail).

- Unleashes the full potential of private cloud storage with improved scalability, performance, and reliability
- Simplifies and centralizes end-to-end SAN management with comprehensive diagnostics, monitoring, and automation
- Protects investments in existing SAN fabrics and automation tools while reducing operational costs and minimizing business disruption
- Maximizes performance for I/O- and bandwidth-intensive applications.

## Cisco MDS

The Cisco MDS family provides a full suite of switches, directors, and routers.

### *Cisco MDS 9100 series Switches*

In this section, we will explore Cisco MDS 9100 series switches.

#### *Cisco MDS 9124 Express*

The Cisco MDS 9124 Express for IBM System Storage ([Figure S.9](#)) is designed to address the needs of small and mid-size businesses with a wide range of SAN capabilities. It can be used as part of SAN solutions from simple single-switch configurations to larger multi-switch configurations in support of fabric connectivity and advanced business continuity capabilities. Fabric connectivity capabilities can be the basis for infrastructure simplification solutions for IBM System i, System p, and System x servers and storage consolidation and high-availability server clustering with IBM System Storage disk storage arrays. Business continuity capabilities can help businesses protect valuable data with IBM System Storage tape



- [Cisco MDS 9124 info on PartnerWorld](#)
- [Cisco MDS 9124 info on IBM.com](#)

**Figure S.9.** Cisco MDS 9124 Express for IBM System Storage (and links to more detail).



libraries and devices and IBM Tivoli Storage Manager data protection software.

Here are some fast Cisco MDS 9124 facts:

- Foundation for new infrastructure simplification and business continuity solutions for servers running Microsoft Windows, UNIX, Linux, NetWare, and IBM OS/400 operating systems
- High-performance 1, 2, and 4 Gigabit per second links with pay-as-you-grow scalability enable growth from 8 to 16 to 24 ports
- Designed for high availability with hot-swappable, dual power supplies and non-disruptive firmware upgrades
- Cisco MDS 9000 family compatibility supports scalability and consistent service as the SAN grows
- Enterprise Package and Fabric Manager Server Package provide added intelligence and value.

### *Cisco MDS 9148*

The Cisco MDS 9148 for IBM System Storage Multilayer Fabric Switch ([Figure S.10](#)) is designed to provide an affordable, highly capable, and scalable storage networking solution for small, midrange, and large enterprise customers. The switch provides line rate 8-Gbps ports with high-performance, high-density, and enterprise-class availability. The switch is designed to offer outstanding value by providing flexibility, high availability, security, and ease of use at an affordable price in a compact one-rack-unit (1RU) form factor. With the ability to expand from 16 to 48 ports in eight-port increments, the Cis-



- [Cisco MDS 9148 info on PartnerWorld](#)
- [Cisco MDS 9148 info on IBM.com](#)

**Figure S.10.** Cisco MDS 9148 for IBM System Storage (and links to more detail).

co MDS 9148 can be used as the foundation for small, stand-alone SANs, as a top-of-rack switch, or as an edge switch in larger core-edge SAN infrastructures.

The Cisco MDS 9148 Multilayer Fabric Switch is designed to support quick configuration with zero-touch plug-and-play features and task wizards that allow it to be deployed quickly and easily in networks of any size. Powered by Cisco MDS 9000 NX-OS Software, it includes advanced storage networking features and functions and is compatible with Cisco MDS 9000 Series Multilayer Directors and Switches, providing transparent, end-to-end service delivery in core-edge deployments.

Here are some fast Cisco MDS 9148 facts:

- Extraordinary price/performance with up to 48 8 Gbps line rate ports in a compact 1 RU platform
- Scales from 16 ports to 48 ports in eight-port increments
- Redundant power supplies and fans and other availability features help minimize downtime and improve business resiliency



- Built-in management, operational and configuration tools, and plug-and-play features support quick deployment and easy end-to-end SAN management
- All-in-one licensing with no hidden charges.

## **Cisco MDS Routers**

In this section, we will explore Cisco MDS routers.

### *Cisco MDS 9222i*

A wide range of IBM System Storage mid-size and enterprise storage area network (SAN) IT simplification and business continuity solutions can be created with the Cisco MDS 9222i for IBM System Storage multiservice modular switch (Figure S.11). Infrastructure simplification solutions for the IBM Power Systems, System i, System p, System x, and System z families of servers include storage consolidation and high-availability server clustering with IBM System Storage disk storage arrays. Business continuity solutions include data protection with IBM System Storage tape libraries and devices and IBM Tivoli Storage Manager data protection software; and disaster protection with IBM System Storage disk metro and global mirroring disaster recovery solutions.

Here are some quick MDS 9222i facts:

- Multiservice design for high performance business continuity solutions with Windows, UNIX, Linux, NetWare, IBM OS/400, and IBM z/OS servers
- Storage media encryption (SME) for secure encryption of data stored on heterogeneous tapes, virtual tape libraries, and disk arrays



- [Cisco MDS 9222i info on PartnerWorld](#)
- [Cisco MDS 9222i info on IBM.com](#)

**Figure S.11.** Cisco MDS 9222i for IBM System Storage (and links to more detail).

- Cost-effective “green” switch design requires up to 27 percent less power per port
- Modular design provides “pay-as-you-grow” scalability and configuration flexibility
- Excellent availability with redundant, hot swappable components and non-disruptive firmware upgrades
- Intelligent network services such as Virtual SAN (VSAN) capability for SAN consolidation into virtual SAN islands on a single physical fabric
- Enterprise, Mainframe, and Data Center Network Manager (DCNM) Advanced Packages provide added intelligence and value.

### ***Cisco MDS 9500 series Multilayer Directors***

In this section, we will explore Cisco MDS 9500 series directors.





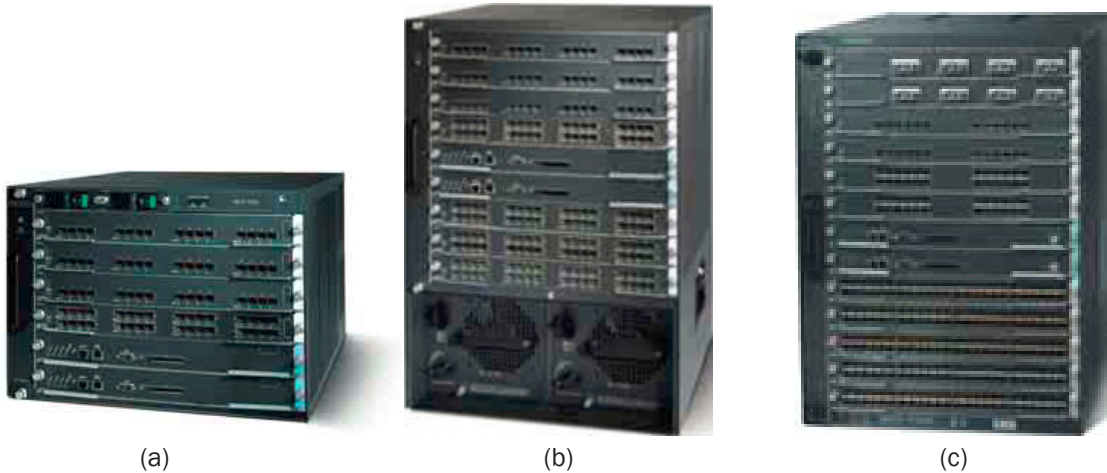
### *Cisco MDS 9506, 9509, and 9513*

The Cisco MDS 9500 Series Multilayer Directors for IBM System Storage ([Figure S.12](#)) are director-class storage area networking (SAN) switches designed for deployment in scalable enterprise and service provider clouds to enable flexibility, resiliency, and reliability. Layering a comprehensive set of intelligent features onto a high-performance, protocol-independent switch fabric, the MDS 9500 Series Multilayer Directors address the critical requirements of large virtualized data center storage environments such as high availability, security, scalability, ease-of-management, and simple integration of new technologies for extremely flexible data center SAN solutions.

Sharing the same operating system and management interface with other Cisco data center switches, the MDS 9500 Directors can help enable smooth deployment of unified fabrics with high-performance Fibre Channel and FCoE connectivity for low total cost of ownership (TCO). Compatible with all generations of Cisco MDS 9000 Family Fibre Channel Switching Modules, the MDS 9500 Series Multilayer Directors can help provide outstanding investment protection.

The Cisco MDS 9513 offers up to 528 1, 2, 4, and 8 Gbps autosensing Fibre Channel ports and up to 264 10 Gbps Fibre Channel ports in an 11-slot modular chassis. The MDS 9513 provides up to 1056 Fibre Channel ports in a single rack.

The Cisco MDS 9509 offers up to 432 1, 2, 4, and 8 Gbps autosensing Fibre Channel ports and up to 216 10 Gbps Fibre Channel ports in a nine-slot modular chassis. The MDS 9509 provides up to 864 Fibre Channel ports in a single rack.



- [Cisco MDS 9500 Series Multilayer Directors info on Partnerworld](#)
- [Cisco MDS 9500 Series Multilayer Directors info on IBM.com](#)

**Figure S.12.** a) Cisco MDS 9506 for IBM System Storage, b) Cisco MDS 9509 for IBM System Storage, c) Cisco MDS 9513 for IBM System Storage (and links to more detail).

The Cisco MDS 9506 provides up to 288 1, 2, 4, and 8 Gbps autosensing Fibre Channel ports and up to 144 10 Gbps Fibre Channel ports in a six-slot modular chassis.

Here are some quick MDS 9500 director facts:

- Offers scalability to 192, 336, and 528 maximum Fibre Channel port count at 1, 2, 4, 8, and 10 Gbps Fibre Channel speed
- Multilayer architecture transparently integrates Fibre Channel, Fibre Channel over Ethernet (FCoE), IBM FICON, Internet Small Computer System Interface (iSCSI), and Fibre Channel over IP (FCIP) in one system



- 32- and 48-port 8 Gbps Advanced Fibre Channel switching modules designed to allow a port to be configured as either 1, 2, 4, 8, or 10 Gbps, consolidating all ports into the same Fibre Channel switching module
- High-performance Inter-Switch Links (ISLs) that provide additional availability at the fabric level; Port Channel capability allows users to aggregate up to 16 physical links into one logical bundle
- Supports all generations of Cisco MDS 9000 Family switching modules, providing outstanding investment protection
- Delivers comprehensive security and unified SAN management
- Includes Virtual SAN (VSAN) capability for SAN consolidation into virtual SAN islands on a single physical fabric.

## Storage Software

Bringing together the best in infrastructure management, vir-

tualization, and productivity software, IBM storage software utilizes the best in storage technology to answer your information on demand needs. In this section, we will examine some of the key storage software offerings.

### MORE ON THE WEB

- [Browse all IBM storage software on IBM.com](#)

## Tivoli Storage Manager

IBM Tivoli Storage Manager ([Figure W.1](#)) is part of a family of products that helps businesses manage and control the “information tidal wave” by delivering a single point of control



**[Tivoli Storage Manager](#)**—automates data backup and restore functions, supports a broad range of platforms and storage devices, and centralizes storage management operations.

**[Tivoli Storage Manager Extended Edition](#)**—expands on backup, restore, and archive abilities with data de-duplication and disaster recovery functionality.

**[IBM Tivoli Storage Manager for Mail](#)**—helps secure IBM Lotus Domino and Microsoft Exchange data, regardless of where or how it is stored.

**[IBM Tivoli Storage Manager for Databases](#)**—helps secure IBM Informix, Oracle, and Microsoft SQL data, no matter where or how it is stored.

**[IBM Tivoli Storage Manager for Microsoft SharePoint](#)**—offers granular backup and recovery of SharePoint business data and content.

**[IBM Tivoli Storage Manager for Virtual Environments](#)**—protects virtual machines by offloading backup workloads to a centralized server and enabling near-instant recovery.

**[IBM Tivoli Storage Manager HSM for Windows](#)**—provides hierarchical storage management with a policy-based management system for migrating Windows files economically and transparently.

**[IBM Tivoli Storage FlashCopy Manager](#)**—Integrated recovery management solution for IBM Storage systems.

**[IBM Tivoli Storage Manager for Enterprise Resource Planning](#)**—helps protect vital SAP R/3 system data efficiently, consistently, and reliably.

**[IBM Tivoli Storage Manager for Space Management](#)**—automatically moves inactive data to free online disk space for important active data.

**[IBM Tivoli Storage Manager for Storage Area Networks](#)**—allows SAN-connected Tivoli Storage Manager servers and client computers to make maximum use of their direct network connection to storage.

**[IBM Tivoli Storage Manager for System Backup and Recovery](#)**—offers a comprehensive system backup, restore, and reinstallation tool that provides bare-metal restore capabilities.

**[IBM Tivoli Storage Manager FastBack](#)**—provides a continuous data protection and recovery management platform for Microsoft Windows servers.



**[IBM Tivoli Storage Manager FastBack for Microsoft Exchange](#)**—provides the ability to quickly and easily recover granular Microsoft Exchange data objects.

**[IBM Tivoli Storage Manager FastBack for Bare Machine Recovery](#)**—restores entire systems, whether to comparable hardware, dissimilar hardware, or a virtual machine.

**[IBM Tivoli Storage Manager FastBack Center](#)**—combines the features of the IBM Tivoli Storage Manager FastBack family of products into one solution.

**[IBM Tivoli Continuous Data Protection for Files](#)**—provides continuous, automated backup of desktop and laptop workstations.

**Figure W.1.** IBM Tivoli Storage Manager family, with links to more detail (continued from previous page).

formation tidal wave” by delivering a single point of control and administration for storage management needs. This advanced, highly scalable product helps increase the efficiency of your IT operations and helps cut costs related to storage management by providing a wide range of data protection, recovery management, and monitoring capabilities using policy-based automation.

Tivoli Storage Manager delivers centralized, Web-based administration and intelligent data move-and-store techniques to help ease storage management. The product scales from small to very large installations, and supports more than 50 operating system versions and hundreds of devices.

**MORE ON THE WEB**

- [Tivoli Storage Manager info on PartnerWorld](#)
- [Tivoli Storage Manager overview on IBM.com](#)



It also facilitates a multitude of connections, including Internet, wide area networks (WANs), local area networks (LANs), and storage area networks (SANs). Tivoli Storage Manager helps organizations improve business continuity, reduce the risks of data loss, minimize complexity, better manage costs, and address strict compliance requirements.

Here are some quick Tivoli Storage Manager facts:

- Helps simplify the protection and management of your data, even as it continues to grow exponentially
- Addresses business continuity by helping to shorten backup and recovery times and helping to maximize application availability with advanced data recovery management technologies
- Employs data deduplication and a hierarchy of storage to help increase efficiencies and conserve resources
- Helps enhance data security with innovative access and encryption features
- Helps adapt to changes within the IT infrastructure to minimize service disruptions and speed restorations and backups
- Helps control storage management costs with ease-of-use features and integration with IBM network attached storage (NAS) products.

## Comprehensive Data Protection Solution Express

The new IBM Comprehensive Data Protection Solution Express includes hardware and software that mid-size organizations need to enhance data protection capabilities in a

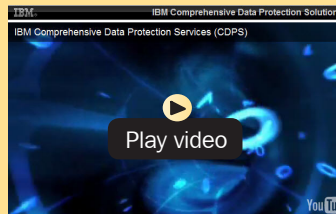


Windows environment. This solution helps clients restore access to email, files, and databases within seconds, rather than the hours or days it takes to restore using traditional backup solutions.

The solution consists of Tivoli FastBack, System x3550 server, and IBM DS3000 Express, DS4000 Express, and DS5000 series storage. The solution offers Microsoft Windows Server-based customers the perfect balance of data protection and recovery. Companies relying on manual tape as their primary backup and recovery medium will have faster, more reliable recoveries. For companies with remote offices, the burden of backup and recovery is removed from the non-IT savvy staff and moved to the central data center where the expertise resides. With Fastback and IBM System Storage, downtime is greatly reduced. Tivoli Fastback is based on continuous, frequent, and scheduled policy-based backups, and when paired with IBM System Storage, data recovery is quick and easy for both remote workgroups and central office environments. And for those who need application and server level protection, Fastback makes recovery of transactions, emails, and even servers quick and simple.

## MORE ON THE WEB

- [Comprehensive Data Protection Solution info on PartnerWorld](#)
- [Comprehensive Data Protection Solution info on IBM.com](#)



*IBM Storwize V7000 overview (6:27)*



Here are some quick facts about the Comprehensive Data Protection Solution Express:

- Tivoli Fastback provides you value with:
  - Patented express mount technology for instant, disk-based recovery: Tape can take hours or even days to recover lost data, which means expensive downtime and low success rates. Fastback and IBM Storage reduces recovery time to minutes and ensures recovery reliability to the transaction level.
  - Protection for both servers and applications: Fastback and IBM Storage protects Windows servers, offering bare metal restores, and application level protection for Oracle, SQL, Exchange, and SAP.
  - Easy administration: Eliminate user error and much of the time spent managing backup and restores. “Set it and forget it” policy engine.
  - Granular data protection for Exchange and SQL Server: Fast, reliable recovery of individual files, emails, database transactions, as well as entire volumes. Recover data and get back to work in minutes.
  - Regulatory compliance: Accurately retain and rapidly access data required by compliance and discovery policies.
- IBM System x server features include:
  - Dedicated server runs TSM FastBack server for high-performance that maximizes your IT investment.
  - Go green and save with new design and tools for optimized power management.





- IBM System Storage features include:
  - Easy-to-use storage management software common across the DS3000 and DS4000 families. Task-driven interface makes managing storage fast and easy.
  - The ASIC based RAID 6 protection with outstanding performance.
  - Single enclosure tiered storage: Put high performance Fibre Channel or SAS and high-capacity SATA drives in the same enclosure, reducing costs by eliminating the need for multiple drive enclosures.
  - Dynamic features enable flexible storage management with very fast provisioning times.
  - DAC store: Volume group metadata is stored on all drives in the array, which allows drives to be relocated within the storage system to improve channel utilization/protection or even migrated as a complete volume group into another storage system.

## **Tivoli Storage Productivity Center**

BM Tivoli Storage Productivity Center can help you manage performance, availability, and capacity utilization of your multivendor storage systems. It performs device configuration and management of multiple devices from a single user interface, and helps tune and proactively manage the performance of storage devices on the SAN while managing, monitoring, and controlling your SAN fabric.



As the amount of data you need to store and retain grows exponentially, you must find better ways to control the cost of storage. In addition, managing storage infrastructure has become increasingly complex as businesses continue to acquire new storage infrastructures or inherit a mix of multivendor storage assets due to acquisitions or company mergers. You need to be able to identify, evaluate, control, and predict the growth of data through its lifecycle in order to meet storage service levels in accordance with IT Infrastructure Library (ITIL) and data retention requirements.

#### MORE ON THE WEB

- [Tivoli Storage Productivity Center info on PartnerWorld](#)
- [Tivoli Storage Productivity Center info on IBM.com](#)
- [Tivoli Productivity Center Information Center](#)

Both requirements—managing storage infrastructure and the data that resides there—are highly labor intensive. Tivoli Storage Productivity Center is a storage infrastructure management tool that is easy to deploy and use, and can help you reduce the complexity of managing your storage environments by centralizing, simplifying, and automating storage tasks associated with storage systems, storage networks, replication services, and capacity management.

Here are some quick Tivoli Storage Productivity Center facts:

- Provide comprehensive visibility and control with centralized management of your heterogeneous storage environment from a single management interface, using role-based administration and single sign-on



- Deliver common services for simple configuration and consistent operations across host, fabric, and storage systems
- Manage performance and connectivity from the host file system to the physical disk, including in-depth performance monitoring and analysis of storage area network (SAN) fabric
- Easily create and integrate IBM Cognos-based custom reports on capacity and performance.

## FastBack for Storwize V7000

IBM FastBack for Storwize V7000 is a smarter data protection and near-instant recovery software solution for business-critical Windows and Linux servers connected to the Storwize V7000 storage platform. FastBack for Storwize V7000 includes non-disruptive block-level local backup and near instant recovery plus data deduplication and highly efficient IP-based replication for off-site disaster recovery and business resilience. It also includes granular recovery for Microsoft Exchange email objects, including messages, attachments, contacts, calendar entries, notes, tasks, and journals.

### MORE ON THE WEB

- [FastBack for Storewize V7000 info on PartnerWorld](#)
- [FastBack for Storewize V7000 info on IBM.com](#)

IBM FastBack for Storwize V7000 can replace the use of tape, especially in small or remote offices that may have a shortage of IT personnel. In larger offices and data centers, it can be integrated with your existing tape backup applications, such as IBM Tivoli Storage Manager, to provide an intermedi-



ary disk-based layer for significantly faster backup and recovery capabilities, while eliminating the need to shut down applications in order to run backup jobs.

Here are some quick FastBack for Storwize V7000 facts:

- Helps provide continuous data protection and recovery management for Microsoft Windows and Linux servers, both locally and replicated to a disaster recovery site
- Gets applications and users back up and running within minutes following any data loss, while full data recovery is performed in the background
- Helps eliminate the need for traditional backup windows by continuously capturing data changes at the block level
- Helps reduce storage and bandwidth requirements with block-level incremental backup, integrated data deduplication, and IP-based replication
- Schedules automated data transfers based on flexible, policy-based settings.

## Grid Access Manager

IBM System Storage Multilevel Grid Access Manager Software (Grid Access Manager Software) is built on an open, high-performance grid architecture that delivers data protection, information life-cycle management, simplified storage management, and multi-site data access. These features can help you save costs and improve operational efficiency.

Grid Access Manager Software is designed to help you improve storage utilization and investment across single or



multiple sites with an enterprise-wide, fault-tolerant storage grid and real-time failover capabilities. Grid Access Manager Software can help protect enterprise data through automated replication, life-cycle management, and digital signature functionality.

#### MORE ON THE WEB

- [Grid Access Manager info on PartnerWorld](#)
- [Redbook: Introducing IBM Grid Access Manager](#)

Here are some quick Grid Access Manager facts:

- Intelligent information life-cycle management that can help deploy the right storage based on its relevance and value to the organization
- Automated data migration designed to eliminate disruption when moving data from obsolete resources to new resources
- Easy-to-use, proactive monitoring and management using a single, Web-based console
- Data integrity protection using digital fingerprints and proactive monitoring, verification, and WAN-optimized replication
- Scalable object-based storage system with global name space that helps eliminate storage silos.

## General Parallel File System

The IBM General Parallel File System (GPFS) is a high-performance file management solution that provides fast, reliable access to a common set of file data from two computers or concurrently from hundreds of systems. GPFS integrates into your environment by bringing together mixed server and



storage components to provide a common view to enterprise file data. GPFS provides online storage management, scalable access, and integrated information life-cycle tools capable of managing pet-

abytes of data and billions of files. The proven GPFS file management

infrastructure provides the foundation for optimizing the use of your computing resources.

Here are some fast GPFS facts:

- Scalable, high-performance file management for AIX and Linux systems
- Capable of supporting petabytes of storage and thousands of disks within a single file system
- Reliable platform with transparent node failover, data replication, and multi-site capabilities
- Information life cycle toolkit simplifies the management of tiered storage, including tape
- More than 10 years of customer experience supporting some of the world's most demanding applications.

#### MORE ON THE WEB

- [General Parallel File System info on PartnerWorld](#)
- [General Parallel File System info on IBM.com](#)

## VTF Mainframe

IBM System Storage VTF Mainframe (VTFM) is an automated mainframe software product that is proven and has been accepted by Global 2000 companies across markets including financial services, automotive, and transportation, as well as



the public sector including government and education. VTfM emulates IBM-compatible cartridge devices and tape volumes on z/OS platforms and transparently directs your tape data onto disk. While continuing to use tape as your apparent data storage target, VTfM enables you to leverage a cost-effective disk solution for tape data storage and retrieval.

#### MORE ON THE WEB

- [VTfM Mainframe announcement letter](#)
- [VTfM Mainframe info on PartnerWorld](#)

VTfM seamlessly integrates within a physical tape environment without the need to change code or applications. VTfM is hardware agnostic—supporting all industry-standard z/OS compatible disk storage subsystems—giving customers the freedom of choice to use VTfM with their existing ESCON or FICON disk arrays. Emulating the widest range of tape devices (3480/3490/3590/3592), it is completely transparent to the host, applications, tape management systems, and users, while offering advanced features such as shared tape access using VTfM Parallel Access Tape, remote data protection using VTfM FTP-Vault, and advanced disk pool free-space management using the VTfM Destager.

Here are some quick VTfM Mainframe facts:

- Supports up to 256 virtual tape drives per VTfM started task and an unlimited number of virtual tapes
- Emulates IBM 3480, 3490, 3590, and 3592 tape drives while supporting all tape commands
- Supports all industry-standard z/OS compatible tape management systems



- VTFM FTP-Vault supports z/OS mainframe FTP servers and open systems FTP servers
- VTFM Destager supports all industry-standard z/OS compatible disk space management systems.

## Storage and Data Services

As business technology continues to evolve, the volume of information available to businesses continues to grow exponentially. Across all industries, more information needs to be stored, managed, and used by the business to drive future decisions. Main drivers for this information explosion include:

Compliance—the requirement for legal and regulatory needs to store key information;

Business Value—the more a business knows about its markets, customers, competition, and overall business climate the better decisions it can make for the future; Customer Satisfaction—as business technology has increased, so too has consumer technology. Customers in all markets are becoming increasingly techno savvy, and are demanding more from the businesses that serve them.

In today's environment, when thinking about Information Infrastructure, one needs to think global and have a worldwide perspective. Businesses operate 24x7x365, and there is no such thing as "real-time." It's about "all the time." Access to information is critical and an imperative that most companies cannot afford to take a risk in this area. In the event of an outage or decreased performance, the level of intensity

### MORE ON THE WEB

- [Storage and data services info on IBM.com](#)





rises exponentially and the problem dramatically shifts to information recovery and damage control. IBM Storage and Data Services can help customers prevent such tragedies and ensure information is securely available at any time, all the time.

By proactively establishing a well-organized approach to your storage and data environment, you can gain the advantages that come from an effective storage infrastructure. You can provide business users with required access to data, giving key decision makers the information they need to help innovate and grow your revenue. You can cost-effectively deliver storage performance that meets current needs, while laying a strong foundation for the future. And you can better manage business risks and uphold regulatory compliance. IBM Global Technology Services offers services that can help you address storage and data needs from end to end, including assessment, planning, design, implementation, and management. [Figure C.1](#) lists some example storage and data services along with links to more detail.

## **STG Lab Services and Training—Storage Consulting Services**

Assessing a client's IT storage environment and developing a strategy/roadmap to optimize their storage infrastructure and control costs takes specialized skills, resources, and time that most businesses do not have readily available. IBM STG Lab Services and Training's team of storage consultants and architects is ready to conduct the following "Storage Sen\$e" services for your customers to assist you, our Business Partners, in your sales efforts.



**Data migration services**—data migration services and tools that can enable non-disruptive, online migrations to reduce costs, optimize infrastructures, and increase productivity.

**Information lifecycle management service**—develop and execute best practices for managing information through its entire life cycle to enable business growth and compliance.

**Simplified storage request management**—optimize storage efficiency by defining enforceable standards.

**Smart business storage cloud**—helps reduce costs and improve performance with a scalable storage-virtualization solution.

**Storage and data product services**—shorten the time to implement new storage technology or migrate data, while reducing risks.

**Storage optimization and integration services**—solutions for the next generation of storage management.

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**Figure C.1.** IBM Global Technology Service offerings.

### ***Rapid Optimization Analysis (ROA)***

- Provides a rapid evaluation of current storage footprint and issues, and can provide specific focus on core areas such as power/energy usage, tiering, virtualization, and data deduplication
- Conducted remotely over a one-week period, the ROA uses conference calls to kick off the engagement, gather data, and present the results



- Provides a 10–15 chart customized report with high-level recommendations, next steps, and a financial analysis showing potential cost savings versus using associated financial metrics (ROI, NPV, IRR, MIRR).

### *Optimization Workshop*

- Focuses on storage best practices used to align the business value of information with the most appropriate and cost-effective IT infrastructure
- Conducted at the client site with STG storage architects professionally facilitating a one- or two-day workshop
- Can address transactional (all types of customers) and medical imaging/fixed content (healthcare providers) environments
- Provides a 40–50 chart customized report with recommendations, next steps, and a financial analysis showing potential cost savings using associated financial metrics (ROI, NPV, IRR, MIRR).

### *Optimization Study*

- Focuses on storage best practices used to align the business value of information with the most appropriate and cost-effective IT infrastructure
- Conducted at the client site with STG storage architects meeting with key client personnel in detailed one-on-one interviews



- Can address transactional (all types of customers) and medical imaging/fixed content (healthcare providers) environments
- Provides an 80–100 chart customized report with detailed recommendations, in-depth analysis data, next steps, and a financial analysis showing potential cost savings using associated financial metrics (ROI, NPV, IRR, MIRR).

### *More on the Phone*

- For more information, contact one of our lab services opportunity managers:
  - Barbara Read (bmread@us.ibm.com, 206-290-7578)
  - Jim Surmacewicz, Jr. (jrsurmac@us.ibm.com, 520-799-4519)
  - Bill O'Brien (wobrien@us.ibm.com, 919-301-8049).

# 5

## IBM System Networking

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The combination of powerful systems for virtualization and converged networks will greatly optimize data center efficiency. However, it requires a closer collaboration in the entire solution

### MORE ON THE WEB

- [Overview of all IBM System Networking on IBM.com](#)

stack, including network switching. For years, IBM has been a trusted vendor for enterprise-class servers, and we are now pleased to offer a broad range of networking switches.

### System Networking Basics

Networking is an essential element in a dynamic infrastructure and an integral part of the strategy to reduce costs, improve services, and manage risk. Organizations must continue to focus on server and storage hardware optimization, technology enhancements, service management improvement, security, resiliency, and integration projects between IT and extended business assets. How-

### MORE ON THE WEB

- [System Networking info on PartnerWorld](#)
- [System Networking info on IBM.com](#)
- [System Networking RackSwitch Sales Kit](#)





ever, it is important to realize that the network is essential to support these initiatives and to ensure that the maximum benefit is derived.

Five important trends are reshaping today's data center networks:

1. Expanding system virtualization (e.g., VMware, Microsoft's Hyper-V, Xen, and KVM): Organizations of all sizes are enhancing their IT agility through the use of cloud-service architectures to enable rapid deployment of new services and to support rapid growth in any particular service. Additionally, organizations are improving their return on their IT investments through the use of virtualization to support server consolidation. It has been estimated that, in distributed computing environments, up to 85 percent of computing capacity sits idle. Server virtualization and consolidation, however, also consolidates network traffic, resulting in very different network traffic characteristics—driving up bandwidth requirements, starting at the server adapters, and continuing through network access and into the network core.
2. Increasing Virtual Machine (VM) mobility: Once virtualized systems have been implemented, it is only natural to want to take advantage of VM-mobility capabilities (such as VMware's VMotion) for higher service availability and performance. Because of the way IP routing protocols work, however, in order for a VM to successfully move from one system to another, both systems must be on the same IP "subnet," driving the need for fundamental changes to data center network designs—also called "flatter" networks. In addition, however,



many organizations use Virtual LANs (VLANs), Access Control Lists (ACLs), and Quality of Service (QoS) settings in the network to enforce systems security and improve service performance. Consequently, when a VM moves, the network must be “VM aware” in order to move those network settings along with it.

3. Growth in distributed application models: Network traffic to and from transaction-based applications historically flowed into the data center directly to the server that would respond to the transaction and the response would flow straight back to the requester (often called “north/south” traffic). With today’s distributed application environments such as Web services, service oriented architectures, and scale-out application environments, however, a single request can result in many sub-requests flowing back and forth between back-end systems (“east/west” traffic). It has been estimated that today 80 percent or more of data center traffic is east/west traffic. And, because that traffic is between computing systems, the overall responsiveness of the IT service is extremely sensitive to network latency. Consequently, in order to deliver satisfactory IT services, organizations must focus on very-low-latency switching at the server network edge switches.
4. Pressure to support network convergence: Storage networks have grown to where the costs of running separate networks are significant—and an attractive target for IT operational cost-cutting initiatives. Likewise, “lossless” Ethernet technologies (e.g., data center bridging standards) are getting to the

point that they can provide a viable converged alternative to separate storage and data networks. And, with the pressures to increase bandwidths—for both storage and data network—being driven by virtualization and consolidation, storage and data network convergence seems inevitable. Network upgrades, particularly for the server network edge switches, will be required in order to deliver those lossless Ethernet capabilities.

5. Increasing energy costs and constraints: Data center energy costs are significant and, in some cases, constraints on available power has prevented organizations from meeting growing IT service requirements. It has been estimated that networking equipment uses about one-sixth of a data center's overall power requirements, making energy efficiency a key requirement for all new networking equipment. In addition, many data centers are adopting “hot-aisle/cold-aisle layouts” in order to improve cooling efficiency; consequently, it is important to ensure that the air flow of networking switches matches that of the rest of the systems in the rack.

Seeing that those trends all intersect at the data center server-access switches and recognizing that those switches can either facilitate or inhibit success in responding to those trends, IBM has made a significant investment in its System Networking portfolio. IBM offers:

- A portfolio of server-access switches from IBM System Networking with 1 Gb, 10 Gb, and 40 Gb Ethernet, delivering:
  - Substantially better price/performance





- Virtual Machine awareness through VMready technology
- Low-latency
- Lossless Ethernet support
- Industry-leading energy efficiency
- Data center core and wide area network access switches
- Switches supporting Fiber Channel Over Ethernet and connectivity to the leading Fiber Channel SANs
- Campus networking switches with robust support for Power Over Ethernet (for devices such as IP telephones, wireless access points, and security cameras).

## **IBM System Networking Product Quick Reference**

IBM System Networking enables an open approach to data center networking, ensuring that clients can implement smarter computing solutions using best-in-class networking equipment. In this section, we will explore the IBM System Networking portfolio of switches and routers.

### **IBM System Networking Switches**

In October 2010, IBM System Networking was created to bring speed and intelligence to the network edge. In this section, we will take a look at the portfolio of offerings. In October 2011, IBM announced IBM Networking Operating System and IBM System Networking Element Manager, giving IBM System Networking our own OS and management tools for our portfolio of IBM engineered and designed products. You



will also notice that IBM's strategy has moved to a focus on promoting and marketing our own portfolio of Ethernet offerings using IBM technical innovation.

## **IBM VMready**

IBM VMready is switch-resident software that reduces the complexity of configuring and managing virtual machines throughout the network, making it VM-Aware. The network can be configured and managed for thousands of virtual ports (v-ports), rather than just a few physical ports, without manual intervention.

With VMready, as VMs migrate across physical hosts, so do their network attributes automatically.

VMready allows you to manage virtual machines as they are added, moved, and removed, while retaining the same ACLs, QoS, and VLAN attributes. VMready allows for a "define once, use many" configuration that evolves as the server and network topologies evolve.

VMready works with all virtualization products, including VMware, Microsoft's Hyper-V, Xen, PowerVM, and KVM, without modification of Virtual Machine Hypervisors or Guest operating systems. Virtual Vision enables network virtualization between data centers.

### **MORE ON THE WEB**

- [VMready info on PartnerWorld](#)
- [VMready info on IBM.com](#)

## **IBM Distributed Virtual Switch 5000V**

The IBM System Networking Distributed Virtual Switch (DVS) 5000V is an advanced, feature-rich distributed virtual switch for VMware environments with policy-based virtual machine



(VM) connectivity. The IBM DVS 5000V enables network administrators familiar with IBM System Networking switches to manage the IBM DVS 5000V just like IBM physical switches using advanced networking, troubleshooting, and management features so the virtual switch is no longer hidden and difficult to manage.

Support for Edge Virtual Bridging (EVB) based on the IEEE 802.1Qbg standard enables scalable, flexible management of networking configuration and policy requirements per VM and eliminates many of the networking challenges introduced with server virtualization. The IBM DVS 5000V works with VMware vSphere 5.0 and beyond and interoperates with any 802.1Qbg-compliant physical switch to enable switching of local VM traffic in the hypervisor or in the upstream physical switch. This provides a competitive advantage for IBM with VMware.

## **IBM RackSwitch Portfolio**

Data centers can standardize on a unified and affordable rack-level, or top of rack, network infrastructure to provision and scale out Web 2.0 environments, high-performance clusters, and virtualized data centers. IBM's Ethernet RackSwitch family is designed to bring speed and intelligence to the edge of your network; where it's closer to your business, users, and innovations. IBM's top of rack products are lossless, low latency, and low power.

IBM RackSwitches are virtual—providing rack-level virtualization of networking interfaces for a rack full of server and storage systems—decoupling the scaling of networking and



computing capacity via on-switch VMready software. VMready enables the movement of virtual machines—providing matching movement of VLAN assignments, ACLs, and other networking and security settings. VMready works with all leading VM providers (VMware, Citrix Xen, PowerVM, KVM, Microsoft Hyper V, etc.).

IBM RackSwitches are cool—implementing a choice of directional cooling to maximize data center layout and provisioning. Their superior air-flow design complements the hot-aisle and cold-aisle data center cooling model.

IBM RackSwitches are easy—with server-oriented provisioning via point-and-click management interfaces, along with the optional IBM System Networking Element Manager software package for updating large groups of switches.

IBM RackSwitches are designed with line-rate throughput and low latency with some at significantly less than 700 nanoseconds.

## **IBM RackSwitch G8000**

The IBM RackSwitch G8000 ([Figure B.1](#)) is an Ethernet switch specifically designed for the data center, providing a virtual, cooler, and easier network solution.

Here are some quick G8000 facts:

- 44 x 1 GbE RJ45 ports, four 1 GbE SFP ports and up to four optional 10 GbE SFP+ or CX4 ports
- The G8000 offers the choice of server-like rear-to-front or front-to-rear airflow models, in addition to proven energy efficient designs to reduce cost



- [G8000 info on PartnerWorld](#)
- [G8000 info on IBM.com](#)

**Figure B.1.** IBM BNT RackSwitch G8000 (and links to more detail).

- Low 120 W power draw and variable speed fans help reduce power consumption (DC power model is also available)
- Simplified configuration with an Industry-Standard Command Line Interface (IS CLI, very similar to the CLI used with Cisco switches)
- System virtualization support—VMready automatically detects virtual machine movement from one physical server to another.

### **IBM RackSwitch G8052**

The IBM RackSwitch G8052 ([Figure B.2](#)) is an Ethernet switch specifically designed for the data center, providing a virtual, cool, and easy network solution.

Here are some quick G8052 Facts:

- 48 × 1 GbE RJ45 ports and four standard 10 GbE SFP+ ports
- Choice of airflow direction, allowing for significant savings in cooling costs



- [G8052 info on PartnerWorld](#)
- [G8052 info on IBM.com](#)

**Figure B.2.** IBM BNT RackSwitch G8052 (and links to more detail).

- Low 130 W power rating with hot-swap power supplies and variable speed fans help reduce power consumption
- Network virtualization—VMready automatically detects virtual machine movement from one physical server to another.

### **IBM RackSwitch G8124**

The IBM RackSwitch G8124 ([Figure B.3](#)) is a 10 Gigabit Ethernet switch specifically designed for the data center, providing a virtual, cooler, and easier network solution. The G8124 offers 24 10 Gigabit Ethernet ports in a high-density, 1U footprint. Designed with top performance in mind, the RackSwitch G8124 provides line-rate, high-bandwidth switching, filtering, and traffic queuing without delaying data, and large data-center grade buffers to keep traffic moving.

The G8124 also supports Virtual Fabric, which allows for the carving up of a physical NIC into 2–8 virtual NICs (vNICs) per dual port adapter and creates a virtual pipe between the adapter and the switch for improved performance, availability, and security, while reducing cost and complexity. The G8124 supports the newest protocols—including Data Center Bridg-



- [G8124 info on PartnerWorld](#)
- [G8124 info on IBM.com](#)

**Figure B.3.** IBM BNT RackSwitch G8124 (and links to more detail).

ing/Converged Enhanced Ethernet (DCB/CEE) for support of Fibre Channel over Ethernet (FCoE) and iSCSI.

Here are some quick G8124 Facts:

- 24 SFP+ ports that operate at 10 Gigabit or 1 Gigabit Ethernet speeds
- Optimal for high-performance computing and applications requiring high bandwidth and low latency
- All ports are non-blocking 10 Gigabit Ethernet with deterministic latency of 570 nanoseconds
- IBM VMready helps reduce configuration complexity and improves security levels in virtualized environments with VM mobility
- IBM Virtual Fabric capability allows for the carving up of a physical NIC into multiple virtual NICs
- G8124E models are equipped with enhanced processing and memory to improve performance for larger layer 3 networks, at the aggregation layer, high-end multicast applications, and rapid failover.



## IBM RackSwitch G8264

The IBM RackSwitch G8264 ([Figure B.4](#)) is a 10 and 40 Giga-bit Ethernet (GbE) switch specifically designed for the data center, providing speed, intelligence, and interoperability on a proven platform.

The RackSwitch G8264 offers the flexibility to use breakout cables in the 40 GbE ports supporting up to 64x10 GbE ports in a small 1U footprint. Designed with top performance in mind, the RackSwitch G8264 provides line-rate, high-bandwidth switching, filtering, and traffic queuing without delaying data. Large data center grade buffers keep traffic moving. Hot swap redundant power and fans along with numerous high availability features enable the RackSwitch G8264 to be available for business-sensitive traffic.

The low latency offered by the RackSwitch G8264 makes it ideal for latency-sensitive applications such as high performance computing clusters and financial applications. The G8264 supports the newest protocols—including Data Center Bridging/Converged Enhanced Ethernet (DCB/CEE) for support of Fibre Channel over Ethernet (FCoE) and iSCSI.

Here are some quick G8264 facts:

- Optimized for applications requiring high bandwidth and low latency
- Up to 64 1 Gb/10 Gb SFP+ ports in a 1U form factor
- Future-proofed with four 40 Gb QSFP+ ports
- 1.28 Tbps non-blocking throughput and around 880 nano-seconds latency





- [G8264 info on PartnerWorld](#)
- [G8264 info on IBM.com](#)

**Figure B.4.** IBM BNT RackSwitch G8264 (and links to more detail).

- Open Flow 1.0 support enabling innovation in networking and routing protocols for the future
  - IBM VMready helps reduce configuration complexity and improves security levels in virtualized environments with VM mobility
  - IBM Virtual Fabric capability allows for the carving up of a physical NIC into multiple virtual NICs.

### ***IBM RackSwitch G8264T***

The RackSwitch G8264T ([Figure B.5](#)) can be leveraged as part of a comprehensive 10GBase-T solution offering from IBM, which includes servers, storage, and networking, providing better virtualization, better management, and a cost-effective option for next generation data centers. Flexible connectivity across distances up to 100 m at a low cost makes the G8264T an optimal choice for connecting high-speed server and storage devices.



- [G8264T info on PartnerWorld](#)
- [G8264T info on IBM.com](#)

**Figure B.5.** IBM RackSwitch G8264T (and links to more detail).

Here are some quick G8264T facts:

- Optimized for low cost cabling using CAT 6 and 6a
- Up to 48 1 Gb/10 Gb 10Gbase-T ports in a 1U form factor
- Future-proofed with four 40 Gb QSFP+ port, which can also be used for 10 Gb SFP+ connections via breakout cables
- 1.28 Tbps non-blocking throughput and around 3.2 micro-second latency.

### ***IBM System Networking RackSwitch G8316***

The IBM System Networking RackSwitch G8316 ([Figure B.6](#)) is a 40 Gigabit Ethernet (GbE) aggregation switch designed for the data center, providing speed, intelligence, and interoperability on a proven platform.

The RackSwitch G8316 offers up to 16×40 GbE ports, which can also be used as a high-density 10 GbE switch using break-out cables (up to 64×10 GbE ports), with 1.28 Tbps—in a 1U foot-print. The G8316 provides a cost-efficient way to



aggregate multiple racks of servers compared to other expensive core switches, while allowing massive scalability for your data center network. It is an ideal aggregation layer switch when used with the 10/40 GbE IBM RackSwitch G8264 at the access layer.

Designed with top performance in mind, the RackSwitch G8316 provides line-rate, high-bandwidth switching, filtering, and traffic queuing without delaying data. Large data center grade buffers keep traffic moving. Hot-swappable, redundant power and fans, along with numerous high-availability features enable the RackSwitch G8316 to be available for business-sensitive traffic.

Here are some quick G8316 facts:

- Optimized for applications requiring high bandwidth and low latency
- Sixteen 40 Gb QSFP+ ports in a 1U form factor
- Up to 64 10 Gb SFP+ ports to form a high-density 10 Gb cluster



- [G8316 info on PartnerWorld](#)
- [G8316 info on IBM.com](#)

**Figure B.6.** IBM System Networking RackSwitch G8316 (and links to more detail).



- Powerful control plane providing higher performance to aggregate multiple racks of servers
- 1.28 Tbps non-blocking throughput.

## **Converged Switch B32**

The IBM b-type Converged Switch B32 ([Figure B.7](#)) is designed to provide outstanding performance with a reliable platform that helps reduce cabling complexity, equipment acquisition costs, and operational costs associated with space, power consumption, and cooling. This multi-protocol top-of-rack switch features excellent space efficiency and low power consumption, leading the way toward a “greener” data center.

The B32 features eight 8 Gbps FC ports along with 24 CEE ports with 10 Gbps link speeds. The CEE ports are capable of transporting both FC storage area network (SAN) data and Ethernet LAN traffic—eliminating the need for separate SAN and LAN adapters and cables.

Here are some quick Converged Switch B32 facts:

- Outstanding performance with eight Fibre Channel (FC) ports concurrently active at 8 Gigabits per second (Gbps) and 24 Converged Enhanced Ethernet (CEE) ports concurrently active at 10 Gbps link speeds
- High density design with 32 ports in a 1U enclosure
- “Green” energy efficiency significantly reduces power consumption while generating less heat
- Enterprise-class availability features such as hot-swappable, redundant, and integrated fan and power supply assemblies



- [Converged Switch B32 info on PartnerWorld](#)
- [Converged Switch B32 info on IBM.com](#)

**Figure B.7.** IBM b-type Converged Switch B32 (and links to more detail).

- Streamlines management by utilizing IBM System Storage Data Centre Fabric Manager (DCFM) and extensions for FCoE and CEE.

### **Brocade VDX 6730 Converged Switch**

The Brocade VDX 6730 Converged Switch for IBM ([Figure B.8](#)) connects to FC storage area networks (SANs) in addition to FCoE, iSCSI, and NAS storage, providing unified Ethernet storage connectivity options. It is available in two models—the 2U Brocade VDX 6730-76 with 60 10 GbE LAN ports and 16 8 Gbps native FC ports, and the 1U Brocade VDX 6730-32 with 24 10 GbE LAN ports and eight 8 Gbps native FC ports. IBM models ship with 8 Gbps FC SWL transceivers standard allowing for connections up to 150 m. Both VDX models come with dual power supplies and customers have the choice of front-to-back or back-to-front airflow models.



- [Brocade VDX 6730 info on PartnerWorld](#)
- [Brocade VDX 6730 info on IBM.com](#)

**Figure B.8.** The Brocade VDX 6730 Converged Switch for IBM (and links to more detail).

Here are some quick Brocade VDX 6730 facts:

- 10 Gigabit Ethernet (GbE) FCoE switch with LAN and native Fibre Channel ports
- Supports multiple protocols including Fibre Channel over Ethernet (FCoE), iSCSI, and NAS
- Streamlines management by utilizing Brocade Network Advisor and available integration with IBM System Director
- Ideal for customers looking to connect to existing Brocade SANs.

## Juniper Ethernet Switches

Juniper has a strong heritage as a high-end Internet Service Provider, and IBM offers a couple of switches via IBM System x sales channels.



## Ethernet Switch J48E

Running Juniper Networks JUNOS Software operating system, the IBM Ethernet Switch J48E ([Figure J.1](#)) was designed for high-performance server access deployments. A single switch can be deployed initially; as requirements grow, Virtual Chassis technology allows up to nine additional switches to be interconnected over a 128 gigabit-per-second (Gbps) back-plane and managed as a single device, with a single configuration file and OS image. Modular Gigabit Ethernet (GbE) and 10-Gigabit Ethernet (10 GbE) uplink module options enable Virtual Chassis technology to be extended to switches in different racks or even in different data centers.

The Ethernet Switch J48E combines the high availability (HA) and carrier-class reliability of modular systems, and it is designed to deliver:

- 1 RU, 320 watts with power over Ethernet
- 48 ports of 10/100/1000BASE-T ports
- Virtual chassis technology allowing up to 480 ports as a single logical device



- [J48E info on PartnerWorld](#)
- [Ethernet Switch J-type e-series info on IBM.com](#)

**Figure J.1.** IBM Ethernet Switch J48E (and links to more detail).



- Optional 10 GbE uplink ports to j-Series core switches (4274Exx and 4274-Mxx)
- Eight ports of Power over Ethernet
- Redundant, internal hot-swappable power supplies
- Hot-swappable fan tray with redundant blowers
- Consistent modular JUNOS control plane feature implementation
- Dual route engines with Graceful Routing Engine Switchover (GRES)
- Single management interface
- Scales from 48 to 480 ports with up to 20 10 GbE uplinks.

## Juniper Networks EX2200 Ethernet Switch

The Juniper Networks EX2200 Ethernet Switch ([Figure J.2](#)) offers an economical, entry-level, stand-alone solution for top-of-rack server applications, access-layer deployments in branch and remote offices, and campus networks. Four platform configurations are available, offering 24 and 48 10/100/1000BASE-T ports with or without Power over Ethernet (PoE). Each EX2200 switch supports four fixed front panel GbE uplink ports with pluggable optics (purchased separately) for high-speed backbone or link aggregation connections. With a packet switching capacity of 56/104 Gbps, Ethernet throughput of 41.7/77.4 Mpps (wire speed), eight hardware queues for QoS, and four SFP uplinks, the EX2200 is designed





- [EX2200 info on PartnerWorld](#)
- [EX2200 info on IBM.com](#)

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**Figure J.2.** Juniper Networks EX2200 Ethernet Switch (and links to more detail).

to deliver the ultimate 1 Gigabit Ethernet top-of-rack solution. If your application includes a converged environment of servers, PCs, VoIP and video, the EX2200 provides the highest levels of flexibility (i.e., POE and POE+) and features in its class, while delivering a reliable platform for unifying enterprise communications.

Here are some quick EX2200 facts:

- Delivers high availability and high performance in a power-efficient 1U form factor
- Includes 4 Gigabit Ethernet SFP uplink ports that provide high-speed connectivity to aggregation-layer switches or other upstream devices
- JUNOS operating system delivers a consistent feature set and shortens the learning curve, lowering operational expense.

## Cisco Nexus Converged Switches

### Cisco Nexus 5000

Cisco Nexus 5000 for IBM System Storage switches ([Figure J.3](#)) support Fibre Channel, Converged Enhanced Ethernet and Fibre Channel over Ethernet (FCoE) to help data centers simplify their growing infrastructures.

The Cisco Nexus 5010 for IBM System Storage and Cisco Nexus 5020 for IBM System Storage switches help reduce costs through data center infrastructure simplification. A unified fabric over 10 Gigabit Ethernet for server LAN and SAN traffic enables consolidation of server adapters, cables, and top-of-rack (TOR) switches by up to 50 percent. In addition, the Cisco Nexus 5010 for IBM System Storage has one expansion port and the Cisco Nexus 5020 for IBM System Storage has two expansion ports that can support any combination of the following modules:

- 8-port 1/2/4 Gigabit Fibre Channel
- 6-port 1/2/4/8 Gigabit Fibre Channel
- 4-port 10 Gigabit Ethernet (DCB and FCoE) and 4-port 1/2/4 Gigabit Fibre Channel
- 6-port 10 Gigabit Ethernet (DCB and FCoE)

Here are some fast Cisco Nexus 5000 facts:

- Cisco Nexus 5020 provides up to 56 ports: 40 fixed 10 GbE and FCoE ports and 16 optional Fibre Channel ports
- Cisco Nexus 5010 provides upto 28 ports: 20 fixed 10 GbE and FCoE ports and 8 optional FC ports



- Enterprise-class availability features such as hot-swappable, field replaceable, redundant power supplies, redundant fan modules, and port expansion modules
- Streamlines management by utilizing Cisco Fabric Manager Suite.



- [Nexus 5000 info on PartnerWorld](#)
- [Nexus 5000 info on IBM.com](#)

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**Figure J.3.** Cisco Nexus 5000 (and links to more detail).

## About the Editor

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Jim Hoskins is the founder of Maximum Press, a premier publisher of books, ebooks, and rich media that help businesses apply technology profitably. Jim has been involved with computer technology design, implementation, and education for over 25 years. He is the author of many articles and books covering a wide range of technology and Internet business topics. Jim spent a decade with IBM designing computer systems and directly helping businesses of all sizes design and implement real-world solutions. He is the author/editor of the popular *Exploring IBM* series, which has sold over 350,000 copies in 12 languages. Jim has a degree in electrical engineering from the University of Florida and resides in Gulf Breeze, Florida, with his wife and five children. You can reach Jim via email at [jimh@maxpress.com](mailto:jimh@maxpress.com).