

IBM storage

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The [**IBM**](https://en.wikipedia.org/wiki/IBM)[**Storage**](https://en.wikipedia.org/wiki/Computer_storage)product portfolio includes disk, flash, tape, [NAS](https://en.wikipedia.org/wiki/Network-attached_storage) storage products, storage software and services. IBM's approach is to focus on data management.[1]

Various IBM storage servers

TS4500 Tape Library TS3500 Tape Library Tape drives

For entry and midrange workloads Tape libraries

Tape drives

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**See also References**

# Software

## IBM Spectrum Storage

IBM Spectrum Storage portfolio can centrally manage more than 300 different storage devices and yottabytes of data.

### IBM Spectrum Accelerate

The functionality of Spectrum Accelerate is based on the IBM XIV, a high-end disk storage system. IBM Spectrum Accelerate and XIV run the same base software stack and interoperate with features such as management, remote replication and volume mobility. [2][3]

### IBM Spectrum Scale

IBM Spectrum Scale is software-defined storage for cloud and analytics.

The product is very widely used in both commercial and academic environments. It has a history going back to the mid 1990s. It was known as [GPFS](https://en.wikipedia.org/wiki/IBM_General_Parallel_File_System) before IBM re-branded all storage products in 2015.

### IBM Spectrum Virtualize

IBM Spectrum Virtualize is a block storage virtualization system. Because the [IBM Storwize](https://en.wikipedia.org/wiki/IBM_Storwize) V7000 uses SVC code, it can also be used to perform storage virtualization in exactly the same way as SVC. Since mid-2012 it offers real time compression with no performance impact, saving up to 80% of disk utilization. SVC can be configured on a Stretched Cluster Mode, with automatic failover between two datacenters and can have [SSD](https://en.wikipedia.org/wiki/Solid-state_drive) that can be used by EasyTier software to perform sub-LUN automatic tiering.

### IBM Spectrum Control

IBM Spectrum Control provides infrastructure management for virtualized, cloud and software-defined storage.[4][5]

### IBM Spectrum Protect

IBM Spectrum Protect is a progression of the Tivoli Storage Management product.

### IBM Spectrum Archive

It allows users to run any application designed for disk files against tape data without concern for the fact that the data is physically stored on tape.[6]

IBM offers four options:

IBM LTFS Single Drive Edition - access and manage data on a standalone tape drive as if the data were on disk

IBM LTFS Library Edition - access and manage data on single or multiple cartridges in a tape library

IBM LTFS Storage Manager - manage both online and offline files in IBM tape libraries IBM LTFS Enterprise Edition - run applications designed for disk files from tape storage.

## IBM SmartCloud Storage Access

IBM SmartCloud Storage Access is a software application designed to create a private cloud storage service on existing storage devices. The software can be configured to allow users self-service, Internet- based access for account creation, storage provisioning and file management. The software offers simple management with monitoring and reporting capabilities, including storage usage by user and group definitions.[7]

## Active Cloud Engine

The Active Cloud Engine (ACE) is an advanced form of multiple site replication. ACE is designed to allow different types of cloud implementations to exchange data dynamically. ACE does is designed to extend the SONAS capability for a single, centrally managed namespace, to a truly distributed, geographically-dispersed, global namespace.[8]

## IBM Easy Tier

IBM Easy Tier is designed to automate data placement throughout the disk pool to improve the efficiency and performance of the storage system. Easy Tier is designed to relocate data (at the extent level) across up to three drive tiers automatically and without disruption to application. IBM Easy Tier is available on the DS8000, Storwize (V7000, V7000 Unified, V5000, V3700 lines) and SAN Volume Controller.

# Current hardware

After 2019 IBM dropped the HDD- and SSD-based storage server series and all current lines provide only flash-oriented or tape-oriented solutions.

## Flash storage

### IBM FlashSystem

[IBM FlashSystem offers a range of dedicated, non-SSD "all-flash" storage systems and based on a Intel x86 platform.](https://en.wikipedia.org/wiki/Intel_x86)

IBM acquired flash storage system maker [Texas Memory Systems](https://en.wikipedia.org/wiki/Texas_Memory_Systems) in 2012,[9] In April 2013, IBM announced a plan for a $1 billion investment in flash storage research and development,[10] and then the product line-up was renewed in 2014 with the announcement of the FlashSystem 840[11] and FlashSystem V840.[12] IBM has been refreshing those systems and adding new capabilities every year. Former FlashSystem has 1U-size solutions only, current lineup contains rackable systems with 1U, 2U or 6U form- factor, and based on a 6U modules [cabinet](https://en.wikipedia.org/wiki/19-inch_rack)-size solution.

In 2017 FlashSystem brand replaces XIV brand, and in 2020 FlashSystem replaces Storwize brand.

**IBM Data Engine for NoSQL -** is an integrated *black-box* device combining an IBM PowerLinux server with FlashSystem modules attached as non-volatile memory extension (not as storage).The integrated system offers large capacity NoSQL services based on pre-loaded [Redis](https://en.wikipedia.org/wiki/Redis), [Cassandra](https://en.wikipedia.org/wiki/Cassandra) and [Neo4J](https://en.wikipedia.org/wiki/Neo4J), up to 57 TB in-memory instances. Compared to a clustered in- memory implementation, the Data Engine for NoSQL consumes a fraction of the power and rack footprint while delivering similar performance by keeping relevant ([hashing](https://en.wikipedia.org/wiki/Hash_function)) data structures in fast memory. Use cases include scalable web shops, gaming, genomics, geolocation, catalogs, hash tables and cluster caches like [memcached](https://en.wikipedia.org/wiki/Memcached).

### DS servers

[IBM POWER-based storage series, that offers specialized advanced functions optimized for IBM Power Systems and](https://en.wikipedia.org/wiki/IBM_Power_Systems) [IBM Z](https://en.wikipedia.org/wiki/IBM_Z) [servers; This line early known as **System Storage DS series**, and former](https://en.wikipedia.org/wiki/IBM_Power_Systems) **TotalStorage DS series**; current models slowly dropped the "System Storage" naming prior to simple line names (DS#### for flash systems, TS#### for tape storage). Currently DS series contains only DS8000 sub-line.

### DS8000 series

The DS8000 line formely offers only as an assembled cabinet-size solution, but current line-up contains half-rack mountable model. The DS8000 also can use self-encrypting drives for every drive tier to help secure data at rest.[13]

## Tape and virtual tape systems

### TS libraries and servers

Like the similar DS storage series, the tape system lines early known as **System Storage TS series** or former **TotalStorage TS series** and based on a IBM POWER controllers.

### TS7000 series

Mainframe-oriented [virtual tape library](https://en.wikipedia.org/wiki/Virtual_tape_library) series,[14] TS7700 line released in 20## as System Storage 7700, updated in 201#, 2016,[15] 2018[16] and 2020[17][18]

Like the DS8000 series, current models can be offered as assembled rack-size solution, or as half-rack rack-mountable system.[19]

### TS4500

General purpose tape library series.

### TS4300 TS2900

**TS readers TS22#0 series TS11#0 series**

**Withdrawn hardware - x86 lines**

**PureData servers**

Was introduced in 2012[20] for replacing the [Netezza](https://en.wikipedia.org/wiki/Netezza) line.

## Flash storage

### IBM DeepFlash



IBM TS7700 opened

**DeepFlash 150** - is an ultra-high density SSD, based on a [SanDisk](https://en.wikipedia.org/wiki/SanDisk) InfiniFlash IF100 drawer (holding up to 0.5 PB of Flash capacity in 3U rack space) and IBM Spectrum Scale software.[21] It is directly attached via [SAS](https://en.wikipedia.org/wiki/Serial_Attached_SCSI) to a maximum of 8 servers used as application cluster or as integrated device running some [SDS](https://en.wikipedia.org/wiki/Software-defined_storage) storage management software. Its design point is *lowest price per reliable capacity*. In contrast, for *lowest price per IOPS* or *best latency per invest*, consider storage built around FlashSystem modules. Introduced in 2016.[22]

**DeepFlash Elastic Storage Server** - an integrated device combining one or two DeepFlash 150 drawers with IBM Spectrum Scale software for Exascale storage repositories with analytics capabilities (Hadoop, CCTV, analytics archive, media server etc.). The DeepFlash- ESS can be clustered non-disruptively with existing IBM Elastic Storage Servers, up to a theoretical limit of 8000 clustered devices. It features file (NFS, SMB), object (Swift, S3) and Hadoop transparent access. Spectrum Scale offers automated data placement and lifecycle management from Memory to Flash to Disk to Tape, besides geographically distributed caching and replication.

### Other flash storage capabilities

High IOPS PCIe Adapters – PCIe card adapters for former [IBM System x](https://en.wikipedia.org/wiki/IBM_System_x) servers, offering capacities up to

* 1. TB. Moved to [Lenovo](https://en.wikipedia.org/wiki/Lenovo).

## HDD/SSD storage - For entry and midrange workloads

### IBM XIV

The **IBM XIV Storage System** was configured as cabinet-size solution and designed to work well in cloud and virtualized environments. The last XIV Gen3 model offers 2, 3, 4 or 6 TB drives, providing up to 485 TB of usable capacity per rack. SSD caching (available as an option) adds up to 12 TB of management-free high-performance data caching capability to the entire array. The system can also connect to external storage via Fibre Channel (8Gbit/s) and iSCSi (1 or 10 Gbit/s).[23] The XIV line was replaced by [IBM FlashSystem](https://en.wikipedia.org/wiki/IBM_FlashSystem) line.[24]

### IBM Storwize family

The Storwize family of storage controllers shares the software with the [IBM SAN Volume Controller](https://en.wikipedia.org/wiki/IBM_SAN_Volume_Controller) and offers the same functionality with few exceptions. Storwize systems are capable of external virtualization, and oriented for technology migration and investment protection for aging systems. Storwize advanced caching, free-of-charge *Easy Tier* (automatic data placement) and automatic hotspot elimination help infuse a second life to previous-generation storage systems. Modern virtualization functions like inline real-time compression for data on external systems can help delay capacity repurchase for several years.

**Storwize V7000 series** - announced in 2010, is a compact (2U rack-mount enclosure) virtualizing storage system that inherits IBM SAN Volume Controller (SVC) functionality.

[**Storwize V7000**](https://en.wikipedia.org/wiki/IBM_Storwize_V7000) **Gen1** - can attach to storage clients via FCP (8 and 16 Gbit/s), [FCoE](https://en.wikipedia.org/wiki/FCoE) or [iSCSI](https://en.wikipedia.org/wiki/ISCSI) (1 or 10 Gbit/s) protocols and can use Real-time Compression to reduce disk space usage by up to 80 percent.

**Storwize V7000 Gen2** and **Gen2 turbo**, each a technology upgrade with increased throughput and number of drives support: 720 slots per single controller or 3040 per clustered controller.

**Storwize V7000F** - designed for SSD-only operations.

**Storwize V7000 Unified** combines two head units running IBM Storwize File Module Software with the IBM Storwize V7000 block storage system. It is described as *unified storage* because it simultaneously implements NAS protocols (such as SMB and NFS) and block storage.[25] It leverages IBM Spectrum Scale software capabilities.

**Storwize V7000 Gen3** - last upgrade of V7000 line, before merging to FlashSystem in 2020.

**Storwize V5000 series** - announced in 2013, is a mid-range virtualizing storage system offering many of the features of the V7000 in a 2U rack-mount enclosure.

**Storwize V5000** - supports 6 Gbit SAS and 1 Gbit iSCSI host attachment and either 8 Gbit FC or 10 Gbit iSCSI/FCoE host attachment. The system can support up to 480 drives with nineteen expansion enclosures, and up to 960 drives in a two-way cluster configuration.[26]

**Storwize V5000 Gen2**, a technology upgrade with increased number of drives support. It is available as V5010, V5020, and V5030 with mutual in-place upgrade capability.

**Storwize V5000F** - designed for SSD-only operations.

**Storwize V5000 Gen3** - last upgrade of v5000 line, before merging to FlashSystem in 2020.

**Storwize V3700** - announced in 2012, is an entry-level 2U system, oriented for the block storage needs of small and midsize businesses. This system offers consolidating and sharing data capabilities previously available in more expensive systems.[27]

**Transparent Cloud Tiering** for Swift- and S3-compatible object datastores can be used as a cold tier for incremental volume snapshots and volume archives without live production access. This allows keeping hourly time machine copies or archiving VM images including attached volumes at a price point somewhat

closer to tape media. Supported on-premise datastores include IBM Cloud Object Store (aka Cleversafe) and IBM Spectrum Scale object. Off-premise datastores would be popular S3-compatible cloud services like IBM Bluemix (aka Cleversafe cloud). Off-premise Transparent Cloud Tiering per default uses AES encryption, which is a licensed feature.

## HDD/SSD storage - High density rack systems

**IBM Storwize High-Density Expansion 5U92** for [Storwize](https://en.wikipedia.org/wiki/IBM_Storwize) V5000 Gen2, V7000 and SAN Volume Controller, attaching via 12Gb SAS lanes. This high density carrier hosts 92 hot-swappable large form factor drives in 5U rack height. Use cases include general footprint reduction, active archives, streaming media applications, or *big data* warehouses.

Peak performance figures are equivalent to four chained 2U Storwize EXP 12Gb SAS expansions, at equal total number (and type) of drives.

# Withdrawn hardware - POWER and early RISC lines

## Flash storage

Some **System Storage DS8000 Series** (models DS8###F)

## HDD/SSD storage

**System Storage** (2006-2019) N7000 series

N6000 series N3000 series

DS300 ([iSCSI](https://en.wikipedia.org/wiki/ISCSI) controller)

DS400 (FC Attached controller, using SCSI drives) DS3000 Series

DS3200 DS3400 DS3500

DS4000 Series

DS4500 DS4700 DS4800

DS5000 Series

DS5020 DS5100 DS5300

DS6000 Series



IBM DS3200 nodes

DS6800

Enterprise storage, with both [FC](https://en.wikipedia.org/wiki/Fibre_Channel) and [FICON](https://en.wikipedia.org/wiki/FICON) host connection

[PowerPC 750](https://en.wikipedia.org/wiki/PowerPC_750) dual-controller with 8 host ports and 8 drive ports

3U enclosure with 16 FC drive bays

Attached up to 128 drives using DS6000 expansion units (1750-EX1 and 1750-EX2)

DS8000 Series DCS3700

DCS9550 (based on the [DataDirect Networks](https://en.wikipedia.org/wiki/DataDirect_Networks) S2A9550)

Expansions

EXP710 (2Gbit FC Expansion drawer for DS4000 attachment)

EXP810 (4Gbit FC Expansion drawer for DS4000 attachment)

**TotalStorage** (2001-2006) DS4000 Series

DS4100 (FC Attached controller, using SATA drives)

DS4200 DS4300

DS4300 Turbo DS4400

FAStT Series (renamed to TotalStorage DS4000 Series in 2004)[28]



IBM System Storage DS4800 and expansions



IBM System Storage DCS3700 server node

EXP200 (1Gbit FC Expansion drawer for FAStT attachment) EXP500 (1Gbit FC Expansion drawer for FAStT attachment) FAStT100 (renamed to DS4100)

FAStT200 FAStT500

FAStT600 (renamed to DS4300) FAStT600 Turbo (renamed DS4300 Turbo) FAStT700 (renamed to DS4400) FAStT900 (renamed to DS4500)

Latest [Enterprise Storage Server](https://en.wikipedia.org/wiki/IBM_Enterprise_Storage_Server) (renamed to TotalStorage DS8000 Series) Expansions

EXP700 (2Gbit FC Expansion drawer for DS4000 attachment) EXP300 ([SCSI](https://en.wikipedia.org/wiki/SCSI) Ultra160 Expansion drawer for direct host attachment)

EXP400 ([SCSI](https://en.wikipedia.org/wiki/SCSI) Ultra320 Expansion drawer for direct host or DS400 attachment) EXP100 (1Gbit FC Expansion drawer for DS4000 attachment, using SATA disks)

[**Enterprise Storage Server**](https://en.wikipedia.org/wiki/IBM_Enterprise_Storage_Server) (or ESS, or *Shark*; predecessor of DS8000 Series) STN6800

STN6500

### SONAS

IBM **Scale Out Network Attached Storage (SONAS)** was the IBM enterprise x86-based storage platform based on [GPFS](https://en.wikipedia.org/wiki/GPFS) technology, and released in 2010[29] as hardware product. This system implements [NAS](https://en.wikipedia.org/wiki/Network-attached_storage) based protocols over a large-scale global name space. Today the system can scale out using commodity components to 30 balanced nodes and up to 21 PB of storage in 2011.[30] The 2013 lineup was based on a DCS3700 storage line.[31] GPFS gives the SONAS system with built-in ILM and tight integration with Tivoli Storage Manager helps move data to disk pools.[32]



IBM TotalStorage DS4400 with two EXP700 expansion units

## Tape and virtual tape systems For enterprise workloads

### TS4500 Tape Library

High density tape library supporting [Linear Tape-Open](https://en.wikipedia.org/wiki/Linear_Tape-Open) (LTO) 5 and 6 or TS1140 and TS1150 drives. Can scale up to 35.5 PB of native capacity with 3592 cartridges and up to 11.7 PB with LTO 6 cartridges. Supports up to 5.5 PB in 10 sq ft.[33]

### TS3500 Tape Library

Highly scalable tape library supporting Linear Tape-Open (LTO) or TS11x0 drives. Can scale up to 16 frames, 192 drives and over 20,000 cartridges capacity per library string or up to 2,700 drives per library complex.[34]

### Tape drives

TS1140 - Tape drive that uses 3592 media.[35]

TS1060 - LTO tape drive that uses LTO generation 6 technology for use in TS3500 tape libraries.[36]

IBM TS3500 D53 tape library - 6 frames

## For entry and midrange workloads

### Tape libraries

TS3310 - Expandable library with up to 18 LTO drives (409 cartridges maximum with expansion modules.)

TS3200 - Up to four LTO drive library using half-height drive assemblies (48 cartridges) or up to two with full-height drives.[37]

TS3100 - Up to two LTO drive library using half-height drive assemblies (24 cartridges) or one full-height drive.[37]

### Tape drives

The IBM System Storage TS2900 Tape Autoloader - Designed for entry-level automation for backup and archiving in small-to-medium business environments. The TS2900 is available with IBM Linear Tape-Open (LTO) Half-High SAS tape technology.[38]

TS2360 - Full-height external standalone or rack mountable shelf unit with a native physical capacity of 2.5 TB. The IBM Ultrium 6 technology is designed to support media partitioning, IBM Linear Tape File System (LTFS) technology and encryption of data and WORM cartridges.[39]

TS2260 - Half-height external standalone or rack mountable shelf unit with a native physical capacity of 2.5 TB.[40]

### Virtual tape libraries

TS7620 ProtecTIER Deduplication Appliance - Preconfigured repository that can be configured with either a Virtual Tape Library or Symantec OpenStorage interface with a capacity of up to 35 TB.[41]

IBM Virtualization Engine TS7700 series - The TS7700 is a virtual tape library for System z (mainframe) that uses disk drives for cache to accelerate backup operations. The design is intended to protect data while having shorter backup windows. [End-to-end encryption](https://en.wikipedia.org/wiki/End-to-end_encryption) protects data in motion, on cache hard drives and on tape. TS7740 and TS7720 are designed to speed up tape backups and restores by using a tiered hierarchy of disk and tape to make more efficient use of tape drives.[42]

IBM System Storage TS7650G ProtecTIER Deduplication Gateway - Designed to meet the disk-based data protection needs of the enterprise data center while reducing costs. The system offers 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.[43]

# See also

[List of IBM products](https://en.wikipedia.org/wiki/List_of_IBM_products) [IBM XIV Storage System](https://en.wikipedia.org/wiki/IBM_XIV_Storage_System)

[IBM SAN Volume Controller](https://en.wikipedia.org/wiki/IBM_SAN_Volume_Controller) [IBM Storwize family](https://en.wikipedia.org/wiki/IBM_Storwize_family)

[IBM FlashSystem](https://en.wikipedia.org/wiki/IBM_FlashSystem)

[IBM Tivoli Storage Manager](https://en.wikipedia.org/wiki/IBM_Tivoli_Storage_Manager)

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