IBM Storage TS7780 Virtual Tape Library

Massive scalability and always-on data availability for IBM Z environments in the cloud era

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Highlights

Mission-critical data protection and business continuance with 19" frame

Seamless hybrid multicloud integration with Transparent Cloud Tiering

Cloud-based Disaster recovery for Tape, and powerful, scalable and cyber-resilient grid

Flexible storage to pay for what you need

Simplify IBM Z tape operations and improve batch window performance

Cost-effective, scalable long-term retention with seamless integration to IBM Storage Deep Archive

More than 85% of enterprises around the world now operate in hybrid multicloud environments, and in the next few years nearly all will move to these architectures.[1] At the same time, mainframe utilization has remained robust – IBM Z mainframes process 30 billion transactions each day, including 87% of all credit card transactions on the planet. [2]

These major technology trends all point to one important conclusion – more companies than ever before need economical mainframe – optimized, tape-based data storage solutions that can help them leverage the advantages of the public cloud. The IBM TS7700 facility of virtual tape systems is designed specially to meet these business-critical requirements.

With seamless integration to IBM Storage Deep Archive, along with many other private/public clouds, organizations benefit from ultra-scalable, energy-efficient, and cost-effective long-term data retention for mainframe workloads. Now able to leverage S3 Glacier-compatible object storage on tape, the TS7780 completes the circle to hybrid multi-cloud compatibility. IBM Storage Deep Archive's ultra-density IBM Diamondback tape library reduces energy consumption by up to 97% when compared to a high-density HDD storage at the same data capacity. [3]

Mission-critical data protection and business continuance with 19" frame

The IBM TS7700 family of virtual tape solutions brings over 20 years of innovation and 13 years of industry leadership. TS7700 systems enable mainframe-centric enterprises to implement a fully integrated tiered storage hierarchy by leveraging powerful virtualization capabilities. Using virtualization and disk cache, the systems operate at disk or SSD speeds while maintaining compatibility with existing tape operations. The newly announced TS7780 helps to create a fully integrated tiered storage hierarchy that can take advantage of both disk/SSD and tape technologies to deliver high performance for active data and better economics for inactive and archive data now in a 19-inch industry standard rack.

Because of its deep integration with IBM Z, the new TS7780 offers powerful advantages and synergies and now delivers at least double the capacity of the previous generation TS7770 in the same footprint. The TS7700 systems are IBM Z intelligent – no additional z/OS software is required to support them – while IBM Z enjoys full access to all IBM property tape library command sets. z/OS sees the entire TS7700 grid instead of a series of independent tape libraries.

IBM

50%

Thanks to deep integration with z/OS, TCT provides up to 50% savings in mainframe CPU utilization when migrating large datasets as compared to other traditional archiving methods.[5]

100%

100% data encryption, at-rest, in-flight and in the cloud

Powerful, scalable and cyber resilient grid
TS7700 solutions can leverage the power of grid architectures that allow interconnection of up to eight systems in a grid configuration. This TS7700 function is comparable to IBM Metro Mirror and IBM Global Mirror. Because TS7700 systems typically reside in different locations to provide better availability and disaster recovery, the grid communications are designed to help keep data available, even when a site experiences an outage. Once any cluster puts a volume in the cloud, all clusters (existing and future) in the same grid will have immediate access to the volume from the cloud, whether grid replicated or not, granting full grid awareness.

The grid helps maintain availability during planned maintenance, service, system upgrades, or unexpected outages and helps avoid the physical transportation of tape cartridges in the event of a disaster. The grid configuration also allows administrators to use TS7700 systems as archival solutions with full back-end tape functionality.

TS7700 grids offer multiple modes of synchronous and asynchronous replication. This can be assigned to volumes through an IBM Data Facility Storage Management Subsystem (DFSMS) policy providing flexibility in implementing business-continuity solutions.

TS7700 grids now seamlessly integrate with IBM Storage Deep Archive, enabling ultra-scalable, energy-efficient, and cost-effective long-term data retention. This integration allows mainframe data to be securely archived on S3 Glacier-compatible tape storage, supporting compliance and rapid access when needed.

Seamless hybrid multicloud integration with Transparent Cloud Tiering
TS7700 virtual tape solutions offer the capability to accept DS8000 archive and backup data through the power of Transparent Cloud Tiering (TCT) technology.

Cloud Storage Tier provides direct data transfer to multilcoud environments for long-term data retention. Cloud Storage Tier for virtual tape enables an alternative storage tier offering massive storage capacity for backup and recovery purposes. The technology supports a choice of multicloud options. It also allows direct attachment to physical tape for cost effective long-term data retention.

In addition, the Cloud Storage Tier leverages existing TS7700 infrastructure for investment protection. It uses existing Ethernet ports; includes encryption, auditing, and security features: it integrates with IBM Cloud Object Storage and can also provide transparent connectivity to IBM Cloud, Amazon S3 and another IBM TS7700 configured as an object storage target.

With Cloud Storage Tier, the challenge of keeping up with explosive data growth becomes much more manageable. Thanks to the scalability of cloud resources, enterprises can meet data growth challenges without significant capital investments. This highlights a powerful advantage of cloud storage cost.

TS7700 systems with Cloud Storage Tier, offers powerful new solutions for unstructured data as well. On average, unstructured data is moved 10 times within different storage tiers during its lifetime.[5] The ability to quickly move data where and when it is required is crucial to deriving business value from growing unstructured data sets. Cloud Storage Tier enables TS7700 users to determine where data should reside and create policies to automatically move the data. This capability allows for informed decisions concerning when and how enterprise data is moved and how to most effectively migrate the data to the appropriate storage tier, keeping costs lower and storage utilization optimal.

Object storage offers many advantages for unstructured and less active data sets. Cloud Storage Tier integrates well with IBM Cloud Storage, which can provide the foundational object storage layer for on-premises cloud implementations or be used to build an off-premises object store using public cloud resources.

TS7700 also integrates with IBM Storage Deep Archive to provide ultra-scalable, cost-effective deep archive storage, delivering up to 46PBs in a 19" rack. It provides a standardized S3 Glacier-compatible interface for seamless integration with TS7700 and multi-cloud environments, enabling secure, long-term retention.

Cloud-based Disaster recovery for Tape

Ensure your critical data is available where and when it is needed while building up your grid. Cloud Storage Tier offers an excellent solution for increasing cyber resilience by making use of the immutability features provided by cloud repositories. It can also be used to create offline point-in-time data backups to the cloud which can then be restored to an empty TS7700 cloud connected system. This dovetails nicely with new cloud-based disaster recovery capabilities for IBM VTL and tape solutions. Data sets can now be restored to an empty TS7700 system outside of the grid using Cloud Storage Tier technology. As volumes are created in a grid, TS7700 Cloud Storage Tier copies them to the assigned cloud pools using policies managed by the Data Facility Storage Management subsystem (DFSMS). Version retention can be enabled within each cloud pool, allowing previous versions to be retained long enough to meet any requirement. These new capabilities are supported in IBM Cloud, AWS S3, IBM Storage Ceph, IBM Cloud Object Storage on-prem, and other S3 compatible technologies on an iRPQ bases.

Flexible storage to pay for what you need

The new TS7780 delivers an even more efficient footprint through larger hard drive and SSD options, as well as flexible deployments designed for organizations of different sizes with different needs. The powerful capabilities of IBM's virtual tape libraries are delivered as prepackaged racked solutions or client-supplied 19" industry-standard rack configurations* (*Note that client supplied rack configurations will not be available until 2nd half 2025). This capability enables clients to order one TS7780 Server 3948 Model VEF, one Cache Controller 3948 Model CFD, and up to nine cache Module Model XSDs or XFDs, as well as all other associated features to be installed in their own client-supplied rack.

Also, the TS7700 family can increase capacity in 20 TB and 100 TB increments concurrently on the new TS7780 cache subsystem using larger 20 TB 7.2K SAS Drives with 157 TB usable capacity per drawer or 15TB SSDs with 260TBs usable capacity per drawer. The TS7780 delivers up to 4.7 PBs with a full base frame and one expansion frame when using HDD drives, or up to 2.66PBs in a single base frame when using SSD. Note that a 2nd HDD based expansion frame is expected in late 2025, taking the total capacity to 7.86PB with two expansion frames. Expansion frames for SSDs are not supported at this time.

Enhanced modern data protection and retention

For long-term data retention, TS7700 solutions can be directly attached to physical tape storage. The systems write data to high-capacity, high-performance IBM Enterprise tape drives installed in IBM TS4500 tape libraries.

Data security is another area of enhancement within the Storage for IBM Z ecosystem.TS7700 supports the IBM Z suite of data protection technologies collectively labeled "pervasive encryption." By adding SP 800-131A compliant encryption in-flight encryption can be extended between DS8000 arrays and all individual VTL systems in a TS7700 grid. And because there's no need to configure key groups, key managers or other configurable items, encryption is now even easier within mission-critical hybrid multicloud environments. (Note that IBM Z Fibre Channel Endpoint Security end to end in-flight data protection is expected in late 2025 for the TS7780 across the 32Gb FICON.)

Tape offers the advantage of portability which allows for a physical "air gap" between data and online hackers providing a uniquely effective safeguard against cyber attacks
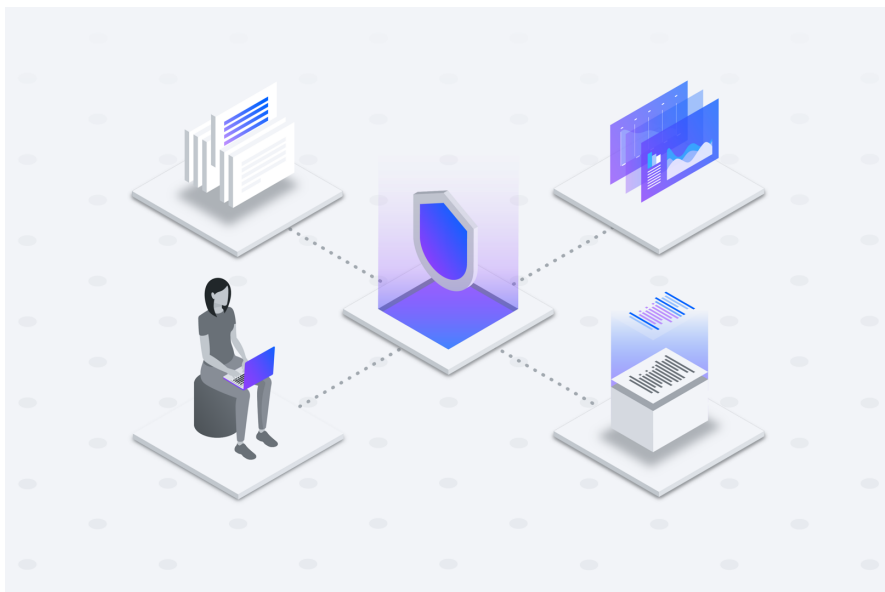
Replication in the grid cloud is handled through Secure Sockets Layers (SSL) transmission over Ethernet. SSL cryptography uses public and private keys to create the secure link between clusters and protecting data in flight from unauthorized access using AES-256 based encryption. AES-256 disk-based encryption is used for data at rest within the disk cache repositories. IBM Guardium Key Lifecycle Manager can generate and manage encryption keys for both disk and tape drives across the enterprise. This feature delivers advanced federated cross-domain key management designed to help lock down organizational data more comprehensively and easily than ever before.

To support the long-term retention of reference data and meet requirements of regulator bodies worldwide, microcode capabilities enable TS7700 solutions to support a virtual equivalent of write-once-read-many (WORM) functionality with optional dual-control retention.

Simplified storage management

TS7700 systems are designed with automated tools and an easy-to-use, web-based user interface for management simplification. TS7700 allows users to store data according to how valuable it is to the organization and how quickly it needs to be accessed resulting in significant operational cost savings compared to traditional disk-only solutions while improving overall tape processing performance.[4]

IBM Storage TS7780 VTL Data sheet

TS7700 systems incorporate extensive self-management capabilities to help reduce the complexity of business continuity/disaster recovery procedures. The systems can improve storage efficiency by providing tape operations at disk speeds, enabling optional policy-managed hierarchical use of cost-effective physical tape and on-prem and public cloud storage. Tape and cloud workloads running at disk speeds can meet the most demanding recovery point objectives and times (RPO/RPT) allowing workloads traditionally retained in primary mainframe-attached disk to move to tape, which can significantly reduce overall costs. And TS7700 enables efficiencies such as impressive zero recovery point objectives, thanks to its synchronous copy capabilities. These combined benefits make TS7700 an attractive repository for all workload and data types, as well as for demanding RPO/RPT requirements.

A web-based graphical user interface (GUI) based on the interface used in several other IBM storage solutions is provided to configure and monitor TS7700 systems. The GUI can be used to access information such as the current system status and resource usage statistics. This interface has been designed to make configuring and managing TS7700 solutions more efficient while also helping reduce the time needed to train new administrators.

Dynamic Disk Pools & Multi-Pool support

TS7700 Dynamic Disk Pools improve data availability by minimizing the rebuild time after a disk drive failure. By distributing the rebuild workload across a pool of drives, the impact of the process is greatly reduced. The Dynamic Disk Pool feature distributes data, parity, information and spare capacity across the drives, while its intelligent algorithm defines which drives are used for segment placement – making sure data is fully protected.

TS7700 can also define multiple pools in the cloud. Each pool can be a unique bucket/vault/provider/location. Using policy management to direct a workload to a pool, this capability is excellent for multi-tenancy.

Optimized data compression

IBM has optimized data compression for TS7700 systems, which can significantly reduce storage requirements and network bandwidth, improve overall system performance and of course reduce operating expenses. Also, TS7780 supports 32Gb FICON connectivity, enabling IBM customers to exploit their most current FICON infrastructure and maximize FICON throughput to IBM Z.

In addition to the standard compression built into the FICON adapters used in TS7700 systems, two enhanced compression options are available to balance performance demands with storage requirements –LZ4 compression and ZSDT compression algorithms. Now, the maximum TS7700 usable disk capacity of 4.7 PB can hold over 23.5 PB using 5:1 compression, depending on which compression method is used. Once the 2nd expansion frame is available, the total will be just over 39PBs. When tape or cloud tier is enabled, this number increases to over 500PB.

Optimized compression
Up to 24 GB/sec of throughput and over 39 PBs of compression-enhanced storage capacity, allowing mainframes to send more data faster while reducing the CPU utilization associated with data management.

On-going innovation

IBM TS7780 is the latest member of the TS7700 family. It is designed to provide better capacity efficiencies, higher performance for active data while reducing the expenses associated with archive, data retention, and backup operations behind IBM Z servers. Built with the most advanced POWER 9+ processors and 32GB FICON, it benefits from years of trailblazing research and deep collaboration between the IBM Storage and IBM Z teams to deliver unique business value for mainframe deployments.

The new TS7780 virtual tape systems combines all the family capabilities while offering several enhancements over previous models, including:

- Dual control security authentication with a "maker" and "checker" approach designed for multi-tenancy environments protecting cloud retention pools and expire/hold and duration enablement. It is deal for customers looking for an additional security level.

- Automated Grid Cloud Failover capabilities that help ensure data is available from anywhere at any time. This leading-edge technology provides nearly zero seconds failover across up to eight grid-linked TS7780 systems.

- Increased performance with new data offload functionality to supported DS8000F platforms.

- 100% higher disk density thanks to new disk technology that also provides much longer data retention.

- Seamless integration with IBM Storage Deep Archive, significantly reducing storage costs and carbon footprint, to meet the demands of modern hybrid cloud strategies.

Innovation drives competitive advantage. The new TS7780 demonstrates that innovation is alive and well within the IBM TS7700 family.

IBM TS7780 at a glance

Offering	TS7780 Base Frame / (Racked solution, Single cluster configuration)	TS7780 Expansion Frame / (One or two, Racked solution per cluster configuration)	TS7780 Racked Mounted Client Supplied Rack Singles cluster configuration	TS7780 Racked solution 8-cluster grid Max configuration
Usable disk cache ✦	Up to 1570 TB	Up to 7.86 PB	Up to 1570 TB	Up to 62.88 PB
Tape Attach Support ┼	Up to 100 PB	Up to 100 PB	Up to 100 PB	Up to 100 PB
Cloud Attach Support ┼	Up to 100 PB	Up to 100 PB	Up to 100 PB	Up to 100 PB
Virtual Volumes ┿	Up to 4,000,000	Up to 4,000,000	Up to 4,000,000	Up to 4,000,000
Virtual Drives	256 to 496	256 to 496	256 to 496	2.048 to 3,698
TS1100 (3592) tape Drives ⇕	4 to 16	-	4 to 16	4 to 128
32 Gbps FICON channels	Up to 8	-	Up to 8	Up to 64
Maximum logical paths	Up to 4,096	-	Up to 4,096	Up to 32,768
Expert Care Support	One to five year Advanced or Premium Expert Care support			
Supported Environments ᏪᏗ	IBM z/OS, IBM z/VM, IBM z/VSE, IBM z/TPF			

✦ Not all array cache capacity is usable. Cache capacities vary with grid configurations, including a combination of TS7720, TS7740, TS7760, TS7770 and TS7780 models

┼ Maximum support is provided for EITHER Tape and /or Cloud attach

┿ 4,000,000 default Virtual Volumes with TS7780

⇕ Tape support is optional

ᏪᏗ Refer to IBM Knowledge Center for minimum software-level requirements and specific function or feature support

IBM TS7780 at a glance

Physical specifications

Offering	TS7780 Base Frame / (Racked solution, Single cluster configuration)	TS7780 Expansion Frame / (One or two, Racked solution per cluster configuration)	*TS7780 Racked Mounted Client Supplied Rack Single cluster configuration (min config. / max config) *note that TS7780 in a client supplied rack is not available at GA
Width	616 mm (24.3 in.)	600 mm (23.62 in.)	483 mm (19.0 in.) of each component
Depth	1,240 mm (48.8 in.)	1,170 mm (46.06 in.)	Depth of the deepest component 3757-VED (p9 p Series) from front to back of the cable management arm & cables in the arm 38.9 inches (98.8 cm)
Height	2,035 mm (80.11 in.)	2,035 mm (80.11 in.)	2 disk module config. 19U in height Minimum configuration
			4 disk module config. 23 U in height
			6 disk module config. 27U in height
			8 disk module config. 31U in height
			10 disk module config. 35U in height
Weight	Max 853.66 Kg (1,882 lbs)	Max 929.3 Kg (2,049 lbs)	Min weight of components for configuration with 2 disk cache drawers is 243 kg (536.4 lbs)
			Max weight of components for configuration with 10 disk cache drawers is 456 kg (1,006 lbs)
Power consumption	Max 3480 watts	Max 4400 watts	Max 3480 watts
Power pase options	Single phase (240 V AC) or three phase (400 V AC)		Single phase only (240 V AC)
Power frequency	50 Hz – 60 Hz (+/- 3 Hz)		
Dry bulb temp (recommended operating per range)	20°C to 25° (68°F to 77°F)		
Relative humidity (recommended operating per range)	40% to 55%		

TS7700 virtual tape solutions enable multicloud architectures that help lower storage costs and increase overall system performance. And TS7700 offers powerful advantages in IBM Z environments. This success is the result of more than six decades of commitment to the technology and the adoption and execution of a product strategy based on innovation, continual improvement, and constant communication with business partners and customers. IBM TS7700 leverages these advantages, providing even more reasons for mainframe-powered enterprises to choose IBM tape solutions.

For more information
To learn more about IBM Storage TS7780 Virtual Tape Library contact your IBM representative or IBM Business Partner, or visit
https://www.ibm.com/products/ts7700

1. IBM Institute for Business Value: *Assembling your Cloud Orchestra*, October 2018
2. IBM: *2018 Annual Report*
3. OCP Bryce Canyon high density HDD storage at the same capacity: 27PB, 16TB HDD, 3 JBOD to 1 controller: total energy usage per year estimated 115,590 kWh compared to IBM Diamondback at 27PB, 4 tape drives: total energy usage 2,367 kWh. This is meant for archival scenarios only. http://files.opencompute.org/oc/public.php?service=files&t=eddcffbce54dba60f72bcf0721ffe6b4 IBM Systems Solution Brief: *IBM TS7700 grid solutions for business continuity*, May 2016
4. *Results are based on internal IBM data measurements on an EC12 when migrating large data sets*
5. *Data Mobility solution factoid*