# ETERNUS CS Virtual Tape

## *For Dynamic Infrastructures*
## *Intelligent Data Protection*

ETERNUS® CS is the first virtual tape solution that provides intelligent data protection by storing all enterprise backup autonomously on disk or on tape.

## STARTING WITH THE BEGINNING OF THE CENTURY

Fujitsu launched its innovative Virtual Tape Appliance, CentricStor® VT (Virtual Tape)—now ETERNUS CS—in 1999, providing a single architecture to support mixed environments with its own mainframe line BS2000/OSD and MVS mainframes. From the beginning, ETERNUS CS was designed to operate as a self-contained appliance with all physical tape processing controlled by the appliance itself, without the need for intervention by any host system or backup server. In 2002, the virtual library interfaces of ETERNUS CS were extended to offer additional support for open systems. This evolutionary step meant that ETERNUS CS became the first and only virtual tape solution to support both mainframes and open systems. Over the years, thanks to comprehensive certification with major operating systems, backup applications, tape library systems and tape drive technologies, ETERNUS CS has evolved into the industry's most-versatile Virtual Tape Appliance, and one that can be deployed in almost any environment while protecting previous investments in tape automation. Since the power on at the first customer data center all deployed ETERNUS CS systems protect today a customer data volume larger than 260PB in data centers of financial services, communications, government and other industries worldwide. Superior intelligent data protection with the unified virtual tape solution for backup to disk and tape is reality.

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### *Consolidation*
ETERNUS CS supports a huge variety of different platforms with host channels of different types, including standard Fibre Channel, ESCON® and FICON™. Different channel types can be mixed in a single system. Simultaneous heterogeneous platform support for major mainframe and non-mainframe backup solutions is a strong advantage and simplifies consolidation efforts to drive to lower TCO.

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## FUNCTIONAL DESCRIPTION

ETERNUS CS is a virtual tape solution that uses virtual tape interfaces not just as a non-disruptive means of introducing disk to replace tape but also as a virtualization layer (True Tape Virtualization) between independent software vendor solutions and physical tape. The goal of ETERNUS CS virtual tape provisioning is to speed up backup/restore processes by allocating virtual tape resources on a just-enough and just-in-time basis. By eliminating interference from physical tape operations, True Tape Virtualization provides insurance against changes or disruption in the physical tape tier.

The ETERNUS CS Grid Architecture differs from others as its modular architecture consists of independent building blocks: A scalable number of front-end processors emulate industry-standard tape drives for diverse heterogeneous host server connections.
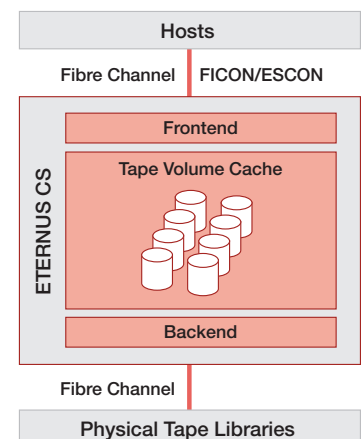
Back-end processors handle communication and data movements to physical tape libraries. Tape volumes are written optionally in a compressed format from the front-end into a highly-scalable internal RAID subsystem. This serves as tape volume cache for backup data written to physical tape and also for temporary or permanent tape volume storage. Two redundant virtual library processors supervise the entire internal operation as well as communication with diverse hosts and various physical tape libraries.

The ETERNUS CS Grid Architecture leverages unmatched disaster resiliency for protection against site outages. Its high level of redundancy is also the basis for non-disruptive upgrades and provides data availability anytime to ensure business continuity for each class of data center. Potential risks in operation are identified through Live Monitoring and Health Check. Therefore, on top of standard maintenance services, activities can be started even before actual errors occur.

## ILM FOR TAPE

The internal RAID system (Tape Volume Cache) of ETERNUS CS functions as a cache buffer between hosts and tape libraries, retaining tape data during usage. Data written to the RAID in tape format is already compressed, allowing the user to store even more data on disk. ETERNUS CS automatically manages tape data in the Tape Volume Cache based on user attributes for tape volume groups that correspond to different SLA requirements. These features, and the "Dual Target" ability to allocate the data on different types of internal disk technologies and on physical tape, provide users with the benefits of a seamless integration of tape into ILM (Information Lifecycle Management) through an "in a box" approach. The ETERNUS CS large cache capability enables several unique functions, while managing tape data in the cache and different migration policies reduce the overall numbers and cost for physical tape.

The "No Migration to Tape" feature retains data on disk, in effect using the appliance for respective logical volumes as a disk library. Another feature is "Cache Residency", which allows files to be locked inside the cache after being de-staged automatically to tape. "Save Delay" allows defining a time delay before de-staging files, therefore saving resources if virtual tapes are frequently overwritten or appended. The above mentioned attributes for "Dual Target" storing (on disk and on tape) are assigned to logical volume groups and are active concurrently. The high cache capacity and intelligent management of tape data in-cache accelerates restore cycles and optimizes the utilization of physical tape drives and tape cartridge capacity, offering savings by reducing the need to purchase additional tape systems.

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**Compression**

Tape data written to the internal RAID system can optionally be compressed by the front-end, without impacting performance. A dedicated CPU in each front-end processor assists in the compression of tape volumes by a factor of 2.5 to 4 before storing these on the internal RAID, allowing users to retain even more data on disk. In addition, compression of attached tape drives can be optionally switched on top, to deliver further decreases of necessary tape library capacities.

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Field information shows that a majority of ETERNUS CS customers use a sized cache capacity to hold backup data from the previous three to five days inside the cache, despite the fact that the volumes have already been moved to physical tape. This allows for much faster restoration of the latest data without the need to load and read from tape. This tape data on disk offers additional protection in the event of physical tape failures or library maintenance.

### Operational and cost efficiency

Combining disk and tape increases efficiency by introducing ILM into the backup process. The cost of tape cartridges is much less than disk. The ability to, from a single appliance, manage two storage tiers and store data automatically on tape for long-term retention requirements, in disk cache for short term as well as to manage the entire lifecycle through the appliance itself reduces the overall disk capacity expense. On a MB for MB basis, disks are still much more expensive than tape even if deduplication is in use. And spinning disks require power and cooling. So moving long-term data onto tape reduces power, cooling, and floor space requirements. The ETERNUS CS provisioning of virtual tape resources further reduces overall disk cache requirements by allowing users to only provision virtual tape volumes on disk as needed, rather than provisioning large chunks of disk space.

### Security

The volume group concept for dedicated data separation, role-based user logins, and authentication provides a secure multi-tenancy platform for service providers and large enterprises alike. Fujitsu added stronger authentication mechanisms leveraging Pluggable Authentication Modules (PAM) and disables passwords after consecutive failed login attempts. ETERNUS CS has robust logging of configuration changes, administrative actions, and logins. Remote access and control can only be operated from a known, verified account such as the vendor's service team for proactive services or maintenance tasks. Security roles (such as Admin, User, and Service) have been added and roles can be associated with group IDs.

## PHYSICAL TAPE PROCESSING

The ETERNUS CS True Tape Virtualization technology liberates the backup software to generate and supervise physical tape, which reduces complexity in mixed and large enterprise environments. As an integrated and automated Disk-to-Disk-to-Tape (D2D2T) solution, the ETERNUS CS system autonomously offloads the virtual tape volumes from its cache to physical tapes, based on attributes and usage. The D2D2T operation mode, with in-process tape creation and self-contained tape processing, is unique to ETERNUS CS in the open systems market. The entire operation of physical tape processing is completely decoupled and independent from the operating system and backup software. The storage management software is merely connected with the front-end and library processor of ETERNUS CS, which provides fully-transparent virtual tape interfaces and provisioning of virtual tape resources. The virtual library processor ensures that the backup software and ETERNUS CS tape volume catalogs are always in sync.

ETERNUS CS maintains its own self-contained physical tape volume catalog for the backend physical tape, without drawbacks for the backup application. Processing and control of physical tape media is operated solely by ETERNUS CS, which controls the attached tape libraries and tape drives. The operation with autonomous data migration over policy-based control by logical volume attributes means that the backup software is not aware of either the effective storage target (dual target with disk and/or tape) or the internal replication features, which increases maximum data protection.

Decoupling front-end and backend (True Tape Virtualization) gives customers free choice in selecting a physical tape environment. This approach embraces multi-vendor strategies and older tape systems can be integrated seamlessly, therefore protecting valuable assets. The entire lifecycle of virtual and physical tape volumes is managed solely by ETERNUS CS, providing Information Lifecycle Management (ILM) for tape. Tape data "healthcare", automatic media cloning and data migration to new tape technology, for example from one LTO generation to the next to achieve double tape library capacity, is all managed automatically. This also prevents host data modifications and follows compliance regulations for long-term archiving requirements. The ETERNUS CS Grid Architecture makes sure that housekeeping activities such as these have minimal impact on overall system performance.

### The Difference

With the emergence of low-cost, high-capacity hard disk drives, Virtual Tape Libraries (VTLs) have also become practical for open systems. With regard to the library interface, VTL implementations represent toward servers a logical image of a tape library. By backing up data to disks via a bunch of virtual tape drives, VTLs are able to decrease bottlenecks in both backup and recovery operations. The shift to VTL also eliminates the streaming problems that are having an increasing impact on performance requirements with progressing new tape technology. Stop-start operation hampers tape drive efficiency and reduces tape lifetimes, while disk technology does not rely on streaming and can write to virtual tape at optimum speeds regardless of actual data transfer speeds.

Typical VTL implementations for open systems do not comprise built-in intelligence that can help exploit the cost and capacity advantages of physical tape. Processes such as backup and restore and also the copy and export of data from VTLs on to physical tape must be managed by backup servers themselves. Major tape management tasks, such as multiple tape replications, media refresh and technology migration must then be processed by the backup server— mainly outside backup windows, since these are already filled with data transfers for backups themselves.

## REMOTE REPLICATION

ETERNUS CS supports a layered data replication structure dependent on the data protection tier. At the disk cache layer, predefined tape volumes are synchronously mirrored between two sites over Fibre Channel or Fibre Channel over IP for long distances. A single confirmation to the backup software process ensures secure replicated data storage at both sites. The partial or complete mirroring to remote locations allows immediate restores from the secondary site in the event of local outages.

Replication at the tape storage layer is provided by the Dual Save and Triple Save options, which allow local and remote copies on physical tape. Common tape volume replication for all sites is performed within a single step via the appliance. Dual Save simultaneously writes data to two tapes in local or dispersed locations. Triple Save adds a third write to this capability. The main usage scenario is to have two images on one site for highest data availability and to replicate one additional image for disaster recovery purposes. This feature protects against failures or loss of a single physical cartridge, against undetected failures of a tape drive during writing, and against local disasters that could result in the loss of a tape library. Tape libraries can be located hundreds of kilometers away. Writing long-distance to remote tape drives is achieved by interconnecting special network components in-between data centers and utilizing the tape pipeline mechanism.
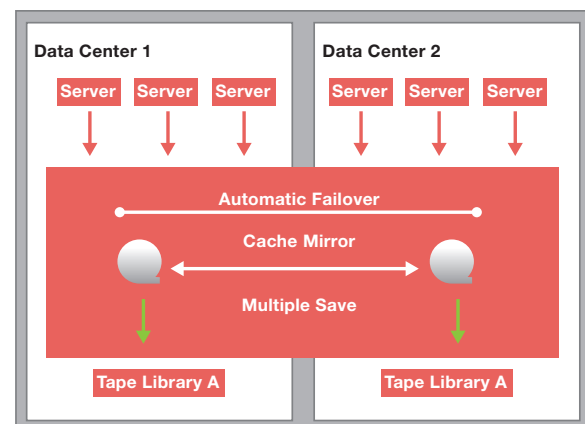
For disaster recovery procedures from replicated tapes, all meta-data remains inside ETERNUS CS but is also internally mirrored, as well as written to tapes. This feature ensures that even in the event of a complete system loss, the database can be rebuilt solely from tape. Thanks to its full tape format compatibility, each ETERNUS CS system can be used to recover data from vault tapes.

## DISASTER RESILIENCY

In addition to the data redundancies at disk and tape layers, ETERNUS CS ensures disaster resiliency in enterprise infrastructures with enhanced system availability features. All components (building blocks) and power supplies are redundant to ensure local availability. The high level of redundancy is also the basis for non-disruptive upgrades and provides data availability anytime. Potential risks in system operation are identified through Live Monitoring and Health Checks.

All nodes are coupled inside the ETERNUS CS Grid Architecture to represent a single system even in split-site configurations. Inside the grid, automatic failover between redundant library processors enables active failover between two sites. Synchronous site operation is assured through heartbeat supervision. In case of a local disaster or site outage, an automatic failover is initiated while the remote site can be operated individually with processing of replicated data. Recovery of sites is completed through mutual synchronization.

Due to its architecture, ETERNUS CS always provides redundant provisioning of tape resources. All internal processes can absorb the loss of a single component, all the way through to the loss of an entire site. With redundant network connections to ETERNUS CS and a suitable backup software configuration, failover of backup and recovery jobs is also ensured.

| Data Center 1 | Data Center 2 |
| --- | --- |
| Server  Server  Server | Server  Server  Server |
| Automatic Failover | |
| Cache Mirror | |
| Multiple Save | |
| Tape Library A | Tape Library A |

## ETERNUS CS VIRTUAL TAPE SYSTEMS

### ETERNUS CS50 Virtual Tape Controller
Customized packages for entry solutions

The ETERNUS CS50 is an inexpensive virtual tape platform and permits smaller enterprises or branches to bring their tape operations up to date irrespective of tape formats or tape technology. The ETERNUS CS50 Virtual Tape Controller can be installed in a 19-inch rack and is configurable together with smaller tape libraries to form a complete solution.

### ETERNUS CS Virtual Tape Appliance
Scalable appliance for the entry-level up to enterprise-class environments

ETERNUS CS Virtual Tape Appliance is the enterprise-class platform and provides for disaster protection in all environments. With its outstanding scalability for a large amount of business-critical data the systems can be configured in fail-save configurations over geographically dispersed locations. Through its industry-leading connectivity ETERNUS CS enables platform-independent consolidation of the entire range of tape automation systems and tape drive technologies with a free choice among the most cost-effective Nearline storage systems. The integrated ILM functionality enables users to assign flexible service-level objectives to their data protection. According to various types of specific requirements the policy-based management allows different priorities to be allocated to data with different business value

## CONCLUSION

ETERNUS CS is the most flexible virtual tape solution available today, especially for data centers with data protection requirements for multiple platforms. It is the only such subsystem supporting heterogeneous platforms which fit the current and future data centre infrastructures. ETERNUS CS deployments reduce operating expenses, increase security, and improve service levels.

## RESOURCE LIBRARY

### Link:
http://solutions.us.fujitsu.com/www/content/products/storage/ETERNUS/tape.php

Data Sheets

White Paper

Flash Demo