ABSTRACT

This whitepaper presents the benefits of the 2nd Generation of the Optica Technologies zVT family of virtual tape systems.

zVT is an innovative solution for the replacement of mainframe virtual tape and aging physical tape systems.

The Optica zVT family delivers new levels of modularity, scalability, performance and enhanced features such as multi-level data integrity checking, hostless tape migration and cloud support. When combined with Optica's world-class service, support and satisfaction guarantee, the zVT 5000-iNAS, zVT 3000i and zVT 5000-FLEX offer enterprise class capabilities required to serve the broadest set of mainframe customers and workloads in the industry.

ACKNOWLEDGEMENTS

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Optica Technologies Technical Services, Product Engineering and Technical Sales Team

EXECUTIVE OVERVIEW

Optica Technologies is headquartered in Louisville, Colorado. For more than 50 years, our mission has been to deliver high-quality data center infrastructure and virtual tape solutions backed by world class customer support. Optica has been an IBM strategic partner since 2002, receiving some of the most extensive IBM testing qualifications available for 3rd party solutions.

MARKET SUMMARY

Optica's zVT family of mainframe virtual tape products deliver new levels of modularity, scalability and performance. When combined with Optica's outstanding service, support and satisfaction guarantee, the zVT 5000-iNAS, zVT 3000i and zVT 5000-FLEX offer the enterprise class features required to serve the broadest set of mainframe customers and workloads in the industry.

The mainframe virtual tape market remains strong for new and improved virtual tape subsystems. The major players in the market, IBM and Dell-EMC, while announcing new releases of their products, have remained focused on serving ultra-high-end requirements. Oracle has terminated all investments in their VSM solution and appear to be exiting the market. These high-end systems tend to come with high-end costs and complexity that may outpace customer requirements and budgets. The market has a need for solutions that are modular, flexible and scalable with robust features that align with specific customer needs and financial requirements. Optica zVT scales to addresses the entire market from the smallest z/VSE client to large enterprise z/OS operations that require high availability, performance and advanced features.

The Virtual Tape subsystems in many datacenters are approaching either end of life or end of support where incumbent vendors can force users to consider higher end replacement solutions that may not be a fit. Optica zVT offers the opportunity to refresh these aging VTS systems with a properly sized solution that includes advanced features such as encryption, replication, one-click DR, user-defined data resiliency levels, hardware compression, deduplication, multi-level data integrity checking and Cloud support.

OPTICA zVT INTRODUCTION

Optica's zVT family of virtual tape products is designed to serve the needs of the most demanding IBM Z Mainframe customers. zVT solutions provide transparent support for all IBM Z operating systems and tape management software and are easy to install, implement and manage. zVT provides an ideal feature set to facilitate the replacement aging virtual and physical tape systems.

All zVT products are built on a next generation extended life hardware platform and include Optica's world-class service and support as well as an industry-unique satisfaction guarantee.

The zVT family is available in three models to serve a wide variety of customer requirements and provides flexibility for storage options, replication alternatives and cloud connectivity. All three models support 3490 and 3590 tape emulation.

zVT ARCHITECTURE

The zVT Virtual Tape Node (VTN) is an appliance with integrated, proprietary hardware and software that serves as the foundational building block of the zVT architecture. The VTN attaches to the mainframe via 16Gb FICON interfaces and is the base technology for all zVT models across the product family – 5000-iNAS, 5000-FLEX and 3000i.

The VTN comes standard with efficient hardware compression, providing a conservative 4:1 or greater compression ratio.

zVT FAMILY OF PRODUCTS

The zVT 5000-iNAS is the flagship model that is fully featured and scalable from 36TB of raw capacity to multi-PB's of capacity within a single system. The modular architecture provides efficient scalability based on three key elements or "building blocks" - the VTN, the Intelligent Storage Node (ISN) and the Capacity Storage Node (CSN).

Both types of storage nodes (ISN and CSN) offer a maximum of 72TB of raw capacity with the ISN housing the licensed features plus capacity while the CSN is an expansion module that provides capacity only. ISNs and CSNs are clustered together and appear as a single storage pool for the virtual tape system. The modular architecture of the 5000-iNAS provides industry leading flexibility to design a virtual tape system that meets your requirements for capacity, system availability, data resiliency and advanced features.

All zVT systems include a robust web-based GUI but can also be fully controlled and managed via CLI and/or JCL.

The zVT 5000-iNAS High Availability (HA) base configuration (10U) is architected with (2) zVT Virtual Tape Nodes (VTNs) and (2) zVT Intelligent Storage Nodes (ISNs) to eliminate all single points of failure. Two VTNs provide (4) FICON interfaces to the mainframe and license support for up to 512 virtual tape drives. Two ISNs deliver 144TB RAW and 96TB of useable NFS storage capacity at Level 3 data resiliency. Hardware compression and data deduplication are standard, enabling 768TB of effective storage capacity based on a conservative 8:1 data reduction benefit (144TB raw = 96TB usable = 768TB effective).

Component	Options	Details
Virtual Tape Nodes (VTN)	• Virtual tape emulation supporting 1 – 8 VTNs in a single zVT 5000-iNAS solution.	• Two 16Gb FICON adapters per VTN. • 256 virtual tape drives per VTN. • 1000 MB/sec throughput per VTN. • 3490 & 3590 tape emulation.
Intelligent Storage Nodes	• Data Deduplication, WAN-optimized replication*, AES 256-bit Data Encryption at Rest*, In-flight encryption and WORM tape format* across all storage nodes. • Scalable from 1 to 165 storage nodes in a single zVT 5000-iNAS solution. * Capacity Storage Node (CSN) is capacity only and adds incremental storage to a clustered ISN.	• 10 GbE VTN to ISN connectivity. • 36TB, 54TB or 72TB Raw capacity per storage node. • 24TB, 36TB or 48TB of usable capacity per storage node. ** • 192TB, 288TB or 384TB Effective*** capacity per storage node. • Expandable to 1PB Raw capacity in a single frame and a maximum capacity that exceeds 11PB Raw.
Cloud Connectivity	• Any cloud provider.	• VTN replication to NFS mountpoint on 3rd party Cloud Gateway.

* Licensed feature.
** Usable & effective capacity is based on a L3 resiliency configuration which is recommended.
*** Effective capacity based on 8:1 benefit from compression and deduplication.

zVT 5000-iNAS (ISN & CSN)

The zVT Intelligent Storage Node (ISN) is a storage array utilizing integrated hardware and software that incorporates two operating system hard disk drives (HDDs), twelve data HDDs and proprietary software to provide a storage repository for the zVT 5000-iNAS system.

Multiple ISNs can be clustered to provide High Availability (HA) configurations with all ISNs in the cluster providing storage services. zVT VTNs have access to all of the storage capacity in the cluster. Standard features of the ISN include compression and highly efficient data deduplication technology.

The zVT ISN provides data encryption at rest and in flight, WORM tape format, replication features for secure data management and advanced Disaster Recovery features.
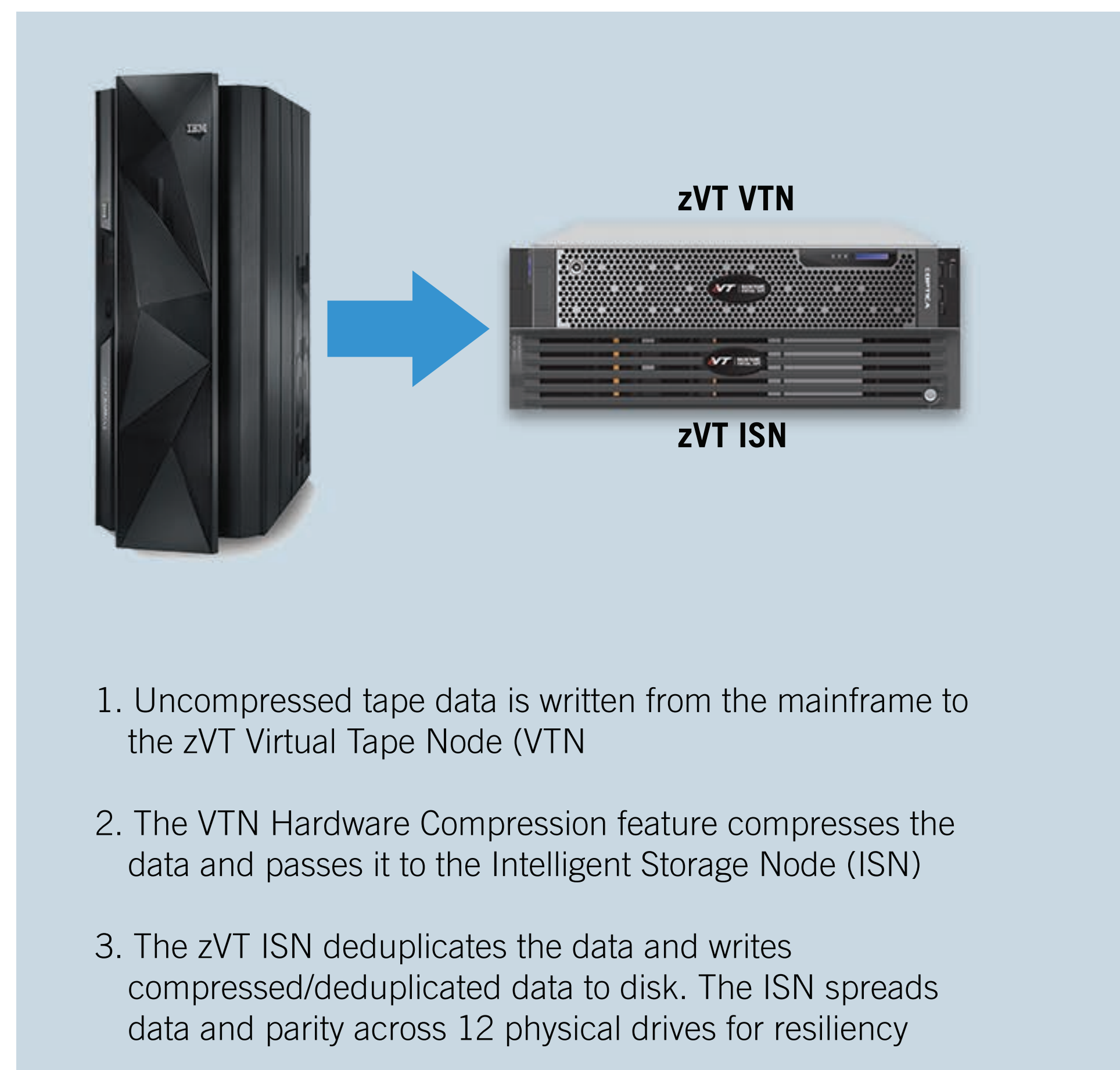
The Capacity Storage Node (CSN) is a capacity array and provides storage capacity only. Management and storage feature licensing is incorporated within the ISN while the CSNs provide non-disruptive capacity expansion of the zVT 5000-iNAS system without requiring additional licensing.

zVT 5000-iNAS DEDUPLICATION

The zVT 5000-iNAS incorporates a unique duplicate data elimination technology that checks for and eliminates the duplication of data, which enables high throughput and high cost performance by preventing the storage of data that already exists on a node (deduplication). The 5000-iNAS system intelligently divides data into variable length segments in order to efficiently detect duplicates which cannot be detected by fixed length data division methods.

Field results from actual customer applications confirm that the data reduction ratio (effective stored data amount / physically stored data amount) for backup purposes to be between 5:1 and 20:1 with a conservative average metric for design purposes being 8:1. As the nature of backup operations involves repeatedly saving duplicate data, the data reduction ratio increases each time data is backed up and stored.

This duplicate elimination technology significantly reduces both the traffic to physical disks and disk usage, making it possible to perform disk backup at higher speeds with lower costs. Furthermore, by utilizing this technology when performing data replication to remote sites, the amount of data that needs to be transferred is greatly reduced, making remote replication highly efficient and feasible even over low-bandwidth connections.

zVT VTN

zVT ISN

1. Uncompressed tape data is written from the mainframe to the zVT Virtual Tape Node (VTN

2. The VTN Hardware Compression feature compresses the data and passes it to the Intelligent Storage Node (ISN)

3. The zVT ISN deduplicates the data and writes compressed/deduplicated data to disk. The ISN spreads data and parity across 12 physical drives for resiliency

zVT 5000-iNAS DATA RESILIENCY

The zVT 5000-iNAS system uses leading edge erasure coding technology to provide efficient and flexible data protection. Traditional RAID schemes are encumbered by performance and reliability problems that become more pronounced with larger capacity virtual tape systems and therefore the zVT iNAS leverages erasure-coding as the superior alternative. Erasure-coded data resiliency is a standard feature that enables the system to reconstruct data with little or no performance degradation.

In addition, users can dynamically configure the resiliency level (1-6) for different file systems with a few GUI selections. The default resiliency setting is Level 3 which provides several times more data protection than RAID 6 while using less disk space. Hard drives are hot-swappable, and replacement drives automatically rebuild upon insertion. There is no performance degradation during data rebuild because data and parity fragments are distributed across all storage nodes.

Storage Node HDDs with Erasure Coding

zVT 5000-FLEX

The zVT 5000-FLEX Virtual Tape Node (VTN) enables customers to leverage their existing investment in NFS or Fibre Channel (FC) storage. The zVT 5000-FLEX VTN connects to the Mainframe via (2) 16Gb FICON interfaces and can be licensed for 16, 64 or 256 virtual tape devices in a single 2U appliance. zVT 5000-FLEX is available with (2) 10-GbE or (2) 8-Gbps Fibre Channel ports for connectivity to your open systems storage. The 5000-FLEX also comes standard with hardware compression and will support the advanced features of your storage arrays including deduplication, replication, encryption and compression. The zVT 5000-FLEX can be deployed in a multi-node configuration with NFS storage for additional scalability and resiliency.

The zVT 5000-FLEX offers a unique opportunity for mainframe customers to leverage their strategic investments in available open systems storage capacity for their mainframe virtual tape applications. The customer's existing replication infrastructure can be leveraged to drive cost and bandwidth efficiency.

zVT 3000i

The zVT 3000i is an affordable, all-in-one mainframe virtual tape solution packaged into a 2U appliance. The zVT 3000i connects to the mainframe via (2) 16Gb FICON interfaces and ships with base license support for 16 virtual tape drives with an upgrade path to 256 drives. Internal storage options include 8TB, 16TB or 24TB of usable RAID-6 capacity. The zVT 3000i can be pre-configured for easy installation and is perfect for companies with smaller, well-defined backup requirements and therefore is a logical replacement for physical tape systems and older virtual tape solutions.

RAID-6 provides enhanced data protection by writing two independent sets of parity data by striping them separately across all disk drives in the array, which allows operations to continue even in the unlikely event of two simultaneous HDD failures within the system.
The internal storage drives are 2.4TB self-encrypting SAS HDDs that are hot pluggable. The efficient hardware compression functionality provides a conservative 4:1 reduction ratio to achieve effective capacities of 32TB, 64TB and 96TB.

zVT ADVANCED FEATURES

zVT VTN Replication

VTN Replication can replicate virtual tapes from one source VTN to one or two destination VTNs, external storage arrays, or cloud gateways. The zVT VTN can perform Mount Point and/or Policy based (VOLSER) replication.

- The two destination mount points can be zVT VTN mount points, stand-alone NFS storage mount points (vaults) or cloud gateways.
- File system or VOLSER based asynchronous and synchronous modes are configurable.
- Real time Replication status and monitoring is available in the zVT GUI.
- Mount point and VOLSER based replication can be configured and used simultaneously.

zVT ISN Replication (zVT 5000-iNAS only)

ISN Replication occurs between 5000-iNAS storage nodes and provides WAN optimization by transferring only unique, compressed data segments and newer reference metadata to significantly reduce network bandwidth. Integrated, in-flight data encryption protects data from unauthorized access while data is replicated between data centers.

- Single ISN to multiple ISN's
- Filesystem based asynchronous replication
- Transfers only unique, compressed and deduplicated data across the replication network
- Reduces network and storage costs with inline global deduplication technology

Data Encryption at Rest and in Flight

Encryption at Rest protects against unauthorized access to lost, stolen, or failed drives by ensuring all sensitive user data on the system is encrypted as it is written to disk. zVT disk drives have built-in electronics to encrypt all data before it is written to the storage medium and decrypts the same data before it is read. All data residing on the internal zVT HDDs will be encrypted with AES 256-bit encryption and is FIPS 140 compliant. User defined encryption passphrases are used to manage the encrypted data.

Integrated, in-flight data encryption protects data from unauthorized access while data is being replicated between data centers when using both VTN and ISN replication.

WORM (zVT 5000-iNAS only)

The WORM (write once read many) feature is an optional, licensed feature that protects information written to a 5000-iNAS filesystem, preventing the user from accidentally or intentionally altering or deleting the data.

Enhanced Multi-level Data Integrity Checking

The enhanced data integrity features allow customers to configure multiple layers of data validation in order to guarantee the integrity of their virtual tape data for as long as they wish to store it. The original CRC that is calculated by the Mainframe is carried end-to-end and stored with each virtual volume and then is used to verify the integrity of the data that is written to the zVT storage repository.

Data can be validated immediately upon being written to the zVT storage repository, and/or on customer scheduled intervals for the life of the data.

Data integrity is paramount to Mainframe users and therefore all models of the zVT provide the multi-level data integrity checking feature to ensure customers will always have the peace of mind that their data is valid and accessible.

Cloud Support

Optica zVT addresses the needs of organizations that want to commit data to the cloud by allowing attachment of any private or public cloud gateway to the zVT VTN via an NFS mount.

Mainframe storage strategies increasingly include leveraging cloud infrastructure to reduce costs, and any physical or virtual tape data that requires long term retention can be efficiently transferred to cloud storage from the zVT using the VTN replication feature. VTN replication offers configuration flexibility and simplifies the movement of tape data to the cloud via scheduled asynchronous or synchronous transfers.

Tape management/Tape database dashboard

The zVT maintains a VOLSER Database that is accessible in the GUI via the Tape Management screen, which allows customers to monitor and manage virtual tapes individually or in VOLSER ranges. The database contains information from HDR1 and HDR2 as well as zVT specific information for each tape, such as Scratch Status, VTN Replication Status and Integrity Check Status. The Tape management screen has robust searching and sorting capabilities that can locate, for example:

- The number of scratch tapes available in the zVT
- Tapes written by a specific job name
- Tapes modified on a specific date

The Tape Management screen also allows users to perform management functions such as:

- Scratch or retain tapes in the zVT
- Write protect or unprotect tapes
- Manually mount tapes (such as an IPL tape)

In addition to the monitoring and management capabilities, the zVT can export the contents of the VOLSER database as a comma separated (.csv) file that can be imported into a spreadsheet, allowing reports to be generated based on the database information.

## Hostless Tape Migration and zVT Control Center (ZCC)

Traditionally when a customer needs to migrate their tape data from a legacy tape system to a new tape system, a tape copy utility is required to move or copy the data via the mainframe, which consumes FICON CHPIDs for connectivity to both tape systems and requires host I/O cycles to move the data.

zVT's **Hostless Migration** feature is an industry unique functionality that copies tapes <u>directly</u> from any legacy tape system – physical or virtual – to the zVT without the use of mainframe CHPIDs or host cycles. The zVT connects directly to the legacy tape system using one or both of the FICON interfaces on the zVT's Virtual Tape Node (VTN). When configured in migration mode, the zVT's FICON ports emulate mainframe CHPIDs to the legacy tape system, enabling the zVT to perform tape mounts and import the data from the source tape system directly into the zVT. Since the zVT FICON interface is emulating a FICON CHIPID, migrating encrypted, compressed and deduplicated volumes from any legacy tape system as well as migrating proprietary file formats from Dell-EMC, IBM, Luminex and Oracle VTLs is fully supported.

zVT Control Center (ZCC) is a powerful toolset that runs under z/OS providing an additional layer of zVT management features and support for hostless migration.

Hostless Tape Migration and zVT Control Center (ZCC) (continued)

In preparation for a hostless tape migration, ZCC builds and sorts the final list of tapes to be migrated using the customer's tape catalog as input. ZCC then sends commands to the zVT telling it which tapes to read directly from the legacy tape system and the zVT imports them. Once the tape is imported, the zVT sends status to the host allowing ZCC to update the tape catalog and TMS. Migrations can be started and stopped at any time, and the ZCC software will automatically resume the migration from the last tape that was successfully migrated. Since ZCC automatically updates the tape catalog and TMS, new tape mounts are automatically directed to either the legacy or zVT system as appropriate.
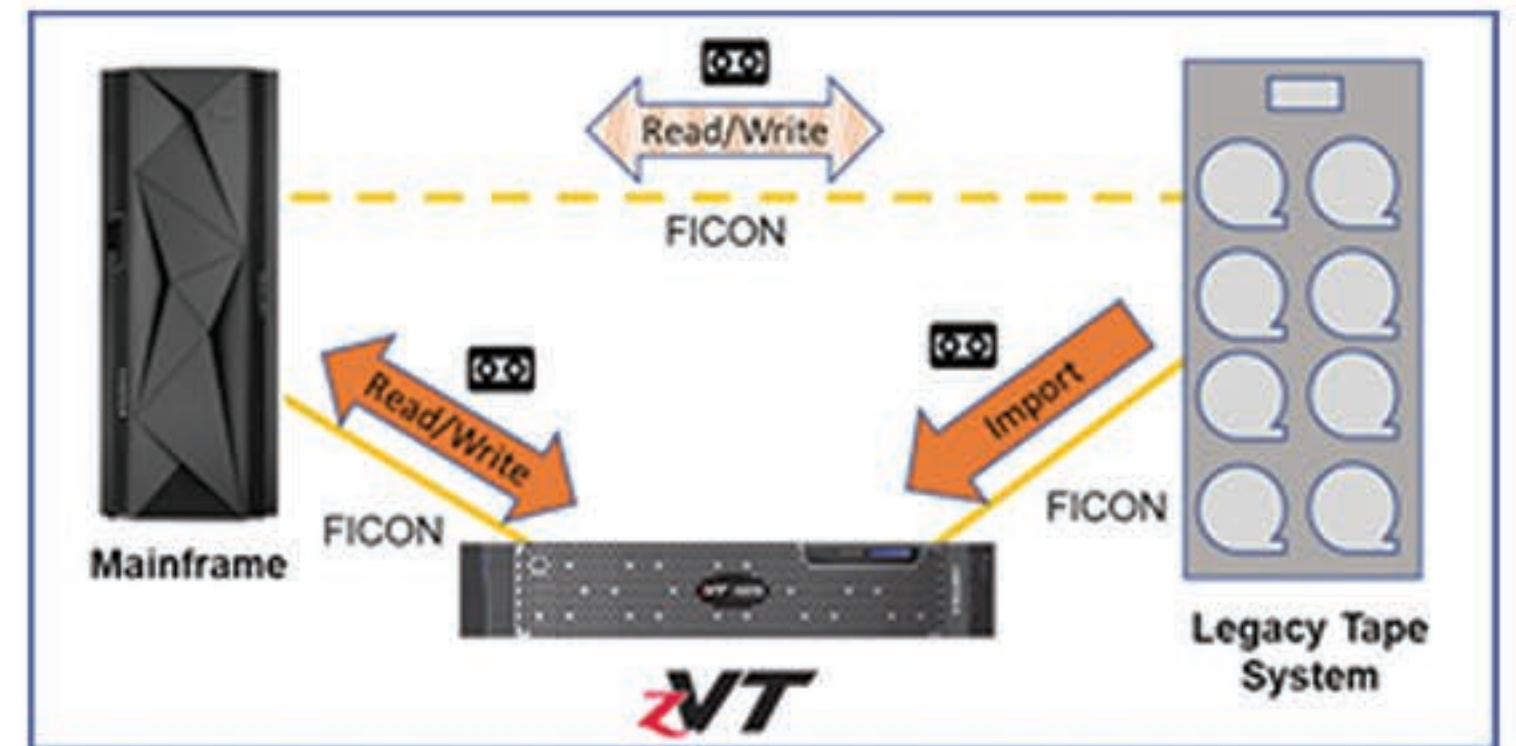
The ability to seamlessly migrate tapes from a legacy physical or virtual tape system directly to the zVT during normal tape operations is a game-changer that removes risks and other barriers to modernizing tape systems.

One-Click DR

During normal tape operations, the production zVT is replicating tapes to the DR zVT using one of zVT's replication methods. One-click DR executes a series of commands within the DR zVT that will automatically set up the DR zVT system for a DR test without impacting production tape operations or on-going replication. With a single click in the DR zVT GUI, the DR zVT is ready for testing. Normal production tape operations and production to DR replication continues, unaffected by the DR test taking place. After the DR test is complete, there are no clean-up steps required in the DR zVT.

In the event of an actual disaster, the same one-click DR function sets up the DR zVT system to run in production for as long as necessary. When the customer is ready to move operations back to the production zVT, One-click Recovery in the production zVT system will replicate tapes from the DR zVT back to the production zVT so that normal production tape operations can efficiently resume.

Integration with industry leading TMS applications

Optica has made significant investments in our testing and integration lab to ensure seamless compatibility with all of the leading tape management systems that are in use by z/VM, z/VSE and z/OS mainframe customers.

Multi-tenant functionality

The zVT has been architected to support multiple tenants securely and to prevent one tenant from interacting with another tenant's virtual tape data. The zVT VTN limits each tenant's access to only the zVT library or libraries that they have contracted to use. zVT commands can be written to a user's library, and the command can only be executed against that tenant's library in the zVT, completely preventing cross-access to another tenant's data.

Support & Maintenance

Optica has earned a world-class reputation for outstanding product support and customer service based on 50+ years of experience with thousands of data center customers worldwide. We are very proud of this reputation and strive to maintain it every day.

A unique aspect of the Optica support model is our long-standing contract that we've enjoyed with the IBM Technical Services division. In the event of a hardware defect, Optica optionally deploys an IBM technician anywhere in the United States. In this case, the IBM technician, who is typically the same SSR who supports the customer's mainframe environment, is directed by Optica and serves as an extension of the Optica support team.

Satisfaction Guarantee

Optica always stands behind our products. If you are not completely satisfied with the zVT solution, you may return it without obligation. This type of guarantee is not typically offered within the mainframe industry, which demonstrates our confidence in the quality of our products and services.

Conclusion

The Optica zVT family of mainframe virtual tape products is uniquely positioned to span all segments of the IBM Z Mainframe market with industry leading levels of modularity, scalability, resiliency and flexibility. In addition, we're committed to your success and satisfaction at a reasonable price.

If you'd like to learn more about zVT and receive a complimentary design review, please contact us at information@opticatech.com