Integrated Lenovo Backup Solution Using ThinkSystem Storage with Commvault Backup and Recovery

Solution Brief

Executive Summary

This document presents a streamlined, enterprise-ready approach to data protection built on Lenovo ThinkSystem servers, Lenovo ThinkSystem DM, DG, DS, and DE storage systems, and Commvault Backup & Recovery software. The integrated design gives organizations a flexible foundation for protecting critical workloads today while providing a practical path to scale as capacity, performance, and recovery requirements evolve.

Comprehensive backup and recovery for virtual and physical workloads is essential to operational resilience. For organizations that require direct control of their data and infrastructure, an on-premises solution can deliver predictable performance, stronger governance, and faster access to protected information when recovery matters most.

By combining Lenovo ThinkSystem servers with the breadth of the ThinkSystem storage portfolio and Commvault Backup & Recovery, customers can align infrastructure to business priorities without adopting a one-size-fits-all design. DM provides unified block and file storage with comprehensive ONTAP data management services; DG combines unified ONTAP capabilities with capacity-optimized, all-QLC flash storage; DS delivers high-performance, all-NVMe SAN storage with SAN-optimized ONTAP data management and protection capabilities; and DE provides high-throughput all-flash and hybrid SAN storage with flexible scalability and strong price/performance.

Scope

The solution uses Lenovo ThinkSystem servers with ThinkSystem DM, DG, DS, and DE Series storage systems. The host infrastructure supports VMware, Linux, and Windows operating environments.

Within the architecture, ThinkSystem DM and DS platforms provide primary workload storage: DM was selected for unified storage and enterprise data-management capabilities, while DS was selected for low-latency, high-performance block workloads. ThinkSystem DM, DG, and DE platforms are positioned as Commvault backup repositories: DM supports feature-rich unified repository services, DG provides capacity-efficient all-flash storage for environments focused on density and total cost of ownership, and DE provides high-throughput block storage with a strong balance of performance and economics.

The validation demonstrates full and incremental protection for virtual machines and host-system files and, more importantly, confirms that protected workloads can be restored successfully after simulated data loss.

Architecture and Configuration

The following figure shows a common single-site backup and recovery architecture. The design uses Lenovo ThinkSystem DM and DS storage for primary workload data, Lenovo ThinkSystem DM, DG, and DE storage as Commvault backup repository options, and Lenovo ThinkSystem servers for the Commvault and workload host infrastructure.

The diagram below provides a conceptual view of the design and solution flow.

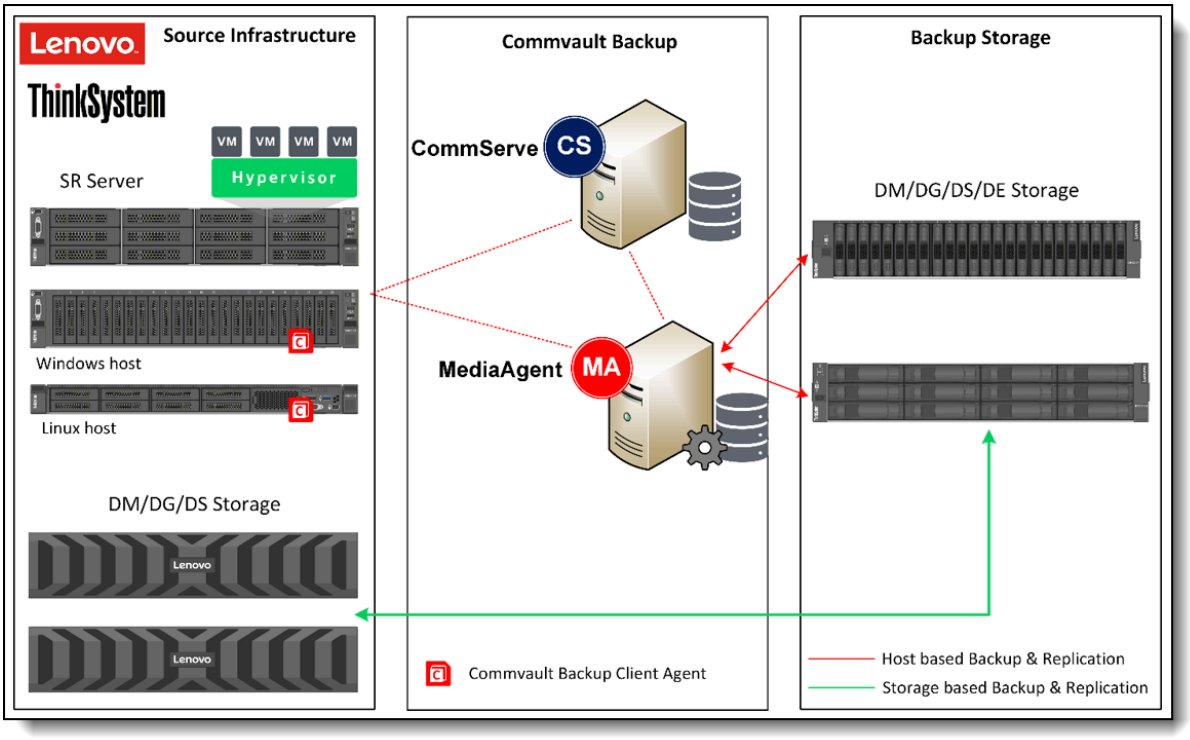

Figure 1. Architecture and Configuration flow.

A robust backup strategy follows the principle of maintaining multiple, independent copies of critical data to ensure reliable recovery during routine failover scenarios as well as full disaster recovery events.

The established 3-2-1 data protection model recommends retaining **three** copies of the data - the original copy plus **two** additional backup copies, with at least **one** copy located off site to safeguard against site level failures.

The ideal backup storage architecture typically uses a mix of media types - such as all flash storage or traditional hard disk drives—to provide flexible, cost efficient options without compromising recovery point (RPO) or recovery time (RTO) objectives.

Depending on application performance requirements, the backup design can use storage array–based replication, host based replication, or a combination of both to meet varying backup and recovery needs. The configuration implemented for this environment required the integration of multiple backup technologies to meet a broad range of data-protection needs. Commvault Backup & Recovery was used to support both virtual machine backups and traditional file-system backup scenarios, ensuring that each workload type could be captured, stored, and restored in alignment with its specific operational and performance requirements.

The table below outlines the backup technologies employed to support this configuration.

Table 1. Backup technologies

Technology	Description	Provided By	Use
Virtual Machine Snapshots	Host intervention to take virtual machine snapshots	Commvault	Virtual machines, containers, applications and databases
File Level Backup	Host intervention to backup files from virtual machines or discrete systems	Commvault	Files
Storage Volume Snapshot	Snapshot of a volume on the storage system, taken at a specific point in time	ONTAP SnapVault	Files, virtual machines, containers, applications and databases

Backup Methods

A variety of backup methods are available to ensure robust data protection and facilitate reliable recovery in the event of an incident. The table below summarizes the backup approaches utilized in this environment and provides an evaluation of their overall effectiveness.

Table 2. Backup methods

Method	Description	Effciency
Full Backup	A complete, independent copy of all data at a specific point in time.	Requires the most storage space and the most time to perform a backup
Incremental Backup	Initially full backup, then all subsequent incremental backups capture only the data blocks that have changed since the last backup.	Requires more compute resources to perform rebuild
Synthetic Full Backup	Reconstructs the full backup image using all required incremental backups	Reduces source-side backup time and network traffic by creating a new full image from existing backup data, but requires processing and I/O resources on the backup repository

Commvault Backup and Recovery Process

In the following sections, we take a deeper dive into the backup and recovery process:

- Backup and Recovery Components
- Integration with Lenovo ThinkSystem Storage
- Backup System Design
- Commvault Backup and Recovery Server
- Storage Data Configuration
- Host Server Configuration

Backup and Recovery Components

The Commvault Backup and Recovery solution comprises an integrated suite of products and services designed to deliver a comprehensive, enterprise grade solution for data protection, recovery, and management.

There are three core components in the Commvault software: the CommServe, MediaAgent, and Client Agents.

Table 3. Backup methods

Component	Primary Role	Key Functions and Details
CommServe	The primary management server that coordinates operations across the CommCell and maintains the SQL Server databases used for configuration, security, job history, and metadata.	Includes Server Manager, Event Manager, Communications Service, and the Configuration Database. Each CommCell has one CommServe.
MediaAgent	The data-movement and storage-management engine that transfers backup data from clients to the designated storage library.	Handles deduplication, encryption, compression, data verification, and communication with backup storage.
Client Agent	Identifies and prepares the data that must be protected on a client system or application.	Provides workload-specific backup and recovery capabilities for supported operating systems, applications, and data types.
Source	The original workload or data set being protected.	Can include virtual machines, physical servers, file systems, applications, and databases.
Storage Library	The physical or virtual repository where Commvault stores protected data.	Commvault supports disk, cloud, and tape libraries. In this solution, Lenovo ThinkSystem storage is configured as a disk library.

Integration with Lenovo ThinkSystem Storage

Commvault's backup and recovery operations integrate tightly with **Lenovo ThinkSystem storage**, using it as the high performance, scalable foundation for storing, optimizing, and retaining backup data. Whether the protected workload is virtual or physical, all backup data flows through a Commvault MediaAgent and is written to a Lenovo ThinkSystem storage platform configured as the backup library.

During backup operations, Commvault captures data using workload-specific agents or hypervisor-level snapshot APIs. This data is streamed to a MediaAgent running on Lenovo ThinkSystem servers, where it can undergo deduplication, compression, encryption, and integrity validation before being written to Lenovo ThinkSystem storage. ThinkSystem DM provides unified NAS and SAN services with advanced data management; DG provides capacity-efficient all-flash unified storage; DS delivers high-performance all-flash block storage; and DE provides high-throughput SAN storage with balanced performance and economics.

Lenovo ThinkSystem storage also plays a central role in recovery operations. When a restore is initiated, the MediaAgent retrieves the required data blocks from the ThinkSystem backup repository, rehydrates deduplicated data as needed, and streams it back to the client or application. Because Commvault maintains detailed indexing and metadata on the storage system, recovery can be performed at any level of granularity - full VM, volume, file, or application item - without requiring full dataset rehydration.

Lenovo ThinkSystem servers provide the compute capacity, high-bandwidth connectivity, and expansion flexibility required for Commvault MediaAgent and workload-host roles. When combined with Lenovo ThinkSystem DM, DG, DS, or DE storage, the solution can be matched to specific requirements for unified data services, capacity efficiency, low-latency block performance, or cost-effective backup throughput.

The result is a **high-performance, scalable, and storage-efficient data protection architecture** that combines Commvault's recovery capabilities with Lenovo infrastructure engineered for choice and flexibility. Organizations can build around their immediate requirements, expand without redesigning the entire environment, and maintain a consistent operational model across virtual and physical workloads

Backup System Design

The validated architecture comprises three primary elements: Lenovo ThinkSystem servers hosting the required operating-system environments, DM and DS storage systems supplying primary data storage for the hosts, and DM and DE storage arrays serving as the tested Commvault backup libraries. DG Series is included as an additional capacity-efficient all-flash repository option for deployments that prioritize storage density and total cost of ownership. All components use Fibre Channel SAN connectivity to provide high-bandwidth, low-latency access between the compute and storage layers.

The image below provides a representation of the configuration layout.

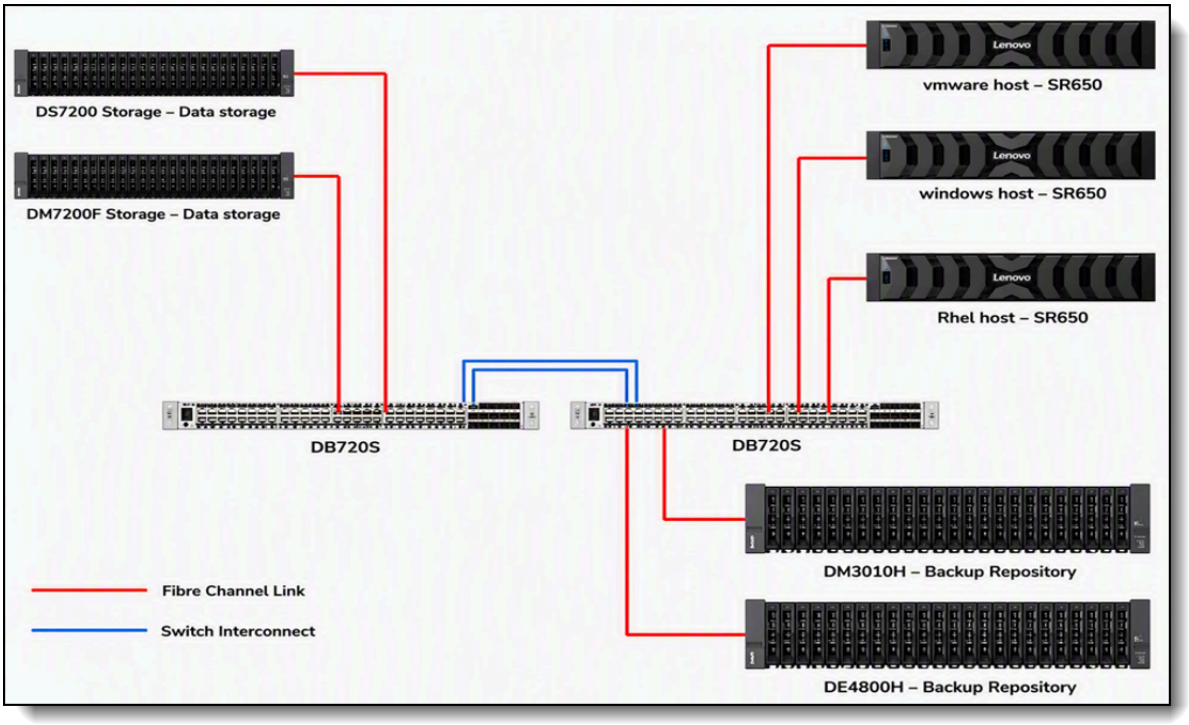

Figure 2. Configuration layout.

Commvault Backup and Recovery Server

Commvault can be deployed using a consolidated model for smaller environments or a distributed model for larger, scale-out environments. In a consolidated deployment, the core Commvault services are placed on a single server or virtual machine to simplify management and reduce infrastructure overhead. In a distributed deployment, components such as the CommServe, MediaAgent, and client agents can be separated across multiple systems to improve scalability, performance, and workload isolation.

A consolidated Commvault deployment was selected because the environment was focused on validating backup and recovery workflows across Lenovo ThinkSystem storage platforms rather than demonstrating large-scale distributed operations.

This approach provided a straightforward validation environment while still allowing Commvault to protect VMware, Windows, and Linux workloads using Lenovo ThinkSystem DM and DE storage as backup repository targets.

In an All in One deployment model, the recommended minimum server specifications are:

- **CPU**: 16 core x86 64 processor (minimum)
- **Memory**: 32 GB RAM

For the validated configuration, Lenovo ThinkSystem SR650 V3 servers were used for the Commvault and workload host roles. The SR650 V3 provides a current-generation, scalable 2U platform with modern processor, memory, and I/O capabilities suited to virtualization and data-protection workloads.

- Current-generation Intel Xeon Scalable processor configuration
- DDR5 memory and flexible PCIe connectivity sized for Commvault and workload requirements

The virtual machine hosting the Commvault Backup & Recovery installation was provisioned with 16 vCPUs and 48 GB of memory.

Commvault Backup Library

The Commvault backup library is provisioned with 2 TB of storage presented to the Commvault server from both the DM3010H and DE4800F storage systems.

The directly attached DM and DE storage volumes are exposed to the Commvault server as block-level devices and formatted using the standard NTFS file system with a 64K allocation unit.

The figure below illustrates the detailed configuration of the backup libraries and associated storage mappings.

The image below provides a representation of the Backup Library layout.

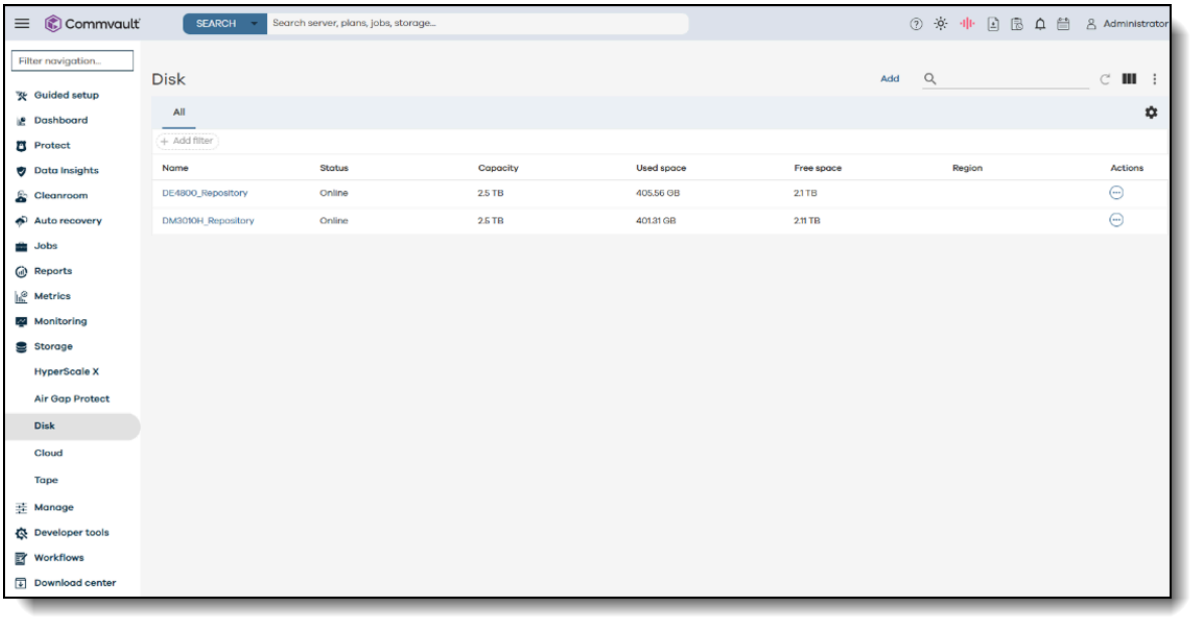

Figure 3. Backup Library.

Storage Data Configuration

A DM7200F and a DS7200 storage system were deployed to provide primary data storage for the host environments. Both arrays were configured with NVMe based SSDs and utilized Fibre Channel host connectivity to deliver high performance, low latency access to the host servers.

The image below provides a representation of the Lenovo DM7200F and DS7200 ThinkSystem Storage Arrays.

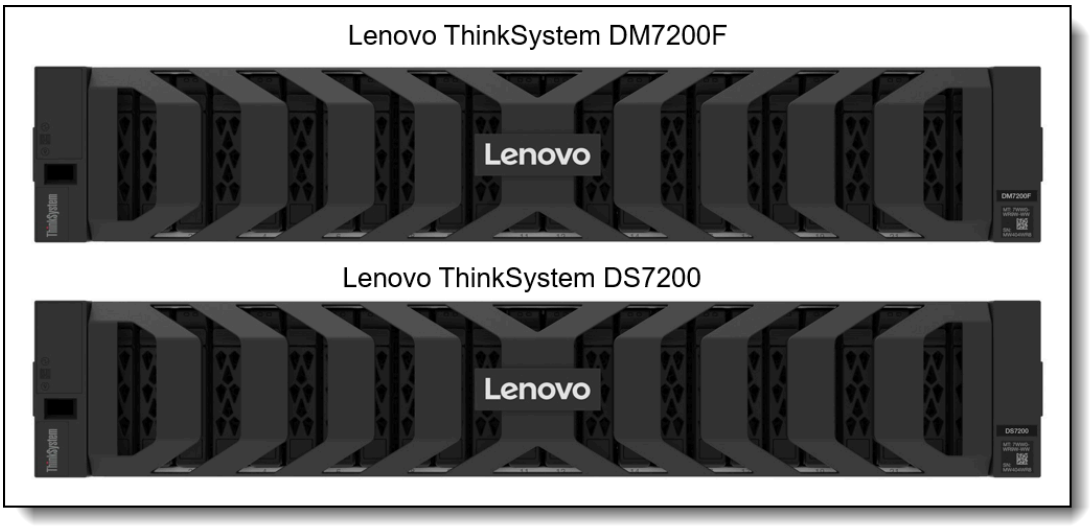

Figure 4. Lenovo ThinkSystem DM7200F Storage Array and Lenovo ThinkSystem DS7200 Storage Array.

Host Server Configuration

For this configuration, three ThinkSystem SR650 V3 servers were deployed as host systems to validate multiple backup scenarios.

The first **ThinkSystem SR650 V3** was configured with VMware virtualization software. Storage volumes from the DS7200 and DM7200F arrays were provisioned to the host through Fibre Channel and used as datastores for the virtual machine workloads.

A second **ThinkSystem SR650 V3** was configured with Windows Server. Storage volumes from the DS7200 and DM7200F arrays were provisioned through Fibre Channel and served as the underlying storage for file-level and volume-level backup operations. The Commvault Windows Client Agent was installed to support consistent backup and recovery workflows.

The third **ThinkSystem SR650 V3** was configured with Linux. Storage volumes from the DS7200 and DM7200F arrays were presented through Fibre Channel and used as primary storage for file-level and volume-level backup operations. The Commvault Linux Client Agent was deployed to enable reliable backup and recovery.

Collectively, these configurations enabled Commvault to protect VMware, Windows, and Linux workloads while using Lenovo ThinkSystem DM and DE storage as backup repository targets. This validated the ability to back up and restore both virtual machine data and host-level files through Commvault-managed workflows.

The image below provides a representation of the ThinkSystem SR650 V3.

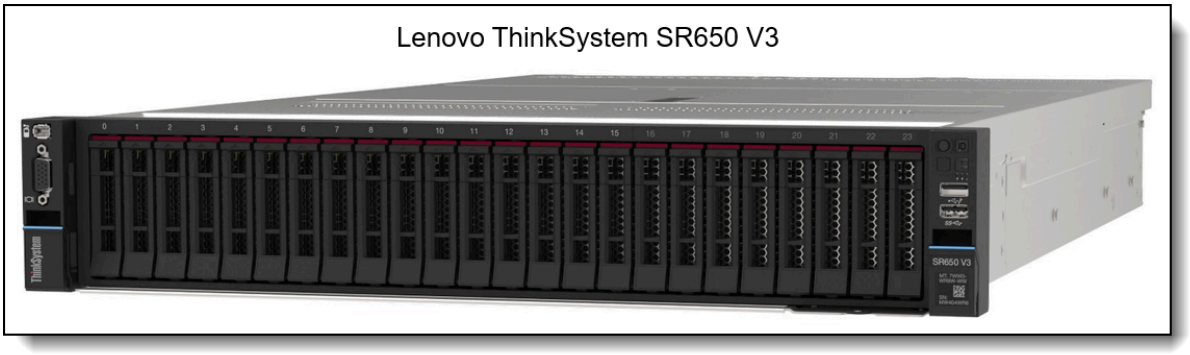

Figure 5. Lenovo ThinkSystem SR650 V3.

Results

Backup operations for VMware virtual machine (VM) images completed successfully, with all data written to the designated Lenovo ThinkSystem storage repositories. To validate the integrity of the block level backup data stored on these systems, the source VM was intentionally removed from the VMware environment and fully restored from the Commvault backup repository residing on the ThinkSystem arrays. The restored VM powered on without issue, confirming that the storage subsystem preserved the VM image accurately and that the recovery workflow functioned as expected.

For Windows and Linux host systems, file and folder level backups were written to the Lenovo ThinkSystem storage platforms without errors. To verify data integrity at the storage layer, selected files and directories were deleted from the source systems. Using Commvault's file level recovery capabilities, the deleted items were restored directly from the ThinkSystem based backup repository. CRC values captured prior to deletion were compared against CRC values of the restored files. Identical results confirmed that the Lenovo storage systems maintained data fidelity throughout the backup, retention, and recovery cycle.

The table below summarizes key storage performance metrics observed during Commvault VMware backup operations using Lenovo ThinkSystem DM and DE Series arrays as the tested backup repositories.

Table 4. Storage Performance Metrics

Backup Source	Backup Repository	Backup Capacity	Backup Time	Average Processing Rate
DM VM Backup	DM3010H	100GB	9:48	655 GB/Hr
DM VM Backup	DE4800F	100GB	9:07	692 GB/Hr
DS VM Backup	DM3010H	100GB	8:55	725 GB/Hr
DS VM Backup	DE4800F	100GB	9:03	697 GB/Hr

These results demonstrate that Lenovo ThinkSystem storage platforms can provide consistent throughput and dependable data integrity required for modern backup repositories. Combined with Commvault, the solution helps customers move beyond simply storing backup data to building a recovery-ready infrastructure designed to support rapid restoration, service continuity, and evolving business demands.

Conclusion

The validation successfully demonstrated full VMware virtual machine recovery and file-level recovery for Windows and Linux hosts. CRC comparisons confirmed the integrity of restored data, while the measured results showed consistent backup throughput across the tested Lenovo ThinkSystem DM and DE repository configurations.

These outcomes show how Lenovo ThinkSystem servers, ThinkSystem storage, and Commvault can work together as a flexible, scalable, and recovery-ready platform that helps organizations protect critical data, simplify infrastructure choices, and strengthen business resilience across VMware, Windows, and Linux environments.

Related publications and links

For more information, see these resources:

- Lenovo ThinkSystem SR650 V3 Server:
  https://lenovopress.lenovo.com/lp1601-thinksystem-sr650-v3-server
- Lenovo ThinkSystem DM3200F, DM5200F and DM7200F Unified Storage Arrays:
  https://lenovopress.lenovo.com/lp2075-lenovo-thinksystem-dm3200f-dm5200f-and-dm7200f-unified-storage-arrays
- Lenovo ThinkSystem DS3200, DS5200, DS7200 and DS5200C Flash Storage Array:
  https://lenovopress.lenovo.com/lp2296-lenovo-thinksystem-ds3200-ds5200-ds7200-and-ds5200c-flash-storage-array
- Lenovo ThinkSystem DE4800H and DE4800F Storage Arrays:
  https://lenovopress.lenovo.com/lp2072-lenovo-thinksystem-de4800h-and-de4800f-storage-arrays
- Lenovo ThinkSystem DG5200 and DG7200 Unified Storage Arrays:
  https://lenovopress.lenovo.com/lp2074-lenovo-thinksystem-dg5200-and-dg7200-unified-storage-arrays

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Related product families

Product families related to this document are the following:

- DE Series Storage
- DG Series Storage
- DM Series Storage
- DS Series Storage
- ThinkSystem SR650 V3 Server

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