

# Scalable Performance with Microsoft SQL Server 2025 on Lenovo ThinkAgile HX665 V3

## Solution Brief

### The challenge with data growth

In our data-rich environment, businesses of all sizes are grappling with a surge of fast-moving information, making the right data collection and management tools crucial. Businesses of all sizes are being inundated by information at increasing velocity. It's important to choose a solution that matches the requirements of the company, resulting in the most efficient outcome.

The Hyperconverged Infrastructure solution offered by Lenovo with Nutanix software simplifies IT and data center operations. By using it, the TCO is lower than the that of traditional, bare metal environments. The system is powered by 5th Gen AMD EPYC processors that offer a high number of cores.

Lenovo ThinkAgile HX665 V3 Integrated Systems with Nutanix software are optimized for Online Transaction Processing (OLTP) and Decision Support Systems (DSS). This paper presents the results of the tests we conducted with Microsoft SQL Server 2025 and Nutanix. The HX665 V3 servers are 2U systems each equipped with two AMD EPYC 9005 Series CPUs, 1.5TB of DDR5 memory and PCIe Gen5 expansion capabilities. The HX665 V3 is a storage dense offering, supporting up to 24x 2.5-inch hot-swap bays, 16 NVMe drives (with no oversubscription) and M.2 RAID for OS.

### Business database solutions with faster time-to-value

Lenovo ThinkAgile HX665 V3 systems are rigorously tested and tuned to save you months of configuration, setup, testing, and tuning.

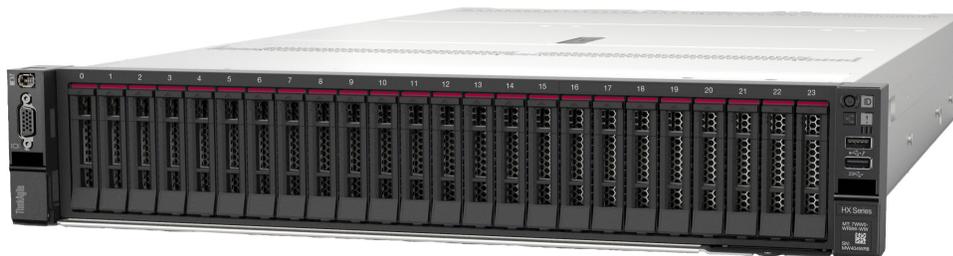


Figure 1. Lenovo ThinkAgile HX665 V3

The main features offered by the 5th Gen AMD EPYC platform are:

- Up to 192 cores (384 threads) per processor
- Up to 512MB L3 cache
- Up to 4 links of Gen 3 Infinity Fabric at up to 32 Gbps
- 12 memory channels that support up to 6TB of DDR5- 6400 memory
- Support for PCIe Gen 5 at up to 32 Gbps

- AVX-512 instruction supports for enhanced HPC and ML performance.

## Microsoft SQL Server 2025

SQL Server 2025 introduces major advancements across performance, analytics, and AI integration. It builds on previous releases with expanded Intelligent Query Processing, improved platform integration, and enhancements designed for modern data-intensive workloads.

The performance enhancements in SQL Server 2025 include:

- Optimized Locking reduces lock memory consumption and improves concurrency without requiring code changes.
- Improved Intelligent Query Processing, including Cardinality Estimation Feedback and Optional Parameter Plan Optimization, ensures more adaptive query execution
- Query Store enabled by default on readable secondaries for better performance consistency across replicas
- Native vector search performance powered by vector data types and DiskANN indexing for rapid similarity-based queries
- Real-Time Change Event Streaming provides fast, low-overhead streaming of inserts, updates, and deletes to Azure Event Hubs or Kafka

Management improvements include the following:

- Fabric Mirroring, enabling real-time replication of SQL Server data into Microsoft Fabric without ETL processes
- REST and GraphQL support for modern application development patterns
- GitHub Copilot integration in SQL Server Management Studio for AI-assisted query writing and schema exploration

Lenovo ThinkAgile HX665 V3 systems, powered by AMD EPYC 9005 series and integrated with Nutanix software, provide an ideal platform for modernizing environments and migrating legacy SQL Server applications. These industry-standard x86 servers deliver cost-effective computing, high performance, and fast, high-density local storage.

## Cluster configuration on ThinkAgile HX665 V3

In our testing we configured a four-node, dual socket ThinkAgile HX665 V3 Nutanix HX cluster with the following configuration.

Table 1. Cluster configuration on ThinkAgile HX665 V3

Item	Description
Server	4x Lenovo ThinkAgile HX665 V3
CPUs	2x AMD EPYC 9475F 48C 400W 3.65GHz Processors
CPU speed	Base frequency: 3.65 GHz Max Boost frequency: 4.80 GHz
Memory	1.5 TB DDR5 6400 MT/s per server, configured at 6000 MT/s (24 x Lenovo ThinkSystem 64 GB TruDDR5)
NIC	ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe Ethernet Adapter

Item	Description
Storage	<ul style="list-style-type: none"> <li>12x ThinkSystem 2.5" U.3 7450 PRO 3.84 TB Read Intensive NVMe PCIe 4.0 x4 HS SSD</li> <li>2x ThinkSystem M.2 7450 PRO 960 GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD</li> </ul>
Hypervisor	Nutanix Acropolis Hypervisor (AHV v. 20230302.100173)
Nutanix AOS	Nutanix 7.0.1.5
OS	Windows Server 2025 Datacenter (Version: 24H2 Build: 26100.6899)
Database	Microsoft SQL Server 2025 (RTM-CU1) – 17.0.4000.2 (x64)
MSTPCE Toolkit	Version 2.5.6
MSTPCH Toolkit	Version 2.18.0-2600
SQL Server 2025 storage configuration (virtual disks)	<ul style="list-style-type: none"> <li>OS Disk (1 x 600 GB)</li> <li>Data Disk 1 (8 x 1 TB)</li> <li>Data Disk 2 (8 x 1 TB)</li> <li>Log Disk (1 x 1 TB)</li> <li>Tempdb Disk (2 x 1 TB)</li> <li>Backup Disk (1 x 2 TB)</li> </ul>

## VM configurations

The configuration of the cluster and the virtual machines used for testing are visualized in the following diagram:

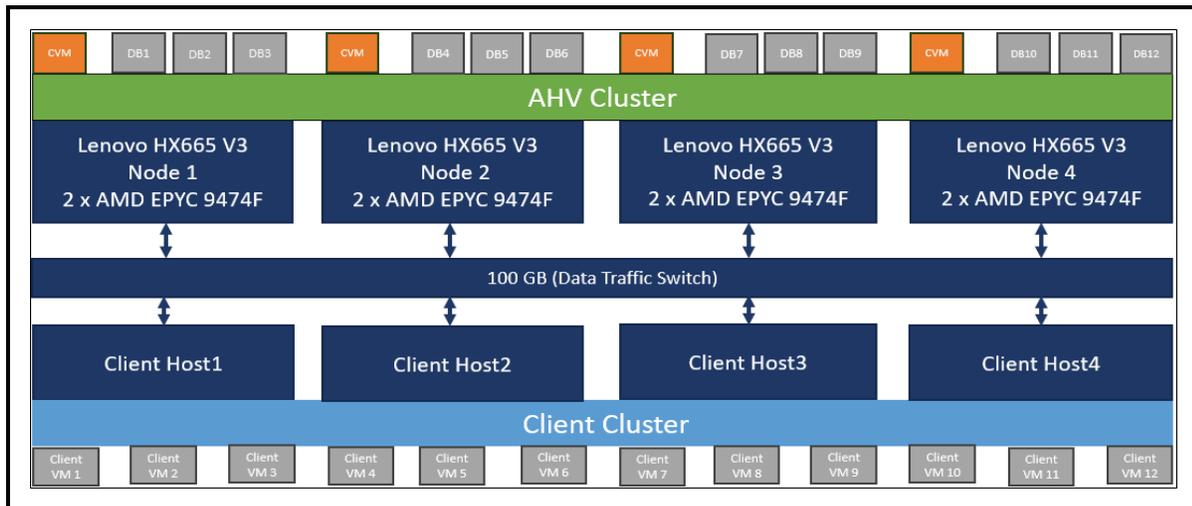


Figure 2. SQL Server 2025 topology

For the database testing, the CVMs were configured with 16vCPU and 64GB of memory.

Performance testing was done on Online Transaction Processing (OLTP) workload while the second set of testing was done on Decision Support Systems (DSS) workload.

The virtual machines that were used for testing out the Scale-Up and Scale-Out for OLTP and DSS were configured with the following resources:

Table 2. VM sizing

VM sizing	Customer count	CPU sizing	Memory
Small	80K	6 vCPU	48 GB
Medium	160K	12 vCPU	96 GB
Large	320K	24 vCPU	192 GB
xLarge	480K	48 vCPU	384 GB
Monster	640K	64 vCPU	512 GB
Colossal	1000K	78 vCPU	768 GB

## OLTP performance

### Scale-Up OLTP Workload testing

During the Scale-Up OLTP workload testing, the goal was to maintain approximately 80–90% CPU utilization on the tested VM. The total test duration was two hours. Performance measurements were taken after the workload reached a steady state, starting at the 30-minute mark and continuing for 90 minutes.

The following figure illustrates the scalability results achieved using Lenovo ThinkAgile HX665 V3 systems powered by AMD EPYC 9005 processors and Nutanix clusters with the Acropolis Hypervisor (AHV) storage architecture.

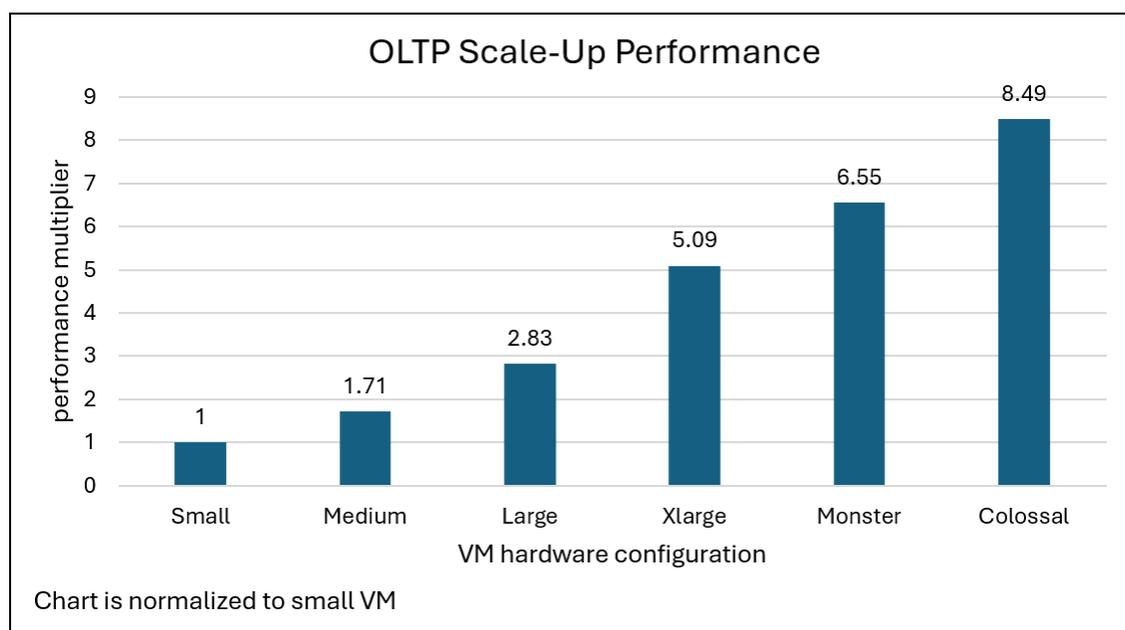


Figure 3. OLTP Scale-Up Performance (normalized data to small instance)

### Scale-Out OLTP Workload testing

The Scale-Out OLTP test demonstrates the consistent performance achievable on Lenovo ThinkAgile HX665 V3 systems powered by AMD EPYC 9005 processors and Nutanix clusters. Designed for heavy SQL Server OLTP workloads, the test was executed using a Large VM configuration. The number of Large VMs was gradually increased until reaching a total of 12 instances. The MSTPCE toolkit was used with a 320K customer count, and each VM's SQL service was configured to utilize 80% of the available memory.

After collecting IOPS and TPS data, the results showed approximately 11.44x scalability when running the OLTP workload across twelve VMs. The following figure illustrates the performance results for each VM count tested.

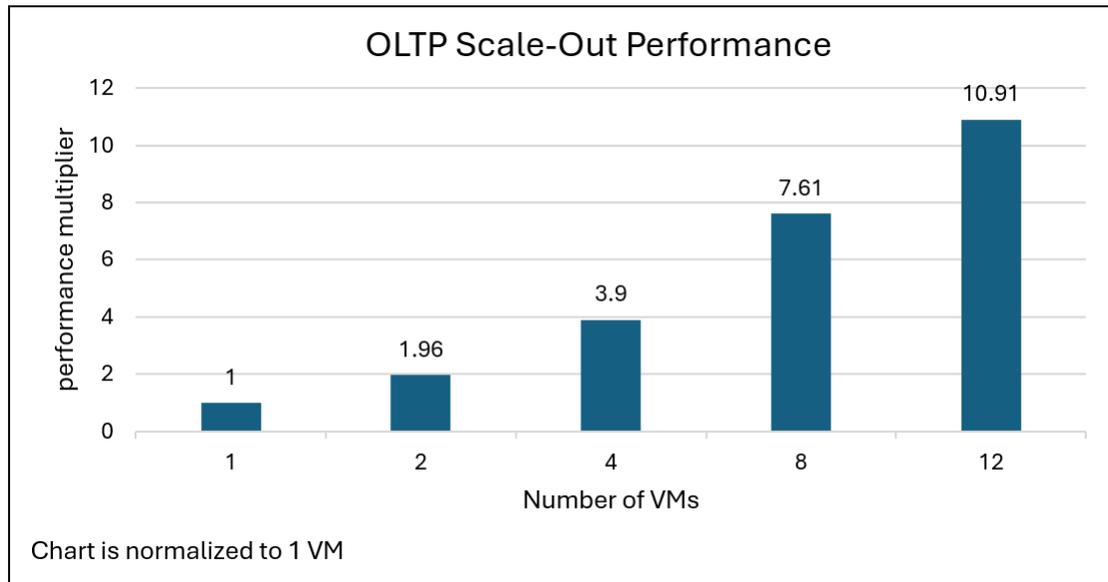


Figure 4. OLTP Scale-Out performance (normalized data to 1 VM)

## DSS performance

Decision Support Systems (DSS) are designed to process large volumes of data and provide insights for business intelligence. These systems typically run complex queries that involve aggregations, joins, and data analysis across multiple tables. The TPC-H benchmark was developed to evaluate how well database systems handle these analytical workloads. It measures performance using a set of business-oriented ad hoc queries and concurrent data modifications, simulating real-world DSS environments where responsiveness and scalability are critical.

### Scale-Up DSS Workload testing

The Scale-Up DSS workload test is designed to assist in sizing SQL Server VMs running on a Nutanix Acropolis Hypervisor storage architecture cluster, using varying customer counts and database sizes. The table in the [VM configurations](#) section lists the tested VM configurations along with the corresponding customer counts for each database. For all configurations, 768 GB of memory was allocated per VM. Databases were generated using the MSTPCH toolkit, and SQL Server was configured to utilize 80% of the VMs available memory.

The primary objective of the test was to achieve an average CPU utilization of 80–90%, measured through Windows Performance Monitor counters during each run. The following figure presents the scalability results obtained from these tests.

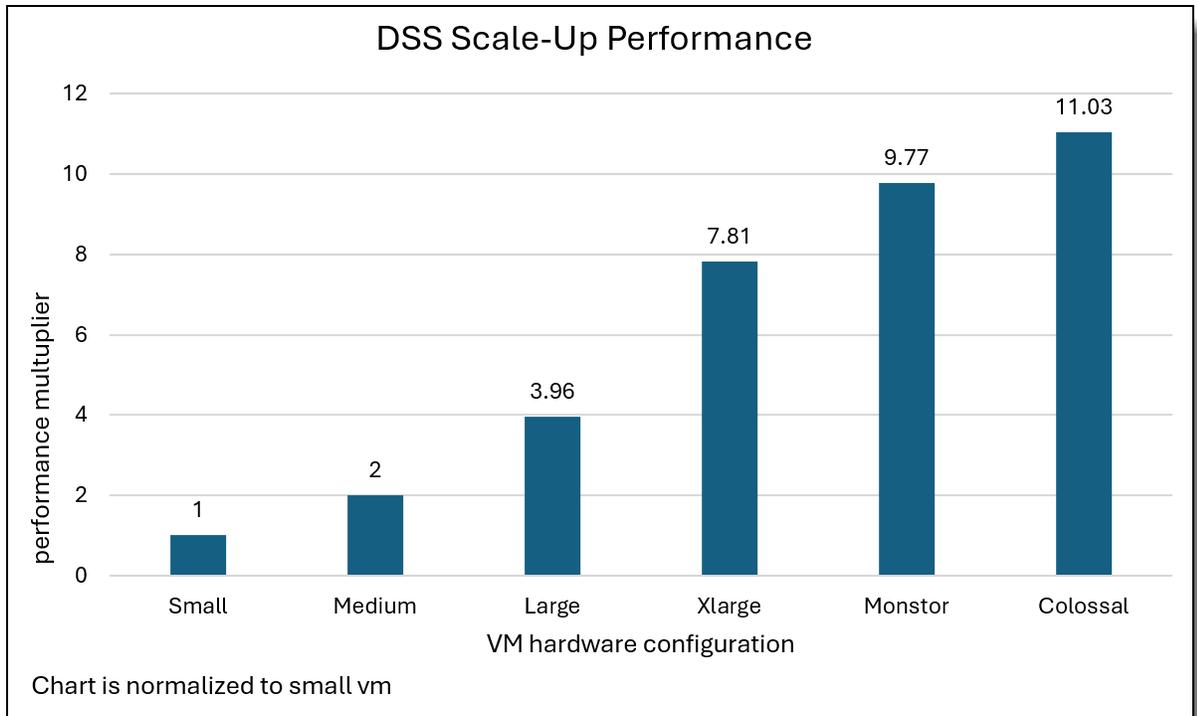


Figure 5. DSS performance on different VM configuration

### Scale-Out DSS Workload testing

Scale-out testing is essential for identifying potential bottlenecks and scalability limits in database systems, ensuring they can support business growth and deliver timely insights from analytics. DSS workload testing demonstrates performance capabilities and evaluates how well a distributed computing platform processes and analyzes large data volumes across a scalable infrastructure. The Lenovo ThinkAgile HX665 V3 systems powered by AMD EPYC 9005 processors with Nutanix and running the Acropolis Hypervisor provides a seamless platform for deploying, scaling, and managing data-intensive applications such as Microsoft SQL Server 2025.

In this DSS scale-out test, we assessed the Nutanix environment’s ability to handle workloads generated by the DSS benchmark, which simulates complex decision-support queries on large datasets. Using the MSTPCH toolkit, we ran DSS workloads across up to 12 SQL Server VMs simultaneously, each configured with 80% memory utilization and databases sized for 320K customers. The objective was to measure overall performance on a 4-node AMD EPYC-powered Nutanix cluster. Starting with a single VM and scaling to 12 VMs, we monitored aggregated IOPS and normalized DSS results to evaluate scalability.

The following figure shows results for 1, 2, 4, 8, and 12 VMs, achieving ~9.18x scalability at 12 VMs, demonstrating strong performance growth as the environment scales.

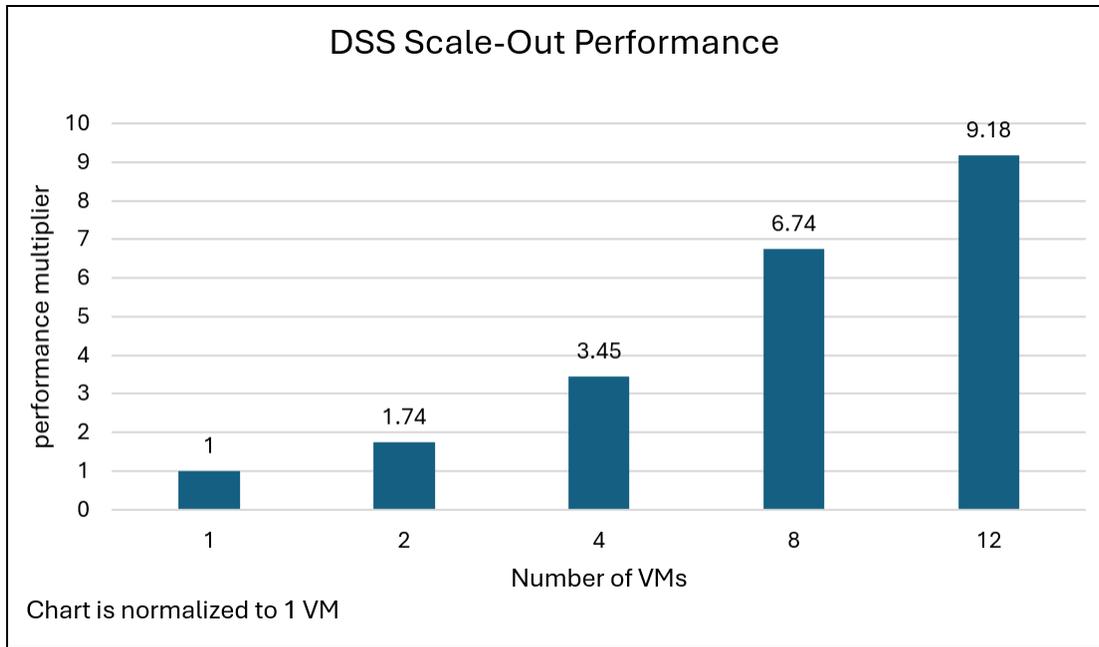


Figure 6. DSS performance with multiple VMs

### Comparing the scalability of SQL Server 2025 to SQL Server 2022

Microsoft SQL Server 2025 delivers noticeable scalability gains across both OLTP and DSS workloads when compared to SQL Server 2022. Testing on Lenovo ThinkAgile HX665 V3 systems shows that SQL Server 2025 handles larger workloads more efficiently and maintains stronger performance as environments scale up or expand across multiple VMs. These improvements come from updates brought to the database engine, helping the database scale more predictably and operate steadily in both scale-up and scale-out configurations.

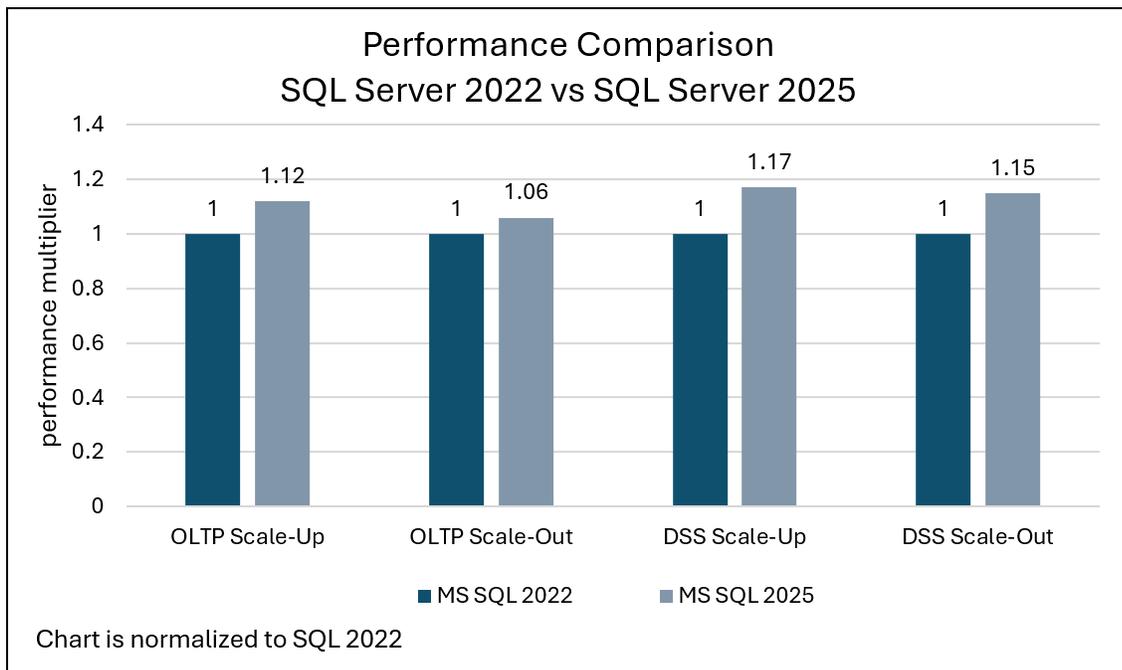


Figure 7. Comparing the scalability of SQL Server 2025 to SQL Server 2022

## Conclusion

Lenovo ThinkAgile HX665 V3 systems, powered by AMD EPYC 9005 processors and integrated with Nutanix software, deliver exceptional scalability and performance for Microsoft SQL Server 2025 workloads. Through comprehensive testing of OLTP and DSS workloads in both Scale-Up and Scale-Out scenarios, the solution demonstrated strong linear scalability and consistent performance across increasing VM counts.

These results validate the platform's ability to support demanding, data-intensive applications while simplifying infrastructure management. Combined with Nutanix's robust data protection, disaster recovery, and automation capabilities, this solution offers a cost-effective, high-performance foundation for modernizing enterprise environments and accelerating business insights.

## For more information

For more information, see the following links:

- Lenovo ThinkAgile HX Series:  
<https://www.lenovo.com/au/en/servers-storage/sdi/thinkagile-hx-series>
- AMD EPYC 9005 Series:  
<https://www.amd.com/en/products/processors/server/epyc/9005-series.html>
- Microsoft SQL Server 2025  
<https://learn.microsoft.com/en-us/sql/sql-server/what-s-new-in-sql-server-2025?view=sql-server-ver17>
- Microsoft SQL Server 2022:  
<https://www.microsoft.com/en-au/sql-server/sql-server-2022>

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## **Related product families**

Product families related to this document are the following:

- [Microsoft SQL Server](#)
- [ThinkAgile HX Series for Nutanix](#)

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