Improve Storage Performance with Lenovo ThinkAgile VX Series using VMware vSAN Express Storage Architecture (ESA) and Micron NVMe SSDs

Positioning Information

As modern applications demand for more resources, IT Leaders need the ability to quickly scale up, scale out, or expand storage infrastructure independently and efficiently. The storage market is going through a fundamental shift in hardware adoption, with newer hardware innovation emerging for highly optimized Hyperconverged Infrastructure (HCI) deployments.

For example, Non-Volatile Memory Express (NVMe) devices are expected to grow to a substantial majority share while the SAS/SATA SSDs and magnetic drives are expected to decline rapidly. NVMe devices offer 2-3x greater performance (based on VMware Internal Analysis, August 2022) than legacy SAS/SATA devices, while their price is steadily declining.

NVMe devices are available in a variety of types across a wide of range of performance, capacity points and support a spectrum of workloads to meet various business needs. NVMe technology is projected to become the de-facto standard and the most widespread deployed storage device in the enterprise.

Storage Architectures in vSAN 8

While spinning disks and SAS/SATA flash drives are still very common in enterprise data centers and will be in the foreseeable future, customers are upgrading to NVMe-based flash devices. With this adoption, VMware has introduced a new storage architecture within the vSAN 8 platform called Express Storage Architecture (ESA).

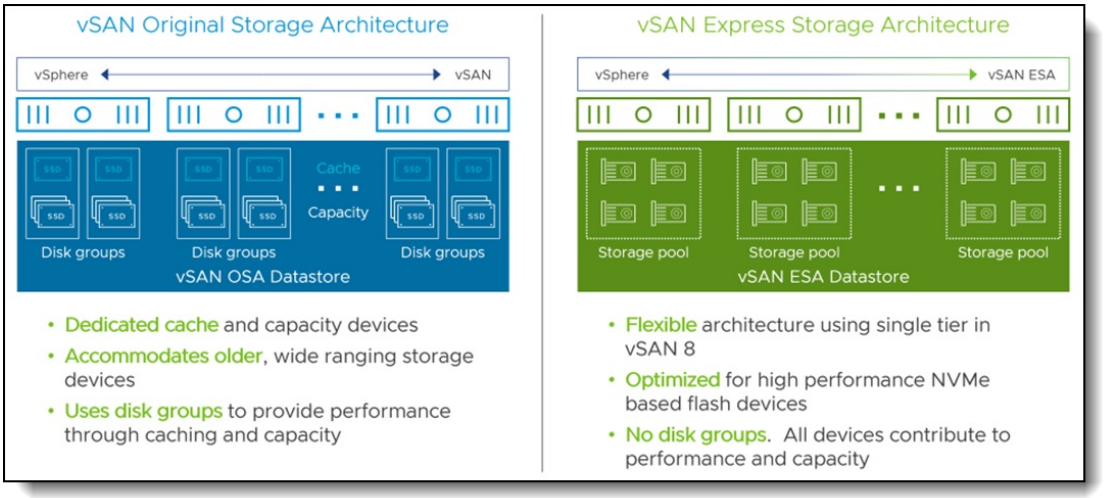

Figure 1. Differences between vSAN 8 Express Storage Architecture (ESA) vs Original Storage Architecture (OSA)

vSAN ESA provides customers with the flexibility to leverage all NVMe based flash devices for new levels of performance, scalability, resilience, and simplicity.

The traditional architecture in vSAN 8, now called Original Storage Architecture (OSA) is still available as an option designed for traditional hardware devices and allows customers to configure a two-tier approach to managing their storage with enhanced efficiency.

Express Storage Architecture (ESA)

vSAN Express Storage Architecture (ESA) is an industry first, single-tier HCI storage solution designed to use compatible next-generation NVMe-based flash devices optimally to reach a wide range of price and performance targets. A major pivot from VMware is the transition from disk groups to storage pools, which eliminates the need to configure a dedicated cache pool as one would in traditional disk groups. The benefit of this transition is the ability to use these previously dedicated cache devices as capacity creating a more resilient vSAN datastore and the scope of a drive failure is now limited to a single device failure rather than the entire disk group.

The new architecture showcases some innovative ways of processing and storing data. vSAN 8 with ESA introduces structural changes like a new patented log-structured file system (vSAN LFS), a new write-optimized log-structured object manager, and a new object format. All these changes enable vSAN ESA achieve near device-level performance levels while storing data and metadata in an extremely efficient way.

Table 1. Minimum Requirements for vSAN 8 Express Storage Architecture (ESA) vs Original Storage Architecture (OSA)

Minimum Requirement	vSAN 8 ESA	vSAN 8 OSA
Storage Devices	4	2
Hardware Choices	vSAN ESA certified NVMe devices	SATA, SAS, NVMe certified devices
Cache Device	No Cache Devices	1 Cache Device per Disk Group
Design	ReadyNodes Only	ReadyNodes or build your own with certified devices
Network	25 Gbps	10 Gbps

Benefits of vSAN 8 ESA

The benefits of vSAN 8 Express Storage Architecture (ESA) include the following:

- **Higher performance targets without trade-offs**

  Customers gain substantial performance improvements due to the new vSAN 8 ESA data path that leverages different tiers of storage devices to deliver a wide range of price/performance targets.

  Improved erasure coding further reduces performance overhead and enables customers to achieve RAID 5/6 at the performance of RAID 1.

  Intelligent I/O traffic management for vSAN network traffic during times of network contention to avoid congestion resulting in higher rate of I/O processing for enhanced efficiency.

- **Space and resource efficiency with simplified storage provisioning**

  The all-new policy-based compression method that occurs higher in the storage stack minimizes CPU costs and network payload. Enabled by default, customers can use a simple storage policy to toggle on a per-VM basis instead of a cluster-based service allowing for up to a 4x improvement in compression on each 4KB block, when compared with the Original Storage Architecture.

- **Scalable, high-performance native snapshots**

  vSAN ESA enables intelligent native snapshotting of point-in-time states of data in a fast and efficient way resulting in minimal impact on the VM’s performance, with consolidation times dramatically reduced.

- **Security**

  Cluster-based encryption has been included with vSAN ESA. The encryption occurs at the top of the stack eliminating the need to encrypt and decrypt as data traverses the stack. This new functionality improves resource utilization when securing data.

ThinkAgile VX with vSAN ESA

Customers can take advantage of Lenovo ThinkAgile VX Integrated Systems with VMware vSAN 8 ESA to run resource-intensive workloads including mission-critical applications, database workloads such as OLTP in retail, finance, and airline industries.

ThinkAgile VX with VMware vSAN 8 ESA plays a particularly interesting role in space constrained deployments. IT admins can take advantage of vSAN ESA's single tier of storage to fit more capacity into smaller footprints such as in Remote Office / Branch Offices (ROBO) and still support a variety of workloads

Micron SSDs Securely Accelerate ESA

NVMe SSDs greatly improve storage performance in VMware vSAN ESA deployments, which are optimized for NVMe SSDs. NVMe SSDs are the de-facto standard for modern low-latency HCI environments like VMware vSAN ESA, providing an optimal balance of storage performance, capacity, and low power to meet a broad variety of deployment requirements.

Micron NVMe SSDs deliver significant performance increases over SAS/SATA drives and with low latency - both imperatives to help improve workloads like transaction processing, real-time analytics, resource planning, virtualization, broad database deployments, video on demand and other similar performance and latency-sensitive workloads that can run on vSAN ESA.

Micron SSDs also offer a robust complement of proven security features built over generations, helping to address emerging security concerns in virtualized environments.

With low latency, wide ranging capacity options, and enhanced security features, Micron SSDs fit a wide variety of VMware vSAN ESA environments for the Lenovo ThinkAgile VX Integrated Systems – helping to reduce complexity while improving storage performance.

For more information about Micron 7450 SSDs, see the following Lenovo Press product guides:

- ThinkSystem 7450 MAX Mixed Use NVMe PCIe 4.0 SSDs
- ThinkSystem 7450 PRO Read Intensive NVMe PCIe 4.0 SSDs

How Lenovo ThinkAgile VX Can Help

Lenovo's ThinkAgile VX Integrated System is an engineered solution with factory-integrated VMware virtualization software and pre-configured based on the most reliable on the market, Lenovo ThinkSystem servers. ThinkAgile VX provides virtualized compute and storage capabilities to run for a variety of workloads and applications powered by industry-leading VMware software such as VMware vSAN, VMware vSphere and VMware Cloud Foundation. ThinkAgile VX is integrated with VMware vSphere Lifecycle Management (vLCM) for a single unified platform for firmware and software updates. In addition, it comes paired with ThinkAgile Premeir support, providing a single source of L1/L2 support for both hardware and software, which enables faster recovery.

Lenovo ThinkAgile VX Series powers a wide range of HCI use cases with its flexibility to scale up or out and broad hardware options ranging from Edge and Remote Office/Branch Office (ROBO), VDI (Virtual Desktop Interface), email and collaboration, to business-critical and large databases like SAP HANA.

Additionally, customers can also leverage Lenovo's TruScale Hybrid Cloud with VMware managed solution with a single, integrated billing, pay-as-you-grow model, which helps achieve significant total cost of ownership savings with specialized expertise to allow customers to accelerate their cloud transformation.

Why Lenovo

Lenovo is a US$70 billion global revenue Fortune Global 500 company serving customers in 180 markets around the world. Focused on a bold vision to deliver smarter technology for all, Lenovo is developing world-changing technologies that power (through devices and infrastructure) and empower (through solutions, services, and software) millions of customers every day.

Lenovo offers simplified and extensible systems management tools so you can manage your infrastructure on your own terms. Consistently ranked #1 in reliability and customer satisfaction, the Lenovo enterprise server, storage, and networking portfolio provides the hardware for businesses that never stand still.

For More Information

To learn more about the Lenovo ThinkAgile VX and other Lenovo solutions with VMware, go to https://www.lenovo.com/vmware or contact your Lenovo Sales Representative or Business Partner.

Related product families

Product families related to this document are the following:

- ThinkAgile VX Series for VMware
- VMware vSphere

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