

Lenovo Cloud Reference Architecture for Microsoft Storage Spaces Direct

A high-performance and high-resilience storage platform



HIGHLIGHTS

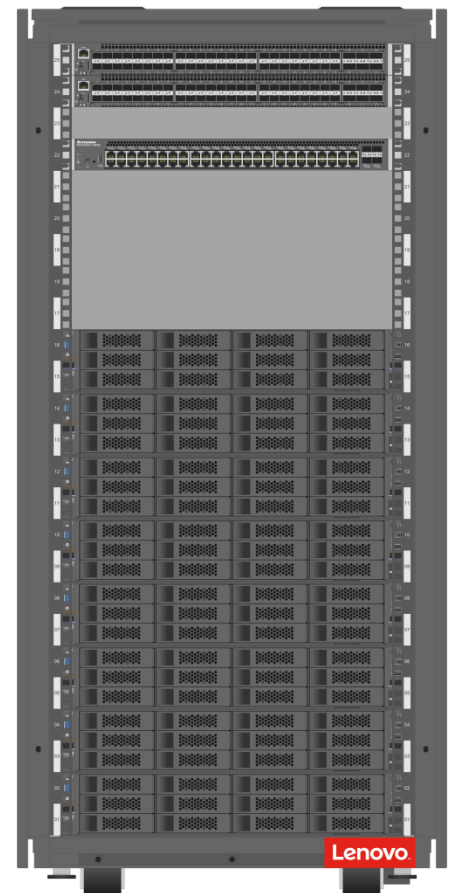
- A highly scalable and resilient storage platform for applications running on Microsoft Hyper-V virtual machines
- A broad ensemble of solution options enables a right-sized reference architecture to be built for SMB and enterprise customers

The growth of enterprise software defined storage

With the high demand for enterprise storage continuing to accelerate in recent years, Lenovo and Microsoft have teamed up to craft a software-defined storage solution leveraging the advanced feature set of Windows Server 2016, the flexibility of the Lenovo System x3650 M5 rack server and RackSwitch™ G8272 switch.

This reference architecture provides a solid foundation for customers looking to consolidate both storage and compute capabilities on a single hardware platform or for those enterprises that wish to have distinct storage and compute environments. In both situations, this solution provides outstanding performance, high availability protection and effortless scale out growth potential to accommodate evolving business needs.

When discussing high performance and shareable storage pools, many IT professionals think of expensive SAN infrastructure. Thanks to the evolution of disk storage and server virtualization technology, as well as ongoing advancements in cost effective network throughput, it is now possible to deliver an economical, highly redundant and high performance storage subsystem.



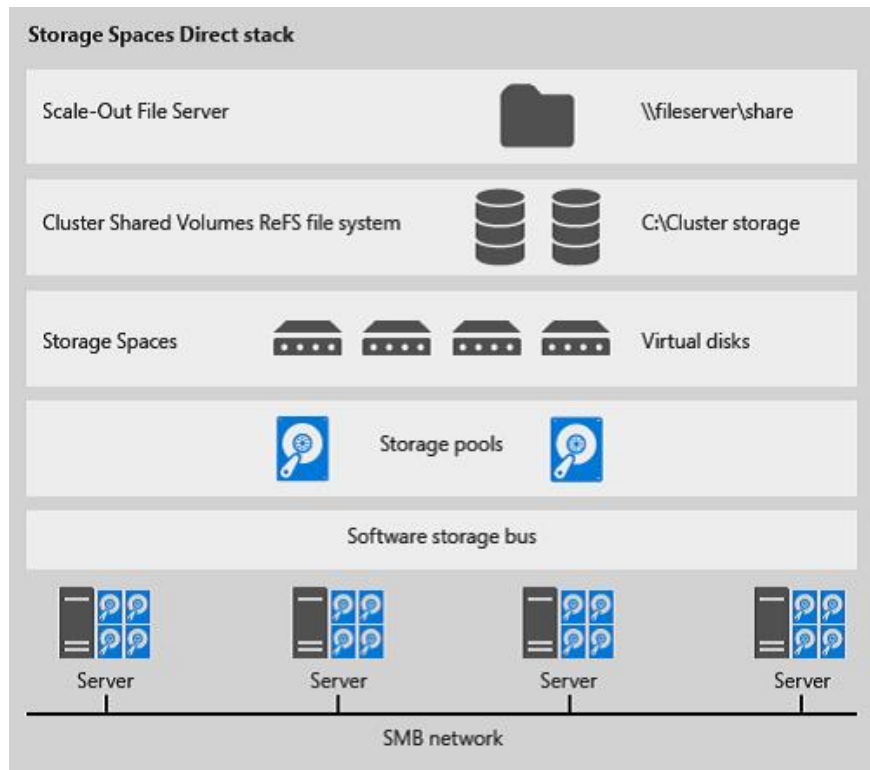
Up to 8 nodes of the Lenovo Cloud Reference Architecture for Microsoft S2D may be deployed in a single 25U rack

ARCHITECTURE BRIEF

Lenovo Cloud Reference Architecture for Microsoft Storage Spaces Direct

Why Lenovo and Microsoft

Lenovo and Microsoft have collaborated to deliver successful, integrated solutions to customers worldwide. These customers recognize Lenovo's leadership in the worldwide server market and Microsoft's leadership in the enterprise market



The shifting role of Enterprise SAN

The values are changing regarding the importance of having a SAN in the enterprise space as a high-performance and high-resilience storage platform. This S2D based reference architecture is a direct response to this shifting focus and it can be deployed to serve two different roles. In one role, this platform can be configured as the principal storage provider for Windows applications. Another use for this platform is as a repository for backup or archival of VHD(X) files. Wherever a shared volume is applicable for use, S2D can be the new solution to support these functions.

The hyperconverged and disaggregated architectures of this S2D reference architecture radically simplify procurement and deployment, while features like caching, storage tiers, and erasure coding, together with the latest hardware innovation like RDMA networking and NVMe devices, deliver unrivaled efficiency and performance. However, the principle function of this S2D reference architecture is as a storage platform for the applications running on Hyper-V VMs, specifically focusing on Hyper-V IaaS (Infrastructure as a Service) for service providers and enterprises.

In the disaggregated storage mode, the environment is separated into compute and storage components. An independent pool of servers running Hyper-V acts to provide the CPU and memory resources (the "compute" component) for the running of VMs that reside on the storage environment. The "storage" component is built using S2D and Scale-Out File Server (SOFS) to provide an independently scalable storage repository for the running of VMs and applications. This method allows for the independent scaling and expanding of the compute farm (Hyper-V) and the storage farm (S2D).



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Elements of the Lenovo Cloud RA for S2D

Capacity and storage growth

Leveraging the 14x 3.5" drive bays of the x3650 M5 and high-capacity drives such as the 4 TB drives in this solution, each server node is itself a JBOD (just a bunch of disks) repository. As demand for storage and/or compute resources grows, additional x3650 M5 systems are added into the environment to provide the necessary storage expansion.

Performance

Using a combination of solid-state drives (SSDs) and regular hard disk drives (HDDs) as the building blocks of the storage volume, an effective method for storage tiering is available. Faster-performing SSDs act as a cache repository to the capacity tier, which is placed on traditional HDDs in this solution. Data is striped across multiple drives, thus allowing for very fast retrieval from multiple read points.

Resilience

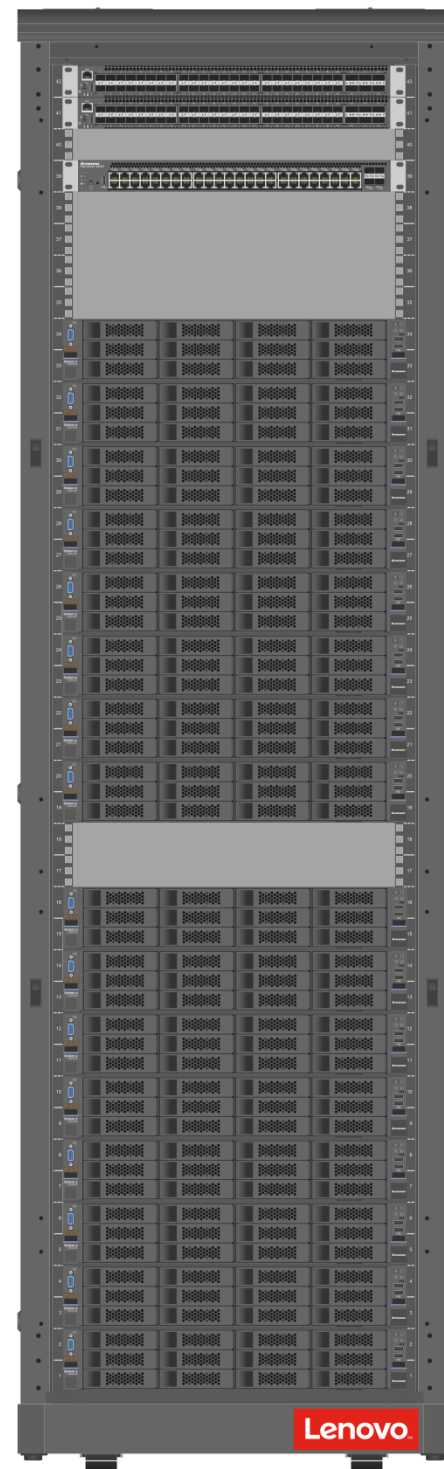
Traditional disk subsystem protection relies on RAID storage controllers. In S2D, high availability of the data is achieved using a non-RAID adapter and adopting redundancy measures provided by Windows Server 2016 itself. The storage can be configured as simple spaces, mirror spaces, or parity spaces.

- **Simple spaces:** Stripes data across a set of pool disks, and is not resilient to any disk failures. Suitable for high performance workloads where resiliency is either not necessary, or is provided by the application.
- **Mirror spaces:** Stripes and mirrors data across a set of pool disks, supporting a two-way or three-way mirror, which are respectively resilient to single disk, or double disk failures. This is suitable for the majority of workloads, in both clustered and non-clustered deployments.
- **Parity spaces:** Stripes data across a set of pool disks, with a single disk write block used to store parity information, and is resilient to a single disk failure. This is suitable for large block append-style workloads, such as archiving, in non-clustered deployments.

Configuration and Scaling

The Lenovo Cloud Reference Architecture for Microsoft S2D scales from a minimum of two storage nodes up to a maximum of 16 nodes. Consequently, this solution has the range and capacity to effectively address the storage needs of SMB and enterprise customers. With this solution three different solution types are available: capacity optimized, performance optimized and balanced. Within each of these solutions storage options also exist. Both 25U and 42U racks are also available. These variables provide a high degree of flexibility so a configuration can be built for the needs of each customer.

Microsoft S2D supports failover cluster configurations of anywhere from 2 to 16 nodes and provides resiliency for multiple drive failures. In fact, a typical 4-node cluster environment can tolerate complete failure of up to two full nodes, including all the drives they contain. When additional storage space is needed, it is a simple matter to add additional drives in existing nodes (if empty bays exist), or to add nodes to the cluster and integrate their storage capacity into the existing S2D Storage Pool. In this manner, the S2D Solution can be scaled up or down depending on current needs.



Up to 16 nodes of the Lenovo Cloud Reference Architecture for Microsoft S2D may be deployed in a single 42U rack

ARCHITECTURE BRIEF

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Cloud solutions with the Lenovo
x3650 M5 server and Microsoft
Storage Spaces Direct



Why Lenovo

Lenovo is a leading provider of x86 servers for the data center. Featuring rack, tower, blade, dense and converged systems, the Lenovo server portfolio provides excellent performance, reliability and security. Lenovo also offers a full range of networking, storage, software, solutions, and comprehensive services supporting business needs throughout the IT lifecycle. With options for planning, deployment, and support, Lenovo offers expertise and services needed to deliver better service-level agreements and generate greater end-user satisfaction.

For More Information

To understand how this solution can optimally be configured and deployed, check out the Deployment Guide for this solution at the following link:

<https://lenovopress.com/lp0064-microsoft-storage-spaces-direct-deployment-guide>

To learn more about the Lenovo Cloud Reference Architecture for Microsoft Storage Spaces Direct, contact your Lenovo Business Partner or visit:

www.lenovo.com/systems/solutions



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CRN: CLDMS2DHV64

04/2017