Lenovo Software Defined Storage with Windows Server 2016 Datacenter Storage Spaces Direct

Configuration Brief

Microsoft and Lenovo have worked together to validate a software-defined storage solution running on Lenovo servers to create hardware configurations that have excellent performance and reliability. Lenovo validated configurations include production deployment tools and procedures. These offerings are designed, assembled, and validated to meet Microsoft's requirements for private cloud environments, helping to ensure reliable operation. Plus, for the third year in a row, Lenovo servers were rated the most reliable x86 servers in the world giving you additional peace of mind when you deploy with Lenovo servers.*

Working with Lenovo you can get up and running faster. Lenovo has developed a deployment tool to help automate the creation and deployment of your cluster setup.

Entry Configuration Details

This configuration allows customers to start with 2 nodes as an entry storage spaces direct solution that has been pre-validated by Lenovo and Microsoft together. This 2 node solution is optimized for medium performance I/O requirements. Performance is delivered through 1.6TB SSD for Cache Tiering with up to 16TB capacity per Node along with 256 GB RAM and dual Intel Xeon E5-2650 v4 Processors. Minimum of 2 nodes per cluster is required with this configuration to match the pre-validated configuration tested with Microsoft for maximum performance and reliability.

*according to the latest ITIC 2015-2016 Global Server Hardware and OS Reliability Survey

Entry Configuration Bill of Materials - Order through Single CRN Number: CLDMS2DBL71

Part Number	Description	Quantity
8871AC1	Lenovo System x3650 M5	1
ATG2	System Documentation and Software-US English	1
A5GE	x3650 M5 12x 3.5" HS HDD Assembly Kit	1
A3YY	N2215 SAS/SATA HBA	1
A5GH	System x3650 M5 Rear 2x 2.5" HDD Kit (Independent RAID)	1
ATE4	System x3650 M5 Planar BDW	1
ATEN	Intel Xeon Processor E5-2650 v4 12C 2.2GHz 30MB Cache 2400MHz 105W	1
ATFD	Addl Intel Xeon Processor E5-2650 v4 12C 2.2GHz 30MB 2400MHz 105W	1
A5FX	System x Enterprise 2U Cable Management Arm (CMA)	1
A5FV	System x Enterprise Slides Kit	1
ATE0	System x3650 M5 12x 3.5" Base without Power Supply BDW	1
A1ML	Integrated Management Module Advanced Upgrade	1
A5EW	System x 900W High Efficiency Platinum AC Power Supply	1
A45W	ServeRAID M1215 SAS/SATA Controller	1
A5EW	System x 900W High Efficiency Platinum AC Power Supply	1
ATEA	System x3650 M5 EIA L - Blank	1
AUK7	Windows Server 2016 Configuration (TPM 2.0 and Secure Boot)	1
AUAJ	Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter	1
A483	Populate and Boot From Rear Drives	1
5977	Select Storage devices - no configured RAID required	1
AT9H	Intel S3710 800GB Enterprise Performance SATA HS 3.5" SSD	2
A3W9	4TB 7.2K 6Gbps NL SATA 3.5" G2HS HDD	4
AT89	300GB 10K 12Gbps SAS 2.5" G3HS HDD	2
ATCA	16GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	16
6400	2.8m, 13A/125-10A/250V, C13 to IEC 320-C14 Rack Power Cable	2
01ET877	3YR Tech Install Parts 24x7x4	1
ATGF	System x3650 M5 WW Packaging	1
ATE2	System x3650 M5 System Agency Label	1
ATE3	System x3650 M5 System Level Code	1
ATRG	system x M5 rear USB port cover	1
AUAK	2U Bracket for Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter	1
A5FZ	System x3650 M5 Riser Filler	1
A5FT	System x3650 M5 Power Paddle Card	1
A5G1	System x3650 M5 EIA Plate	1
A5V5	System x3650 M5 Right EIA for Storage Dense Model	1
ASQA	System x3650 M5 Rear 2x 2.5" HDD Label (Independent RAID-Riser1)	1

For Lenovo ROK Windows Server 2016 Datacenter and CAL part numbers go here:
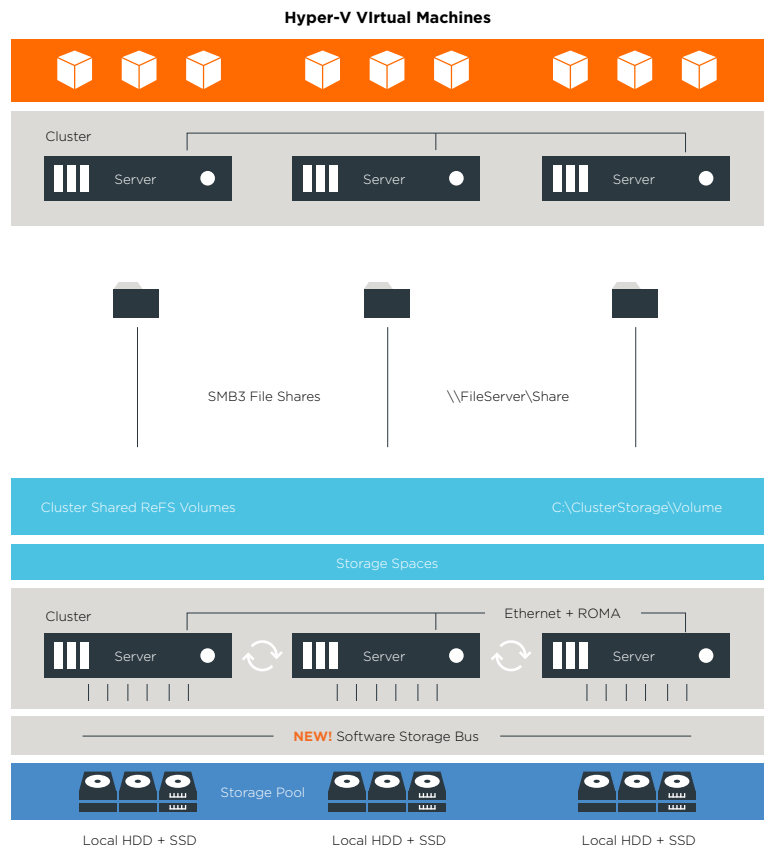https://www.lenovosalesportal.com/public-resources.aspx?item=511

Microsoft Storage Spaces Direct

Storage Spaces Direct is the evolution of Storage Spaces, first introduced in Windows Server 2012. It leverages many of the features you know today in Windows Server, such as Failover Clustering, the Cluster Shared Volume (CSV) file system, Server Message Block (SMB) 3, and Storage Spaces. It also introduces new technology, most notably the Software Storage Bus. Storage Spaces Direct unlocks use of new classes of disk devices, such as SATA SSD and NVMe disk devices, that were previously not possible with clustered Storage Spaces with shared disks.

Lenovo servers running Storage Spaces Direct in Windows Server 2016 Datacenter allow you to provision and manage storage independently of the underlying hardware to achieve an agile and cost-effective software defined storage solution.

Storage Spaces Direct is included in Windows Server 2016 Datacenter along with unlimited virtual machines. When you purchase a Lenovo server with Windows Server 2016 Datacenter you can potentially save thousands of dollars by avoiding the purchase of costly NAS or SAN devices and additional software because the hyper v, storage controller and intelligence is built into Windows Server 2016 Datacenter and full functionality is included with the license.

Storage Spaces Direct uses Lenovo servers with local-attached drives to create highly available, highly scalable software-defined storage at a fraction of the cost of traditional SAN or NAS arrays. Its converged or hyper-converged architecture radically simplifies procurement and deployment.

Hyper-V VIrtual Machines

Cluster

Server Server Server

SMB3 File Shares \\FileServer\Share

Cluster Shared ReFS Volumes C:\ClusterStorage\Volume

Storage Spaces

Cluster Ethernet + ROMA

Server Server Server

NEW! Software Storage Bus

Storage Pool

Local HDD + SSD Local HDD + SSD Local HDD + SSD

Storage Spaces Direct key benefits

Unrivaled Performance. Whether all-flash or hybrid, Storage Spaces Direct easily exceeds 150,000 mixed 4k random IOPS per server with consistent, low latency thanks to its hypervisor-embedded architecture, its built-in read/write cache, and support for cutting-edge NVMe drives mounted directly on the PCIe bus.

Fault Tolerance. Built-in resiliency handles drive, server, or component failures with continuous availability. Larger deployments can also be configured for chassis and rack fault tolerance. When hardware fails, just swap it out; the software heals itself, with no complicated management steps.

Manageability. Use Storage QoS Controls to keep overly busy VMs in check with minimum and maximum per-VM IOPS limits. The Health Service provides continuous built-in monitoring and alerting, and new APIs make it easy to collect rich, cluster-wide performance and capacity metrics.

Simplicity. Go from industry-standard servers running Windows Server 2016 to your first Storage Spaces Direct cluster in under 15 minutes. For System Center users, deployment is just one checkbox.

Resource Efficiency. Erasure coding delivers up to 2.4x greater storage efficiency, with unique innovations like Local Reconstruction Codes and ReFS real-time tiers to extend these gains to hard disk drives and mixed hot/cold workloads, all while minimizing CPU consumption to give resources back to where they are needed most — the VMs.

Scalability. Go up to 16 servers and over 400 drives, for multiple petabytes of storage per cluster. To scale out, simply add drives or add more servers; Storage Spaces Direct will automatically onboard new drives and begin using them. Storage efficiency and performance improve predictably at scale.

For more detail on storage spaces direct and information on listed performance specifications go to:
https://docs.microsoft.com/en-us/windows-server/storage/storage-spaces/storage-spaces-direct-overview

Additional Resources

Lenovo Software Defined Storage page: http://www3.lenovo.com/us/en/data-center/solutions/cloud/

Reference Architecture for Microsoft Storage Spaces Direct (S2D): https://lenovopress.com/lp0569.pdf

Microsoft Storage Spaces Direct (S2D) Deployment Guide: https://lenovopress.com/lp0064.pdf

Case Studies:
1. Acuutech: http://news.lenovo.com/customer-stories/acuutech-boosts-client-services-by-harnessing-power-software-defined-storage.htm
2. SE Cloud Factory: http://www.lenovo.com/images/products/system-x/pdfs/testimonials/se_cloud_factory_cs.pdf

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