Spectrum Scale
User Group

Lenovo HPC Storage Update

Spectrum Scale User Group – US Spring Meeting
IBM Cambridge, 17-May-2018

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Lenovo HPC Storage Update – Agenda

- **Lenovo** Overview
- Lenovo **ThinkSystem Storage** Update
- Lenovo GPFS Storage Server (**GSS**) Update
- Lenovo Distributed Storage Solution for IBM Spectrum Scale (**DSS-G**) Update
  - Including G100 NVMe-based model
- GSS / DSS-G status regarding „**Spectre/Meltdown**“ security vulnerability

Lenovo Worldwide

2 Headquarters (Beijing and RTP)

165 Countries of Business

12 Global Research & Development Labs

10,000+ IT Support Specialists

3,000 Field Service Locations

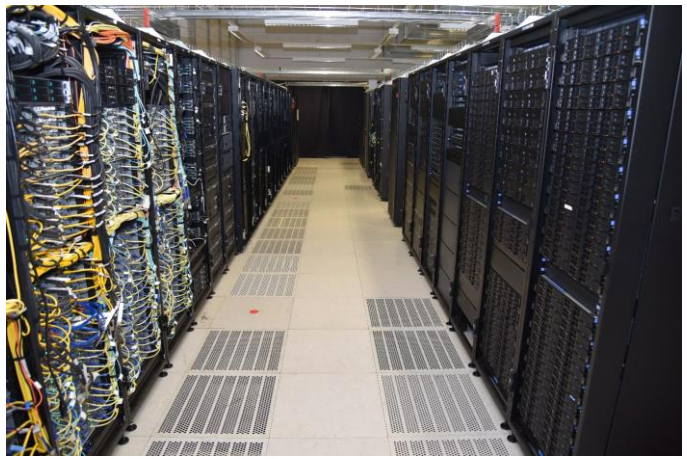
51 Contact Centers

147 Languages

Lenovo Innovation Centers – HPC and AI

Research Triangle Park
North Carolina, USA

Stuttgart
Germany



Beijing
China

Taipei
Taiwan

- Collaborate with HPC experts to validate solutions and demonstrate future technologies
- Test at scale: hundreds of servers and choice of storage & networking
- Application optimization
- Supported with industry leading partners
- Customer collaborations and POCs

Lenovo Scalable Infrastructure Solutions

From Complete Portfolio to Results Driven Designs

Lenovo ThinkSystem HPC Proven Portfolio + **Best of Industry Partners** + **Lenovo HPC Expertise** + **Lenovo Factory Integration Services** = **Lenovo HPC Solutions**

openHPC, IBM, SUSE, redhat, NVIDIA, intel, Mellanox TECHNOLOGIES

Testing hardware and software interoperability resulting in best recipe code level:

SLES, RHEL
MOFED, IFS
xCat/Confluent,
Spectrum Scale

Shipping fully built, racked & cabled, best recipe, client settings and image loaded, power and burn in tested with Linpack.

A single outcome based integrated cluster, designed by HPC experts, built and shipped ready to run.

Mass customizing solutions for each client's unique needs

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ThinkSystem DS Series Controller Feature Comparison

Category	Detail	DS2200	DS4200	DS6200
Scale Factors	LUNs	1024	1024	1024
	Asynch Rep	32 Vols / 1 Peer	32 Vols / 1 Peer	32 Vols / 1 Peer
	Virtual Pool Size	1.1 PB	1.1 PB	1.1 PB
	Host Ports (max per controller)	2-Port SAS 2-Port FC 2-port iSCSI	4-Port SAS 4-Port FC 4-port iSCSI	4-port SAS 4-Port FC 4-port iSCSI
	Hybrid Ports	No	Yes (FC/iSCSI)	Yes (FC/iSCSI)
	SSD Read Cache	4TB	4TB	4TB
Controller HW	CPU	1.2 GHz Broadwell DE Single Core **OS: 32-bit**	2.4GHz Broadwell DE Dual Core (1 core used) **OS: 32-bit**	2.5GHz Broadwell DE w/Turbo Quad Core (D1527) **OS: 64-bit Multi-Core**
	Total Dual Controller Memory	16 GB	16 GB	32 GB
	CPU Memory / Controller	4GB	4GB	8GB
	I/O Cache / Controller	4GB	4GB	8GB
Performance* **(tuning ongoing)**	Read IOPs **(SAS Target)**	100K	235K	375K
	Read IOPs **(FC, seq measured)**	265K	425K	525K
	Read Throughput **(SAS Target)**	**3.5 GB/s**	**7.0 GB/s**	**7.0 GB/s**
	Write Throughput **(SAS Target)**	**3.0 GB/s**	**5.5 GB/s**	**5.5 GB/s**

Common Planar Design

Lenovo ThinkSystem Storage Update

- Three ThinkSystem Block Storage Controllers: DS200, DS4200, and DS6200
  - https://www3.lenovo.com/us/en/data-center/storage/storage-area-network/lenovo-thinksystem-ds-series/c/lenovo-thinksystem-ds-series
  - Initially only 2U12 and 2U24 enclosures → max 120x LFF or 240x SFF drives
  - 4TB to 12TB today; 14TB in 4Q2018
- **D3284** dense enclosure **attachment** to DS4200 and DS6200 (Mar/2018)
  - 24x SFF drives in **DS6200** controller enclosure (there is **no LFF model** of the DS6200)
  - 12x LFF or 24x SFF in **DS4200** controller enclosure
  - Up to 3x D3284 „EBOD“ expansion enclosures (252 drives) ... needs firmware level **G265**

  → **{252x or 264x} NL-SAS** in a single {DS6200 or DS4200}
- New **declustered RAID6** layout (Mar/2018)
  - Up to 128 drives in a declustered RAID6 group ... dramatically speeding up rebuilds
- Still limited to two disk pools per storage subsystems
  - No possibility to have SSD and NL-SAS in same system without auto-tiering
  - Evaluating options to allow four disk pools in a future firmware release..

Lenovo Storage Building Blocks – DS6200 and D3284

Lenovo

LENOVO PRESS

Lenovo ThinkSystem DS6200 Storage Array

Product Guide

The Lenovo ThinkSystem DS6200 is a versatile, scalable mid-range storage system designed to provide simplicity, speed, scalability, security, and high availability for medium to large businesses. The ThinkSystem DS6200 delivers enterprise-class storage management technology in a performance-optimized solution with a wide choice of host connectivity options, flexible drive configurations, and enhanced data management features. The ThinkSystem DS6200 is a perfect fit for a wide range of enterprise workloads, including big data and analytics, transactional systems, OLTP databases, and other storage I/O-intensive applications.

The ThinkSystem DS6200 supports up to 240 drives with up to nine external expansion enclosures. It also offers flexible drive configurations with the choice of 2.5-inch (controller and expansion units) and 3.5-inch (expansion units only) drive form factors, 10 K or 15 K rpm SAS and 7.2 K rpm NL SAS hard disk drives (HDDs) and self-encrypting drives (SEDs), and SAS solid-state drives (SSDs). The DS6200 can be scaled up to 3.68 PB of raw storage capacity.

The Lenovo ThinkSystem DS6200 enclosure is shown in the following figure.

Figure 1. Lenovo ThinkSystem DS6200 SFF enclosure

Did you know?

The ThinkSystem DS6200 supports Intelligent Real-time Tiering capabilities that help optimize system performance, reduce costs, and simplify management. The base software includes the ability to move data dynamically between SAS HDDs that are optimized for cost per IOPS and NL SAS HDDs that are optimized for cost per GB. With the optional software license, the DS6200 supports hybrid tiering across HDDs and SSDs.

The ThinkSystem DS6200 offers the flexible choice of 12 Gb SAS, 1/10 Gb iSCSI, and 4/8/16 Gb Fibre Channel (FC) host connectivity protocols, with support for hybrid iSCSI and Fibre Channel connectivity at

https://lenovopress.com/lp0511-lenovo-thinksystem-ds6200-storage-array

Click here to check for updates

Lenovo ThinkSystem DS6200 Storage Array 1

Lenovo

LENOVO PRESS

Lenovo Storage D3284 External High Density Drive Expansion Enclosure

Product Guide

The Lenovo Storage D3284 High Density Expansion Enclosure offers 12 Gbps SAS direct-attached storage expansion capabilities that are designed to provide density, speed, scalability, security, and high availability for medium to large businesses. The D3284 delivers enterprise-class storage technology in a cost-effective dense solution with flexible drive configurations of up to 84 drives in 5U rack space and JBOD (non-RAID) host connectivity.

The D3284 expansion unit is designed for a wide range of workloads, including big data and analytics, video surveillance, private and hybrid clouds, file and print serving, and backup and archiving. The D3284 is also well-suited for software defined storage (SDS) and Windows Storage Spaces.

Figure 1. Lenovo Storage D3284 HD Expansion Enclosure

Did you know?

The D3284 expansion enclosures support 12 Gbps SAS connectivity, which doubles the data transfer rate compared to 6 Gb SAS solutions to maximize performance of storage I/O-intensive applications.

With support for daisy chaining, the D3284 expansion enclosures can be scaled up to 3.36 PB for capacity-optimized configurations.

The D3284 expansion enclosures allow daisy chaining with D1212 and D1224 expansion enclosures: Up to two D3284 and two D1212 or one D1224 drive enclosures is supported in a single chain.

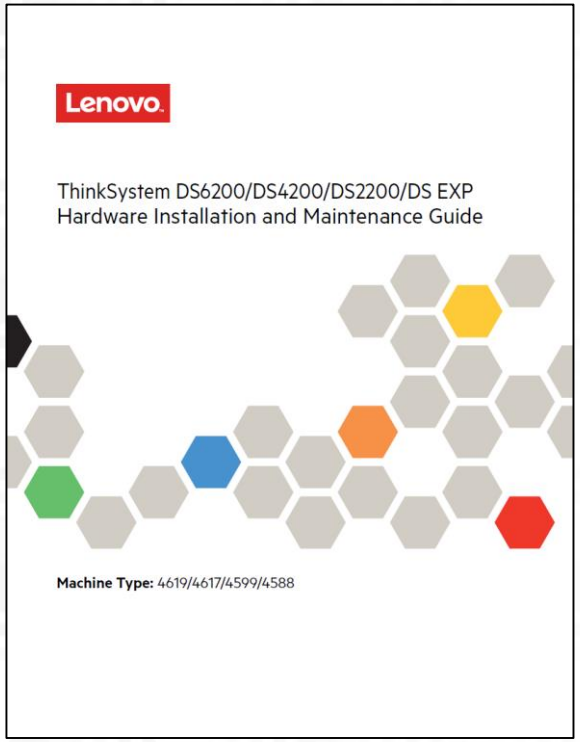
https://lenovopress.com/lp0513-lenovo-storage-d3284-external-high-density-drive-expansion-enclosure

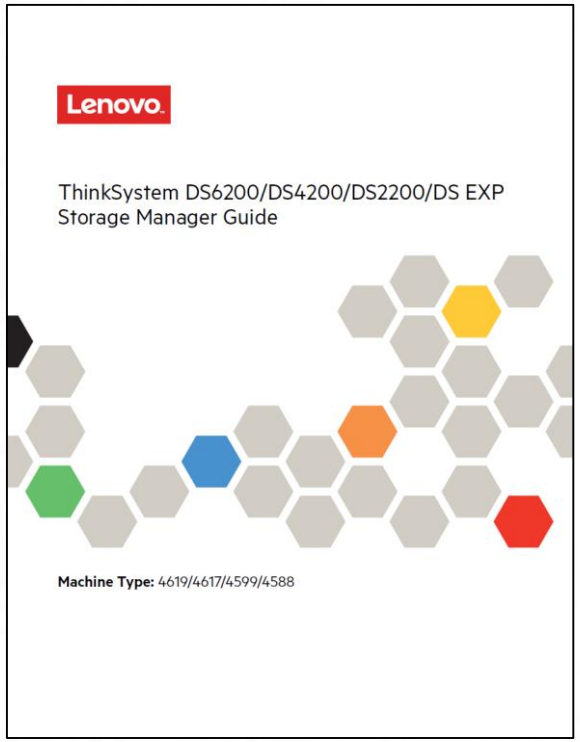
Click here to check for updates

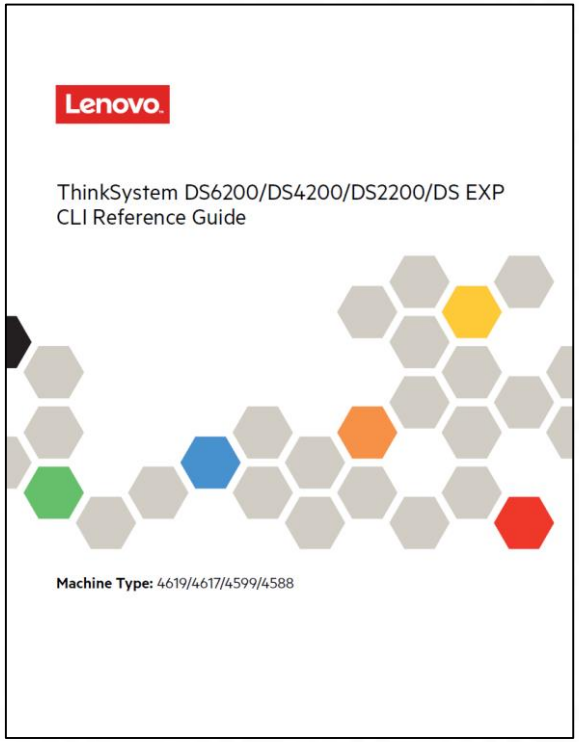
Lenovo Storage D3284 External High Density Drive Expansion Enclosure 1

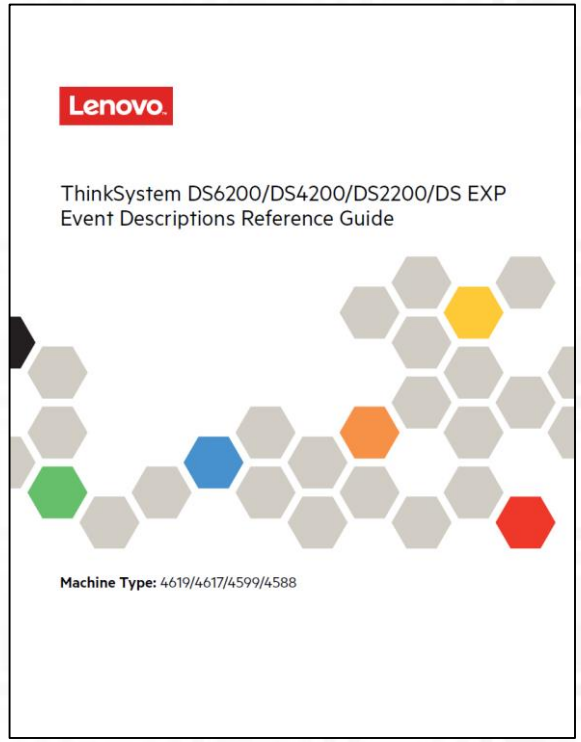
DS6200 Documentation

- https://datacentersupport.lenovo.com/de/en/products/storage/lenovo-storage/thinksystem-ds6200/documentation









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Lenovo GSS Update

- Lenovo **GSS has been superceded by** Lenovo **DSS-G**
  - Same underlying **Spectrum Scale RAID** technology
  - Organic Lenovo ThinkSystem components (servers and storage)
  - All new development is on DSS-G
  - GSS has been withdrawn in Dec/2017 ... no longer possible to order
- GSS software will still be maintained/refreshed
  - Aligning with latest software/firmware levels, usually in lock-step with LeSI „best recipe“
- **GSS 3.2** Contents (Dec/2017)
  - RHEL **7.3**; xCAT 2.13
  - Latest GPFS 4.2.3 and 4.1.1 PTF/efix levels
  - MOFED 4.2; OPA 10.6
- **GSS 3.3** contents (Mar/2018)
  - RHEL **7.4**
  - Latest GPFS 4.2.3 and 4.1.1 PTF/efix levels (GNR version of GPFS 5.0 is not ready yet)
  - PTF update to GPFS **5.0**.0-1 on a by-request basis until **GSS 3.4** (Aug/2018)

Obtaining Updates for Lenovo GSS Releases

- **GSS v2.5 and newer** are **owned by Lenovo** (released after the IBM divestiture)
- Installation images for **Lenovo releases** (for IBM and Lenovo servers) are available on the Lenovo Electronic Software Distribution (ESD) website (needs entitlement):
  - https://lenovoesd.flexnetoperations.com/control/lnvo/home
- **Archived** Lenovo GSS packages of older GSS releases (as of 05-May-2017):
  (These packages are no longer available from the Lenovo website; please use GSS v3.2 instead.
  Contact hpcstorage@lenovo.com if you still need access to these older Lenovo GSS releases.)
  - GSS v2.5.9: **gss2.5.9.8-1e.tgz** (18-Oct-2016) with gpfs-4.1.1-8 (efix1) → upgrade to 3.3a
  - GSS v2.6: **gss2.6.0.4-0b.tgz** (23-Jul-2016) with gpfs-4.2.0-4 (no efix) → upgrade to 3.3a
  - GSS v3.0: **gss3.0.1.0-2b.tgz** (04-Oct-2016) with gpfs-4.2.1-0 (efix2) → upgrade to 3.3a
- **Previous** Lenovo GSS v3.1 and v3.2 packages (as of 10-Nov-2017):
  - **gss3.1a**-*-gpfs4*.tgz (08-Dec-2016) with gpfs-4.2.1-1 or gpfs-4.1.1-8-efix1
  - **gss3.1b**-*-gpfs4*.tgz (18-Apr-2017) with gpfs-4.2.1-2-efix12 or gpfs-4.1.1-14
  - **gss3.1c**-*-gpfs4*.tgz (30-Aug-2017) with gpfs-4.2.3-3-efix2 or gpfs-4.1.1-16-efix1
  - **gss3.1d**-*-gpfs4*.tgz (01-Sep-2017) with gpfs-4.2.3-4 or gpfs-4.1.1-16-efix1
  - **(gss3.1e**-*-gpfs4*.tgz (18-Oct-2017) with gpfs-4.2.3-4-efix2 or gpfs-4.1.1-16-efix4)
  - **gss3.2a**-*-gpfs4*.tgz (06-Dec-2017) with gpfs-4.2.3-5 or gpfs-4.1.1-16-efix6

GSS pre-2016 Release History (Spectrum Scale 3.5 and 4.1 based)

1Q/2013 GSS v1.0

Server:
2 * x3650-M4
- E5-2670-v1
- SAS6 (gen2)
- 10G,FDR

Storage:
GSS24/26:
- 2,3 TB

Software:
- xCat 2.8.2
- rhel-6.3
- gpfs-3.5.0-5 +
- mofed-1.5-3

4Q/2013 GSS v1.5

Server:
2 * x3650-M4
- E5-2670-v1
- SAS6 (gen2)
- 10G,FDR

Storage:
GSS24/26:
- 2,3, **4 TB**

Software:
- xCat 2.8.**3**
- rhel-6.**4**
- gpfs-3.5.0-**13** +
- mofed-**2.0**-3

2Q/2014 GSS v2.0

Server:
2 * x3650-M4-**HD**
- E5-2670-**v2**
- SAS6
- 10G,**40G**,FDR

Storage:
GSS24/26:
- 2,3,4 TB

GSS22s/24s/26s:
- **1.2 TB SAS**

GSS21s/22s/24s:
- **200,800 GB SSD**

Software:
- xCat 2.8.**4**
- rhel-6.**5**
- gpfs-**4.1**.0-1 +
- mofed-**2.1**-1

4Q/2014 GSS v2.5

Server:
2 * x3650-M4-HD
- E5-2670-v2
- SAS6
- 10G,40G,FDR

Storage:
GSS24/26:
- 3,4, **6 TB**

GSS22s/24s/26s:
- 1.2 TB SAS

GSS21s/22s/24s:
- 200,800 GB SSD

Software:
- xCat 2.8.**5**
- rhel-**7.0**
- gpfs-4.1.0-**5** +
- mofed-2.**3**-1

3Q/2015 GSS v2.5.8

Server:
2 * x3650-**M5**
- E5-2670-**v3**
- SAS**12**
- 10G,40G,FDR,
  EDR interoperability

Storage:
GSS24/26:
- 3,4,6 TB

GSS22s/24s/26s:
- 1.2 TB SAS

GSS21s/22s/24s:
- 200,800 GB SSD

Software:
- xCat 2.**9.2**
- rhel-7.**1**
- gpfs-4.1.0-**8**
- mofed-2.**4**-1

4Q/2015 GSS v2.5.9

Server:
2 * x3650-M5
- E5-2670-v3
- SAS12
- 10G,40G,FDR,
  EDR interoperability

Storage:
GSS24/26:
- 3,4,6, **8 TB**

GSS22s/24s/26s:
- 1.2 TB SAS

GSS21s/22s/24s:
- 200,800 GB SSD

Software:
- xCat 2.9.2
- rhel-7.1
- gpfs-4.1.**1-2** +
- mofed-**3.1-1**

Blue GSS versions released by IBM. **Red GSS** versions released by Lenovo. **Items in green** are new in that version.

GSS 2016/2017 Release History (Spectrum Scale 4.2 based)

1Q/2016 GSS v2.5.10

Server:
2 * x3650-M5
- E5-2670-v3
- SAS12
- 10G,40G,FDR, EDR interoperability

Storage:
GSS24/26:
- 3,4,6,8 TB

GSS22s/24s/26s
- 1.2 TB SAS

GSS21s/22s/24s:
- 200,800 GB SSD

Software:
- xCat 2.9.2
- rhel-7.1
- gpfs-4.**2.0-2** +
- mofed-3.1-1

2Q/2016 GSS v2.6

Server:
2 * x3650-M5
- E5-2670-v3
- SAS12
- 10G,40G, FDR EDR interoperability
- **Intel OmniPath**

Storage:
GSS24/26:
- 3,4,6,8 TB

GSS22s/24s/26s:
- 1.2 TB SAS

GSS21s/22s/24s:
- 200,800 GB SSD

Software:
- xCat 2.**10**
- rhel-7.**2**
- gpfs-4.2.0-**3** +
- mofed-3.**2-2**; **OPA-10.1**

3Q/2016 GSS v3.0

Server:
2 * x3650-**M5+**
- E5-26**90-v4**
- SAS12
- 10/40/**100GbE**, FDR, native **EDR** support
- Intel OmniPath

Storage:
GSS24/26:
- 3,4,6,8 TB

GSS22s/24s/26s:
- 1.2 TB SAS

GSS21s/22s/24s:
- 200,800 GB SSD

Software:
- xCat 2.10
- rhel-7.2
- gpfs-4.2.**1-0** +
- mofed-3.**3**-2; OPA-10.**1**

4Q/2016 GSS v3.1

Server:
2 * x3650-m5+
- E5-2690-v4
- SAS12
- 10/40/100GbE, FDR/EDR, Intel OmniPath 100

Storage:
GSS**22**/GSS24/GSS26:
- 4,6,8, **10 TB**

GSS21s/22s/24s/26s:
- 1.2 TB SAS; 200,800 GB SSD

JBOD Expansion
- e.g. GSS24s→GSS26s

Software:
- xCat 2.**12**
- rhel-7.2
- **gpfs-4.2.1+ or** gpfs-4.**1.1**
- mofed-3.3-2; OPA-10.**2+**

4Q/2017 GSS v3.2

Server:
same as GSS v3.1
(hardware WfM in Dec/2017)

Storage:
same as GSS v3.1
(hardware WfM in Dec/2017)

Software:
- xCat 2.**13**
- rhel-7.**3**
- gpfs-4.2.**3**-latest or gpfs-4.1.1-latest
- mofed-**4.2-1**;
- OPA-10.**6**

Items in green are new in that release.

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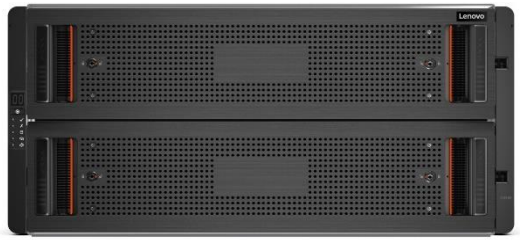
Lenovo™



Distributed Storage Solution

Distributed Storage Solution
for
IBM Spectrum Scale

DSS-G

Defined „appliance-like“ **Solution** for high demanding and high performance workloads.

Distributed Storage Solution
for
SUSE Enterprise Storage

DSS-C

Defined **Solution** for Lenovo scale-out HANA TDI offerings.

Distributed Storage Architecture
for
CEPH (SUSE or RedHat)

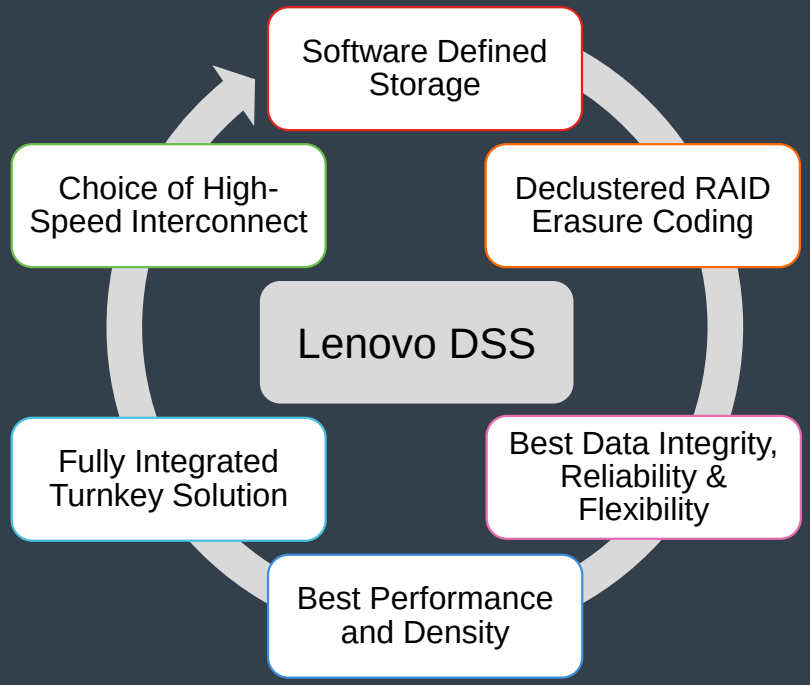
Expert design solutions customized for each client environment and need.

Lenovo™

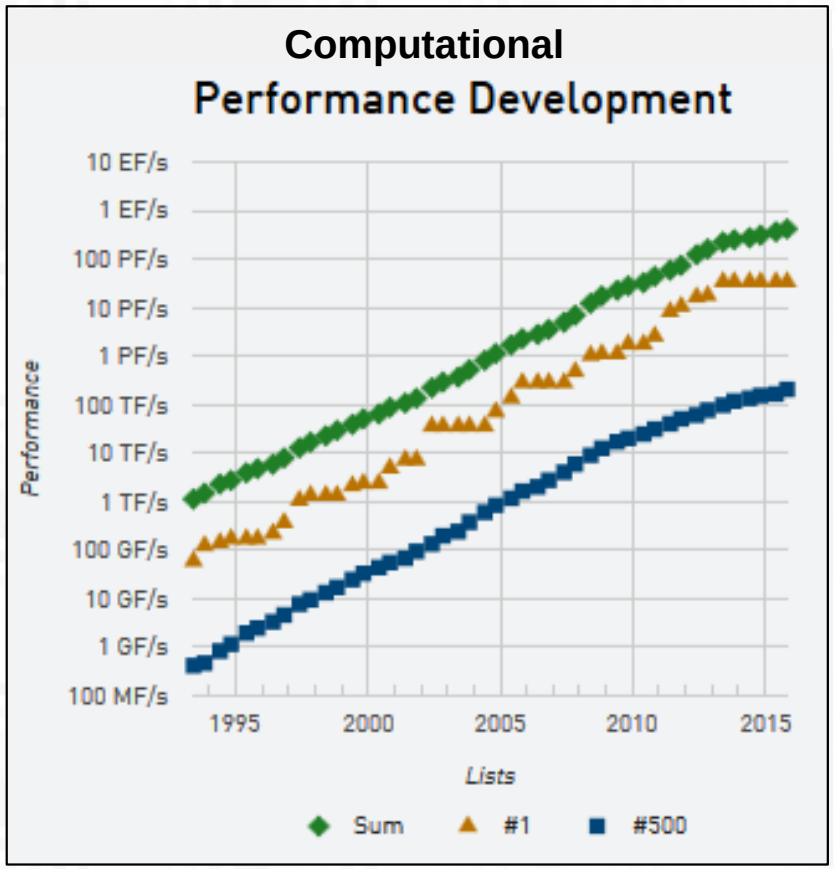
Distributed Storage Solution

DSS-G

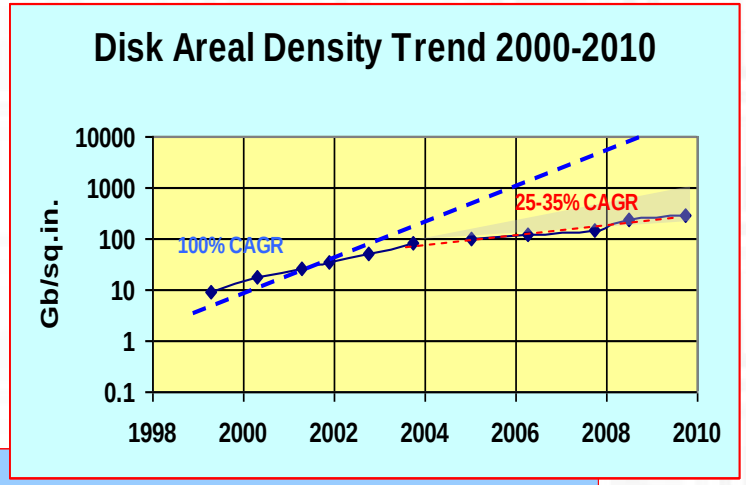
- Powered by IBM Spectrum Scale™
- Owned and supported by Lenovo
- Easily scales from small to large
- >6 PB per Rack

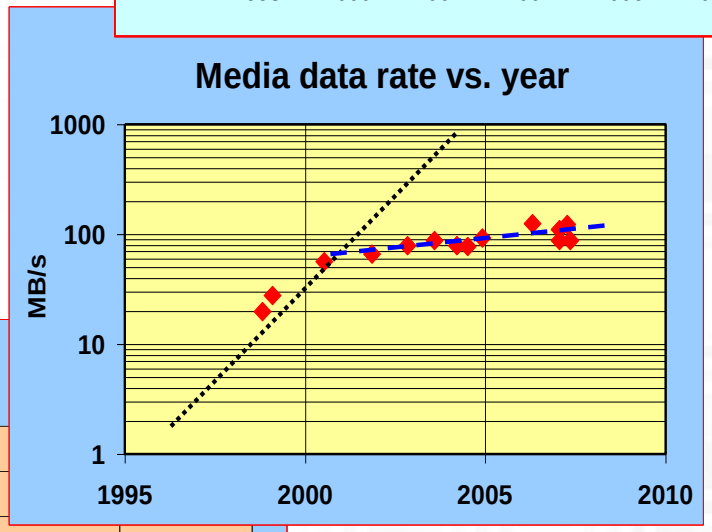


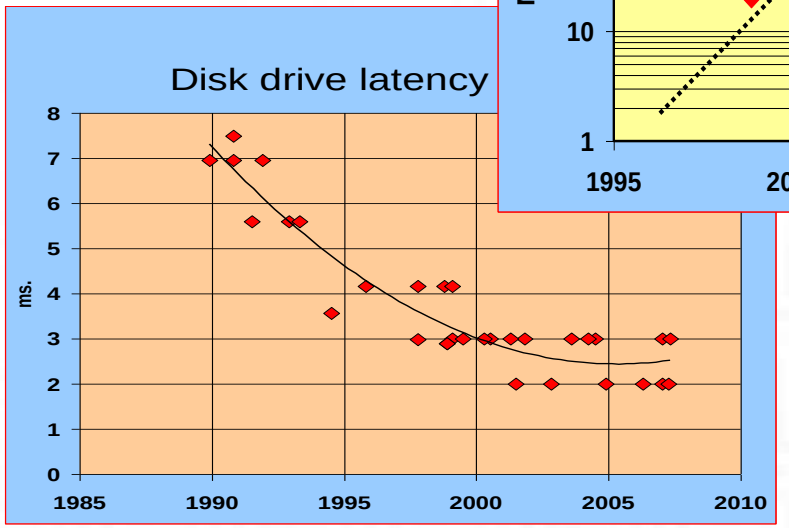
Disk Storage – Mind the Gap…



- Computational performance is still growing exponentially
- Disk technology metrics have flattened out
  - Except areal density, which still grows but much slower
- **Higher performance means more parts...**







Disk Reliability – Failure is the Norm

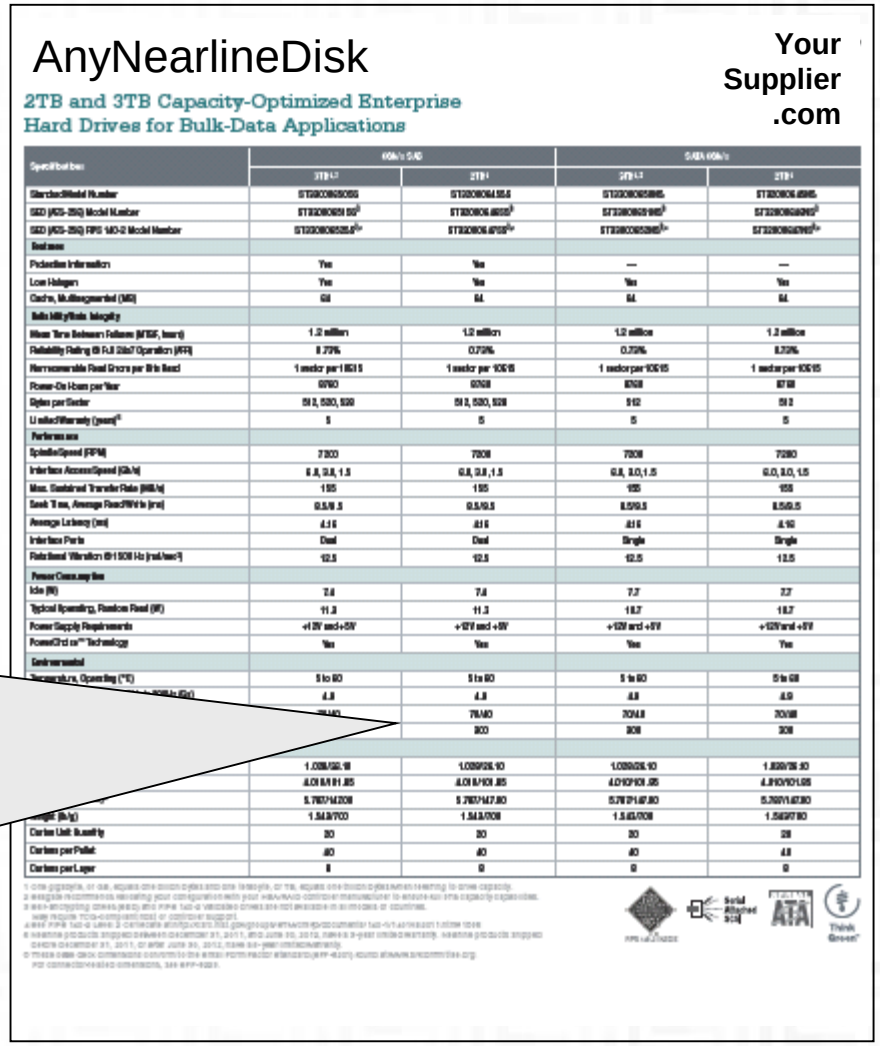
- Unpleasant facts about hard disks #1

MTBF

(Mean Time Between Failures):

- Best specs are ~1 to ~2 million hours

- **Question:**
  What does this mean in terms of yearly / monthly failures?
- **Answer:**
  Annual Failure Rate (AFR) = 1 / MTBF
  MTBF 1.000.000 h → AFR 0.9%
- For 10.000 disks this means:
  90 disks/year, or one disk every 4 days



AnyNearlineDisk

Your Supplier .com

2TB and 3TB Capacity-Optimized Enterprise Hard Drives for Bulk-Data Applications

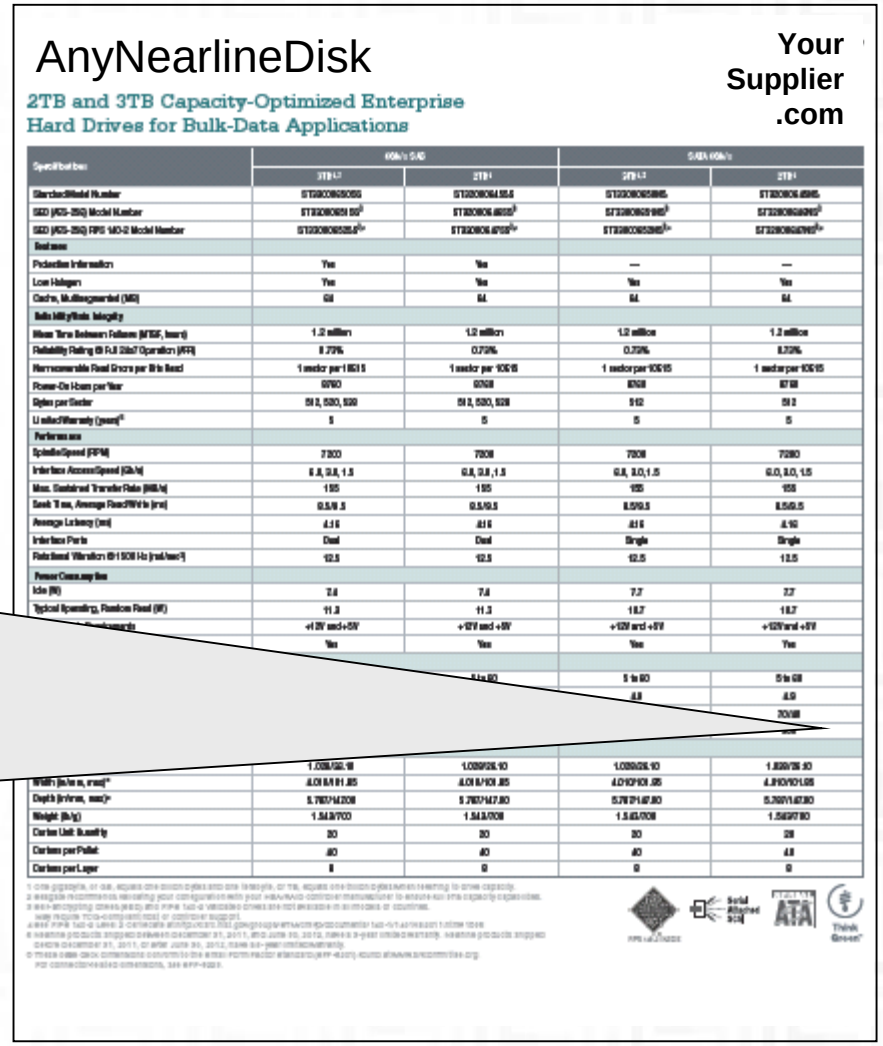
Disk Reliability – Failure is the Norm

- Unpleasant facts about hard disks #2

BER

(Bit Error Rate):

- Typical spec is 1 in 10^{15} bits read
- **Question:**
  How often can you read an 8TB disk before you hit a hard bit error?
- **Answer:**
  8 TeraByte = 8 * 10^{12} * 8 bit, so after ~15 complete disk reads


AnyNearlineDisk

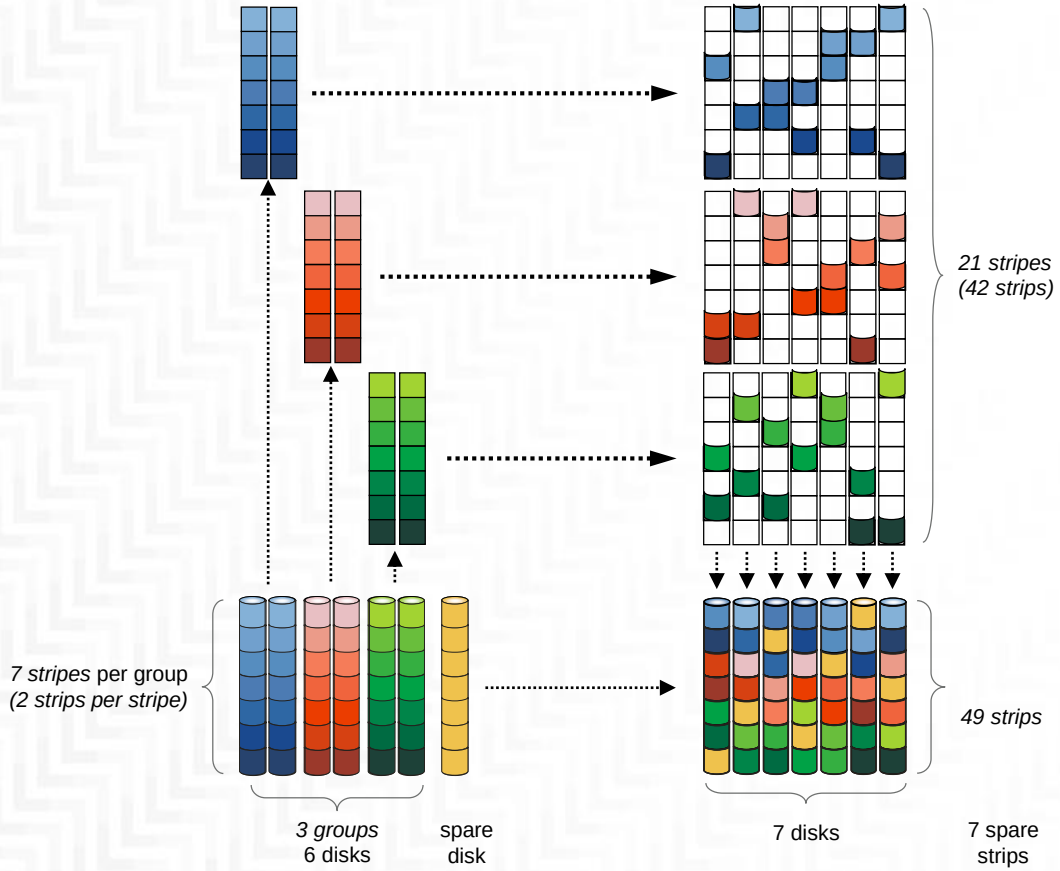
Your Supplier .com

2TB and 3TB Capacity-Optimized Enterprise Hard Drives for Bulk-Data Applications

The Magic of Declustered RAID

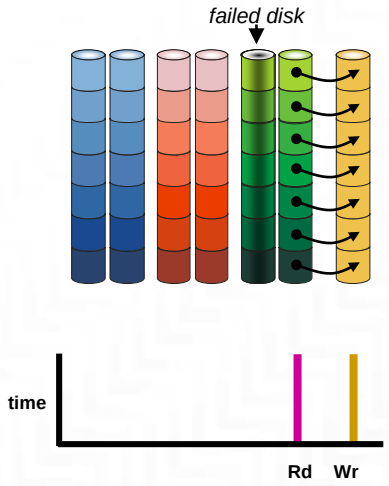
How does Declustered RAID work?

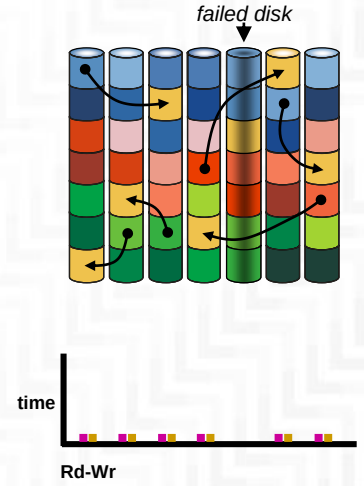
- Distributing Data and Parity information as well as Spare Capacity across all disks



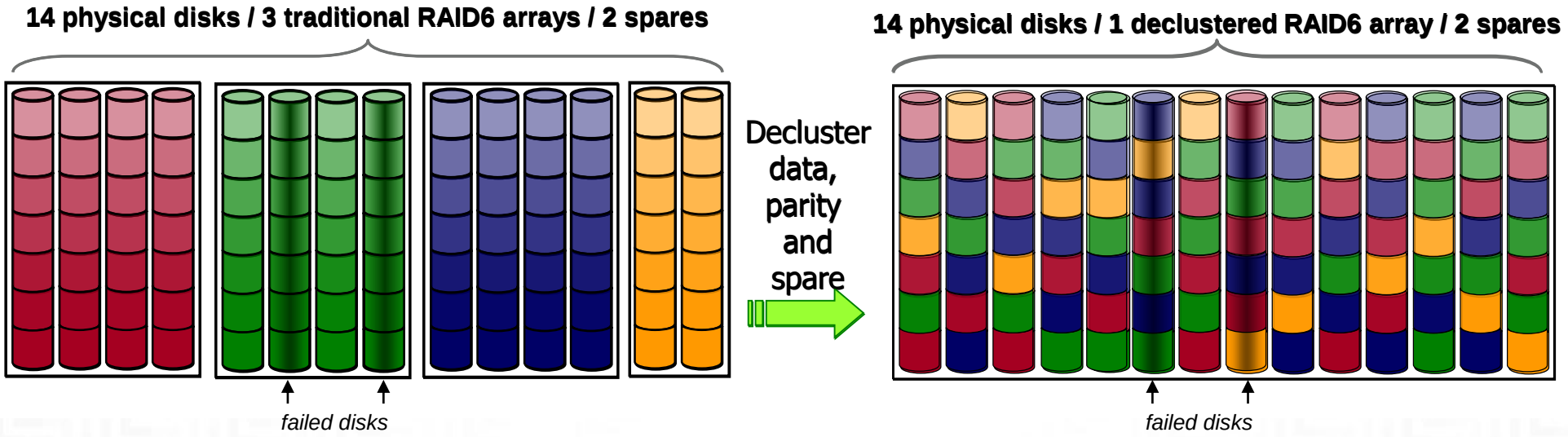
Rebuild with Declustered RAID1

- Traditional RAID would have one LUN (logical unit number) fully busy resulting in slow rebuild and high impact overall
- **Declustered RAID** rebuild activity spreads the load across many disks resulting in **faster rebuild** and **less disruption** to user programs
- **Declustered RAID minimizes** critical data exposed to **data loss in case of a second failure.**

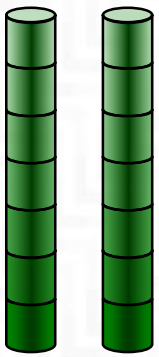




Declustered RAID6 Rebuild Example – Two disk faults



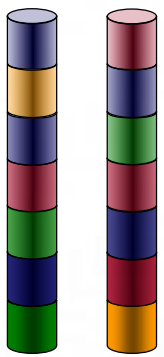
failed disks



Number of faults per stripe		
Red	Green	Blue
0	2	0
0	2	0
0	2	0
0	2	0
0	2	0
0	2	0
0	2	0

Number of stripes with 2 faults = 7

failed disks



Number of faults per stripe		
Red	Green	Blue
1	0	1
0	0	1
0	1	1
2	0	0
0	1	1
1	0	1
0	1	0

Number of stripes with 2 faults = 1

DSS-G220 8+**3p** → 3 faults in a 83-disk array: (11/83)*(10/82)*(9/81)=0.18%

DSS-G260 8+**3p** → 3 faults in a 251-disk array: (11/251)*(10/250)*(9/249)=0.006%

New IBM Spectrum Scale™ Licensing

	Standard Edition	Standard Edition for DSS	Data Mgmt Edition for DSS
Multi protocol scalable file service with simultaneous access to a common set of data	●	●	●
Facilitate data access with a global namespace, massively scalable file system, quotas and snapshots, data integrity & availability and filesets	●	●	●
Simplify management with GUI	●	●	●
Improved efficiency with QoS and Compression	●	●	●
Create optimized tiered storage pools based on performance, locality, or cost	●	●	●
Simplify data management with Information Lifecycle Management (ILM) tools that include policy based data placement and migration	●	●	●
Enable worldwide data access using AFM asynchronous replication	●	●	●
Asynchronous multi site Disaster Recovery			●
Hybrid cloud (TCT)			●
Protect data with native encryption and secure erase, NIST compliant and FIPS certified.			●
Erasure coding for certified platforms		●	●
Server/Client based **per socket** licensing	●		
Storage based **per spindle** licensing		●	●
Storage based **per usable TiB** licensing			●

- Are any additional licenses (client, server, ...) needed for Spectrum Scale for Distributed Storage Server licensed per drive / flash module / capacity?
  - No, with this new model, solely the storage itself is licensed.
- What license option do I have for non-DSS storage in the same Cluster, e.g. separated Metadata on traditional controller based Storage?
  - For non-DSS storage there is the choice between the old socket-based licenses (Standard Edition only) and new capacity based licensed (Data Mgmt Edition only) – a per TB license.
- Can I mix traditional GPFS/Spectrum Scale storage licensed per socket and new Spectrum Scale storage licensed per drive?
  - Yes, however the drive-based license is only available with DSS-G. As long as a server/client accesses (cross-cluster/remote or locally) storage that is licensed per socket, it will also require a socket based client/server license.
- Can I mix Standard Edition and Data Management Edition within a cluster?
  - No, due to the additional features that is not possible. If a part of a cluster is Data Mgmt Edition, the whole Cluster needs to be Data Mgmt Edition.
- Are the drive-based Spectrum Scale for DSS licenses transferrable?
  - No, a license is attached to the storage/machine sold with.
- Where can I get more information?
  - For more FAQ please have a look at https://www.ibm.com/support/knowledgecenter/en/STXKQY/gpfsclustersfaq.html

Lenovo Distributed Storage Solution for IBM Spectrum Scale

Lenovo

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Lenovo ThinkSystem SR650 Server
Product Guide

Lenovo ThinkSystem SR650 is an ideal 2-socket 2U rack server for small businesses up to large enterprises that need industry-leading reliability, management, and security, as well as maximizing performance and flexibility for future growth. The SR650 server is designed to handle a wide range of workloads, such as databases, virtualization and cloud computing, virtual desktop infrastructure (VDI), enterprise applications, collaboration/email, and business analytics and big data.

Featuring the Intel Xeon Processor Scalable Family, the SR650 server offers scalable performance, storage capacity, and I/O expansion. The SR650 server supports up to two processors, up to 1.5 TB (support for up to 3 TB is planned for future) of 2666 MHz TruDDR4 memory, up to 24x 2.5-inch or 14x 3.5-inch drive bays with an extensive choice of NVMe PCIe SSDs, SAS/SATA SSDs, and SAS/SATA HDDs, and flexible I/O expansion options with the LOM slot, the dedicated storage controller slot, and up to 6x PCIe slots.

The SR650 server offers basic or advanced hardware RAID protection and a wide range of networking options, including selectable LOM, ML2, and PCIe network adapters. The next-generation Lenovo XClarity Controller, which is built into the SR650 server, provides advanced service processor control, monitoring, and alerting functions.

The following figure shows the ThinkSystem SR650.

Figure 1. Lenovo ThinkSystem SR650

Did you know?

The SR650 server features a unique AnyBay design that allows a choice of drive interface types in the same drive bay: SAS drives, SATA drives, or U.2 NVMe PCIe drives.

The SR650 server offers onboard NVMe PCIe ports that allow direct connections to the U.2 NVMe PCIe SSDs, which frees up I/O slots and helps lower NVMe solution acquisition costs.

The SR650 server delivers impressive compute power per watt, featuring 80 PLUS Titanium and Platinum redundant power supplies that can deliver 96% (Titanium) or 94% (Platinum) efficiency at 50% load when connected to a 200 - 240 V AC power source.

The SR650 server is designed to meet ASHRAE A4 standards (up to 45 °C [113 °F]) in select configurations, which enable customers to lower energy costs, while still maintaining world-class reliability.

https://lenovopress.com/lp0644-lenovo-thinksystem-sr650-server

Lenovo ThinkSystem SR650 Server 1

Lenovo

LENOVO PRESS

Lenovo Distributed Storage Solution for IBM Spectrum Scale (DSS-G)
Product Guide

Lenovo Distributed Storage Solution for IBM Spectrum Scale (DSS-G) is a software-defined storage (SDS) solution for dense scalable file and object storage suitable for high-performance and data-intensive environments. Enterprises or organizations running HPC, BigData or cloud workloads will benefit the most from the DSS-G implementation.

DSS-G combines the performance of Lenovo latest generation x3650 M5 servers, Lenovo D1224 and D3284 storage enclosures, and industry leading IBM Spectrum Scale software to offer a high performance, scalable building block approach to modern storage needs.

Lenovo DSS-G is delivered a pre-integrated, easy-to-deploy rack-level solution that dramatically reduces time-to-value and total cost of ownership (TCO). The DSS-G base offerings are built on Lenovo System x3650 M5 servers with Intel Xeon E5-2600 v4 series processors, Lenovo Storage D1224 Drive Enclosures with high-performance 2.5-inch SAS solid-state drives, and Lenovo Storage D3284 High-Density Drive Enclosures with large capacity 3.5-inch NL SAS HDDs.

Combined with IBM Spectrum Scale (formerly IBM General Parallel File System, GPFS), an industry leader in high-performance clustered file system, you have an ideal solution for the ultimate file and object storage solution for HPC and BigData.

Figure 1. Lenovo DSS-G

Did you know?

The DSS-G solution ships fully integrated into a rack cabinet, tested, configured, and ready to be plugged in and turned on; it is designed to integrate into an existing infrastructure effortlessly, to dramatically accelerate time to value and reduce infrastructure maintenance costs.

Lenovo DSS-G is licensed by the number of drives installed, rather than the number of processor cores or the number of connected clients, so there are no added licenses for other servers or clients that mount and work with the file system.

https://lenovopress.com/lp0626-lenovo-distributed-storage-solution-for-ibm-spectrum-scale

Lenovo Distributed Storage Solution for IBM Spectrum Scale (DSS-G) 1

Lenovo Storage – 12Gb SAS JBODs

Lenovo

LENOVO PRESS

Lenovo Storage D1212 and D1224 Drive Enclosures

Product Guide

The Lenovo Storage D1212 and D1224 Disk Expansion Enclosures offer 12 Gbps SAS direct-attached storage expansion capabilities that are designed to provide simplicity, speed, scalability, security, and high availability for small to large businesses. The D1212 and D1224 deliver enterprise-class storage technology in a cost-effective solution with flexible drive configurations and RAID or JBOD (non-RAID) host connectivity.

The D1212 and D1224 expansion units are designed for a wide range of workloads, including big data and analytics, video surveillance, media streaming, private clouds, file and print serving, e-mail and collaboration, and databases. They also well-suited for software defined storage (SDS) and Windows Server solutions with Storage Spaces.

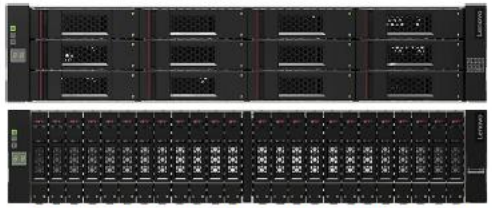


Figure 1. Lenovo Storage D1212 and D1224 Disk Expansion Enclosures

Did you know?

The D1212 and D1224 expansion enclosures offer flexible drive configurations with the choice of 2.5-inch and 3.5-inch drive form factors, 10K or 15K rpm SAS and 7.2K rpm NL SAS hard disk drives (HDDs) and self-encrypting drives (SEDs), and SAS solid-state drives (SSDs).

With support for daisy chaining, the D1212 can be scaled up to 960 TB for capacity-optimized configurations, and the D1224 can be scaled up to 192 drives for performance-optimized configurations.

The D1212 and D1224 expansion units support 12 Gbps SAS connectivity, which doubles the data transfer rate compared to 6 Gb SAS solutions to maximize performance of storage I/O-intensive applications.

https://lenovopress.com/lp0512-lenovo-storage-d1212-d1224-drive-enclosures

Click here to check for updates

Lenovo Storage D1212 and D1224 Drive Enclosures 1

Lenovo

LENOVO PRESS

Lenovo Storage D3284 External High Density Drive Expansion Enclosure

Product Guide

The Lenovo Storage D3284 High Density Expansion Enclosure offers 12 Gbps SAS direct-attached storage expansion capabilities that are designed to provide density, speed, scalability, security, and high availability for medium to large businesses. The D3284 delivers enterprise-class storage technology in a cost-effective dense solution with flexible drive configurations of up to 84 drives in 5U rack space and JBOD (non-RAID) host connectivity.

The D3284 expansion unit is designed for a wide range of workloads, including big data and analytics, video surveillance, private and hybrid clouds, file and print serving, and backup and archiving. The D3284 is also well-suited for software defined storage (SDS) and Windows Storage Spaces.

Figure 1. Lenovo Storage D3284 HD Expansion Enclosure

Did you know?

The D3284 expansion enclosures support 12 Gbps SAS connectivity, which doubles the data transfer rate compared to 6 Gb SAS solutions to maximize performance of storage I/O-intensive applications.

With support for daisy chaining, the D3284 expansion enclosures can be scaled up to 3.36 PB for capacity-optimized configurations.

The D3284 expansion enclosures allow daisy chaining with D1212 and D1224 expansion enclosures: Up to two D3284 and two D1212 or one D1224 drive enclosures is supported in a single chain.

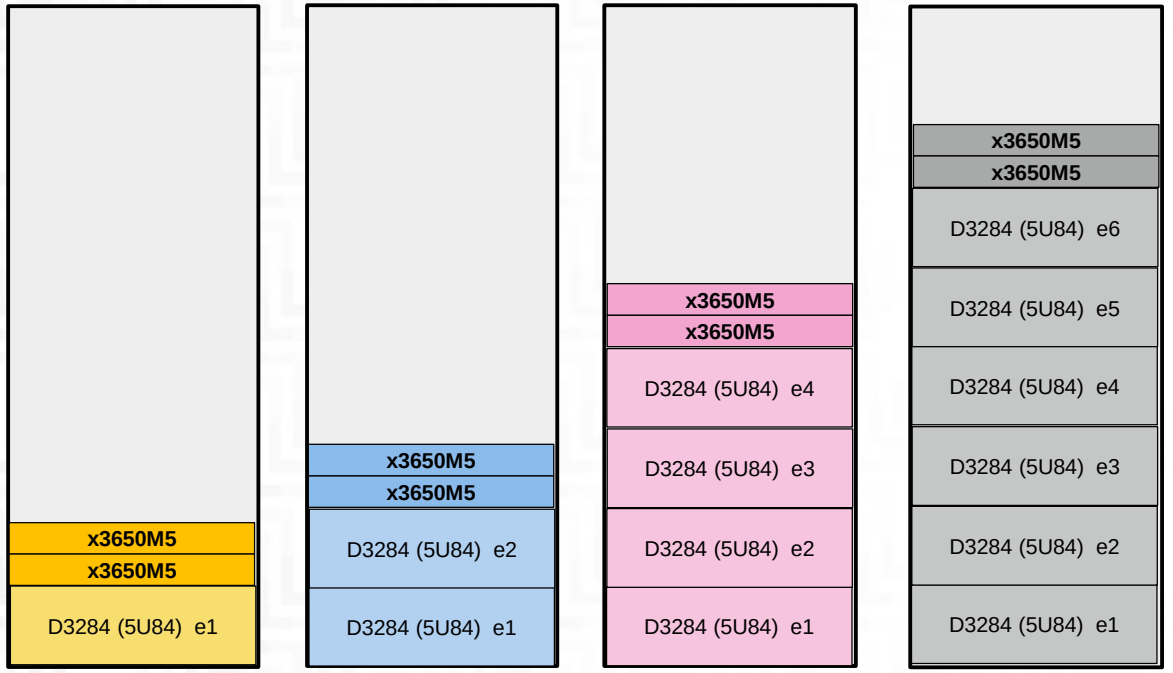
https://lenovopress.com/lp0513-lenovo-storage-d3284-external-high-density-drive-expansion-enclosure

Click here to check for updates

Lenovo Storage D3284 External High Density Drive Expansion Enclosure 1

Lenovo DSS-G 2.0: Enclosure-based building blocks

Models with Lenovo D3284 JBODs:



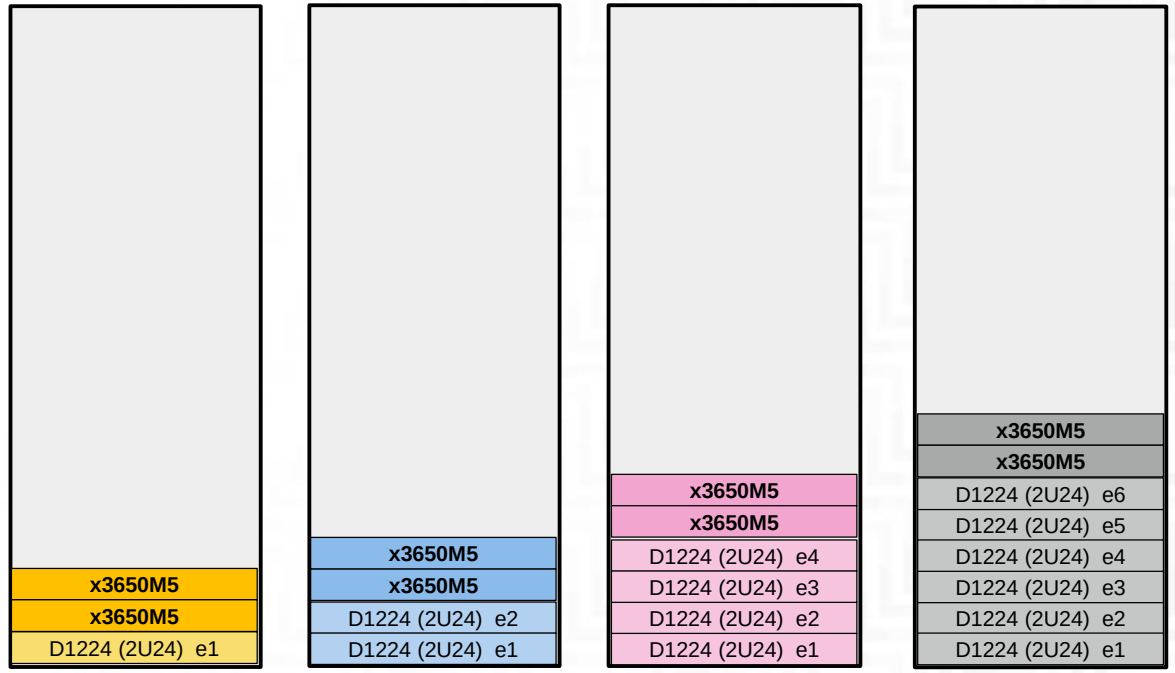
82 x NL-SAS
2x SSD

166 x NL-SAS
2x SSD

334 x NL-SAS
2x SSD

502 x NL-SAS
2x SSD

Models with Lenovo D1224 JBODs:



n/a

24x SSD

46 x 10k-SAS
2x SSD
or
48x SSD

94 x 10k-SAS
2x SSD
or
96x SSD

142 x 10k-SAS
2x SSD

Lenovo DSS-G – Current Releases

- DSS-G 1.2 (Dec/2017)
  - **Rackless** DSS-G (order without a 1410 rack)
  - **12TB** NL-SAS drives
  - Software refresh:
    - RHEL **7.3**
    - Latest GPFS 4.2.3 PTF/efix levels
    - MOFED 4.2; OPA 10.6; xCAT 2.13
  - DSS **G100 NVMe** with SR650 (2U) server: 1..8 NVMe drives (classical Spectrum Scale, not GNR)
- DSS-G 2.0 (Mar/2018)
  - Server transition to Lenovo SR650 (Purley)
  - **4x SAS adapters** (Lenovo 430-16e) ... enables **more storage bandwidth**
  - DSS-G Model **G210** (one D3284 enclosure) ... „**special bid**“ until single enclosure is IBM GA
  - Latest software levels; disk drive refreshes
    - RHEL **7.4**
    - Still based on GPFS 4.2.3 (PTF update to 5.0 on a by-request basis until DSS-G 2.1)

Lenovo DSS-G – 2018 Roadmap

- DSS-G 2.1 (Aug/2018)
  - DSS G100 NVMe refresh to **SR630 (1U)** server
  - DSS **G210** (**generally available**, no longer special bid)
  - GPFS/GNR **5.0.1** (and 4.2.3-ptf8)
  - Latest software levels; disk drive refreshes (incl. more SSDs)
  - Withdrawal from Marketing of x3650-M5 server (8871-AC3)

- DSS-G 2.2 (Nov/2018)
  - **14TB** NL-SAS drives
  - Enabling **G250** ... finalizing test plans with IBM
  - Other NL-SAS building blocks, incl. DSS **G230** and **G280** ... finalizing test plans with IBM
  - **Enclosure intermix** (e.g. DSS G242) ... pending IBM support
  - Latest software levels; disk drive refreshes
  - RHEL **7.5**
  - New **NVMe** based solutions

DSS-G2x0 with Lenovo D3284 – NL-SAS Capacities

	NL-SAS Drive Capacity [TB]:			4		6		8		10		12		14		
DSS-G Model:	Size [U]	Drives	Spares	Usable Drives	Capacity per DSS-G building block											Metric
					PB	PiB	PB	PiB	PB	PiB	PB	PiB	PB	PiB	PB	PiB	
DSS-G 2 1 0	9	82	4	78	0,328	0,291	0,492	0,437	0,656	0,583	0,820	0,728	0,984	0,874	1,148	1,020	raw
					0,312	0,277	0,468	0,416	0,624	0,554	0,780	0,693	0,936	0,831	1,092	0,970	unrepl.
					0,250	**0,222**	**0,374**	**0,333**	**0,499**	**0,443**	**0,624**	**0,554**	**0,749**	**0,665**	**0,874**	**0,776**	**8+2P**
					0,227	0,202	0,340	0,302	0,454	0,403	0,567	0,504	0,681	0,605	0,794	0,705	8+3P
DSS-G 2 2 0	14	166	4	162	0,664	0,590	0,996	0,885	1,328	1,180	1,660	1,474	1,992	1,769	2,324	2,064	raw
					0,648	0,576	0,972	0,863	1,296	1,151	1,620	1,439	1,944	1,727	2,268	2,014	unrepl.
					0,518	**0,460**	**0,778**	**0,691**	**1,037**	**0,921**	**1,296**	**1,151**	**1,555**	**1,381**	**1,814**	**1,612**	8+2P
					0,471	0,419	0,707	0,628	0,943	0,837	1,178	1,046	1,414	1,256	1,649	1,465	8+3P
DSS-G 2 3 0	19	250	6	244	1,000	0,888	1,500	1,332	2,000	1,776	2,500	2,220	3,000	2,665	3,500	3,109	raw
					0,976	0,867	1,464	1,300	1,952	1,734	2,440	2,167	2,928	2,601	3,416	3,034	unrepl.
					0,781	**0,693**	**1,171**	**1,040**	**1,562**	**1,387**	**1,952**	**1,734**	**2,342**	**2,080**	**2,733**	**2,427**	**8+2P**
					0,710	0,630	1,065	0,946	1,420	1,261	1,775	1,576	2,129	1,891	2,484	2,207	8+3P
DSS-G 2 4 0	24	334	8	326	1,336	1,187	2,004	1,780	2,672	2,373	3,340	2,967	4,008	3,560	4,676	4,153	raw
					1,304	1,158	1,956	1,737	2,608	2,316	3,260	2,895	3,912	3,475	4,564	4,054	unrepl.
					1,043	**0,927**	**1,565**	**1,390**	**2,086**	**1,853**	**2,608**	**2,316**	**3,130**	**2,780**	**3,651**	**3,243**	**8+2P**
					0,948	0,842	1,423	1,263	1,897	1,685	2,371	2,106	2,845	2,527	3,319	2,948	8+3P
DSS-G 2 5 0	29	418	10	408	1,672	1,485	2,508	2,228	3,344	2,970	4,180	3,713	5,016	4,455	5,852	5,198	raw
					1,632	1,450	2,448	2,174	3,264	2,899	4,080	3,624	4,896	4,349	5,712	5,073	unrepl.
					1,306	**1,160**	**1,958**	**1,739**	**2,611**	**2,319**	**3,264**	**2,899**	**3,917**	**3,479**	**4,570**	**4,059**	**8+2P**
					1,187	1,054	1,780	1,581	2,374	2,108	2,967	2,635	3,561	3,163	4,154	3,690	8+3P
DSS-G 2 6 0	34	502	12	490	2,008	1,783	3,012	2,675	4,016	3,567	5,020	4,459	6,024	5,350	7,028	6,242	raw
					1,960	1,741	2,940	2,611	3,920	3,482	4,900	4,352	5,880	5,222	6,860	6,093	unrepl.
					1,568	**1,393**	**2,352**	**2,089**	**3,136**	**2,785**	**3,920**	**3,482**	**4,704**	**4,178**	**5,488**	**4,874**	**8+2P**
					1,425	1,266	2,138	1,899	2,851	2,532	3,564	3,165	4,276	3,798	4,989	4,431	8+3P

Greyed-out items are not yet available in DSS-G v2.0.

DSS-G20x with Lenovo D1224 – SSD Capacities

	SSD Capacity [GB]:				400 (3 or 10 DWD)		800 (3 or 10 DWD)		1600 (3 or 10 DWD)		1920 (1 DWD)		3840 (1 DWD)		7680 (1 DWD)		15360 (1 DWD)		
DSS-G Model:	**Size [U]**	**Drives**	**Spares**	**Usable Drives**	**Capacity per DSS-G building block**														**Metric**
					TB	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	
DSS-G 2 0 1	6	24	2	22	9,6	8,7	19,2	17,5	38,4	34,9	46,1	41,9	92,2	83,8	184,3	167,6	368,6	335,3	raw
					8,8	8,0	17,6	16,0	35,2	32,0	42,2	38,4	84,5	76,8	169,0	153,7	337,9	307,3	unrepl.
					7,0	**6,4**	**14,1**	**12,8**	**28,2**	**25,6**	**33,8**	**30,7**	**67,6**	**61,5**	**135,2**	**122,9**	**270,3**	**245,9**	**8+2P**
					6,4	5,8	12,8	11,6	25,6	23,3	30,7	27,9	61,4	55,9	122,9	111,8	245,8	223,5	8+3P
DSS-G 2 0 2	8	48	4	44	19,2	17,5	38,4	34,9	76,8	69,8	92,2	83,8	184,3	167,6	368,6	335,3	737,3	670,6	raw
					17,6	16,0	35,2	32,0	70,4	64,0	84,5	76,8	169,0	153,7	337,9	307,3	675,8	614,7	unrepl.
					14,1	**12,8**	**28,2**	**25,6**	**56,3**	**51,2**	**67,6**	**61,5**	**135,2**	**122,9**	**270,3**	**245,9**	**540,7**	**491,7**	8+2P
					12,8	11,6	25,6	23,3	51,2	46,6	61,4	55,9	122,9	111,8	245,8	223,5	491,5	447,0	8+3P
DSS-G 2 0 3	10	72	4	68	28,8	26,2	57,6	52,4	115,2	104,8	138,2	125,7	276,5	251,5	553,0	502,9	1.105,9	1.005,8	raw
					27,2	24,7	54,4	49,5	108,8	99,0	130,6	118,7	261,1	237,5	522,2	475,0	1.044,5	949,9	unrepl.
					21,8	**19,8**	**43,5**	**39,6**	**87,0**	**79,2**	**104,4**	**95,0**	**208,9**	**190,0**	**417,8**	**380,0**	**835,6**	**760,0**	**8+2P**
					19,8	18,0	39,6	36,0	79,1	72,0	95,0	86,4	189,9	172,7	379,8	345,4	759,6	690,9	8+3P
DSS-G 2 0 4	12	96	4	92	38,4	34,9	76,8	69,8	153,6	139,7	184,3	167,6	368,6	335,3	737,3	670,6	1.474,6	1.341,1	raw
					36,8	33,5	73,6	66,9	147,2	133,9	176,6	160,7	353,3	321,3	706,6	642,6	1.413,1	1.285,2	unrepl.
					29,4	**26,8**	**58,9**	**53,6**	**117,8**	**107,1**	**141,3**	**128,5**	**282,6**	**257,0**	**565,2**	**514,1**	**1.130,5**	**1.028,2**	**8+2P**
					26,8	24,3	53,5	48,7	107,1	97,4	128,5	116,8	256,9	233,7	513,9	467,4	1.027,7	934,7	8+3P

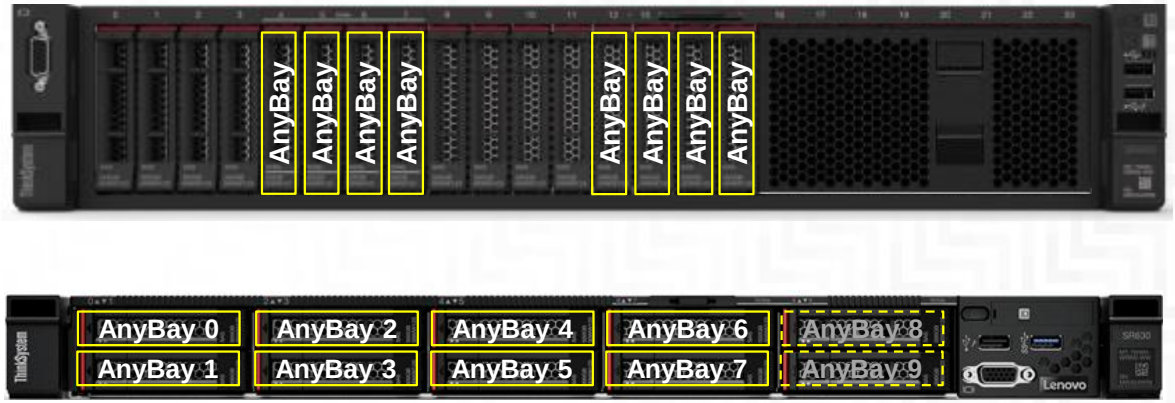
Greyed-out items are not yet available in DSS-G v2.0.

Lenovo HPC Storage Update – Agenda

- **Lenovo** Overview
- Lenovo **ThinkSystem Storage** Update
- Lenovo GPFS Storage Server (**GSS**) Update
- Lenovo Distributed Storage Solution for IBM Spectrum Scale (**DSS-G**) Update
  - Including **G100 NVMe**-based model
- GSS / DSS-G status regarding „**Spectre/Meltdown**“ security vulnerability

Lenovo DSS G100 NVMe Server

- Lenovo ThinkSystem SR650 server
  - **SR650** (2U) available since Dec/2017
  - **SR630** (1U) coming in 2018
  - 2x 6142 SkyLake CPUs; 192 or 384GB
  - Up to **8x U.2 NVMe** drives in AnyBay slots
    - All NVMe drives from ThinkSystem portfolio...
  - Networking options:
    - 2x Mellanox ConnectX-5 2-port (VPI)
    - 2x Intel OPA100 1-port
    - Ethernet options: 10 / 25 / 40 / 100GbE
- Software stack: „Classical“ Spectrum Scale
  - GPFS replication as needed for redundancy
  - Can also use **Excelero NVMesh**
    - JBOF and RAID0/10 today, erasure coding coming
  - **E8-Storage** software certified on SR630
    - RAID within the server (4+1p; 8+2p)



Current NVMe drive portfolio:

- Intel P4800 (Optane): 375 GB (30DWD)
- Intel P4600: 1.6 / 3.2 TB (3DWD)
- Intel P4500: 1 / 2 / 4 TB (<=1 DWD)
- Toshiba PX04PMB:
  - 800 GB / 1600 GB (10DWD)
  - 960 GB /1920 GB (3DWD)
- Samsung PM963: 1.92 / 3.84TB (1DWD)

DSS-G100 – NVMe Capacities (Toshiba, Samsung)

	NVMe Capacity [GB]:				800 (10 DWD, PX04PMB)		1600 (10 DWD, PX04PMB)		960 (3 DWD, PX04PMB)		1920 (3 DWD, PX04PMB)		1920 (1 DWD, PM963)		3840 (1 DWD, PM963)		
DSS-G Model:	**Size [U]**	**Drives**	**Spares**	**Usable Drives**	**Capacity per DSS-G building block**												**Metric**
					TB	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	
DSS-G 1 0 0	2	1	0	1	**0,80** 0,40	**0,73** 0,36	**1,60** 0,80	**1,46** 0,73	**0,96** 0,48	**0,87** 0,44	**1,92** 0,96	**1,75** 0,87	**1,92** 0,96	**1,75** 0,87	**3,84** 1,92	**3,49** 1,75	**1Way** 2Way
DSS-G 1 0 0	2	2	0	2	**1,60** 0,80	**1,46** 0,73	**3,20** 1,60	**2,91** 1,46	**1,92** 0,96	**1,75** 0,87	**3,84** 1,92	**3,49** 1,75	**3,84** 1,92	**3,49** 1,75	**7,68** 3,84	**6,98** 3,49	**1Way** 2Way
DSS-G 1 0 0	2	3	0	3	**2,40** 1,20	**2,18** 1,09	**4,80** 2,40	**4,37** 2,18	**2,88** 1,44	**2,62** 1,31	**5,76** 2,88	**5,24** 2,62	**5,76** 2,88	**5,24** 2,62	**11,52** 5,76	**10,48** 5,24	**1Way** 2Way
DSS-G 1 0 0	2	4	0	4	**3,20** 1,60	**2,91** 1,46	**6,40** 3,20	**5,82** 2,91	**3,84** 1,92	**3,49** 1,75	**7,68** 3,84	**6,98** 3,49	**7,68** 3,84	**6,98** 3,49	**15,36** 7,68	**13,97** 6,98	**1Way** 2Way
DSS-G 1 0 0	2	5	0	5	**4,00** 2,00	**3,64** 1,82	**8,00** 4,00	**7,28** 3,64	**4,80** 2,40	**4,37** 2,18	**9,60** 4,80	**8,73** 4,37	**9,60** 4,80	**8,73** 4,37	**19,20** 9,60	**17,46** 8,73	**1Way** 2Way
DSS-G 1 0 0	2	6	0	6	**4,80** 2,40	**4,37** 2,18	**9,60** 4,80	**8,73** 4,37	**5,76** 2,88	**5,24** 2,62	**11,52** 5,76	**10,48** 5,24	**11,52** 5,76	**10,48** 5,24	**23,04** 11,52	**20,95** 10,48	**1Way** 2Way
DSS-G 1 0 0	2	7	0	7	**5,60** 2,80	**5,09** 2,55	**11,20** 5,60	**10,19** 5,09	**6,72** 3,36	**6,11** 3,06	**13,44** 6,72	**12,22** 6,11	**13,44** 6,72	**12,22** 6,11	**26,88** 13,44	**24,45** 12,22	**1Way** 2Way
DSS-G 1 0 0	2	8	0	8	**6,40** 3,20	**5,82** 2,91	**12,80** 6,40	**11,64** 5,82	**7,68** 3,84	**6,98** 3,49	**15,36** 7,68	**13,97** 6,98	**15,36** 7,68	**13,97** 6,98	**30,72** 15,36	**27,94** 13,97	**1Way** 2Way

DSS-G100 – NVMe Capacities (Intel)

	NVMe Capacity [GB]:				375 (30 DWD, P4800X)		1600 (3 DWD, P4600)		3200 (3 DWD, P4600)		1000 (0,75 DWD, P4500)		2000 (0,5 DWD, P4500)		4000 (0,65 DWD, P4500)		
DSS-G Model:	**Size [U]**	**Drives**	**Spares**	**Usable Drives**	**Capacity per DSS-G building block**												**Metric**
					TB	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	**TB**	**TiB**	
DSS-G 1 0 0	2	1	0	1	**0,38** 0,19	**0,34** 0,17	**1,60** 0,80	**1,46** 0,73	**3,20** 1,60	**2,91** 1,46	**1,00** 0,50	**0,91** 0,45	**2,00** 1,00	**1,82** 0,91	**4,00** 2,00	**3,64** 1,82	**1Way** 2Way
DSS-G 1 0 0	2	2	0	2	**0,75** 0,38	**0,68** 0,34	**3,20** 1,60	**2,91** 1,46	**6,40** 3,20	**5,82** 2,91	**2,00** 1,00	**1,82** 0,91	**4,00** 2,00	**3,64** 1,82	**8,00** 4,00	**7,28** 3,64	**1Way** 2Way
DSS-G 1 0 0	2	3	0	3	**1,13** 0,56	**1,02** 0,51	**4,80** 2,40	**4,37** 2,18	**9,60** 4,80	**8,73** 4,37	**3,00** 1,50	**2,73** 1,36	**6,00** 3,00	**5,46** 2,73	**12,00** 6,00	**10,91** 5,46	**1Way** 2Way
DSS-G 1 0 0	2	4	0	4	**1,50** 0,75	**1,36** 0,68	**6,40** 3,20	**5,82** 2,91	**12,80** 6,40	**11,64** 5,82	**4,00** 2,00	**3,64** 1,82	**8,00** 4,00	**7,28** 3,64	**16,00** 8,00	**14,55** 7,28	**1Way** 2Way
DSS-G 1 0 0	2	5	0	5	**1,88** 0,94	**1,71** 0,85	**8,00** 4,00	**7,28** 3,64	**16,00** 8,00	**14,55** 7,28	**5,00** 2,50	**4,55** 2,27	**10,00** 5,00	**9,09** 4,55	**20,00** 10,00	**18,19** 9,09	**1Way** 2Way
DSS-G 1 0 0	2	6	0	6	**2,25** 1,13	**2,05** 1,02	**9,60** 4,80	**8,73** 4,37	**19,20** 9,60	**17,46** 8,73	**6,00** 3,00	**5,46** 2,73	**12,00** 6,00	**10,91** 5,46	**24,00** 12,00	**21,83** 10,91	**1Way** 2Way
DSS-G 1 0 0	2	7	0	7	**2,63** 1,31	**2,39** 1,19	**11,20** 5,60	**10,19** 5,09	**22,40** 11,20	**20,37** 10,19	**7,00** 3,50	**6,37** 3,18	**14,00** 7,00	**12,73** 6,37	**28,00** 14,00	**25,47** 12,73	**1Way** 2Way
DSS-G 1 0 0	2	8	0	8	**3,00** 1,50	**2,73** 1,36	**12,80** 6,40	**11,64** 5,82	**25,60** 12,80	**23,28** 11,64	**8,00** 4,00	**7,28** 3,64	**16,00** 8,00	**14,55** 7,28	**32,00** 16,00	**29,10** 14,55	**1Way** 2Way

Lenovo HPC Storage Update – Agenda

- **Lenovo** Overview
- Lenovo **ThinkSystem Storage** Update
- Lenovo GPFS Storage Server (**GSS**) Update
- Lenovo Distributed Storage Solution for IBM Spectrum Scale (**DSS-G**) Update
  - Including G100 NVMe-based model
- GSS / DSS-G status regarding „**Spectre/Meltdown**“ security vulnerability

GSS / DSS-G Status regarding „Spectre/Meltdown“

https://support.lenovo.com/de/en/solutions/len-18282 (Main Lenovo Advisory)

HPC Storage Solutions

GSS and DSS-G customers are advised to install the below GSS 3.3a and DSS-G 2.0a update packages in their entirety, following the accompanying update procedure. GSS and DSS-G customers should **not** apply either UEFI or RHEL patches individually on their GSS and DSS-G servers, to avoid incompatibilities with other solution components. Please also refer to “Scalable Infrastructure/Intelligent Cluster” for information regarding other cluster solution components.
Note that GSS servers need to be equipped with at least 128GB of memory before they can be updated to GSS Version 3.3.

Solution	Status	Minimum Fix Version	Link to Update	Last Updated
IBM GSS Version 1.x (using GPFS **3.5**), on GSS server machine type 7915	Affected	GSS 3.3a (must use GPFS **4.1.1)**	https://lenovoesd.flexnetoperations.com/	2018-03-30
IBM GSS Version 2.0 (using GPFS 4.1), on GSS server machine type 7915, 5460	Affected	GSS 3.3a (can use GPFS 4.1.1 or GPFS 4.2.3)	https://lenovoesd.flexnetoperations.com/	2018-03-30
Lenovo GSS Version 2.5.0 to 2.5.9 (using GPFS 4.1), on GSS server machine type 7915, 5460, 5462, 8871	Affected	GSS 3.3a (can use GPFS 4.1.1 or GPFS 4.2.3)	https://lenovoesd.flexnetoperations.com/	2018-03-30
Lenovo GSS Version 2.5.10 to 3.0 (using GPFS 4.2), on GSS server machine type 7915, 5460, 5462, 8871	Affected	GSS 3.3a (must use GPFS 4.2.3)	https://lenovoesd.flexnetoperations.com/	2018-03-30
Lenovo GSS Version 3.1 to 3.2 (using GPFS **4.1**), on GSS server machine type 7915, 5460, 5462, 8871	Affected	GSS 3.3a (can use GPFS 4.1.1 or GPFS 4.2.3)	https://lenovoesd.flexnetoperations.com/	2018-03-30
Lenovo GSS Version 3.1 to 3.2 (using GPFS **4.2**), on GSS server machine type 7915, 5460, 5462, 8871	Affected	GSS 3.3a (must use GPFS 4.2.3)	https://lenovoesd.flexnetoperations.com/	2018-03-30
Lenovo GSS Version 3.3 (using GPFS 4.1 or 4.2), on GSS server machine type 7915, 5460, 5462, 8871	**Not** Affected			2018-03-30
Solution	**Status**	**Minimum Fix Version**	**Link to Update**	**Last Updated**
Lenovo DSS-G Version 1.0 to 1.2 (using GPFS 4.2), on DSS-G server machine type 8871	Affected	DSS-G 2.0a (must use GPFS 4.2)	https://lenovoesd.flexnetoperations.com/	2018-03-30
Lenovo DSS-G Version 2.0 (using GPFS 4.2), on DSS-G server machine type 8871, 7X06	**Not** Affected			2018-03-30

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