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Solution Guide for DataCore Software Defined Storage with Lenovo ThinkSystem Servers

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Describes customer benefits and use cases

Defines proven Lenovo – DataCore Software Defined Storage solutions

Provides guidelines for building the right SDS solution

Lists the detailed reference configurations

Manny Cabezas

Khalid Ansari

Florence Chabrier

LENOVO PRESS

Abstract

Lenovo® and DataCore have successfully conducted a series of tests to certify Software-Defined Storage (SDS) solutions based on Lenovo ThinkSystem™ servers and DataCore Software. This document describes the reference architecture designed to guide technical personnel through the creation of complete solutions (hardware and software configurations) to meet specific customer requirements. This flexible approach allows the right solutions to be built for each unique customer engagement.

In addition, this document also provides sample configurations for the most popular Lenovo-DataCore use cases. These reference configurations, defined with unique Solution IDs, can be used as is or can be imported into Lenovo configurators and be easily modified to address specific end user scenarios. These deployment ready solutions allow technical resources and presales engineers to quickly address customer requirements by using ready-to-go proven configurations.

Best practices have been used in developing this guide. Specific hardware and software options are identified, so customers can be sure the proposed solution is built using the most advanced Lenovo hardware components and DataCore features to meet their unique Software-Defined Storage needs.

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Contents

High-level solution overview

This section provides a high-level overview of Lenovo-DataCore Software Defined Storage (SDS) solutions available to help customers improve and enhance their existing IT Storage infrastructure, while deploying a best practices architecture as a foundation to manage future growth effectively.

Benefits of SDS solutions

Lenovo SDS solutions powered by DataCore are the simplest and easiest way to bring the benefits of Software-Defined Storage to the data center. By combining the strengths of Lenovo's ThinkSystem servers and the rich functions of DataCore software, a powerful and disruptive set of advanced SDS solutions are available to meet customer requirements.

Benefits of this solution include:

- ► Universal storage management
- ► IT cost reduction
- ► High levels of I/O performance
- ► Simplified operations
- ► High data availability with no single points of failure
- ► Unmatched flexibility for future expansion.

Lenovo-DataCore SDS solutions are designed for a wide range of customer environments, from small to very large installations across different industries supporting mission critical applications.

Challenges with today's storage environments

IT organizations are constantly challenged to meet Storage related demands. Key challenges include:

- ► Management of complex, heterogeneous storage systems that don't work with each other

- ► Delivering high I/O performance while eliminating painful bottlenecks.

- ► Providing data access 7x24x365, eliminating costly single points of failure and ensuring production applications are always running, even when component failures happen.

- ► Being able to purchase and deploy an effective solution even with limited budgets.

- ► Seamlessly replacing existing storage, including non-disruptive data migration

- ► Flexibility to add Storage with no changes or disruption to existing processes and operations

- ► Implementing efficient Disaster Recovery with the ability to quickly resume operations at a remote site in case of unplanned events at the primary location.

For years, customers have tried to meet these challenges by adding more traditional storage, buying expensive and inappropriate flash systems or by expanding already saturated arrays. While this approach provides temporary relief, it does not address the fundamental challenges, which customers will face again.

Lenovo-DataCore SDS solutions

As shown in Figure 1, Lenovo-DataCore SDS solutions provide a solid architecture that gives customers the flexibility to:

► Deploy high performance and high availability storage systems
► Manage ALL storage arrays (regardless of manufacturer) from a single console
► Support any hypervisor (KVM, ESX or Hyper V)
► Serve I/Os for application on dedicated servers as well as virtual hosts
► Use any storage protocol (iSCSI, FC, FCoE, SAS)
► Support both block and file storage requests
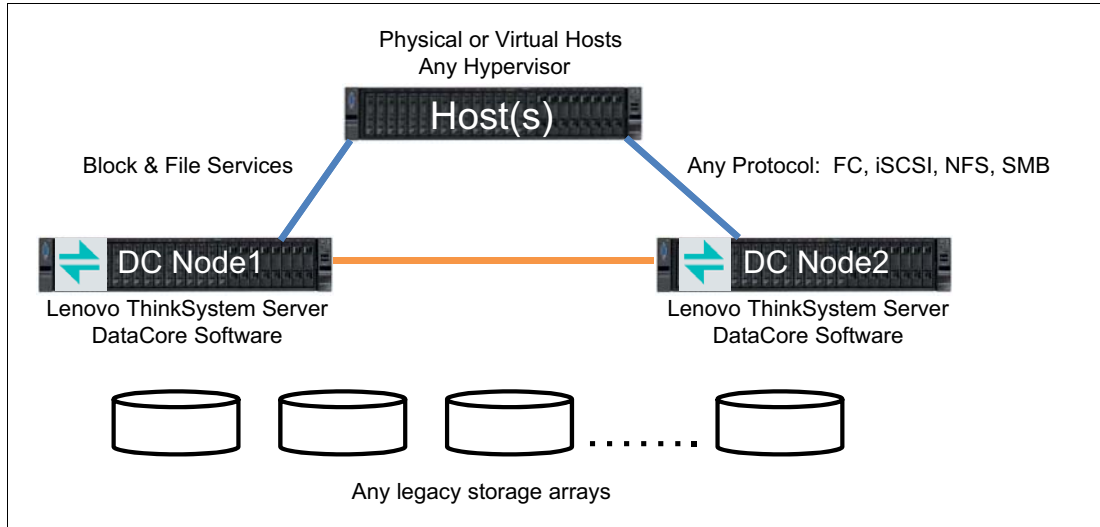

Figure 1   General topology

Lenovo-DataCore SDS solutions are designed to help customers overcome the challenges associated with today's storage environments. These solutions address the performance (latency), uptime (high availability), business continuity (D/R), data migration, storage management, ease of growth and flexibility concerns faced by customers around the world.

DataCore Universal Data Services

DataCore provides a rich set of *consistent* storage data services across ALL types of storage: internal ThinkSystem storage as well as external storage, regardless of size, manufacturer or brand.
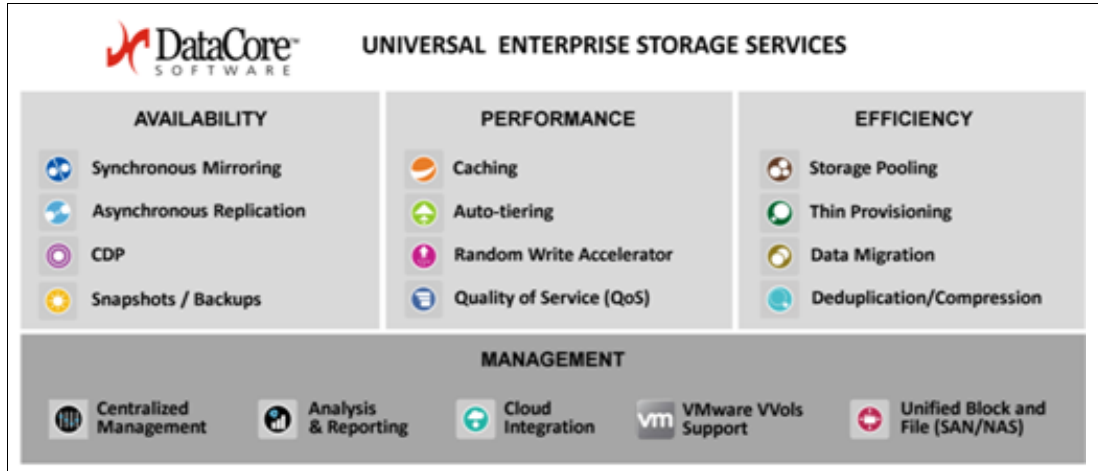

Figure 2   DataCore Universal Data Services

These universal data services are easy to use and are designed to increase productivity, as customers no longer have to manage individual features that vary for each storage system. Simplicity is achieved by using standard processes for storage provisioning, data migration, auto-tiering, replication, snapshots and quality of service. Array independent, universal data services is one of the key benefits of a software-defined storage infrastructure.

Always On data availability

Lenovo SDS solutions powered by DataCore are based on a 2-node implementation. This follows best practices to provide access to data with 100% uptime while eliminating costly single points of failures that traditional storage solutions cannot prevent.
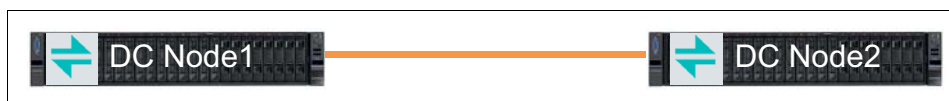
Figure 3   Basic 2-node deployment

Key benefits:

► **Duplicate, mirrored data**: Data Access available 7x24x365, as the 2-node configuration provides redundancy to ensure customers always have access to their critical information.

► **Elimination of single points of failure**. Applications continue to run even as HW components fail (controllers, HBAs, Raid adapters, RAM, disks, etc). Either node is capable of supporting continuous operations with maximum uptime while maintaining high performance.

► **Synchronous Replication** to keep both copies of data 100% in sync. This ensures the highest level of data availability (zero RPO, recovery point objective and zero RTO, recovery time objective). Customers have the choice of using iSCSI or Fibre Channel as inter-node links.

▶ **Metro Distance** / **Stretched Cluster support**. Nodes can reside in a production location or they can be physically separated by up to 100km, delivering true high availability data access even at metro distances.

Effective disaster recovery

Lenovo-DataCore SDS solutions allow the use of both Synchronous and Asynchronous advanced replication techniques to deliver effective Disaster Recovery scenarios. Unlike traditional storage systems, Lenovo SDS solutions powered by DataCore perform replication across internal or external storage, in an Any-to-Any approach, meaning we can replicate between unlike storage arrays (EMC to Lenovo, for example).

This level of flexibility allows customers to use new or existing storage devices to create unique business continuity solutions based on their own RTO (recovery time objectives) and RPO (recovery point objectives).

DC Node1	DC Node2	DC Node3
Primary Site		Secondary (D/R) Site
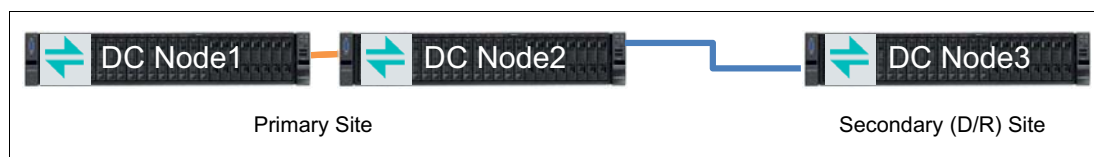
Figure 4   Disaster Recovery deployment

Most customers use Async Replication when the distance between sites is greater than 100 km. Lenovo-DataCore SDS solutions can use existing networking equipment and can easily adapt to available bandwidth.

High performance systems

DataCore nodes exploit Lenovo ThinkSystem server components in a way that traditional storage arrays simply cannot. In addition, DataCore's unique Parallel I/O processing eliminates storage bottlenecks that many storage arrays have, despite attempts to hide them.

Lenovo-DataCore solutions make use of server RAM, advanced caching techniques, load balancing, auto-tiering, Flash & NVMe devices, random write acceleration and QoS to deliver high performance systems that allow customers to meet their SLAs consistently and securely.

Parallel I/O

DataCore's Parallel I/O is designed to exploit available multi-core processors in the same fashion as servers exploit multi-core technology to deliver increased compute power, flexibility & performance to a wide range of applications. Similarly, DataCore software opens up multiple I/O lanes to schedule I/O operations (reads & writes) across available CPU cores simultaneously.

Figure 5   DataCore Multi-Core Parallel I/O

This unique capability removes existing storage bottlenecks as it accelerates application performance and drives increased throughput to support mixed workload environments. Parallel I/O is equivalent to opening up more cashiers when a store gets busy and has customers waiting in line f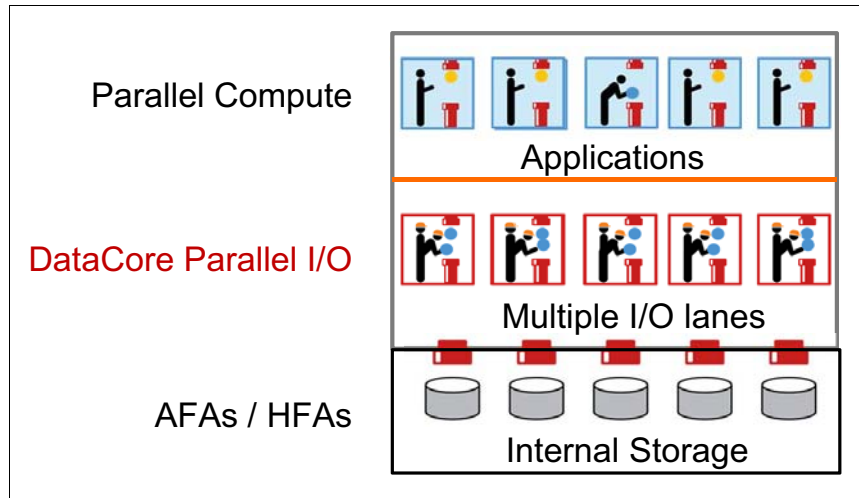or service. SDS solutions powered by DataCore, are able to take full advantage of Lenovo's multi-core server technology to deliver unmatched storage systems.

Advanced Caching

Lenovo SDS solutions powered by DataCore use server RAM memory as I/O caching, providing storage acceleration for critical business applications. SDS solutions can be configured with as little as 64GB, to over 8TB of RAM memory. Note that additional memory can be added as applications expand or need even greater performance capabilities. This advanced caching is key to enabling high hit ratios as more active data remains in memory.

Automated Storage Tiering

DataCore software uses automated storage tiering to dynamically move data between available NVMe, SSDs and traditional disk drives (HDDs). No manual intervention is required, as the Lenovo SDS system (DataCore node) monitors I/O patterns to automatically promote hot data in real time versus the more common batched model that may miss the mark. Data is promoted to solid-state drives (SSDs) while keeping least frequently used data on the lower performing hard disk drives (HDDs).

Random Write Accelerator

Writes to random locations are typical in databases and can present serious challenges to application performance. In traditional systems, a read operation is required to update a given record, as RAID parity is checked and recalculated. This creates a write performance penalty. When writing to SSDs, legacy storage systems must perform an erase operation before updating data. Lenovo SDS solutions overcome these challenges by grouping random writes and storing them in new locations.

Quality of Service

Lenovo SDS solutions powered by DataCore provide QoS controls that allow high-priority workloads to meet their service level agreements (SLAs) with consistent I/O performance. QoS controls limit resource consumption (memory, I/O channels, etc) from lower priority workloads, so critical work is done with predictable and consistent performance.

Architectural overview

This section provides a high-level overview of the reference architecture that can be used in designing and configuring the right Lenovo-DataCore SDS solutions, based on unique customer requirements.

Lenovo ThinkSystem servers

While DataCore software can run on any Lenovo ThinkSystem server, Table 1 shows the recommended options, taking into account price / performance characteristics. Note that alternate options should be considered depending on customer needs.

Table 1   Lenovo ThinkSystem Server choices

Server	Positioning
SR630	For small to mid-size deployments, for remote offices. 1U form factor.
SR650	Should be used for most use cases. Sweet Spot. 2U form factor.
SR850	Positioned for larger compute needs, additional processors (4-socket), higher performance. 2U form factor. This option can be useful for HCI deployments.

ThinkSystem server base

Using a 24x 2.5-inch server chassis is recommended as it provides the most flexibility in selecting high performance storage resources.

Table 2   ThinkSystem Server Base options

Base selection	Description
24-bay 2.5-inch	3x SATA/SAS 8-bay Backplane. **Note**: This is the default.
224-bay 2.5-inch	2x SATA/SAS 8-bay Backplane + 1x AnyBay™ 8-bay Backplane. **Note**: Use this option when NVMe resources are involved (even in the future).

Note that while 8-bay and 16-bay options are available and are less expensive, they tend to limit future upgrade potential. Exercise caution as you choose these options. Also, while 3.5-inch chassis are available, they offer limited internal storage options. Again, exercise caution.

ThinkSystem processors

Lenovo offers a vast selection of processor options: Intel Xeon Bronze, Silver, Gold and Platinum processors. There is also quite a range of number of cores in each processor family, as well as core frequency (GHz) options. Cache capacities as well as power options vary

from model to model as well. As you'd expect, there is also a wide spectrum of prices, which can make processor selection seem overwhelming.

DataCore software uses processor cores very effectively and thus, Table 3 on page 9 offers some considerations in terms of processor options.

Table 3   ThinkSystem Processor options

Processor	Recommendation
Intel Xeon Silver 4108 8C 85W 1.8GHz	Use this for SR630 servers.
Intel Xeon Silver 4110 8C 85W 2.1GHz	Use this for SR650 servers. Default. Should be used for most use cases.
Intel Xeon Gold 5115 10C 85W 2.4GHz	Use this for SR650 servers. Advanced RAS options (HA features at CPU level).
Intel Xeon Gold 6148 20C 150W 2.4GHz	Use this for SR650 servers. HCI deployments and full memory frequency exploitation.

Note that other processor options can be selected based on requirements, as DataCore will work just fine with them. In general, an 8-core processor system (with a minimum of 96GB memory) is sufficient for most DataCore use cases. Higher core counts and higher memory should be considered when running hyper-converged systems with multiple virtual machines. For advanced (vs standard) RAS capabilities, the Gold 5100 series should be strongly considered. For full memory frequency exploitation as well as HCI requirements, the Gold 6100 series should be considered.

ThinkSystem server memory

While Lenovo offers several choices for server memory, Table 4 describes recommended options.

Table 4   ThinkSystem Server Memory options

Memory option	Recommendation
16GB TruDDR4™ 2666 MHz RDIMM	▶ 6x (96 GB total) is the smallest recommended memory ▶ 12x (192 GB) is the default. Applies to most use cases. ▶ 18x (288 GB) for larger Storage capacities.
32GB TruDDR4 2666 MHz RDIMM	▶ 6x (192 GB) default. Applies to most use cases. ▶ 12x (384 GB) for above average High Performance requirements. ▶ 24x (768 GB) for HCI or extremely high performance needs.

Other options such as 8GB RDIMMs, 64GB LRDIMMs and 128GB 3DS RDIMMs are acceptable but are not ideal or necessary for most DataCore workloads. At this time, the recommended 16GB and 32GB RDIMMs provide the most optimal price / performance trade-offs. As the 64GB LRDIMMs become more mainstream and drop in price, they should be considered as options that are more viable.

ThinkSystem internal RAID adapters

Lenovo has a good selection of RAID adapters to meet customer needs. Generally, DataCore favors the use of RAID adapters for hard disk drives (HDDs), which are typically protected via RAID-5 and RAID-6.

For SSDs, given the very high Mean Time Between Failures (MTBF) and the fact that DataCore deployments are based a 2-node minimum, DataCore suggests not to RAID these devices, but to use SAS/SATA adapters, allowing the DataCore software to write directly to the SSDs. This provides the maximum performance for the system overall. If there is an SSD failure, a rare event, the surviving node continues to provide uninterrupted data access. Note this is a preference, not a requirement.

If customers prefer to RAID SSDs, then our second best option is to allow DataCore to provide software RAID 10. This bypasses the hardware RAID adapter and thus, can provide high performance capabilities. Note the internal RAID adapter (hardware) can also provide RAID 1 or RAID 10 protection and can be an option for customers who prefer hardware vs software RAID functionality. Generally, DataCore software can exploit SSD resources more efficiently as hardware RAID can at times be a limiting factor, particularly in high IOPS environments.

If SSD capacity if important, then RAID-5 via the internal hardware RAID adapter, can be an option. This is generally used for less intensive performance environments. This represents a reasonable trade-off between performance and capacity.

Table 5   ThinkSystem Internal RAID Adapter options

Adapter	Recommendation
RAID 930-24i 4GB Flash PCIe 12Gb	This is the default for 24-bay backplanes.
RAID 930-8i 2GB Flash PCIe 12Gb	This is a good option for assigning an adapter to each group of (8) devices. Trade-off is PCIe slot consumption.
430-8i SAS/SATA 12Gb HBA	Good option if no HW RAID is to be used. 3x 430-8i HBAs for a 24 bay system. Trade-off is PCIe slot consumption.

Note that other options, such as RAID 930-16i and the 530/730 adapter series, are available and work just fine, the recommended options above provide the right levels of data protection and flash memory to complement DataCore software.

ThinkSystem internal storage

Lenovo offers a wide range of good options in terms of internal storage, from very high performance NVMe (U.2), SATA/SAS SSDs to traditional 10K and 15K RPM drives to dense, high capacity devices, a good selection to meet customers' most strict and unique storage needs.

While the ample choices can be somewhat overwhelming, DataCore has found the options in Table 6 to be adequate for most uses cases.

Table 6   ThinkSystem Internal Storage options

Drive option	Recommendation
U.2 NVMe PCIe 3.0 Hot Swap SSDs	For very high performance requirements. Multiple capacity options, starting at 800GB
Intel Sxxxx Mainstream 6Gb SATA Hot Swap SSDs	Good overall options for most use cases. SATA-based. Sweet Spots: 960GB - 1.92TB SSDs
PMxxxx Mainstream SAS 12Gb Hot Swap SSD	Good overall options for most use cases. SAS-based. Sweet Spots: 800GB - 3.2TB SSDs

Drive option	Recommendation
PMxxxx Capacity SAS 12Gb Hot Swap SSD	Use for Larger SSD capacities. SAS-based. Sweet Spots: 3.84TB - 15.36TB SSDs
x.xTB 10K SAS 12Gb Hot Swap HDD	Good Tier-2 or Tier-3 options for mixed hybrid configurations. Sweet Spots: 1.2 - 2.4TB HDDs
xTB 7.2K SAS 12Gb Hot Swap HDD	Good Tier-2 or Tier-3 capacity options for mixed configurations. Sweet Spots: 1.0 - 2.0TB HDDs

General drive guidelines:

► Do not use Entry level SSDs, use Mainstream options (more durable).

Note: For large AFA configs, it may need to necessary to use large Capacity/Entry SSDs to reach the desired capacity. In these instances, adding a second tier consisting of Mainstream SSDs would be recommended for durability

► Do not use small capacities. Avoid $240 - 600$GB devices, use drives from 800GB up, as they offer improved price / performance ratio.

► Do not use 15K rpm devices. For mixed, hybrid environments, use SSDs and 10K rpm drives or SSDs and 7.2K dense drives. DataCore Auto-tiering feature will exploit these resources and get the best out of them as Tier-1 and Tier-2/3 options.

NOTE: Lenovo is constantly updating the list of available options for internal storage. Thus, it is important to focus more on general guidelines vs specific devices. Look for newer, equivalent options as time goes on.

Table 7   ThinkSystem Boot Drive options

Drive option	Recommendation
M.2 480GB 6Gbps SSDs	Preferred. Applies to most use cases.
M.2 CV3 128GB 6Gbps SSDs	Minimum Requirement.
M.2 with Mirroring Enablement Kit	Preferred. (2) SSDs as boot drives.

ThinkSystem PCIe riser cards

Table 8 reflects two popular riser cards for Lenovo ThinkSystem SR550/SR590/SR650 and SR530/SR570/SR630 server families. These riser cards allow additional server resources to complement and expand Lenovo $-$ DataCore solutions.

Table 8   ThinkSystem Riser Card options

Riser option	Recommendation
SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	For SR650 based solutions (Riser 1 kit)
SR550/SR590/SR650 (x16/x8)(x16/x16) PCIe FH Riser 2 Kit	For SR650 based solutions (Riser 2 kit)
SR530/SR570/SR630 x8/x16 PCIe LP+LP FH Riser 1 Kit	For SR630 based solutions (Riser 1 kit)

Please use equivalent riser cards for other Lenovo ThinkSystem servers in your design, based on customer requirements.

ThinkSystem adapter cards

Lenovo offers a good selection of adapter cards to meet various connectivity requirements from customers. Note that DataCore is able to work in a wide number of environments, including Fibre Channel, iSCSI, Ethernet. The one exception at this time is InfiniBand. Table 9 shows popular adapter options for Lenovo-DataCore configurations.

Table 9   ThinkSystem Adapter Card options

Adapter cards	Connectivity
10Gb 4-Port SFP+ LOM	10Gb SFP+ LOM (can also work in 1Gb environments)
10Gb 4-Port Base-T LOM	10Gb Base-T LOM (can also work in 1Gb environments)
1Gb 4-Port RJ45 LOM	1Gb RJ45 LOM
QLogic or Emulex 16Gb Dual Port HBAs	FC 16Gb options (both QLogic and Emulex) Dual Port
QLogic or Emulex PCIe 32Gb 2-Port SFP+ FC Adapter	FC 32Gb options (both QLogic and Emulex) 2-Port
RAID 930-8e 4GB Flash PCIe 12GB Adapter	Required for attachment to external storage devices (JBODs)
Broadcom NX-E PCIe 10Gb 2-Port Base-T Ethernet Adapter	10Gb Base-T Ethernet option. 2-Port
Emulex PCIe 10Gb 4-Port SFP+ Ethernet Adapter	10Gb SFP+ Ethernet option. 4-Port
QLogic PCIe 25Gb 2-Port SFP Ethernet Adapter	25Gb SFP+ Ethernet option. 2-Port
HHHL PX series Mainstream NVMe PCIe 3.0 x4 Flash Adapters	NVMe Mainstream / Capacity options.

General adapter guidelines:

► Use multi-port adapters (dual or quad) if possible as they provide density.

► Use Fibre Channel adapters for node-to-node data transfers whenever possible.

► Use 10Gb iSCSI / Ethernet instead of 1Gb adapters. 10Gb adapters will auto-negotiate down to 1Gb.

► Use LOM options for general management tasks and for light node-to-node traffic.

► Configure appropriate Transceivers based on customer environments.

► Some Intel adapters (X710) have had technical difficulties. Please validate before using.

► NVMe controllers may be required if NVMe resources are configured.

ThinkSystem power supplies

Table 10 lists the options for power supplies, based on recommended ThinkSystem servers. Best practices are to configure redundant power supplies (quantity = 2).

Table 10   ThinkSystem Power Supply options

Power supply	Recommendation
750W (230/115V) Platinum Hot Swap	Default. Applies to most use cases.

Power supply	Recommendation
1100W (230/115V) Platinum Hot Swap	Suggested for AFA & HCI configurations

Note: Ensure you configure appropriate power cables, based on length, voltage and amperage requirements.

ThinkSystem services

While services are usually optional, Table 11 lists the options for warranty service upgrade as well as professional services for implementation.

Table 11   ThinkSystem Services options

Lenovo Services™ offering	Recommendation
Essential Service – 3Yr 24x7 4Hr Response + YourDrive YourData	Recommended.
Professional Installation Services per day	Recommended. Use (3) days for basic (2) node installations. Includes skills transfer. Services can be delivered by Lenovo or DataCore. DataCore SKU found in DCSC under DataCore Expansion & Services.

Note: For more complex installations, including multiple sites, please work with your local DataCore representative for guidance.

DataCore Software

DataCore software is provided based on the class of service required. There are three classes of services, Enterprise, Standard and Large Scale:

► Enterprise licenses include ALL DataCore software features and functions. This is an all-inclusive service class that applies to most installations.

► Standard licenses include all DataCore features with the exception of Fibre Channel and support for Shared Multi Port Arrays (SMPA). Standard licenses are ideal for Hyperconverged installations, where Fibre Channel support is not required.

► Large Scale licenses are designed for backup and archive scenarios where high performance is not as critical. Typically, Large Scale class of service supports large amount of inactive or rarely accessed data.

Table 12 compares the three classes of service.

Note that DataCore Enterprise and Standard licenses start at 1TB and can grow to multi Petabytes. Large Scale licenses, since designed for bulk storage, start at 50TB and can also grow to very large capacities.

Table 12   DataCore Software Comparison

Edition	Enterprise (EN)	Standard (ST)	Large Scale (LS)
Ideal for	Enterprise class, highest performance	Standard, midrange	Large scale secondary storage
Host Connectivity			
Fibre Channel	Yes	No	Yes

Edition	Enterprise (EN)	Standard (ST)	Large Scale (LS)
iSCSI	Yes	Yes	Yes
Performance			
Parallel I/O	Yes	Yes	No
Caching	Yes	Yes	No
Random Write Accelerator	Yes	Yes	No
QoS Controls	Yes	Yes	Yes
Business Continuity			
Synchronous Mirroring	Fibre Channel, iSCSI	iSCSI	Fibre Channel, iSCSI
Automatic Failover/Failback	Yes	Yes	Yes
Asynchronous Replication	Yes	Yes	Yes
Advanced Site Recovery	Yes	Yes	Yes
Storage Pooling			
Shared multi-port array	Yes	No	Yes
Auto-tiering	Yes	Yes	Yes
Thin Provisioning	Yes	Yes	Yes
Backup / Restore			
Continuous Data Protection	Yes	Yes	No
Snapshot	Yes	Yes	Yes
Centralized Management			
REST API	Yes	Yes	Yes
PowerShell API	Yes	Yes	Yes
Task Scheduling	Yes	Yes	Yes
Real-time charting	Yes	Yes	Yes
Historical tracking	Yes	Yes	Yes
Upgrades and Interoperability			
Upgrades	No	ST to EN	LS to EN
Interoperability	EN, ST and LS nodes may be intermixed in a group		

Once a particular class of service is determined (most cases will include either Enterprise or Standard), then the next question is how much storage capacity is to be placed under DataCore management. DataCore licenses are provided and priced on a per-TB basis. For ease of consumption, storage capacity is divided into eight tiers for Enterprise and Standard licenses and into five tiers for Large Scale licenses.

Capacity tiers for Enterprise and Standard licenses:

► 1 - 9 TB
► 10 - 24 TB
► 25 - 49 TB

- ▶ 50 - 99 TB
- ▶ 100 - 249 TB
- ▶ 250 - 499 TB
- ▶ 500 - 999 TB
- ▶ 1000 - 2499 TB

Capacity tiers for Large Scale licenses:

- ▶ 50 - 99 TB
- ▶ 100 - 249 TB
- ▶ 250 - 499 TB
- ▶ 500 - 999 TB
- ▶ 1000 - 2400 TB

The last question is about the desired initial warranty or support period. Lenovo offers 3, 4 and 5 year support options as initial purchase. Note that longer periods are possible and can be handled via a simple VLS process.

Table 13 lists the Lenovo part numbers for DataCore licenses:

Table 13   Lenovo part numbers

Tier	Perpetual License plus 3-Year Support & SUS	Perpetual License plus 4-Year Support & SUS	Perpetual License plus 5-Year Support & SUS
Enterprise (EN)			
1-9 TB	7S07000TWW	7S070021WW	7S070011WW
10-24 TB	7S07000UWW	7S070022WW	7S070012WW
25-49 TB	7S07000VWW	7S070023WW	7S070013WW
50-99 TB	7S07000WWW	7S070024WW	7S070014WW
100-249 TB	7S07000XWW	7S070025WW	7S070015WW
250-499 TB	7S07000YWW	7S070026WW	7S070016WW
500-999 TB	7S07000ZWW	7S070027WW	7S070017WW
1000-2499 TB	7S070010WW	7S070028WW	7S070018WW
Standard (ST)			
1-9 TB	7S070019WW	7S070029WW	7S07001HWW
10-24 TB	7S07001AWW	7S07002AWW	7S07001JWW
25-49 TB	7S07001BWW	7S07002BWW	7S07001KWW
50-99 TB	7S07001CWW	7S07002CWW	7S07001LWW
100-249 TB	7S07001DWW	7S07002DWW	7S07001MWW
250-499 TB	7S07001EWW	7S07002EWW	7S07001NWW
500-999 TB	7S07001FWW	7S07002FWW	7S07001PWW
1000-2499 TB	7S07001GWW	7S07002GWW	7S07001QWW
Large Scale (LS) (Minimum order of 50 TBs per node for LS edition)			
50-99 TB	7S07001RWW	7S07002HWW	7S07001WWW

Tier	Perpetual License plus 3-Year Support & SUS	Perpetual License plus 4-Year Support & SUS	Perpetual License plus 5-Year Support & SUS
100-249 TB	7S07001SWW	7S07002JWW	7S07001XWW
250-499 TB	7S07001TWW	7S07002KWW	7S07001YWW
500-999 TB	7S07001UWW	7S07002LWW	7S07001ZWW
1000-2499 TB	7S07001VWW	7S07002MWW	7S070020WW

General Highlights:

► DataCore are perpetual licenses, which means that upon initial purchase, customers own DataCore licenses forever. Customers have the flexibility to transfer the DataCore licenses from one hardware platform to another, from one location to another, as long as support is kept current and active. This is important as DataCore licenses can be moved from today's server family to tomorrow's server technology, at no additional cost.

► DataCore licenses are delivered in a simple, capacity based consumption model. Licenses are priced per TB. Total purchase price is easily determined based on the total amount of storage capacity in TBs times the per-TB cost of the desired license (Enterprise, Standard or Large Scale) and the required warranty or support period (3, 4 or 5 years). A single SKU is all that is needed.

► Low entry point – just 1TB – for Enterprise and Standard licenses. This allows installations to start with minimum capacity and grow over time, based on usage requirements. Large Scale starts at 50 TBs.

► DataCore licenses are very granular, allowing customers to purchase exactly the right amount of licensing required, both as an initial purchase or future upgrade.

► DataCore licensing is also delivered on a declining cost per TB structure. Each higher Storage capacity tier is priced at a lower cost per TB, allowing customers to benefit from lower licensing costs as more capacity is placed under DataCore management. This is important, as future upgrades are likely to be priced at a lower cost per TB as new total capacity can fall on higher capacity tiers or brackets.

Lenovo has enabled DataCore software part numbers in DCSC. They are found under the OS & Software tab as shown in Figure 6.
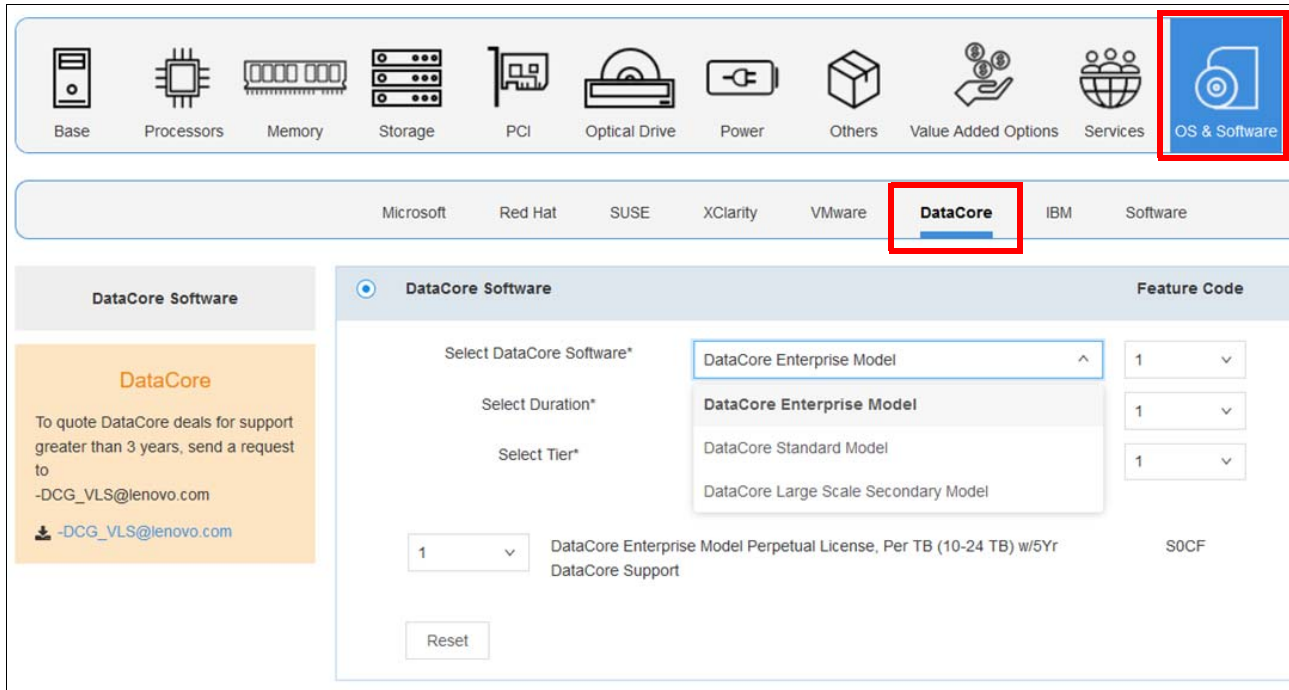
Figure 6   DataCore software SKUs in DCSC

Additional software

DataCore software runs on Microsoft Windows, and as such, a base Windows Server license is required. If customers can provide it, then, it does not need to be included on the DataCore node configuration. Otherwise, it needs to be added, as shown in Table 14.

In addition, although optional, ThinkSystem XClarity Enterprise software is highly recommended.

Table 14   Additional Software options

Software	Recommendation
XClarity Controller Standard to Enterprise Upgrade	Recommended.
Windows Server 2016 (16C ML, no preinstall) Drop in the box.	Required. Can be removed if customers supply a copy.

External storage options

While most of this document focuses on designing and configuring solutions based on internal storage, the fact is that many customers will need storage capacities beyond what is deliverable on the DataCore server nodes.

Adding additional storage to DataCore nodes is simple yet very effective. There are three ways to accomplish this, direct attach SAS, shared Lenovo DS Storage Arrays, use of existing customer-owned storage.

Direct-attach storage

By adding direct-attached Lenovo storage enclosures (DAS) to each node, storage capacity can be scaled up without having to add additional compute resources. This assumes the DataCore nodes have been appropriately sized to handle the overall storage capacity (both internal and external) and can deliver the expected level of performance. Since performance requirements vary from application to application and from customer to customer, care must be exercised as additional DAS capacity is added. Note that in this approach, external storage enclosures are symmetrically added to each node, maintaining equal capacity and mirrored data across a pair of DataCore nodes, as shown on the graphics below. The table below lists the available Lenovo DAS (JBOD) enclosures.

Table 15   Lenovo DAS (JBOD) enclosures

Lenovo JBOD enclosures	Recommendation
Lenovo Storage D1212	Direct-attached option. LFF (3.5-inch drives).
Lenovo Storage D1224	Direct-attached option. SFF (2.5-inch drives).
Lenovo Storage D3284	Direct-attached option. Large capacity option.
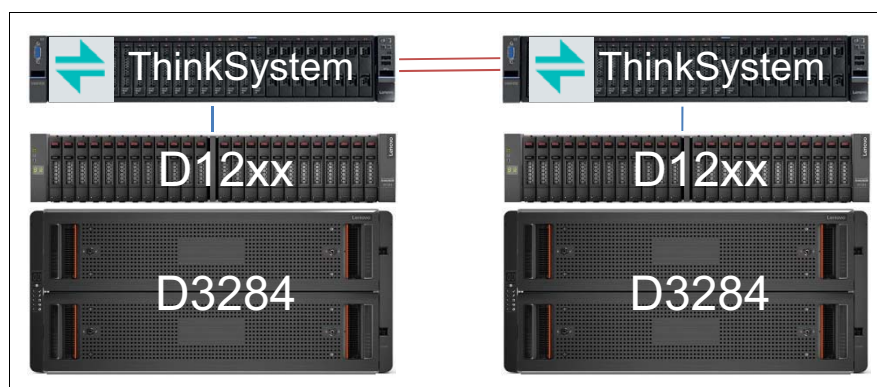
Figure 7   Direct-attached external storage expansion

Lenovo DS Storage arrays

The second approach involves the use of Lenovo DS Storage arrays. In this particular case, a DS Storage array is shared and managed by a pair of DataCore nodes. This is known as Shared Multi-Port Array mode (SMPA) in DataCore terminology. Since the array is shared, there is only a single copy of data and thus, care must be exercised with this topology.

Customers choose this approach as they feel the data stored on the shared array does not need to be mirrored. Trade off involves data availability vs cost (single copy vs mirrored data). This topology is popular for Disaster Recovery sites, as production data is well protected at the primary site.
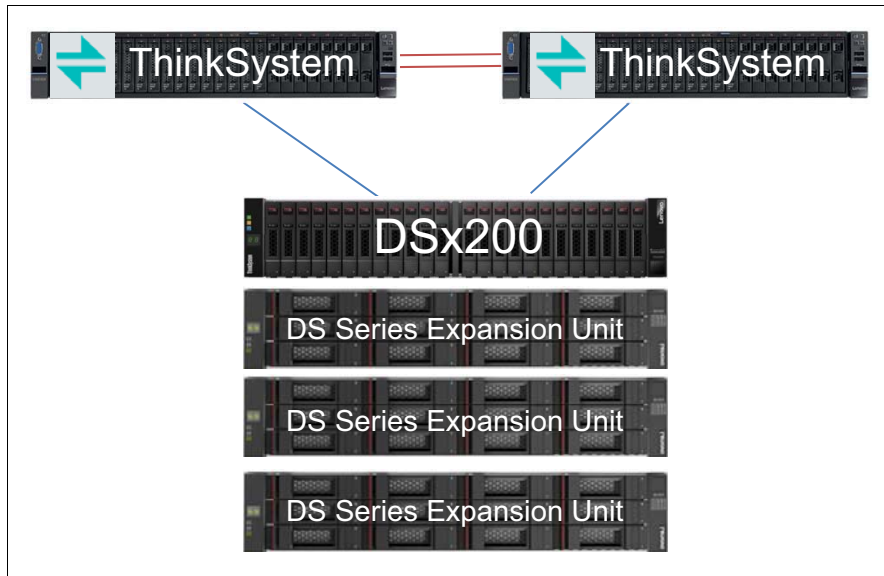
Figure 8   SMPA-based external storage expansion

As stated above, DataCore nodes must be sized appropriately to manage the added storage capacity and to deliver expected performance. Note that there are some limitations in SMPA mode.

The following DataCore features are not supported:

► Auto-tiering

► Write Caching (SMPA operates in cache write-through mode)

► Continuous Data Protection (CDP)

► Differential Snapshots (snapshots must be full snapshots)

Note that some of these features are available and provided by Lenovo DS Storage arrays.

Existing customer storage

The third option for adding storage to DataCore nodes involves customers choosing to attach their existing legacy storage to the nodes and letting DataCore manage these resources. This Storage Virtualization use case is very popular and represents one of the key customer benefits delivered by DataCore software.

Under this scenario, customers let DataCore manage their existing storage assets and obtain the following benefits:

► Extend the life of older storage arrays. Repurpose them to perform other tasks such as backup, D/R storage or test & development.

► Stop paying expensive optional software maintenance on existing arrays. DataCore provides features such as thin provisioning, synchronous replication, quality of service, auto-tiering and others as standard. The savings from these annual maintenance and support-related expenses can help cover the cost of the Lenovo-DataCore SDS solution.

► Use the existing storage arrays as additional storage capacity to complement internal storage on DataCore nodes. Lower the overall storage costs.

► Get improved performance by letting DataCore exploit server memory and multi-core parallel I/O processing to deliver better IOPS and lower latency from existing arrays.
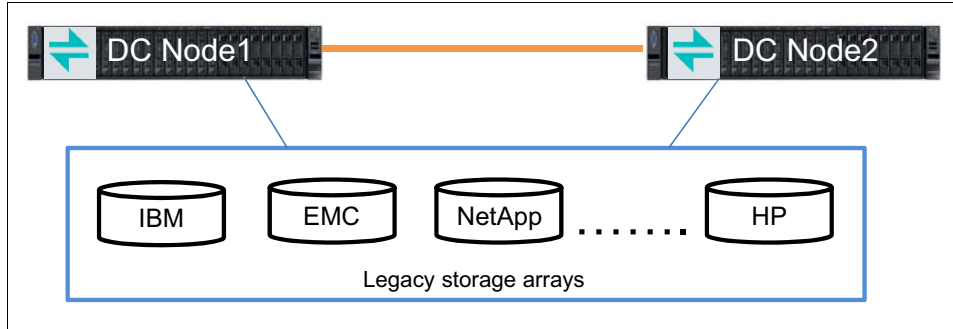
Figure 9   Legacy external storage expansion

Table 16 lists the options for direct-attached as well as SMPA external storage expansion.

Table 16   External storage expansion options

External storage	Recommendation
Lenovo DS6200 Storage Array Lenovo DS Series Disk Expansion	For larger configurations. SMPA Certified. SFF or LFF (based on customer requirements)
Lenovo DS4200 Storage Array Lenovo DS Series Disk Expansion	For smaller configurations. SMPA Certified. SFF or LFF (based on customer requirements)
Lenovo Storage D1212	Direct-attached option. LFF.
Lenovo Storage D1224	Direct-attached option. SFF.
Lenovo Storage D3284	Direct-attached option. Large Capacity option.

Reference configurations

This section provides a list of the most popular Lenovo-DataCore SDS use cases. It also provides reference configurations for each of these use cases. Note these CTO reference configurations are designed to be used as is (they include a complete BOM for hardware and software components) or they can be easily modified to meet specific customer requirements.

Highlighted are a few variables that are typically involved in customizing a given configuration. These variables include:

► Amount of server memory
► Amount of internal storage
► Choice of SSDs and HDDs
► Connectivity options (FC vs iSCSI)
► Choice of HBAs and options for external storage (either direct-attached or shared arrays)

The objective of these reference configurations is to facilitate the process of building, quoting and ordering the right SDS solutions for customers around the world. As such, these configurations are available online so they can be easily imported into Lenovo's DCSC configurator and modified to come up with the unique solution based on the specific needs of a customer.

Note: The DataCore licenses included on each configuration are for the amount of storage capacity for that configuration. If the amount of storage (either internal or external) changes, DataCore licenses need to be adjusted accordingly. DCSC will not automatically calculate DataCore licensing. Please consult with your DataCore representative if any questions.

Use cases

There are three core principles that enable DataCore to provide a differentiated value proposition for SDS solutions:

► Provide highest data availability (no single point of failure – 2 node minimum deployment)

► Deliver world-class performance. Turn ThinkSystem servers into powerful SDS engines.

► Deploy cost-effective solutions. Deliver value to customers in each engagement.

These core principles are then applied to create specific SDS use cases:

► High Performance Storage Systems

- All Flash Arrays
- Hybrid Flash Arrays
- SDS Starter Kits
- Shared Arrays

► Hyperconverged Infrastructure (HCI) solutions

► Storage Virtualization (based on All Flash Array configurations)

The following sections list the configurations and the detailed bills of material.

All Flash Array configurations

Table 17 shows the high level hardware and software components recommended for building All Flash Array SDS configurations.

Table 17   All Flash Array high level components

Component	Description
Lenovo ThinkSystem servers	
Server	SR650 (2U / 24 x 2.5 bays)
Processors	Intel Xeon Silver 4110 8C 85W 2.1GHz x 2 (Dual processor)
Memory	16GB or 32GB TruDDR4 2666 MHz RDIMM (Small = 96GB, Medium = 192GB, Large = 384GB)
Internal Storage	Mainstream SATA 6Gb /12Gb SSDs (Small = 10TB, Medium = 50TB, Large = 100TB)
Boot drives	M.2 5100 480GB SATA 6Gbps SSD or equivalent

Component	Description
HBA	FC: QLogic 16Gb Enhanced Gen5 FC Dual Port HBAs x2 FC: Emulex LPe32002 32Gb 2-Port SPF+ HBA x2
RAID	RAID 930-24i 4GB PCIe 12Gb (Internal storage) - Optional
Management Interface	(LOM) 10Gb 4x RJ45 or SPF+
DataCore software licenses	
Enterprise	Select if Fibre Channel is required Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)
Standard	Select if Fibre Channel is NOT required (iSCSI support) Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)

Using the guidelines in Table 17, three specific configurations have been created, as listed in Table 18 below.

Table 18   Specific All Flash Array configurations

	Small configuration	Medium config	Large configuration
Usable Capacity	10 TB	50 TB	100 TB
Solution ID	DCAFASDS010 See Table 19 on page 23	DCAFASDS050 See Table 20 on page 25	DCAFASDS100 See Table 21 on page 27
Server Platform	ThinkSystem SR650 ▸ Dual Xeon Silver 4110 8C 85W 2.1GHz Processors (16 cores total) ▸ Internal RAID adapter ▸ Dual Power Supply ▸ Dual M.2 Bootable drives		
Connectivity	4x FC 16Gb Ports		
Warranty	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData		
Memory	96 GB	192 GB	384 GB
OS & Additional software	Windows Server 2016 XClarity Pro		
DataCore Licenses			
Enterprise	DataCore Enterprise Model Perpetual License, Per TB (10-24 TB) w/3Yr DataCore Support QTY = 10	DataCore Enterprise Model Perpetual License, Per TB (50-99 TB) w/3Yr DataCore Support QTY = 50	DataCore Enterprise Model Perpetual License, Per TB (100-249 TB) w/3Yr DataCore Support QTY = 100

The following tables list the bills of materials:

▸ "Solution ID: DCAFASDS010 (All Flash Array – 10TBs)"
▸ "Solution ID: DCAFASDS050 (All Flash Array – 50TBs)" on page 25
▸ "Solution ID: DCAFASDS100 (All Flash Array – 100TBs)" on page 27

Solution ID: DCAFASDS010 (All Flash Array – 10TBs)

Table 19   Bill of materials for DCAFASDS010

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCAFASDS010: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	2
AUNC	ThinkSystem 16GB TruDDR4 2666 MHz (2Rx8 1.2V) RDIMM	6
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	2
AUR5	ThinkSystem 2U/Twr 2.5" AnyBay 8-Bay Backplane	1
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	6
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
ATZC	QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	2
AVWF	ThinkSystem 1100W (230V/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AUTU	ThinkSystem 4-7 NVMe sequence Label for 16x2.5"and 24x2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	1
B0ML	Feature Enable TPM on MB	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	10
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AVEP	ThinkSystem 4x1 2.5" HDD Filler	2

Part number	Product Description	Quantity
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AUTA	XCC Network Access Label	1
AUSE	Lenovo ThinkSystem 2U CPU Entry Heatsink	2
AUTD	ThinkSystem SR650 model number Label	1
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AURS	Lenovo ThinkSystem Memory Dummy	18
AWF9	ThinkSystem Response time Service Label LI	1
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AUT8	ThinkSystem 1100W RDN PSU Caution Label	1
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUSQ	On Board to 2U 8x2.5" HDD BP NVME Cable	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1
AUTJ	ThinkSystem common Intel Label	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
A2HP	Configuration ID 01	1
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1

Part number	Product Description	Quantity
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0C7	DataCore Enterprise Model Perpetual License, Per TB (10-24 TB) w/3Yr DataCore Support	10
5372SWX	xSeries® HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Solution ID: DCAFASDS050 (All Flash Array – 50TBs)

Table 20   Bill of materials for DCAFASDS050

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCAFASDS050: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	2
AUNC	ThinkSystem 16GB TruDDR4 2666 MHz (2Rx8 1.2V) RDIMM	12
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	2
AUR5	ThinkSystem 2U/Twr 2.5" AnyBay 8-Bay Backplane	1
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1
AUMK	ThinkSystem 2.5" PM1633a 3.84TB Capacity SAS 12Gb Hot Swap SSD	14
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
ATZC	QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	2
AVWF	ThinkSystem 1100W (230V/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1

Part number	Product Description	Quantity
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AUTU	ThinkSystem 4-7 NVMe sequence Label for 16x2.5"and 24x2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	1
B0ML	Feature Enable TPM on MB	1
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AUTA	XCC Network Access Label	1
AVEP	ThinkSystem 4x1 2.5" HDD Filler	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	6
AURS	Lenovo ThinkSystem Memory Dummy	12
AUSE	Lenovo ThinkSystem 2U CPU Entry Heatsink	2
AUTD	ThinkSystem SR650 model number Label	1
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AWF9	ThinkSystem Response time Service Label LI	1
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AUT8	ThinkSystem 1100W RDN PSU Caution Label	1
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUSQ	On Board to 2U 8x2.5" HDD BP NVME Cable	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1

Part number	Product Description	Quantity
AUTJ	ThinkSystem common Intel Label	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
A2HP	Configuration ID 01	1
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0C9	DataCore Enterprise Model Perpetual License, Per TB (50-99 TB) w/3Yr DataCore Support	50
5372SWX	xSeries HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Solution ID: DCAFASDS100 (All Flash Array – 100TBs)

Table 21   Bill of materials for DCAFASDS100

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCAFASDS100: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	2
AUNC	ThinkSystem 16GB TruDDR4 2666 MHz (2Rx8 1.2V) RDIMM	24
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	2
AUR5	ThinkSystem 2U/Twr 2.5" AnyBay 8-Bay Backplane	1
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1

Part number	Product Description	Quantity
AUMK	ThinkSystem 2.5" PM1633a 3.84TB Capacity SAS 12Gb Hot Swap SSD	18
AUML	ThinkSystem 2.5" PM1633a 7.68TB Capacity SAS 12Gb Hot Swap SSD	4
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
ATZC	QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	2
AVWF	ThinkSystem 1100W (230V/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AUTU	ThinkSystem 4-7 NVMe sequence Label for 16x2.5"and 24x2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	1
B0ML	Feature Enable TPM on MB	1
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	2
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AUTA	XCC Network Access Label	1
AUSE	Lenovo ThinkSystem 2U CPU Entry Heatsink	2
AUTD	ThinkSystem SR650 model number Label	1
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AWF9	ThinkSystem Response time Service Label LI	1
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1

Part number	Product Description	Quantity
AUNP	FBU345 SuperCap	1
AUT8	ThinkSystem 1100W RDN PSU Caution Label	1
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUSQ	On Board to 2U 8x2.5" HDD BP NVME Cable	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1
AUTJ	ThinkSystem common Intel Label	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
A2HP	Configuration ID 01	1
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0CA	DataCore Enterprise Model Perpetual License, Per TB (100-249 TB) w/3Yr DataCore Support	100
5372SWX	xSeries HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Hybrid Flash Array configurations

Table 22 shows the high-level hardware and software components recommended for building the most cost effective Hybrid Flash Array SDS configurations.

Table 22   Hybrid Flash Array high level components

Component	Description
Lenovo ThinkSystem servers	
Server	SR650 (2U / 24 x 2.5 bays)
Processors	Intel Xeon Silver 4110 8C 85W 2.1GHz x 2 (Dual Processor)
Memory	32GB TruDDR4 2666 MHz RDIMM 192GB (small) - 384GB (medium) - 576GB (large)
Internal Storage	Mainstream SATA 6Gb SSD and 10K SAS 12Gb 512n HDD Ratio: (SSD 20% + SAS 80%). 20TB (small) / 40TB (medium) / 100TB (large)
External Storage	D1212 DAS (JBOD >40TB, for large) 7.2k 3.5in NL-SAS HDDs
Boot drives	M.2 5100 480GB SATA 6Gbps SSD or equivalent
HBAs	FC: QLogic 16Gb Enhanced Gen5 Dual Port HBA x 2 OR Emulex LPe32002 32Gb 2-Port SPF+ HBA iSCSI: Broadcom NXE 10GBase-T or Emulex VFA5.2 ML2 SFP+x 2 (Dual Port)
RAID	RAID 930-24i 4GB PCIe 12Gb (Internal storage) RAID 930-8e 4GB Flash PCI 12G Adapter (External storage)
Management interface	(LOM) 10Gb 4-Port SFP+ OR (LOM) 10Gb 4-Port Base-T
DataCore Licenses	
Enterprise	Select if Fibre Channel is required Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)
Standard	Select if Fibre Channel is NOT required (iSCSI support) Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)

Using the guidelines in Table 22 on page 30, three specific configurations have been created, as shown in Table 23.

Table 23   Specific HFA configurations

	Small config	Medium config	Large config
Usable Capacity	20 TB	40 TB	100 TB
Solution ID	DCHFASDS020 See Table 24	DCHFASDS040 See Table 25 on page 33	DCHFASDS100 See Table 26 on page 36

	Small config	Medium config	Large config
Server Platform	ThinkSystem SR650 Dual Xeon Silver 4110 8C 85W 2.1GHz Processors (16 cores total) Internal RAID adapter Dual Power Supply Dual M.2 Bootable drives No JBOD		
Connectivity	4 FC 16Gb Ports		
External storage	no JBOD	no JBOD	D1212 JBOD
Warranty	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData		
Memory	192 GB	384 GB	576 GB
OS & Additional SW	Windows Server 2016 XClarity Pro		
DataCore Software			
Enterprise	DataCore Enterprise Model Perpetual Li-cense, Per TB (10-24 TB) w/3Yr DataCore Support QTY = 20	DataCore Enterprise Model Perpetual License, Per TB (25-49 TB) w/3Yr DataCore Support QTY = 40	DataCore Enterprise Model Perpetual License, Per TB (100-249 TB) w/3Yr DataCore Support QTY = 100

The following tables list the bills of materials:

► "Solution ID: DCHFASDS020 (Hybrid Flash Array – 20TBs)"
► "Solution ID: DCHFASDS040 (Hybrid Flash Array – 40TBs)" on page 33
► "Solution ID: DCHFASDS100 (Hybrid Flash Array – 100TBs)" on page 36

Solution ID: DCHFASDS020 (Hybrid Flash Array – 20TBs)

Table 24   Bill of materials for DCHFASDS020

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCHFASDS020: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	2
AUND	ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	6
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	3
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1
AUM1	ThinkSystem 2.5" 1.2TB 10K SAS 12Gb Hot Swap 512n HDD	16
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	2
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2

Part number	Product Description	Quantity
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
ATZC	QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	2
AVWD	ThinkSystem 750W(230/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AVWJ	ThinkSystem 750W Platinum RDN PSU Caution Label	1
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AUTA	XCC Network Access Label	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	6
AUSE	Lenovo ThinkSystem 2U CPU Entry Heatsink	2
AUTD	ThinkSystem SR650 model number Label	1
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AURS	Lenovo ThinkSystem Memory Dummy	18
AWF9	ThinkSystem Response time Service Label LI	1
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1

Part number	Product Description	Quantity
AUTJ	ThinkSystem common Intel Label	1
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUTF	ThinkSystem 4-7 sequence Label for 2U 2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
B0ML	Feature Enable TPM on MB	1
A2HP	Configuration ID 01	1
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0C7	DataCore Enterprise Model Perpetual License, Per TB (10-24 TB) w/3Yr DataCore Support	20
5372SWX	xSeries HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Solution ID: DCHFASDS040 (Hybrid Flash Array — 40TBs)

Table 25   Bill of materials for DCHFASDS040

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCHFASDS040: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1

Part number	Product Description	Quantity
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	2
AUND	ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	12
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	3
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1
B0YS	ThinkSystem 2.5" 2.4TB 10K SAS 12Gb Hot Swap 512e HDD	16
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	4
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
ATZC	QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	2
AVWD	ThinkSystem 750W(230/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AVWJ	ThinkSystem 750W Platinum RDN PSU Caution Label	1
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AUTA	XCC Network Access Label	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	4
ASFE	Notice for Advanced Format 512e Hard Disk Drives	1
AURS	Lenovo ThinkSystem Memory Dummy	12
AUSE	Lenovo ThinkSystem 2U CPU Entry Heatsink	2
AUTD	ThinkSystem SR650 model number Label	1

Part number	Product Description	Quantity
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AWF9	ThinkSystem Response time Service Label LI	1
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1
AUTJ	ThinkSystem common Intel Label	1
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUTF	ThinkSystem 4-7 sequence Label for 2U 2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
B0ML	Feature Enable TPM on MB	1
A2HP	Configuration ID 01	1
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1

Part number	Product Description	Quantity
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0C8	DataCore Enterprise Model Perpetual License, Per TB (25-49 TB) w/3Yr DataCore Support	40
5372SWX	xSeries HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Solution ID: DCHFASDS100 (Hybrid Flash Array – 100TBs)

Table 26   Bill of materials for DCHFASDS100

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCHFASDS100: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	2
AUND	ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	18
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	3
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	12
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
ATZC	QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	2
AUNQ	ThinkSystem RAID 930-8e 4GB Flash PCIe 12Gb Adapter	2
AVWD	ThinkSystem 750W(230/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1

Part number	Product Description	Quantity
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AVWJ	ThinkSystem 750W Platinum RDN PSU Caution Label	1
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AVEP	ThinkSystem 4x1 2.5" HDD Filler	1
AUTA	XCC Network Access Label	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	8
AUSE	Lenovo ThinkSystem 2U CPU Entry Heatsink	2
AUTD	ThinkSystem SR650 model number Label	1
AURS	Lenovo ThinkSystem Memory Dummy	6
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AWF9	ThinkSystem Response time Service Label LI	1
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	3
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1
AUTJ	ThinkSystem common Intel Label	1
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	3
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUTF	ThinkSystem 4-7 sequence Label for 2U 2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
B0ML	Feature Enable TPM on MB	1
A2HP	Configuration ID 01	1

Part number	Product Description	Quantity
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0CA	DataCore Enterprise Model Perpetual License, Per TB (100-249 TB) w/3Yr DataCore Support	100
5372SWX	xSeries HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1
4587HC1	Storage: Lenovo Storage D1212	1
AU14	Lenovo Storage D1212 Disk Exp Enclosure	1
AU0W	12Gb SAN Rack Mount Kit-Rails 25"-36"	1
AU1B	Lenovo Storage 8TB 7.2K 3.5" NL-SAS HDD	12
6201	1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	2
AU10	Standard Label Kit Agency Label Generic PN Labels	1
AU12	Lenovo Storage D1212 Label Kit	1
AU0X	Publications - Statement of Warranty, Safety Std.	1
AUC6	D/DS Series Packaging	1
01KC753	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5AS7A02065	Hardware Installation Storage (Business Hours)	1

Hyperconverged Infrastructure configurations

Table 27 shows the high level hardware and software components recommended for building efficient (2 nodes) hyperconverged Infrastructure SDS configurations.

Table 27   Hyperconverged high level components

Component	Description
Lenovo ThinkSystem servers	
Server	SR650 (2U / 24 x 2.5 bays)
Processors	Intel Xeon Gold 6148 20C 150W 2.4GHz (Dual Proc)
Memory	32GB TruDDR4 2666 MHz RDIMM 384GB (S) - 576GB (M) - 768GB (L) Note: DataCore only needs 64GB
Internal Storage	Mainstream SAS 12Gb SSD (AFA) and 10K SAS 12Gb 512 HDD for HFA solutions Ratio: (SSD 20% + SAS 80%). 20TB (small) / 40TB (medium) / 80TB (large)
External Storage	D1224 or D1212 DAS (JBOD) (>40TB, for large)
Boot drives	M.2 5100 480GB SATA 6Gbps SSD or equivalent
HBAs	iSCSI: Broadcom NX-E PCIe 10Gb 2-Port Base-T or Emulex VFA5.2 ML2 SFP+
RAID	RAID 930-24i 4GB PCIe 12Gb (Internal storage) RAID 930-8e 4GB Flash PCI 12G Adapter (External storage)
Mgmt & VM Traffic	(LOM) 10Gb 4-Port SFP+
DataCore Licenses	
Standard	Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)

Using the guidelines in Table 27, three specific configurations have been created, as shown in Table 28.

Table 28   Specific HCI configurations

	Small config	Medium config	Large config
Usable Capacity	20 TB	40 TB	80 TB
Solution ID	DCHCISDS020 See Table 29	DCHCISDS040 See Table 30 on page 42	DCHCISDS080 See Table 31 on page 45
Server Platform	ThinkSystem SR650 Dual Xeon Gold 6148 20C 150W 2.4GHz Processors (40 cores total) Internal RAID adapter Dual Power Supply Dual M.2 Bootable drives		
Connectivity	2x 10Gb Base-T Ethernet Ports		
External storage	no JBOD	no JBOD	D1224 JBOD
Warranty	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData		
Memory	384 GB	576 GB	768 GB
OS & Additional SW	Windows Server 2016 XClarity Pro.		

	Small config	Medium config	Large config
DataCore VirtualSAN Software			
Standard	DataCore Standard Model Perpetual Li-cense, Per TB (10-24 TB) w/3Yr DataCore Support QTY = 20	DataCore Standard Model Perpetual License, Per TB (25-49 TB) w/3Yr DataCore Support QTY = 40	DataCore Standard Model Perpetual License, Per TB (50-99 TB) w/3Yr DataCore Support QTY = 80

The following tables list the bills of materials:

► "Solution ID: DCHCISDS020 (Hyperconverged - 20TBs)"
► "Solution ID: DCHCISDS040 (Hyperconverged - 40TBs)" on page 42
► "Solution ID: DCHCISDS080 (Hyperconverged - 80TBs)" on page 45

Solution ID: DCHCISDS020 (Hyperconverged - 20TBs)

Table 29   Bill of materials for DCHCISDS020

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCHCISDS020: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1
AWDX	Intel Xeon Gold 6148 20C 150W 2.4GHz Processor	2
AUND	ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	12
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	2
AUR5	ThinkSystem 2U/Twr 2.5" AnyBay 8-Bay Backplane	1
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	11
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
AUKP	ThinkSystem Broadcom NX-E PCIe 10Gb 2-Port Base-T Ethernet Adapter	1
AVWF	ThinkSystem 1100W (230V/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1

Part number	Product Description	Quantity
AURD	ThinkSystem 2U left EIA Latch Standard	1
AUTU	ThinkSystem 4-7 NVMe sequence Label for 16x2.5"and 24x2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	1
B0ML	Feature Enable TPM on MB	1
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AUTA	XCC Network Access Label	1
AVEP	ThinkSystem 4x1 2.5" HDD Filler	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	9
AURS	Lenovo ThinkSystem Memory Dummy	12
AUTD	ThinkSystem SR650 model number Label	1
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AWF9	ThinkSystem Response time Service Label LI	1
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AUT8	ThinkSystem 1100W RDN PSU Caution Label	1
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
AUSF	Lenovo ThinkSystem 2U MS CPU Performance Heatsink	2
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUSQ	On Board to 2U 8x2.5" HDD BP NVME Cable	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1
AUTJ	ThinkSystem common Intel Label	1

Part number	Product Description	Quantity
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
A2HP	Configuration ID 01	1
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5731WA6	Windows Server 2016 Additional License	1
V2N9BG	Per 2 Cores Win2016StdAddLic 2 Core POS	12
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0CP	DataCore Standard Model Perpetual License, Per TB (10-24 TB) w/3Yr DataCore Support	20
5372SWX	xSeries HIPO	1
AXUY	Windows Svr 2016 Standard Addl Lic (2 core) (POS Only)	12
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Solution ID: DCHCISDS040 (Hyperconverged - 40TBs)

Table 30   Bill of materials for DCHCISDS040

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCHCISDS040: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1
AWDX	Intel Xeon Gold 6148 20C 150W 2.4GHz Processor	2
AUND	ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	18
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	2
AUR5	ThinkSystem 2U/Twr 2.5" AnyBay 8-Bay Backplane	1

Part number	Product Description	Quantity
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1
B0YS	ThinkSystem 2.5" 2.4TB 10K SAS 12Gb Hot Swap 512e HDD	16
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	4
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
AUKP	ThinkSystem Broadcom NX-E PCIe 10Gb 2-Port Base-T Ethernet Adapter	1
AVWF	ThinkSystem 1100W (230V/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AUTU	ThinkSystem 4-7 NVMe sequence Label for 16x2.5"and 24x2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	1
B0ML	Feature Enable TPM on MB	1
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AUTA	XCC Network Access Label	1
ASFE	Notice for Advanced Format 512e Hard Disk Drives	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	4
AUTD	ThinkSystem SR650 model number Label	1
AURS	Lenovo ThinkSystem Memory Dummy	6
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AWF9	ThinkSystem Response time Service Label LI	1

Part number	Product Description	Quantity
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AUT8	ThinkSystem 1100W RDN PSU Caution Label	1
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
AUSF	Lenovo ThinkSystem 2U MS CPU Performance Heatsink	2
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUSQ	On Board to 2U 8x2.5" HDD BP NVME Cable	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1
AUTJ	ThinkSystem common Intel Label	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
A2HP	Configuration ID 01	1
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5731WA6	Windows Server 2016 Additional License	1
V2N9BG	Per 2 Cores Win2016StdAddLic 2 Core POS	12
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1

Part number	Product Description	Quantity
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0CQ	DataCore Standard Model Perpetual License plus 3-Year Support & SUS (25-49 TB)	40
5372SWX	xSeries HIPO	1
AXUY	Windows Svr 2016 Standard Addl Lic (2 core) (POS Only)	12
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Solution ID: DCHCISDS080 (Hyperconverged - 80TBs)

Table 31   Bill of materials for DCHCISDS080

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCHCISDS080: ThinkSystem SR650 - 3yr Warranty	1
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	1
AWDX	Intel Xeon Gold 6148 20C 150W 2.4GHz Processor	2
AUND	ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	24
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	2
AUR5	ThinkSystem 2U/Twr 2.5" AnyBay 8-Bay Backplane	1
5977	Select Storage devices - no configured RAID required	1
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	1
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	16
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	2
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
AUNQ	ThinkSystem RAID 930-8e 4GB Flash PCIe 12Gb Adapter	3
AUKP	ThinkSystem Broadcom NX-E PCIe 10Gb 2-Port Base-T Ethernet Adapter	1
AVWF	ThinkSystem 1100W (230V/115V) Platinum Hot-Swap Power Supply	2
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1

Part number	Product Description	Quantity
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AUTU	ThinkSystem 4-7 NVMe sequence Label for 16x2.5"and 24x2.5"	1
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5" Chassis	1
B0ML	Feature Enable TPM on MB	1
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	1
AUSZ	ThinkSystem SR650 Service Label LI	1
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	4
AUSG	ThinkSystem SR650 6038 Fan module	1
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	1
AUTA	XCC Network Access Label	1
AUNP	FBU345 SuperCap	4
AVEP	ThinkSystem 4x1 2.5" HDD Filler	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	4
AUTD	ThinkSystem SR650 model number Label	1
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	1
AWF9	ThinkSystem Response time Service Label LI	1
AUSU	ThinkSystem Package for SR650	1
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUT1	ThinkSystem SR650 Lenovo Agency Label	1
AUT8	ThinkSystem 1100W RDN PSU Caution Label	1
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	4
AUSF	Lenovo ThinkSystem 2U MS CPU Performance Heatsink	2
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	4
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	1
AUSM	MS 2nd 2U 8X2.5" Cable Kit	2
AUSQ	On Board to 2U 8x2.5" HDD BP NVME Cable	1
AWFF	ThinkSystem SR650 WW Lenovo LPK	1
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1
AUTJ	ThinkSystem common Intel Label	1

Part number	Product Description	Quantity
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
A2HP	Configuration ID 01	1
5374CM1	Configuration Instruction	1
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	1
A2JX	Controller 01	1
A2HP	Configuration ID 01	1
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5731WA6	Windows Server 2016 Additional License	1
V2N9BG	Per 2 Cores Win2016StdAddLic 2 Core POS	12
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0CR	DataCore Standard Model Perpetual License, Per TB (50-99 TB) w/3Yr DataCore Support	80
5372SWX	xSeries HIPO	1
AXUY	Windows Svr 2016 Standard Addl Lic (2 core) (POS Only)	12
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1
4587HC2	Storage: Lenovo Storage D1224	1
AU15	Lenovo Storage D1224 Disk Exp Enclosure	1
AU0W	12Gb SAN Rack Mount Kit-Rails 25"-36"	1
B103	Lenovo Storage 2.4TB 10K 2.5" SAS HDD	24
6201	1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	2
AU10	Standard Label Kit Agency Label Generic PN Labels	1
AU13	Lenovo Storage D1224 Label Kit	1
AUC6	D/DS Series Packaging	1
AU0X	Publications - Statement of Warranty, Safety Std.	1

Part number	Product Description	Quantity
01JR578	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5AS7A02065	Hardware Installation Storage (Business Hours)	1

SDS Starter Kit configurations

Table 32 shows the high level hardware and software components recommended for building SDS Starter Kit configurations, designed to help small to mid size customers establish a solid Software Defined Infrastructure.

Table 32   SDS Starter Kit high level components

Component	Description
Lenovo ThinkSystem servers	
Server	SR630 (1U / 8x 2.5 bays)
Processors	Intel Xeon Silver 4108 8C 85W 2.1GHz (single or dual processor)
Memory	16GB TruDDR4 2666 MHz RDIMM 96GB (S) — 192GB (M) — 288GB (L)
Internal Storage	Mainstream SATA 6Gb /12Gb SSD (Tier-1 AFA Storage) 10K SAS 12Gb 512n HDD (Tier-2 HDD Storage for HFA solutions) Ratio: SSD 20% + SAS 80% (Small = 4TB, Medium = 10TB, Large=20TB)
Boot drives	M.2 CV3 128GB SATA 6Gbps SSDs or equivalent
HBA	QLogic or Emulex for FC. Broadcom NX-E PCIe 10Gb 2-Port Base-T
RAID	RAID 930-8i 2GB PCIe 12Gb adapter (Internal storage)
Management interface	10Gb 4-port SFP+ LOM
DataCore Licenses	
Enterprise	Select if Fibre Channel is required Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)
Standard	Select if Fibre Channel is NOT required (iSCSI support) Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)

Using the guidelines in Table 32, three specific configurations have been created, as shown in Table 33.

Table 33   Specific SDS Starter Kit configurations

	Small config	Medium config	Large config
Usable Capacity	4 TB	10 TB	20 TB
Solution ID	DCSTRKIT004 See Table 34 on page 49	DCSTRKIT010 See Table 35 on page 51	DCSTRKIT020 See Table 36 on page 53

	Small config	Medium config	Large config
Server Platform	ThinkSystem SR630 Single or Dual Xeon Silver 4108 8C 85W 1.8GHz Processors (8-16 Cores) Internal RAID adapter Single or dual Power Supply Single or dual M.2 Bootable drives		
	Single Proc, PS, Boot drive	Dual Proc, PS, Boot drive	Dual Proc, PS, Boot drive
Connectivity	2x 10Gb Base-T Ethernet Ports		
Warranty	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData		
Memory	96 GB	192 GB	288 GB
OS & ADDITIONAL SW	Windows Server 2016 XClarity Pro		
DataCore Software			
Standard	DataCore Standard Model Perpetual Li-cense, Per TB (1-9 TB) w/3Yr DataCore Support QTY = 4	DataCore Standard Model Perpetual License, Per TB (10-24 TB) w/3Yr DataCore Support QTY = 10	DataCore Standard Model Perpetual License, Per TB (10-24 TB) w/3Yr DataCore Support QTY = 20

The following tables list the bills of materials:

Solution ID: DCSTRKIT004 (Starter Kit – 4TBs)

Table 34   Bill of material for DCSTRKIT004

Part number	Product Description	Quantity
7X02CTO1WW	SR630 DataCore DCSTRKIT004: ThinkSystem SR630 - 3yr Warranty	1
AUW0	ThinkSystem SR630 2.5" Chassis with 8 Bays	1
AWEG	Intel Xeon Silver 4108 8C 85W 1.8GHz Processor	1
AUNC	ThinkSystem 16GB TruDDR4 2666 MHz (2Rx8 1.2V) RDIMM	6
AUWB	ThinkSystem SR530/SR630/SR570 2.5" SATA/SAS 8-Bay Backplane	1
5977	Select Storage devices - no configured RAID required	1
AUNJ	ThinkSystem RAID 930-8i 2GB Flash PCIe 12Gb Adapter	1
B0ZR	ThinkSystem 2.5" Intel S4600 960GB Mainstream SATA 6Gb Hot Swap SSD	5
AUMU	ThinkSystem M.2 Enablement Kit	1
AUUV	ThinkSystem M.2 CV3 128GB SATA 6Gbps Non-Hot Swap SSD	1
AUWC	ThinkSystem SR530/SR570/SR630 x8/x16 PCIe LP+LP Riser 1 Kit	1
AUWQ	Lenovo ThinkSystem 1U LP+LP BF Riser Bracket	1

Part number	Product Description	Quantity
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
AUKP	ThinkSystem Broadcom NX-E PCIe 10Gb 2-Port Base-T Ethernet Adapter	1
AVWA	ThinkSystem 750W (230/115V) Platinum Hot-Swap Power Supply	1
6311	2.8m, 10A/100-250V, C13 to C14 Jumper Cord	1
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AUWW	Front VGA Cable for 1U 2.5"	1
AWGE	ThinkSystem SR630 WW Lenovo LPK	1
AUX4	MS 1U Service Label LI	1
AUX0	ThinkSystem Package for SR630	1
AURN	Lenovo ThinkSystem Super Cap Box	1
AUW3	Lenovo ThinkSystem Mainstream MB - 1U	1
AUS6	Lenovo ThinkSystem 1U height CPU HS Dummy	1
AVWJ	ThinkSystem 750W Platinum RDN PSU Caution Label	1
AUS9	Lenovo ThinkSystem CFF V3 PSU Dummy	1
AUTA	XCC Network Access Label	1
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AUTV	ThinkSystem large Label for non-24x2.5"/12x3.5"/10x2.5"	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	3
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	2
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUX3	ThinkSystem SR630 Model Number Label	1
AUWL	Lenovo ThinkSystem 1U LP Riser Dummy	1
AUWK	Lenovo ThinkSystem 4056 Fan Dummy	1
AWF9	ThinkSystem Response time Service Label LI	1
AUTC	ThinkSystem SR630 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AVJ2	ThinkSystem 4R CPU HS Clip	1
AULP	ThinkSystem 1U CPU Heatsink	1
AUTJ	ThinkSystem common Intel Label	1
AUWX	8x2.5" HDD BP Cable Kit	1

Part number	Product Description	Quantity
AV00	6.8m Super Cap Cable	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1
9201	Windows Specify	1
B0ML	Feature Enable TPM on MB	1
5PS7A01504	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0CN	DataCore Standard Model Perpetual License, Per TB (1-9 TB) w/3Yr DataCore Support	4
5372SWX	xSeries HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Solution ID: DCSTRKIT010 (Starter Kit – 10TBs)

Table 35   Bill of materials for DCSTRKIT010

Part number	Product Description	Quantity
7X02CTO1WW	SR630 DataCore DCSTRKIT010: ThinkSystem SR630 - 3yr Warranty	1
AUW0	ThinkSystem SR630 2.5" Chassis with 8 Bays	1
AWEG	Intel Xeon Silver 4108 8C 85W 1.8GHz Processor	2
AUNC	ThinkSystem 16GB TruDDR4 2666 MHz (2Rx8 1.2V) RDIMM	12
AUWB	ThinkSystem SR530/SR630/SR570 2.5" SATA/SAS 8-Bay Backplane	1
5977	Select Storage devices - no configured RAID required	1
AUNJ	ThinkSystem RAID 930-8i 2GB Flash PCIe 12Gb Adapter	1
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	6
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
AUUV	ThinkSystem M.2 CV3 128GB SATA 6Gbps Non-Hot Swap SSD	2
AUWC	ThinkSystem SR530/SR570/SR630 x8/x16 PCIe LP+LP Riser 1 Kit	1
AUWQ	Lenovo ThinkSystem 1U LP+LP BF Riser Bracket	1

Part number	Product Description	Quantity
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1
AUKP	ThinkSystem Broadcom NX-E PCIe 10Gb 2-Port Base-T Ethernet Adapter	1
AVWA	ThinkSystem 750W (230/115V) Platinum Hot-Swap Power Supply	2
6311	2.8m, 10A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AUWW	Front VGA Cable for 1U 2.5"	1
AWGE	ThinkSystem SR630 WW Lenovo LPK	1
AUX4	MS 1U Service Label LI	1
AUX0	ThinkSystem Package for SR630	1
AURN	Lenovo ThinkSystem Super Cap Box	1
AUW3	Lenovo ThinkSystem Mainstream MB - 1U	1
AVEN	ThinkSystem 1x1 2.5" HDD Filler	2
AVWJ	ThinkSystem 750W Platinum RDN PSU Caution Label	1
AUTA	XCC Network Access Label	1
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AUTV	ThinkSystem large Label for non-24x2.5"/12x3.5"/10x2.5"	1
AUW7	ThinkSystem SR630 4056 Fan Module	2
AULP	ThinkSystem 1U CPU Heatsink	2
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	2
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUX3	ThinkSystem SR630 Model Number Label	1
AUWL	Lenovo ThinkSystem 1U LP Riser Dummy	1
AWF9	ThinkSystem Response time Service Label LI	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUTC	ThinkSystem SR630 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AUTJ	ThinkSystem common Intel Label	1
AUWX	8x2.5" HDD BP Cable Kit	1
AV00	6.8m Super Cap Cable	1
9205	Drop-in-the-Box Specify	1

Part number	Product Description	Quantity
9206	No Generic Preload Specify	1
9201	Windows Specify	1
B0ML	Feature Enable TPM on MB	1
5PS7A01504	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0CP	DataCore Standard Model Perpetual License, Per TB (10-24 TB) w/3Yr DataCore Support	10
5372SWX	xSeries HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Solution ID: DCSTRKIT020 (Starter Kit – 20TBs)

Table 36   Bill of materials for DCSTRKIT020

Part number	Product Description	Quantity
7X02CTO1WW	SR630 DataCore DCSTRKIT020: ThinkSystem SR630 - 3yr Warranty	1
AUW0	ThinkSystem SR630 2.5" Chassis with 8 Bays	1
AWEG	Intel Xeon Silver 4108 8C 85W 1.8GHz Processor	2
AUNC	ThinkSystem 16GB TruDDR4 2666 MHz (2Rx8 1.2V) RDIMM	18
AUWB	ThinkSystem SR530/SR630/SR570 2.5" SATA/SAS 8-Bay Backplane	1
5977	Select Storage devices - no configured RAID required	1
AUNJ	ThinkSystem RAID 930-8i 2GB Flash PCIe 12Gb Adapter	1
B0YS	ThinkSystem 2.5" 2.4TB 10K SAS 12Gb Hot Swap 512e HDD	6
AUMK	ThinkSystem 2.5" PM1633a 3.84TB Capacity SAS 12Gb Hot Swap SSD	2
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
AUUV	ThinkSystem M.2 CV3 128GB SATA 6Gbps Non-Hot Swap SSD	2
AUWC	ThinkSystem SR530/SR570/SR630 x8/x16 PCIe LP+LP Riser 1 Kit	1
AUWQ	Lenovo ThinkSystem 1U LP+LP BF Riser Bracket	1
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	1

Part number	Product Description	Quantity
AUKP	ThinkSystem Broadcom NX-E PCIe 10Gb 2-Port Base-T Ethernet Adapter	1
AVWA	ThinkSystem 750W (230/115V) Platinum Hot-Swap Power Supply	2
6311	2.8m, 10A/100-250V, C13 to C14 Jumper Cord	2
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
B0MJ	Feature Enable TPM 1.2	1
AXCA	ThinkSystem Toolless Slide Rail	1
AUWW	Front VGA Cable for 1U 2.5"	1
AWGE	ThinkSystem SR630 WW Lenovo LPK	1
AUX4	MS 1U Service Label LI	1
AUX0	ThinkSystem Package for SR630	1
AURN	Lenovo ThinkSystem Super Cap Box	1
AUW3	Lenovo ThinkSystem Mainstream MB - 1U	1
ASFE	Notice for Advanced Format 512e Hard Disk Drives	1
AVWJ	ThinkSystem 750W Platinum RDN PSU Caution Label	1
AUTA	XCC Network Access Label	1
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	1
AUTV	ThinkSystem large Label for non-24x2.5"/12x3.5"/10x2.5"	1
AUW7	ThinkSystem SR630 4056 Fan Module	2
AULP	ThinkSystem 1U CPU Heatsink	2
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	2
AVWK	ThinkSystem EIA Plate with Lenovo Logo	1
AUX3	ThinkSystem SR630 Model Number Label	1
AUWL	Lenovo ThinkSystem 1U LP Riser Dummy	1
AWF9	ThinkSystem Response time Service Label LI	1
AVJ2	ThinkSystem 4R CPU HS Clip	2
AUTC	ThinkSystem SR630 Lenovo Agency Label	1
AUNP	FBU345 SuperCap	1
AUTJ	ThinkSystem common Intel Label	1
AUWX	8x2.5" HDD BP Cable Kit	1
AV00	6.8m Super Cap Cable	1
9205	Drop-in-the-Box Specify	1
9206	No Generic Preload Specify	1

Part number	Product Description	Quantity
9201	Windows Specify	1
B0ML	Feature Enable TPM on MB	1
5PS7A01504	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
5731W16	Windows Server 2016	1
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	1
3523	Drop-in-the-Box	1
3444	Serial Number Only	1
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	1
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	1
3444	Serial Number Only	1
7S07CTO1WW	DataCore Software	1
S0CP	DataCore Standard Model Perpetual License, Per TB (10-24 TB) w/3Yr DataCore Support	20
5372SWX	xSeries HIPO	1
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	1

Shared Array configurations

Table 37 shows the high level hardware and software components recommended for building Shared Multi-Port Array (SMPA) SDS configurations. As covered previously, a shared array by definition does not provide mirrored data, but can be the right solution for many customer environments.

Table 37   Shared Array high level components

Component	Description
Lenovo ThinkSystem server	
Server	SR650 (2U / 24 x 2.5 bays)
Processors	Intel Xeon Silver 4110 8C 85W 2.1GHz x 2 (Dual processor)
Memory	32GB TruDDR4 2666 MHz RDIMM 192GB (No Internal Storage) - 384GB (Internal Storage)
Internal Storage	Mainstream SATA 6Gb SSD
External Storage	DS4200 / DS6200 with corresponding DS Series LFF Disk Expansion 7.2k 3.5in NL-SAS HDDs
Boot drives	M.2 5100 480GB SATA 6Gbps SSD or equivalent
HBAs	FC: QLogic 16Gb Enhanced Gen5 Dual Port HBA x 3, or Emulex LPe32002 32Gb 2-Port SPF+ HBA iSCSI: Broadcom NXE 10GBase-T or Emulex VFA5.2 ML2 SFP+x 2 (Dual Port)

Component	Description
RAID	RAID 930-24i 4GB PCIe 12Gb (Internal storage)
Management interface	(LOM) 10Gb 4-Port SFP+ OR (LOM) 10Gb 4-Port Base-T
DataCore Licenses	
Enterprise	Select if Fibre Channel is required Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)
Standard	Select if Fibre Channel is NOT required (iSCSI support) Select the amount of storage capacity to be placed under DataCore. Select the number of years for support (3, 4 or 5)

Using the guidelines in Table 37 on page 55, two specific configurations have been created, as shown in Table 38.

Table 38   Specific Shared Array configurations

	No Internal Storage	Internal Storage
Usable Capacity	100 TB	200 TB (20+180)
Solution ID	DCSMP00-100 See Table 39 on page 57	DCSMP20-180 See Table 40 on page 59
Server Platform	ThinkSystem SR650, Dual Xeon Silver 4110 8C 85W 2.1GHz Processors Internal RAID adapter, dual Power Supply, dual M.2 Bootable drives	
Connectivity	6 FC 16Gb Ports	
External Storage	DS4200 + DS LFF Expansion	DS6200 + DS LFF Expansion
Warranty	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	
Memory	192 GB	384 GB
OS & Additional SW	Windows Server 2016 XClarity Pro	
DataCore Software		
Enterprise	DataCore Enterprise Model Perpetual License, Per TB (100-249 TB) w/3Yr DataCore Support QTY = 100	DataCore Enterprise Model Perpetual License, Per TB (100-249 TB) w/3Yr DataCore Support QTY = 200

The following tables list the bills of materials:

► "Solution ID: DCSMP00-100 (Shared Array ─ 100TBs)" on page 57
► "Solution ID: DCSMP20-180 (Shared Array ─ 200TBs)" on page 59

Solution ID: DCSMP00-100 (Shared Array – 100TBs)

Table 39   Bill of materials for DCSMP00-100

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCSMPA00-100: ThinkSystem SR650 - 3yr Warranty	2
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	2
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	4
AUND	ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	12
5977	Select Storage devices - no configured RAID required	2
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	2
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	4
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	2
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	2
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	2
ATZC	QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	6
AVWD	ThinkSystem 750W(230/115V) Platinum Hot-Swap Power Supply	4
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	4
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	2
B0MJ	Feature Enable TPM 1.2	2
AXCA	ThinkSystem Toolless Slide Rail	2
AURD	ThinkSystem 2U left EIA Latch Standard	2
AWFF	ThinkSystem SR650 WW Lenovo LPK	2
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	2
AUSZ	ThinkSystem SR650 Service Label LI	2
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	8
AUSG	ThinkSystem SR650 6038 Fan module	2
AVWJ	ThinkSystem 750W Platinum RDN PSU Caution Label	2
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	2
AVEQ	ThinkSystem 8x1 2.5" HDD Filler	6
AUTA	XCC Network Access Label	2
AUSE	Lenovo ThinkSystem 2U CPU Entry Heatsink	4
AUTD	ThinkSystem SR650 model number Label	2
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	2
AWF9	ThinkSystem Response time Service Label LI	2

Part number	Product Description	Quantity
AUSU	ThinkSystem Package for SR650	2
AVWK	ThinkSystem EIA Plate with Lenovo Logo	2
AUT1	ThinkSystem SR650 Lenovo Agency Label	2
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	8
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	2
AVJ2	ThinkSystem 4R CPU HS Clip	4
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	2
AUTJ	ThinkSystem common Intel Label	2
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	2
AUTF	ThinkSystem 4-7 sequence Label for 2U 2.5"	2
9205	Drop-in-the-Box Specify	2
9206	No Generic Preload Specify	2
9201	Windows Specify	2
B0ML	Feature Enable TPM on MB	2
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	2
5731W16	Windows Server 2016	2
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	2
3523	Drop-in-the-Box	2
3444	Serial Number Only	2
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	2
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	2
3444	Serial Number Only	2
7S07CTO1WW	DataCore Software	2
S0CA	DataCore Enterprise Model Perpetual License, Per TB (100-249 TB) w/3Yr DataCore Support	100
5372SWX	xSeries HIPO	2
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	2
4617HC2	Storage: Lenovo ThinkSystem DS4200 SFF Chassis	1
AU2E	Lenovo ThinkSystem DS4200 SFF Chassis	1
AU2J	DS4200 FC/iSCSI Controller Module	2
B30K	Lenovo Storage 1.92TB 1DWD 2.5" SAS SSD	11
AT1F	Lenovo USB A Male-to-Mini-B 1.5m cable	1
6201	1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	2

Part number	Product Description	Quantity
AXD2	DS Series ShipKit	1
AU1Y	SFF Drive Blank AMS Filler	13
AUC6	D/DS Series Packaging	1
AU0W	12Gb SAN Rack Mount Kit-Rails 25"-36"	1
AUDM	DS4200 Product Label	1
AUDN	DS Series Label GBM	1
AUDP	DS Series Carton label	1
01JR480	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
4588HC1	Storage: Lenovo ThinkSystem DS Series LFF Disk Expansion	1
AU25	Lenovo ThinkSystem DS Series LFF Expansion Unit	1
AU2K	DS Series 12G SAN Expansion Module	2
AU0W	12Gb SAN Rack Mount Kit-Rails 25"-36"	1
AU1B	Lenovo Storage 8TB 7.2K 3.5" NL-SAS HDD	12
6201	1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	2
AUE5	DS Series Expansion Product Labeling	1
AXD2	DS Series ShipKit	1
AUC6	D/DS Series Packaging	1
AUDN	DS Series Label GBM	1
AUDP	DS Series Carton label	1
01KC753	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1

Solution ID: DCSMP20-180 (Shared Array — 200TBs)

Table 40   Bill of materials for DCSMP20-180

Part number	Product Description	Quantity
7X06CTO1WW	SR650 DataCore DCSMPA20-180: ThinkSystem SR650 - 3yr Warranty	2
AUVV	ThinkSystem SR650 2.5" Chassis with 8, 16 or 24 bays	2
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	4
AUND	ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	24
AURA	ThinkSystem 2U/Twr 2.5" SATA/SAS 8-Bay Backplane	6
5977	Select Storage devices - no configured RAID required	2
AUV1	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter	2
B0ZS	ThinkSystem 2.5" Intel S4600 1.92TB Mainstream SATA 6Gb Hot Swap SSD	22
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	2

Part number	Product Description	Quantity
B11V	ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	4
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	2
AUR3	ThinkSystem SR550/SR590/SR650 x16/x8 PCIe FH Riser 1 Kit	2
AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	2
ATZC	QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	6
AVWD	ThinkSystem 750W(230/115V) Platinum Hot-Swap Power Supply	4
6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord	4
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	2
B0MJ	Feature Enable TPM 1.2	2
AXCA	ThinkSystem Toolless Slide Rail	2
AURD	ThinkSystem 2U left EIA Latch Standard	2
AWFF	ThinkSystem SR650 WW Lenovo LPK	2
AURQ	Lenovo ThinkSystem 2U 3FH Riser Bracket	2
AUSZ	ThinkSystem SR650 Service Label LI	2
AURR	ThinkSystem M3.5 Screw for Riser 2x2pcs and SR530/550/558/570/590 Planar 5pcs	8
AUSG	ThinkSystem SR650 6038 Fan module	2
AVWJ	ThinkSystem 750W Platinum RDN PSU Caution Label	2
AUTQ	ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"	2
AVEP	ThinkSystem 4x1 2.5" HDD Filler	2
AUTA	XCC Network Access Label	2
AURS	Lenovo ThinkSystem Memory Dummy	24
AUSE	Lenovo ThinkSystem 2U CPU Entry Heatsink	4
AUTD	ThinkSystem SR650 model number Label	2
AVEN	ThinkSystem 1x1 2.5" HDD Filler	18
AURP	Lenovo ThinkSystem 2U 2FH Riser Bracket	2
AWF9	ThinkSystem Response time Service Label LI	2
AUSU	ThinkSystem Package for SR650	2
AVWK	ThinkSystem EIA Plate with Lenovo Logo	2
AUT1	ThinkSystem SR650 Lenovo Agency Label	2
AUNP	FBU345 SuperCap	2
AUSA	Lenovo ThinkSystem M3.5" Screw for EIA	8
B173	Companion Part for XClarity Controller Standard to Enterprise Upgrade in Factory	2

Part number	Product Description	Quantity
AVJ2	ThinkSystem 4R CPU HS Clip	4
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	2
AUTJ	ThinkSystem common Intel Label	2
AUSH	MS First 2U 8x2.5" HDD BP Cable Kit	2
AVJ0	ThinkSystem SR650/ST550/ST558 Super Cap Cable	2
AUSM	MS 2nd 2U 8X2.5" Cable Kit	4
AUTF	ThinkSystem 4-7 sequence Label for 2U 2.5"	2
AUTY	ThinkSystem 12-15 sequence Label for 24x2.5"Chassis	2
9205	Drop-in-the-Box Specify	2
9206	No Generic Preload Specify	2
9201	Windows Specify	2
B0ML	Feature Enable TPM on MB	2
A2HP	Configuration ID 01	2
5374CM1	Configuration Instruction	2
AVE4	ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter placement	2
A2JX	Controller 01	2
A2HP	Configuration ID 01	2
5PS7A01558	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	2
5731W16	Windows Server 2016	2
V2NMBG	Per 16 Cores W2016 Std 16C ML NoPreinstal	2
3523	Drop-in-the-Box	2
3444	Serial Number Only	2
5641PX3	XClarity Pro for Server w/3 Yr SW S&S	2
1340	Per Managed Server with 3 year SW Subscription and Support XClarity Pro-3 Yr	2
3444	Serial Number Only	2
7S07CTO1WW	DataCore Software	2
S0CA	DataCore Enterprise Model Perpetual License, Per TB (100-249 TB) w/3Yr DataCore Support	200
5372SWX	xSeries HIPO	2
AXU8	Windows Svr 2016 Standard (16 core)-MultiLang (not preinstalled)	2
4619HC2	Storage: Lenovo ThinkSystem DS6200 SFF Chassis	1
AU32	Lenovo ThinkSystem DS6200 SFF Chassis	1
AU34	DS6200 FC/iSCSI Controller Module	2

Part number	Product Description	Quantity
AU0W	12Gb SAN Rack Mount Kit-Rails 25"-36"	1
B30K	Lenovo Storage 1.92TB 1DWD 2.5" SAS SSD	12
6201	1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	2
AXD2	DS Series ShipKit	1
AUE6	DS6200 Product Label	1
AUDN	DS Series Label GBM	1
AUDP	DS Series Carton label	1
AT1F	Lenovo USB A Male-to-Mini-B 1.5m cable	1
AU1Y	SFF Drive Blank AMS Filler	12
01JR529	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	1
4588HC1	Storage: Lenovo ThinkSystem DS Series LFF Disk Expansion	2
AU25	Lenovo ThinkSystem DS Series LFF Expansion Unit	2
AU2K	DS Series 12G SAN Expansion Module	4
AU0W	12Gb SAN Rack Mount Kit-Rails 25"-36"	2
AU1B	Lenovo Storage 8TB 7.2K 3.5" NL-SAS HDD	24
6201	1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4
AUE5	DS Series Expansion Product Labeling	2
AXD2	DS Series ShipKit	2
AUC6	D/DS Series Packaging	2
AUDN	DS Series Label GBM	2
AUDP	DS Series Carton label	2
01KC753	Essential Service - 3Yr 24x7 4Hr Response + YourDrive YourData	2

Reference configuration summary

Table 41 summarizes the Reference Configurations available online via DCSC.

Table 41   Summary of the Reference Configurations

Solution ID	Storage capacity	Bill of materials
All Flash Array configurations		
DCAFASDS010	10TB	Table 19 on page 23
DCAFASDS050	50TB	Table 20 on page 25
DCAFASDS100	100TB	Table 21 on page 27
Hybrid Flash Arrays configurations		
DCHFASDS020	20TB	Table 24 on page 31

Solution ID	Storage capacity	Bill of materials
DCHFASDS040	40TB	Table 25 on page 33
DCHFASDS100	100TB	Table 26 on page 36
Hyperconverged Infrastructure (HCI) configurations		
DCHCISDS020	20TB	Table 29 on page 40
DCHCISDS040	40TB	Table 30 on page 42
DCHCISDS080	100TB	Table 31 on page 45
Starter Kits		
DCSTRKIT004	4TB	Table 34 on page 49
DCSTRKIT010	10TB	Table 35 on page 51
DCSTRKIT020	20TB	Table 36 on page 53
Shared Array (SMPA) configurations		
DCSMP00-100	100TB	Table 39 on page 57
DCSMP20-180	200TB	Table 40 on page 59

These configurations can be used and quoted as is or they can be modified to meet specific customer requirements. The objective is to improve the speed of execution and responsiveness to customers.

Business processes

This section provides a description of some of the principal business processes for managing Lenovo-DataCore SDS opportunities.

Deal registration

Lenovo sales representatives must register direct or business partner-related opportunities within Lenovo. If DataCore is part of the SDS solution, then DataCore must be identified as a strategic alliance partner as part of the internal Lenovo registration process.

Once DataCore is identified as the alliance partner, then an automated deal protection request is sent from Lenovo's SAE (Strategic Alliance Enhancement) system to DataCore. DataCore reviews and provides a response back to Lenovo, usually within 24 hours. If accepted, the response includes the DataCore opportunity number, the deal protection period (120 days) and the contact information of the DataCore sales representative assigned to the opportunity.

Quoting process

Lenovo is responsible for pricing complete SDS solutions, including hardware, DataCore software and services. Once a configuration has been established and agreed upon by customers, a Lenovo representative (sales or presales) takes the output of the DCSC configurator (complete BOM) and submits it to his/her local finance team as a special bid quote. This is a business as usual process performed in every geography.

The local finance team reviews and determines the end user price based on each geography's finance guidelines. They will contact DataCore if a particular engagements needs further assistance (submit a cost relief request using a standard form). DataCore responds back to the geo finance organization, which then determines the final customer price and sends to the local sales person who submitted the special bid request initially.

DataCore key activation process

Upon receiving a purchase order from Lenovo for a given customer engagement, DataCore processes and sends activation keys for the DataCore software licenses involved, directly to the customer. This process usually takes less than 24 hours. Software activation keys are sent to customer contacts listed on the PO. Thus, it is very important to make sure the correct customer contact info is provided.

Note that in many instances, the DataCore email containing the activation keys is sent before the physical Lenovo hardware (DataCore nodes) arrives. Thus, it is also important for customers to save the email with the activation keys. Activation keys are required to enable the DataCore software, which can be downloaded from a secure website. Activation keys are part of the DataCore installation and enablement process.

Please contact your DataCore representative if activation keys are lost or not available at installation or implementation time.

Conclusion

Lenovo and DataCore are in a strong position to deliver innovative SDS solutions to the market. The combination of Lenovo ThinkSystem servers and storage devices coupled with the power of DataCore software creates a compelling value proposition for customers who are looking to enhance their IT environment and exploit the benefits of a state-of-the-art software defined infrastructure.

Lenovo-DataCore SDS solutions are designed to meet customer needs across their enterprise. As shown in Figure 10 on page 65, customers can deploy differentiated solutions in their production site, at disaster recovery locations, across several remote environments, even to the cloud, in a consistent and uniform management approach, with unique performance and data availability characteristics that other SDS solutions simply cannot provide.
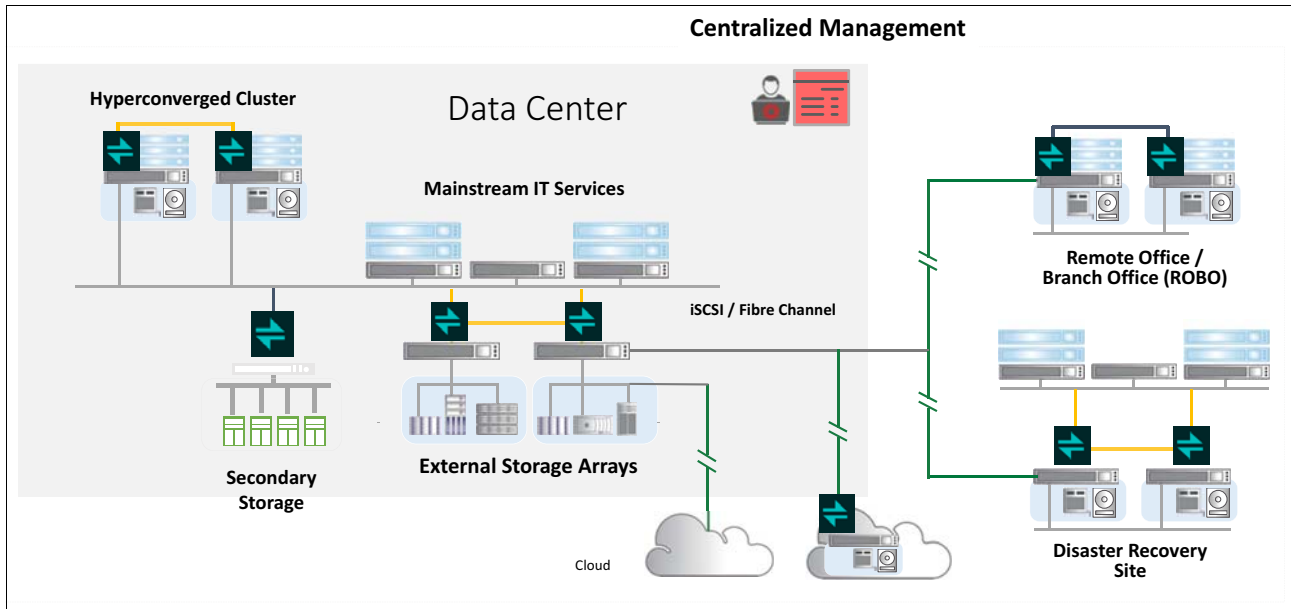

Figure 10   Complete enterprise-wide solutions

The goal of this document is to define tools and resources available to create and deliver unique SDS solutions to meet customer requirements. To that end, this document has defined the use cases where Lenovo-DataCore solutions bring the most value to customers around the world. It has also defined a solid reference architecture that can be used to create proven configurations.

In addition, a set of ready-to-go reference configurations has been provided. As stated previously, these configurations are available online and can be imported into Lenovo's DCSC for easy customization.

As technology continues its fast pace of product introductions, the audience is advised to subscribe to this document for future updates.

Appendix: DataCore configurations in DCSC

The following steps show how to find and use the DataCore reference configurations in the Lenovo Data Center Solution Configurator (DCSC).

Language and country selections: While this appendix uses English as the language and US Dollars (USD) as the currency, note that other countries/regions, languages and currencies can be selected for local customization.

1. Go to the DCSC Portal, http://dcsc.lenovo.com/

2. Click **Deployment Ready Solution** and click **Learn More** as shown in Figure 11 on page 66
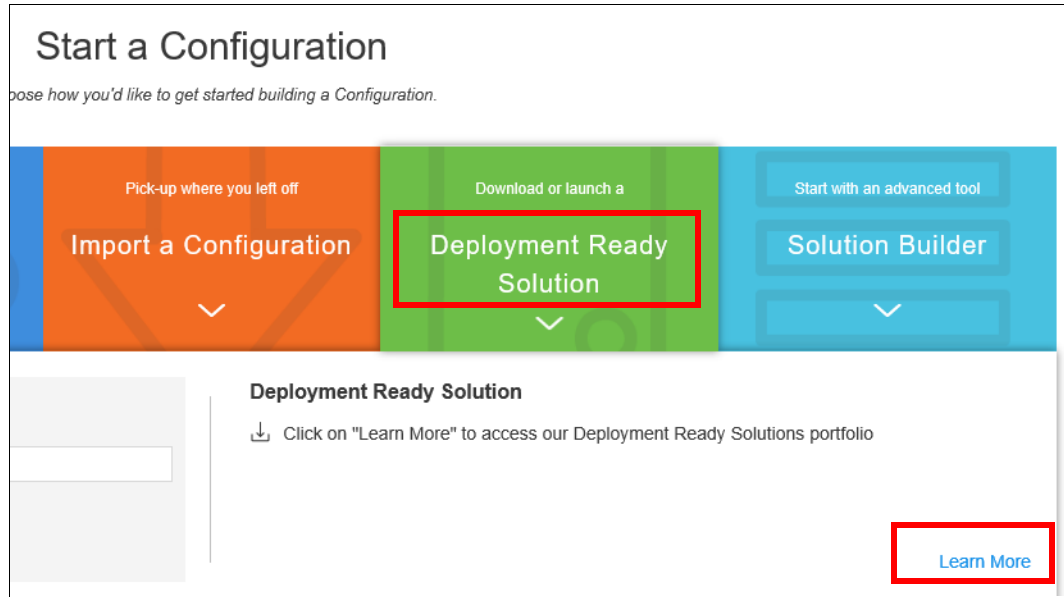

Figure 11   DCSC Start a configuration

3. Scroll down to **Software Defined Storage** and click on **Learn More** as shown in Figure 12.
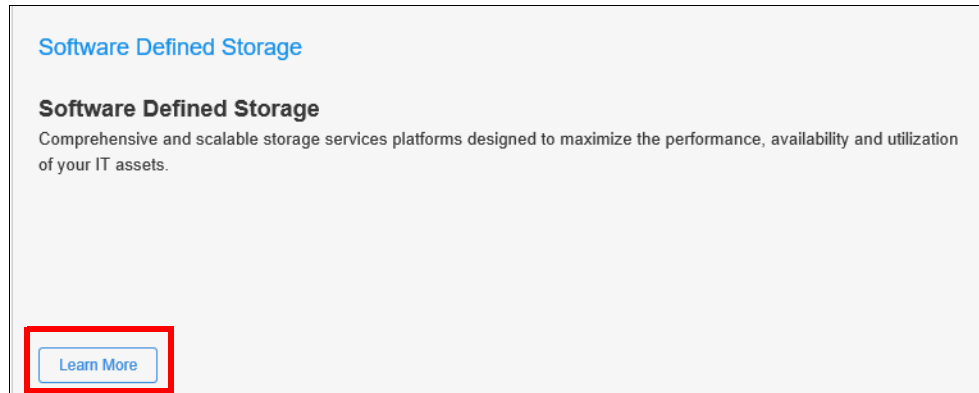

Figure 12   DCSC Software Defined Storage

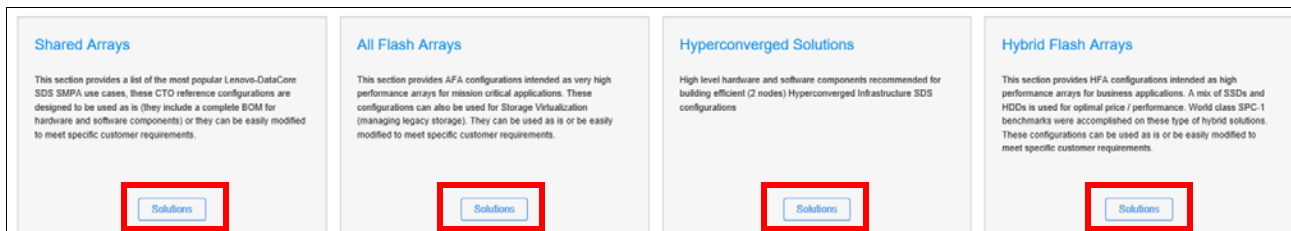4. Choose the right DataCore use case / type of solution as shown in Figure 13.

Figure 13   Selecting the DataCore use case/solution

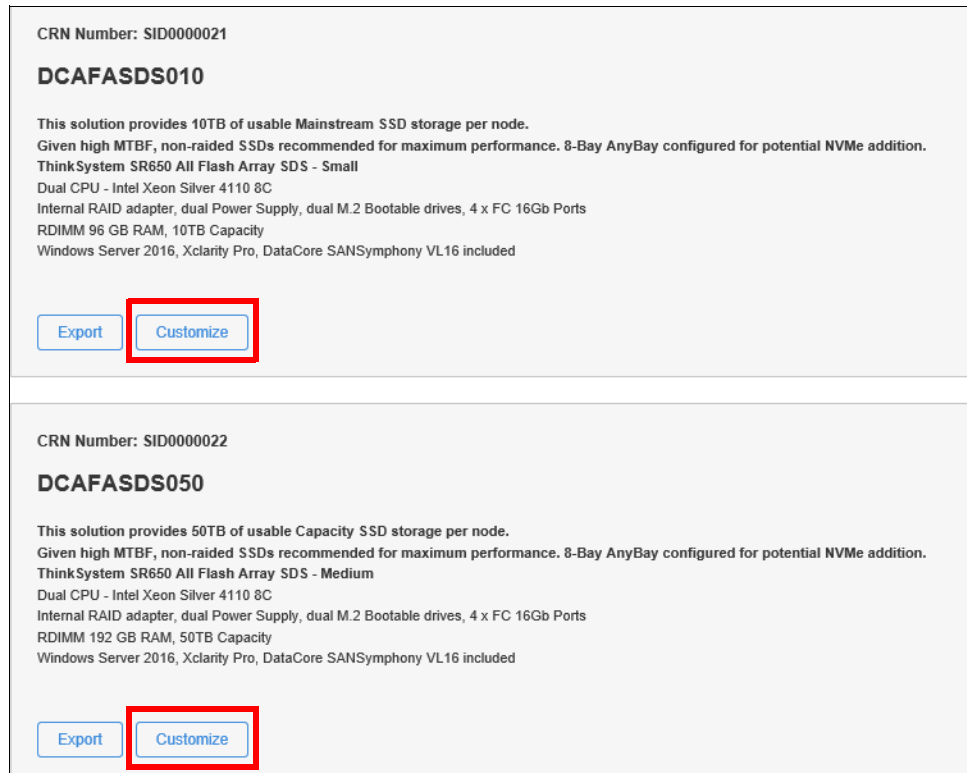5. Select the appropriate configuration, based on the opportunity size. Click **Customize**.

CRN Number: SID0000021

DCAFASDS010

This solution provides 10TB of usable Mainstream SSD storage per node.
Given high MTBF, non-raided SSDs recommended for maximum performance. 8-Bay AnyBay configured for potential NVMe addition.
ThinkSystem SR650 All Flash Array SDS - Small
Dual CPU - Intel Xeon Silver 4110 8C
Internal RAID adapter, dual Power Supply, dual M.2 Bootable drives, 4 x FC 16Gb Ports
RDIMM 96 GB RAM, 10TB Capacity
Windows Server 2016, Xclarity Pro, DataCore SANSymphony VL16 included

Export   Customize

CRN Number: SID0000022

DCAFASDS050

This solution provides 50TB of usable Capacity SSD storage per node.
Given high MTBF, non-raided SSDs recommended for maximum performance. 8-Bay AnyBay configured for potential NVMe addition.
ThinkSystem SR650 All Flash Array SDS - Medium
Dual CPU - Intel Xeon Silver 4110 8C
Internal RAID adapter, dual Power Supply, dual M.2 Bootable drives, 4 x FC 16Gb Ports
RDIMM 192 GB RAM, 50TB Capacity
Windows Server 2016, Xclarity Pro, DataCore SANSymphony VL16 included

Export   Customize

Figure 14   DataCore configurations

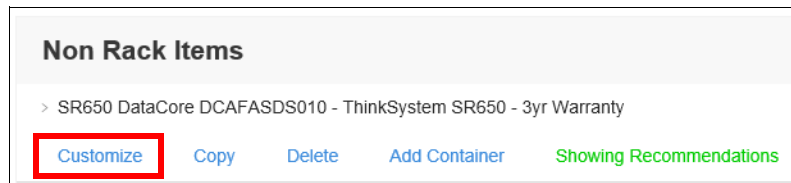6. You are now inside the DCSC configurator. Click **Customize** as shown in Figure 15.

Non Rack Items

> SR650 DataCore DCAFASDS010 - ThinkSystem SR650 - 3yr Warranty

Customize   Copy   Delete   Add Container   Showing Recommendations

Figure 15   Customize the configuration

7. Make appropriate changes to the imported configuration, Figure 16.

Base   Processors   Memory   Storage   PCI   Optical Drive   Power   Others   Value Added Options   Ser
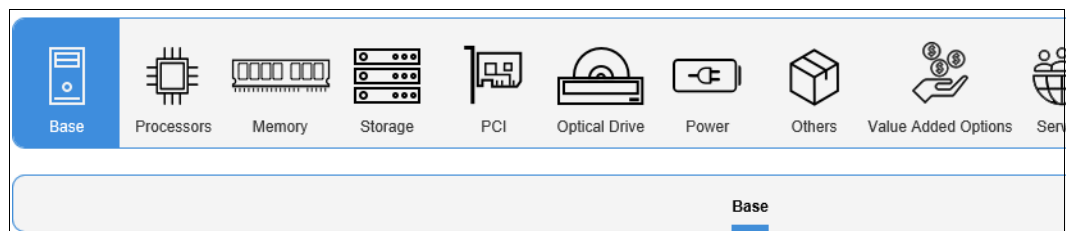
Base

Figure 16   Modifying the components in the configuration

Tip: Typically, you would adjust / modify memory components, internal storage, and adapter cards.

8. Manually modify DataCore licenses if you have made changes to the storage capacity on the original configuration. Click **OS & Software** then click **DataCore** as shown in Figure 17.
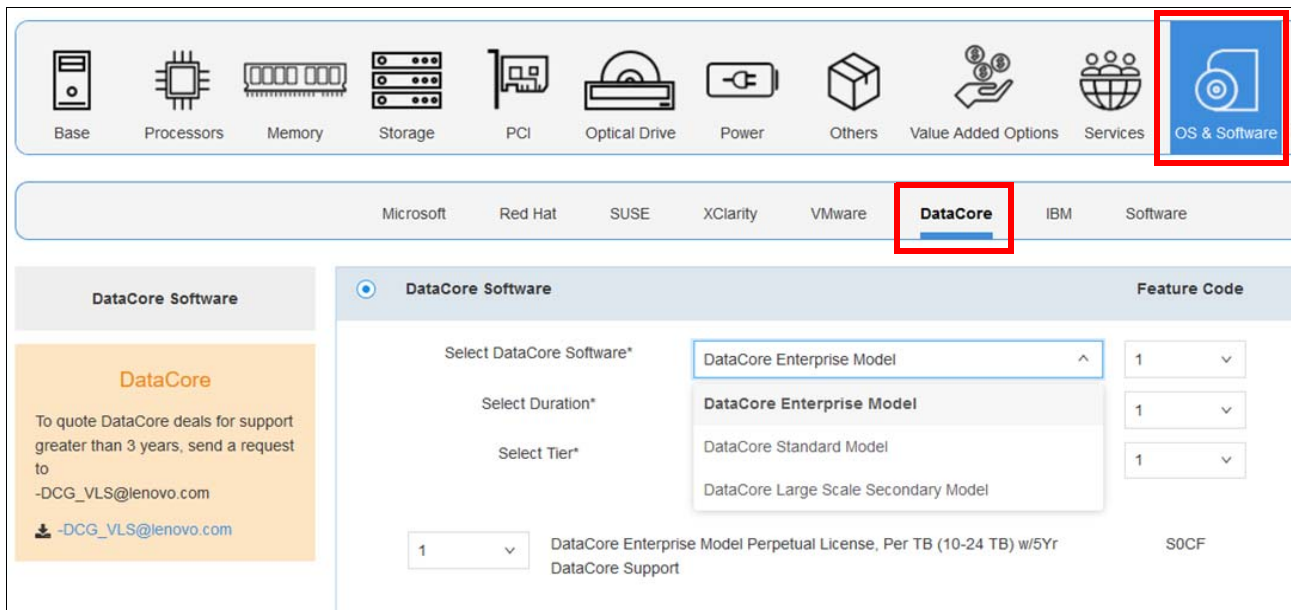

Figure 17   DataCore software

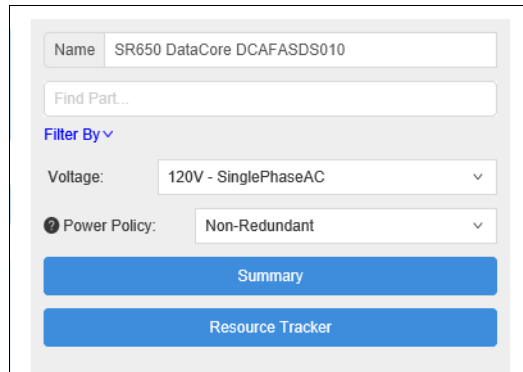9. Once all customization changes are made, click **Summary** as shown in Figure 18.

Figure 18   Summary

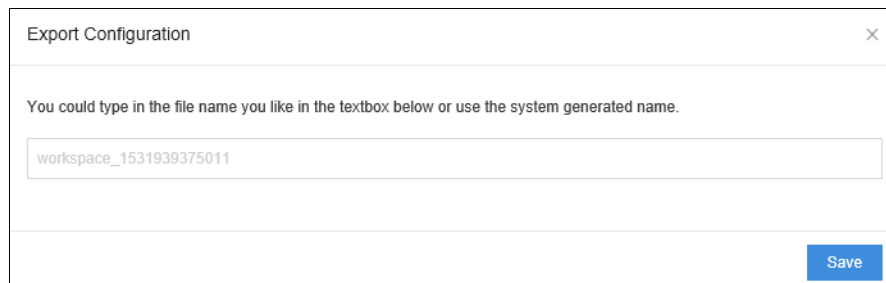10. Click **Export** to save your configuration. Provide a name for your modified configuration then click **Save**.

Figure 19   Export the configuration

11. Your browser will then prompt you to save the zip file containing the customized configuration, as shown in Figure 20.

Figure 20   Browser file save

There are two files provided in the ZIP:

► A machine readable file that can be used to import the configuration into DCSC again
► An Excel spreadsheet with your detailed Bill of Materials (BOM).

These files can now be sent for quotation and order processing.

Change history

December 2018:

► New DataCore part numbers, "DataCore Software" on page 13
► Updated Bills of Materials, "Use cases" on page 21

Authors

This paper was produced by the following team of specialists:

Manny Cabezas is a Business Development Director at DataCore. He has been in the Storage industry for over 30 years and has held a number of sales and management roles at IBM, Lenovo and DataCore.

Khalid Ansari is the Technical Lead for Lenovo Storage and SAN solutions. He is a member of the Advanced Solutions Group and his responsibilities include assisting with pre-sales storage and SDS opportunities in North America. Khalid has more than 15 years of experience with end to end deployment of storage networking solutions.

Florence Chabrier is a member of the Lenovo Expert Technical Sales (LETS) team in EMEA, providing pre-sales technical support to Lenovo sellers and channel partners. She has over 15 years of experience with x86 servers and storage products, and has been focusing on software-defined storage (SDS) and hyperconverged infrastructure (HCI) solutions in the last five years.

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► David Watts, Lenovo Press

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