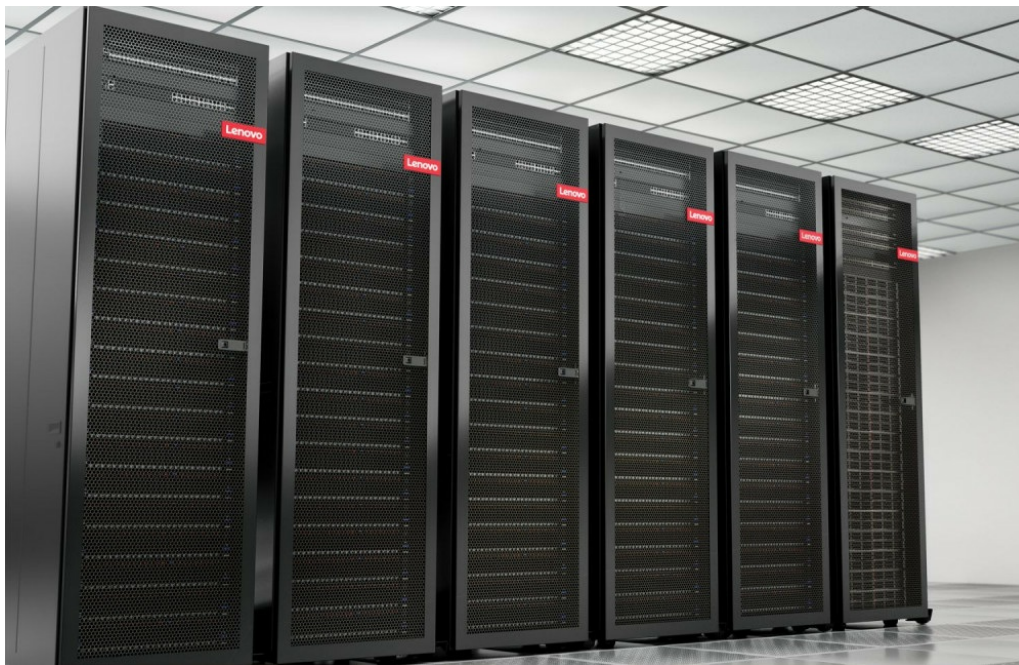# Lenovo Scalable Infrastructure (LeSI) Solutions
Product Guide

Lenovo Scalable Infrastructure (LeSI) is a framework for designing, manufacturing, integrating and delivering data center solutions, with a focus on High Performance Computing (HPC), Technical Computing, and Artificial Intelligence (AI) environments.

Benefits

Lenovo Scalable Infrastructure provides Best Recipe guides to warrant interoperability of hardware, software and firmware among a variety of Lenovo and third-party components.

Addressing specific needs in the data center, while also optimizing the solution design for application performance requires a significant level of effort and expertise. Customers need to choose the right hardware and software components, solve interoperability challenges across multiple vendors, and determine optimal firmware levels across the entire solution to ensure operational excellence, maximize performance, and drive best total cost of ownership.

LeSI reduces this burden on the customer by pre-testing and validating a large selection of Lenovo and third-party components, to create a "Best Recipe" of components and firmware levels that work seamlessly together as a solution. From this testing, customers can be confident that such a best practice solution will run optimally for their workloads, tailored to the client's needs.

In addition to interoperability testing, LeSI hardware is pre-integrated, pre-cabled, pre-loaded with the best recipe and optionally an OS-image and tested at the rack level in manufacturing, to ensure a reliable delivery and minimize installation time in the customer data center.

With LeSI, customers can focus their efforts on maximizing their business value, instead of consuming valuable resources to design, optimize, install, and support the infrastructure required to meet business demands. Whether the need is for a small AI training solution, a mid-sized HPC cluster, or the world's largest supercomputers, customers can take advantage of the decades of Lenovo experience, innovation, and expertise in solution deployment with Lenovo Scalable Infrastructure. LeSI delivers optimized IT solutions to the customer pre-integrated, pre-loaded, and tested, and ready to install, increasing time-to-value and reducing deployment risk.

LeSI solutions are based on:

- Industry-leading Lenovo ThinkSystem servers, storage and networking
- Open source and OEM software
- Best-of-breed third-party components especially in high performance networking and acceleration.

Lenovo thoroughly tests and optimizes all LeSI components for reliability, interoperability and maximum performance, so clients can quickly deploy the system and get to work achieving their business goals.

Hardware components

LeSI supports the following hardware components.

- Lenovo Servers
- Lenovo Ethernet Networking
- Lenovo Storage Expansion Units
- Rack Cabinets and Options
- Other Lenovo ThinkSystem Hardware
- HPC Acceleration
- InfiniBand Interconnects
- Omni-Path Architecture

Servers

- ThinkSystem SD530

  The Lenovo ThinkSystem SD530 is an ultra-dense and economical two-socket server in a 0.5U rack form factor. With four SD530 server nodes installed in the ThinkSystem D2 enclosure, and the ability to cable and manage up to seven D2 enclosures as one asset, you have an ideal high-density 2U four-node (2U4N) platform for performance-oriented enterprise and cloud workloads. Leveraging Lenovo Neptune liquid cooling technology within a Thermal Transfer Module it is the only dense system in the market supporting up to 205W TDP processors at 35°C (ASHRAE A2) ambient temperature without throttling. For more information, see the SD530 product guide.

- ThinkSystem SD650

  The ThinkSystem SD650 direct water-cooled server is a flexible and simple data center solution for users of high performance and technical computing, grid deployments, analytics workloads, and large-scale cloud infrastructures. The direct-to-node water cooled solution based on Lenovo Neptune liquid cooling technology, with up to 95% cooling efficiency, is designed to operate by using either cold or warm water, up to 50°C (122°F). Chillers are not needed for most customers, meaning even greater savings and a lower total cost of ownership. For more information, see the SD650 product guide.

- ThinkSystem SR670

  The Lenovo ThinkSystem SR670 is a purpose-built two-socket 2U node for GPU-accelerated workloads. Supporting the latest NVIDIA GPUs and Intel Xeon Scalable processors, the SR670 has been designed for optimal performance for high-end computation required by both Artificial Intelligence and High Performance Computing workloads, as well as high-end Virtual Desctop Infrastructure (VDI). The SR670 is key for Lenovo's AI strategy, delivering up to 4 double-wide or 8 single-wide GPUs per node and providing the optimal hardware for the LiCO platform. For more information, see the SR670 product guide.

- ThinkSystem SR630

  The Lenovo ThinkSystem SR630 is an ideal 2-socket 1U rack server for small businesses up to large enterprises that need industry-leading reliability, management, and security, as well as maximizing performance and flexibility for future growth. The SR630 server is designed to handle a wide range of workloads, such as databases, virtualization and cloud computing, virtual desktop infrastructure (VDI), infrastructure security, systems management, enterprise applications, collaboration/email, streaming media, web, and HPC. For more information, see the SR630 product guide.

- ThinkSystem SR650

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

- ThinkSystem SR850

  The Lenovo ThinkSystem SR850 is a 4-socket 2U rack server with a streamlined rack design that is optimized for price and performance, with best-in-class flexibility and expandability. Models of the SR850 are powered by up to four Intel Xeon Processor Scalable Family processors, each with up to 28 cores, for an efficient 4-socket solution. The ThinkSystem SR850's agile design provides rapid upgrades for processors and memory, and its large, flexible storage capacity helps to keep pace with data growth. For more information, see the SR850 product guide.

- ThinkSystem SR860

  The Lenovo ThinkSystem SR860 is a 4-socket server that features a 4U rack design with support for GPUs, and is optimized for price and performance and best-in-class expandability. Models of the SR860 are powered by up to four Intel Xeon Processor Scalable Family processors, each with up to 28 cores, for an efficient 4-socket solution. Using the same design as the 2U ThinkSystem SR850, the SR860's agile design provides rapid upgrades for processors and memory, and its large, flexible storage capacity helps to keep pace with data growth. For more information, see the SR860 product guide.

  Note: The ThinkSystem SR860 server is only available in EMEA and China.

- ThinkSystem SR950

  The Lenovo ThinkSystem SR950 is Lenovo's flagship server, suitable for mission-critical applications that need the most processing power possible in a single server. The powerful 4U ThinkSystem SR950 can expand from two to as many as eight Intel Xeon Scalable Family processors. The modular design of SR950 speeds upgrades and servicing with easy front or rear access to all major subsystems that ensures maximum performance and maximum server uptime. For more information, see the SR950 product guide.

The following table lists all the Lenovo ThinkSystem Servers that are supported by LeSI.

Table 1. Lenovo Server Selection

Description	Machine Type-Model	Feature code	Summary
Rack Server			
ThinkSystem SR630	7X02CTO1WW	AUW0 (8 SFF) AUW1 (10 SFF) AUW2 (4 LFF)	2-Socket Mainstream 1U rack server
ThinkSystem SR650	7X06CTO1WW	AUVV (8/16/24 SFF) AUVW (8/12 LFF) AUVX (8/16 SFF)	2-Socket Mainstream 2U rack server
ThinkSystem SR670	7Y37CTO1WW	B3XX (4x DW GPU) B3XY (8x SW GPU)	2-Socket Mainstream 4x-8x GPU 2U rack server
ThinkSystem SR850	7X19CTO1WW	AUPP	4-Socket High-End 2U rack server
ThinkSystem SR860	7X69CTO1WW	AXL6 (S 1+2) AUPY (S 3+4)	4-Socket High-End with GPU support 4U rack server
ThinkSystem SR950	7X12CTO1WW	AUNY (2-4S) AUKF (2-8S)	8-Socket High-End 4U rack server
Dense Server			
ThinkSystem D2 Enclosure	7X20CTO1WW	AUXM	2U4N chassis for SD530
ThinkSystem Modular Enclosure	7X22CTO1WW	AUXM	2U4N scalable chassis for SD530
ThinkSystem SD530	7X21CTO1WW	AUXN	2-Socket Dense 0.5U server
NeXtScale n1200 DWC Enclosure	5468-HC1	A5M3	6U12N direct water-cooled chassis for SD650
NeXtScale n1200 DWC Manifold	5469-HC1	A5MN (1-drop) A5N7 (2-drop) A5N8 (3-drop) A5N9 (4-drop) A5ML (5-drop) A5MM (6-drop)	Direct water-cooling manifold attached to n1200 enclosures.
ThinkSystem SD650	7X58CTO1WW	B15M	1U tray with two 2-Socket direct water cooled Dense servers

Ethernet Networking

- 1 Gb Ethernet

  The 1 Gb Lenovo RackSwitch series is ideal for next-generation data centers. They deliver unmatched price performance, along with benefits such as server-matched airflow, lower power consumption, low latency, and easy switch management. For more information on these products, see the relevant product guides:

  - Lenovo RackSwitch G8052 – 52-port layer 2/3 switch
  - Lenovo ThinkSystem NE0152T – 52-port layer 2/3 switch
  - Lenovo RackSwitch G7052 – 52-port layer 2 switch
  - Lenovo RackSwitch G7028 – 28-port layer 2 switch

- 10 Gb Ethernet

  The 10 Gb Lenovo RackSwitch series delivers exceptional performance, being both lossless and low latency. These switches also deliver excellent cost savings as you consider acquisition costs, energy costs, operational expenses, and ease of use and management. They have feature-rich design with key virtualization features, such as CEE/FCoE, high availability, and enterprise class Layer 2 and Layer 3 functionalities. For more information on these products, see the product guides:

  - Lenovo RackSwitch G8272 – 48x 10Gb SFP+ + 6x 40Gb QSFP+ ports
  - Lenovo RackSwitch G8296 – 86x 10Gb SFP+ + 10x 40Gb QSFP+ ports
  - Lenovo ThinkSystem NE1032 RackSwitch – 32 10Gb SFP+ ports
  - Lenovo ThinkSystem NE1032T RackSwitch – 24 10GBASE-T + 8 10Gbit SFP+ ports
  - Lenovo ThinkSystem NE1072T RackSwitch – 48 10GBASE-T + 6 40Gbit QSFP+ ports

- 25 Gb Ethernet

  The 25 Gb Lenovo RackSwitch series is designed for the data center and provides 25 Gb Ethernet connectivity with 100 Gb Ethernet upstream links. They are ideal for big data, cloud, and enterprise workload solutions. For more information on these products, see the product guides:

  - Lenovo ThinkSystem NE2572 RackSwitch – 48 25Gb SFP28 + 6 100Gb QSFP28 ports

- 100 Gb Ethernet

  The 100 Gb ThinkSystem Networking series uses 100 Gb QSFP28 and 40Gb QSFP+ Ethernet technology is and specifically designed for the data center. It is ideal for today's big data, cloud, and enterprise workload solutions. It provides enterprise class Layer 2 and Layer 3 full featured switches that deliver line-rate, high-bandwidth switching, filtering, and traffic queuing without delaying data. Large data center-grade buffers help keep traffic moving, while the hot-swap redundant power supplies and fans (along with numerous high-availability features) help provide high availability for business sensitive traffic.

  - Lenovo ThinkSystem NE10032 RackSwitch – 32 100Gb QSFP28 ports

The following table summarizes all the Lenovo Ethernet Switches that are supported by LeSI.

Table 2. Lenovo Ethernet Networking Switch Selection

Description	Orientation	Part number	MTM	Feature code	Summary
1 Gbit Ethernet					
Lenovo ThinkSystem NE0152T	Rear to Front (PSE	7Y810011WW	7Y81CTO1WW	B45U	1U ToR L2/3 1Gbit Switch with 48 GBASE-T RJ45 and 4 10Gbit SFP+ Ports
	Front to Rear (oPSE)	7Y810012WW	7Y81CTO2WW	B45T	

Description	Orientation	Part number	MTM	Feature code	Summary
Lenovo RackSwitch G8052	Rear to Front (PSE	7159G52	7159-HC1	ASY2	1U ToR L2/3 1Gbit Switch with 48 GBASE-T RJ45 and 4 10Gbit SFP+ Ports
	Front to Rear (oPSE)	715952F	7159-HC2	ASY1	
Lenovo RackSwitch G7052	Rear to Front (PSE)	7159CAX	7159-HCT	AT0A	1U ToR L2 1Gbit Switch with 48 GBASE-T RJ45 and 4 10Gbit SFP+ Ports
Lenovo RackSwitch G7028	Rear to Front (PSE)	7159BAX	7159-HCP	AT09	1U ToR L2 1Gbit Switch with 24 GBASE-T RJ45 and 4 10Gbit SFP+ Ports
10 Gbit Ethernet					
Lenovo ThinkSystem NE1032 RackSwitch	Rear to Front (PSE)	7159A1X	7159-HD1	AU3A	1U L2/3 10Gbit CNOS Switch with 32 10Gbit SFP+ Ports
	Front to Rear (oPSE)	7159A2X	7159-HD2	AU39	
Lenovo ThinkSystem NE1032T RackSwitch	Rear to Front (PSE)	7159B1X	7159-HD3	AU38	1U L2/3 10Gbit CNOS Switch with 24 10GBASE-T and 8 10Gbit SFP+ Ports
	Front to Rear (oPSE)	7159B2X	7159-HD4	AU37	
Lenovo ThinkSystem NE1072T RackSwitch	Rear to Front (PSE)	7159C1X	7159-HD5	AU36	1U L2/3 10Gbit CNOS Switch with 48 GBASE-T and 6 40Gbit QSFP+ Ports
	Front to Rear (oPSE)	7159C2X	7159-HD6	AU35	
Lenovo RackSwitch G8272	Rear to Front (PSE)	7159CRW	7159-HCW	ASRD	1U L2/3 10Gbit C/ENOS Switch with 48 10Gbit SFP+ and 6 40Gbit QSFP+ Ports
	Front to Rear (oPSE)	7159CFV	7159-HCV	ASRE	
Lenovo RackSwitch G8296	Rear to Front (PSE)	7159GR6	7159-HC6	ASVM	2U L2/3 10Gbit C/ENOS Switch with 86 10Gbit SFP+ and 10 40Gbit QSFP+ Ports
	Front to Rear (oPSE)	7159GF5	7159-HC5	ASVN	
25 Gbit Ethernet					
Lenovo ThinkSystem NE2572 RackSwitch	Rear to Front (PSE)	7159E1X	7159-HE3	AV19	1U L2/3 25Gbit CNOS Switch with 48 25Gbit SFP28 and 6 100Gbit QSFP28 Ports
	Front to Rear (oPSE)	7159E2X	7159-HE4	AV1A	
100 Gbit Ethernet					
Lenovo ThinkSystem NE10032 RackSwitch	Rear to Front (PSE)	7159D1X	7159-HE1	AV17	1U L2/3 100Gbit CNOS Switch with 32 100Gbit QSFP28 Ports
	Front to Rear (oPSE)	7159D2X	7159-HE2	AV18	

The following cable types can be purchased, with the lists of cables given in the tables below:

- Cables for 10 GbE and 1 GbE RJ-45 adapters
- Cables for 10 GbE SFP+ adapters
- Cables for 25 GbE SFP28 adapters
- Cables for 100 GbE QSFP28 network adapters
- Cables for network transceivers

The following table lists cables for the 10 GbE and 1 GbE RJ-45 adapters.

Table 3. Cables for 10 GbE and 1 GbE RJ-45 ports

Description	Part number	Feature code
UTP Category 5e cables (Blue) for 1 GbE RJ-45 ports		
0.6m Blue Cat5e Cable	40K5679	3801
0.75m Blue Cat5e Cable	00WE111	AVFT
1.0m Blue Cat5e Cable	00WE114	AVFU
1.25m Blue Cat5e Cable	00WE119	AVFV
1.5m Blue Cat5e Cable	40K8785	3802
3m Blue Cat5e Cable	40K5581	3803
10m Blue Cat5e Cable	40K8927	3804
25m Blue Cat5e Cable	40K8930	3805
UTP Category 5e cables (Green) for 1 GbE RJ-45 ports		
0.6m Green Cat5e Cable	40K5563	3796
0.75m Green Cat5e Cable	00WE099	AVFQ
1.0m Green Cat5e Cable	00WE103	AVFR
1.25m Green Cat5e Cable	00WE107	AVFS
1.5m Green Cat5e Cable	40K5643	3797
3m Green Cat5e Cable	40K5793	3798
10m Green Cat5e Cable	40K5794	3799
25m Green Cat5e Cable	40K8869	3800
UTP Category 5e cables (Yellow) for 1 GbE RJ-45 ports		
0.6m Yellow Cat5e Cable	40K8933	3791
1.5m Yellow Cat5e Cable	40K8951	3792
3m Yellow Cat5e Cable	40K8957	3793
10m Yellow Cat5e Cable	40K8801	3794
25m Yellow Cat5e Cable	40K8807	3795

The following table lists cables for 10 GbE SFP+ port connection.

Table 4. Cables for 10 GbE SFP+ ports

Description	Part number	Feature code
SFP+ passive direct-attach cables - 10 GbE		
Lenovo 0.5m Passive SFP+ DAC Cable	00D6288	A3RG
Lenovo 1m Passive SFP+ DAC Cable	90Y9427	A1PH
Lenovo 1.5m Passive SFP+ DAC Cable	00AY764	A51N
Lenovo 2m Passive SFP+ DAC Cable	00AY765	A51P
Lenovo 3m Passive SFP+ DAC Cable	90Y9430	A1PJ
Lenovo 5m Passive SFP+ DAC Cable	90Y9433	A1PK
Lenovo 7m Passive SFP+ DAC Cable	00D6151	A3RH
SFP+ active direct-attach cables - 10 GbE		
Lenovo 1m Active DAC SFP+ Cable	00VX111	AT2R
Lenovo 3m Active DAC SFP+ Cable	00VX114	AT2S
Lenovo 5m Active DAC SFP+ Cable	00VX117	AT2T
SFP+ active optical cables - 10 GbE		
Lenovo 1m SFP+ to SFP+ Active Optical Cable	00YL634	ATYX
Lenovo 3m SFP+ to SFP+ Active Optical Cable	00YL637	ATYY
Lenovo 5m SFP+ to SFP+ Active Optical Cable	00YL640	ATYZ
Lenovo 7m SFP+ to SFP+ Active Optical Cable	00YL643	ATZ0
Lenovo 15m SFP+ to SFP+ Active Optical Cable	00YL646	ATZ1
Lenovo 20m SFP+ to SFP+ Active Optical Cable	00YL649	ATZ2

The following table lists cables for 25 GbE SFP28 port connection.

Table 5. Cables for 25 GbE SFP28 ports

Description	Part number	Feature code
SFP28 passive direct-attach copper cables - 25 GbE		
Lenovo 1m Passive 25G SFP28 DAC Cable	7Z57A03557	AV1W
Lenovo 3m Passive 25G SFP28 DAC Cable	7Z57A03558	AV1X
Lenovo 5m Passive 25G SFP28 DAC Cable	7Z57A03559	AV1Y
SFP28 active optical cables - 25 GbE		
Lenovo 3m 25G SFP28 Active Optical Cable	7Z57A03541	AV1F
Lenovo 5m 25G SFP28 Active Optical Cable	7Z57A03542	AV1G
Lenovo 10m 25G SFP28 Active Optical Cable	7Z57A03543	AV1H
Lenovo 15m 25G SFP28 Active Optical Cable	7Z57A03544	AV1J
Lenovo 20m 25G SFP28 Active Optical Cable	7Z57A03545	AV1K

The following table lists cables for 100 GbE QSFP28 port connection.

Table 7. Cables for 100 GbE QSFP28 ports

Description	Part number	Feature code
QSFP28 passive direct-attach copper cables - 100 GbE		
Lenovo 1m Passive 100G QSFP28 DAC Cable	7Z57A03561	AV1Z
Lenovo 3m Passive 100G QSFP28 DAC Cable	7Z57A03562	AV20
Lenovo 5m Passive 100G QSFP28 DAC Cable	7Z57A03563	AV21
QSFP28 active optical cables - 100 GbE		
Lenovo 1m 100G QSFP28 Active Optical Cable	4Z57A10844	B2UZ
Lenovo 3m 100G QSFP28 Active Optical Cable	7Z57A03546	AV1L
Lenovo 5m 100G QSFP28 Active Optical Cable	7Z57A03547	AV1M
Lenovo 10m 100G QSFP28 Active Optical Cable	7Z57A03548	AV1N
Lenovo 15m 100G QSFP28 Active Optical Cable	7Z57A03549	AV1P
Lenovo 20m 100G QSFP28 Active Optical Cable	7Z57A03550	AV1Q
QSFP28 direct attach copper breakout cables - 100 GbE to 4x 25 GbE		
Lenovo 1m 100G QSFP28 to 4x25G SFP28 Breakout DAC Cable	7Z57A03564	AV22
Lenovo 3m 100G QSFP28 to 4x25G SFP28 Breakout DAC Cable	7Z57A03565	AV23
Lenovo 5m 100G QSFP28 to 4x25G SFP28 Breakout DAC Cable	7Z57A03566	AV24
QSFP28 active optical breakout cables - 100 GbE to 4x 25 GbE		
Lenovo 3m 100G to 4x25G Breakout Active Optical Cable	7Z57A03551	AV1R
Lenovo 5m 100G to 4x25G Breakout Active Optical Cable	7Z57A03552	AV1S
Lenovo 10m 100G to 4x25G Breakout Active Optical Cable	7Z57A03553	AV1T
Lenovo 15m 100G to 4x25G Breakout Active Optical Cable	7Z57A03554	AV1U
Lenovo 20m 100G to 4x25G Breakout Active Optical Cable	7Z57A03555	AV1V

The following table lists cables for 10 GbE SR SFP+, 25Gbit SR SFP28, 40Gb SR QSFP+ and 100Gb SR QSFP28 transceiver connections.

Table 8. Cables for network transceiver ports

Description	Part number	Feature code
OM3 optical cables for 10 GbE SR SFP+, 25 GbE SR SFP28, and 40 GbE SR QSFP+ BiDi transceivers		
Lenovo 0.5m LC-LC OM3 MMF Cable	00MN499	ASR5
Lenovo 1m LC-LC OM3 MMF Cable	00MN502	ASR6
Lenovo 3m LC-LC OM3 MMF Cable	00MN505	ASR7
Lenovo 5m LC-LC OM3 MMF Cable	00MN508	ASR8
Lenovo 10m LC-LC OM3 MMF Cable	00MN511	ASR9
Lenovo 15m LC-LC OM3 MMF Cable	00MN514	ASRA
Lenovo 25m LC-LC OM3 MMF Cable	00MN517	ASRB
Lenovo 30m LC-LC OM3 MMF Cable	00MN520	ASRC
OM3 optical cables for 40 GbE QSFP+ SR4/iSR4/eSR4 transceivers		
Lenovo 10m QSFP+ MPO-MPO OM3 MMF Cable	00VX003	AT2U
Lenovo 30m QSFP+ MPO-MPO OM3 MMF Cable	00VX005	AT2V
OM3 optical breakout cables for 40 GbE QSFP+ iSR4/eSR4 transceivers		
Lenovo 1m MPO-4xLC OM3 MMF Breakout Cable	00FM412	A5UA
Lenovo 3m MPO-4xLC OM3 MMF Breakout Cable	00FM413	A5UB
Lenovo 5m MPO-4xLC OM3 MMF Breakout Cable	00FM414	A5UC
OM4 optical cables for 10 GbE SR SFP+, 25 GbE SR SFP28, and 40 GbE SR QSFP+ BiDi transceivers		
Lenovo 0.5m LC-LC OM4 MMF Cable	4Z57A10845	B2P9
Lenovo 1m LC-LC OM4 MMF Cable	4Z57A10846	B2PA
Lenovo 3m LC-LC OM4 MMF Cable	4Z57A10847	B2PB
Lenovo 5m LC-LC OM4 MMF Cable	4Z57A10848	B2PC
Lenovo 10m LC-LC OM4 MMF Cable	4Z57A10849	B2PD
Lenovo 15m LC-LC OM4 MMF Cable	4Z57A10850	B2PE
Lenovo 25m LC-LC OM4 MMF Cable	4Z57A10851	B2PF
Lenovo 30m LC-LC OM4 MMF Cable	4Z57A10852	B2PG
OM4 Optical cables for 100 GbE QSFP28 SR4 transceivers		
Lenovo 5m MPO-MPO OM4 MMF Cable	7Z57A03567	AV25
Lenovo 7m MPO-MPO OM4 MMF Cable	7Z57A03568	AV26
Lenovo 10m MPO-MPO OM4 MMF Cable	7Z57A03569	AV27
Lenovo 15m MPO-MPO OM4 MMF Cable	7Z57A03570	AV28
Lenovo 20m MPO-MPO OM4 MMF Cable	7Z57A03571	AV29
Lenovo 30m MPO-MPO OM4 MMF Cable	7Z57A03572	AV2A
OM4 Optical breakout cables for 100 GbE QSFP28 SR4 transceivers		
Lenovo 1m MPO-4xLC Breakout OM4 MMF Cable	7Z57A03573	AV2B
Lenovo 3m MPO-4xLC Breakout OM4 MMF Cable	7Z57A03574	AV2C
Lenovo 5m MPO-4xLC Breakout OM4 MMF Cable	7Z57A03575	AV2D

Storage Expansion Units

The Lenovo Expansion Units are designed to provide simplicity, speed, scalability, security, and high availability for small to large businesses. For more information on these products, see the product guides.

- Lenovo Storage D1224 Drive Enclosure

  The Lenovo Storage D1224 delivers enterprise-class storage technology in a cost-effective solution with flexible drive configurations and RAID or JBOD (non-RAID) host connectivity. For more information, see the D1224 product guide.

- Lenovo Storage D3284 External High Density Drive Expansion Enclosure

  The Lenovo Storage D3284 High Density Expansion Enclosure delivers enterprise-class storage technology in a cost-effective dense solution with flexible drive configurations of up to 84 drives in 5U and RAID or JBOD (non-RAID) host connectivity or Lenovo ThinkSystem DS Series storage area network (SAN) array expansion. For more information, see the D3284 product guide.

The following table lists all the Lenovo Storage Enclosures that are supported by LeSI.

Table 9. Lenovo Storage Enclosure selection

Description	Machine Type - Model	Feature Code	Summary
Lenovo Storage D1224 Drive Enclosure	4587-HC2	AU15	12Gb SAS 2U Enclosure for up to 24x 2.5-inch SFF SAS drives
Lenovo Storage D3284 External High Density Drive Expansion Enclosure	6413-HC1	AUDV	12G SAS 5U enclosure for up to 84x 3.5-inch LFF NL-SAS drives

Rack Cabinets and Options

The Lenovo rack cabinets are industry-standard 19-inch server cabinets that are designed for high availability server environments. They are optimized to help maximize floor space, expedite installation, simplify cable management, and increase accessibility for improved serviceability. Lenovo also offers rack options, including accessories like a front extension to the rack, heat exchangers and console kits and a rear door heat exchanger, which is part of Lenovo Neptune liquid cooling technologies. These options improve thermal performance and simplify rack management.

The following table lists all the rack cabinets and rack options that are supported by LeSI.

Table 10. Rack Cabinets and Options

Description	MTM / PN	Feature Code	Summary
Rack cabinets			
Scalable Infrastructure 42U 1100mm Enterprise V2 Dynamic Rack	1410-HPB	A2M8	Primary Rack for LeSI Solutions
	1410-HPB	AS9Y	RDHX ready Rack for LeSI Solutions
	1410-HEB	A2M9	Expansion Rack for LeSI Solutions
	1410-HEB	B27C	LeSI Rack with Enhanced Packaging
Scalable Infrastructure 42U 1200mm Deep Rack	1410-HPA	A1MP	Deep Primary Rack for LeSI Solutions
	1410-HEA	A1MQ	Deep Expansion Rack for LeSI Solutions
Client Site Integration Kit	7X74-CTO1WW	B1EN	Virtual Rack for DSS-G Solution
Rack Options			
Rear Door Heat eXchanger V2 (RDHX)	1756-HC1	A2FP	Rear Door Heat Exchanger for 30-40kW room neutral liquid cooling.
Rack Extension Kit	00Y456	AUEE	Extension Kit for front cabling space
Other			
1U 18.5' Standard Console	1723-HC1	A3EK	Console kit for rack management
Local 1X8 Console Manager (LCM8)	1754-HC3/A1X	0725	8-port analog KVM switch
Local 2X16 Console Manager (LCM16)	1754-HC4/A2X	0725	16-port analog KVM switch
Global 2X2X16 Console Manager (GCM16)	1754-HC1/D1X	6694	16-port KVM supporting 2 remote users
Global 4X2X16 Console Manager (GCM32)	1754-HC2/D2X	6695	16-port KVM supporting 4 remote users

Other Lenovo ThinkSystem hardware

While LeSI maintains a set of best recipe configurations guaranteeing interoperability, this does not mean that other ThinkSystem hardware is never used. Other Lenovo ThinkSystem hardware system and configurations outside of the defined stack may be compatible with LeSI, though not formally covered by interoperability warranty/support.

For example, the ThinkSystem DS6200 Storage Array may be part of the optimal hardware choices for a client use case. Because LeSI strives to offer the optimal data center solution to every client, a special bid process is available for incorporating these hardware options. For more information, please check with your Lenovo sales representative.

HPC Acceleration

LeSI solutions include GPUs from NVIDIA. For a summary of GPU features, see the Lenovo ThinkSystem GPU Summary.

Click the links below to read the product briefs from NVIDIA:

- NVIDIA Tesla Series
  - NVIDIA Tesla M10
  - NVIDIA Tesla M60
  - NVIDIA Tesla P40
  - NVIDIA Tesla V100
  - NVIDIA Tesla T4

- NVIDIA Quadro Series
  - NVIDIA Quadro P6000
  - NVIDIA Quadro P4000
  - NVIDIA Quadro P2000
  - NVIDIA Quadro P620

The following table lists all the graphics processing units (GPU) acceleration options that are supported by LeSI.

Table 11. GPU adapters

Description	Part Number	Feature Code	SR630	SR650	SR670	SR850	SR860	SR950	SD530	SD650
NVIDIA Tesla GPUs										
NVIDIA Tesla M10 GPU, PCIe (passive)	7C57A02891	AX8L	N	2	N	N	N	N	2	N
	None	B0RK	N	N	N	N	N	N	2	N
	None	B15V	N	2	N	N	N	N	N	N
NVIDIA Tesla M60 GPU, PCIe (passive)	00KG655	ATZE	N	2	N	N	N	N	2	N
	None	B0M0	N	N	N	N	N	N	2	N
	None	B13J	N	2	N	N	N	N	N	N
	00KG655	B0TB	N	N	N	N	2	N	N	N
NVIDIA Tesla P40 GPU, PCIe (passive)	7C57A02888	AVNZ	N	2	N	N	N	N	2	N
	SBB7A06772	B0LZ	N	N	N	N	N	N	2	N
	None	B15U	N	2	4	N	N	N	N	N
NVIDIA Tesla V100 PCIe 16GB, PCIe (passive)	4C57A09498	B1JY	N	2	4	N	2	N	2	N
NVIDIA Tesla V100 FHHL 16GB GPU, PCIe (passive)	SBB7A09754	B32D	N	2	N	N	N	N	N	N
NVIDIA Tesla V100 32GB GPU, PCIe (passive)	4X67A12088	B34S	N	2	4	N	2	N	2	N
NVIDIA Tesla T4 16GB GPU, PCIe (passive)	4X67A14926	B4YB	2	N	8	N	N	N	N	N
NVIDIA Quadro GPUs										
ThinkSystem NVIDIA Quadro P620 2GB GPU, PCIe (active)	4X67A11584	B31D	3	3	N	N	N	N	N	N
ThinkSystem NVIDIA Quadro P2000 GPU, PCIe (active)	None	AUW6	1	N	N	N	N	N	N	N
ThinkSystem NVIDIA Quadro P4000 8GB GPU, PCIe (active)	None	B225	1	3	N	N	N	N	N	N
ThinkSystem NVIDIA Quadro P6000 24GB GPU, PCIe (active)	None	B2V5	N	2	N	N	N	N	N	N

InfiniBand Interconnects

- Mellanox SX6000 Series

  Built with Mellanox's latest SwitchX-2 InfiniBand switch device, these switches provide up to 56Gb/s full bidirectional bandwidth per port. These stand-alone switches are an ideal choice for top-of-rack leaf connectivity or for building small to medium sized clusters. They are designed to carry converged LAN and SAN traffic with the combination of assured bandwidth and granular Quality of Service (QoS). For more information, see the Mellanox product briefs below:

  - Mellanox SX6036 – 36-port Non-blocking Managed 56Gb InfiniBand/VPI SDN Switch
  - Mellanox SX6025 – 36-port Non-blocking Unmanaged 56Gb InfiniBand SDN Switch

- Mellanox SB7800 Series

  Built with Mellanox's Switch-IB 2 InfiniBand switch device, the SB7800 series provides up to 100Gb/s full bi-directional bandwidth per port. SB7800 smart network switch is designed to enable in-network computing through the Co-Design Scalable Hierarchical Aggregation Protocol (SHARP) technology. The Co-Design architecture enables the usage of all active data center devices to accelerate the communications frameworks using embedded hardware, resulting in significant applications performance improvements. For more information, see the product briefs below:

  - Mellanox SB7800 – 36-port Non-blocking Managed EDR 100Gb InfiniBand Smart Switch
  - Mellanox SB7890 – 36-port Non-blocking Externally-managed EDR 100Gb InfiniBand Smart Switch

- Mellanox QM8700 Series
  Built with Mellanox's Quantum InfiniBand switch device, the QM8700 series provides up to 200Gb/s full bi-directional bandwidth per port. QM8700 is the world's smartest network switch, designed to enable in-network computing through the Co-Design Scalable Hierarchical Aggregation Protocol (SHARP) technology. The Co-Design architecture enables the usage of all active data center devices to accelerate the communications frameworks using embedded hardware, result in order of magnitude applications performance improvements. For more information, see the product briefs below:

  - Mellanox QM8700 – 40-port Non-blocking Managed HDR 200Gb InfiniBand Smart Switch
  - Mellanox QM8790 – 40-port Non-blocking Externally-managed HDR 200Gb InfiniBand Smart Switch
  Note: The Mellanox QM8700 Series switches are planned to be available in June 2019.

- Mellanox InfiniBand Adapters

  Data centers, high scale storage systems and cloud computing require I/O services such as bandwidth, consolidation and unification, and flexibility. Mellanox InfiniBand adapters provide advanced levels of data center IT performance, efficiency and scalability. In addition, Mellanox's InfiniBand adapters support traffic consolidation and provides hardware acceleration for server virtualization as well as functioning as both InfiniBand and Ethernet adapters. For more information, see the product briefs below:

  - Mellanox ConnectX-4 EDR InfiniBand Adapter
  - Mellanox ConnectX-4 Lx Ethernet Adapter (EN only)
  - Mellanox ConnectX-5 EDR InfiniBand Adapter
  - Mellanox ConnectX-6 HDR InfiniBand Adapter

  Note: The ConnectX-5 EDR InfiniBand adapters are only available to Lenovo customers through LeSI. The ConnectX-6 HDR InfiniBand adapters are planned to be available in May 2019.

The following table lists all the InfiniBand switches that are supported by LeSI.

Table 12. InfiniBand switches

Description	Orientation	Part Number	Machine Type - Model	Feature Code	Summary
InfiniBand Switches					
Mellanox SX6025 FDR InfiniBand Switch	PSE	None	0724-HCU	ASW8	1U 36 Port Unmanaged 56Gb/s SwitchX InfiniBand Switch
	oPSE	None	0724-HCV	ASW9	
Mellanox SX6036 FDR InfiniBand Switch	PSE	None	0724-HCF	A2Y6	1U 36 Port Managed 56Gb/s SwitchX InfiniBand Switch
	oPSE	None	0724-HCG	A2Y7	
Mellanox SB7800 EDR InfiniBand Switch	PSE	None	0724-HD3	AUPK	1U 36 Port Managed 100Gb/s Switch-IB2 InfiniBand Switch
	oPSE	None	0724-HD4	AUPL	
Mellanox SB7890 EDR InfiniBand Switch	PSE	None	0724-HD5	AUPM	1U 36 Port Unmanaged 100Gb/s Switch-IB2 InfiniBand Switch
	oPSE	None	0724-HD6	AUPN	
Mellanox QM8700 HDR InfiniBand Switch	PSE	None	0724-HD7	B4RH	1U 40 Port Managed 200Gb/s Quantum InfiniBand Switch
	oPSE	None	0724-HD8	B4RJ	
Mellanox QM8790 HDR InfiniBand Switch	PSE	None	0724-HD9	B4RK	1U 40 Port Unmanaged 200Gb/s Quantum InfiniBand Switch
	oPSE	None	0724-HEA	B4RL	
InfiniBand Switch Options					
Mellanox SX60xx/10xx 75mm Recessed Enterprise Rack Mount Kit	Not applicable	00AE043	None	A4HK	Rack mount kit for MSX60xx switch
Mellanox MSX60xx/ MSX10xx 300w Power Supply with Intake Fan	PSE	90Y3800	None	A2F2	300W Power supply for port side exhaust MSX60xx switch
Mellanox MSX60xx/ MSX10xx 300w Power Supply with Exhaust Fan	oPSE	90Y3802	None	A2F3	300W Power supply for opposite port side exhaust MSX60xx switch
Mellanox 1U Switch Enterprise Rack Air Duct Kit	Not applicable	00AE039	None	A4HJ	Air duct for recessed 1U InfiniBand Switches
Mellanox QM87xx RMK w/ Air Duct	Not applicable	4M27A16331	None	B5RV	Mounting kit with air duct for 1U HDR InfiniBand Switches
Mellanox QM87xx RMK for Recessed Mounting	Not applicable	4M27A16332	None	B5RW	Recessed Mounting kit for 1U HDR InfiniBand Switches

The following table lists all InfiniBand adapters that are supported by LeSI.

Table 13. InfiniBand adapters

Description	Part Number	Feature Code	SR630	SR650	SR670	SR850	SR860	SR950	SD530	SD650
FDR Adapters										
ThinkSystem Mellanox ConnectX-4 PCIe x8 FDR 1-Port QSFP VPI Adapter	7XC7A05524	B0WX	Y	Y	N	N	N	Y	Y	N
ThinkSystem Mellanox ConnectX-4 PCIe FDR 2-Port QSFP VPI Adapter	7ZT7A00500	AUVG	Y	Y	N	Y	Y	Y	Y	N
EDR Adapters										
Mellanox ConnectX-4 EDR IB VPI Single-port x16 PCIe 3.0 HCA	00KH924	ASWQ	Y	Y	N	Y	Y	Y	Y	N
Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter	00MM960	ATRP	Y	Y	Y	Y	Y	Y	Y	N
Mellanox ConnectX-5 1x100GbE / EDR IB QSFP28 VPI Adapter *	4C57A08979	B0RL	Y	Y	N	Y	Y	Y	Y	N
Mellanox ConnectX-5 2x100GbE / EDR IB QSFP28 VPI Adapter *	4C57A08980	B0RM	Y	Y	Y	Y	Y	Y	Y	N
ThinkSystem SD650 DWC Mellanox ConnectX-5 EDR 1-port Adapter *	CTO only	B1C2	N	N	N	N	N	N	N	Y
Specialized FDR / EDR Adapters										
Lenovo ThinkSystem SharedIO ConnectX-5 Adapter *	CTO only	B3RZ	N	N	N	N	N	N	Y	N
Mellanox ConnectX-5 Socket-Direct EDR IB/100GbE Adapter Kit *	4C57A09506	B1DD	N	Y	N;	N	N	Y	N	N
HDR Adapters										
Mellanox ConnectX-6 HDR100 IB Single-port x16 PCIe 3.0 HCA	4C57A14177	B4R9	Y	Y	N	Y	Y	Y	Y	N
Mellanox ConnectX-6 HDR100 IB Dual-port x16 PCIe3.0 HCA	4C57A14178	B4RA	Y	Y	N	Y	Y	Y	Y	N
ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe Adapter SharedIO SD650	CTO only	B4RG	N	N	N	N	N	N	N	Y
ThinkSystem Mellanox HDR IB 2x PCIe Aux Kit	CTO only	B4RB	N	N	N	N	N	N	N	Y

* Note: These InfiniBand Adapters are only available to Lenovo customers through LeSI.

The following table lists all the InfiniBand cables that are supported by LeSI.

Table 14. InfiniBand cables

Description	Part number	Feature code
QSFP to 10Gb Ethernet (SFP+) Conversion		
Mellanox QSFP to SFP+ adapter	00D9676	ARZH
QSFP FDR InfiniBand Passive Copper Cables		
0.75m Mellanox QSFP Passive DAC Cable	00KF002	ARZB
1m Mellanox QSFP Passive DAC Cable	00KF003	ARZC
1.25m Mellanox QSFP Passive DAC Cable	00KF004	ARZD

Description	Part number	Feature code
1.5m Mellanox QSFP Passive DAC Cable	00KF005	ARZE
3m Mellanox QSFP Passive DAC Cable	00KF006	ARZF
QSFP FDR InfiniBand Active Optical Cables		
3m Mellanox IB FDR Active Optical Fiber Cable	00KF007	ARYC
5m Mellanox IB FDR Active Optical Fiber Cable	00KF008	ARYD
10m Mellanox IB FDR Active Optical Fiber Cable	00KF009	ARYE
15m Mellanox IB FDR Active Optical Fiber Cable	00KF010	ARYF
20m Mellanox IB FDR Active Optical Fiber Cable	00KF011	ARYG
30m Mellanox IB FDR Active Optical Fiber Cable	00KF012	ARYH
QSFP28 EDR InfiniBand Passive Copper Cables		
0.5m Mellanox EDR IB Passive Copper QSFP28 Cable	00MP516	ASQT
0.75m Mellanox EDR IB Passive Copper QSFP28 Cable	00MP520	ASQU
1m Mellanox EDR IB Passive Copper QSFP28 Cable	00MP524	ASQV
1.25m Mellanox EDR IB Passive Copper QSFP28 Cable	00MP528	ASQW
1.5m Mellanox EDR IB Passive Copper QSFP28 Cable	00MP532	ASQX
2m Mellanox EDR IB Passive Copper QSFP28 Cable	00MP536	ASQY
3m Mellanox EDR IB Passive Copper QSFP28 Cable	00MP560	ASRM
0.5m Mellanox EDR IB Passive Copper QSFP28 Cable	00MP516	ASQT
QSFP28 EDR InfiniBand Active Optical Cables		
3m Mellanox EDR IB Optical QSFP28 Cable	00MP563	ASRN
5m Mellanox EDR IB Optical QSFP28 Cable	00MP540	ASQZ
10m Mellanox EDR IB Optical QSFP28 Cable	00MP544	ASR0
15m Mellanox EDR IB Optical QSFP28 Cable	00MP548	ASR1
20m Mellanox EDR IB Optical QSFP28 Cable	00MP552	ASR2
30m Mellanox EDR IB Optical QSFP28 Cable	00MP556	ASR3
50m Mellanox EDR IB Optical QSFP28 Cable	00MP566	ASRP
QSFP56 HDR InfiniBand Passive Copper Cables		
0.5m Mellanox HDR IB Passive Copper QSFP56 Cable	4Z57A14182	B4QQ
1m Mellanox HDR IB Passive Copper QSFP56 Cable	4Z57A14183	B4QR
1.5m Mellanox HDR IB Passive Copper QSFP56 Cable	4Z57A14184	B4QS
2m Mellanox HDR IB Passive Copper QSFP56 Cable	4Z57A14185	B4QT
QSFP56 HDR to 2x HDR100 InfiniBand Passive Copper Splitter Cables		
1m Mellanox HDR IB Passive Copper Splitter QSFP56 Cable	4Z57A14193	B4R1
1.5m Mellanox HDR IB Passive Copper Splitter QSFP56 Cable	4Z57A14194	B4R2
2m Mellanox HDR IB Passive Copper Splitter QSFP56 Cable	4Z57A11477	B68L
QSFP56 HDR InfiniBand Active Optical Cables		
3m Mellanox HDR IB Active Optical QSFP56 Cable	4Z57A14188	B4QW
5m Mellanox HDR IB Active Optical QSFP56 Cable	4Z57A14189	B4QX
10m Mellanox HDR IB Active Optical QSFP56 Cable	4Z57A14190	B4QY
15m Mellanox HDR IB Active Optical QSFP56 Cable	4Z57A14191	B4QZ

Description	Part number	Feature code
20m Mellanox HDR IB Active Optical QSFP56 Cable	4Z57A14192	B4R0
30m Mellanox HDR IB Active Optical QSFP56 Cable	4Z57A16016	B68P
50m Mellanox HDR IB Active Optical QSFP56 Cable	4Z57A16017	B68N
100m Mellanox HDR IB Active Optical QSFP56 Cable	4Z57A16018	B68M
QSFP56 HDR to 2x HDR100 InfiniBand Active Optical Splitter Cables		
3m Mellanox HDR IB Active Optical Splitter QSFP56 Cable	4Z57A14196	B4R4
5m Mellanox HDR IB Active Optical Splitter QSFP56 Cable	4Z57A14197	B4R5
10m Mellanox HDR IB Active Optical Splitter QSFP56 Cable	4Z57A14198	B4R6
15m Mellanox HDR IB Active Optical Splitter QSFP56 Cable	4Z57A14199	B4R7
20m Mellanox HDR IB Active Optical Splitter QSFP56 Cable	4Z57A14214	B4R8

Omni-Path Architecture

- Intel Omni-Path Fabric Edge Switches 100 Series

  Intel Omni-Path Edge Switches deliver 100Gb port bandwidth with low latency at scale. These switches can lower fabric acquisition costs by as much as 50%, while simultaneously reducing space and power requirements. With these savings, you can achieve higher total cluster performance within the same hardware budget to expand and accelerate your research. For more information, see the Intel product brief below:

    - Intel OPA 100 Series 24-port and 48-port switches

- OPA Adapters

  Intel Omni-Path adapters are designed specifically for high performance computing. These adapters use an advanced connectionless design that delivers performance that scales with high node and core counts, making it an ideal choice for most demanding applications. The Omni-Path adapters support 100Gb per port, which means each port can deliver up to 25Gb per port of bi-directional bandwidth. The same ASIC utilized in the Omni-Path adapters will also be integrated into future Intel Xeon processors and used in third-party products. For more information, see the Intel product brief below:

    - Intel Omni-Path 100 Series Host Fabric Interface Adapter

The following table lists all the Omni-Path switches that are supported by LeSI.

Table 15. OPA switches

Description	Orientation	Part Number	Machine Type - Model	Feature Code	Summary
OPA Switches					
Intel OPA 100 Series 24-port Unmanaged Edge Switch	PSE	None	0449-HCP	AU06	1U 24 Port Unmanaged 100Gb/s OPA Switch
	oPSE	None	0449-HCQ	AU07	
Intel OPA 100 Series 48-port Unmanaged Edge Switch	PSE	None	0449-HCR	AU08	1U 48 Port Unmanaged 100Gb/s OPA Switch
	oPSE	None	0449-HCS	AU09	
OPA Switch Options					
Intel OPA 100 Series Edge Switch Management Card	Not applicable	00WE075	None	AU0C	Management Card for 1U 24P / 48P OPA Switch
Intel 1U Switch Air Duct Kit for Enterprise Racks	Not applicable	00WE079	None	AU0D	Air duct for recessed 1U 24P / 48P OPA Switch

The following table lists all Omni-Path adapters that are supported by LeSI.

Table 16. OPA adapters

Description	Part Number	Feature Code	SR630	SR650	SR670	SR850	SR860	SR950	SD530	SD650
Intel OPA 100 Series Single-port PCIe 3.0 x8 HFA	00WE023	AU0A	Y	Y	N	Y	Y	Y	Y	N
Intel OPA 100 Series Single-port PCIe 3.0 x16 HFA	00WE027	AU0B	Y	Y	Y	Y	Y	Y	Y	Y
Intel OPA 100 Series Single-port PCIe 3.0 x16 HFA for SD650 DWC	SBB7A08433	B21S	N	N	N	N	N	N	N	Y

The following table lists all the Omni-Path cables that are supported by LeSI.

Table 17. OPA cables

Description	Part number	Feature code
QSFP28 OPA Passive Copper Cables		
0.5m Intel OPA 100 Series Passive Copper QSFP28 Cable	00WE031	AU0E
0.75m Intel OPA 100 Passive Copper QSFP28 Cable	00WE035	AU0F
1m Intel OPA 100 Series Passive Copper QSFP28 Cable	00WE039	AU0G
1.25m Intel OPA 100 Series Passive Copper QSFP28 Cable	00WE043	AU0H
1.5m Intel OPA 100 Series Passive Copper QSFP28 Cable	00WE047	AU0J
2m Intel OPA 100 Series Passive Copper QSFP28 Cable	00WE051	AU0K
3m Intel OPA 100 Series Passive Copper QSFP28 Cable	00WE055	AU0L
QSFP28 OPA Active Optical Cables		
5m Intel OPA 100 Series Active Optical QSFP28 Cable	00WE059	AU0M
15m Intel OPA 100 Series Active Optical QSFP28 Cable	00WE067	AU0P
20m Intel OPA 100 Series Active Optical QSFP28 Cable	00WE071	AU0Q
QSFP28 OPA Active Optical Low Power Cables		
5m Intel OPA 100 Series Active Optical QSFP28 Low Power Cable	4X97A11034	B22J
10m Intel OPA 100 Series Active Optical QSFP28 Low Power Cable	4X97A11035	B22K
15m Intel OPA 100 Series Active Optical QSFP28 Low Power Cable	4X97A11036	B22L
20m Intel OPA 100 Series Active Optical QSFP28 Low Power Cable	4X97A11037	B22M

Software components

LeSI best recipe supports the following software components. The licenses are usually packaged with 3 years subscription and/or support, with the option to extend the license coverage to 5 years. For additional years or renewal of existing licenses bought through Lenovo, please contact your Lenovo Services sales representative.

- SUSE Linux Enterprise Server

  SUSE Linux Enterprise Server (SLES) is a world-class, secure open source server operating system, built to power physical, virtual and cloud-based mission-critical workloads. The operating system further raises the bar in helping organizations to accelerate innovation, enhance system reliability, meet tough security requirements and adapt to new technologies. For more information, see the SLES Product Features web page.

- Red Hat Enterprise Linux Server

  Red Hat Enterprise Linux Server (RHEL) is the world's leading enterprise Linux platform. Red Hat Enterprise Linux Server orchestrates the hardware resources that fulfill the infrastructure's basic computing requirements such as CPU, memory, networking, and storage. For more information, see the RHEL product datasheet.

- CentOS

  CentOS is a stable, predictable, manageable and reproducible Linux distribution derived from the sources of Red Hat Enterprise Linux. CentOS provides a development framework for cloud providers, the hosting community, and scientific data processing. For more information, see the CentOS Project Wiki.

- IBM Spectrum Scale

  IBM Spectrum Scale is a cluster file system that provides concurrent access to a single file system or a set of file systems from multiple nodes. The nodes can be SAN attached, network attached, a mixture of SAN and network attached, or in a shared nothing cluster configuration. This enables high performance access to this common set of data to support a scale-out solution or to provide a high availability platform. For more information, see the IBM Spectrum Scale product documentation.

- xCAT/Confluent

  xCAT enables users to easily manage large number of servers for any type of technical computing workload. xCAT is known for exceptional scaling, wide variety of supported hardware and operating systems, virtualization platforms, and complete "day 0" setup capabilities. Confluent is an easy-to-use adaptation of xCAT with faster performance for larger solutions. For more information, see the xCAT/Confluent product documentation.

- LiCO (Lenovo Intelligent Computing Orchestration)

  Lenovo Intelligent Computing Orchestration (LiCO) is a Lenovo-developed software solution that simplifies the management and use of distributed clusters for High Performance Computing (HPC) and Artificial Intelligence (AI) environments. LiCO provides a consolidated Graphical User Interface (GUI) for monitoring and usage of LeSI cluster resources, allowing you to easily run both HPC and AI workloads across a choice of Lenovo infrastructure, including both CPU and GPU solutions to suit varying application requirements. For more information, see the LiCO product guide.

- Excelero

  Excelero delivers low-latency distributed block storage for web-scale applications. NVMesh enables shared NVMe network and supports any local or distributed file systems. The solution features an intelligent management layer that abstracts underlying hardware with CPU offload, creates logical volumes with redundancy, and provides centralized intelligent management and monitoring. Applications can enjoy the latency, throughput, and IOPs of a local NVMe device with the convenience of centralized storage while avoiding proprietary hardware lock-in and reducing the overall storage TCO. For more information, see the Excelero NVMesh2 datasheet.

The following table lists the HPC versions of all the commercial operating systems that are supported by LeSI. Other versions are supported as well, but would exceed the limits of documentation here.

Table 18. Commercial Operating Systems

Description	Part number	Feature code
SUSE Linux Enterprise Server (SLES) – Single Server and HPC only listed, others available		
SLES X86 2 Socket Standard Subscription w/Lenovo Support 1Yr	7S0G0007WW	S0LM
SLES X86 2 Socket Standard Subscription w/Lenovo Support 3Yr	7S0G0008WW	S0LN
SLES X86 2 Socket Standard Subscription w/Lenovo Support 5Yr	7S0G0009WW	S0LP

Description	Part number	Feature code
SLES X86 2 Socket Priority Subscription w/Lenovo Support 1Yr	7S0G0001WW	S0LF
SLES X86 2 Socket Priority Subscription w/Lenovo Support 3Yr	7S0G0002WW	S0LG
SLES X86 2 Socket Priority Subscription w/Lenovo Support 5Yr	7S0G0003WW	S0LH
SUSE Linux Enterprise HPC Standard SUSE Support 1 Year (US/CA/AP)	00YC039	1860
SUSE Linux Enterprise HPC Standard SUSE Support 1 Year (EMEA/LA)	00YC149	1860
SUSE Linux Enterprise HPC Standard SUSE Support 3 Years (US/CA/AP)	00YC040	1861
SUSE Linux Enterprise HPC Standard SUSE Support 3 Years (EMEA/LA)	00YC150	1861
SUSE Linux Enterprise HPC Standard SUSE Support 5 Years (US/CA/AP)	00YC041	1859
SUSE Linux Enterprise HPC Standard SUSE Support 5 Years (EMEA/LA)	00YC151	1859
SUSE Linux Enterprise HPC Priority SUSE Support 1 Year (US/CA/AP)	00YC042	1856
SUSE Linux Enterprise HPC Priority SUSE Support 1 Year (EMEA/LA)	00YC152	1856
SUSE Linux Enterprise HPC Priority SUSE Support 3 Years (US/CA/AP)	00YC043	1857
SUSE Linux Enterprise HPC Priority SUSE Support 3 Years (EMEA/LA)	00YC153	1857
SUSE Linux Enterprise HPC Priority SUSE Support 5 Years (US/CA/AP)	00YC044	1858
SUSE Linux Enterprise HPC Priority SUSE Support 5 Years (EMEA/LA)	00YC154	1858
Red Hat Enterprise Linux (RHEL) – Single Server and HPC only listed, others available		
RHEL Server Physical or Virtual Node, 2 Skt Std Sub w/ Lenovo Sup 1Yr	7S0F0001WW	S0N5
RHEL Server Physical or Virtual Node, 2 Skt Std Sub w/ Lenovo Sup 3Yr	7S0F0002WW	S0N6
RHEL Server Physical or Virtual Node, 2 Skt Std Sub w/ Lenovo Sup 5Yr	7S0F0003WW	S0N7
RHEL Server Physical or Virtual Node, 2 Skt Prem Sub w/ Lenovo Sup 1Yr	7S0F0004WW	S0N8
RHEL Server Physical or Virtual Node, 2 Skt Prem Sub w/ Lenovo Sup 3Yr	7S0F0005WW	S0N9
RHEL Server Physical or Virtual Node, 2 Skt Prem Sub w/ Lenovo Sup 5Yr	7S0F0006WW	S0NA
RHEL for HPC Head Node Sub w/ Lenovo Std Sup 1Yr	7S0F000RWW	S0NV
RHEL for HPC Head Node Sub w/ Lenovo Std Sup 3Yr	7S0F000SWW	S0NW
RHEL for HPC Head Node Sub w/ Lenovo Std Sup 5Yr	7S0F000TWW	S0NX
RHEL for HPC Head Node Sub w/ Lenovo Prem Sup 1Yr	7S0F000UWW	S0NY
RHEL for HPC Head Node Sub w/ Lenovo Prem Sup 3Yr	7S0F000VWW	S0NZ
RHEL for HPC Head Node Sub w/ Lenovo Prem Sup 5Yr	7S0F000WWW	S0P0
RHEL for HPC Compute Node Sub w/ RedHat L3 only Sup 1Yr	01PG270	B1X9
RHEL for HPC Compute Node Sub w/ RedHat L3 only Sup 3Yr	01PG271	B1XA
RHEL for HPC Compute Node Sub w/ RedHat L3 only Sup 5Yr	01PG272	B1XB
RHEL for HPC Compute Node Sub w/ RedHat L3 only Sup 1Yr EUS	01PG267	B1XC
RHEL for HPC Compute Node Sub w/ RedHat L3 only Sup 3Yr EUS	01PG268	B1XD
RHEL for HPC Compute Node Sub w/ RedHat L3 only Sup 5Yr EUS	01PG269	B1XE

The following table lists all Orchestration software available with LeSI. Only LiCO is being fully tested within LeSI and part of the Best Recipe. The other packages are supported by the respective software vendor for use within LeSI.

Table 19. Orchestration Software

Description	Part number	Feature code
Lenovo Intelligent Computing Orchestration (LiCO)		
Lenovo HPC AI LiCO Software 90 Day Evaluation License	7S090004WW	B1YC
Lenovo HPC AI LiCO Software w/1 yr S&S	7S090001WW	B1Y9
Lenovo HPC AI LiCO Software w/3 yr S&S	7S090002WW	B1YA
Lenovo HPC AI LiCO Software w/5 yr S&S	7S090003WW	B1YB
IBM Spectrum LSF (not tested within LeSI / no Solution Interoperability Support)		
Spectrum LSF Suite for HPC per Inst w/1Yr S&S	7S0A0001WW	B1YW
Spectrum LSF Suite for HPC per Inst w/3Yr S&S	7S0A0002WW	B1YX
Spectrum LSF Suite for HPC per Inst w/4Yr S&S	7S0A0003WW	B1YY
Spectrum LSF Suite for HPC per Inst w/5Yr S&S	7S0A0004WW	B1YZ
Spectrum LSF Suite for Enterprise per Inst w/1Yr S&S	7S0A0005WW	B1Z0
Spectrum LSF Suite for Enterprise per Inst w/3Yr S&S	7S0A0006WW	B1Z1
Spectrum LSF Suite for Enterprise per Inst w/4Yr S&S	7S0A0007WW	B1Z2
Spectrum LSF Suite for Enterprise per Inst w/5Yr S&S	7S0A0008WW	B1Z3
Spectrum LSF Suite for Workgroup per Inst w/1Yr S&S	7S0A0009WW	B1Z4
Spectrum LSF Suite for Workgroup per Inst w/3Yr S&S	7S0A000AWW	B1Z5
Spectrum LSF Suite for Workgroup per Inst w/4Yr S&S	7S0A000BWW	B1Z6
Spectrum LSF Suite for Workgroup per Inst w/5Yr S&S	7S0A000CWW	B1Z7
Spectrum LSF Suite per Server w/1Yr S&S	7S0A000HWW	B1ZC
Spectrum LSF Suite per Server w/3Yr S&S	7S0A000JWW	B1ZD
Spectrum LSF Suite per Server w/4Yr S&S	7S0A000KWW	B1ZE
Spectrum LSF Suite per Server w/5Yr S&S	7S0A000LWW	B1ZF
Spectrum LSF Suite per User w/1Yr S&S	7S0A000DWW	B1Z8
Spectrum LSF Suite per User w/3Yr S&S	7S0A000EWW	B1Z9
Spectrum LSF Suite per User w/4Yr S&S	7S0A000FWW	B1ZA
Spectrum LSF Suite per User w/5Yr S&S	7S0A000GWW	B1ZB

The following table lists the storage software available with LeSI. Only IBM Spectrum Scale file system software is being fully tested within LeSI and part of the Best Recipe. The other packages are supported by the respective software vendor for use within LeSI.

Table 20. File System Software

Description	Part number	Feature code
IBM Spectrum Scale		
Spectrum Scale Data Management Edition per TiB w/1Yr S&S	01GU920	AVZ3
Spectrum Scale Data Management Edition per TiB w/3Yr S&S	01GU921	AVZ4
Spectrum Scale Data Management Edition per TiB w/4Yr S&S	01GU922	AVZ5
Spectrum Scale Data Management Edition per TiB w/5Yr S&S	01GU923	AVZ6
Spectrum Scale Data Access Edition per TiB w/1Yr S&S	01PG893	S185
Spectrum Scale Data Access Edition per TiB w/3Yr S&S	01PG894	S186
Spectrum Scale Data Access Edition per TiB w/4Yr S&S	01PG895	S187
Spectrum Scale Data Access Edition per TiB w/5Yr S&S	01PG896	S188
Spectrum Scale x86 Std Edition Client per Skt w/1Yr S&S	00KE544	1168
Spectrum Scale x86 Std Edition Client per Skt w/3Yr S&S	00KE562	1149
Spectrum Scale x86 Std Edition Client per Skt w/4Yr S&S	00KH125	1387
Spectrum Scale x86 Std Edition Client per Skt w/5Yr S&S	00KE580	1131
Spectrum Scale x86 Std Edition Client per 250 Skt w/1Yr S&S	00KE545	1167
Spectrum Scale x86 Std Edition Client per 250 Skt w/3Yr S&S	00KE563	1150
Spectrum Scale x86 Std Edition Client per 250 Skt w/4Yr S&S	00KH126	1388
Spectrum Scale x86 Std Edition Client per 250 Skt w/5Yr S&S	00KE581	1132
Spectrum Scale x86 Std Edition Server per Skt w/1Yr S&S	00KE542	1172
Spectrum Scale x86 Std Edition Server per Skt w/3Yr S&S	00KE560	1154
Spectrum Scale x86 Std Edition Server per Skt w/4Yr S&S	00KH123	1391
Spectrum Scale x86 Std Edition Server per Skt w/5Yr S&S	00KE578	1136
Spectrum Scale x86 Std Edition Server per 250 Skt w/1Yr S&S	00KE543	1171
Spectrum Scale x86 Std Edition Server per 250 Skt w/3Yr S&S	00KE561	1153
Spectrum Scale x86 Std Edition Server per 250 Skt w/4Yr S&S	00KH124	1392
Spectrum Scale x86 Std Edition Server per 250 Skt w/5Yr S&S	00KE579	1135

The following table lists the available Excelero block storage software.

Table 21. Block Storage Software

Description	Part number	Feature code
Excelero NVMesh (not tested within LeSI / no solution interoperability support)		
Excelero NVMesh, Per User w/1Yr Premium Support	7S0H0001WW	S0EF
Excelero NVMesh, Per User w/3Yr Premium Support	7S0H0002WW	S0EG
Excelero NVMesh, Per User w/4Yr Premium Support	7S0H0003WW	S0EH
Excelero NVMesh, Per User w/5Yr Premium Support	7S0H0004WW	S0EJ
Excelero NVMesh, Per User w/1Yr Mission Critical Support	7S0H0005WW	S0EK
Excelero NVMesh, Per User w/3Yr Mission Critical Support	7S0H0006WW	S0EL
Excelero NVMesh, Per User w/4Yr Mission Critical Support	7S0H0007WW	S0EM
Excelero NVMesh, Per User w/5Yr Mission Critical Support	7S0H0008WW	S0EN
Excelero NVMesh, Per NVMe Drive w/1Yr Premium Support	7S0H0009WW	S0EP
Excelero NVMesh, Per NVMe Drive w/3Yr Premium Support	7S0H000AWW	S0EQ
Excelero NVMesh, Per NVMe Drive w/4Yr Premium Support	7S0H000BWW	S0ER
Excelero NVMesh, Per NVMe Drive w/5Yr Premium Support	7S0H000CWW	S0ES
Excelero NVMesh, Per NVMe Drive w/1Yr Mission Critical Support	7S0H000DWW	S0ET
Excelero NVMesh, Per NVMe Drive w/3Yr Mission Critical Support	7S0H000EWW	S0EU
Excelero NVMesh, Per NVMe Drive w/4Yr Mission Critical Support	7S0H000FWW	S0EV
Excelero NVMesh, Per NVMe Drive w/5Yr Mission Critical Support	7S0H000GWW	S0EW
Excelero NVMesh, Client Inclusive, Per NVMe Drive w/1Yr Premium Support	7S0H000HWW	S0EX
Excelero NVMesh, Client Inclusive, Per NVMe Drive w/3Yr Premium Support	7S0H000JWW	S0EY
Excelero NVMesh, Client Inclusive, Per NVMe Drive w/4Yr Premium Support	7S0H000KWW	S0EZ
Excelero NVMesh, Client Inclusive, Per NVMe Drive w/5Yr Premium Support	7S0H000LWW	S0F0
Excelero NVMesh, Client Inclusive, Per NVMe Drive w/1Yr Mission Critical Support	7S0H000MWW	S0F1
Excelero NVMesh, Client Inclusive, Per NVMe Drive w/3Yr Mission Critical Support	7S0H000NWW	S0F2
Excelero NVMesh, Client Inclusive, Per NVMe Drive w/4Yr Mission Critical Support	7S0H000PWW	S0F3
Excelero NVMesh, Client Inclusive, Per NVMe Drive w/5Yr Mission Critical Support	7S0H000QWW	S0F4
Excelero Remote,NVMesh General Professional Services , Per Day	7S0H000RWW	S0F5
Excelero Remote, Webinar-based, NVMesh Training Services, Per Day	7S0H000SWW	S0F6

For more information about Excelero NVMesh, see the datasheet:
https://www.excelero.com/wp-content/uploads/2018/10/NVMesh2-Data-Sheet.pdf

Public Cloud partnerships

LeSI partners with premier cloud providers to provide optimal solutions to customers that need to expand their on-premise HPC capabilities with off-premise resources. Especially for customers that have seasonal HPC requirements that go above and beyond their baseline need, pairing an LeSI cluster with public cloud compute capacity provides a superior Lenovo solution. Customers can also use the cloud provider to prototype workloads on technology for which they may not have business justification.

LeSI partners with cloud provider, Nimbix Cloud. Nimbix is a leading provider of purpose-built cloud computing for machine learning, AI and HPC applications. Powered by JARVICE, the Nimbix Cloud provides high-performance software as a service, dramatically speeding up data processing; customers select their preferred containerized application and server configuration along with the required cluster capacity. Applications run on bare-metal servers within Nimbix's data centers. The Nimbix cloud offers high speed, low latency network connectivity with no virtualization and access to more than 1,000 application workflows. For more information, see the Nimbix web site.

The following table lists the public cloud offerings available with LeSI. They are supported by the respective cloud vendor for use with LeSI.

Table 22. Public cloud offerings

Description	Part number	Feature code
Nimbix HPC Cloud		
Nimbix HPC Cloud Compute Unit	7SZZ100819	N/A
Nimbix HPC Cloud Block Storage Per TB /Per Month	7SZZ100820	N/A
Nimbix HPC Cloud SSD Storage – 1000 IOPs – Per TB /Per Month	7SZZ100821	N/A
Nimbix HPC Cloud SSD Storage – 5000 IOPs – Per TB /Per Month	7SZZ100822	N/A
Nimbix HPC Cloud SSD Storage – 10000 IOPs – Per TB /Per Month	7SZZ100823	N/A

For more information, see the Nimbix web site:
https://www.nimbix.net/platform/

LeSI factory integration

Lenovo manufacturing implements a robust testing and integration program to insure LeSI components are fully operational when shipped out of the factory. In addition to the standard component level validation performed on all hardware components produced by Lenovo, LeSI performs rack level testing to verify that the LeSI cluster operates as a solution. The rack level testing and validation includes the following:

- Performing a power on test. Assure device power is present, with no error indicators
- Set up RAID (when required)
- Set up storage devices and verify functionality
- Validate network connectivity and functionality
- Verify functionality of server hardware, network infrastructure, and server configuration correctness. Verify health of components
- Configure all devices per Best Recipe software settings
- Perform stress testing of server CPU and memory via software and power cycling
- Data collection for quality records and test results

LeSI onsite installation

Lenovo experts can manage the physical installation of your pre-integrated Racks so you can quickly benefit from your investment. Working at a time convenient to you, the technician will unpack and inspect the systems at your site, install them, verify operation, and dispose of the packaging at the on-site location. Any LeSI solution is eligible for the basic Lenovo Hardware Installation services. Customized installation services are also available to meet the specific needs of the client.

Before installation, the client should complete the following steps to ensure the hardware will be successfully installed:

- Backing up the data being migrated to the new hardware
- Ensuring the new hardware is available and in place
- Designating a representative who is available and able to assist the technician with access, approvals,
- Providing a safe workspace and appropriate access for the technician

Once the client is ready, an expert technician will perform the installation. This process will include the following:

- Initial removal of the product from packaging, including inspection for damage
- Physical installation of the product per the associated documentation
- Physical connection and powering on of hardware
- Consolidation of all packaging materials and disposal within your site

Lenovo can also provide comprehensive onsite configuration of software, including integration and validation for operating systems and software, virtualization and high-availability configurations.

Client Site Integration Kit onsite installation

Besides shipping fully integrated into the Lenovo 1410 rack cabinet, LeSI solution gives clients the choice of shipping with the Lenovo Client Site Integration Kit (7X74) which allows clients to have Lenovo or a business partner install the solution in a rack of their own choosing. The Lenovo Client Site Integration Kit enables clients to gain the interoperability warranty benefit of a LeSI solution while also providing them flexibility in custom-fitting into the client datacenter.

With the Lenovo Client Site Integration Kit, the LeSI solution is tested at the component level in Lenovo manufacturing, with integration and validation performed on-site by Lenovo Professional Services or the Business Partner. Servers, switches, and other items are packaged in individual boxes with a ship group box for cables, publications, labeling, and other rack documentation. Clients are required to purchase installation services from Lenovo or a business partner. The installation team will install the solution at the customer site into the customer provided rack per racking diagrams and point-to-point instructions.

Professional Services

Lenovo offers a wide variety of services designed to get the most value and effectiveness out of your data center.

Deployment Services

From basic hardware installation to more complex optimization and configuration, Lenovo Deployment Services provide everything you need to get up and running, increasing time to value. Deployment services are instrumental in the integration, migration, or expansion of your datacenter. Lenovo can provide comprehensive onsite configuration of hardware and software, including:

- Basic Hardware Installation – Lenovo experts unpack and configure systems, update firmware, and conduct final operation verification, with post-installation documentation for reference
- Integration, Migration, and Expansion – move or scale IT resources intelligently and cost-effectively, including tuning validation, and documenting ongoing run processes
- Customized HPC Deployment Services – besides providing basic hardware installation, Application experts can tune the performance and provide benchmark for LeSI clusters or offer education and training for the solution and its components

Data Center Infrastructure Services

Lenovo offers a wide variety of services designed to get the most value and effectiveness out of your data center. These reach from the assessment over planning and finally the implementation of your Data Center infrastructure:

- Data Center Best Practices Workshop – attend a one-day, onsite interactive workshop to review power, cooling, and energy efficiency associated with IT systems and data center infrastructure
- Assessment – examine the thermal and electrical health of your data center with help from Lenovo experts; understand your Power Usage Effectiveness (PUE) and compare with the industry
- Planning – design your data center with state-of-the-art insight into best practices in power, cooling, and energy efficiency, towards a best-in-class PUE and future-proof for the next decade of IT equipment
- Installing – put your power and cooling plans into action with Lenovo installation services, from traditional air-cooled environments, to leveraging chilled water in e.g. Rear Door Heat Exchangers or In-Row Coolers to the most modern environments with hot water cooling and adsorption chillers maximizing the Energy Reuse Efficiency (ERE)

Premium and Managed Services

For the relevant systems and workloads, consider advanced services, ranging from Enterprise Software Support over Premier System Support to Managed Services, managing your solution remotely or onsite:

- Lenovo Enterprise Software Support – provides comprehensive support covering server operating systems and business applications.
    - Single-source enterprise software support
    - Additional software support beyond hardware break/fix
    - Reduced problem resolution time and reduced cost to address technical issues and increased uptime
    - Unlimited access to technical experts, fast precise answers from highly trained call center experts
- Lenovo Premier Support Services – provides prioritized call queuing direct to Level 2 technicians for select systems.
    - Direct technician-to-technician access to ensure faster, accurate resolution
    - Live answer, with a simple process through a single point of contact

- End-to-end ownership of cases for a seamless support experience
- Lenovo Managed Services for HPC Clusters – provides 24x7 monitoring and technical system management for your cluster. This can include:
  - Ongoing monitoring of infrastructure hardware and software
  - Resolving Lenovo hardware and solution-specific, software-related problems
  - Reporting support problems that require your attention
  - Facilitating quarterly meetings as part of ongoing administration and management
  - Designating a client-care manager to interface between you and Lenovo

For more information on Lenovo Services, please contact your Lenovo sales representative.

Warranty options

LeSI exclusive components (Machine Types 1410, 7X74, 0724, 0449; for the other Hardware and Software components configured within LeSI their respective warranty terms apply) have a three-year customer-replaceable unit (CRU) and onsite limited (for field-replaceable units [FRUs] only) warranty with standard call center support during normal business hours and 9x5 Next Business Day Parts Delivered.

Some countries might have different warranty terms and conditions than the standard warranty. This is due to local business practices or laws in the specific country. Local service teams can assist in explaining country-specific terms when needed. Examples of country-specific warranty terms are second or longer business day parts delivery or parts-only base warranty.

If warranty terms and conditions include onsite labor for repair or replacement of parts, Lenovo will dispatch a service technician to the customer site to perform the replacement. Onsite labor under base warranty is limited to labor for replacement of parts that have been determined to be field-replaceable units (FRUs). Parts that are determined to be customer-replaceable units (CRUs) do not include onsite labor under base warranty.

If warranty terms include parts-only base warranty, Lenovo is responsible for delivering only replacement parts that are under base warranty (including FRUs) that will be sent to a requested location for self-service. Parts-only service does not include a service technician being dispatched onsite. Parts must be changed at customer's own cost and labor and defective parts must be returned following the instructions supplied with the spares parts.

Also available are Lenovo Services warranty maintenance upgrades and post-warranty maintenance agreements, with a predefined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

The following warranty upgrades are available:

Table 23. Warranty upgrades

Foundation	The Foundation support level provides: • Next-business-day onsite response during normal business hours, 5 days per week • Base warranty upgrade covering onsite installation of all replacement parts
Essential	The Essential support level provides all the benefits of Foundation services, plus: • Four-hour onsite response, 24 hours per day, 7 days per week • YourDrive YourData
Advanced	The Advanced support level provides all the benefits of Essential services, plus: • Two-hour onsite response, 24 hours per day, 7 days per week

The following recommended additions are available to the warranty upgrades:

- Extend services with coverages up to 5 years
- Basic hardware installation services
- Enterprise server software support
- 24 hour committed service repair
- YourDrive YourData (Foundation)

The YourDrive YourData service allows you to retain possession and dispose of failed drives. Otherwise, failed drives under warranty must be returned to Lenovo upon replacement. This service is essential for organizations that must keep their data secure on premises, such as medical, retail, insurance, education, financial and technology sectors.

Table 24. Warranty upgrade part numbers – 1410 Rack

Description	Option Part Number
Scalable Infrastructure 42U 1100mm Enterprise V2 Dynamic Rack (1410-HPB, -HEB, -HPA, -HEA)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17328
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17332
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17336
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17348
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17351
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17354

Table 25. Warranty upgrade part numbers – Mellanox InfiniBand Switches

Description	Option Part Number
Mellanox SX6025 FDR InfiniBand Switch (0724-HCU, -HCV)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17633
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17637
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17641
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17653
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17656
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17659
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A17668
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A17671
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A17674
Mellanox SX6036 FDR InfiniBand Switch (0724-HCF, -HCG)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17533
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17537
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17541
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17553
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17556
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17559
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A17568
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A17571
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A17574

Description	Option Part Number
Mellanox SB7700 EDR InfiniBand Switch (0724-HCS, -HCT)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17583
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17587
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17591
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17603
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17606
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17609
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A17618
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A17621
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A17624
Mellanox SB7790 EDR InfiniBand Switch (0724-HCZ, -HD1)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17683
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17687
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17691
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17703
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17706
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17709
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A17718
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A17721
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A17724
Mellanox SB7800 EDR InfiniBand Switch (0724-HD3, -HD4)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17583
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17587
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17591
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17603
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17606
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17609
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A17618
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A17621
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A17624
Mellanox SB7890 EDR InfiniBand Switch (0724-HD5, -HD6)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17683
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17687
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17691
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17703
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17706
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17709
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A17718
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A17721
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A17724
Mellanox QM8700 HDR InfiniBand Switch (0724-HD7, -HD8)	

Description	Option Part Number
Foundation Service w/Next Business Day Response, 3Yr	5WS7A30560
Foundation Service w/Next Business Day Response, 4Yr	5WS7A30574
Foundation Service w/Next Business Day Response, 5Yr	5WS7A30588
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A30568
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A30582
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A30596
Mellanox QM8790 HDR InfiniBand Switch (0724-HD9, -HEA)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A30700
Foundation Service w/Next Business Day Response, 4Yr	5WS7A30714
Foundation Service w/Next Business Day Response, 5Yr	5WS7A30728
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A30708
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A30722
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A30736

Table 26. Warranty upgrade part numbers – Intel Omni-Path Switches

Description	Option Part Number
Intel OPA 100 Series 24-port Edge Switch (0449-HCP, -HCQ)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17433
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17437
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17441
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17453
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17456
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17459
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A17468
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A17471
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A17474
Intel OPA 100 Series 48-port Edge Switch (0449-HCR, -HCS)	
Foundation Service w/Next Business Day Response, 3Yr	5WS7A17483
Foundation Service w/Next Business Day Response, 4Yr	5WS7A17487
Foundation Service w/Next Business Day Response, 5Yr	5WS7A17491
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A17503
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A17506
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A17509
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A17518
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A17521
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A17524

Solution Interoperability Support

On top of their individual warranty and maintenance scope or support entitlement, LeSI offers solution-level interoperability support for HPC and AI configurations based on the above selection of Lenovo ThinkSystem portfolio and OEM components.

The extensive testing results in a "Best Recipe" release of software and firmware levels Lenovo warrants to work seamlessly together as a fully integrated data center solution instead of a collection of individual components at the time of implementation.

To see the latest Best Recipe for Scalable Infrastructure at Lenovo, see the following link: https://support.lenovo.com/us/en/solutions/HT505184#5

The Solution Support is engaged by opening a hardware ticket based on the LeSI Rack (Model 1410) or LeSI Client Site Integration Kit (Model 7X74). The LeSI Support team then will triage the issue and recommend next steps for you, including potentially to open tickets with other components of the solution.

For issues that require debugging beyond hardware and firmware (Driver, UEFI, IMM/XCC) an additional ticket will have to be opened with the software vendor (e.g. Lenovo SW Support or 3rd party SW vendor) to assist working towards a fix. The LeSI Support team will then work with the SW Support team in isolating root cause and fixing the defect

For more information about opening tickets, as well as the scope of support for different LeSI components, see the Lenovo Scalable Infrastructure Support Plan information page.

When a cluster ships the most recent Best Recipe is its compliant version, which is always defined exactly for that specific Scalable Infrastructure release and the cluster is delivered as a solution of that specific release. Using a Support call clients can request a review if their solution is also compatible with a newer Best Recipe release and if it is, are able to upgrade to that while maintaining solution interoperability support.

As long as a cluster (Model 1410, 7X74) is under Lenovo warranty or maintenance entitlement, full solution interoperability support will be provided for the original Best Recipes. Even when newer Best Recipes are available the previous Recipe will remain valid and supported.

Of course, any client is free to choose to not adhere to the Best Recipe and instead deploy different software and firmware versions or integrate other components that were not tested for interoperability. While Lenovo cannot warrant interoperability with those deviations from the tested scope, a client continues to receive full break & fix support for the components based on the individual warranty and maintenance entitlement of the components. This is comparable to the level of support clients will receive when not buying it as a LeSI solution, but building the solution from individual components – so-called "roll your own" (RYO).

In those cases, to minimize risk we suggest still staying as close as possible to the Best Recipe even when deviating. We also suggest when deviating first to test it on a small portion of the cluster and only roll it out completely if this test was stable.

For clients who need to upgrade the firmware or software of a component – for example due to OS entitlement support issues or Common Vulnerabilities and Exposures (CVE) fixes – that is part of the best recipe, a support call should be placed on the 1410/7X74 rack and serial number. Lenovo product engineering will review the proposed changes, and advise the client on the viability of an upgrade path. If an upgrade can be supported and is performed, LeSI will note the change in the support records for the solution.

Operating Environment

Lenovo Scalable Infrastructure does fully comply with ASHRAE class A2 specifications for the air-cooled data center, with ASHRAE class W4 for direct to node water cooling for the LeSI exclusive Lenovo ThinkSystem SD650.

Depending on the hardware configuration, some server models comply with ASHRAE class A3 and class A4 specifications, however the server performance might be impacted when the operating temperature is outside the ASHRAE A2 specifications. Please find more details in the product guides of the individual components.

- Air temperature:
  - Operating: ASHRAE Class A2: 10 °C - 35 °C (50 °F - 95 °F); for altitudes above 900 m (2,953 ft), decrease the maximum ambient temperature by 1 °C for every 300-m (984-ft) increase in altitude
  - Non-operating: 5 °C - 45 °C (41 °F - 113 °F)
  - Storage: -40 °C - +60 °C (-40 °F - 140 °F)
- Maximum altitude: 3,050 m (10,000 ft)
- Humidity:
  - Operating: ASHRAE Class A2: 8% - 80% (non-condensing); maximum dew point: 21 °C (70 °F)
  - Storage: 8% - 90% (non-condensing)
- Electrical:
  - 100 - 127 (nominal) V AC; 50 Hz / 60 Hz
  - 200 - 240 (nominal) V AC; 50 Hz / 60 Hz
  - 180 - 300 V DC (HVDC; supported in China only)

Regulatory compliance

Lenovo Scalable Infrastructure adopts the conformity of its individual components to international standards, as minimum however

- UL/IEC / CSA C22.2 No. 60950-1
- United States FCC Part 15, Class A
- Canada ICES-003, Class A
- Europe CE Mark (EN55032 Class A, EN60950-1, EN55024, EN61000-3-2, EN61000-3-3)
- New Zealand/Australia CISPR 22, Class A
- Russia/GOST ME01; IEC-60950-1; GOST R 51318.22, 51317.3.2, and 51317.3.3
- Japan VCCI, Class A
- China CCC Class A
- CISPR 22, Class A

Please find more details on the regulatory compliance for the individual components in their respective product guides.

LeSI solution - DSS-G

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

DSS-G combines the performance of the Lenovo ThinkSystem SR650 servers, Lenovo D1224 and D3284 storage enclosures, and industry leading IBM Spectrum Scale software to offer a high performance, scalable building block approach to modern storage needs.

For more information, see the DSS-G product guide.

Case studies and references

These customers have already implemented LeSI solutions. Click the links to review the customer case studies.

- Barcelona Supercomputing Center

    Climate change. Energy security. Fighting disease. Air quality. To help scientists turn mountains of data into accurate models of our complex world, Barcelona Supercomputing Center (BSC) has powered up a Lenovo supercomputer with Intel processors capable of performing trillions of computations per second.

- Mark III Systems

    The Artificial Intelligence AI revolution is here, and it has the power to transform everything from daily life to the production line. With support from the Lenovo AI Innovation Center and access to ThinkSystem servers, Mark III Systems is leading the way, helping its clients to harness the power of AI to improve manufacturing quality and efficiency.

- Umeå University

    Satisfying researchers' appetite for bigger, better, faster computing resources is never easy. With its new Lenovo supercomputer, High Performance Computing Center North (HPC2N) at Umeå University can deliver on these demands – boosting performance fivefold to support innovative computational and data-intensive research.

- Leibniz Supercomputing Centre

    Leibniz Supercomputing Centre (LRZ) wanted to remain a leading hub within the HPC community, which means providing compute resources that combine industry-leading performance and energy efficiency. The organization implemented its SuperMUC Phase 2 supercomputer based on 3,072 Lenovo NeXtScale nx360 M5 WCT compute nodes.

LeSI installation in the Barcelona Supercomputing Center

Related publications and links

For more information, see these resources:

- LeSI product page:
  https://www.lenovo.com/us/en/data-center/servers/high-density/Lenovo-Scalable-Infrastructure/p/WMD00000276
- LeSI support page:
  https://datacentersupport.lenovo.com/us/en/solutions/ht505184
- Lenovo DSS-G product page:
  https://www.lenovo.com/us/en/data-center/servers/high-density/Distributed-Storage-Solution-for-IBM-Spectrum-Scale/p/WMD00000275
- LiCO website:
  https://www.lenovo.com/us/en/data-center/software/Lenovo-Intelligent-Computing-Orchestration/p/WMD00000356
- Lenovo HPC website:
  https://www.lenovo.com/us/en/data-center/solutions/hpc/
- x-config configurator:
  https://lesc.lenovo.com/products/hardware/configurator/worldwide/bhui/asit/x-config.jnlp
- Best recipe index:
  https://support.lenovo.com/us/en/solutions/HT505184#5

Related product families

Product families related to this document are the following:

- Artificial Intelligence
- High Performance Computing

Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service. Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
1009 Think Place - Building One
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary. Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk. Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

© Copyright Lenovo 2019. All rights reserved.

This document, LP0900, was created or updated on May 24, 2019.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:
  http://lenovopress.com/LP0900

- Send your comments in an e-mail to:
  comments@lenovopress.com

This document is available online at http://lenovopress.com/LP0900.

Trademarks

Lenovo and the Lenovo logo are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. A current list of Lenovo trademarks is available on the Web at https://www.lenovo.com/us/en/legal/copytrade/.

The following terms are trademarks of Lenovo in the United States, other countries, or both:
Lenovo Neptune
Lenovo Services
Lenovo®
NeXtScale
RackSwitch
ThinkSystem

The following terms are trademarks of other companies:

Intel® and Xeon® are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Linux® is a trademark of Linus Torvalds in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.