



Lenovo Storage DX8200C Object Storage Product Guide (withdrawn product)

The Lenovo Storage DX8200C powered by Cloudfian appliance provides affordable, highly efficient, high-capacity storage to meet the growth of unstructured data, including media images, video, backups, web content, and file shares. It makes it easy to build full-featured, on-premise Amazon S3-compliant storage at a cost of pennies per GB per month. The pre-validated Lenovo system that is based on the Cloudfian HyperStore object-storage platform provides petabyte-level scalability, high resiliency, geographic independence, and multi-tenancy.

The Cloudfian HyperStore software provides enterprise-grade, scalable, secure and cost-effective object storage solutions for on premise, private and hybrid clouds. It delivers multi-data center storage with no constraints on data size; unlimited scale; optional, fully automated data tiering to any S3 cloud; and support for all S3 ecosystem applications (1000+ and growing). HyperStore ensures seamless S3 integration with every available AWS/S3 application.

The Lenovo Storage DX8200C is shown in the following figure.



Figure 1. Lenovo Storage DX8200C

Did you know?

The Lenovo Storage DX8200C is built on industry-leading Lenovo servers that feature enterprise-class reliability, management, and security.

HyperStore's peer-to-peer architecture allows almost endless scaling from as few as three servers to many hundreds of servers, across data centers and geographic regions.

The Lenovo Storage DX8200C is designed for always-on data storage with protection using Erasure Coding and Replication. It is secured with encryption, certificate-based access controls, and multi-tenancy controls.

The Lenovo Storage DX8200C powered by Cloudfian solution is part of the Lenovo StorSelect Software Defined Storage (SDS) program, which provides quality, engineering expertise, and Lenovo's worldwide global services. You can quickly and confidently deploy new SDS technologies using preloaded appliances with software from best-of-breed Independent Software Vendors (ISVs) on proven Lenovo systems.

Key features

The Lenovo Storage DX8200C powered by Cloudian HyperStore provides an affordable, highly efficient and durable storage platform to meet the growth of unstructured data. It has virtually unlimited scalability with native support of hundreds of S3 applications.

The Lenovo Storage DX8200C infrastructure is shown in the following figure.

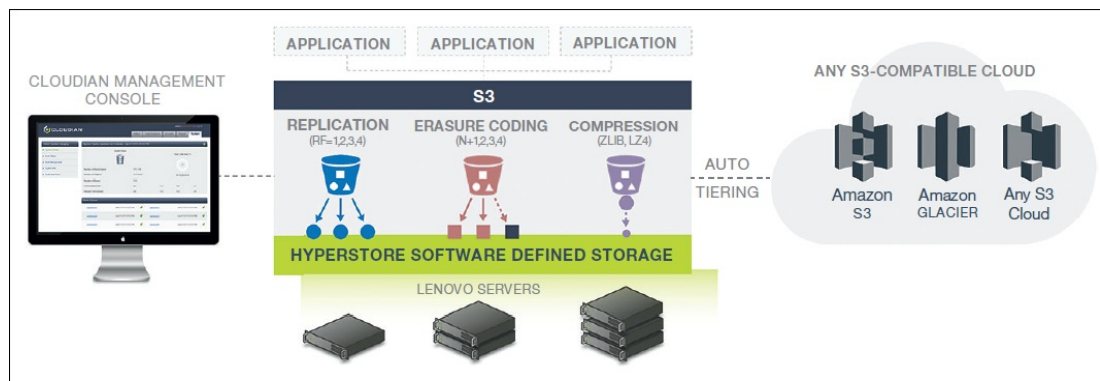


Figure 2. Lenovo Storage DX8200C infrastructure

The Lenovo Storage DX8200C offers the following features:

- **Hybrid storage cloud**
Builds highly cost effective data storage by securely moving data between public and private clouds.
- **Lower cost**
Uses industry-leading Lenovo servers to deliver highly scalable and durable software defined storage with modular architecture that accommodates hot-swappable, redundant, and highly available components to eliminate downtime, data migration, and forklift upgrades.
- **Limitless scalability**
Scales on demand with your business. Lenovo Storage DX8200C systems can grow from tens of terabytes to petabyte scale and beyond.
- **Always on**
Designed to tolerate all disk, server, rack, network and datacenter failures and automatically fixes inconsistent data.
- **Data protection**
Choose from various data protection options via storage policies based on cost efficiency and security levels.
- **Data analytics**
The intelligent storage system can capture additional information about your data and run in-place analytics on that data.
- **Multi-tenancy architecture**
Designed from the ground up to support multi-tenant applications and to isolate and protect tenant data with built in quality of service (QoS), billing and reporting.
- **Billing and reporting**
Configure chargeback, rate plans and report storage utilization based on users, department and applications.
- **Agility**
100% software-defined storage architecture which dynamically adjusts to changing demands and allows your storage to scale with your business needs.

- Natively S3
Fully S3 compliant API deliver broadest range of S3 feature coverage and 100% fidelity with AWS S3 API.
- Geo distribution
Automatically distribute data in one or multiple data center across the globe with single global namespace.

Components and connectors

The following figure shows the front view of the Lenovo Storage DX8200C.

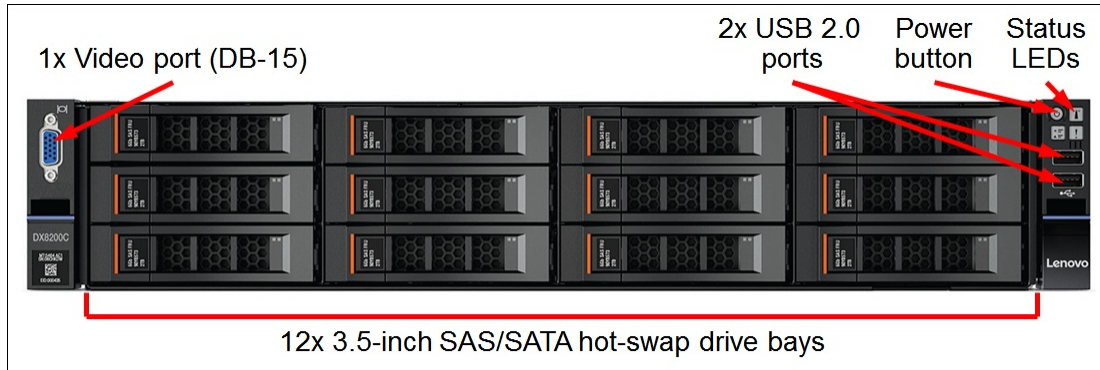


Figure 3. Lenovo Storage DX8200C front view

The following figure shows the rear view of the Lenovo Storage DX8200C.

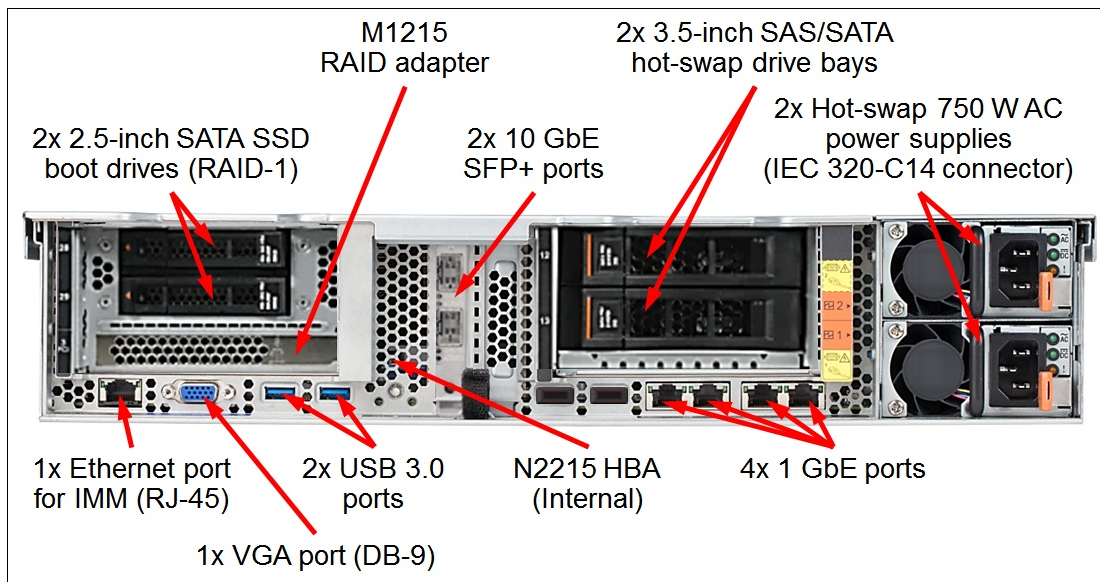


Figure 4. Lenovo Storage DX8200C rear view

System specifications

The following table lists the system specifications of the Lenovo Storage DX8200C appliances.

Table 1. System specifications

Components	Specification
Form factor	2U Rack-mount (Machine Type 5120).
Processor	One Intel Xeon processor E5-2630 v4: <ul style="list-style-type: none"> • 10 cores (2.2 GHz core speeds) • Two QPI links up to 8 GT/s each • 25 MB cache • Up to 2133 MHz memory speed
Chipset	Intel C612.
Memory	12 DIMM sockets. Support for 16 GB and 32 GB RDIMMs. Memory speed up to 2133 MHz.
Memory capacity	Up to 384 GB with 12x 32 GB RDIMMs.
Memory protection	ECC and Chipkill.
Drive bays	14x 3.5-inch SAS/SATA hot-swap
Drive types	<ul style="list-style-type: none"> • 4 TB, 6 TB , 8 TB, 10 TB, and 12 TB 3.5-inch NL SATA HDDs • 6 TB, 8 TB, and 12 TB 3.5-inch NL SAS HDDs
Storage capacity	Up to 168 TB
Storage controller	1x N2215 (12 Gbps SAS/6 Gbps SATA)
Network interfaces	<ul style="list-style-type: none"> • 2x 10 GbE SFP+ ports on the dual-port Intel X520 10 GbE adapter (Intel 82599 NIC). • 4x 10/100/1000 Mbps Ethernet (BCM5719 NIC) RJ-45 ports on the system board.
Boot drive	2x 2.5-in. SATA hot-swap SSDs (rear) in a RAID 1 array connected to the M1215 controller.
I/O expansion slots	Three slots. The slots are as follows: <ul style="list-style-type: none"> • Slot 0: PCIe 3.0 x8 (for the N2215 storage controller) • Slot 3: PCIe 3.0 x8 (for the M1215 storage controller) • Slot 4: PCIe 3.0 x8; low profile (for the 10 GbE network adapter)
Ports	<ul style="list-style-type: none"> • Front: 2x USB 2.0 and 1x DB-15 VGA. • Rear: 2x USB 3.0, 1x DB-15 VGA, and 1x 10/100/1000 Mbps Ethernet (RJ-45) systems management.
Cooling	Calibrated Vectored Cooling with four redundant hot-swap fans.
Power supply	Up to two redundant hot-swap 750 W AC (100 - 240 V) High Efficiency Platinum AC power supplies.
Video	Matrox G200eR2 with 16 MB memory integrated into the IMM2.1. Maximum resolution is 1600x1200 at 75 Hz with 16 M colors.
Hot-swap parts	SSDs and HDDs, power supplies, and fans.
Systems management	UEFI, Integrated Management Module II (IMM2.1) (Renesas SH7758) with Advanced Upgrade, Predictive Failure Analysis, light path diagnostics, Lenovo XClarity, Cloudian Management Console.
Security features	Power-on password, administrator's password, Trusted Platform Module (TPM) 2.0-ready, Secure Sockets Layer (SSL), data-at-rest encryption.
Software	Cloudian HyperStore.
Host connectivity	Simple Storage Service (S3).

Components	Specification
Hardware warranty	Three-year customer-replaceable unit and onsite limited warranty with 9x5 next business day (NBD) parts delivery and remote technical support. Optional service upgrades are available: technician installed parts, 4-hour or 2-hour response time; 6-hour, 8-hour, or 24-hour committed repair; 1-year or 2-year warranty extension.
Software maintenance	Three-, four-, or five-year software license with support and subscription.
Dimensions	Height: 87 mm (3.4 in), width: 446 mm (17.5 in), depth: 800 mm (31.5 in)
Weight	Maximum configuration: 34 kg (75 lb)

Models

The following table lists the base models of the Lenovo Storage DX8200C nodes. Custom factory-build models can also be used.

Note: A minimum of three nodes are required per solution; each model number represents one node.

Product availability: The Lenovo Storage DX8200C is withdrawn and no longer available for ordering.

Table 2. Lenovo Storage DX8200C models

Model number*	Intel Xeon processor	Memory (RDIMMs)	Storage controllers	Hot-swap drives	NIC	Power supply	Software license
5120D1x	1x E5-2630 v4	64 GB (4x 16 GB)	1x N2215 1x M1215	56 TB: 14x 4 TB SATA HDDs Boot: 2x 240 GB 5100 SSDs	2x 10 GbE 4x 1 GbE	2x 750W Platinum	56 TB 3-year S&S
5120D2x	1x E5-2630 v4	64 GB (4x 16 GB)	1x N2215 1x M1215	84 TB: 14x 6 TB SATA HDDs Boot: 2x 480 GB 5100 SSDs	2x 10 GbE 4x 1 GbE	2x 750W Platinum	84 TB 3-year S&S
5120D3x	1x E5-2630 v4	96 GB (6x 16 GB)	1x N2215 1x M1215	112 TB: 14x 8 TB SATA HDDs Boot: 2x 480 GB 5100 SSDs	2x 10 GbE 4x 1 GbE	2x 750W Platinum	112 TB 3-year S&S
5120D4x	1x E5-2630 v4	96 GB (6x 16 GB)	1x N2215 1x M1215	140 TB: 14x 10 TB SATA HDDs Boot: 2x 480 GB 5100 SSDs	2x 10 GbE 4x 1 GbE	2x 750W Platinum	140 TB 3-year S&S
5120D5x	1x E5-2630 v4	96 GB (6x 16 GB)	1x N2215 1x M1215	168 TB: 14x 12 TB SATA HDDs Boot: 2x 960 GB 5100 SSDs	2x 10 GbE 4x 1 GbE	2x 750W Platinum	168 TB 3-year S&S

* x in the Model number represents a region- or geo-specific letter (see the note below the table).

** Software and support license is required and must be purchased together with the appliance based on the total capacity of a storage solution (See [Software](#) for details).

Note: The following region- or geo-specific letters are used:

- A = Asia Pacific (US English documentation)
- M = Australia and New Zealand (US English documentation)
- C = China (Simplified Chinese documentation)
- G = Europe, Middle East, Africa (UK English documentation)
- B = Hong Kong (Traditional Chinese documentation)
- J = Japan (Japanese documentation)
- K = Korea (Korean documentation)
- U = North America, Latin America (US English documentation)
- V = Taiwan (Traditional Chinese documentation)

The Lenovo Storage DX8200C models ship with the following items:

- Documentation package
- Enterprise Slides Kit
- Enterprise 2U Cable Management Arm (CMA)
- Two 1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cables
- One 1.5 m Passive SFP+ DAC Cable
- One 1.5 m Cat5 Ethernet cable

Processors

The Lenovo Storage DX8200C ships with one Intel Xeon processor E5-2630 v4. The processor specifications are listed in the following table.

Table 3. CPU specifications (HT = Hyper-Threading, TB = Turbo Boost, VT = Virtualization Technology)

Processor model	Core frequency (Base / TB Max)	Number of cores / threads	Cache	Max DDR4 frequency	QPI speed	TDP	HT	TB	VT-x	VT-d
E5-2630 v4	2.2 / 3.1 GHz	10 / 20	25 MB	2133 MHz	8.0 GT/s	85 W	Yes	Yes	Yes	Yes

Memory

The Lenovo Storage DX8200C supports Lenovo TruDDR4 memory. TruDDR memory is selected, tested and tuned to maximize performance and reliability, and it enables extended memory performance features to support memory speeds that exceed industry standards.

The appliance supports up to 12 DIMMs with one processor. The processor has four memory channels, and there are three DIMMs per channel.

Note: The appliance has 24 DIMM slots, however, it supports only up to 12 DIMMs.

The following memory protection technologies are supported:

- ECC
- Chipkill

Lenovo engineering tested and validated system designs that support memory speeds beyond Intel memory specifications, which provides benefits for workloads that require memory speed and density. Lenovo TruDDR4 memory is fully supported up to the rated speeds that are shown in the following table.

Table 4. Maximum memory speeds and capacities

DIMMs per channel	RDIMM	
	Memory bus speed	Maximum capacity
1 DPC	2133 MHz	128 GB (4x 32 GB)
2 DPC	2133 MHz	256 GB (8x 32 GB)
3 DPC	1866 MHz	384 GB (12x 32 GB)

The following table lists factory-configurable memory options that are available for the Lenovo Storage DX8200C.

Table 5. Memory options

Description	Part number	Feature code	Maximum supported
RDIMMs - 2400 MHz			
16GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	46W0829	ATCA	12
32GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	46W0833	ATCB	12

Note: At least 64 GB of memory is required per appliance.

Internal storage

The Lenovo Storage DX8200C supports the internal drive bay configurations that are listed in the following table. The SSD boot drives are configured in a RAID 1 array.

Table 6. Internal drive bay configurations

Hot-swap front drive bays (main storage)		Boot drive bays	
Quantity, form factor, drive types	Storage controller	Quantity, form factor, drive type	Storage controller
12x 3.5-inch NL SAS/SATA HDDs (front) + 2x 3.5-inch NL SAS/SATA HDDs (rear)	1x N2215	2x 2.5-inch SATA SSDs (rear)	1x M1215

The following table summarizes features of the storage controllers used in the Lenovo Storage DX8200C.

Table 7. Storage controller features and specifications summary

Feature	N2215	M1215
Form factor	PCIe low profile	PCIe low profile
Controller chip	LSI SAS3008	LSI SAS3008
Host interface	PCIe 3.0 x8	PCIe 3.0 x8
Port interface	12 Gbps SAS	12 Gbps SAS
Number of ports	8	8
Port connectors	2x Mini-SAS HD x4 (SFF-8643)	2x Mini-SAS HD x4 (SFF-8643)
Drive interface	SAS, SATA	SATA
Drive type	HDD	SSD
Drive form factor	LFF	SFF
Number of drives	14*	2
RAID level	None	1 (2 drives)
Cache	None	None

* Connected via the SAS expander that is built into the 3.5-inch drive backplane.

The following table lists the factory-configurable hard drive options that are available for selection.

Table 8. 3.5-inch hot-swap hard drives

Description	Part number	Feature code	Quantity
3.5-inch hot-swap HDDs - 12 Gbps NL SAS			
6TB 7.2K 12Gbps NL SAS 3.5" G2HS 512e HDD	00FN228	A5VR	14
8TB 7.2K 12Gbps NL SAS 3.5" G2HS 512e HDD	00WH121	ATRS	14
12TB 7.2K 12Gbps NL SAS 3.5" G2HS 512e HDD	01GV055	B119	14
3.5-inch hot-swap HDDs - 6 Gbps NL SATA			
4TB 7.2K 6Gbps NL SATA 3.5" G2HS HDD	49Y6002	A3W9	14
6TB 7.2K 6Gbps NL SATA 3.5" G2HS 512e HDD	00FN173	A5VM	14
8TB 7.2K 6Gbps NL SATA 3.5" G2HS 512e HDD	00WH126	ATRT	14
10TB 7.2K 6Gbps NL SATA 3.5" G2HS 512e HDD	00YK341	AU7S	14
12TB 7.2K 6Gbps NL SATA 3.5" G2HS 512e HDD	01GV060	B11A	14

The following table lists the factory-configurable solid-state drive options that are available for selection.

Table 9. 2.5-inch hot-swap solid state drives

Description	Part number	Feature code	Quantity
2.5-inch hot-swap SSDs - Mainstream 6 Gbps SATA			
5100 240GB Enterprise Mainstream SATA G3HS 2.5" SSD	01GV843	AXFV	2
5100 480GB Enterprise Mainstream SATA G3HS 2.5" SSD	01GV848	AXFW	2
5100 960GB Enterprise Mainstream SATA G3HS 2.5" SSD	01GV853	AXFX	2
2.5-inch hot-swap SSDs - Entry 6 Gbps SATA			
Intel S3510 480GB Enterprise Entry SATA G3HS 2.5" SSD	00WG630	AT95	2
Intel S4500 480GB Enterprise Entry SATA G3HS 2.5" SSD	7SD7A05731	B0Z9	2

Network connectivity

The Lenovo Storage DX8200C provides two-port 10 GbE and four-port 1 GbE network connectivity. The Intel X520 10 GbE Dual Port 10GbE SFP+ Adapter that is based on the Intel 82599 network interface controller (NIC) provides two 10 GbE ports with SFP+ connectors. The onboard 1 GbE solution that is based on the Broadcom BCM5719 chip provides four 10/100/1000 Mb Ethernet ports with RJ-45 connectors.

The 10 GbE SFP+ ports require SFP+ transceivers or direct-attach copper (DAC) cables that should be ordered together with the appliance (up to two SFP+ transceivers or DAC cables per appliance). The following table lists supported SFP+ transceiver and cable options.

Note: The Lenovo Storage DX8200C ships with one 1.5 m SFP+ Passive DAC Cable (00AY764).

Table 10. SFP+ transceivers and cable options

Description	Part number	Feature code	Maximum quantity per appliance
SFP+ transceivers - 10 GbE			
Lenovo 10GBASE-SR SFP+ Transceiver	46C3447	5053	2
QLogic 10Gb SFP+ SR Optical Transceiver	49Y4218	0064	2
Optical cables for 10 GbE SFP+ SR transceivers			
Lenovo 0.5m LC-LC OM3 MMF Cable	00MN499	ASR5	2
Lenovo 1m LC-LC OM3 MMF Cable	00MN502	ASR6	2
Lenovo 3m LC-LC OM3 MMF Cable	00MN505	ASR7	2
Lenovo 5m LC-LC OM3 MMF Cable	00MN508	ASR8	2
Lenovo 10m LC-LC OM3 MMF Cable	00MN511	ASR9	2
Lenovo 15m LC-LC OM3 MMF Cable	00MN514	ASRA	2
Lenovo 25m LC-LC OM3 MMF Cable	00MN517	ASRB	2
Lenovo 30m LC-LC OM3 MMF Cable	00MN520	ASRC	2
SFP+ passive direct-attach cables - 10 GbE			
Lenovo 0.5m Passive SFP+ DAC Cable	00D6288	A3RG	2
Lenovo 1m Passive SFP+ DAC Cable	90Y9427	A1PH	2
Lenovo 1.5m Passive SFP+ DAC Cable	00AY764	A51N	2

Description	Part number	Feature code	Maximum quantity per appliance
Lenovo 2m Passive SFP+ DAC Cable	00AY765	A51P	2
Lenovo 3m Passive SFP+ DAC Cable	90Y9430	A1PJ	2
Lenovo 5m Passive SFP+ DAC Cable	90Y9433	A1PK	2
Lenovo 7m Passive SFP+ DAC Cable	00D6151	A3RH	2

Power supplies and cables

The Lenovo Storage DX8200C supports up to two redundant power supplies, and is capable of N+N redundancy. If a model comes with one power supply, the second power supply can be ordered as an option. The following table lists the power supply options.

Table 11. Power supplies

Description	Part number	Feature code	Maximum supported
System x 750W High Efficiency Platinum AC Power Supply	00FK932	A5EU	2

The Lenovo Storage DX8200C models listed in [Models](#) ship with two 1.5m, 10A/100-250V, C13 to IEC 320-C14 rack power cables. A hot-swap power supply option comes with one 2.8m, 10A/100-250V, IEC 320-C13 to C14 rack power cable.

Other line cords or rack power cables can be ordered with the Lenovo Storage DX8200C, if needed (see the following table).

Table 12. Power cables

Description	Part number	Feature code
Rack power cables		
1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	39Y7937	6201
2.8m, 10A/100-250V, C13 to IEC 320-C20 Rack Power Cable	39Y7938	6204
4.3m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	39Y7932	6263
Line cords		
Argentina 10A/250V C13 to IRAM 2073 2.8m line cord	39Y7930	6222
Australia/NZ 10A/250V C13 to AS/NZ 3112 2.8m line cord	39Y7924	6211
Brazil 10A/125V C13 to NBR 6147 2.8m line cord	39Y7929	6223
China 10A/250V C13 to GB 2099.1 2.8m line cord	39Y7928	6210
Denmark 10A/250V C13 to DK2-5a 2.8m line cord	39Y7918	6213
European 10A/230V C13 to CEE7-VII 2.8m line cord	39Y7917	6212
India 10A/250V C13 to IS 6538 2.8m line cord	39Y7927	6269
Israel 10A/250V C13 to SI 32 2.8m line cord	39Y7920	6218
Italy 10A/250V C13 to CEI 23-16 2.8m line cord	39Y7921	6217
Japan 12A/125V C13 to JIS C-8303 2.8m line cord	46M2593	A1RE
Korea 12A/250V C13 to KETI 2.8m line cord	39Y7925	6219
South Africa 10A/250V C13 to SABS 164 2.8m line cord	39Y7922	6214

Description	Part number	Feature code
Switzerland 10A/250V C13 to SEV 1011-S24507 2.8m line cord	39Y7919	6216
Taiwan 10A/250V C13 to CNS 10917-3 2.8m line cord	00CG265	6317
Taiwan 15A/125V C13 to CNS 10917-3 2.8m line cord	00CG267	6386
United Kingdom 10A/250V C13 to BS 1363/A 2.8m line cord	39Y7923	6215
United States 10A/125V C13 to NEMA 5-15P 4.3m line cord	39Y7931	6207
United States 10A/250V C13 to NEMA 6-15P 2.8m line cord	46M2592	A1RF

Software

The Lenovo Storage DX8200C runs preloaded Cloudian HyperStore software that offers the following features:

- **100% S3 API compatibility**
Allows developers continued use of Amazon's S3 SDK without any changes to S3 APIs in development.
- **Scale-out peer-to-peer cloud storage platform**
Scales to thousands of nodes and billions of objects in a bucket for reliable, affordable and scalable hybrid, private and public cloud storage solutions with granular storage policy management, reporting and administration.
- **Multi-tenancy**
Multiple users and applications can use and share a single scale-out storage infrastructure with Role Based Access Control (RBAC) to control access to users' data.
- **Self-service portal**
Users can select and provision storage services on demand from a service catalog through a self-service portal.
- **Quality of Service (QoS)**
Uses QoS to vigorously control usage rate limits for each group or on a per user basis.
- **Quotas**
Dynamically controls storage quotas for each group or on a per user basis.
- **Data protection**
Creates logical storage policies for groups or users with either replication or erasure coding storage policies, or a combination of both to easily meet your IT requirements for data protection and data availability.
- **Smart storage policies**
Users can define their own policies for data protection to allow IT administrators to focus on providing Storage as a Service (STaaS) and giving users the self-service look and feel of an AWS S3 service while providing IT oversight and control.
- **Smart tiering**
Defines tiering policy on a per bucket level and automatically tiers to Amazon S3, Glacier or other S3 endpoints such as tape libraries.
- **Single or multi-datacenter**
Supports geo-distributed model that enables lower latency and provides better cloud services performance with a single global namespace.
- **Chargeback and accounting**
Built-in analytics easily performs chargeback at the group or user level and creates usage and storage reports for accounting purposes.

- Security and encryption
SSL support for secure access and supports AES 256 encryption for data-at-rest on premise and on public clouds.
- Tunable consistency levels
Supports logical storage policies with the data consistency levels to meet your IT and data protection requirements.
- Store files as objects
Granular metadata management at the object level with metadata and file that are bundled into an object for near-infinite scalability of highly available shared storage.
- Object lifecycle management
Users can dynamically manage their own data and object retention period with IT having the management oversight for security and long term data protection.
- Data compression
Reduces storage usage and increases your storage capacity savings with built-in data compression
- Proactive rebuild
Tracks and logs signs of problems with a node, disk, or network failure, or incomplete I/O to quickly pinpoint the problem and rebuild the data in a matter of hours instead of days.
- Object locator
Enables an administrator to easily locate any object and determine the number of copies that exist, as well as their exact storage location across geographically dispersed data centers to meet compliance regulations.
- Rebuild on read
Objects are checked on a read request and missing or out-of-date replicas are automatically replaced or updated.
- Version control
Users can access different revisions of the same file stored on the system with a S3 client.
- Event notifications
Uses secure SNMP traps and JMX for system monitoring and for charge back reporting.
- Geo clusters
Deploy multi-site clusters for disaster recovery purposes and to ensure your data is highly available and always on.
- Replication
Provides the ability to replicate objects to other S3 endpoints such as another Cloudfire HyperStore for disaster recovery (DR).

The models of the Lenovo Storage DX8200C listed in [Models](#) come with a 3-year software support and subscription license for the total internal storage capacity of the particular model.

For custom models of the Lenovo Storage DX8200C, software licenses must be purchased together with the appliances. The number of licenses required is based on the total storage capacity of the entire solution.

The software license options are listed in the following table.

Table 13. Cloudian HyperStore software license options

Description	Part number
Cloudian HyperStore, per Terabyte with 3Yr S&S	00YC297
Cloudian HyperStore, per 250 Terabytes with 3Yr S&S	01GU500
Cloudian HyperStore, per Terabyte with 4Yr S&S	00YC298
Cloudian HyperStore, per 250 Terabytes with 4Yr S&S	01GU501
Cloudian HyperStore, per Terabyte with 5Yr S&S	00YC299
Cloudian HyperStore, per 250 Terabytes with 5Yr S&S	01GU502

Systems management

The Lenovo Storage DX8200C supports the following systems management tools:

- Integrated Management Module 2.1
- Light path diagnostics
- Lenovo XClarity
- Cloudian Management Console
- Lenovo XClarity Energy Manager

Integrated Management Module 2.1

The Lenovo Storage DX8200C contains Integrated Management Module II (IMM2.1), which provides advanced service-processor control, monitoring, and an alerting function. If an environmental condition exceeds a threshold or if a system component fails, the IMM2.1 lights LEDs to help you diagnose the problem, records the error in the event log, and alerts you to the problem. The Integrated Management Module Advanced Upgrade comes standard with the appliances, and it provides a virtual presence for remote management capabilities of the appliances.

The IMM provides remote appliance management through industry-standard interfaces:

- Intelligent Platform Management Interface (IPMI) Version 2.0
- Simple Network Management Protocol (SNMP) Version 3
- Common Information Model (CIM)
- Web browser

The remote presence feature provides the following functions:

- Remotely viewing video with graphics resolutions up to 1600x1200 at 75 Hz with up to 23 bits per pixel colors, regardless of the system state
- Remotely accessing the appliance using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the appliance
- Uploading a diskette image to the IMM memory and mapping it to the appliance as a virtual drive

Light path diagnostics

The Lenovo Storage DX8200C includes basic light path diagnostics, which includes system LEDs on the front of the appliance and LEDs near the monitored components (for example, the DIMM error LED on the system board).

Lenovo XClarity

Lenovo XClarity is a centralized systems management solution that helps administrators deliver infrastructure faster. This solution integrates easily with Lenovo System x M5 and X6 rack servers, Lenovo Storage DX Series, Converged HX Series appliances, and Flex System, providing automated agent-less discovery, monitoring, firmware updates, configuration management, and bare metal deployment of operating systems and hypervisors across multiple systems.

Lenovo XClarity Administrator is an optional software component for the Lenovo Storage DX8200C which can be downloaded and used at no charge to discover and monitor Lenovo Storage DX Series and manage firmware upgrades for them.

If software support and subscription is required for Lenovo XClarity Administrator, Lenovo XClarity Pro software subscription must be ordered. Lenovo XClarity Pro is licensed on a per managed system basis, that is, each managed Lenovo Storage DX8200C system requires a license.

The following table lists the geo-specific Lenovo XClarity Pro software license options.

Table 14. Lenovo XClarity Pro software options

Description	Part number (NA, AP, Japan)*	Part number (EMEA, LA)**
Lenovo XClarity Pro, per Mngd Server w/1 Yr SW S&S	00MT201	00MT207
Lenovo XClarity Pro, per Mngd Server w/3 Yr SW S&S	00MT202	00MT208
Lenovo XClarity Pro, per Mngd Server w/5 Yr SW S&S	00MT203	00MT209

* NA = North America; AP = Asia Pacific

** EMEA = Europe, Middle East, Africa; LA = Latin America

Lenovo XClarity Administrator offers the following features:

- Auto-discovery and monitoring of Lenovo Storage DX Series
- Firmware updates and compliance enforcement
- External alerts and notifications via SNMP traps, syslog remote logging, and e-mail
- Secure connections to managed endpoints
- NIST 800-131A or FIPS 140-2 compliant cryptographic standards between the management solution and managed endpoints
- Integration into existing higher level management systems such as cloud automation and orchestration tools through REST APIs, providing extensive external visibility and control over hardware resources
- An intuitive, easy-to-use GUI
- Scripting support with Windows PowerShell, providing command-line visibility and control over hardware resources

Cloudian Management Console

The Cloudian Management Console (CMC) is a web-based user interface for Cloudian HyperStore system administrators, group administrators, and end users. The functionality available through the CMC depends on the user type associated with a user account.

Using the CMC, Cloudian HyperStore system administrators can perform the following tasks:

- Provisioning groups and users.
- Managing quality of service (QoS) controls.
- Creating and managing rating plans.
- Generating usage data reports.
- Generating bills. Viewing and managing users' stored data objects. Setting access control rights on users' buckets and stored objects.

Group administrators can perform a more limited range of administrative tasks pertaining to their own group. Regular users can perform S3 operations such as uploading and downloading S3 objects.

Lenovo XClarity Energy Manager

Lenovo XClarity Energy Manager offers the following capabilities:

- Reports vital server information, such as power, temperature and resource utilization
- Monitors inlet temperature to locate hot spots, reducing the risk of data or device damage
- Provides finely-grained controls to limit platform power in compliance with IT policy
- Generates alerts when a user-defined threshold is reached

Lenovo XClarity Energy Manager is an optional, separately orderable software component for the Lenovo Storage DX8200C that is licensed on a per managed node basis; that is, each managed Lenovo Storage DX8200C system requires a license.

The following table lists the geo-specific Lenovo XClarity Energy Manager software license options.

Table 15. Lenovo XClarity Energy Manager software options

Description	Part number (NA, AP, Japan)*	Part number (EMEA, LA)**
Lenovo XClarity Energy Manager, 1 Node w/ 1 Yr S&S	01DA225	01DA228
Lenovo XClarity Energy Manager, 5 Nodes w/ 1 Yr S&S	01DA226	01DA229
Lenovo XClarity Energy Manager, 50 Nodes w/ 1 Yr S&S	01DA227	01DA230

* NA = North America; AP = Asia Pacific

** EMEA = Europe, Middle East, Africa; LA = Latin America

Physical specifications

The Lenovo Storage DX8200C has the following dimensions and weight (approximate):

- Height: 87 mm (3.4 in.)
- Width: 446 mm (17.5 in.)
- Depth: 800 mm (31.5 in.)
- Weight (maximum): 34 kg (75 lb)

Operating environment

The Lenovo Storage DX8200C is supported in the following environment:

- Air temperature:
 - System on: 5 °C to 40 °C (41 °F to 104 °F); altitude: 0 to 950 m (3,117 ft); decrease the maximum system temperature by 1 °C for every 175-m increase in altitude above 950 m.
 - System off: 5 °C to 45 °C (41 °F to 113 °F)
 - Shipment: -40 °C to +60 °C (-40 °F to 140 °F) at up to 10,700 m (35,105 ft)
- Maximum altitude: 3,050 m (10,000 ft) at 5 °C to 28 °C (41 °F to 82 °F)
- Humidity:
 - System on: 8% to 85%, maximum dew point 24 °C, maximum rate of change 5 °C/hr
 - System off: 8% to 85%, maximum dew point 27 °C
- Design to ASHRAE Class A3, ambient of 36 °C to 40 °C (96.8 °F to 104 °F), with relaxed support:
 - Supports cloud-like workload with no performance degradation acceptable (Turbo-Off).
 - Under no circumstance can any combination of worst-case workload and configuration result in system shutdown or design exposure at 40 °C.
 - The worst-case workload (like Linpack, Turbo-On) might have performance degradation.
- Electrical:
 - 100 to 127 (nominal) V AC; 50 Hz or 60 Hz; 8.6 A
 - 200 to 240 (nominal) V AC; 50 Hz or 60 Hz; 4.2 A
 - Input kilovolt-amperes (kVA) (approximately): 1.047 kVA
- BTU output (maximum): 3572 Btu/hr (1047 watts)
- Noise level:
 - 6.6 bels (operating)
 - 6.4 bels (idle)

Regulatory compliance

The Lenovo Storage DX8200C conforms to the following regulations:

- AS/NZS CISPR 22, Class A (Australia/New Zealand)
- BSMI CNS 13438, Class A; CNS 14336 (Taiwan)
- CCC GB 4943.1, GB 17625.1, GB 9254 Class A (China)
- CE Mark (European Union)
- CISPR 22, Class A
- EAC (Russia)
- EN 55022, Class A
- EN 55024
- EN/IEC 61000-3-2
- EN/IEC 61000-3-3
- EN/IEC/CSA/UL 60950-1
- Energy Star 2.0
- FCC Part 15, Class A (United States)
- GS/TUV (Germany)
- ICES-003/NMB-03, Class A (Canada)
- MSIP (Korea)
- NOM-019 (Mexico)
- Reduction of Hazardous Substances (ROHS)
- TUV S (Argentina)
- VCCI, Class A (Japan)

Hardware warranty

The Lenovo Storage DX8200C has a three-year customer-replaceable unit (CRU) and onsite (for field-replaceable units [FRUs] only) limited warranty with standard call center support during normal business hours, 9x5 Next Business Day replacement parts delivery, and Remote Technical Support (RTS) services. Also available are Lenovo Services warranty maintenance upgrades and post-warranty maintenance agreements, with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

The Lenovo local support centers perform problem determination and resolution for hardware-related issues and escalate to Cloudian, on behalf of the customer, for software-related problem determination. Cloudian will contact the customer and will own the software-related problem resolution until closure.

Lenovo warranty service upgrade offerings are region-specific. Not all warranty service upgrades are available in every region. For more information about Lenovo warranty service upgrade offerings that are available in your region, go to the Lenovo Enterprise Solutions Configurator (LESC):

<http://lesc.lenovo.com>

The following table explains warranty service definitions.

Table 16. Warranty service definitions

Term	Description
On-site service	A service technician will arrive at the customer's location for equipment service.
Parts delivered	A CRU will be delivered at the customer's location for replacement by the customer, or a service technician will arrive at the customer's location to replace a FRU.
Technician installed parts	A service technician will arrive at the customer's location to replace a CRU or FRU.
24x7x2 hour	A replacement part is scheduled for delivery or a service technician is scheduled to arrive at the customer's location within two hours after remote problem determination is completed. Lenovo provides service around the clock, every day, including Lenovo holidays.
24x7x4 hour	A replacement part is scheduled for delivery or a service technician is scheduled to arrive at the customer's location within four hours after remote problem determination is completed. Lenovo provides service around the clock, every day, including Lenovo holidays.
9x5x4 hour	A replacement part is scheduled for delivery or a service technician is scheduled to arrive at the customer's location within four business hours after remote problem determination is completed. Lenovo provides service 8:00 am - 5:00 pm in the customer's local time zone, Monday-Friday, excluding Lenovo holidays. For example, if a customer reports an incident at 3:00 pm on Friday, the technician will arrive by 10:00 am the following Monday.
9x5 next business day	A replacement part is scheduled for delivery or a service technician is scheduled to arrive at the customer's location on the business day after remote problem determination is completed. Lenovo provides service 8:00 am - 5:00 pm in the client's local time zone, Monday - Friday, excluding Lenovo holidays. Calls received after 4:00 pm local time require an extra business day for service dispatch. Next business day service is not guaranteed.
Committed Repair	Problems receive priority handling so that repairs are completed within the committed time of 6, 8, or 24 hours. Lenovo provides service 24 hours/day, every day, including Lenovo holidays.

The following Lenovo warranty service upgrades are available:

- Warranty and maintenance service upgrades:
 - Three, four, or five years of 9x5 or 24x7 service coverage
 - Parts delivered or technician installed parts from next business day to 4 or 2 hours
 - Committed repair service from 24 to 8 or 6 hours
 - Warranty extension of up to 5 years
 - Post warranty extensions
- Committed Service Repair
Committed Service Repair (CSR) enhances the level of Warranty Service Upgrade or Post Warranty/Maintenance Service offering associated with the selected systems. Offerings vary and are available in select regions.
 - Priority handling to meet defined time frames to restore the failing machine to good working condition
 - Service performed 24 hours per day, 7 days per week, and within 6 hours, 8 hours, or 24 hours
- YourDrive YourData
Lenovo's YourDrive YourData service is a multi-drive retention offering that ensures your data is always under your control, regardless of the number of drives that are installed in your Lenovo server. In the unlikely event of a drive failure, you retain possession of your drive while Lenovo replaces the failed drive part. Your data stays safely on your premises, in your hands. The YourDrive YourData service can be purchased in convenient bundles with Lenovo warranty upgrades and extensions.
- Hardware Installation Services
Lenovo experts can seamlessly manage the physical installation of your server, storage, or networking hardware. Working at a time convenient for you (business hours or off shift), the technician will unpack and inspect the systems on your site, install options, mount in a rack cabinet, connect to power and network, check and update firmware to the latest levels, verify operation, and dispose of the packaging, allowing your team to focus on other priorities.

Software maintenance

The Lenovo Storage DX8200C includes three-year, four-year, or five-year software support and subscription (depending on the selected warranty service upgrade and software license) that entitles you to submit service requests to troubleshoot Cloudian software issues and receive code updates, including fixes, patches, and new software releases.

The Lenovo local support centers perform problem determination and resolution for hardware-related issues and escalate to Cloudian, on behalf of the customer, for software-related problem determination. Cloudian will contact the customer and will own the software-related problem resolution until closure.

Software support that is provided by Cloudian includes 24x7 (for critical errors) or 9x5 (for errors other than critical) phone and web coverage with the following target response times (priorities are determined by Cloudian based on the impact on functionality):

- Priority 1 Error (Critical: Complete inability to store and retrieve data): 30 minutes
- Priority 2 Error (Major: Severe loss of any major functionality): 4 business hours
- Priority 3 Error (Minor: Any error that is not Critical or Major): 24 business hours

Ethernet LAN switches

The following table lists the top-of-rack Ethernet switches that are offered by Lenovo that can be used in Lenovo Storage DX8200C solutions.

Table 17. Ethernet LAN switches

Description	Part number
1 Gb Ethernet switches	
Lenovo RackSwitch G7028 (Rear to Front)	7159BAX
Lenovo RackSwitch G7052 (Rear to Front)	7159CAX
Lenovo RackSwitch G8052 (Rear to Front)	7159G52
10 Gb Ethernet switches	
Lenovo ThinkSystem NE1032 RackSwitch (Rear to Front)	7159A1X
Lenovo ThinkSystem NE1032T RackSwitch (Rear to Front)	7159B1X
Lenovo ThinkSystem NE1072T RackSwitch (Rear to Front)	7159C1X
Lenovo RackSwitch G8124E (Rear to Front)	7159BR6
Lenovo RackSwitch G8264 (Rear to Front)	7159G64
Lenovo RackSwitch G8264CS (Rear to Front)	7159DRX
Lenovo RackSwitch G8272 (Rear to Front)	7159CRW
Lenovo RackSwitch G8296 (Rear to Front)	7159GR6
25 Gb Ethernet switches	
Lenovo ThinkSystem NE2572 RackSwitch (Rear to Front)	7159E1X
40 Gb Ethernet switches	
Lenovo RackSwitch G8332 (Rear to Front)	7159BRX
100 Gb Ethernet switches	
Lenovo ThinkSystem NE10032 RackSwitch (Rear to Front)	7159D1X

For more information, see the list of Product Guides in the Top-of-rack Switches category:
<http://lenovopress.com/servers/options/switches#rt=product-guide>

Rack cabinets

The following table lists the rack cabinets that are offered by Lenovo that can be used in Lenovo Storage DX8200C solutions.

Table 18. Rack cabinets

Description	Part number
25U S2 Standard Rack (1000 mm deep; 2 sidewall compartments)	93072RX
25U Static S2 Standard Rack (1000 mm deep; 2 sidewall compartments)	93072PX
42U S2 Standard Rack (1000 mm deep; 6 sidewall compartments)	93074RX
42U 1100mm Enterprise V2 Dynamic Rack (6 sidewall compartments)	93634PX
42U 1100mm Enterprise V2 Dynamic Expansion Rack (6 sidewall compartments)	93634EX
42U 1200mm Deep Dynamic Rack (6 sidewall compartments)	93604PX
42U 1200mm Deep Static Rack (6 sidewall compartments)	93614PX
42U Enterprise Rack (1105 mm deep; 4 sidewall compartments)	93084PX
42U Enterprise Expansion Rack (1105 mm deep; 4 sidewall compartments)	93084EX

For more information, see the list of Product Guides in the Rack Cabinets category:
<http://lenovopress.com/servers/options/racks>

Power distribution units

The following table lists the power distribution units (PDUs) that are offered by Lenovo that can be used in Lenovo Storage DX8200C solutions.

Table 19. Power distribution units

Description	Part number
0U Basic PDUs	
0U 36 C13/6 C19 24A/200-240V 1 Phase PDU with NEMA L6-30P line cord	00YJ776
0U 36 C13/6 C19 32A/200-240V 1 Phase PDU with IEC60309 332P6 line cord	00YJ777
0U 21 C13/12 C19 32A/200-240V/346-415V 3 Phase PDU with IEC60309 532P6 line cord	00YJ778
0U 21 C13/12 C19 48A/200-240V 3 Phase PDU with IEC60309 460P9 line cord	00YJ779
Switched and Monitored PDUs	
0U 20 C13/4 C19 Switched and Monitored 24A/200-240V/1Ph PDU w/ NEMA L6-30P line cord	00YJ781
0U 20 C13/4 C19 Switched and Monitored 32A/200-240V/1Ph PDU w/ IEC60309 332P6 line cord	00YJ780
0U 18 C13/6 C19 Switched / Monitored 32A/200-240V/346-415V/3Ph PDU w/ IEC60309 532P6 cord	00YJ782
0U 12 C13/12 C19 Switched and Monitored 48A/200-240V/3Ph PDU w/ IEC60309 460P9 line cord	00YJ783
1U 9 C19/3 C13 Switched and Monitored DPI PDU (without line cord)	46M4002
1U 9 C19/3 C13 Switched and Monitored 60A 3Ph PDU with IEC 309 3P+Gnd cord	46M4003
1U 12 C13 Switched and Monitored DPI PDU (without line cord)	46M4004
1U 12 C13 Switched and Monitored 60A 3 Phase PDU with IEC 309 3P+Gnd line cord	46M4005
Ultra Density Enterprise PDUs (9x IEC 320 C13 + 3x IEC 320 C19 outlets)	
Ultra Density Enterprise C19/C13 PDU Module (without line cord)	71762NX

Description	Part number
Ultra Density Enterprise C19/C13 PDU 60A/208V/3ph with IEC 309 3P+Gnd line cord	71763NU
C13 Enterprise PDUs (12x IEC 320 C13 outlets)	
DPI C13 Enterprise PDU+ (without line cord)	39M2816
DPI Single Phase C13 Enterprise PDU (without line cord)	39Y8941
C19 Enterprise PDUs (6x IEC 320 C19 outlets)	
DPI Single Phase C19 Enterprise PDU (without line cord)	39Y8948
DPI 60A 3 Phase C19 Enterprise PDU with IEC 309 3P+G (208 V) fixed line cord	39Y8923
Front-end PDUs (3x IEC 320 C19 outlets)	
DPI 30amp/125V Front-end PDU with NEMA L5-30P line cord	39Y8938
DPI 30amp/250V Front-end PDU with NEMA L6-30P line cord	39Y8939
DPI 32amp/250V Front-end PDU with IEC 309 2P+Gnd line cord	39Y8934
DPI 60amp/250V Front-end PDU with IEC 309 2P+Gnd line cord	39Y8940
DPI 63amp/250V Front-end PDU with IEC 309 2P+Gnd line cord	39Y8935
Universal PDUs (7x IEC 320 C13 outlets)	
DPI Universal 7 C13 PDU (with 2 m IEC 320-C19 to C20 rack power cord)	00YE443
NEMA PDUs (6x NEMA 5-15R outlets)	
DPI 100-127V PDU with fixed NEMA L5-15P line cord	39Y8905
Line cords for PDUs that ship without a line cord	
DPI 30a Line Cord (NEMA L6-30P)	40K9614
DPI 32a Line Cord (IEC 309 P+N+G)	40K9612
DPI 32a Line Cord (IEC 309 3P+N+G)	40K9611
DPI 60a Cord (IEC 309 2P+G)	40K9615
DPI 63a Cord (IEC 309 P+N+G)	40K9613
DPI Australian/NZ 3112 Line Cord (32A)	40K9617
DPI Korean 8305 Line Cord (30A)	40K9618

For more information, see the list of Product Guides in the PDU category:
<http://lenovopress.com/servers/options/pdu#rt=product-guide>

Uninterruptible power supply units

The following table lists the uninterruptible power supply (UPS) units that are offered by Lenovo that can be used in Lenovo Storage DX8200C solutions.

Table 20. Uninterruptible power supply units

Description	Part number
RT1.5kVA 2U Rack or Tower UPS (100-125VAC) (8x NEMA 5-15R 12A outlets)	55941AX
RT1.5kVA 2U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A outlets)	55941KX
RT2.2kVA 2U Rack or Tower UPS (100-125VAC) (8x NEMA 5-20R 16A outlets)	55942AX
RT2.2kVA 2U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A, 1x IEC 320 C19 16A outlets)	55942KX
RT3kVA 2U Rack or Tower UPS (100-125VAC) (6x NEMA 5-20R 16A, 1x NEMA L5-30R 24A outlets)	55943AX
RT3kVA 2U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A, 1x IEC 320 C19 16A outlets)	55943KX
RT5kVA 3U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A, 2x IEC 320 C19 16A outlets)	55945KX
RT6kVA 3U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A, 2x IEC 320 C19 16A outlets)	55946KX
RT8kVA 6U Rack or Tower UPS (200-240VAC) (4x IEC 320-C19 16A outlets)	55948KX
RT11kVA 6U Rack or Tower UPS (200-240VAC) (4x IEC 320-C19 16A outlets)	55949KX
RT8kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC) (4x IEC 320-C19 16A outlets)	55948PX
RT11kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC) (4x IEC 320-C19 16A outlets)	55949PX

For more information, see the list of Product Guides in the Uninterruptible Power Supply Units category: <http://lenovopress.com/servers/options/ups#rt=product-guide>

Lenovo Financial Services

Lenovo Financial Services reinforces Lenovo's commitment to deliver pioneering products and services that are recognized for their quality, excellence, and trustworthiness. Lenovo Financial Services offers financing solutions and services that complement your technology solution anywhere in the world.

We are dedicated to delivering a positive finance experience for customers like you who want to maximize your purchase power by obtaining the technology you need today, protect against technology obsolescence, and preserve your capital for other uses.

We work with businesses, non-profit organizations, governments and educational institutions to finance their entire technology solution. We focus on making it easy to do business with us. Our highly experienced team of finance professionals operates in a work culture that emphasizes the importance of providing outstanding customer service. Our systems, processes and flexible policies support our goal of providing customers with a positive experience.

We finance your entire solution. Unlike others, we allow you to bundle everything you need from hardware and software to service contracts, installation costs, training fees, and sales tax. If you decide weeks or months later to add to your solution, we can consolidate everything into a single invoice.

Our Premier Client services provide large accounts with special handling services to ensure these complex transactions are serviced properly. As a premier client, you have a dedicated finance specialist who manages your account through its life, from first invoice through asset return or purchase. This specialist develops an in-depth understanding of your invoice and payment requirements. For you, this dedication provides a high-quality, easy, and positive financing experience.

For your region specific offers please ask your Lenovo sales representative or your technology provider about the use of Lenovo Financial Services. For more information, see the following Lenovo website: <http://www.lenovofs.com>

Related publications and links

For more information, see these resources:

- Lenovo Storage DX8200C product page
<https://www3.lenovo.com/us/en/p/77X2SHESH06>
- Lenovo Enterprise Solutions Configurator (LESC):
<http://lesc.lenovo.com>
- Standalone Solution Configuration Tool:
<http://lesc.lenovo.com/ssct>
- System x and Cluster Solutions Configurator (x-config)
<http://lesc.lenovo.com/products/hardware/configurator/worldwide/bhui/asit/>
- Support Portal - Lenovo Storage DX8200C
<https://datacentersupport.lenovo.com/us/en/products/storage/storselect/dx8200c/5120>

Related product families

Product families related to this document are the following:

- [Cloud Storage](#)
- [Cloud Storage](#)
- [Software-Defined Storage](#)

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