

ThinkSystem Intel P4610 Mainstream NVMe PCIe 3.0 x4 SSDs

Product Guide

The ThinkSystem Intel P4610 Mainstream NVMe SSDs are advanced data center SSDs optimized for mixed read-write performance, endurance, and strong data protection for Lenovo servers. They are designed for greater performance and endurance in a cost-effective design, and to support a broader set of workloads.

The Intel P4610 SSDs are based on Intel-developed controller, firmware, and 64-layer TLC Intel 3D NAND technology. Rigorous qualification and compatibility testing by Lenovo ensures a highly reliable SSD.



Figure 1. ThinkSystem Intel P4610 Mainstream NVMe PCIe 3.0 x4 SSDs

Did You Know?

NVMe (Non-Volatile Memory Express) is a technology that overcomes SAS/SATA SSD performance limitations by optimizing hardware and software to take full advantage of flash technology. Intel Xeon processors efficiently transfer data in fewer clock cycles with the NVMe optimized software stack compared to the legacy Advance Host Controller Interface (AHCI) stack, thereby reducing latency and overhead. These SSDs connect directly to the processor via the PCIe bus, further reducing latency and TCO.

Part number information

The following table lists the ordering part numbers and feature codes for the SSDs.

Table 1. Ordering information

Part number	Feature	Description
2.5-inch drives for ThinkSystem servers		
4XB7A13936	B589	ThinkSystem U.2 Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD
4XB7A13937	B58A	ThinkSystem U.2 Intel P4610 3.2TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD
4XB7A13938	B58B	ThinkSystem U.2 Intel P4610 6.4TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD
4XB7A13968*	None*	ThinkSystem U.2 Intel P4610 7.68TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD
2.5-inch drives for ThinkSystem SD650 (not hot-swap)		
4XB7A13947	B62M	ThinkSystem SD650 U.2 Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD
3.5-inch drives for ThinkSystem servers		
4XB7A13944	B58C	ThinkSystem 3.5" Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD
4XB7A13945	B58D	ThinkSystem 3.5" Intel P4610 3.2TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD
4XB7A13946	B58E	ThinkSystem 3.5" Intel P4610 6.4TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD
4XB7A13969*	None*	ThinkSystem 3.5" Intel P4610 7.68TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD

* The 7.68TB is available via special bid

The part numbers for the drives include the following items:

- One drive with a hot-swap tray attached
- Publication flyer

Features

Non-Volatile Memory Express (NVMe) is new PCIe 3.0 high performance SSD technology that provides high I/O throughput and low latency. NVMe interfaces remove SAS/SATA bottlenecks and unleash all of the capabilities of contemporary NAND flash memory. Each NVMe PCI SSD has direct PCIe 3.0 x4 connection, which provides at least 2x more bandwidth and 2x less latency than SATA/SAS-based SSD solutions. NVMe drives are also optimized for heavy multi-threaded workloads by using internal parallelism and many other improvements, such as enlarged I/O queues.

The P4610 drives provide performance, quality of service (QoS) and capacity improvements over the previous generation P4600 drives. With the P4610 compared to the P4600, applications can achieve up to 35% faster write rate and up to a 4x reduction in service time at a QoS metric of 99.99% availability for random access workloads.

The Intel P4610 NVMe drives have the following key characteristics:

- PCIe 3.0 connection for each NVMe drive
- Ultra-low I/O latency
- Suitable for mixed read-write workloads
- Available in capacities up to 7.68 TB
- Variable sector size and end-to-end data-path protection
- Enhanced power-loss data protection
- Thermal throttling and monitoring
- SMART health reporting

The key metric for solid state drives is their endurance (life expectancy). SSDs have a huge, but finite, number of program/erase (P/E) cycles, which determines how long the drives can perform write operations and thus their life expectancy. Performance SSDs have better endurance than Mainstream SSDs, which in turn have better endurance than Entry SSDs.

SSD write endurance is typically measured by the number of program/erase cycles that the drive can incur over its lifetime, which is listed as TBW in the device specification. The TBW value that is assigned to a solid-state device is the total bytes of written data that a drive can be guaranteed to complete. Reaching this limit does not cause the drive to immediately fail; the TBW simply denotes the maximum number of writes that can be guaranteed.

A solid-state device does not fail upon reaching the specified TBW, but at some point after surpassing the TBW value (and based on manufacturing variance margins), the drive reaches the end-of-life point, at which time the drive goes into read-only mode. Because of such behavior, careful planning must be done to use SSDs in the application environments to ensure that the TBW of the drive is not exceeded before the required life expectancy.

For example, the 3.2TB P4610 drive has an endurance of 21.8 PB of total bytes written (TBW). This means that for full operation over five years, write workload must be limited to no more than 11.9 TB of writes per day, which is equivalent to 3.7 full drive writes per day (DWPD). For the device to last three years, the drive write workload must be limited to no more than 19.9 TB of writes per day, which is equivalent to 6.2 full drive writes per day.

Technical specifications

The following table present technical specifications for the Intel P4610 drives.

Table 2. Technical specifications

Feature	1.6 TB drive	3.2 TB drive	6.4 TB drive	7.68 TB drive
Interface	PCIe 3.0 x4	PCIe 3.0 x4	PCIe 3.0 x4	PCIe 3.0 x4
Capacity	1.6 TB	3.2 TB	6.4 TB	7.68 TB
Endurance (total bytes written)	12.25 PB	21.85 PB	36.54 PB	44.25 PB
Endurance (drive writes per day over 5 years)	4.2 DWPD	3.7 DWPD	3.1 DWPD	3.2 DWPD
Data reliability	< 1 in 10 ¹⁷ bits read	< 1 in 10 ¹⁷ bits read	< 1 in 10 ¹⁷ bits read	< 1 in 10 ¹⁷ bits read
MTBF, hours	2,000,000	2,000,000	2,000,000	2,000,000
IOPS read (4 KB blocks)	643,000	638,000	654,000	651,000
IOPS write (4 KB blocks)	199,000	222,000	210,500	219,000
Sequential read rate	3.20 GBps	3.20 GBps	3.20 GBps	3.20 GBps
Sequential write rate	2.08 GBps	3.05 GBps	3.20 GBps	3.20 GBps
Read access latency random*	77 µs	77 µs	77 µs	77 µs
Write access latency random*	18 µs	18 µs	18 µs	18 µs
Shock, operating	1,000 G (Max) at 0.5 ms	1,000 G (Max) at 0.5 ms	1,000 G (Max) at 0.5 ms	1,000 G (Max) at 0.5 ms
Vibration, max, operating	2.17 G _{RMS} (5-700 Hz)	2.17 G _{RMS} (5-700 Hz)	2.17 G _{RMS} (5-700 Hz)	2.17 G _{RMS} (5-700 Hz)
Average power (Active Read / Active Write)	10.2 / 13.3 W	8.7 / 13.8 W	9.3 / 14.6 W	9.3 / 14.8 W

* Latency measured using 4 KB transfer size with queue depth = 1 on a random workload.

Server support

The following tables list the ThinkSystem servers that are compatible.

Table 3. ThinkSystem server support (Part 1)

Part number	Description	Intel 2S								AMD			
		ST550 (7X09/7X10)	SR530 (7X07/7X08)	SR550 (7X03/7X04)	SR570 (7Y02/7Y03)	SR590 (7X98/7X99)	SR630 (7X01/7X02)	SR650 (7X05/7X06)	SR670 (7Y36/37/38)	SR635 (7Y98/7Y99)	SR655 (7Y00/7Z01)	SR645 (7D2Y/7D2X)	SR665 (7D2W/7D2V)
2.5-inch drives for ThinkSystem servers													
4XB7A13936	ThinkSystem U.2 Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y
4XB7A13937	ThinkSystem U.2 Intel P4610 3.2TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y
4XB7A13938	ThinkSystem U.2 Intel P4610 6.4TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y
2.5-inch drives for ThinkSystem SD650 (not hot-swap)													
4XB7A13947	ThinkSystem SD650 U.2 Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 SSD	N	N	N	N	N	N	N	N	N	N	N	N
3.5-inch drives for ThinkSystem servers													
4XB7A13944	ThinkSystem 3.5" Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	Y	Y	N	N	Y	Y	Y
4XB7A13945	ThinkSystem 3.5" Intel P4610 3.2TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	Y	Y	N	N	Y	Y	Y
4XB7A13946	ThinkSystem 3.5" Intel P4610 6.4TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	Y	Y	N	N	Y	Y	Y

Table 4. ThinkSystem server support (Part 2)

Part number	Description	E		1S Intel				4S Intel						Dense/ Blade		
		SE350 (7Z46/7D1X)	ST50 (7Y48/7Y50)	ST250 (7Y45/7Y46)	SR150 (7Y54)	SR250 (7Y51/7Y52)	SR850 (7X18/7X19)	SR850P (7D2F/2D2G)	SR860 (7X69/7X70)	SR950 (7X11/12/13)	SR850 V2 (7D31/32/33)	SR860 V2 (7Z59/7Z60)	SD530 (7X21)	SD650 (7X58)	SN550 (7X16)	SN850 (7X15)
2.5-inch drives for ThinkSystem servers																
4XB7A13936	ThinkSystem U.2 Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
4XB7A13937	ThinkSystem U.2 Intel P4610 3.2TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
4XB7A13938	ThinkSystem U.2 Intel P4610 6.4TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
2.5-inch drives for ThinkSystem SD650 (not hot-swap)																
4XB7A13947	ThinkSystem SD650 U.2 Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
3.5-inch drives for ThinkSystem servers																
4XB7A13944	ThinkSystem 3.5" Intel P4610 1.6TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A13945	ThinkSystem 3.5" Intel P4610 3.2TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A13946	ThinkSystem 3.5" Intel P4610 6.4TB Mainstream NVMe PCIe3.0 x4 Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Operating system support

The drives support the following operating systems:

Tip: This table is automatically generated based on data from [Lenovo ServerProven](#).

Table 5. Operating system support for ThinkSystem U.2 Intel P4610 1.6TB Mainstream NVMe PCIe3.0 Hot Swap SSD, 4XB7A13936 (Part 1 of 2)

Operating systems	SR635	SR645	SR655	SR665	SD530 (Gen 2)	SN550 (Gen 2)	SN850 (Gen 2)	SR570 (Gen 2)	SR590 (Gen 2)	SR630 (Gen 2)	SR650 (Gen 2)	SR850 (Gen 2)	SR850P	SR860 (Gen 2)	SR950 (Gen 2)
Microsoft Windows Server 2012 R2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Microsoft Windows Server 2016	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2019	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server version 1709	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Microsoft Windows Server version 1803	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 6.10	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 6.9	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 7.3	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 7.4	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 7.5	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 7.6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.7	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.8	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.9	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.2	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 11 SP4	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 12 SP2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 12 SP3	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
SUSE Linux Enterprise Server 12 SP4	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
SUSE Linux Enterprise Server 12 SP5 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
SUSE Linux Enterprise Server 15	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2 with Xen	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.5	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 6.5 U3	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 6.7 U2	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U1	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 6. Operating system support for ThinkSystem U.2 Intel P4610 1.6TB Mainstream NVMe PCIe3.0 Hot Swap SSD, 4XB7A13936 (Part 2 of 2)

Operating systems	SD530 (Gen 1)	SN550 (Gen 1)	SN850 (Gen 1)	SR570 (Gen 1)	SR590 (Gen 1)	SR630 (Gen 1)	SR650 (Gen 1)	SR850 (Gen 1)	SR860 (Gen 1)	SR950 (Gen 1)
Microsoft Windows Server 2012 R2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server version 1709	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server version 1803	Y	Y	N	N	N	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 6.10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 6.9	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.3	Y	Y	Y	N	N	Y	Y	Y	N	Y
Red Hat Enterprise Linux 7.4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.6	N	N	N	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.8	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.9	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 11 SP4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP2	Y	N	Y	N	N	Y	Y	Y	N	Y
SUSE Linux Enterprise Server 12 SP3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP4	N	N	N	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.5	Y	Y	Y	N	N	Y	Y	Y	N	Y
VMware vSphere Hypervisor (ESXi) 6.5 U3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Warranty

The SSDs carry a 1-year, customer-replaceable unit (CRU) limited warranty. When installed in a supported Lenovo server, these drives assume the server's base warranty and any warranty upgrade.

Solid State Memory cells have an intrinsic, finite number of program/erase cycles that each cell can incur. As a result, each solid state device has a maximum amount of program/erase cycles to which it can be subjected. The warranty for Lenovo solid state drives (SSDs) is limited to drives that have not reached the maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the SSD product. A drive that reaches this limit may fail to operate according to its Specifications.

Physical specifications

The Intel P4610 drives have the following physical dimensions and weight (without tray):

- Height: 15 mm (0.6 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (4.0 in.)
- Weight: up to 139 g (4.9 oz)

Operating environment

The Intel P4610 drives are supported in the following environment:

- Temperature (operational): 0 to 70 °C (32 to 158 °F) at 0 to 3,048 m (0 to 10,000 ft)
- Relative humidity: 5 to 90% (non-condensing)
- Maximum altitude (operational): 3,048 m (10,000 ft)
- Shock: 1,000 G (Max) at 0.5 ms
- Vibration: 2.17 G_{RMS} (5-700 Hz)

Agency approvals

The Intel P4610 drives conform to the following regulations:

- FCC Title 47, Part 15B, Class B
- CA/CSA-CEI/IEC CISPR 22:02
- EN 55024: 1998
- EN 55022: 2006
- EN-60950-1 2nd Edition
- UL/CSA EN-60950-1 2nd Edition
- Low Voltage Directive 2006/95/EC
- C-Tick: AS/NZS3584
- BSMI: CNS 13438
- KCC Article 11.1
- RoHS DIRECTIVE 2011/65/EU
- WEEE Directive 2002/96/EC

Related publications and links

For more information, see the following documents:

- Storage Options for ThinkSystem Servers
<https://lenovopress.com/lp0761-storage-options-for-thinksystem-servers>
- ServerProven
<http://www.lenovo.com/us/en/serverproven>
- Intel P4610 specifications
<https://www.intel.com/content/www/us/en/products/memory-storage/solid-state-drives/data-center-ssds/dc-p4610-series.html>
- Intel P4610 product brief
<https://www.intel.com/content/www/us/en/products/docs/memory-storage/solid-state-drives/data-center-ssds/dc-p4610-series-brief.html>

Related product families

Product families related to this document are the following:

- [Drives](#)

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