

## SUSE Linux Enterprise for High-Performance Computing 15 SP4

# Release Notes

SUSE Linux Enterprise for High-Performance Computing is a highly-scalable, high-performance open-source operating system designed to utilize the power of parallel computing. This document provides an overview of high-level general features, capabilities, and limitations of SUSE Linux Enterprise for High-Performance Computing 15 SP4 and important product updates.

These release notes are updated periodically. The latest version of these release notes is always available at <https://www.suse.com/releasenotes>. General documentation can be found at <https://documentation.suse.com/sle-hpc/15-SP4>.

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# 1 About the release notes

These Release Notes are identical across all architectures, and the most recent version is always available online at <https://www.suse.com/releasesnotes> .

Entries are only listed once but they can be referenced in several places if they are important and belong to more than one section.

Release notes usually only list changes that happened between two subsequent releases. Certain important entries from the release notes of previous product versions are repeated. To make these entries easier to identify, they contain a note to that effect.

However, repeated entries are provided as a courtesy only. Therefore, if you are skipping one or more service packs, check the release notes of the skipped service packs as well. If you are only reading the release notes of the current release, you could miss important changes.

## 2 SUSE Linux Enterprise for High-Performance Computing

SUSE Linux Enterprise for High-Performance Computing is a highly scalable, high performance open-source operating system designed to utilize the power of parallel computing for modeling, simulation and advanced analytics workloads.

SUSE Linux Enterprise for High-Performance Computing 15 SP4 provides tools and libraries related to High Performance Computing. This includes:

- Workload manager
- Remote and parallel shells
- Performance monitoring and measuring tools
- Serial console monitoring tool
- Cluster power management tool
- A tool for discovering the machine hardware topology
- System monitoring
- A tool for monitoring memory errors
- A tool for determining the CPU model and its capabilities (x86-64 only)

- User-extensible heap manager capable of distinguishing between different kinds of memory (x86-64 only)
- Serial and parallel computational libraries providing the common standards BLAS, LAPACK, ...
- Various MPI implementations
- Serial and parallel libraries for the HDF5 file format

## 2.1 Hardware Platform Support

SUSE Linux Enterprise for High-Performance Computing 15 SP4 is available for the Intel 64/AMD64 (x86-64) and AArch64 platforms.

## 2.2 Important Sections of This Document

If you are upgrading from a previous SUSE Linux Enterprise for High-Performance Computing release, you should review at least the following sections:

- *Section 2.4, “Support statement for SUSE Linux Enterprise for High-Performance Computing”*

## 2.3 Support and life cycle

SUSE Linux Enterprise for High-Performance Computing is backed by award-winning support from SUSE, an established technology leader with a proven history of delivering enterprise-quality support services.

SUSE Linux Enterprise for High-Performance Computing 15 has a 13-year life cycle, with 10 years of General Support and 3 years of Extended Support. The current version (SP4) will be fully maintained and supported until 6 months after the release of SUSE Linux Enterprise for High-Performance Computing 15 SP5.

Any release package is fully maintained and supported until the availability of the next release. Extended Service Pack Overlay Support (ESPOS) and Long Term Service Pack Support (LTSS) are also available for this product. If you need additional time to design, validate and test your upgrade plans, Long Term Service Pack Support (LTSS) can extend the support you get by an additional 12 to 36 months in 12-month increments, providing a total of 3 to 5 years of support on any given Service Pack.

For more information, see:

- The support policy at <https://www.suse.com/support/policy.html> ↗
- Long Term Service Pack Support page at <https://www.suse.com/support/programs/long-term-service-pack-support.html> ↗

## 2.4 Support statement for SUSE Linux Enterprise for High-Performance Computing

To receive support, you need an appropriate subscription with SUSE. For more information, see [https://www.suse.com/support/programs/subscriptions/?id=SUSE\\_Linux\\_Enterprise\\_Server](https://www.suse.com/support/programs/subscriptions/?id=SUSE_Linux_Enterprise_Server) ↗.

The following definitions apply:

### L1

Problem determination, which means technical support designed to provide compatibility information, usage support, ongoing maintenance, information gathering and basic troubleshooting using available documentation.

### L2

Problem isolation, which means technical support designed to analyze data, reproduce customer problems, isolate problem area and provide a resolution for problems not resolved by Level 1 or prepare for Level 3.

### L3

Problem resolution, which means technical support designed to resolve problems by engaging engineering to resolve product defects which have been identified by Level 2 Support.

For contracted customers and partners, SUSE Linux Enterprise for High-Performance Computing is delivered with L3 support for all packages, except for the following:

- Technology Previews, see [Section 4, “Technology previews”](#)
- Sound, graphics, fonts and artwork
- Packages that require an additional customer contract, see [Section 2.4.1, “Software requiring specific contracts”](#)

SUSE will only support the usage of original packages. That is, packages that are unchanged and not recompiled.

### 2.4.1 Software requiring specific contracts

Certain software delivered as part of SUSE Linux Enterprise for High-Performance Computing may require an external contract. Check the support status of individual packages using the RPM metadata that can be viewed with `rpm`, `zypper`, or YaST.

### 2.4.2 Software under GNU AGPL

SUSE Linux Enterprise for High-Performance Computing 15 SP4 (and the SUSE Linux Enterprise modules) includes the following software that is shipped *only* under a GNU AGPL software license:

- Ghostscript (including subpackages)

SUSE Linux Enterprise for High-Performance Computing 15 SP4 (and the SUSE Linux Enterprise modules) includes the following software that is shipped under multiple licenses that include a GNU AGPL software license:

- MySpell dictionaries and LightProof
- ArgyllCMS

## 2.5 Documentation and other information

### 2.5.1 Available on the product media

- Read the READMEs on the media.
- Get the detailed change log information about a particular package from the RPM (where `FILENAME.rpm` is the name of the RPM):

```
rpm --changelog -qp FILENAME.rpm
```

- Check the `ChangeLog` file in the top level of the installation medium for a chronological log of all changes made to the updated packages.
- Find more information in the `docu` directory of the installation medium of SUSE Linux Enterprise for High-Performance Computing 15 SP4. This directory includes PDF versions of the SUSE Linux Enterprise for High-Performance Computing 15 SP4 Installation Quick Start Guide.

### 2.5.2 Online documentation

- For the most up-to-date version of the documentation for SUSE Linux Enterprise for High-Performance Computing 15 SP4, see <https://documentation.suse.com/sle-hpc/15-SP4>.
- Find a collection of White Papers in the SUSE Linux Enterprise for High-Performance Computing Resource Library at <https://www.suse.com/products/server#resources>.

## 3 Modules, extensions, and related products

This section comprises information about modules and extensions for SUSE Linux Enterprise for High-Performance Computing 15 SP4. Modules and extensions add functionality to the system.

### 3.1 Modules in the SLE 15 SP4 product line


The SLE 15 SP4 product line is made up of modules that contain software packages. Each module has a clearly defined scope. Modules differ in their life cycles and update timelines.

The modules available within the product line based on SUSE Linux Enterprise 15 SP4 at the release of SUSE Linux Enterprise for High-Performance Computing 15 SP4 are listed in the *Modules and Extensions Quick Start* at <https://documentation.suse.com/sles/15-SP3/html/SLES-all/article-modules.html>.


Not all SLE modules are available with a subscription for SUSE Linux Enterprise for High-Performance Computing 15 SP4 itself (see the column *Available for*).







For information about the availability of individual packages within modules, see <https://scc.suse.com/packages>.

## 3.2 Available extensions

The following extension is not covered by SUSE support agreements, available at no additional cost and without an extra registration key: SUSE Package Hub, see <https://packagehub.suse.com/> .

## 3.3 Related products

This sections lists related products. Usually, these products have their own release notes documents that are available from <https://www.suse.com/releasesnotes> .

- SUSE Linux Enterprise Server: <https://www.suse.com/products/server> 
- SUSE Linux Enterprise JeOS: <https://www.suse.com/products/server/jeos> 
- SUSE Linux Enterprise Desktop: <https://www.suse.com/products/desktop> 
- SUSE Linux Enterprise Server for SAP Applications: <https://www.suse.com/products/sles-for-sap> 
- SUSE Linux Enterprise Real Time: <https://www.suse.com/products/realtime> 
- SUSE Manager: <https://www.suse.com/products/suse-manager> 

## 4 Technology previews

Technology previews are packages, stacks, or features delivered by SUSE which are not supported. They may be functionally incomplete, unstable or in other ways not suitable for production use. They are included for your convenience and give you a chance to test new technologies within an enterprise environment.

Whether a technology preview becomes a fully supported technology later depends on customer and market feedback. Technology previews can be dropped at any time and SUSE does not commit to providing a supported version of such technologies in the future.

Give your SUSE representative feedback about technology previews, including your experience and use case.



## 4.1 64K page size kernel flavor has been added

SUSE Linux Enterprise for High-Performance Computing for Arm 12 SP2 and later kernels have used a page size of 4K. This offers the widest compatibility also for small systems with little RAM, allowing to use Transparent Huge Pages (THP) where large pages make sense.

As a technology preview, SUSE Linux Enterprise for High-Performance Computing for Arm 15 SP4 adds a kernel flavor `64kb`, offering a page size of 64 KiB and physical/virtual address size of 52 bits. Same as the `default` kernel flavor, it does not use preemption.

Main purpose at this time is to allow for side-by-side benchmarking for High Performance Computing, Machine Learning and other Big Data use cases. Contact your SUSE representative if you notice performance gains for your specific workloads.



### Important: Swap needs to be re-initialized

After booting the 64K kernel, any swap partitions need to be re-initialized to be usable. To do this, run the `swapon` command with the `--fixpgsz` parameter on the swap partition. Note that this process deletes data present in the swap partition (for example, suspend data). In this example, the swap partition is on `/dev/sdc1`:

```
swapon --fixpgsz /dev/sdc1
```



### Important: Btrfs file system uses page size as block size

It is currently not possible to use Btrfs file systems across page sizes. Block sizes below page size are not yet supported and block sizes above page size might never be supported. During installation, change the default partitioning proposal and choose another file system, such as Ext4 or XFS, to allow rebooting from the default 4K page size kernel of the Installer into `kernel-64kb` and back.

See the *Storage Guide* for a discussion of supported file systems.



### Warning: RAID 5 uses page size as stripe size

It is currently not yet possible to configure stripe size on volume creation. This will lead to sub-optimal performance if page size and block size differ.

Avoid RAID 5 volumes when benchmarking 64K vs. 4K page size kernels.

See the *Storage Guide* for more information on software RAID.



## Note: Cross-architecture compatibility considerations

The SUSE Linux Enterprise for High-Performance Computing 15 SP4 kernels on x86-64 use 4K page size.

The SUSE Linux Enterprise for High-Performance Computing for POWER 15 SP4 kernel uses 64K page size.

## 5 Modules

### 5.1 HPC module

The HPC module contains HPC specific packages. These include the workload manager Slurm, the node deployment tool `clustduct`, `munge` for user authentication, the remote shell `mrsh`, the parallel shell `pdsh`, as well as numerous HPC libraries and frameworks.

This module is available with the SUSE Linux Enterprise for High-Performance Computing only. It is selected by default during the installation. It can be added or removed using the YaST UI or the `SUSEConnect` CLI tool. Refer to the system administration guide for further details.

### 5.2 NVIDIA Compute Module

The NVIDIA Compute Module provides the NVIDIA CUDA repository for SUSE Linux Enterprise 15. Note that any software within this repository is under a 3rd party EULA. For more information check <https://docs.nvidia.com/cuda/eula/index.html>.

This module is not selected for addition by default when installing SUSE Linux Enterprise for High-Performance Computing. It may be selected manually during installation from the *Extension and Modules* screen. You may also select it on an installed system using YaST. To do so, run from a shell as root `yast registration`, select: `Select Extensions` and search for `NVIDIA Compute Module` and press `Next`.



## Important

Do not attempt to add this module with the SUSEConnect CLI tool. This tool is not yet capable of handling 3rd party repositories.

Once you have selected this module you will be asked to confirm the 3rd party license and verify the repository signing key.

## 6 Changes affecting all architectures

Information in this section applies to all architectures supported by SUSE Linux Enterprise for High-Performance Computing 15 SP4.

### 6.1 Enriched system visibility in the SUSE Customer Center (SCC)

SUSE is committed to helping provide better insights into the consumption of SUSE subscriptions regardless of where they are running or how they are managed; physical or virtual, on-prem or in the cloud, connected to SCC or Repository Mirroring Tool (RMT), or managed by SUSE Manager. To help you identify or filter out systems in SCC that are no longer running or decommissioned, SUSEConnect now features a daily “ping”, which will update system information automatically. For more details see the documentation at <https://documentation.suse.com/subscription/suseconnect/single-html/SLE-suseconnect-visibility/>.

### 6.2 Automatically opened ports

Installing the following packages automatically opens the following ports:

- dolly - TCP ports 9997 and 9998
- slurm - TCP ports 6817, 6818, and 6819


## Important

These release notes only document changes in SUSE Linux Enterprise for High-Performance Computing compared to the immediate previous service pack of SUSE Linux Enterprise for High-Performance Computing. The full changes and fixes can be found on the respective web site of the packages.

### 6.3 dolly

dolly has been updated to version 0.63.6. It includes some fixes for hostname resolution, a better documentation and now provides a default configuration for firewall.


### 6.4 memkind

memkind has been updated to version 1.12.0. The full list of changes is available at <http://memkind.github.io/memkind/> .

### 6.5 openblas

openblas has been updated to version 0.3.17. It contains performance regression fixes and optimization. For more information see <https://github.com/xianyi/OpenBLAS/releases/tag/v0.3.17> .

### 6.6 spack

spack has been updated to version 0.17.1. It now includes support to build singularity containers from <https://registry.suse.com/> .

### 6.7 mpich

mpich has been updated to version 3.4.2. For more information see <https://www.mpich.org/2021/05/28/mpich-3-4-2-released/> .

## 6.8 Creating containers from current HPC environment


Usually users use environment modules to adjust their environment (that is, environment variables like `PATH`, `LD_LIBRARY_PATH`, `MANPATH` etc.) to pick exactly the tools and libraries they need for their work. The same can be achieved with containers by including only those components in a container that are part of this environment. This functionality is now provided using the `spack` and `singularity` applications.

# 7 Removed and deprecated features and packages

This section lists features and packages that were removed from SUSE Linux Enterprise for High-Performance Computing or will be removed in upcoming versions.

## 7.1 Removed features and packages

The following features and packages have been removed in this release.

- Python 2 bindings for `genders` has been removed. These are now provided for Python 3.
- Ganglia is not supported anymore in 15 SP4. It has been replaced with Grafana (<https://grafana.com/> )
- Due to a lack of usage by customers, some library packages have been removed from the HPC module in SLE HPC 15 SP4. On SUSE Linux Enterprise you can build your own library using `spack`. These libraries will continue to be available through SUSE Package Hub. The following libraries have been removed:

- `boost`
- `adios`
- `gsl`
- `fftw3`
- `hypre`
- `metis`
- `mumps`

- [netcdf](#)
- [ocr](#)
- [petsc](#)
- [ptscotch](#)
- [scalapack](#)
- [superlu](#)
- [trilinos](#)

## 7.2 Deprecated features and packages

The following features and packages are deprecated and will be removed in a future version of SUSE Linux Enterprise for High-Performance Computing.


## 8 Obtaining source code

This SUSE product includes materials licensed to SUSE under the GNU General Public License (GPL). The GPL requires SUSE to provide the source code that corresponds to the GPL-licensed material. The source code is available for download at <https://www.suse.com/download/sle-hpc/> on Medium 2. For up to three years after distribution of the SUSE product, upon request, SUSE will mail a copy of the source code. Send requests by e-mail to [sle\\_source\\_request@suse.com](mailto:sle_source_request@suse.com) ([mailto:sle\\_source\\_request@suse.com](mailto:sle_source_request@suse.com)). SUSE may charge a reasonable fee to recover distribution costs.


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## A Changelog for 15 SP4

### A.1 Pre-release

#### A.1.1 New

- Added *Section 6.1, "Enriched system visibility in the SUSE Customer Center (SCC)"* (Jira (<https://jira.suse.com/browse/SLE-24988>) )

### A.2 2022-08-31

#### A.2.1 New

- Added *Section 6.2, "Automatically opened ports"* (Jira (<https://jira.suse.com/browse/SLE-22743>) )


### A.3 2022-05-11

#### A.3.1 New



- Added this changelog

### A.4 2022-03-23


#### A.4.1 New

- Added *Section 6.8, "Creating containers from current HPC environment"* (Jira (<https://jira.suse.com/browse/SLE-12352>) )
- Added notes about dolly, memkind, openblas, spack, and mpich in *Section 6, "Changes affecting all architectures"*



- Added note about Ganglia being unsupported in *Section 7, “Removed and deprecated features and packages”* (Jira (<https://jira.suse.com/browse/SLE-17777>) )
- Added note about removal of Python 2 bindings for genders (Jira (<https://jira.suse.com/browse/SLE-23359>) )

#### A.4.2 Updates

- Added a note about building libraries using spack in *Section 7, “Removed and deprecated features and packages”* (Jira (<https://jira.suse.com/browse/SLE-17776>) )
- Added adios and superlu to the list of removed libraries in *Section 7, “Removed and deprecated features and packages”*

#### A.5 2021-11-03

- Initial SP4 release