



Release Notes

SUSE Linux Enterprise High Availability Extension 15 SP2

SUSE Linux Enterprise High Availability Extension is an enterprise-level clustering solution to implement highly available Linux clusters and eliminate single points of failure. This document provides a high-level overview of features, capabilities, and limitations of SUSE Linux Enterprise High Availability Extension 15 SP2, and highlights 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-ha-15>.

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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/releasenotes> .

Entries can be listed twice, 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. 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 High Availability Extension

SUSE Linux Enterprise High Availability Extension 15 SP2 is an industry-leading open source high availability clustering system. It is designed to virtually eliminate unplanned downtime, be easy to use and be deployed in both physical and virtual environments. Also included is Geo Clustering for SUSE Linux Enterprise High Availability Extension, designed to manage cluster servers in data centers anywhere in the world. High availability clustering helps to minimize data loss due to corruption or failure by protecting your data assets using your existing IT infrastructure.

High availability clustering is used to automate application and data recovery. You can use our flexible, policy-driven clustering solution to implement highly available Linux clusters and eliminate single points of failure. Your servers are continuously monitored, and when a fault or failure occurs, the workload is transferred from one server to another, or the application is automatically restarted on a known working system. This helps you maintain business continuity and minimize unplanned downtime.

2.1 What Is New?

2.1.1 General Changes in Codestream 15

SUSE Linux Enterprise High Availability Extension 15 introduces many innovative changes compared to SUSE Linux Enterprise High Availability Extension 12. The most important changes are listed below.

2.1.2 Changes in 15 SP2

SUSE Linux Enterprise High Availability Extension 15 SP2 introduces changes compared to SUSE Linux Enterprise High Availability Extension SP1. The most important changes are listed below.

2.1.3 Changes in the Base Product

In addition to these release notes, make sure to also review the release notes for the base product, SUSE Linux Enterprise Server 15 SP2. They are published at https://www.suse.com/releases/x86_64/SUSE-SLES/15-SP2 (these release notes are identical across all supported hardware architectures).

2.2 Important Sections of This Document

If you are upgrading from a previous SUSE Linux Enterprise High Availability Extension release, you should review at least the following sections:

- *Section 2.5, “Support Statement for SUSE Linux Enterprise High Availability Extension”*
- *Section 4.2, “Upgrade-Related Notes”*

2.3 Documentation and Other Information



2.3.1 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 media for a chronological log of all changes made to the updated packages.
- Find more information in the docu directory of the media of SUSE Linux Enterprise High Availability Extension 15 SP2. This directory includes the basic Quick Starts for SUSE Linux Enterprise High Availability Extension 15 SP2 in PDF format.

2.3.2 Online Documentation

- For the most up-to-date version of the documentation for SUSE Linux Enterprise High Availability Extension 15 SP2, including SUSE Best Practices, see <https://documentation.suse.com/sle-ha-15> .
- Find a collection of White Papers at <https://www.suse.com/products/server/#resources> . As Resource Type, select White Papers.

2.4 Support and Life Cycle

SUSE Linux Enterprise High Availability Extension 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 High Availability Extension 15 has a 13-year life cycle, with 10 years of General Support and 3 years of Extended Support. The current version (SP2) will be fully maintained and supported until 6 months after the release of SUSE Linux Enterprise High Availability Extension 15 SP3.

If you need additional time to design, validate and test your upgrade plans, Long Term Service Pack Support can extend the support duration. You can buy an additional 12 to 36 months in twelve month increments. This means, you receive a total of 3 to 5 years of support per Service Pack.

For more information, check our Support Policy page <https://www.suse.com/support/policy.html> or the Long Term Service Pack Support Page <https://www.suse.com/support/programs/long-term-service-pack-support.html>.

2.5 Support Statement for SUSE Linux Enterprise High Availability Extension

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_High_Availability_Extension.

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 High Availability Extension is delivered with L3 support for all packages, except for the following:

- Technology Previews, see [Section 2.6, "Technology Previews"](#)
- Sound, graphics, fonts and artwork
- Packages that require an additional customer contract

- Some packages shipped as part of the module *Workstation Extension* are L2-supported only
- Packages with names ending in `-devel` (containing header files and similar developer resources) will only be supported together with their main packages.

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

2.5.1 General Support

To learn about supported features and limitations, refer to the following sections in this document:

- *Section 11, “Removed and Deprecated Features and Packages”*

2.6 Technology Previews

Technology previews are packages, stacks, or features delivered by SUSE to provide glimpses into upcoming innovations. Technology previews are included for your convenience to give you a chance to test new technologies within your environment. We would appreciate your feedback! If you test a technology preview, please contact your SUSE representative and let them know about your experience and use cases. Your input is helpful for future development.

Technology previews come with the following limitations:


- Technology previews are still in development. Therefore, they may be functionally incomplete, unstable, or in other ways not suitable for production use.
- Technology previews are **not** supported.
- Technology previews may only be available for specific hardware architectures. Details and functionality of technology previews are subject to change. As a result, upgrading to subsequent releases of a technology preview may be impossible and require a fresh installation.
- Technology previews can be removed from a product at any time. This may be the case, for example, if SUSE discovers that a preview does not meet the customer or market needs, or does not comply with enterprise standards.

3 Modules, Extensions, and Related Products


This section comprises information about modules and extensions for SUSE Linux Enterprise High Availability Extension 15 SP2. Modules and extensions add parts or functionality to the system.

3.1 Modules in the SLE 15 SP2 Product Line


The SLE 15 SP2 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 SP2 at the release of SUSE Linux Enterprise High Availability Extension 15 SP2 are listed in the *Modules and Extensions Quick Start* at <https://documentation.suse.com/sles/15-SP2/html/SLES-all/art-modules.html> .



Not all SLE modules are available with a subscription for SUSE Linux Enterprise High Availability Extension 15 SP2 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

Extensions add extra functionality to the system and require their own registration key, usually at additional cost. Usually, extensions have their own release notes documents that are available from <https://www.suse.com/releasenotes> .

The following extensions are available for SUSE Linux Enterprise High Availability Extension 15 SP2:









- SUSE Linux Enterprise Live Patching: <https://www.suse.com/products/live-patching> 
- SUSE Linux Enterprise High Availability Extension: <https://www.suse.com/products/highavailability> 

Additionally, there is the following extension which is not covered by SUSE support agreements, available at no additional cost and without an extra registration key:

- SUSE Package Hub: <https://packagehub.suse.com/> 

3.3 Derived and Related Products

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

- SUSE Linux Enterprise JeOS: <https://www.suse.com/products/server/jeos> 
- SUSE Enterprise Storage: <https://www.suse.com/products/suse-enterprise-storage> 
- 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 for High-Performance Computing: <https://www.suse.com/products/server/hpc> 
- SUSE Linux Enterprise Real Time: <https://www.suse.com/products/realtime> 
- SUSE Manager: <https://www.suse.com/products/suse-manager> 
- SUSE OpenStack Cloud: <https://www.suse.com/products/suse-openstack-cloud> 

4 Installation and Upgrade

SUSE Linux Enterprise High Availability Extension can be deployed in several ways:

- Physical machine
- Virtual host
- Virtual machine
- System containers
- Application containers

4.1 Installation

This section includes information related to the initial installation of SUSE Linux Enterprise High Availability Extension 15 SP2. Make sure to also review the respective section of the release notes for the base product, SUSE Linux Enterprise Server 15 SP2 which are published at https://www.suse.com/releasenotes/x86_64/SUSE-SLES/15-SP2.

Important: Installation Documentation

The following release notes contain additional notes regarding the installation of SUSE Linux Enterprise High Availability Extension. However, they do not document the installation procedure itself.

For installation documentation, see the *Installation and Setup Quick Start* at <https://documentation.suse.com/sle-ha-15/html/SLE-HA-all/art-sleha-install-quick.html> and the *Geo Clustering Quick Start* at <https://documentation.suse.com/sle-ha-15/html/SLE-HA-all/art-sleha-geo-quick.html>.

4.2 Upgrade-Related Notes

This section includes upgrade-related information for SUSE Linux Enterprise High Availability Extension 15 SP2. Make sure to also review the respective section of the release notes for the base product, SUSE Linux Enterprise Server 15 SP2 which are published at https://www.suse.com/releasenotes/x86_64/SUSE-SLES/15-SP2.

Important: Upgrade Documentation

The following release notes contain additional notes regarding the upgrade of SUSE Linux Enterprise High Availability Extension. However, they do not document the upgrade procedure itself.

For upgrade documentation, see the *Admin Guide* at <https://documentation.suse.com/sle-ha-15/html/SLE-HA-all/book-sleha-guide.html>.

4.2.1 Make Sure the Current System Is Up-To-Date Before Upgrading

Upgrading the system is only supported from the most recent patch level. Make sure the latest system updates are installed by either running `zypper patch` or by starting the YaST module Online-Update. An upgrade on a system not fully patched may fail.

4.2.2 Skipping Service Packs Requires LTSS

Skipping service packs during an upgrade is only supported if you have a Long Term Service Pack Support contract. Otherwise you first need to upgrade to SP1 before upgrading to SP2.

4.2.3 Terminology Changes in the Upgrade Documentation

To increase consistency and better distinguish types of upgrades, the terminology in the product documentation has been changed:

- *Cluster Rolling Upgrade* (previously, *Rolling Upgrade*): You take the first node offline, upgrade it and bring it back online to join the cluster. Then you continue one by one until all cluster nodes are upgraded to a major version.
- *Cluster Offline Upgrade* (previously, *Offline Migration*): You need to take all nodes offline and upgrade the cluster as a whole (incurring cluster downtime), before you can bring all nodes back online.

This change has been applied to the documentation for SUSE Linux Enterprise High Availability Extension 15 GA and later.

4.3 For More Information

For more information, see [Section 5, “New Features, Changes & Fixes”](#) and the sections relating to your respective hardware architecture.

5 New Features, Changes & Fixes

Information in this section applies to all architectures supported by SUSE Linux Enterprise High Availability Extension 15 SP2 unless noted otherwise.

6 Cluster

This section lists cluster-related information for SUSE Linux Enterprise High Availability Extension 15 SP2.

6.1 To Take Down Cluster Nodes, Always Use `crm cluster stop`

In previous versions of SUSE Linux Enterprise High Availability Extension, you could stop a cluster node by only executing `systemctl stop pacemaker`. The Corosync service would then automatically quit in response.

However, this behavior of Corosync was problematic in rare edge cases when SBD was used as the fencing mechanism: If the Pacemaker service failed more often in a short time than allowed by systemd's `StartLimitBurst`, systemd would not restart Pacemaker anymore. In consequence, the Corosync and SBD services would be stopped and the node would unexpectedly go offline while still holding resources. With SBD not running, the node could also not be fenced anymore.

To avoid this issue, starting with SUSE Linux Enterprise High Availability Extension 15 SP2, the Corosync service will no longer be stopped when the Pacemaker service fails.

For starting, stopping, and restarting cluster nodes, we recommend consistently using the commands `crm cluster start`, `crm cluster stop`, and `crm cluster restart`.

If you want to continue to use `systemctl` commands, make sure to read the SUSE blog post [SUSE High Availability Cluster Services – How to stop, start or view the status \(https://www.suse.com/c/suse-high-availability-cluster-services-how-to-stop-start-or-view-the-status/\)](https://www.suse.com/c/suse-high-availability-cluster-services-how-to-stop-start-or-view-the-status/) ↗.

7 High-Availability Tools

This section list information related to the high-availability tools of SUSE Linux Enterprise High Availability Extension 15 SP2.

8 Resources and Resource Agents

This section lists information related to resources and resource agents in SUSE Linux Enterprise High Availability Extension 15 SP2.

9 Storage

This section list storage-related information for SUSE Linux Enterprise High Availability Extension 15 SP2.

10 Known Issues & Workarounds

This is a list of known issues for this release.

11 Removed and Deprecated Features and Packages

This section lists features and packages that got removed from SUSE Linux Enterprise High Availability Extension or will be removed in upcoming versions.

11.1 Removed Features and Packages

The following features and packages had been deprecated with a previous release and have been removed with SUSE Linux Enterprise High Availability Extension 15 SP2.


11.1.1 lvm2-cmirrord and lvm2-clvm Have Been Removed


With the upgrade to lvm2 2.03, the packages `lvm2-clvm` and `lvm2-cmirrord` that were deprecated in SUSE Linux Enterprise High Availability Extension 15 GA have been removed.

11.2 Deprecated Features and Packages

The following features and packages are deprecated and will be removed with a future service pack of SUSE Linux Enterprise High Availability Extension.

12 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-ha/> 

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