1984787 - SUSE LINUX Enterprise Server 12: Installation notes

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Language	English	**Master Language**	English
Priority	Recommendations / Additional Info	**Category**	Installation information
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Component	BC-OP-LNX (Linux)		

Please find the original document at **https://launchpad.support.sap.com/#/notes/ 1984787**

Symptom

You want to use SAP software on SUSE Linux Enterprise Server 12 (SLES 12) or SUSE Linux Enterprise Server for SAP Applications 12 (SLES for SAP 12).

Other Terms

SUSE, SLES, Enterprise Server, suse, SuSE, SLES 12, sles, sles12, virtualization, XEN, KVM, PowerVM, SLES for SAP, SLES for SAP applications, SUSE Linux Enterprise Server for SAP applications 12, live patching, zero downtime, update, patching, Linux, kernel, Kernel

Reason and Prerequisites

You want to use SAP software on SUSE Linux Enterprise Server 12 (SLES 12) or SUSE Linux Enterprise Server for SAP Applications 12 (SLES for SAP 12).

Solution

Remarks

This SAP note is also valid for SUSE Linux Enterprise Server for SAP Applications 12 (SLES for SAP 12). All SAP hardware and software certifications for SLES 12 are inherited by SLES for SAP 12.

This document is about the installation and configuration of SAP Software on SLES 12, as well as upgrading an existing SAP system from SUSE Linux Enterprise Server 11 (SLES 11). Details about hardware platforms can be found in a section below.

For SAP HANA special installation instructions release restrictions apply. Please check SAP note "2235581 - SAP HANA: Supported Operating Systems" for the list of supported SLES releases and links to the SAP notes providing installation and configuration guidelines to prepare SLES for running SAP HANA.

Requirements for support

To receive full support for your SAP system, the following requirements must be met (this list is not exclusive):

- To ensure support for problems that may occur with the operating system a valid support contract for SUSE Linux Enterprise Server is required. A support contract can be made directly with SUSE or with a support partner who is authorized to redirect possible level 3 support queries to SUSE.
  For more information, see the following links or contact your local SUSE sales representative:

http://www.suse.com/support/
http://www.suse.com/products/server/policy.html
For more information about "SUSE Priority Support for SAP applications", please, refer to SAP note 1056161.

- You must use hardware that is certified by your hardware vendor for use with SAP on Linux.
  See SAP note 171356 for a list of the corresponding notes of hardware partners.
- You may use any Linux kernel provided by SUSE for your architecture.

Life cycle of SUSE Linux Enterprise Server 12

An overview of the various life cycles for the SUSE Linux Enterprise Server product line can be found in SAP note 936887.
SUSE documents the life-cycle information at https://www.suse.com/lifecycle/

Service Packs for SUSE Linux Enterprise Server 12

Updates for SLES 12 are released in the form of Service Packs (SP). When you import a Service Pack, many RPM packages are updated to a new version. For SLES 12 you may use all Service Packs officially released by SUSE. It is highly recommended to install the most current Service Pack. Also, kindly notice that after the release of a new Service Pack, older versions of packages that are updated with this Service Pack, are considered obsolete.
If you have an issue with a package, for which a newer version is available in a service pack, you might be requested to update to the new package version in order to be fully supported with your issues.

Software Modules in SLES 12

SUSE Linux Enterprise Server Modules offer a choice of supplemental packages, ranging from tools for Web Development and Scripting, through a Cloud Management module, all the way to a sneak preview of SUSE's upcoming management tooling called Advanced Systems Management. Modules are part of your SUSE Linux Enterprise Server subscription, are technically delivered as online repositories, and differ from the base of SUSE Linux Enterprise Server only by their lifecycle.

These software modules can be added during the registration process at installation time or later on using YaST2 Add On Product.

Please note for some of these extra subscriptions are necessary.

- **Legacy Module 12**
  The Legacy Module helps you migrating applications from SUSE Linux Enterprise 10 and 11 and other systems to SUSE Linux Enterprise 12, by providing packages which are discontinued on SUSE Linux Enterprise Server, such as: sendmail , syslog-ng , IBM Java6 , and a number of libraries (for example openssl-0.9.8).
  Access to the Legacy Module is included in your SUSE Linux Enterprise Server subscription. The module has a different lifecycle than SUSE Linux Enterprise Server itself. Packages in this module are usually supported for at most three years. Support for Sendmail and IBM Java 6 will end in September 2017 at the latest.
- **Web and Scripting Module 12**
  The SUSE Linux Enterprise Web and Scripting Module delivers a comprehensive suite of scripting languages, frameworks, and related tools helping developers and systems administrators accelerate the creation of stable, modern webapplications, using dynamic languages, such as PHP, Ruby on Rails, and Python. Access to the Web and Scripting Module is included in your SUSE Linux Enterprise Server subscription. The module has a different lifecycle than SUSE Linux Enterprise Server itself:

Package versions in the this module are usually supported.

- **Advanced System Management Module 12**
  This Module contains current versions of the popular configuration management frameworks Puppet and CFEngine as well as the new systems management toolbox called machinery. The machinery tool will be frequently updated and is SUSE's upcoming systems management toolbox for inspecting and validating systems remotely, storing their system description and creating new systems to deploy them in datacenters and clouds.
- **Toolchain Module 12**
  Via this Module you will have access to a more recent GCC and Toolchain in addition to the default compiler of SUSE Linux Enterprise. Access to the Toolchain Module is included in your SUSE Linux Enterprise Server subscription. The module has a different lifecycle than SUSE Linux Enterprise Server itself. Please check the Release Notes for further details.
- **SUSE Linux Enterprise Live Patching 12**
  SUSE Linux Enterprise Live Patching provides packages to update critical kernel modules live in SUSE Linux Enterprise. With SUSE Linux Enterprise Live Patching, you can perform critical kernel patching without shutting down your system, reducing the need for planned downtime and increasing service availability.
- **SUSE Linux Enterprise Workstation Extension 12**
  SUSE Linux Enterprise Workstation Extension extends the functionality of SUSE Linux Enterprise Server with packages of SUSE Linux Enterprise Desktop, like additional desktop applications (office suite, email client, graphical editor ...) and libraries. It allows to combine both products to create a full featured Workstation.
- **Containers Module 12**
  This Module contains several packages revolving around containers and related tools.

Installing SUSE Linux Enterprise Server 12

Install SLES 12 as described in the documentation delivered with the product. The documentation is also electronically available in a number of languages and can be found on the first SLES 12 installation medium in the directory "/docu/<language>" (e.g. "en" for English):

- installquick.pdf - Quick Installation Guide
- admin.pdf - Admin Manual
- deployment.pdf - Deployment Guide - This manual should help with selecting the appropriate method of deployment for your installation.
- storage.pdf - Storage Admin Guide

General installation instructions:

- Select English as the installation and system language.
- Use as a starting point for package selections the default pattern selection presented by YaST in the "Software Selection" sub-menu and make the additional selections below:
  - Manually select the pattern "SAP Application Server Base" from the Software Selection Dialogue. This ensures the installation of sapconf, see also SAP note 1275776 for more details.
  - Manually select the pattern "C/C++ Compiler and Tools" from the Software Selection Dialogue.
  - Manually deselect pattern apparmor from the Software Selection Dialogue.
  - Finally you should then have the following software selections:
    - SUSE Linux Enterprise Server 12
    - Base System:
      - Help and Support Documentation
      - Minimal System (Appliances)

        - X Window System (only as an **option**, but we need at least the X11-server and X11-libs to run the graphical installer)
        - Print Server
        - SAP Application Server Base
        - Web-Based Enterprise Management
        - C/C++ Compiler and Tools
    - Optional software selections:
        - Gnome Desktop Environment

Note the following additional installation instructions (all platforms):

- Manually adjust the hard disk partitioning to the requirements of the SAP components. Usually, SAP components and any database components are installed on separate partitions.
- During network configuration do not set the option "Assign Hostname to Loopback IP". Otherwise an additional entry in /etc/hosts will be created:
  127.0.0.2 <hostname>.<domain> <hostname>
  This leads to errors in the hostname resolution later. If existing you need to remove this entry manually.
- If you configure the network settings manually, please make sure to include DNS, gateway and routing.
- The "hostname" command (without options) may only output the host name and not the FQDN (Fully Qualified Domain Name).
  When the system has been correctly configured, "hostname -f" can be used to get the FQDN.
  Example:
  Fully qualified domain name is "ls3001.example.com". Needed output of the "hostname" command is "ls3001", while "hostname -f" will print "ls3001.example.com".
- If you can access an NTP server, you should configure and activate the Network Time Protocol service. This can easily be done using "yast2 -> Network services -> NTP client. This automatically synchronizes the date and time of all SAP application servers.
- TAI based timezones should not be used and therefore are not available in YaST. For questions about the leap second, please read https://www.suse.com/support/kb/doc?id=7017873 and https://www.suse.com/support/kb/doc/?id=7016150.
- For typical use types see SAP note 1597355 for the recommended swap space sizing.
- After the initial installation, it is strongly recommended to carry out an online update either by using YaST or manually using zypper to bring the system up-to-date.
  You can use either SUSE Manager or Subscription Management Tool (SMT). When using SUSE Manager you can even define software channels and patch lists as snap shots of the online updates. This allows to re-install a system with exactly same software versions (i.e. after a system hardware crash). SMT is a plain proxy server for SLES updates and patches. SMT is available on the SUSE web site. Since SLES12 the SMT package is available on the installation media.
- With SLES 12 you can run your installation with the latest available patches and fixes if you register your SLES 12 against the SUSE Customer Center (SCC), your SUSE manager or your SMT server during installation.
- It is also recommended to install always the latest available updates and patches to keep your system up-to-date.
- We recommend to set non graphical boot target (formerly known as runlevel 3) to avoid graphical UI.

Hardware platforms
The following hardware platforms are certified to use SAP software on SUSE Linux Enterprise Server 12:

- x86_64 (AMD and Intel-compatible 64-bit - "x86_64") SUSE Linux Enterprise Server 12 for AMD64
- IBM zSeries (64-bit - "s390x") SUSE Linux Enterprise Server 12 for IBM zSeries
- IBM Power Systems (64 bit – „ppc64le“) - SUSE Linux Enterprise Server 12 for IBM Power

Upgrading information from SLES 11 to SLES 12

Migration is supported from SLES 11 SP3 / SP4 using the following methods (see release notes for SLES 12):

- Booting from an installation medium (ISO image)
- Automated migration from SLES 11 SP3 / SP4 to SLES 12 SP1

For more information see the deployment guide coming with SLES 12 SP1.

https://www.suse.com/documentation/sles-12/book_sle_deployment/data/cha_update_sle.html

Before starting the upgrade please make sure that all SAP and DB instances running on the server have been updated to a level that is supported on SLES 12 or the respective service pack of SLES 12 and that a working backup of the server exists.

All SAP and DB instances running on the server must be stopped, and all file systems belonging to the SAP installation (/usr/sap, /sapmnt, /<DB>) must be unmounted before starting the OS upgrade procedure to avoid damage to the SAP installation during the OS upgrade.

Known issues and workarounds

- **SLES 12 GA and SLES 12 SP1: systemd, sapinit and saphostexec**
  Due to the handling of SysV init scripts by systemd on SLES 12 GA and SLES 12 SP1, all SAP instances will be stopped if saphostexec is stopped or restarted. This can be worked around by creating a systemd drop-in configuration file:
  mkdir /etc/systemd/system/sapinit.service.d
  create a file called type.conf with the following content in this directory, e.g.
  vi /etc/systemd/system/sapinit.service.d/type.conf
  [Service]
  Type=oneshot
  To make systemd aware of the drop-in file you have either to reboot or call
  systemctl daemon-reload
  to re-read the configuration.
  For SLES12 (for SAP Applications) GA and SLES12 SP1 (for SAP Applications) a new RPM sapinit-systemd-compat is available in the update repositories which contains this drop-in file.
- **SLES 12 SP2**
  SLES 12 SP2 introduces a PIDs cgroup Controller which limits the maximum number of threads per cgroup to 12288 by default (see https://www.suse.com/releasenotes/x86_64/SUSE-SLES/12-SP2/). Since this thread limit may be too low for Java or SAP HANA, please update to systemd-228-142.1 or newer and make sure to create a sap.conf file as follows:
  vi /etc/systemd/logind.conf.d/sap.conf
  [Login]
  UserTasksMax=infinity
  The system should be rebooted for the new limits to take effect.
  Recent versions of sapconf set this automatically, for details see SAP Note 1275776 - Linux: Preparing SLES for SAP environments.
- **Compat-libraries for legacy applications not available on installation media**
  Add the Legacy Module 12 repository to your SLES 12 installation via YaST->Add On Product->Add and choose Extensions and Modules from Registration Server. Select the Legacy 12 Module and install it. Afterwards certain compatibility packages are available for installation.
  NB: You need to register your SLES 12 installation to either your local SMT server or SUSE Customer Center to gain access to this repository.
- **sysstat**
  If sar data shall be collected, you have to install the sysstat package and enable the sysstat.service:

zypper install sysstat
systemctl enable sysstat
systemctl start sysstat
Recent versions of sapconf do this automatically, for details see SAP Note 1275776 - Linux: Preparing SLES for SAP environments.

- **UUID daemon**
  You have to install the following updates for the util-linux, util-linux-systemd and uuidd packages
  - util-linux at least version: util-linux-2.25-22.1
  - uuidd at least version: uuidd-2.25-22.
  - util-linux-systemd-2.25-22.1

  After the installation of uuid daemon and the related packages make sure that the socket activation is enabled and started:
  systemctl status uuidd.socket
  The output should look like:
  uuidd.socket - UUID daemon activation socket
  Loaded: loaded (/usr/lib/systemd/system/uuidd.socket; enabled)
  Active: active (running) since Thu 2016-01-14 15:49:26 CET; 6 days ago
  Listen: /run/uuidd/request (Stream)
  If you do not see "Active: active (running) since ..." you can either start the socket activation of uuidd by issuing:
  systemctl start uuidd.socket
  or reboot the server.
  Recent versions of sapconf do this automatically, for details see SAP Note 1275776 - Linux: Preparing SLES for SAP environments.
- **vm.dirty_background_bytes/vm.dirty_bytes**
  Please read https://www.suse.com/support/kb/doc/?id=7010287 and set the values accordingly, if you are run into the described scenario.
  Recent versions of sapconf set this automatically, for details see SAP Note 1275776 - Linux: Preparing SLES for SAP environments.
- **I/O scheduler**
  For most SAP environments (e.g. RAID, storage arrays, virtualizaton) the IO scheduler 'noop' (non-multiqueue) or 'none' (multiqueue) is the better choice. To set the scheduler, please use udev rules, tuned, systemd units or use sapconf or saptune. The boot parameter "elevator=..." will not always work with multiqueue schedulers!
  Both sapconf and saptune will set "noop" as default at the moment. To change it to 'none', please change the default from 'noop' to 'none'. For saptune see TID 7024298 (https://www.suse.com/support/kb/doc/?id=7024298) and for sapconf see TID 7024299 (https://www.suse.com/support/kb/doc/?id=7024299) for details.
  The next versions released soon will support 'noop' and 'none' simultaneously.
  Please test the impact of the available schedulers and choose the most effective one.
- **SAP HANA**
  In order to install SAP HANA on SLES 12 or SLES 12 for SAP Applications please refer to
  - SAP Note 1944799 - SAP HANA Guidelines for SLES Operating System installation
  - SAP Note 2205917 - SAP HANA DB: Recommended OS settings for SLES 12 / SLES for SAP Applications 12
- **DB2 LUW**
  - Installation of DB2 LUW requires editing the file /etc/services. Please remove the lines containing the "fis" service.
  - Symptom: On running DVD_CLIENT/CLIENT/db6_update_client.sh of DB2 10.5 FP6SAP, you encounter the following error message: DVD_CLIENT/CLIENT_LINUXX86_64/SAPCAR: error while loading shared libraries: libstdc++.so.5: cannot open shared object file: No such file or directory

Solution: Either install the libstdc++33 package from the Legacy Module 12 repository (see above)
or
Download SAPCAR, kernel 7.21 EXT from SAP service marketplace and copy it to folder DVD_CLIENT/CLIENT_LINUXX86_64 .

- **Oracle 12c** (12.1.0.2)
  - Minimum Release SLES 12 SP1 or SLES 12 for SAP Applications SP1
  - Make sure that the following packages are installed
    - Linux kernel at least 3.12.49-11-default
    - Install libcap1: libcap1-1.10-59.61.x86_64 and libcap1-32bit-1.10-59.61.x86_64
    - ksh has been replaced by mksh: mksh-50-2.13.x86_64
    - libaio has been renamed to libaio1. Make sure that libaio1 is installed.
  - Edit CV_ASSUME_DISTID=SUSE11 parameter in database/stage/cvu/cv/admin/cvu_config & grid/stage/cvu/cv/admin/cvu_config
    Apply Oracle Patch 20737462 to address CVU issues relating to lack of reference data.
- **Oracle 11gR2** (11.2.0.4)
  - Minimum Release SLES12 SP1
  - Minimum kernel version 3.12.49-11-default
  - For RAC installation use minimum of SAP Bundle Patch 201502 for Grid Infrastructure
  - Install libcap1 (libcap2 libraries are installed by default); i.e. libcap1-1.10-59.61.x86_64 & libcap1-32bit-1.10-59.61.x86_64
  - Set the variable "CV_ASSUME_DISTID=SUSE11" in database/stage/cvu/cv/admin/cvu_config
  - libaio has been renamed to libaio1 (i.e. libaio1-0.3.109-17.15.x86_64); ensure that libaio1 is installed
  - ksh is replaced by mksh; e.g. mksh-50-2.13.x86_64
  - Pre-requisite warnings for software packages can be ignored. (Newer versions installed)
  - Linking Error - "ins_emagent.mk" - Fix & Retry
    To solve this problem do following changes as user Oracle:
    Edit $ORACLE_HOME/sysman/lib/ins_emagent.mk, search for the line
    $(MK_EMAGENT_NMECTL)
    and replace the line with
    $(MK_EMAGENT_NMECTL) -lnnz11
    Afterwards click the retry button.

SUSE Linux Enterprise Live Patching

This section describes the basic principles of SUSE Linux Enterprise Live Patching (SLE Live Patching) and the usage of SLE Live Patching with SAP workloads.

- **Scope of SUSE Linux Enterprise Live Patching**
  The scope of SLE Live Patching 12 SP1 contains Linux kernel bugs that meet the following criteria: Fixes for CVSS (Common Vulnerability Scoring System) level 6+ vulnerabilities and bug fixes related to system stability or data corruption will be shipped in the scope of SLE Live Patching. It might not be possible to produce a live patch for all kinds of fixes fulfilling the above criteria. SUSE reserves the right to skip fixes where production of a kernel live patch is unviable due to technical reasons. For more information on CVSS, see http://nvd.nist.gov/cvss.cfm/.
- **Pre-Requisites**
  - SLES for SAP 12 SP1 or later on x86_64 hardware
  - Valid subscription for SLES for SAP 12 SP1
  - Valid subscription for SLE Live Patching
  - Ask your SUSE vendor how to buy subscriptions for SLES and SLE Live Patching

- **Installation**
  - Installation of SLES 12 for SAP SP1 or later
  - register your system at SUSE Customer Center (SCC) or local Subscription Management Tool (SMT) server.
  - Add SLE Live Patching product
  - Select SUSE Linux Enterprise Live Patching 12 (SP1) in the list of available extensions and click Next.
  - Confirm the license terms and click Next.
  - Enter the SLE Live Patching registration code and click Next.
  - Check the Installation Summary and selected Patterns. The pattern Live Patching should be selected for installation.
  - Click Accept to complete the installation. This will install the base SUSE Live Patching components on your system together with the initial live patch.
- **Apply updates to your installation**
  SLE Live Patching updates are distributed in a form that allows using standard SLE update stack for patch application. The initial live patch can be updated using zypper patch, YaST2 Online Update or equivalent method.
  The kernel is patched automatically during the package installation. However, invocations of the old kernel functions are not completely eliminated until all sleeping processes wake up and get out of the way. This can take a considerable amount of time. Despite this, sleeping processes that use the old kernel functions are not considered a security issue. Nevertheless, in the current version of kGraft, it is not possible to apply another kGraft patch until all processes cross the kernel-userspace boundary to use patched functions from the previous patch.
  To see the global status of patching, check the flag in /sys/kernel/kgraft/in_progress. The value 1 signifies the existence of sleeping processes that still need to be woken (the patching is still in progress). The value 0 signifies that all processes are using solely the patched functions and patching has finished already. Alternatively, use the kgr status command to obtain the same information.
  The flag can be checked on a per-process basis too. Check the number in /proc/process_number/kgr_in_progress for each process individually. Again, the value 1 signifies sleeping process that still needs to be woken. Alternatively, use the kgr blocking command to output the list of sleeping processes.
  It is up to the system administrator to decide how to deal with the sleeping processes. One possibility is to wait, another possibility is to send a SIGSTOP signal followed by a SIGCONT signal to all the sleeping processes. It can be achieved easily using the kgr poke command. Running processes are not interrupted.

- **Manage SLE Live Patching with kgr(1)**
  Several SLE Live Patching management tasks can be simplified with the kgr tool. The available commands are:

  - kgr status
    Displays the overall status of SLE Live Patching (ready or in_progress).
  - kgr patches
    Displays the list of loaded SLE Live Patching patches.
  - kgr blocking
    Lists processes that are preventing SLE Live Patching from finishing. By default just the PIDs are listed. Specifying -v prints out command lines if available. Another -v displays also stack traces.
  - kgr poke
    Sends SIGSTOP and SIGCONT to all processes that are blocking SLE Live Patching from finishing.
  - For detailed information, see man kgr.
- **Supportability**

Patches that have been issued by SUSE and applied via SLE Live Patching 12 SP1 are fully supported by SUSE.

Other Components

Component	Description
BC-OP-LNX-SUSE	SUSE Linux

This document refers to

SAP Note/KBA	Title
980426	Oracle 10.2 Software installation on new operating systems
936887	End of maintenance for Linux distributions
801415	DB6 Installation on Unix with db2_install
405827	Linux: Recommended file systems
20577	Cpio cannot backup files larger than or equal to 2 GB
19466	Downloading SAP kernel patches
1944799	SAP HANA Guidelines for SLES Operating System Installation
1880960	Lenovo Systems Solution for SAP HANA Platform Edition FW/OS/Driver Maintenance
1824819	SAP HANA DB: Recommended OS settings for SLES 11 / SLES for SAP Applications 11 SP2
1763512	Support details for SUSE Linux Enterprise for SAP Applications
171356	SAP Software on Linux: General information
1644499	Database connectivity from Linux to SQL Server
1629558	Linux 3.x kernel
153641	Swap space requirement for R/3 64-bit kernel
1522993	Linux: SAP on SUSE KVM - Kernel-based Virtual Machine
1452070	DB2-z/OS: SAP on Linux on IBM Z and z/VM
1437105	Operating system limits for SAP instances
1403020	Linux: Certified Cisco Hardware

1391070	Linux UUID solutions
1379130	Linux: Released NEC hardware
1367498	SAP JVM installation prerequisites
1275776	Linux: Preparing SLES for SAP environments
1262987	Swap space requirement for R/3 64-bit kernel installation PI
1172419	Linux: Supported Java versions on the x86_64 platform
1056161	SUSE Priority Support for SAP applications

This document is referenced by

SAP Note/KBA	Title
2751030	Index server crash unresponsive or using a lot of memory on HANA
2891837	Native memory allocation (mmap) failed to map
2817572	java.lang.OutOfMemoryError: Java heap space
2712166	Installation of SAP HANA Database 2.00.033.00 with Linux SLES 12.3 fails with SIGNAL 4 (SIGILL)
2575377	SWPM - Problem with the DNS configuration
2530758	SAP Host Agent restart causes SAP system down
1452070	DB2-z/OS: SAP on Linux on IBM Z and z/VM
2919991	Db2-z/OS: Platform Availability Matrix - Additional Details
2369910	SAP Software on Linux: General information
2172935	Installation - SAP Systems based on SAP NetWeaver : Oracle Database
2205917	SAP HANA DB: Recommended OS settings for SLES 12 / SLES for SAP Applications 12
1275776	Linux: Preparing SLES for SAP environments
2460914	SAP HANA Platform 2.0 SPS 02 Release Note
2378874	Install SAP Solutions on Linux on IBM Power Systems (little endian)
1391070	Linux UUID solutions
1522993	Linux: SAP on SUSE KVM - Kernel-based Virtual Machine
2309342	SUSE Linux Enterprise High Availability Extension on AWS for SAP HANA
2404375	SAP HANA Platform 2.0 SPS 01 Release Note

2380257	SAP HANA Platform 2.0 SPS 00 Release Note
405827	Linux: Recommended file systems
2611430	Hdbalm SSL Connection Fails With TLSv1.2
2588272	SAP HANA Support for aggregated virtualized environments
2513384	SUSE Linux Enterprise Server for SAP Applications on Azure
2187639	Linux 4.x kernel