Red Hat Enterprise Linux 8.5

8.5 Release Notes

Release Notes for Red Hat Enterprise Linux 8.5

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Legal Notice

Abstract

The Release Notes provide high-level coverage of the improvements and additions that have been implemented in Red Hat Enterprise Linux 8.5 and document known problems in this release, as well as notable bug fixes, Technology Previews, deprecated functionality, and other details.

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PROVIDING FEEDBACK ON RED HAT DOCUMENTATION

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1. Log in to the Jira website.
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CHAPTER 1. OVERVIEW

1.1. MAJOR CHANGES IN RHEL 8.5

Installer and image creation

In RHEL 8.5, Image Builder supports the following features:

- Ability to customize filesystem configuration.
- Ability to override official repositories available
- Ability to create bootable installer images and install them to a bare metal system.

For more information, see Section 4.1, “Installer and image creation” .

RHEL for Edge

RHEL 8.5 introduces RHEL for Edge Simplified Installer image, optimized for unattended installation to a device, and provisioning the image to a RHEL for Edge image.

For more information, see Section 4.2, “RHEL for Edge” .

Security

The system-wide **cryptographic policies** support scopes and wildcards for directives in custom policies. You can now enable different sets of algorithms for different back ends.

The **Rsyslog** log processing application has been updated to version 8.2102.0-5. This update introduces, among other improvements, the OpenSSL network stream driver. This implements **TLS-protected transport** using the OpenSSL library into Rsyslog.

The **SCAP Security Guide** project now includes several new profiles and improvements of existing profiles:

- A new profile aligned with the Australian Cyber Security Centre Information Security Manual (ACSC ISM).
- The Center for Internet Security (CIS) profile restructured into four different profiles (Workstation Level 1, Workstation Level 2, Server Level 1, Server Level 2).
- The Security Technical Implementation Guide (STIG) security profile updated to version V1R3.
- A new STIG profile compatible with **Server with GUI** installations.
- A new French National Security Agency (ANSSI) High Level profile, which completes the availability of profiles for all ANSSI-BP-028 v1.2 hardening levels in the **SCAP Security Guide**.

With these enhancements, you can install a system that conforms with one of these security baselines and use the **OpenSCAP** suite for checking security compliance and remediation using the risk-based approach for security controls defined by the relevant authorities.

See New features - Security for more information.

The new **RHEL VPN System Role** makes it easier to set up secure and properly configured IPsec tunneling and virtual private networking (VPN) solutions on large numbers of hosts. For more information, see New Features - Red Hat Enterprise Linux System Roles .

Networking

NetworkManager now supports configuring a device to accept all traffic. You can configure this feature using, for example, the **nmcli** utility.

The **firewalld** service supports forwarding traffic between different interfaces or sources within a zone.

The **firewalld** service supports filtering traffic that is forwarded between zones.

Dynamic programming languages, web and database servers

Later versions of the following components are now available as new module streams:

- **Ruby 3.0**
- **nginx 1.20**
- **Node.js 16**

The following components have been upgraded:

- **PHP** to version 7.4.19
- **Squid** to version 4.15
- **Mutt** to version 2.0.7

See New features - Dynamic programming languages, web and database servers for more information.

Compilers and development tools

The following compiler toolsets have been updated:

- **GCC Toolset 11**
- **LLVM Toolset 12.0.1**
- **Rust Toolset 1.54.0**
- **Go Toolset 1.16.7**

See New features - Compilers and development tools for more information.

OpenJDK updates

- Open Java Development Kit 17 (OpenJDK 17) is now available. For more information about the features introduced in this release and changes in the existing functionality, see OpenJDK documentation.
- OpenJDK 11 has been updated to version 11.0.13. For more information about the features introduced in this release and changes in the existing functionality, see OpenJDK documentation.
- OpenJDK 8 has been updated to version 8.0.312. For more information about the features introduced in this release and changes in the existing functionality, see OpenJDK documentation.

Red Hat Enterprise Linux System Roles

The **Postfix RHEL System Role** is fully supported.

The Network Time Security (NTS) option is now added to the **Timesync RHEL System Role**.

The **Storage RHEL System Role** now supports LVM VDO volumes and expresses volume sizes as a percentage.

The new **RHEL VPN System Role** makes it easier to set up secure and properly configured IPsec tunneling and virtual private networking (VPN) solutions on large numbers of hosts.

High Availability Cluster RHEL System Role is available as a Technology Preview for the 8.5 GA Release.

See New features - Red Hat Enterprise Linux System Roles and Technology Previews - Red Hat Enterprise Linux System Roles for more information.

1.2. IN-PLACE UPGRADE AND OS CONVERSION

In-place upgrade from RHEL 7 to RHEL 8

The supported in-place upgrade paths currently are:

- From RHEL 7.9 to RHEL 8.4 on the 64-bit Intel, IBM POWER 8 (little endian), and IBM Z architectures
- From RHEL 7.6 to RHEL 8.4 on architectures that require kernel version 4.14: IBM POWER 9 (little endian) and IBM Z (Structure A). This is the final in-place upgrade path for these architectures.
- From RHEL 7.7 to RHEL 8.2 on systems with SAP HANA. To ensure your system with SAP HANA remains supported after upgrading to RHEL 8.2, enable the RHEL 8.2 Update Services for SAP Solutions (E4S) repositories.

To ensure your system remains supported after upgrading to RHEL 8.4, either update to the latest RHEL 8.5 version or ensure that the RHEL 8.4 Extended Update Support (EUS) repositories have been enabled. On systems with SAP HANA, enable the RHEL 8.2 Update Services for SAP Solutions (E4S) repositories.

For more information, see Supported in-place upgrade paths for Red Hat Enterprise Linux . For instructions on performing an in-place upgrade, see Upgrading from RHEL 7 to RHEL 8 . For instructions on performing an in-place upgrade on systems with SAP environments, see How to in-place upgrade SAP environments from RHEL 7 to RHEL 8.

Notable enhancements include:

- It is now possible to perform an in-place upgrade with SAP HANA on Pay-As-You-Go instances on AWS with Red Hat Update Infrastructure (RHUI).
- It is now possible to enable EUS or E4S repositories during the in-place upgrade.
- The Leapp utility can now be installed using the **yum install leapp-upgrade** command. As part of this change, the **leapp-repository** and **leapp-repository-deps** RPM packages have been renamed **leapp-upgrade-el7toel8** and **leapp-upgrade-el7toel8-deps** respectively. If the old packages are already installed on your system, they will be automatically replaced by the new packages when you run **yum update**.
- Leapp reports, logs, and other generated documentation are in English, regardless of the language configuration.
- After the upgrade, leftover Leapp packages must be manually removed from the exclude list in the **/etc/dnf/dnf.conf** configuration file before they can be removed from the system.

- The **repomap.csv** file, which is located in the **leapp-data15.tar.gz** archive, has been deprecated and has been replaced with the **repomap.json** file. The deprecated file will remain available until March 2022.

- The IBM POWER 9 (little endian) and IBM Z (Structure A) architectures have reached end of life. Subsequent releases to the in-place upgrade, including new upgrade paths, features, and bug fixes, will not include these architectures.

In-place upgrade from RHEL 6 to RHEL 8

To upgrade from RHEL 6.10 to RHEL 8.4, follow instructions in Upgrading from RHEL 6 to RHEL 8 .

Conversion from a different Linux distribution to RHEL

If you are using CentOS Linux 8 or Oracle Linux 8, you can convert your operating system to RHEL 8 using the Red Hat-supported **Convert2RHEL** utility. For more information, see Converting from an RPM-based Linux distribution to RHEL.

If you are using an earlier version of CentOS Linux or Oracle Linux, namely versions 6 or 7, you can convert your operating system to RHEL and then perform an in-place upgrade to RHEL 8. Note that CentOS Linux 6 and Oracle Linux 6 conversions use the unsupported **Convert2RHEL** utility. For more information on unsupported conversions, see How to perform an unsupported conversion from a RHEL-derived Linux distribution to RHEL.

For information regarding how Red Hat supports conversions from other Linux distributions to RHEL, see the Convert2RHEL Support Policy document .

1.3. RED HAT CUSTOMER PORTAL LABS

Red Hat Customer Portal Labs is a set of tools in a section of the Customer Portal available at https://access.redhat.com/labs/. The applications in Red Hat Customer Portal Labs can help you improve performance, quickly troubleshoot issues, identify security problems, and quickly deploy and configure complex applications. Some of the most popular applications are:

- Registration Assistant
- Product Life Cycle Checker
- Kickstart Generator
- Kickstart Converter
- Red Hat Enterprise Linux Upgrade Helper
- Red Hat Satellite Upgrade Helper
- Red Hat Code Browser
- JVM Options Configuration Tool
- Red Hat CVE Checker
- Red Hat Product Certificates
- Load Balancer Configuration Tool
- Yum Repository Configuration Helper

- Red Hat Memory Analyzer
- Kernel Oops Analyzer
- Red Hat Product Errata Advisory Checker
- Red Hat Out of Memory Analyzer

1.4. ADDITIONAL RESOURCES

- **Capabilities and limits** of Red Hat Enterprise Linux 8 as compared to other versions of the system are available in the Knowledgebase article Red Hat Enterprise Linux technology capabilities and limits.
- Information regarding the Red Hat Enterprise Linux **life cycle** is provided in the Red Hat Enterprise Linux Life Cycle document.
- The Package manifest document provides a **package listing** for RHEL 8.
- Major **differences between RHEL 7 and RHEL 8**, including removed functionality, are documented in Considerations in adopting RHEL 8 .
- Instructions on how to perform an **in-place upgrade from RHEL 7 to RHEL 8** are provided by the document Upgrading from RHEL 7 to RHEL 8 .
- The **Red Hat Insights** service, which enables you to proactively identify, examine, and resolve known technical issues, is now available with all RHEL subscriptions. For instructions on how to install the Red Hat Insights client and register your system to the service, see the Red Hat Insights Get Started page.

CHAPTER 2. ARCHITECTURES

Red Hat Enterprise Linux 8.5 is distributed with the kernel version 4.18.0-348, which provides support for the following architectures:

- AMD and Intel 64-bit architectures
- The 64-bit ARM architecture
- IBM Power Systems, Little Endian
- 64-bit IBM Z

Make sure you purchase the appropriate subscription for each architecture. For more information, see Get Started with Red Hat Enterprise Linux - additional architectures . For a list of available subscriptions, see Subscription Utilization on the Customer Portal.

CHAPTER 3. DISTRIBUTION OF CONTENT IN RHEL 8

3.1. INSTALLATION

Red Hat Enterprise Linux 8 is installed using ISO images. Two types of ISO image are available for the AMD64, Intel 64-bit, 64-bit ARM, IBM Power Systems, and IBM Z architectures:

- Binary DVD ISO: A full installation image that contains the BaseOS and AppStream repositories and allows you to complete the installation without additional repositories.

NOTE

The Binary DVD ISO image is larger than 4.7 GB, and as a result, it might not fit on a single-layer DVD. A dual-layer DVD or USB key is recommended when using the Binary DVD ISO image to create bootable installation media. You can also use the Image Builder tool to create customized RHEL images. For more information about Image Builder, see the *Composing a customized RHEL system image* document.

- Boot ISO: A minimal boot ISO image that is used to boot into the installation program. This option requires access to the BaseOS and AppStream repositories to install software packages. The repositories are part of the Binary DVD ISO image.

See the Interactively installing RHEL from installation media document for instructions on downloading ISO images, creating installation media, and completing a RHEL installation. For automated Kickstart installations and other advanced topics, see the Automatically installing RHEL document.

3.2. REPOSITORIES

Red Hat Enterprise Linux 8 is distributed through two main repositories:

- BaseOS
- AppStream

Both repositories are required for a basic RHEL installation, and are available with all RHEL subscriptions.

Content in the BaseOS repository is intended to provide the core set of the underlying OS functionality that provides the foundation for all installations. This content is available in the RPM format and is subject to support terms similar to those in previous releases of RHEL. For a list of packages distributed through BaseOS, see the Package manifest.

Content in the Application Stream repository includes additional user space applications, runtime languages, and databases in support of the varied workloads and use cases. Application Streams are available in the familiar RPM format, as an extension to the RPM format called *modules*, or as Software Collections. For a list of packages available in AppStream, see the Package manifest.

In addition, the CodeReady Linux Builder repository is available with all RHEL subscriptions. It provides additional packages for use by developers. Packages included in the CodeReady Linux Builder repository are unsupported.

For more information about RHEL 8 repositories, see the Package manifest.

3.3. APPLICATION STREAMS

Red Hat Enterprise Linux 8 introduces the concept of Application Streams. Multiple versions of user space components are now delivered and updated more frequently than the core operating system packages. This provides greater flexibility to customize Red Hat Enterprise Linux without impacting the underlying stability of the platform or specific deployments.

Components made available as Application Streams can be packaged as modules or RPM packages and are delivered through the AppStream repository in RHEL 8. Each Application Stream component has a given life cycle, either the same as RHEL 8 or shorter. For details, see Red Hat Enterprise Linux Life Cycle.

Modules are collections of packages representing a logical unit: an application, a language stack, a database, or a set of tools. These packages are built, tested, and released together.

Module streams represent versions of the Application Stream components. For example, several streams (versions) of the PostgreSQL database server are available in the **postgresql** module with the default **postgresql:10** stream. Only one module stream can be installed on the system. Different versions can be used in separate containers.

Detailed module commands are described in the Installing, managing, and removing user-space components document. For a list of modules available in AppStream, see the Package manifest.

3.4. PACKAGE MANAGEMENT WITH YUM/DNF

On Red Hat Enterprise Linux 8, installing software is ensured by the **YUM** tool, which is based on the **DNF** technology. We deliberately adhere to usage of the **yum** term for consistency with previous major versions of RHEL. However, if you type **dnf** instead of **yum**, the command works as expected because **yum** is an alias to **dnf** for compatibility.

For more details, see the following documentation:

- Installing, managing, and removing user-space components
- Considerations in adopting RHEL 8

CHAPTER 4. NEW FEATURES

This part describes new features and major enhancements introduced in Red Hat Enterprise Linux 8.5.

4.1. INSTALLER AND IMAGE CREATION

RHEL for Edge now supports a Simplified Installer

This enhancement enables Image Builder to build the RHEL for Edge Simplified Installer (**edge-simplified-installer**) and RHEL for Edge Raw Images (**edge-raw-image**).

RHEL for Edge Simplified Installer enables you to specify a new blueprint option, **installation_device** and thus, perform an unattended installation to a device. To create the raw image, you must provide an existing OSTree commit. It results in a raw image with the existing commit deployed in it. The installer will use this raw image to the specified installation device.

Additionally, you can also use Image Builder to build RHEL for Edge Raw Images. These are compressed raw images that contain a partition layout with an existing deployed OSTree commit in it. You can install the RHEL for Edge Raw Images to flash on a hard drive or booted in a virtual machine.

(BZ#1937854)

Warnings for deprecated kernel boot arguments

Anaconda boot arguments without the **inst.** prefix (for example, **ks**, **stage2**, **repo** and so on) are deprecated starting RHEL7. These arguments will be removed in the next major RHEL release.

With this release, appropriate warning messages are displayed when the boot arguments are used without the **inst** prefix. The warning messages are displayed in **dracut** when booting the installation and also when the installation program is started on a terminal.

Following is a sample warning message that is displayed on a terminal:

Deprecated boot argument **ks** must be used with the **inst.** prefix. Please use **inst.ks** instead. Anaconda boot arguments without **inst.** prefix have been deprecated and will be removed in a future major release.

Following is a sample warning message that is displayed in **dracut**:

ks has been deprecated. All usage of Anaconda boot arguments without the **inst.** prefix have been deprecated and will be removed in a future major release. Please use **inst.ks** instead.

(BZ#1897657)

Red Hat Connector is now fully supported

You can connect the system using Red Hat Connector (**rhc**). Red Hat Connector consists of a command-line interface and a daemon that allow users to execute Insights remediation playbook directly on their host within the web user interface of Insights (console.redhat.com). Red Hat Connector was available as a Technology Preview in RHEL 8.4 and as of RHEL 8.5, it is fully supported.

(BZ#1957316)

Ability to override official repositories available

By default, the **osbuild-composer** backend has its own set of official repositories defined in the **/usr/share/osbuild-composer/repositories** directory. Consequently, it does not inherit the system

repositories located in the **/etc/yum.repos.d/** directory. You can now override the official repositories. To do that, define overrides in the **/etc/osbuild-composer/repositories** and, as a result, the files located there take precedence over those in the **/usr** directory.

(BZ#1915351)

Image Builder now supports filesystem configuration

With this enhancement, you can specify custom filesystem configuration in your blueprints and you can create images with the desired disk layout. As a result, by having non-default layouts, you can benefit from security benchmarks, consistency with existing setups, performance, and protection against out-of-disk errors.

To customize the filesystem configuration in your blueprint, set the following customization:

```
[[customizations.filesystem]]
mountpoint = "MOUNTPOINT"
size = MINIMUM-PARTITION-SIZE
```

(BZ#2011448)

Image Builder now supports creating bootable installer images

With this enhancement, you can use Image Builder to create bootable ISO images that consist of a **tarball** file, which contains a root file system. As a result, you can use the bootable ISO image to install the **tarball** file system to a bare metal system.

(BZ#2019318)

4.2. RHEL FOR EDGE

Greenboot services now enabled by default

Previously, the greenboot services were not present in the default presets so, when the greenboot package was installed, users had to manually enable these greenboot services. With this update, the greenboot services are now present in the default presets configuration and users are no longer required to manually enable it.

(BZ#1935177)

4.3. SOFTWARE MANAGEMENT

RPM now has read-only support for the sqlite database backend

The ability to query an RPM database based on **sqlite** may be desired when inspecting other root directories, such as containers.This update adds read-only support for the RPM **sqlite** database backend. As a result, it is now possible to query packages installed in a UBI 9 or Fedora container from the host RHEL 8. To do that with Podman:

1. Mount the container's file system with the **podman mount** command.
2. Run the **rpm -qa** command with the **--root** option pointing to the mounted location.

Note that RPM on RHEL 8 still uses the BerkeleyDB database (**bdb**) backend.

(BZ#1938928)

libmodulemd rebased to version 2.12.1

The **libmodulemd** packages have been rebased to version 2.12.1. Notable changes include:

- Added support for version 1 of the **modulemd-obsoletes** document type, which provides information about a stream obsoleting another one, or a stream reaching its end of life.
- Added support for version 3 of the **modulemd-packager** document type, which provides a packager description of a module stream content for a module build system.
- Added support for the **static_context** attribute of the version 2 **modulemd** document type. With that, a module context is now defined by a packager instead of being generated by a module build system.
- Now, a module stream value is always serialized as a quoted string.

(BZ#1894573)

libmodulemd rebased to version 2.13.0

The **libmodulemd** packages have been rebased to version 2.13.0, which provides the following notable changes over the previous version:

- Added support for delisting demodularized packages from a module.
- Added support for validating **modulemd-packager-v3** documents with a new **--type** option of the **modulemd-validator** tool.
- Fortified parsing integers.
- Fixed various **modulemd-validator** issues.

(BZ#1984402)

sslverifystatus has been added to dnf configuration

With this update, when **sslverifystatus** option is enabled, **dnf** checks each server certificate revocation status using the **Certificate Status Request** TLS extension (OCSP stapling). As a result, when a revoked certificate is encountered, **dnf** refuses to download from its server.

(BZ#1814383)

4.4. SHELLS AND COMMAND-LINE TOOLS

ReaR has been updated to version 2.6

Relax-and-Recover (ReaR) has been updated to version 2.6. Notable bug fixes and enhancements include:

- Added support for **eMMC** devices.
- By default, all kernel modules are included in the rescue system. To include specific modules, set the **MODULES** array variable in the configuration file as: **MODULES=(mod1 mod2)**
- On the AMD and Intel 64-bit architectures and on IBM Power Systems, Little Endian, a new configuration variable **GRUB2_INSTALL_DEVICES** is introduced to control the location of the bootloader installation. See the description in **/usr/share/rear/conf/default.conf** for more

details.

- Improved backup of multipath devices.
- Files under **/media**, **/run**, **/mnt**, **/tmp** are automatically excluded from backups as these directories are known to contain removable media or temporary files. See the description of the AUTOEXCLUDE_PATH variable in **/usr/share/rear/conf/default.conf**.
- **CLONE_ALL_USERS_GROUPS=true** is now the default. See the description in **/usr/share/rear/conf/default.conf** for more details.

(BZ#1988493)

The modulemd-tools package is now available

With this update, the **modulemd-tools** package has been introduced which provides tools for parsing and generating **modulemd** YAML files.

To install **modulemd-tools**, use:

```
# yum install modulemd-tools
```

(BZ#1924850)

opencryptoki rebased to version 3.16.0

opencryptoki has been upgraded to version 3.16.0. Notable bug fixes and enhancements include:

- Improved the **protected-key** option and support for the **attribute-bound keys** in the **EP11** core processor.
- Improved the import and export of secure key objects in the **cycle-count-accurate** (CCA) processor.

(BZ#1919223)

lsvpd rebased to version 1.7.12

lsvpd has been upgraded to version 1.7.12. Notable bug fixes and enhancements include:

- Added the UUID property in **sysvpd**.
- Improved the **NVMe** firmware version.
- Fixed PCI device manufacturer parsing logic.
- Added **recommends clause** to the **lsvpd** configuration file.

(BZ#1844428)

ppc64-diag rebased to version 2.7.7

ppc64-diag has been upgraded to version 2.7.7. Notable bug fixes and enhancements include:

- Improved unit test cases.
- Added the UUID property in **sysvpd**.

- The **rtas_errd** service does not run in the Linux containers.
- The obsolete logging options are no longer available in the **systemd** service files.

(BZ#1779206)

The ipmi_power and ipmi_boot modules are available in the redhat.rhel_mgmt Collection

This update provides support to the Intelligent Platform Management Interface (**IPMI**) Ansible modules. **IPMI** is a specification for a set of management interfaces to communicate with baseboard management controller (BMC) devices. The **IPMI** modules - **ipmi_power** and **ipmi_boot** - are available in the **redhat.rhel_mgmt** Collection, which you can obtain by installing the **ansible-collection-redhat-rhel_mgmt** package.

(BZ#1843859)

udftools 2.3 are now added to RHEL

The **udftools** packages provide user-space utilities for manipulating Universal Disk Format (UDF) file systems. With this enhancement, **udftools** provides the following set of tools:

- **cdrwtool** - It performs actions like blank, format, quick setup, and write to the DVD-R/CD-R/CD-RW media.
- **mkfs.udf**, **mkudffs** - It creates a Universal Disk Format (UDF) filesystem.
- **pktsetup** - It sets up and tears down the packet device.
- **udfinfo** - It shows information about the Universal Disk Format (UDF) file system.
- **udflabel** - It shows or changes the Universal Disk Format (UDF) file system label.
- **wrudf** - It provides an interactive shell with **cp**, **rm**, **mkdir**, **rmdir**, **ls**, and **cd** operations on the existing Universal Disk Format (UDF) file system.

(BZ#1882531)

Tesseract 4.1.1 is now present in RHEL 8.5

Tesseract is an open-source OCR (optical character reading) engine and has the following features:

- Starting with **tesseract** version 4, character recognition is based on Long Short-Term Memory (LSTM) neural networks.
- Supports UTF-8.
- Supports plain text, hOCR (HTML), PDF, and TSV output formats.

(BZ#1826085)

Errors when restoring LVM with thin pools do not happen anymore

With this enhancement, ReaR now detects when thin pools and other logical volume types with kernel metadata (for example, RAIDs and caches) are used in a volume group (VG) and switches to a mode where it recreates all the logical volumes (LVs) in the VG using lvcreate commands. Therefore, LVM with thin pools are restored without any errors.

NOTE

This new method does not preserve all the LV properties, for example LVM UUIDs. A restore from the backup should be tested before using ReaR in a Production environment in order to determine whether the recreated storage layout matches the requirements.

(BZ#1747468)

Net-SNMP now detects RSA and ECC certificates

Previously, Net-Simple Network Management Protocol (Net-SNMP) detected only Rivest, Shamir, Adleman (RSA) certificates. This enhancement adds support for Elliptic Curve Cryptography (ECC). As a result, Net-SNMP now detects RSA and ECC certificates.

(BZ#1919714)

FCoE option is changed to rd.fcoe

Previously, the man page for **dracut.cmdline** documented **rd.nofcoe=0** as the command to turn off Fibre Channel over Ethernet (FCoE).

With this update, the command is changed to **rd.fcoe**. To disable FCoE, run the command **rd.fcoe=0**.

For further information on FCoE see, Configuring Fibre Channel over Ethernet

(BZ#1929201)

4.5. INFRASTRUCTURE SERVICES

linuxptp rebased to version 3.1

The **linuxptp** package has been updated to version 3.1. Notable bug fixes and enhancements include:

- Added **ts2phc** program for synchronization of Precision Time Protocol (PTP) hardware clock to Pulse Per Second (PPS) signal.
- Added support for the automotive profile.
- Added support for client event monitoring.

(BZ#1895005)

chrony rebased to version 4.1

chrony has been updated to version 4.1. Notable bug fixes and enhancements include:

- Added support for Network Time Security (NTS) authentication. For more information, see Overview of Network Time Security (NTS) in chrony .
- By default, the Authenticated Network Time Protocol (NTP) sources are trusted over non-authenticated NTP sources. Add the **autselectmode ignore** argument in the **chrony.conf** file to restore the original behavior.
- The support for authentication with **RIPEMD** keys - **RMD128**, **RMD160**, **RMD256**, **RMD320** is no longer available.

- The support for long non-standard MACs in NTPv4 packets is no longer available. If you are using **chrony 2.x**, **non-MD5/SHA1** keys, you need to configure **chrony** with the **version 3** option.

(BZ#1895003)

PowerTop rebased to version 2.14

PowerTop has been upgraded to version 2.14. This is an update adding Alder Lake, Sapphire Rapids, and Rocket Lake platforms support.

(BZ#1834722)

TuneD now moves unnecessary IRQs to housekeeping CPUs

Network device drivers like **i40e**, **iavf**, **mlx5**, evaluate the online CPUs to determine the number of queues and hence the **MSIX** vectors to be created.

In low-latency environments with a large number of isolated and very few housekeeping CPUs, when TuneD tries to move these device IRQs to the housekeeping CPUs it fails due to the per CPU vector limit.

With this enhancement, TuneD explicitly adjusts the numbers of network device channels (and hence MSIX vectors) as per the housekeeping CPUs. Therefore, all the device IRQs can now be moved on the housekeeping CPUs to achieve low latency.

(BZ#1951992)

4.6. SECURITY

libreswan rebased to 4.4

The **libreswan** packages have been upgraded to upstream version 4.4, which introduces many enhancements and bug fixes. Most notably:

- The IKEv2 protocol:
  - Introduced fixes for TCP encapsulation in **Transport Mode** and host-to-host connections.
  - Added the **--globalstatus** option to the **ipsec whack** command for displaying redirect statistics.
  - The **vhost** and **vnet** values in the **ipsec.conf** configuration file are no longer allowed for IKEv2 connections.
- The **pluto** IKE daemon:
  - Introduced fixes for host-to-host connections that use non-standard IKE ports.
  - Added peer ID (**IKEv2 IDr** or **IKEv1 Aggr**) to select the best initial connection.
  - Disabled the **interface-ip=** option because Libreswan does not provide the corresponding functionality yet.
  - Fixed the **PLUTO_PEER_CLIENT** variable in the **ipsec__updown** script for NAT in **Transport Mode**.

- Set the **PLUTO_CONNECTION_TYPE** variable to **transport** or **tunnel**.
- Non-templated wildcard ID connections can now match.

(BZ#1958968)

GnuTLS rebased to 3.6.16

The **gnutls** packages have been updated to version 3.6.16. Notable bug fixes and enhancements include:

- The **gnutls_x509_crt_export2()** function now returns 0 instead of the size of the internal base64 blob in case of success. This aligns with the documentation in the **gnutls_x509_crt_export2(3)** man page.
- Certificate verification failures due to the Online Certificate Status Protocol (OCSP) must-stapling not being followed are now correctly marked with the **GNUTLS_CERT_INVALID** flag.
- Previously, even when TLS 1.2 was explicitly disabled through the **-VERS-TLS1.2** option, the server still offered TLS 1.2 if TLS 1.3 was enabled. The version negotiation has been fixed, and TLS 1.2 can now be correctly disabled.

(BZ#1956783)

socat rebased to 1.7.4

The **socat** packages have been upgraded from version 1.7.3 to 1.7.4, which provides many bug fixes and improvements. Most notably:

- **GOPEN** and **UNIX-CLIENT** addresses now support **SEQPACKET** sockets.
- The generic **setsockopt-int** and related options are, in the case of listening or accepting addresses, applied to the connected sockets. To enable setting options on a listening socket, the **setsockopt-listen** option is now available.
- Added the **-r** and **-R** options for a raw dump of transferred data to a file.
- Added the **ip-transparent** option and the **IP_TRANSPARENT** socket option.
- **OPENSSL-CONNECT** now automatically uses the SNI feature and the **openssl-no-sni** option turns SNI off. The **openssl-snihost** option overrides the value of the **openssl-commonname** option or the server name.
- Added the **accept-timeout** and **listen-timeout** options.
- Added the **ip-add-source-membership** option.
- **UDP-DATAGRAM** address now does not check peer port of replies as it did in 1.7.3. Use the **sourceport** optioon if your scenario requires the previous behavior.
- New **proxy-authorization-file** option reads **PROXY-CONNECT** credentials from a file and enables to hide this data from the process table.
- Added **AF_VSOCK** support for **VSOCK-CONNECT** and **VSOCK-LISTEN** addresses.

(BZ#1947338)

crypto-policies rebased to 20210617

The **crypto-policies** packages have been upgraded to upstream version 20210617, which provides a number of enhancements and bug fixes over the previous version, most notably:

- You can now use scoped policies to enable different sets of algorithms for different back ends. Each configuration directive can now be limited to specific protocols, libraries, or services. For a complete list of available scopes and details on the new syntax, see the **crypto-policies(7)** man page. For example, the following directive allows using AES-256-CBC cipher with the SSH protocol, impacting both the **libssh** library and the OpenSSH suite:

  ```
  cipher@SSH = AES-256-CBC+
  ```

- Directives can now use asterisks for specifying multiple values using wildcards. For example, the following directive disables all CBC mode ciphers for applications using **libssh**:

  ```
  cipher@libssh = -*-CBC
  ```

  Note that future updates can introduce new algorithms matched by the current wildcards.

(BZ#1960266)

crypto-policies now support AES-192 ciphers in custom policies

The system-wide cryptographic policies now support the following values for the **cipher** option in custom policies and subpolicies: **AES-192-GCM**, **AES-192-CCM**, **AES-192-CTR**, and **AES-192-CBC**. As a result, you can enable the **AES-192-GCM** and **AES-192-CBC** ciphers for the Libreswan application and the **AES-192-CTR** and **AES-192-CBC** ciphers for the **libssh** library and the OpenSSH suite through **crypto-policies**.

(BZ#1876846)

CBC ciphers disabled in the FUTURE cryptographic policy

This update of the **crypto-policies** packages disables ciphers that use cipher block chaining (CBC) mode in the **FUTURE** policy. The settings in **FUTURE** should withstand near-term future attacks, and this change reflects the current progress. As a result, system components respecting **crypto-policies** cannot use CBC mode when the **FUTURE** policy is active.

(BZ#1933016)

Adding new kernel AVC tracepoint

With this enhancement, a new **avc:selinux_audited** kernel tracepoint is added that triggers when an SELinux denial is to be audited. This feature allows for more convenient low-level debugging of SELinux denials. The new tracepoint is available for tools such as **perf**.

(BZ#1954024)

New ACSC ISM profile in the SCAP Security Guide

The **scap-security-guide** packages now provide the Australian Cyber Security Centre (ACSC) Information Security Manual (ISM) compliance profile and a corresponding Kickstart file. With this enhancement, you can install a system that conforms with this security baseline and use the OpenSCAP suite for checking security compliance and remediation using the risk-based approach for security controls defined by ACSC.

(BZ#1955373)

SCAP Security Guide rebased to 0.1.57

The **scap-security-guide** packages have been rebased to upstream version 0.1.57, which provides several bug fixes and improvements. Most notably:

- The Australian Cyber Security Centre (**ACSC**) Information Security Manual (**ISM**) profile has been introduced. The profile extends the Essential Eight profile and adds more security controls defined in the ISM.
- The Center for Internet Security (**CIS**) profile has been restructured into four different profiles respecting levels of hardening and system type (server and workstation) as defined in the official CIS benchmarks.
- The Security Technical Implementation Guide (**STIG**) security profile has been updated, and implements rules from the recently-released version V1R3.
- The Security Technical Implementation Guide with GUI (**STIG with GUI**) security profile has been introduced. The profile derives from the STIG profile and is compatible with RHEL installations that select the **Server with GUI** package selection.
- The **ANSSI** High level profile, which is based on the ANSSI BP-028 recommendations from the French National Security Agency (ANSSI), has been introduced. This contains a profile implementing rules of High hardening levels.

(BZ#1966577)

OpenSCAP rebased to 1.3.5

The OpenSCAP packages have been rebased to upstream version 1.3.5. Notable fixes and enhancements include:

- Enabled Schematron-based validation by default for the **validate** command of **oval** and **xccdf** modules.
- Added SCAP 1.3 source data stream Schematron.
- Added XML signature validation.
- Allowed clamping **mtime** to **SOURCE_DATE_EPOCH**.
- Added **severity** and **role** attributes.
- Support for **requires** and **conflicts** elements of the Rule and Group (XCCDF).
- Kubernetes remediation in the HTML report.
- Handling **gpfs**, **proc** and **sysfs** file systems as non-local.
- Fixed handling of common options styled as **--arg=val**.
- Fixed behavior of the **StateType** operator.
- Namespace ignored in XPath expressions (**xmlfilecontent**) to allow for incomplete XPath queries.
- Fixed a problem that led to a warning about the presence of obtrusive data.

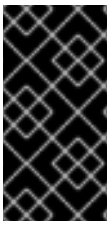
- Fixed multiple segfaults and a broken test in the **--stig-viewer** feature.
- Fixed the **TestResult/benchmark/@href** attribute.
- Fixed many memory management issues.
- Fixed many memory leaks.

(BZ#1953092)

Validation of digitally signed SCAP source data streams

To conform with the Security Content Automation Protocol (SCAP) 1.3 specifications, OpenSCAP now validates digital signatures of digitally signed SCAP source data streams. As a result, OpenSCAP validates the digital signature when evaluating a digitally signed SCAP source data stream. The signature validation is performed automatically while loading the file. Data streams with invalid signatures are rejected, and OpenSCAP does not evaluate their content. OpenSCAP uses the XML Security Library with the OpenSSL cryptography library to validate the digital signature.

You can skip the signature validation by adding the **--skip-signature-validation** option to the **oscap xccdf eval** command.



IMPORTANT

OpenSCAP does not address the trustworthiness of certificates or public keys that are part of the **KeyInfo** signature element and that are used to verify the signature. You should verify such keys by yourselves to prevent evaluation of data streams that have been modified and signed by bad actors.

(BZ#1966612)

New DISA STIG profile compatible with Server with GUI installations

A new profile, **DISA STIG with GUI**, has been added to the **SCAP Security Guide**. This profile is derived from the **DISA STIG** profile and is compatible with RHEL installations that selected the **Server with GUI** package group. The previously existing **stig** profile was not compatible with **Server with GUI** because DISA STIG demands uninstalling any Graphical User Interface. However, this can be overridden if properly documented by a Security Officer during evaluation. As a result, the new profile helps when installing a RHEL system as a **Server with GUI** aligned with the DISA STIG profile.

(BZ#1970137)

STIG security profile updated to version V1R3

The **DISA STIG for Red Hat Enterprise Linux 8** profile in the SCAP Security Guide has been updated to align with the latest version **V1R3**. The profile is now also more stable and better aligns with the RHEL 8 STIG (Security Technical Implementation Guide) manual benchmark provided by the Defense Information Systems Agency (DISA).

This second iteration brings approximately 90% of coverage with regards to the STIG. You should use only the current version of this profile because older versions are no longer valid.

WARNING

Automatic remediation might render the system non-functional. Run the remediation in a test environment first.

(BZ#1993056)

Three new CIS profiles in SCAP Security Guide

Three new compliance profiles aligned with the Center for Internet Security (CIS) Red Hat Enterprise Linux 8 Benchmark have been introduced to the SCAP Security Guide. The CIS RHEL 8 Benchmark provides different configuration recommendations for "Server" and "Workstation" deployments, and defines two levels of configuration, "level 1" and "level 2" for each deployment. The CIS profile previously shipped in RHEL8 represented only the "Server Level 2". The three new profiles complete the scope of the CIS RHEL8 Benchmark profiles, and you can now more easily evaluate your system against CIS recommendations.

All currently available CIS RHEL 8 profiles are:

Workstation Level 1	**xccdf_org.ssgproject.content_profile_cis_workstation_l1**
Workstation Level 2	**xccdf_org.ssgproject.content_profile_cis_workstation_l2**
Server Level 1	**xccdf_org.ssgproject.content_profile_cis_server_l1**
Server Level 2	**xccdf_org.ssgproject.content_profile_cis**

(BZ#1993197)

Performance of remediations for Audit improved by grouping similar system calls

Previously, Audit remediations generated an individual rule for each system call audited by the profile. This led to large numbers of audit rules, which degraded performance. With this enhancement, remediations for Audit can group rules for similar system calls with identical fields together into a single rule, which improves performance.

Examples of system calls grouped together:

```
-a always, exit -F arch=b32 -S chown, fchown, fchownat, lchown -F auid>=1000 -F auid!=unset -F key=perm_mod
```

```
-a always, exit -F arch=b32 -S unlink, unlinkat, rename, renameat, rmdir -F auid>=1000 -F auid!=unset -F key=delete
```

```
-a always, exit -F arch=b32 -S chown, fchown, fchownat, lchown -F exit=-EACCES -F auid>=1000 -F
```

> auid!=unset -F key=unsuccesful-perm-change

> -a always, exit -F arch=b32 -S unlink, unlinkat, rename, renameat -F auid>=1000 -F auid!=unset -F exit=-EACCES -F auid>=1000 -F auid!=unset -F key=unsuccessful-delete

(BZ#1876483)

Added profile for ANSSI-BP-028 High level

The ANSSI High level profile, based on the ANSSI BP-028 recommendations from the French National Security Agency (ANSSI), has been introduced. This completes the availability of profiles for all ANSSI-BP-028 v1.2 hardening levels in the **SCAP Security Guide**. With the new profile, you can harden the system to the recommendations from ANSSI for GNU/Linux Systems at the High hardening level. As a result, you can configure and automate compliance of your RHEL 8 systems to the strictest hardening level by using the ANSSI Ansible Playbooks and the ANSSI SCAP profiles.

(BZ#1955183)

OpenSSL added for encrypting Rsyslog TCP and RELP traffic

The OpenSSL network stream driver has been added to Rsyslog. This driver implements TLS-protected transport using the OpenSSL library. This provides additional functionality compared to the stream driver using the GnuTLS library. As a result, you can now use either OpenSSL or GnuTLS as an Rsyslog network stream driver.

(BZ#1891458)

Rsyslog rebased to 8.2102.0-5

The **rsyslog** packages have been rebased to upstream version 8.2102.0-5, which provides the following notable changes over the previous version:

- Added the **exists()** script function to check whether a variable exists or not, for example **$!path!var**.
- Added support for setting OpenSSL configuration commands with a new configuration parameter **tls.tlscfgcmd** for the **omrelp** and **imrelp** modules.
- Added new rate-limit options to the **omfwd** module for rate-limiting syslog messages sent to the remote server:
  - **ratelimit.interval** specifies the rate-limiting interval in seconds.
  - **ratelimit.burst** specifies the rate-limiting burst in the number of messages.
- Rewritten the **immark** module with various improvements.
- Added the **max sessions** config parameter to the **imptcp** module. The maximum is measured per instance, not globally across all instances.
- Added the **rsyslog-openssl** subpackage; this network stream driver implements TLS-protected transport using the OpenSSL library.
- Added per-minute rate limiting to the **imfile** module with the **MaxBytesPerMinute** and **MaxLinesPerMinute** options. These options accept integer values and limit the number of bytes or lines that may be sent in a minute.

- Added support to the **imtcp** and **omfwd** module to configure a maximum depth for the certificate chain verification with the **streamdriver.TlsVerifyDepth** option.

(BZ#1932795)

4.7. NETWORKING

Support for pause parameter of ethtool in NetworkManager

Non auto-pause parameters need to be set explicitly on a specific network interface in certain cases. Previously, NetworkManager could not pause the control flow parameters of **ethtool** in **nmstate**. To disable the auto negotiation of the pause parameter and enable RX/TX pause support explicitly, use the following command:

```
# nmcli connection modify enp1s0 ethtool.pause-autoneg no ethtool.pause-rx true ethtool.pause-tx true
```

(BZ#1899372)

New property in NetworkManager for setting physical and virtual interfaces in promiscuous mode

With this update the **802-3-ethernet.accept-all-mac-addresses** property has been added to NetworkManager for setting physical and virtual interfaces in the **accept all MAC addresses** mode. With this update, the kernel can accept network packages targeting current interfaces' MAC address in the **accept all MAC addresses** mode. To enable **accept all MAC addresses** mode on **eth1**, use the following command:

```
$ sudo nmcli c add type ethernet  ifname eth1 connection.id eth1  802-3-ethernet.accept-all-mac-addresses true
```

(BZ#1942331)

NetworkManager rebased to version 1.32.10

The **NetworkManager** packages have been upgraded to upstream version 1.32.10, which provides a number of enhancements and bug fixes over the previous version.

For further information about notable changes, read the upstream release notes for this version.

(BZ#1934465)

NetworkManager now supports nftables as firewall back end

This enhancement adds support for the **nftables** firewall framework to NetworkManager. To switch the default back end from **iptables** to **nftables**:

1. Create the **/etc/NetworkManager/conf.d/99-firewall-backend.conf** file with the following content:

   ```
   [main]
   firewall-backend=nftables
   ```

2. Reload the **NetworkManager** service.

```
# systemctl reload NetworkManager
```

(BZ#1548825)

firewalld rebased to version 0.9.3

The **firewalld** packages have been upgraded to upstream version 0.9.3, which provides a number of enhancements and bug fixes over the previous version.

For further details, see the upstream release notes:

- firewalld 0.9.3 Release Notes
- firewalld 0.9.2 Release Notes
- firewalld 0.8.6 Release Notes
- firewalld 0.8.5 Release Notes
- firewalld 0.8.4 Release Notes

(BZ#1872702)

The firewalld policy objects feature is now available

Previously, you could not use **firewalld** to filter traffic flowing between virtual machines, containers, and zones. With this update, the **firewalld** policy objects feature has been introduced, which provides forward and output filtering in **firewalld**.

(BZ#1492722)

Multipath TCP is now fully supported

Starting with RHEL 8.5, Multipath TCP (MPTCP) is fully supported. MPTCP improves resource usage within the network and resilience to network failure. For example, with Multipath TCP on the RHEL server, smartphones with MPTCP v1 enabled can connect to an application running on the server and switch between Wi-Fi and cellular networks without interrupting the connection to the server.

RHEL 8.5 introduced additional features, such as:

- Multiple concurrent active substreams
- Active-backup support
- Improved stream performances
- Better memory usage, with **receive** and **send** buffer auto-tuning
- SYN cookie support

Note that either the applications running on the server must natively support MPTCP or administrators must load an **eBPF** program into the kernel to dynamically change **IPPROTO_TCP** to **IPPROTO_MPTCP**.

For further details see, Getting started with Multipath TCP.

(JIRA:RHELPLAN-57712)

Alternative network interface naming is now available in RHEL

Alternative interface naming is the RHEL kernel configuration, which provides the following networking benefits:

- Network interface card (NIC) names can have arbitrary length.
- One NIC can have multiple names at the same time.
- Usage of alternative names as handles for commands.

(BZ#2164986)

4.8. KERNEL

Kernel version in RHEL 8.5

Red Hat Enterprise Linux 8.5 is distributed with the kernel version 4.18.0-348.

(BZ#1839151)

EDAC for Intel Sapphire Rapids processors is now supported

This enhancement provides Error Detection And Correction (EDAC) device support for Intel Sapphire Rapids processors. EDAC mainly handles Error Code Correction (ECC) memory and detects and reports PCI bus parity errors.

(BZ#1837389)

The bpftrace package rebased to version 0.12.1

The **bpftrace** package has been upgraded to version 0.12.1, which provides multiple bug fixes and enhancements. Notable changes over previous versions include:

- Added the new **builtin** path, which is a new reliable method to display the full path from a path structure.
- Added wildcard support for **kfunc** probes and **tracepoint** categories.

(BZ#1944716)

vmcore capture works as expected after CPU hot-add or hot-removal operations

Previously, on IBM POWER systems, after every CPU or memory hot-plug or removal operation, the CPU data on the device tree became stale unless the **kdump.service** is reloaded. To reload the latest CPU information, the **kdump.service** parses through the device nodes to fetch the CPU information. However, some of the CPU nodes are already lost during its hot-removal. Consequently, a race condition between the **kdump.service** reload and a CPU **hot-removal** happens at the same time and this may cause the dump to fail. A subsequent crash might then not capture the **vmcore** file.

This update eliminates the need to reload the **kdump.service** after a CPU hot-plug and the **vmcore** capture works as expected in the described scenario.

Note: This enhancement works as expected for firmware-assisted dumps (**fadump**). In the case of standard **kdump**, the **kdump.service** reload takes place during the **hot-plug** operation.

(BZ#1922951)

The kdumpctl command now supports the new kdumpctl estimate utility

The **kdumpctl** command now supports the **kdumpctl estimate** utility. Based on the existing **kdump** configuration, **kdumpctl estimate** prints a suitable estimated value for **kdump** memory allocation.

The minimum size of the crash kernel may vary depending on the hardware and machine specifications. Hence, previously, it was difficult to estimate an accurate **crashkernel=** value.

With this update, the **kdumpctl estimate** utility provides an estimated value. This value is a best effort recommended estimate and can serve as a good reference to configure a feasible **crashkernel=** value.

(BZ#1879558)

IBM TSS 2.0 package rebased to 1.6.0

The IBM's Trusted Computing Group (TCG) Software Stack (TSS) 2.0 binary package has been upgraded to 1.6.0. This update adds the IBM TSS 2.0 support on AMD64 and Intel 64 architecture.

It is a user space TSS for Trusted Platform Modules (TPM) 2.0 and implements the functionality equivalent to (but not API compatible with) the TCG TSS working group's Enhanced System Application Interface (ESAPI), System Application Interface (SAPI), and TPM Command Transmission Interface (TCTI) API with a simpler interface.

It is a security middleware that allows applications and platforms to share and integrate the TPM into secure applications.

This rebase provides many bug fixes and enhancements over the previous version. The most notable changes include the following new attributes:

- **tsscertifyx509**: validates the **x509** certificate
- **tssgetcryptolibrary**: displays the current cryptographic library
- **tssprintattr**: prints the TPM attributes as text
- **tsspublicname**: calculates the public name of an entity
- **tsssetcommandcodeauditstatus**: clears or sets code via **TPM2_SetCommandCodeAuditStatus**
- **tsstpmcmd**: sends an in-band TPM simulator signal

(BZ#1822073)

The schedutil CPU frequency governor is now available on RHEL 8

The **schedutil** CPU governor uses CPU utilization data available on the CPU scheduler. **schedutil** is a part of the CPU scheduler and it can access the scheduler's internal data structures directly. **schedutil** controls how the CPU would raise and lower its frequency in response to system load. You must manually select the **schedutil** frequency governor as it is not enabled as default.

There is one **policyX** directory per CPU. **schedutil** is available in the **policyX/scaling_governors** list of the existing **CPUFreq** governors in the kernel and is attached to **/sys/devices/system/cpu/cpufreq/policyx** policy. The policy file can be overwritten to change it.

Note that when using **intel_pstate** scaling drivers, it might be necessary to configure the **intel_pstate=passive** command line argument for **intel_pstate** to become available and be listed by the governor. **intel_pstate** is the default on Intel hardware with any modern CPU.

(BZ#1938339)

The rt-tests suite rebased to rt-tests-2.1 upstream version

The **rt-tests** suite has been rebased to **rt-tests-2.1** version, which provides multiple bug fixes and enhancements. The notable changes over the previous version include:

- Fixes to various programs in the **rt-tests** suite.
- Fixes to make programs more uniform with the common set of options, for example, the **oslat** program's option **-t --runtime** option is renamed to **-D** to specify the run duration to match the rest of the suite.
- Implements a new feature to output data in **json** format.

(BZ#1954387)

Intel® QuickAssist Technology Library (QATlib) was rebased to version 21.05

The **qatlib** package has been rebased to version 21.05, which provides multiple bug fixes and enhancements. Notable changes include:

- Adding support for several encryption algorithms:
  - AES-CCM 192/256
  - ChaCha20-Poly1305
  - PKE 8K (RSA, DH, ModExp, ModInv)
- Fixing device enumeration on different nodes
- Fixing **pci_vfio_set_command** for 32-bit builds

For more information about QATlib installation, check Ensuring that Intel® QuickAssist Technology stack is working correctly on RHEL 8.

(BZ#1920237)

4.9. FILE SYSTEMS AND STORAGE

xfs_quota state command now outputs all grace times when multiple quota types are specified

The **xfs_quota state** command now outputs grace times for multiple quota types specified on the command line. Previously, only one was shown even if more than one of **-g**, **-p**, or **-u** was specified.

(BZ#1949743)

-H option added to the rpc.gssd daemon and the set-home option added to the /etc/nfs.conf file

This patch adds the **-H** option to **rpc.gssd** and the **set-home** option into **/etc/nfs.conf**, but does not change the default behavior.

By default, **rpc.gssd** sets **$HOME** to / to avoid possible deadlock that may happen when users' home directories are on an NFS share with Kerberos security. If either the **-H** option is added to **rpc.gssd**, or **set-home=0** is added to **/etc/nfs.conf**, **rpc.gssd** does not set **$HOME** to /.

These options allow you to use Kerberos k5identity files in **$HOME/.k5identity** and assumes NFS home directory is not on an NFS share with Kerberos security. These options are provided for use in only specific environments, such as the need for k5identity files. For more information see the **k5identity** man page.

(BZ#1868087)

The storage RHEL system role now supports LVM VDO volumes

Virtual Data Optimizer (VDO) helps to optimize usage of the storage volumes. With this enhancement, administrators can use the **storage** system role to manage **compression** and **deduplication** on Logical Manager Volumes (LVM) VDO volumes.

(BZ#1882475)

LVM system.devices file feature now available in RHEL 8

RHEL 8.5 introduces the LVM **system.devices** file feature. By creating a list of devices in the **/etc/lvm/devices/system.devices** file, you can select specific devices for LVM to recognize and use, and prevent LVM from using unwanted devices.

To enable the **system.devices** file feature, set **use_devicesfile=1** in the **lvm.conf** configuration file and add devices to the **system.devices** file. LVM ignores any devices filter settings while the **system.devices** file feature is enabled. To prevent warning messages, remove your filter settings from the **lvm.conf** file.

For more information, see the **lvmdevices(8)** man page.

(BZ#1922312)

quota now supports HPE XFS

The **quota** utilities now provide support for the HPE XFS file system. As a result, users of HPE XFS can monitor and manage user and group disk usage through **quota** utilities.

(BZ#1945408)

4.10. HIGH AVAILABILITY AND CLUSTERS

Local mode version of pcs cluster setup command is now fully supported

By default, the **pcs cluster setup** command automatically synchronizes all configuration files to the cluster nodes. Since RHEL 8.3, the **pcs cluster setup** command has provided the **--corosync-conf** option as a Technology Preview. This feature is now fully supported in RHEL 8.5. Specifying this option switches the command to **local** mode. In this mode, the **pcs** command-line interface creates a **corosync.conf** file and saves it to a specified file on the local node only, without communicating with any other node. This allows you to create a **corosync.conf** file in a script and handle that file by means of the script.

(BZ#1839637)

Ability to configure watchdog-only SBD for fencing on subset of cluster nodes

Previously, to use a watchdog-only SBD configuration, all nodes in the cluster had to use SBD. That prevented using SBD in a cluster where some nodes support it but other nodes (often remote nodes) required some other form of fencing. Users can now configure a watchdog-only SBD setup using the new **fence_watchdog** agent, which allows cluster configurations where only some nodes use watchdog-only SBD for fencing and other nodes use other fencing types. A cluster may only have a single such device, and it must be named **watchdog**.

(BZ#1443666)

New pcs command to update SCSI fencing device without causing restart of all other resources

Updating a SCSI fencing device with the **pcs stonith update** command causes a restart of all resources running on the same node where the stonith resource was running. The new **pcs stonith update-scsi-devices** command allows you to update SCSI devices without causing a restart of other cluster resources.

(BZ#1872378)

New reduced output display option for pcs resource safe-disable command

The **pcs resource safe-disable** and **pcs resource disable --safe** commands print a lengthy simulation result after an error report. You can now specify the **--brief** option for those commands to print errors only. The error report now always contains resource IDs of affected resources.

(BZ#1909901)

pcs now accepts Promoted and Unpromoted as role names

The **pcs** command-line interface now accepts **Promoted** and **Unpromoted** anywhere roles are specified in Pacemaker configuration. These role names are the functional equivalent of the **Master** and **Slave** Pacemaker roles. **Master** and **Slave** remain the names for these roles in configuration displays and help text.

(BZ#1885293)

New pcs resource status display commands

The **pcs resource status** and the **pcs stonith status** commands now support the following options:

- You can display the status of resources configured on a specific node with the **pcs resource status node=*node_id*** command and the **pcs stonith status node=*node_id*** command. You can use these commands to display the status of resources on both cluster and remote nodes.
- You can display the status of a single resource with the **pcs resource status *resource_id*** and the **pcs stonith status *resource_id*** commands.
- You can display the status of all resources with a specified tag with the **pcs resource status *tag_id*** and the **pcs stonith status *tag_id*** commands.

(BZ#1290830, BZ#1285269)

New LVM volume group flag to control autoactivation

LVM volume groups now support a **setautoactivation** flag which controls whether logical volumes that you create from a volume group will be automatically activated on startup. When creating a volume group that will be managed by Pacemaker in a cluster, set this flag to **n** with the **vgcreate --setautoactivation n** command for the volume group to prevent possible data corruption. If you have an existing volume group used in a Pacemaker cluster, set the flag with **vgchange --setautoactivation n**.

(BZ#1899214)

4.11. DYNAMIC PROGRAMMING LANGUAGES, WEB AND DATABASE SERVERS

The nodejs:16 module stream is now fully supported

The **nodejs:16** module stream, previously available as a Technology preview, is fully supported with the release of the RHSA-2021:5171 advisory. The **nodejs:16** module stream now provides **Node.js 16.13.1**, which is a Long Term Support (LTS) version.

Node.js 16 included in RHEL 8.5 provides numerous new features and bug and security fixes over **Node.js 14** available since RHEL 8.3.

Notable changes include:

- The **V8** engine has been upgraded to version 9.4.
- The **npm** package manager has been upgraded to version 8.1.2.
- A new **Timers Promises** API provides an alternative set of timer functions that return **Promise** objects.
- **Node.js** now provides a new experimental **Web Streams** API.
- **Node.js** now includes **Corepack**, an experimental tool that enables you to use package managers configured in the given project without the need to manually install them.
- **Node.js** now provides an experimental ECMAScript modules (ESM) loader hooks API, which consolidates ESM loader hooks.

To install the **nodejs:16** module stream, use:

```
# yum module install nodejs:16
```

If you want to upgrade from the **nodejs:14** stream, see Switching to a later stream .

(BZ#1953991, BZ#2027610)

A new module stream: ruby:3.0

RHEL 8.5 introduces **Ruby 3.0.2** in a new **ruby:3.0** module stream. This version provides a number of performance improvements, bug and security fixes, and new features over **Ruby 2.7** distributed with RHEL 8.3.

Notable enhancements include:

- Concurrency and parallelism features:

    - **Ractor**, an Actor-model abstraction that provides thread-safe parallel execution, is provided as an experimental feature.
    - **Fiber Scheduler** has been introduced as an experimental feature. **Fiber Scheduler** intercepts blocking operations, which enables light-weight concurrency without changing existing code.

- Static analysis features:
    - The **RBS** language has been introduced, which describes the structure of **Ruby** programs. The **rbs** gem has been added to parse type definitions written in **RBS**.
    - The **TypeProf** utility has been introduced, which is a type analysis tool for **Ruby** code.
- Pattern matching with the **case/in** expression is no longer experimental.
- One-line pattern matching, which is an experimental feature, has been redesigned.
- Find pattern has been added as an experimental feature.

The following performance improvements have been implemented:

- Pasting long code to the **Interactive Ruby Shell (IRB)** is now significantly faster.
- The **measure** command has been added to **IRB** for time measurement.

Other notable changes include:

- Keyword arguments have been separated from other arguments.
- The default directory for user-installed gems is now **$HOME/.local/share/gem/** unless the **$HOME/.gem/** directory is already present.

To install the **ruby:3.0** module stream, use:

```
# yum module install ruby:3.0
```

If you want to upgrade from an earlier **ruby** module stream, see Switching to a later stream .

(BZ#1938942)

Changes in the default separator for the Python urllib parsing functions

To mitigate the Web Cache Poisoning CVE-2021-23336 in the Python **urllib** library, the default separator for the **urllib.parse.parse_qsl** and **urllib.parse.parse_qs** functions is being changed from both ampersand (**&**) and semicolon (**;**) to only an ampersand.

This change was implemented in Python 3.6 with the release of RHEL 8.4, and now is being backported to Python 3.8 and Python 2.7.

The change of the default separator is potentially backwards incompatible, therefore Red Hat provides a way to configure the behavior in Python packages where the default separator has been changed. In addition, the affected **urllib** parsing functions issue a warning if they detect that a customer's application has been affected by the change.

For more information, see the Mitigation of Web Cache Poisoning in the Python urllib library (CVE-2021-23336) Knowledgebase article.

Python 3.9 is unaffected and already includes the new default separator (**&**), which can be changed only by passing the separator parameter when calling the **urllib.parse.parse_qsl** and **urllib.parse.parse_qs** functions in Python code.

(BZ#1935686, BZ#1931555, BZ#1969517)

The Python ipaddress module no longer allows zeros in IPv4 addresses

To mitigate CVE-2021-29921, the Python **ipaddress** module now rejects IPv4 addresses with leading zeros with an **AddressValueError: Leading zeros are not permitted** error.

This change has been introduced in the **python38** and **python39** modules. Earlier Python versions distributed in RHEL are not affected by CVE-2021-29921.

Customers who rely on the previous behavior can pre-process their IPv4 address inputs to strip the leading zeros off. For example:

```
>>> def reformat_ip(address): return '.'.join(part.lstrip('0') if part != '0' else part for part in
address.split('.'))
>>> reformat_ip('0127.0.0.1')
'127.0.0.1'
```

To strip the leading zeros off with an explicit loop for readability, use:

```
def reformat_ip(address):
    parts = []
    for part in address.split('.'):
        if part != "0":
            part = part.lstrip('0')
        parts.append(part)
    return '.'.join(parts)
```

(BZ#1986007, BZ#1970504, BZ#1970505)

The php:7.4 module stream rebased to version 7.4.19

The PHP scripting language, provided by the **php:7.4** module stream, has been upgraded from version 7.4.6 to version 7.4.19. This update provides multiple security and bug fixes.

(BZ#1944110)

A new package: pg_repack

A new **pg_repack** package has been added to the **postgresql:12** and **postgresql:13** module streams. The **pg_repack** package provides a **PostgreSQL** extension that lets you remove bloat from tables and indexes, and optionally restore physical order of clustered indexes.

(BZ#1967193, BZ#1935889)

A new module stream: nginx:1.20

The **nginx 1.20** web and proxy server is now available as the **nginx:1.20** module stream. This update provides a number of bug fixes, security fixes, new features, and enhancements over the previously released version 1.18.

New features:

- **nginx** now supports client SSL certificate validation with Online Certificate Status Protocol (OCSP).
- **nginx** now supports cache clearing based on the minimum amount of free space. This support is implemented as the **min_free** parameter of the **proxy_cache_path** directive.
- A new **ngx_stream_set_module** module has been added, which enables you to set a value for a variable.

Enhanced directives:

- Multiple new directives are now available, such as **ssl_conf_command** and **ssl_reject_handshake**.
- The **proxy_cookie_flags** directive now supports variables.

Improved support for HTTP/2:

- The **ngx_http_v2** module now includes the **lingering_close**, **lingering_time**, **lingering_timeout** directives.
- Handling connections in HTTP/2 has been aligned with HTTP/1.x. From **nginx 1.20**, use the **keepalive_timeout** and **keepalive_requests** directives instead of the removed **http2_recv_timeout**, **http2_idle_timeout**, and **http2_max_requests** directives.

To install the **nginx:1.20** stream, use:

```
# yum module install nginx:1.20
```

If you want to upgrade from the **nginx:1.20** stream, see Switching to a later stream .

(BZ#1945671)

The squid:4 module stream rebased to version 4.15

The **Squid** proxy server, available in the **squid:4** module stream, has been upgraded from version 4.11 to version 4.15. This update provides various bug and security fixes.

(BZ#1964384)

mutt rebased to version 2.0.7

The **Mutt** email client has been updated to version 2.0.7, which provides a number of enhancements and bug fixes.

Notable changes include:

- **Mutt** now provides support for the **OAuth 2.0** authorization protocol using the **XOAUTH2** mechanism. Mutt now also supports the **OAUTHBEARER** authentication mechanism for the IMAP, POP, and SMTP protocols. The OAuth-based functionality is provided through external

scripts. As a result, you can connect **Mutt** with various cloud email providers, such as **Gmail** using authentication tokens. For more information on how to set up **Mutt** with OAuth support, see How to set up Mutt with Gmail using OAuth2 authentication .

- **Mutt** adds support for domain-literal email addresses, for example, **user@[IPv6:fcXX:...]**.
- The new **$ssl_use_tlsv1_3** configuration variable allows TLS 1.3 connections if they are supported by the email server. This variable is enabled by default.
- The new **$imap_deflate** variable adds support for the **COMPRESS=DEFLATE** compression. The variable is disabled by default.
- The **$ssl_starttls** variable no longer controls aborting an unencrypted IMAP **PREAUTH** connection. Use the **$ssl_force_tls** variable instead if you rely on the **STARTTLS** process.

Note that even after an update to the new **Mutt** version, the **ssl_force_tls** configuration variable still defaults to **no** to prevent RHEL users from encountering problems in their existing environments. In the upstream version of **Mutt**, **ssl_force_tls** is now enabled by default.

(BZ#1912614, BZ#1890084)

4.12. COMPILERS AND DEVELOPMENT TOOLS

Go Toolset rebased to version 1.16.7

Go Toolset has been upgraded to version 1.16.7. Notable changes include:

- The **GO111MODULE** environment variable is now set to **on** by default. To revert this setting, change **GO111MODULE** to **auto**.
- The Go linker now uses less resources and improves code robustness and maintainability. This applies to all supported architectures and operating systems.
- With the new **embed** package you can access embedded files while compiling programs.
- All functions of the **io/ioutil** package have been moved to the **io** and **os** packages. While you can still use **io/ioutil**, the **io** and **os** packages provide better definitions.
- The Delve debugger has been rebased to 1.6.0 and now supports Go 1.16.7 Toolset.

For more information, see Using Go Toolset.

(BZ#1938071)

Rust Toolset rebased to version 1.54.0

Rust Toolset has been updated to version 1.54.0. Notable changes include:

- The Rust standard library is now available for the **wasm32-unknown-unknown** target. With this enhancement, you can generate WebAssembly binaries, including newly stabilized intrinsics.
- Rust now includes the **IntoIterator** implementation for arrays. With this enhancement, you can use the **IntoIterator** trait to iterate over arrays by value and pass arrays to methods. However, **array.into_iter()** still iterates values by reference until the 2021 edition of Rust.

- The syntax for **or** patterns now allows nesting anywhere in the pattern. For example: **Pattern(1|2)** instead of **Pattern(1)|Pattern(2)**.
- Unicode identifiers can now contain all valid identifier characters as defined in the Unicode Standard Annex #31.
- Methods and trait implementations have been stabilized.
- Incremental compilation is re-enabled by default.

For more information, see Using Rust Toolset.

(BZ#1945805)

LLVM Toolset rebased to version 12.0.1

LLVM Toolset has been upgraded to version 12.0.1. Notable changes include:

- The new compiler flag **-march=x86-64-v[234]** has been added.
- The compiler flag **-fasynchronous-unwind-tables** of the Clang compiler is now the default on Linux AArch64/PowerPC.
- The Clang compiler now supports the C++20 likelihood attributes [[likely]] and [[unlikely]].
- The new function attribute **tune-cpu** has been added. It allows microarchitectural optimizations to be applied independently from the **target-cpu** attribute or TargetMachine CPU.
- The new sanitizer **-fsanitize=unsigned-shift-base** has been added to the integer sanitizer **-fsanitize=integer** to improve security.
- Code generation on PowerPC targets has been optimized.
- The WebAssembly backend is now enabled in LLVM. With this enhancement, you can generate WebAssembly binaries with LLVM and Clang.

For more information, see Using LLVM Toolset.

(BZ#1927937)

CMake rebased to version 3.20.2

CMake has been rebased from 3.18.2 to 3.20.2. To use CMake on a project that requires the version 3.20.2 or less, use the command cmake_minimum_required(version 3.20.2).

Notable changes include:

- C++23 compiler modes can now be specified by using the target properties **CXX_STANDARD**, **CUDA_STANDARD**, **OBJCXX_STANDARD**, or by using the **cxx_std_23** meta-feature of the compile features function.
- CUDA language support now allows the NVIDIA CUDA compiler to be a symbolic link.
- The Intel oneAPI NextGen LLVM compilers are now supported with the **IntelLLVM** compiler ID .
- CMake now facilitates cross compiling for Android by merging with the Android NDK's toolchain file.

- When running **cmake(1)** to generate a project build system, unknown command-line arguments starting with a hyphen are now rejected.

For further information on new features and deprecated functionalities, see the CMake Release Notes.

(BZ#1957947)

New GCC Toolset 11

GCC Toolset 11 is a compiler toolset that provides recent versions of development tools. It is available as an Application Stream in the form of a Software Collection in the **AppStream** repository.

The following components have been rebased since GCC Toolset 10:

- GCC to version 11.2
- GDB to version 10.2
- Valgrind to version 3.17.0
- SystemTap to version 4.5
- binutils to version 2.36
- elfutils to version 0.185
- dwz to version 0.14
- Annobin to version 9.85

For a complete list of components, see GCC Toolset 11.

To install GCC Toolset 11, run the following command as root:

```
# yum install gcc-toolset-11
```

To run a tool from GCC Toolset 11:

```
$ scl enable gcc-toolset-11 tool
```

To run a shell session where tool versions from GCC Toolset 11 override system versions of these tools:

```
$ scl enable gcc-toolset-11 bash
```

For more information, see Using GCC Toolset.

The GCC Toolset 11 components are also available in the two container images:

- **rhel8/gcc-toolset-11-toolchain**, which includes the GCC compiler, the GDB debugger, and the **make** automation tool.
- **rhel8/gcc-toolset-11-perftools**, which includes the performance monitoring tools, such as SystemTap and Valgrind.

To pull a container image, run the following command as root:

```
# podman pull registry.redhat.io/<image_name>
```

Note that only the GCC Toolset 11 container images are now supported. Container images of earlier GCC Toolset versions are deprecated.

(BZ#1953094)

.NET updated to version 6.0

Red Hat Enterprise Linux 8.5 is distributed with **.NET** version 6.0. Notable improvements include:

- Support for 64-bit Arm (aarch64)
- Support for IBM Z and LinuxONE (s390x)

For more information, see Release Notes for .NET 6.0 RPM packages and Release Notes for .NET 6.0 containers.

(BZ#2022794)

GCC Toolset 11: GCC rebased to version 11.2

In GCC Toolset 11, the GCC package has been updated to version 11.2. Notable bug fixes and enhancements include:

General improvements

- GCC now defaults to the DWARF Version 5 debugging format.
- Column numbers shown in diagnostics represent real column numbers by default and respect multicolumn characters.
- The straight-line code vectorizer considers the whole function when vectorizing.
- A series of conditional expressions that compare the same variable can be transformed into a switch statement if each of them contains a comparison expression.
- Interprocedural optimization improvements:
  - A new IPA-modref pass, controlled by the **-fipa-modref** option, tracks side effects of function calls and improves the precision of points-to analysis.
  - The identical code folding pass, controlled by the **-fipa-icf** option, was significantly improved to increase the number of unified functions and reduce compile-time memory use.
- Link-time optimization improvements:
  - Memory allocation during linking was improved to reduce peak memory use.
- Using a new **GCC_EXTRA_DIAGNOSTIC_OUTPUT** environment variable in IDEs, you can request machine-readable “fix-it hints” without adjusting build flags.
- The static analyzer, run by the **-fanalyzer** option, is improved significantly with numerous bug fixes and enhancements provided.

Language-specific improvements

C family

- C and C++ compilers support non-rectangular loop nests in OpenMP constructs and the allocator routines of the OpenMP 5.0 specification.
- Attributes:
  - The new **no_stack_protector** attribute marks functions that should not be instrumented with stack protection (**-fstack-protector**).
  - The improved **malloc** attribute can be used to identify allocator and deallocator API pairs.
- New warnings:
  - **-Wsizeof-array-div**, enabled by the **-Wall** option, warns about divisions of two **sizeof** operators when the first one is applied to an array and the divisor does not equal the size of the array element.
  - **-Wstringop-overread**, enabled by default, warns about calls to string functions that try to read past the end of the arrays passed to them as arguments.
- Enhanced warnings:
  - **-Wfree-nonheap-object** detects more instances of calls to deallocation functions with pointers not returned from a dynamic memory allocation function.
  - **-Wmaybe-uninitialized** diagnoses the passing of pointers and references to uninitialized memory to functions that take **const**-qualified arguments.
  - **-Wuninitialized** detects reads from uninitialized dynamically allocated memory.

C

- Several new features from the upcoming C2X revision of the ISO C standard are supported with the **-std=c2x** and **-std=gnu2x** options. For example:
  - The standard attribute is supported.
  - The **__has_c_attribute** preprocessor operator is supported.
  - Labels may appear before declarations and at the end of a compound statement.

C++

- The default mode is changed to **-std=gnu++17**.
- The C++ library **libstdc++** has improved C++17 support now.
- Several new C++20 features are implemented. Note that C++20 support is experimental. For more information about the features, see C++20 Language Features.
- The C++ front end has experimental support for some of the upcoming C++23 draft features.
- New warnings:
  - **-Wctad-maybe-unsupported**, disabled by default, warns about performing class template argument deduction on a type with no deduction guides.

- **-Wrange-loop-construct**, enabled by **-Wall**, warns when a range-based for loop is creating unnecessary and resource inefficient copies.
- **-Wmismatched-new-delete**, enabled by **-Wall**, warns about calls to operator delete with pointers returned from mismatched forms of operator new or from other mismatched allocation functions.
- **-Wvexing-parse**, enabled by default, warns about the most vexing parse rule: the cases when a declaration looks like a variable definition, but the C++ language requires it to be interpreted as a function declaration.

Architecture-specific improvements

The 64-bit ARM architecture

- The Armv8-R architecture is supported through the **-march=armv8-r** option.
- GCC can autovectorize operations performing addition, subtraction, multiplication, and the accumulate and subtract variants on complex numbers.

AMD and Intel 64-bit architectures

- The following Intel CPUs are supported: Sapphire Rapids, Alder Lake, and Rocket Lake.
- New ISA extension support for Intel AVX-VNNI is added. The **-mavxvnni** compiler switch controls the AVX-VNNI intrinsics.
- AMD CPUs based on the znver3 core are supported with the new **-march=znver3** option.
- Three microarchitecture levels defined in the x86-64 psABI supplement are supported with the new **-march=x86-64-v2**, **-march=x86-64-v3**, and **-march=x86-64-v4** options.

(BZ#1946782)

GCC Toolset 11: dwz now supports DWARF 5

In GCC Toolset 11, the **dwz** tool now supports the DWARF Version 5 debugging format.

(BZ#1948709)

GCC Toolset 11: GCC now supports the AIA user interrupts

In GCC Toolset 11, GCC now supports the Accelerator Interfacing Architecture (AIA) user interrupts.

(BZ#1927516)

GCC Toolset 11: Generic SVE tuning defaults improved

In GCC Toolset 11, generic SVE tuning defaults have been improved on the 64-bit ARM architecture.

(BZ#1979715)

SystemTap rebased to version 4.5

The SystemTap package has been updated to version 4.5. Notable bug fixes and enhancements include:

- 32-bit floating-point variables are automatically widened to double variables and, as a result, can be accessed directly as **$context** variables.

- **enum** values can be accessed as **$context** variables.
- The BPF uconversions tapset has been extended and includes more tapset functions to access values in user space, for example **user_long_error()**.
- Concurrency control has been significantly improved to provide stable operation on large servers.

For further information, see the upstream SystemTap 4.5 release notes.

(BZ#1933889)

elfutils rebased to version 0.185

The **elfutils** package has been updated to version 0.185. Notable bug fixes and enhancements include:

- The **eu-elflint** and **eu-readelf** tools now recognize and show the **SHF_GNU_RETAIN** and **SHT_X86_64_UNWIND** flags on ELF sections.
- The **DEBUGINFOD_SONAME** macro has been added to **debuginfod.h**. This macro can be used with the **dlopen** function to load the **libdebuginfod.so** library dynamically from an application.
- A new function **debuginfod_set_verbose_fd** has been added to the **debuginfod-client** library. This function enhances the **debuginfod_find_*** queries functionality by redirecting the verbose output to a separate file.
- Setting the **DEBUGINFOD_VERBOSE** environment variable now shows more information about which servers the **debuginfod** client connects to and the HTTP responses of those servers.
- The **debuginfod** server provides a new thread-busy metric and more detailed error metrics to make it easier to inspect processes that run on the **debuginfod** server.
- The **libdw** library now transparently handles the **DW_FORM_indirect** location value so that the **dwarf_whatform** function returns the actual FORM of an attribute.
- To reduce network traffic, the **debuginfod-client** library stores negative results in a cache, and client objects can reuse an existing connection.

(BZ#1933890)

Valgrind rebased to version 3.17.0

The Valgrind package has been updated to version 3.17.0. Notable bug fixes and enhancements include:

- Valgrind can read the DWARF Version 5 debugging format.
- Valgrind supports debugging queries to the **debuginfod** server.
- The ARMv8.2 processor instructions are partially supported.
- The Power ISA v.3.1 instructions on POWER10 processors are partially supported.
- The IBM z14 processor instructions are supported.
- Most IBM z15 instructions are supported. The Valgrind tool suite supports the miscellaneous-instruction-extensions facility 3 and the vector-enhancements facility 2 for the IBM z15

processor. As a result, Valgrind runs programs compiled with GCC **-march=z15** correctly and provides improved performance and debugging experience.

- The **--track-fds=yes option** respects **-q** (**--quiet**) and ignores the standard file descriptors **stdin**, **stdout**, and **stderr** by default. To track the standard file descriptors, use the **--track-fds=all** option.
- The DHAT tool has two new modes of operation: **--mode=copy** and **--mode=ad-hoc**.

(BZ#1933891)

Dyninst rebased to version 11.0.0

The Dyninst package has been updated to version 11.0.0. Notable bug fixes and enhancements include:

- Support for the **debuginfod** server and for fetching separate **debuginfo** files.
- Improved detection of indirect calls to procedure linkage table (PLT) stubs.
- Improved C++ name demangling.
- Fixed memory leaks during code emitting.

(BZ#1933893)

DAWR functionality improved in GDB on IBM POWER10

With this enhancement, new hardware watchpoint capabilities are now enabled for GDB on the IBM POWER10 processors. For example, a new set of DAWR/DAWRX registers has been added.

(BZ#1854784)

GCC Toolset 11: GDB rebased to version 10.2

In GCC Toolset 11, the GDB package has been updated to version 10.2. Notable bug fixes and enhancements include:

New features

- Multithreaded symbol loading is enabled by default on architectures that support this feature. This change provides better performance for programs with many symbols.
- Text User Interface (TUI) windows can be arranged horizontally.
- GDB supports debugging multiple target connections simultaneously but this support is experimental and limited. For example, you can connect each inferior to a different remote server that runs on a different machine, or you can use one inferior to debug a local native process or a core dump or some other process.

New and improved commands

- A new **tui new-layout *name window weight* [*window weight...*]** command creates a new text user interface (TUI) layout, you can also specify a layout name and displayed windows.
- The improved **alias [-a] [--] *alias = command* [*default-args*]** command can specify default arguments when creating a new alias.
- The **set exec-file-mismatch** and **show exec-file-mismatch** commands set and show a new

exec-file-mismatch option. When GDB attaches to a running process, this option controls how GDB reacts when it detects a mismatch between the current executable file loaded by GDB and the executable file used to start the process.

Python API

- The **gdb.register_window_type** function implements new TUI windows in Python.
- You can now query dynamic types. Instances of the **gdb.Type** class can have a new boolean attribute **dynamic** and the **gdb.Type.sizeof** attribute can have value **None** for dynamic types. If **Type.fields()** returns a field of a dynamic type, the value of its **bitpos** attribute can be **None**.
- A new **gdb.COMMAND_TUI** constant registers Python commands as members of the TUI help class of commands.
- A new **gdb.PendingFrame.architecture()** method retrieves the architecture of the pending frame.
- A new **gdb.Architecture.registers** method returns a **gdb.RegisterDescriptorIterator** object, an iterator that returns **gdb.RegisterDescriptor** objects. Such objects do not provide the value of a register but help understand which registers are available for an architecture.
- A new **gdb.Architecture.register_groups** method returns a **gdb.RegisterGroupIterator** object, an iterator that returns **gdb.RegisterGroup** objects. Such objects help understand which register groups are available for an architecture.

(BZ#1954332)

GCC Toolset 11: SystemTap rebased to version 4.5

In GCC Toolset 11, the SystemTap package has been updated to version 4.5. Notable bug fixes and enhancements include:

- 32-bit floating-point variables are now automatically widened to double variables and, as a result, can be accessed directly as **$context** variables.
- **enum** values can now be accessed as **$context** variables.
- The BPF uconversions tapset has been extended and now includes more tapset functions to access values in user space, for example **user_long_error()**.
- Concurrency control has been significantly improved to provide stable operation on large servers.

For further information, see the upstream SystemTap 4.5 release notes.

(BZ#1957944)

GCC Toolset 11: elfutils rebased to version 0.185

In GCC Toolset 11, the **elfutils** package has been updated to version 0.185. Notable bug fixes and enhancements include:

- The **eu-elflint** and **eu-readelf** tools now recognize and show the **SHF_GNU_RETAIN** and **SHT_X86_64_UNWIND** flags on ELF sections.

- The **DEBUGINFOD_SONAME** macro has been added to **debuginfod.h**. This macro can be used with the **dlopen** function to load the **libdebuginfod.so** library dynamically from an application.
- A new function **debuginfod_set_verbose_fd** has been added to the **debuginfod-client** library. This function enhances the **debuginfod_find_*** queries functionality by redirecting the verbose output to a separate file.
- Setting the **DEBUGINFOD_VERBOSE** environment variable now shows more information about which servers the **debuginfod** client connects to and the HTTP responses of those servers.
- The **debuginfod** server provides a new thread-busy metric and more detailed error metrics to make it easier to inspect processes that run on the **debuginfod** server.
- The **libdw** library now transparently handles the **DW_FORM_indirect** location value so that the **dwarf_whatform** function returns the actual FORM of an attribute.
- The **debuginfod-client** library now stores negative results in a cache and client objects can reuse an existing connection. This way unnecessary network traffic when using the library is prevented.

(BZ#1957225)

GCC Toolset 11: Valgrind rebased to version 3.17.0

In GCC Toolset 11, the Valgrind package has been updated to version 3.17.0. Notable bug fixes and enhancements include:

- Valgrind can now read the DWARF Version 5 debugging format.
- Valgrind now supports debugging queries to the **debuginfod** server.
- Valgrind now partially supports the ARMv8.2 processor instructions.
- Valgrind now supports the IBM z14 processor instructions.
- Valgrind now partially supports the Power ISA v.3.1 instructions on POWER10 processors.
- The **--track-fds=yes option** now respects **-q** (**--quiet**) and ignores the standard file descriptors **stdin**, **stdout**, and **stderr** by default. To track the standard file descriptors, use the **--track-fds=all** option.
- The DHAT tool now has two new modes of operation: **--mode=copy** and **--mode=ad-hoc**.

(BZ#1957226)

GCC Toolset 11: Dyninst rebased to version 11.0.0

In GCC Toolset 11, the Dyninst package has been updated to version 11.0.0. Notable bug fixes and enhancements include:

- Support for the **debuginfod** server and for fetching separate **debuginfo** files.
- Improved detection of indirect calls to procedure linkage table (PLT) stubs.
- Improved C++ name demangling.

- Fixed memory leaks during code emitting.

(BZ#1957942)

PAPI library support for Fujitsu A64FX added

PAPI library support for Fujitsu A64FX has been added. With this feature, developers can collect hardware statistics.

(BZ#1908126)

The PCP package was rebased to 5.3.1

The Performance Co-Pilot (PCP) package has been rebased to version 5.3.1. This release includes bug fixes, enhancements, and new features. Notable changes include:

- Scalability improvements, which now support centrally logged performance metrics for hundreds of hosts (**pmlogger** farms) and automatic monitoring with performance rules (**pmie** farms).
- Resolved memory leaks in the **pmproxy** service and the **libpcp_web** API library, and added instrumentation and new metrics to **pmproxy**.
- A new **pcp-ss** tool for historical socket statistics.
- Improvements to the **pcp-htop** tool.
- Extensions to the over-the-wire PCP protocol which now support higher resolution timestamps.

(BZ#1922040)

The grafana package was rebased to version 7.5.9

The **grafana** package has been rebased to version 7.5.9. Notable changes include:

- New time series panel (beta)
- New pie chart panel (beta)
- Alerting support for Loki
- Multiple new query transformations

For more information, see What's New in Grafana v7.4 , What's New in Grafana v7.5 .

(BZ#1921191)

The grafana-pcp package was rebased to 3.1.0

The **grafana-pcp** package has been rebased to version 3.1.0. Notable changes include:

- Performance Co-Pilot (PCP) Vector Checklist dashboards use a new time series panel, show units in graphs, and contain updated help texts.
- Adding **pmproxy** URL and **hostspec** variables to PCP Vector Host Overview and PCP Checklist dashboards.
- All dashboards display datasource selection.

- Marking all included dashboards as readonly.
- Adding compatibility with Grafana 8.

(BZ#1921190)

grafana-container rebased to version 7.5.9

The **rhel8/grafana** container image provides Grafana. Notable changes include:

- The **grafana** package is now updated to version 7.5.9.
- The **grafana-pcp** package is now updated to version 3.1.0.
- The container now supports the **GF_INSTALL_PLUGINS** environment variable to install custom Grafana plugins at container startup

The rebase updates the **rhel8/grafana** image in the Red Hat Container Registry.

To pull this container image, execute the following command:

```
# podman pull registry.redhat.io/rhel8/grafana
```

(BZ#1971557)

pcp-container rebased to version 5.3.1

The **rhel8/pcp** container image provides Performance Co-Pilot. The **pcp-container** package has been upgraded to version 5.3.1. Notable changes include:

- The **pcp** package is now updated to version 5.3.1.

The rebase updates the **rhel8/pcp** image in the Red Hat Container Registry.

To pull this container image, execute the following command:

```
# podman pull registry.redhat.io/rhel8/pcp
```

(BZ#1974912)

The new pcp-ss PCP utility is now available

The **pcp-ss** PCP utility reports socket statistics collected by the **pmdasockets(1)** PMDA. The command is compatible with many of the **ss** command line options and reporting formats. It also offers the advantages of local or remote monitoring in live mode and historical replay from a previously recorded PCP archive.

(BZ#1879350)

Power consumption metrics now available in PCP

The new **pmda-denki** Performance Metrics Domain Agent (PMDA) reports metrics related to power consumption. Specifically, it reports:

- Consumption metrics based on Running Average Power Limit (RAPL) readings, available on recent Intel CPUs

- Consumption metrics based on battery discharge, available on systems which have a battery

(BZ#1629455)

4.13. IDENTITY MANAGEMENT

IdM now supports new password policy options

With this update, Identity Management (IdM) supports additional **libpwquality** library options:

--maxrepeat

Specifies the maximum number of the same character in sequence.

--maxsequence

Specifies the maximum length of monotonic character sequences (**abcd**).

--dictcheck

Checks if the password is a dictionary word.

--usercheck

Checks if the password contains the username.

Use the **ipa pwpolicy-mod** command to apply these options. For example, to apply the user name check to all new passwords suggested by the users in the managers group:

```
*$ ipa pwpolicy-mod --usercheck=True managers*
```

If any of the new password policy options are set, then the minimum length of passwords is 6 characters regardless of the value of the **--minlength** option. The new password policy settings are applied only to new passwords.

In a mixed environment with RHEL 7 and RHEL 8 servers, the new password policy settings are enforced only on servers running on RHEL 8.4 and later. If a user is logged in to an IdM client and the IdM client is communicating with an IdM server running on RHEL 8.3 or earlier, then the new password policy requirements set by the system administrator will not be applied. To ensure consistent behavior, upgrade or update all servers to RHEL 8.4 and later.

(JIRA:RHELPLAN-89566)

Improved the SSSD debug logging by adding a unique identifier tag for each request

As SSSD processes requests asynchronously, it is not easy to follow log entries for individual requests in the backend logs, as messages from different requests are added to the same log file. To improve the readability of debug logs, a unique request identifier is now added to log messages in the form of **RID#<integer>**. This allows you to isolate logs pertaining to an individual request, and you can track requests from start to finish across log files from multiple SSSD components.

For example, the following sample output from an SSSD log file shows the unique identifiers RID#3 and RID#4 for two different requests:

```
(2021-07-26 18:26:37): [be[testidm.com]] [dp_req_destructor] (0x0400): RID#3 Number of active DP request: 0
(2021-07-26 18:26:37): [be[testidm.com]] [dp_req_reply_std] (0x1000): RID#3 DP Request AccountDomain #3: Returning [Internal Error]: 3,1432158301,GetAccountDomain() not supported
(2021-07-26 18:26:37): [be[testidm.com]] [dp_attach_req] (0x0400): RID#4 DP Request Account #4:
```

```
REQ_TRACE: New request. sssd.nss CID #1 Flags [0x0001].
(2021-07-26 18:26:37): [be[testidm.com]] [dp_attach_req] (0x0400): RID#4 Number of active DP
request: 1
```

(JIRA:RHELPLAN-92473)

IdM now supports the automember and server Ansible modules

With this update, the **ansible-freeipa** package contains the **ipaautomember** and **ipaserver** modules:

- Using the **ipaautomember** module, you can add, remove, and modify automember rules and conditions. As a result, future IdM users and hosts that meet the conditions will be assigned to IdM groups automatically.
- Using the **ipaserver** module, you can ensure various parameters of the presence or absence of a server in the IdM topology. You can also ensure that a replica is hidden or visible.

(JIRA:RHELPLAN-96640)

IdM performance baseline

With this update, a RHEL 8.5 IdM server with 4 CPUs and 8GB of RAM has been tested to successfully enroll 130 IdM clients simultaneously.

(JIRA:RHELPLAN-97145)

SSSD Kerberos cache performance has been improved

The System Security Services Daemon (SSSD) Kerberos Cache Manager (KCM) service now includes the new operation **KCM_GET_CRED_LIST**. This enhancement improves KCM performance by reducing the number of input and output operations while iterating through a credentials cache.

(BZ#1956388)

SSSD now logs backtraces by default

With this enhancement, SSSD now stores detailed debug logs in an in-memory buffer and appends them to log files when a failure occurs. By default, the following error levels trigger a backtrace:

- Level 0: fatal failures
- Level 1: critical failures
- Level 2: serious failures

You can modify this behavior for each SSSD process by setting the **debug_level** option in the corresponding section of the **sssd.conf** configuration file:

- If you set the debugging level to 0, only level 0 events trigger a backtrace.
- If you set the debugging level to 1, levels 0 and 1 trigger a backtrace.
- If you set the debugging level to 2 or higher, events at level 0 through 2 trigger a backtrace.

You can disable this feature per SSSD process by setting the **debug_backtrace_enabled** option to **false** in the corresponding section of **sssd.conf**:

```
[sssd]
```

```
debug_backtrace_enabled = true
debug_level=0
...

[nss]
debug_backtrace_enabled = false
...

[domain/idm.example.com]
debug_backtrace_enabled = true
debug_level=2
...

...
```

(BZ#1949149)

SSSD KCM now supports the auto-renewal of ticket granting tickets

With this enhancement, you can now configure the System Security Services Daemon (SSSD) Kerberos Cache Manager (KCM) service to auto-renew ticket granting tickets (TGTs) stored in the KCM credential cache on an Identity Management (IdM) server. Renewals are only attempted when half of the ticket lifetime has been reached. To use auto-renewal, the key distribution center (KDC) on the IdM server must be configured to support renewable Kerberos tickets.

You can enable TGT auto-renewal by modifying the [kcm] section of the **/etc/sssd/sssd.conf** file. For example, you can configure SSSD to check for renewable KCM-stored TGTs every 60 minutes and attempt auto-renewal if half of the ticket lifetime has been reached by adding the following options to the file:

```
[kcm]
tgt_renewal = true
krb5_renew_interval = 60m
```

Alternatively, you can configure SSSD to inherit **krb5** options for renewals from an existing domain:

```
[kcm]
tgt_renewal = true
tgt_renewal_inherit = domain-name
```

For more information, see the **Renewals** section of the **sssd-kcm** man page.

(BZ#1627112)

samba rebased to version 4.14.4

The _samba_ packages have been upgraded to upstream version 4.14.4, which provides bug fixes and enhancements over the previous version:

- Publishing printers in Active Directory (AD) has increased reliability, and additional printer features have been added to the published information in AD. Also, Samba now supports Windows drivers for the ARM64 architecture.
- The **ctdb isnotrecmaster** command has been removed. As an alternative, use **ctdb pnn** or the **ctdb recmaster** commands.

- The clustered trivial database (CTDB) **ctdb natgw master** and **slave-only** parameters have been renamed to **ctdb natgw leader** and **follower-only**.

Back up the database files before starting Samba. When the **smbd**, **nmbd**, or **winbind** services start Samba automatically updates its **tdb** database files. Note that Red Hat does not support downgrading **tdb** database files.

After updating Samba, verify the **/etc/samba/smb.conf** file using the **testparm** utility.

For further information about notable changes, read the upstream release notes before updating.

(BZ#1944657)

The dnaInterval configuration attribute is now supported

With this update, Red Hat Directory Server supports setting the **dnaInterval** attribute of the Distributed Numeric Assignment (DNA) plug-in in the **cn=*<DNA_config_entry>*,cn=Distributed Numeric Assignment Plugin,cn=plugins,cn=config** entry. The DNA plug-in generates unique values for specified attributes. In a replication environment, servers can share the same range. To avoid overlaps on different servers, you can set the **dnaInterval** attribute to skip some values. For example, if the interval is **3** and the first number in the range is **1**, the next number used in the range is **4**, then **7**, then **10**.

For further details, see the dnaInterval parameter description.

(BZ#1938239)

Directory Server rebased to version 1.4.3.27

The **389-ds-base** packages have been upgraded to upstream version 1.4.3.27, which provides a number of bug fixes and enhancements over the previous version. For a complete list of notable changes, read the upstream release notes before updating:

- https://directory.fedoraproject.org/docs/389ds/releases/release-1-4-3-24.html
- https://directory.fedoraproject.org/docs/389ds/releases/release-1-4-3-23.html
- https://directory.fedoraproject.org/docs/389ds/releases/release-1-4-3-22.html
- https://directory.fedoraproject.org/docs/389ds/releases/release-1-4-3-21.html
- https://directory.fedoraproject.org/docs/389ds/releases/release-1-4-3-20.html
- https://directory.fedoraproject.org/docs/389ds/releases/release-1-4-3-19.html
- https://directory.fedoraproject.org/docs/389ds/releases/release-1-4-3-18.html
- https://directory.fedoraproject.org/docs/389ds/releases/release-1-4-3-17.html

(BZ#1947044)

Directory Server now supports temporary passwords

This enhancement enables administrators to configure temporary password rules in global and local password policies. With these rules, you can configure that, when an administrator resets the password of a user, the password is temporary and only valid for a specific time and for a defined number of attempts. Additionally, you can configure that the expiration time does not start directly when the

administrator changes the password. As a result, Directory Server allows the user only to authenticate using the temporary password for a finite period of time or attempts. Once the user authenticates successfully, Directory Server allows this user only to change its password.

(BZ#1626633)

IdM KDC now issues Kerberos tickets with PAC information to increase security

With this update, to increase security, RHEL Identity Management (IdM) now issues Kerberos tickets with Privilege Attribute Certificate (PAC) information by default in new deployments. A PAC has rich information about a Kerberos principal, including its Security Identifier (SID), group memberships, and home directory information. As a result, Kerberos tickets are less susceptible to manipulation by malicious servers.

SIDs, which Microsoft Active Directory (AD) uses by default, are globally unique identifiers that are never reused. SIDs express multiple namespaces: each domain has a SID, which is a prefix in the SID of each object.

Starting with RHEL 8.5, when you install an IdM server or replica, the installation script generates SIDs for users and groups by default. This allows IdM to work with PAC data. If you installed IdM before RHEL 8.5, and you have not configured a trust with an AD domain, you may not have generated SIDs for your IdM objects. For more information about generating SIDs for your IdM objects, see Enabling Security Identifiers (SIDs) in IdM.

By evaluating PAC information in Kerberos tickets, you can control resource access with much greater detail. For example, the **Administrator** account in one domain has a uniquely different SID than the **Administrator** account in any other domain. In an IdM environment with a trust to an AD domain, you can set access controls based on globally unique SIDs rather than simple user names or UIDs that might repeat in different locations, such as every Linux **root** account having a UID of 0.

(Jira:RHELPLAN-159143)

Directory Server provides monitoring settings that can prevent database corruption caused by lock exhaustion

This update adds the **nsslapd-db-locks-monitoring-enable** parameter to the **cn=bdb,cn=config,cn=ldbm database,cn=plugins,cn=config** entry. If it is enabled, which is the default, Directory Server aborts all of the searches if the number of active database locks is higher than the percentage threshold configured in **nsslapd-db-locks-monitoring-threshold**. If an issue is encountered, the administrator can increase the number of database locks in the **nsslapd-db-locks** parameter in the **cn=bdb,cn=config,cn=ldbm database,cn=plugins,cn=config** entry. This can prevent data corruption. Additionally, the administrator now can set a time interval in milliseconds that the thread sleeps between the checks.

For further details, see the parameter descriptions in the Red Hat Directory Server Configuration, Command, and File Reference.

(BZ#1812286)

Directory Server can exclude attributes and suffixes from the retro changelog database

This enhancement adds the **nsslapd-exclude-attrs** and **nsslapd-exclude-suffix** parameters to Directory Server. You can set these parameters in the **cn=Retro Changelog Plugin,cn=plugins,cn=config** entry to exclude certain attributes or suffixes from the retro changelog database.

(BZ#1850664)

Directory Server supports the entryUUID attribute

With this enhancement, Directory Server supports the **entryUUID** attribute to be compliant with RFC 4530. For example, with support for **entryUUID**, migrations from OpenLDAP are easier. By default, Directory Server adds the **entryUUID** attribute only to new entries. To manually add it to existing entries, use the **dsconf *<instance_name>* plugin entryuuid fixup** command.

(BZ#1944494)

Added a new message to help set up nsSSLPersonalitySSL

Previously, many times happened that RHDS instance failed to start if the TLS certificate nickname didn't match the value of the configuration parameter **nsSSLPersonalitySSL**. This mismatch happened when customer copy the NSS DB from a previous instance or export the certificate's data but forget to set the **nsSSLPersonalitySSL** value accordingly. With this update, you can see log an additional message which should help a user to set up **nsSSLPersonalitySSL** correctly.

(BZ#1895460)

4.14. DESKTOP

You can now connect to network at the login screen

With this update, you can now connect to your network and configure certain network options at the GNOME Display Manager (GDM) login screen. As a result, you can log in as an enterprise user whose home directory is stored on a remote server.

The login screen supports the following network options:

- Wired network
- Wireless network, including networks protected by a password
- Virtual Private Network (VPN)

The login screen cannot open windows for additional network configuration. As a consequence, you cannot use the following network options at the login screen:

- Networks that open a captive portal
- Modem connections
- Wireless networks with enterprise WPA or WPA2 encryption that have not been preconfigured

The network options at the login screen are disabled by default. To enable the network settings, use the following procedure:

1. Create the **/etc/polkit-1/rules.d/org.gnome.gdm.rules** file with the following content:

```
polkit.addRule(function(action, subject) {
    if (action.id == "org.freedesktop.NetworkManager.network-control" &&
        subject.user == "gdm") {
            return polkit.Result.YES;
    }

    return polkit.Result.NOT_HANDLED;
});
```

2. Restart GDM:

```
# systemctl restart gdm
```

WARNING

Restarting GDM terminates all your graphical user sessions.

3. At the login screen, access the network settings in the menu on the right side of the top panel.

(BZ#1935261)

Displaying the system security classification at login

You can now configure the GNOME Display Manager (GDM) login screen to display an overlay banner that contains a predefined message. This is useful for deployments where the user is required to read the security classification of the system before logging in.

To enable the overlay banner and configure a security classification message, use the following procedure:

1. Install the **gnome-shell-extension-heads-up-display** package:

```
# yum install gnome-shell-extension-heads-up-display
```

2. Create the **/etc/dconf/db/gdm.d/99-hud-message** file with the following content:

```
[org/gnome/shell]
enabled-extensions=['heads-up-display@gnome-shell-extensions.gcampax.github.com']

[org/gnome/shell/extensions/heads-up-display]
message-heading="Security classification title"
message-body="Security classification description"
```

Replace the following values with text that describes the security classification of your system:

Security classification title

A short heading that identifies the security classification.

Security classification description

A longer message that provides additional details, such as references to various guidelines.

3. Update the **dconf** database:

```
# dconf update
```

4. Reboot the system.

(BZ#1651378)

Flicker free boot is available

You can now enable flicker free boot on your system. When flicker free boot is enabled, it eliminates abrupt graphical transitions during the system boot process, and the display does not briefly turn off during boot.

To enable flicker free boot, use the following procedure:

1. Configure the boot loader menu to hide by default:

```
# grub2-editenv - set menu_auto_hide=1
```

2. Update the boot loader configuration:
   - On UEFI systems:

```
# grub2-mkconfig -o /etc/grub2-efi.cfg
```

   - On legacy BIOS systems:

```
# grub2-mkconfig -o /etc/grub2.cfg
```

3. Reboot the system.

As a result, the boot loader menu does not display during system boot, and the boot process is graphically smooth.

To access the boot loader menu, repeatedly press **Esc** after turning on the system.

(JIRA:RHELPLAN-99148)

Updated support for emoji

This release updates support for Unicode emoji characters from version 11 to version 13 of the emoji standard. As a result, you can now use more emoji characters on RHEL.

The following packages that provide emoji functionality have been rebased:

Package	Previous version	Rebased to version
cldr-emoji-annotation	33.1.0	38
google-noto-emoji-fonts	20180508	20200723
unicode-emoji	10.90.20180207	13.0

(JIRA:RHELPLAN-61867)

You can set a default desktop session for all users

With this update, you can now configure a default desktop session that is preselected for all users that have not logged in yet.

If a user logs in using a different session than the default, their selection persists to their next login.

To configure the default session, use the following procedure:

1. Copy the configuration file template:

```
# cp /usr/share/accountsservice/user-templates/standard \
    /etc/accountsservice/user-templates/standard
```

2. Edit the new **/etc/accountsservice/user-templates/standard** file. On the **Session=*gnome*** line, replace ***gnome*** with the session that you want to set as the default.

3. Optional: To configure an exception to the default session for a certain user, follow these steps:

   a. Copy the template file to **/var/lib/AccountsService/users/*user-name***:

```
# cp /usr/share/accountsservice/user-templates/standard \
    /var/lib/AccountsService/users/user-name
```

   b. In the new file, replace variables such as **${USER}** and **${ID}** with the user values.

   c. Edit the **Session** value.

(BZ#1812788)

4.15. GRAPHICS INFRASTRUCTURES

Support for new GPUs

The following new GPUs are now supported.

Intel graphics:

- Alder Lake-S (ADL-S)
  Support for Alder Lake-S graphics is disabled by default. To enable it, add the following option to the kernel command line:

```
i915.force_probe=PCI_ID
```

  Replace *PCI_ID* with either the PCI device ID of your Intel GPU, or with the * character to enable support for all alpha-quality hardware that uses the **i915** driver.

- Elkhart Lake (EHL)

- Comet Lake Refresh (CML-R) with the TGP Platform Controller Hub (PCH)

AMD graphics:

- Cezzane and Barcelo

- Sienna Cichlid

- Dimgrey Cavefish

(JIRA:RHELPLAN-99040, BZ#1784132, BZ#1784136, BZ#1838558)

The Wayland session is available with the proprietary NVIDIA driver

The proprietary NVIDIA driver now supports hardware accelerated OpenGL and Vulkan rendering in Xwayland. As a result, you can now enable the GNOME Wayland session with the proprietary NVIDIA driver. Previously, only the legacy X11 session was available with the driver. X11 remains as the default session to avoid a possible disruption when updating from a previous version of RHEL.

To enable Wayland with the NVIDIA proprietary driver, use the following procedure:

1. Enable Direct Rendering Manager (DRM) kernel modesetting by adding the following option to the kernel command line:

   ```
   nvidia-drm.modeset=1
   ```

   For details on enabling kernel options, see Configuring kernel command-line parameters.

2. Reboot the system.
   The Wayland session is now available at the login screen.

3. Optional: To avoid the loss of video allocations when suspending or hibernating the system, enable the power management option with the driver. For details, see Configuring Power Management Support.

For the limitations related to the use of DRM kernel modesetting in the proprietary NVIDIA driver, see Direct Rendering Manager Kernel Modesetting (DRM KMS) .

(JIRA:RHELPLAN-99049)

Improvements to GPU support

The following new GPU features are now enabled:

- Panel Self Refresh (PSR) is now enabled for Intel Tiger Lake and later graphics, which improves power consumption.
- Intel Tiger Lake, Ice Lake, and later graphics can now use High Bit Rate 3 (HBR3) mode with the DisplayPort Multi-Stream Transport (DP-MST) transmission method. This enables support for certain display capabilities with docks.
- Modesetting is now enabled on NVIDIA Ampere GPUs. This includes the following models: GA102, GA104, and GA107, including hybrid graphics systems.
- Most laptops with Intel integrated graphics and an NVIDIA Ampere GPU can now output to external displays using either GPU.

(JIRA:RHELPLAN-99043)

Updated graphics drivers

The following graphics drivers have been updated:

- **amdgpu**
- **ast**
- **i915**
- **mgag2000**

- **nouveau**
- **vmwgfx**
- **vmwgfx**
- The Mesa library
- Vulkan packages

(JIRA:RHELPLAN-99044)

Intel Tiger Lake graphics are fully supported

Intel Tiger Lake UP3 and UP4 Xe graphics, which were previously available as a Technology Preview, are now fully supported. Hardware acceleration is enabled by default on these GPUs.

(BZ#1783396)

4.16. RED HAT ENTERPRISE LINUX SYSTEM ROLES

Users can configure the maximum root distance using the timesync_max_distance parameter

With this update, the **timesync** RHEL system role is able to configure the **tos maxdist** of **ntpd** and the **maxdistance** parameter of the **chronyd** service using the new **timesync_max_distance** parameter. The **timesync_max_distance** parameter configures the maximum root distance to accept measurements from Network Time Protocol (NTP) servers. The default value is 0, which keeps the provider-specific defaults.

(BZ#1938016)

Elasticsearch can now accept lists of servers

Previously, the **server_host** parameter in Elasticsearch output for the Logging RHEL system role accepted only a string value for a single host. With this enhancement, it also accepts a list of strings to support multiple hosts. As a result, you can now configure multiple Elasticsearch hosts in one Elasticsearch output dictionary.

(BZ#1986463)

Network Time Security (NTS) option added to the timesync RHEL system role

The **nts** option was added to the **timesync** RHEL system role to enable NTS on client servers. NTS is a new security mechanism specified for Network Time Protocol (NTP), which can secure synchronization of NTP clients without client-specific configuration and can scale to large numbers of clients. The **NTS** option is supported only with the **chrony** NTP provider in version 4.0 and later.

(BZ#1970664)

The SSHD RHEL system role now supports non-exclusive configuration snippets

With this feature, you can configure SSHD through different roles and playbooks without rewriting the previous configurations by using namespaces. Namespaces are similar to a drop-in directory, and define non-exclusive configuration snippets for SSHD. As a result, you can use the SSHD RHEL system role from a different role, if you need to configure only a small part of the configuration and not the entire configuration file.

(BZ#1970642)

The SELinux role can now manage SELinux modules

The **SElinux** RHEL system role has the ability to manage SELinux modules. With this update, users can provide their own custom modules from **.pp** or **.cil** files, which allows for a more flexible SELinux policy management.

(BZ#1848683)

Users can manage the chrony interleaved mode, NTP filtering, and hardware timestamping

With this update, the **timesync** RHEL system role enables you to configure the Network Time Protocol (NTP) interleaved mode, additional filtering of NTP measurements, and hardware timestamping. The **chrony** package of version 4.0 adds support for these functionalities to achieve a highly accurate and stable synchronization of clocks in local networks.

- To enable the NTP interleaved mode, make sure the server supports this feature, and set the **xleave** option to **yes** for the server in the **timesync_ntp_servers** list. The default value is **no**.
- To set the number of NTP measurements per clock update, set the **filter** option for the NTP server you are configuring. The default value is **1**.
- To set the list of interfaces which should have hardware timestamping enabled for NTP, use the **timesync_ntp_hwts_interfaces** parameter. The special value **["*"]** enables timestamping on all interfaces that support it. The default is **[]**.

(BZ#1938020)

timesync role enables customization settings for chrony

Previously, there was no way to provide customized chrony configuration using the **timesync** role. This update adds the **timesync_chrony_custom_settings** parameter, which enables users to to provide customized settings for chrony, such as:

```
timesync_chrony_custom_settings:
  - "logdir /var/log/chrony"
  - "log measurements statistics tracking"
```

(BZ#1938023)

timesync role supports hybrid end-to-end delay mechanisms

With this enhancement, you can use the new **hybrid_e2e option** in **timesync_ptp_domains** to enable hybrid end-to-end delay mechanisms in the **timesync** role. The hybrid end-to-end delay mechanism uses unicast delay requests, which are useful to reduce multicast traffic in large networks.

(BZ#1957849)

ethtool now supports reducing the packet loss rate and latency

Tx or Rx buffers are memory spaces allocated by a network adapter to handle traffic bursts. Properly managing the size of these buffers is critical to reduce the packet loss rate and achieve acceptable network latency.

The **ethtool** utility now reduces the packet loss rate or latency by configuring the **ring** option of the specified network device.

The list of supported **ring** parameters is:

- **rx** - Changes the number of ring entries for the Rx ring.
- **rx-jumbo** - Changes the number of ring entries for the Rx Jumbo ring.
- **rx-mini** - Changes the number of ring entries for the Rx Mini ring.
- **tx** - Changes the number of ring entries for the Tx ring.

(BZ#1959649)

New ipv6_disabled parameter is now available

With this update, you can now use the **ipv6_disabled** parameter to disable ipv6 when configuring addresses.

(BZ#1939711)

RHEL system roles now support VPN management

Previously, it was difficult to set up secure and properly configured IPsec tunneling and virtual private networking (VPN) solutions on Linux. With this enhancement, you can use the VPN RHEL system role to set up and configure VPN tunnels for host-to-host and mesh connections more easily across large numbers of hosts. As a result, you have a consistent and stable configuration interface for VPN and IPsec tunneling configuration within the RHEL system roles project.

(BZ#1943679)

The storage RHEL system role now supports filesystem relabel

Previously, the **storage** role did not support relabelling. This update fixes the issue, providing support to relabel the **filesystem** label. To do this, set a new label string to the **fs_label** parameter in **storage_volumes**.

(BZ#1876315)

Support for volume sizes expressed as a percentage is available in the storage system role

This enhancement adds support to the **storage** RHEL system role to express LVM volume sizes as a percentage of the pool's total size. You can specify the size of LVM volumes as a percentage of the pool/VG size, for example: **50%** in addition to the human-readable size of the file system, for example, **10g**, **50 GiB**.

(BZ#1894642)

New Ansible Role for Microsoft SQL Server Management

The new **microsoft.sql.server** role is designed to help IT and database administrators automate processes involved with setup, configuration, and performance tuning of SQL Server on Red Hat Enterprise Linux.

(BZ#2013853)

RHEL system roles do not support Ansible 2.8

With this update, support for Ansible 2.8 is no longer supported because the version is past the end of the product life cycle. The RHEL system roles support Ansible 2.9.

(BZ#1989199)

The postfix role of RHEL system roles is fully supported

Red Hat Enterprise Linux system roles provides a configuration interface for Red Hat Enterprise Linux subsystems, which makes system configuration easier through the inclusion of Ansible Roles. This interface enables managing system configurations across multiple versions of Red Hat Enterprise Linux, as well as adopting new major releases.

The **rhel-system-roles** packages are distributed through the AppStream repository.

As of RHEL 8.5, the **postfix** role is fully supported.

For more information, see the Knowledgebase article about RHEL system roles.

(BZ#1812552)

4.17. VIRTUALIZATION

Enhancements to managing virtual machines in the web console

The Virtual Machines (VM) section of the RHEL 8 web console has been redesigned for a better user experience. In addition, the following changes and features have also been introduced:

- A single page now includes all the relevant VM information, such as VM status, disks, networks, or console information.
- You can now live migrate a VM using the web console
- The web console now allows editing the MAC address of a VM's network interface
- You can use the web console to view a list of host devices attached to a VM

(JIRA:RHELPLAN-79074)

zPCI device assignment

It is now possible to attach zPCI devices as mediated devices to virtual machines (VMs) hosted on RHEL 8 running on IBM Z hardware. For example, thís enables the use of NVMe flash drives in VMs.

(JIRA:RHELPLAN-59528)

4.18. SUPPORTABILITY

sos rebased to version 4.1

The **sos** package has been upgraded to version 4.1, which provides multiple bug fixes and enhancements. Notable enhancements include:

- Red Hat Update Infrastructure (**RHUI**) plugin is now natively implemented in the **sos** package. With the **rhui-debug.py** python binary, **sos** can collect reports from **RHUI** including, for example, the main configuration file, the **rhui-manager** log file, or the installation configuration.
- **sos** introduces the **--cmd-timeout** global option that sets manually a timeout for a command execution. The default value (-1) defers to the general command timeout, which is 300 seconds.

(BZ#1928679)

4.19. CONTAINERS

Default container image signature verification is now available

Previously, the policy YAML files for the Red Hat Container Registries had to be manually created in the **/etc/containers/registries.d/** directory. Now, the **registry.access.redhat.com.yaml** and **registry.redhat.io.yaml** files are included in the **containers-common** package. You can now use the **podman image trust** command to verify the container image signatures on RHEL.

(JIRA:RHELPLAN-75166)

The container-tools:rhel8 module has been updated

The **container-tools:rhel8** module, which contains the Podman, Buildah, Skopeo, and runc tools is now available. This update provides a list of bug fixes and enhancements over the previous version.

(JIRA:RHELPLAN-76515)

The containers-common package is now available

The **containers-common** package has been added to the **container-tools:rhel8** module. The **containers-common** package contains common configuration files and documentation for container tools ecosystem, such as Podman, Buildah and Skopeo.

(JIRA:RHELPLAN-77542)

Native overlay file system support in the kernel is now available

The overlay file system support is now available from kernel 5.11. The non-root users will have native overlay performance even when running rootless (as a user). Thus, this enhancement provides better performance to non-root users who wish to use overlayfs without the need for bind mounting.

(JIRA:RHELPLAN-77241)

A podman container image is now available

The **registry.redhat.io/rhel8/podman** container image, previously available as a Technology Preview, is now fully supported. The **registry.redhat.io/rhel8/podman** container image is a containerized implementation of the **podman** package. The **podman** tool manages containers and images, volumes mounted into those containers, and pods made of groups of containers.

(JIRA:RHELPLAN-57941)

Universal Base Images are now available on Docker Hub

Previously, Universal Base Images were only available from the Red Hat container catalog. Now, Universal Base Images are also available from Docker Hub.

For more information, see Red Hat Brings Red Hat Universal Base Image to Docker Hub .

(JIRA:RHELPLAN-85064)

CNI plugins in Podman are now available

CNI plugins are now available to use in Podman rootless mode. The rootless networking commands now work without any other requirement on the system.

(BZ#1934480)

Podman has been updated to version 3.3.1

The Podman utility has been updated to version 3.3.1. Notable enhancements include:

- Podman now supports restarting containers created with the **--restart** option after the system is rebooted.
- The **podman container checkpoint** and **podman container restore** commands now support checkpointing and restoring containers that are in pods and restoring those containers into pods. Further, the **podman container restore** command now supports the **--publish** option to change ports forwarded to a container restored from an exported checkpoint.

(JIRA:RHELPLAN-87877)

The crun OCI runtime is now available

The **crun** OCI runtime is now available for the **container-tools:rhel8** module. The **crun** container runtime supports an annotation that enables the container to access the rootless user's additional groups. This is useful for container operations when volume mounting in a directory where setgid is set, or where the user only has group access.

(JIRA:RHELPLAN-75164)

The podman UBI image is now available

The registry.access.redhat.com/ubi8/podman is now available as a part of UBI.

(JIRA:RHELPLAN-77489)

The container-tools:rhel8 module has been updated

The **container-tools:rhel8** module, which contains the Podman, Buildah, Skopeo, and runc tools is now available. This update provides a list of bug fixes and enhancements over the previous version.

For more details, see the RHEA-2022:0352.

(BZ#2009153)

The ubi8/nodejs-16 and ubi8/nodejs-16-minimal container images are now fully supported

The **ubi8/nodejs-16** and **ubi8/nodejs-16-minimal** container images, previously available as a Technology Preview, are fully supported with the release of the RHBA-2021:5260 advisory. These container images include **Node.js 16.13**, which is a Long Term Support (LTS) version.

(BZ#2001020)

CHAPTER 5. IMPORTANT CHANGES TO EXTERNAL KERNEL PARAMETERS

This chapter provides system administrators with a summary of significant changes in the kernel shipped with Red Hat Enterprise Linux 8.5. These changes could include for example added or updated **proc** entries, **sysctl**, and **sysfs** default values, boot parameters, kernel configuration options, or any noticeable behavior changes.

New kernel parameters

idxd.sva = [HW]

Format: <bool>
With this parameter you can force disable Shared Virtual Memory (SVA) support for the **idxd** kernel module.

The default value is **true** (**1**).

lsm.debug = [SECURITY]

With this parameter you can enable Linux Security Module (LSM) initialization debugging output.

lsm = lsm1,...,lsmN [SECURITY]

With this parameter you can choose the order of Linux Security Module (LSM) initialization.
This parameter overrides **CONFIG_LSM** option, and the **security=** parameter.

rcutree.qovld = [KNL]

With this parameter you can set a threshold of queued Read-copy-update (RCU) callbacks. Beyond this threshold, RCU's force-quiescent-state scan will aggressively enlist help from the **cond_resched()** system call and schedule IPIs to help CPUs reach more quickly quiescent states.
You can set this parameter to values smaller than zero to make this parameter be set based on the **rcutree.qhimark** parameter at boot time. Alternatively, set this parameter to zero to disable more aggressive help enlistment.

rcutree.rcu_unlock_delay = [KNL]

With this parameter you can specify the **rcu_read_unlock()**-time delay, in kernels where the config boolean is set to **CONFIG_RCU_STRICT_GRACE_PERIOD=y**.
The default value is 0.

Larger delays increase the probability of catching Read-copy-update (RCU) pointer leaks. That is a flawed use of RCU-protected pointers after the relevant **rcu_read_unlock()** has completed.

rcutorture.irqreader = [KNL]

With this parameter you can run Read-copy-update (RCU) readers from Interrupt request (IRQ) handlers, or from a timer handler.

rcutorture.leakpointer = [KNL]

With this parameter you can leak a Read-copy-update (RCU) protected pointer out of the reader. This can result in splats, and is intended to test the ability of configurations such as **CONFIG_RCU_STRICT_GRACE_PERIOD=y** to detect such leaks.

rcutorture.read_exit = [KNL]

With this parameter you can set the number of read-then-exit kthreads to test the interaction of Read-copy-update (RCU) updaters and task-exit processing.

rcutorture.read_exit_burst = [KNL]

With this parameter you can specify the number of times in a given read-then-exit episode that a set of read-then-exit kthreads is spawned.

rcutorture.read_exit_delay = [KNL]

With this parameter you can specify the delay, in seconds, between successive read-then-exit testing episodes.

rcutorture.stall_cpu_block = [KNL]

With this parameter you can set sleep while stalling. As a result, warnings from pre-emptible Read-copy-update (RCU) in addition to any other stall-related activity can occur.

rcutorture.stall_gp_kthread = [KNL]

With this parameter you can specify duration, in seconds, of forced sleep within Read-copy-update (RCU) grace-period kthread to test RCU CPU stall warnings.
Set this parameter to zero to disable the functionality.

If both **stall_cpu** and **stall_gp_kthread** parameters are specified, the kthread is starved first, then the CPU.

rcupdate.rcu_cpu_stall_suppress_at_boot = [KNL]

With this parameter you can suppress RCU CPU stall warning messages and rcutorture writer stall warnings that occur during early boot. That is during the time before the **init** task is spawned.

rcupdate.rcu_task_ipi_delay = [KNL]

With this parameter you can set time in jiffies during which Read-copy-update (RCU) tasks avoid sending IPIs, starting with the beginning of a given grace period.
Setting a large number avoids disturbing real-time workloads, but lengthens grace periods.

refscale.holdoff = [KNL]

With this parameter you can set test-start holdoff period. The purpose of this parameter is to delay the start of the test until boot completes in order to avoid interference.

refscale.loops = [KNL]

With this parameter you can set the number of loops over the synchronization primitive under test.
Increasing this number reduces noise due to loop start/end overhead.
The default value has already reduced the per-pass noise to a handful of picoseconds on about 2020 x86 laptops.

refscale.nreaders = [KNL]

With this parameter you can set the number of readers.
The default value of -1 selects N, where N is roughly 75% of the number of CPUs.

refscale.nruns = [KNL]

With this parameter you can set the number of runs, each of which is dumped onto the console log.

refscale.readdelay = [KNL]

With this parameter you can set the read-side critical-section duration, measured in microseconds.

refscale.scale_type = [KNL]

With this parameter you can specify the read-protection implementation to test.

refscale.shutdown = [KNL]

With this parameter you can shut down the system at the end of the performance test.
The default value is 1 and it shuts down the system - refscale is built into the kernel.

The value 0 and leaves the system running - refscale is built as a module.

refscale.verbose = [KNL]

With this parameter you can enable additional **printk()** statements.

scftorture.holdoff = [KNL]

With this parameter you can specify the number of seconds to hold off before starting test.
The paramter defaults to zero for module insertion and to 10 seconds for built-in **smp_call_function()** tests.

scftorture.longwait = [KNL]

With this parameter you can request very long waits, which are randomly selected up to the chosen limit in seconds.
The default value is zero and it disables this feature.

Note that requesting even small non-zero numbers of seconds can result in Read-copy-update (RCU) CPU stall warnings, softlockup complaints, and so on.

scftorture.nthreads = [KNL]

With this parameter you can specify the number of kthreads to spawn to invoke the **smp_call_function()** family of functions.
The default of -1 specifies a number of kthreads equal to the number of CPUs.

scftorture.onoff_holdoff = [KNL]

With this parameter you can specify the number of seconds to wait after the start of the test before initiating CPU-hotplug operations.

scftorture.onoff_interval = [KNL]

With this parameter you can specify the number of seconds to wait between successive CPU-hotplug operations.
The default value is zero and it disables CPU-hotplug operations.

scftorture.shutdown_secs = [KNL]

With this parameter you can specify the number of seconds following the start of the test. After the test the system shuts down.
With the default value of zero you can avoid shutting down the system. Non-zero values are useful for automated tests.

scftorture.stat_interval = [KNL]

With this parameter you can specify the number of seconds between outputting the current test statistics to the console.
A value of zero disables statistics output.

scftorture.stutter_cpus = [KNL]

With this parameter you can specify the number of jiffies to wait between each change to the set of CPUs under test.

scftorture.use_cpus_read_lock = [KNL]

With this parameter you can use the **use_cpus_read_lock()** system call instead of the default **preempt_disable()** system call to disable CPU hotplug while invoking one of the **smp_call_function*()** functions.

scftorture.verbose = [KNL]

With this parameter you can enable additional **printk()** statements.

scftorture.weight_single = [KNL]

This parameter specifies the probability weighting to use for the **smp_call_function_single()** function with a zero "wait" parameter.
A value of -1 selects the default if all other weights are -1. However, if at least one weight has some other value, a value of -1 will instead select a weight of zero.

scftorture.weight_single_wait = [KNL]

This parameter specifies the probability weighting to use for the **smp_call_function_single()** function with a non-zero "wait" parameter. For more information see **weight_single**.

scftorture.weight_many = [KNL]

This parameter specifies the probability weighting to use for the **smp_call_function_many()** function with a zero "wait" parameter.
Note that setting a high probability for this weighting can place serious Inter-processor Interrupt (IPI) load on the system.

For more information see **weight_single**.

scftorture.weight_many_wait = [KNL]

This parameter specifies the probability weighting to use for the **smp_call_function_many()** function with a non-zero "wait" parameter.
For more information see **weight_single** and **weight_many**.

scftorture.weight_all = [KNL]

This parameter specifies the probability weighting to use for the **smp_call_function_all()** function with a zero "wait" parameter.
For more information see **weight_single** and **weight_many**.

scftorture.weight_all_wait = [KNL]

This parameter specifies the probability weighting to use for the **smp_call_function_all()** function with a non-zero "wait" parameter.
For more information see **weight_single** and **weight_many**.

sched_energy_aware

This parameter enables or disables Energy Aware Scheduling (EAS).
EAS starts automatically on platforms with asymmetric CPU topologies which have an Energy Model available.

If your platform meets the requirements for EAS but you do not want to use it, change this value to 0.

torture.disable_onoff_at_boot = [KNL]

With this parameter you can prevent the CPU-hotplug component of torturing until after the **init** task has spawned.

torture.ftrace_dump_at_shutdown = [KNL]

With this parameter you can dump the **ftrace** buffer at torture-test shutdown, even if there were no errors.

This can be a very costly operation when many torture tests are running concurrently, especially on systems with rotating-rust storage.

Updated kernel parameters

iommu.forcedac = [ARM64, X86]

With this parameter you can control input-output virtual address (IOVA) allocation for PCI devices. Format: { 0 | 1 }

- **0** - Try to allocate a 32-bit Direct Memory Access (DMA) address first, before falling back to the full range if needed.
- **1** - Allocate directly from the full usable range. The option is forcing Dual Address Cycle for PCI cards which support greater than 32-bit addressing.

page_poison = [KNL]

With this boot-time parameter you can change the state of poisoning on the buddy allocator, available with the **CONFIG_PAGE_POISONING=y** configuration.

- **off**: turn off poisoning (default)
- **on**: turn on poisoning

rcuscale.gp_async = [KNL]

With this parameter you can measure performance of asynchronous grace-period primitives such as **call_rcu()**.

rcuscale.gp_async_max = [KNL]

With this parameter you can specify the maximum number of outstanding callbacks per writer thread. When a writer thread exceeds this limit, it invokes the corresponding flavor of **rcu_barrier()** to allow previously posted callbacks to drain.

rcuscale.gp_exp = [KNL]

With this parameter you can measure the performance of expedited synchronous grace-period primitives.

rcuscale.holdoff = [KNL]

With this parameter you can set test-start holdoff period. The purpose of this parameter is to delay the start of the test until boot completes in order to avoid interference.

rcuscale.kfree_rcu_test = [KNL]

With this parameter you can measure performance of **kfree_rcu()** flooding.

rcuscale.kfree_nthreads = [KNL]

With this parameter you can specify the number of threads running loops of the **kfree_rcu()** function.

rcuscale.kfree_alloc_num = [KNL]

With this parameter you can specify the number of allocations and frees done in an iteration.

rcuscale.kfree_loops = [KNL]

With this parameter you can specify the number of loops doing **rcuscale.kfree_alloc_num** number of allocations and frees.

rcuscale.nreaders = [KNL]

With this parameter you can set the number of Read-copy-update (RCU) readers.

The value -1 selects N, where N is the number of CPUs.

rcuscale.nwriters = [KNL]

With this parameter you can set the number of Read-copy-update (RCU) writers.
The values operate the same as for **rcuscale.nreaders=N**, where N is the number of CPUs.

rcuscale.perf_type = [KNL]

With this parameter you can specify the Read-copy-update (RCU) implementation to test.

rcuscale.shutdown = [KNL]

With this parameter you can shut the system down after performance tests complete. This is useful for hands-off automated testing.

rcuscale.verbose = [KNL]

With this parameter you can enable additional **printk()** statements.

rcuscale.writer_holdoff = [KNL]

With this parameter you can write-side holdoff between grace periods in microseconds.
The default value is zero and it means "no holdoff".

security = [SECURITY]

With this parameter you can choose a legacy "major" security module to be enabled at boot.
This has been deprecated by the **lsm** parameter.

split_lock_detect = [X86]

With this parameter you can enable split lock detection or bus lock detection.
When enabled, and if hardware support is present, atomic instructions that access data across cache line boundaries will result in:

- an alignment check exception for split lock detection
- a debug exception for bus lock detection
  Possible values:
- **off** - the functionality is not enabled
- **warn** - the kernel emits rate-limited warnings about applications and trigger the #AC exception or the #DB exception. This mode is the default on CPUs that support the split lock detection or the bus lock detection. The default behavior is by #AC if both features are enabled in hardware.
- **fatal** - the kernel sends the **SIGBUS** signal to applications that trigger the #AC exception or the #DB exception. The default behavior is by #AC if both features are enabled in hardware.
- **ratelimit:N** - sets the system wide rate limit to N bus locks per second for bus lock detection (0 < N ⇐ 1000). N/A for split lock detection.
  If an #AC exception is hit in the kernel or in firmware (for example not while executing in user mode) the kernel will oops in either the **warn** or **fatal** mode.

  #DB exception for bus lock is triggered only when CPL > 0.

usb-storage.quirks =

k = NO_SAME (do not use **WRITE_SAME**, UAS only)

CHAPTER 6. DEVICE DRIVERS

6.1. NEW DRIVERS

Network drivers

- SYNOPSYS DESIGNWARE Ethernet XPCS driver (pcs-xpcs.ko.xz)
- INTEL 10/100/1000 Ethernet PCI driver (dwmac-intel.ko.xz)
- STMMAC 10/100/1000 Ethernet device driver (stmmac.ko.xz)
- Crypto IPSEC for Chelsio Terminator cards. (ch_ipsec.ko.xz): 1.0.0.
- Chelsio NIC TLS ULD driver (ch_ktls.ko.xz): 1.0.0.
- Microsoft Azure Network Adapter driver (mana.ko.xz)
- Core module for Qualcomm Atheros 802.11ax wireless LAN cards. (ath11k.ko.xz)
- Driver support for Qualcomm Technologies 802.11ax WLAN PCIe devices (ath11k_pci.ko.xz)
- MAC to optional PHY connection (phylink.ko.xz)

Graphics drivers and miscellaneous drivers

- MC Driver for Intel client SoC using In-Band ECC (igen6_edac.ko.xz)
- Regmap SoundWire MBQ Module (regmap-sdw-mbq.ko.xz)
- Intel Platform Monitoring Technology PMT driver (intel_pmt.ko.xz)
- Intel PMT Crashlog driver (intel_pmt_crashlog.ko.xz)
- Sysfs structure for UV systems (uv_sysfs.ko.xz)
- Intel PMT Telemetry driver (intel_pmt_telemetry.ko.xz)
- Intel PMT Class driver (intel_pmt_class.ko.xz)
- AMD PMC Driver (amd-pmc.ko.xz)
- MHI Host Interface (mhi.ko.xz)
- Modem Host Interface (MHI) PCI controller driver (mhi_pci_generic.ko.xz)
- vDPA Device Simulator for block device (vdpa_sim_blk.ko.xz): 0.1
- vDPA Device Simulator for networking device (vdpa_sim_net.ko.xz): 0.1
- vp-vdpa (vp_vdpa.ko.xz): 1
- Mellanox VDPA driver (mlx5_vdpa.ko.xz)
- Basic STM framing protocol driver (stm_p_basic.ko.xz)
- MIPI SyS-T STM framing protocol driver (stm_p_sys-t.ko.xz)

- QMI encoder/decoder helper (qmi_helpers.ko.xz)
- ACPI DPTF platform power driver (dptf_power.ko.xz)
- ACPI Platform profile sysfs interface (platform_profile.ko.xz)
- Intel Emmitsburg PCH pinctrl/GPIO driver (pinctrl-emmitsburg.ko.xz)
- Intel Alder Lake PCH pinctrl/GPIO driver (pinctrl-alderlake.ko.xz)
- MPI3 Storage Controller Device Driver (mpi3mr.ko.xz): 00.255.45.01
- device-mapper multipath path selector that selects paths based on the CPU IO is being executed on (dm-io-affinity.ko.xz)
- device-mapper measured service time oriented path selector (dm-historical-service-time.ko.xz)

6.2. UPDATED DRIVERS

Network drivers

- Mellanox 5th generation network adapters (ConnectX series) core driver (mlx5_core.ko.xz) has been updated to version 4.18.0-348.el8.x86_64.
- Realtek RTL8152/RTL8153 Based USB Ethernet Adapters (r8152.ko.xz) has been updated to version v1.11.11.

Graphics and miscellaneous driver updates

- LSI MPT Fusion SAS 3.0 Device Driver (mpt3sas.ko.xz) has been updated to version 37.101.00.00.
- Emulex LightPulse Fibre Channel SCSI driver (lpfc.ko.xz) has been updated to version 0:12.8.0.10.
- QLogic Fibre Channel HBA Driver (qla2xxx.ko.xz) has been updated to version 10.02.00.106-k.
- Driver for Microsemi Smart Family Controller version (smartpqi.ko.xz) has been updated to version 2.1.8-045.
- Broadcom MegaRAID SAS Driver (megaraid_sas.ko.xz) has been updated to version 07.717.02.00-rh1.

CHAPTER 7. BUG FIXES

This part describes bugs fixed in Red Hat Enterprise Linux 8.5 that have a significant impact on users.

7.1. INSTALLER AND IMAGE CREATION

RHEL installation no longer aborts when Insights client fails to register system

Previously, the RHEL installation failed with an error at the end if the Red Hat Insights client failed to register the system during the installation. With this update, the system completes the installation even if the insights client fails. The user is notified about the error during installation so the error can be handled later independently.

(BZ#1931069)

Anaconda allows data encryption for automatically created disk layout in the custom partitioning screen

Previously, requesting encrypted disk layout when the disk layout was automatically created in the custom partitioning screen was not possible. With this update, Anaconda provides an option on the custom partitioning screen to encrypt the automatically created disk layout.

(BZ#1903786)

Installation program does not attempt automatic partitioning when partitioning scheme is not specified in the Kickstart file

When using a Kickstart file to perform an automated installation, the installation program does not attempt to perform automatic partitioning when you do not specify any partitioning scheme in the Kickstart file. The installation process is interrupted and allows the user to configure the partitioning.

(BZ#1954408)

RHEL-Edge container image now uses nginx and serves on port 8080

Previously, the **edge-container** image type was unable to run in non-root mode. As a result, Red Hat OpenShift 4 was unable to use the **edge-container** image type. With this enhancement, the container now uses **nginx** HTTP server to serve the commit and a configuration file that allows the server to run as a non-root user inside the container, enabling its use on Red Hat OpenShift 4. The internal web server now uses the port **8080** instead of **80**.

(BZ#1945238)

7.2. SHELLS AND COMMAND-LINE TOOLS

opal-prd rebased to version 6.7.1

opal-prd has been upgraded to version 6.7.1. Notable bug fixes and enhancements include:

- Fixed **xscom** error logging issues caused due to **xscom OPAL** call.
- Fixed possible deadlock with the **DEBUG** build.
- Fallback to **full_reboot** if **fast-reboot** fails in **core/platform**.
- Fixed **next_ungarded_primary** in **core/cpu**.

- Improved rate limit timer requests and the timer state in Self-Boot Engine (SBE).

(BZ#1921665)

libservicelog rebased to version 1.1.19

libservicelog has been upgraded to version 1.1.19. Notable bug fixes and enhancements include:

- Fixed output alignment issue.
- Fixed **segfault** on **servicelog_open()** failure.

(BZ#1844430)

ipmitool sol activate command no longer crashes

Previously, after upgrading from RHEL 7 to RHEL 8 the **ipmitool sol activate** command would crash while trying to access the remote console on an IBM DataPower appliance.

With this update, the bug has been fixed and one can use **ipmitool** to access the remote console again.

(BZ#1951480)

Relax-and-Recover (ReaR) package now depends on the bootlist executable

Previously, ReaR could produce a rescue image without the bootlist executable on the IBM Power Systems, Little Endian architecture. Consequently, if the **powerpc-utils-core** package is not installed, the rescue image did not contain the bootlist executable.

With this update, the ReaR package now depends on the bootlist executable. The dependency ensures that the bootlist executable is present. ReaR does not create a rescue image if the bootlist executable is missing. This avoids creating an invalid rescue image.

(BZ#1983013)

rsync with an unprivileged remote user can now be used in ReaR

Previously, when rsync was used to back up and restore the system data **(BACKUP=RSYNC)**, the parameters to rsync were incorrectly quoted, and the **--fake-super** parameter was not passed to the remote rsync process. Consequently, the file metadata was not correctly saved and restored.

With this update following bugs have been fixed:

- ReaR uses the correct parameters for rsync.
- Improved rsync code for error detection during backup and restore:
  - If there is a rsync error detected during the backup, ReaR aborts with an error message.
  - If there is a rsync error detected during the restore, ReaR displays a warning message.

In the **/etc/rear/local.conf** file set **BACKUP_INTEGRITY_CHECK=1** to turn the warning into an error message.

(BZ#1930662)

Loss of backup data on network shares when using ReaR does not occur anymore

Previously, when a network file system like NFS was used to store the ReaR backups, in case of an error ReaR removed the directory where the NFS was mounted. Consequently, this caused backup data loss.

With this update, ReaR now uses a new method to unmount network shares. This new method does not remove the content of the mounted filesystem when it is removes the mount point. The loss of backup data on network shares when using ReaR is now fixed.

(BZ#1958247)

ReaR can now be used to back up and recover machines that use ESP

Previously, ReaR did not create Extensible Firmware Interface (EFI) entries when software RAID (MDRAID) is used for the EFI System Partition on machines with Unified Extensible Firmware Interface (UEFI) firmware. When a system with UEFI firmware and EFI System Partition on software RAID were recovered using ReaR; the recovered system was unbootable and required manual intervention to fix the boot EFI variables.

With this update, the support for creating boot EFI entries for software RAID devices is added to ReaR. ReaR can now be used to back up and recover machines that use EFI System Partition (ESP) on software RAID, without manual post-recovery intervention.

(BZ#1958222)

/etc/slp.spi file added to openslp package

Previously, the **/etc/slp.spi** file was missing in the **openslp** package. Consequently, the **/usr/bin/slptool** command did not generate output. With this update, **/etc/slp.spi** has been added to **openslp**.

(BZ#1965649)

BM Power Systems, Little Endian architecture machines with multipath can now be safely recovered using ReaR

Previously, the **/sys** file system was not mounted in the chroot when ReaR was recovering the system. The **ofpathname** executable on the IBM Power Systems, Little Endian architecture failed when installing the boot loader. Consequently, the error remained undetected and the recovered system was unbootable.

With this update, ReaR now mounts the **/sys** file system in the recovery chroot. ReaR ensures that **ofpathname** is present in the rescue system on Power Systems, Little Endian architecture machines.

(BZ#1983003)

The which utility no longer aborts with a syntax error message when used with an alias

Previously, when you tried to use the **which** command with an alias, for example, **A=B which ls**, the **which** utility aborted with the syntax error message **bash: syntax error near unexpected token `('**.

This bug has been fixed, and **which** correctly displays the full path of the command without an error message.

(BZ#1940468)

7.3. INFRASTRUCTURE SERVICES

Permissions of the /var/lib/chrony have changed

Previously, enterprise security scanners would flag the **/var/lib/chrony** directory for having world-readable and executable permissions. With this update, the permissions of the **/var/lib/chrony** directory have changed to limit access only to the root and chrony users.

(BZ#1939295)

7.4. SECURITY

GnuTLS no longer rejects SHA-1-signed CAs if they are explicitly trusted

Previously, the **GnuTLS** library checked signature hash strength of all certificate authorities (CA) even if the CA was explicitly trusted. As a consequence, chains containing CAs signed with the SHA-1 algorithm were rejected with the error message **certificate's signature hash strength is unacceptable**. With this update, **GnuTLS** excludes trusted CAs from the signature hash strength checks and therefore no longer rejects certificate chains containing CAs even if they are signed using weak algorithms.

(BZ#1965445)

Hardware optimization enabled in FIPS mode

Previously, the Federal Information Processing Standard (FIPS 140-2) did not allow using hardware optimization. Therefore, the operation was disabled in the **libgcrypt** package when in the FIPS mode. This update enables hardware optimization in FIPS mode, and as a result, all cryptographic operations are performed faster.

(BZ#1976137)

leftikeport and rightikeport options work correctly

Previously, Libreswan ignored the **leftikeport** and **rightikeport** options in any host-to-host Libreswan connections. As a consequence, Libreswam used the default ports regardless of any non-default options settings. With this update, the issue is now fixed and you can use **leftikeport** and **rightikeport** connection options over the default options.

(BZ#1934058)

SELinux policy did not allow GDM to set the GRUB boot_success flag

Previously, SELinux policy did not allow the GNOME Display Manager (GDM) to set the GRUB **boot_success** flag during the power-off and reboot operations. Consequently, the GRUB menu appeared on the next boot. With this update, the SELinux policy introduces a new **xdm_exec_bootloader** boolean that allows the GDM to set the GRUB **boot_success** flag, and which is enabled by default. As a result, the GRUB boot menu is shown on the first boot and the flicker-free boot support feature works correctly.

(BZ#1994096)

selinux-policy now supports IPsec-based VPNs using TCP encapsulation

Since RHEL 8.4, the **libreswan** packages have supported IPsec-based VPNs using TCP encapsulation, but the **selinux-policy** package did not reflect this update. As a consequence, when Libreswan was configured to use TCP, the **ipsec** service failed to bind to the given TCP port. With this update to the **selinux-policy** package, the **ipsec** service can bind and connect to the commonly used TCP port **4500**, and therefore you can use TCP encapsulation in IPsec-based VPNs.

(BZ#1931848)

SELinux policy now prevents staff_u users from switching to unconfined_r

Previously, when the **secure_mode** boolean was enabled, **staff_u** users could incorrectly switch to the **unconfined_r** role. As a consequence, **staff_u** users could perform privileged operations affecting the security of the system. With this fix, SELinux policy prevents **staff_u** users from switching to the **unconfined_r** role using the **newrole** command. As a result, unprivileged users cannot run privileged operations.

(BZ#1947841)

OSCAP Anaconda Addon now handles customized profiles

Previously, the **OSCAP Anaconda Addon** plugin did not correctly handle security profiles with customizations in separate files. Consequently, the customized profiles were not available in the RHEL graphical installation even when you specified them in the corresponding Kickstart section. The handling has been fixed, and you can use customized SCAP profiles in the RHEL graphical installation.

(BZ#1691305)

OpenSCAP no longer fails during evaluation of the STIG profile and other SCAP content

Previously, initialization of the cryptography library in OpenSCAP was not performed properly in OpenSCAP, specifically in the **filehash58** probe. As a consequence, a segmentation fault occurred while evaluating SCAP content containing the **filehash58_test** Open Vulnerability Assessment Language (OVAL) test. This affected in particular the evaluation of the STIG profile for Red Hat Enterprise Linux 8. The evaluation failed unexpectedly and results were not generated. The process of initializing libraries has been fixed in the new version of the **openscap** package. As a result, OpenSCAP no longer fails during the evaluation of the STIG profile for RHEL 8 and other SCAP content that contains the **filehash58_test** OVAL test.

(BZ#1959570)

Ansible updates banner files only when needed

Previously, the playbook used for banner remediation always removed the file and recreated it. As a consequence, the banner file inodes were always modified regardless of need. With this update, the Ansible remediation playbook has been improved to use the **copy** module, which first compares existing content with the intended content and only updates the file when needed. As a result, banner files are only updated when the existing content differs from the intended content.

(BZ#1857179)

USB devices now work correctly with the DISA STIG profile

Previously, the DISA STIG profile enabled the **USBGuard** service but did not configure any initially connected USB devices. Consequently, the **USBGuard** service blocked any device that was not specifically allowed. This made some USB devices, such as smart cards, unreachable. With this update, the initial USBGuard configuration is generated when applying the DISA STIG profile and allows the use of any connected USB device. As a result, USB devices are not blocked and work correctly.

(BZ#1946252)

OSCAP Anaconda Addon now installs all selected packages in text mode

Previously, the **OSCAP Anaconda Addon** plugin did not evaluate rules that required certain partition layout or package installations and removals before the installation started when running in text mode. Consequently, when a security policy profile was specified using Kickstart and the installation was running in text mode, any additional packages required by a selected security profile were not installed.

OSCAP Anaconda Addon now performs the required checks before the installation starts regardless of whether the installation is graphical or text-based, and all selected packages are installed also in text mode.

(BZ#1674001)

rpm_verify_permissions removed from the CIS profile

The **rpm_verify_permissions** rule, which compares file permissions to package default permissions, has been removed from the Center for Internet Security (CIS) Red Hat Enterprise Linux 8 Benchmark. With this update, the CIS profile is aligned with the CIS RHEL 8 benchmark, and as a result, this rule no longer affects users who harden their systems according to CIS.

(BZ#1843913)

7.5. KERNEL

A revert of upstream patch allows some systemd services and user-space workloads to run as expected

The backported upstream change to the **mknod()** system call caused the **open()** system call to be more privileged with respect to device nodes than **mknod()**. Consequently, multiple user-space workloads and some **systemd** services in containers became unresponsive. With this update, the incorrect behavior has been reverted and no crashes occur any more.

(BZ#1902543)

Improved performance regression in memory accounting operations

Previously, a slab memory controller was increasing the frequency of memory accounting operations per slab. Consequently, a performance regression occurred due to an increased number of memory accounting operations. To fix the problem, the memory accounting operations have been streamlined to use as much caching and as little atomic operations as possible. As a result, a slight performance regression still remains. However, the user experience is much better.

(BZ#1959772)

Hard lockups and system panic no longer occur when issuing multiple SysRg-T magic keys

Issuing multiple SysRg-T magic key sequences to a system caused an interrupt to be disabled for an extended period of time, depending on the serial console speed, and on the volume of information being printed out. This prolonged disabled-interrupt time often resulted in a hard lockup followed by a system panic. This update brings the SysRg-T key sequence to substantially reduce the period when interrupt is disabled. As a result, no hard lockups or system panic occur in the described scenario.

(BZ#1954363)

Certain BCC utilities do not display the "macro redefined" warning anymore

Macro redefinitions in some compiler-specific kernel headers caused some BPF Compiler Collection (BCC) utilities to display the following zero-impact warning:

```
warning: '__no_sanitize_address' macro redefined [-Wmacro-redefined]
```

With this update, the problem has been fixed by removing the macro redefinitions. As a result, the relevant BCC utilities no longer display the warning in this scenario.

(BZ#1907271)

kdump no longer fails to dump vmcore on SSH or NFS targets

Previously, when configuring a network interface card (NIC) port to a static IP address and setting **kdump** to dump **vmcore** on SSH or NFS dump targets, the **kdump** service started with the following error message:

```
ipcalc: command not found
```

Consequently, a **kdump** on SSH or NFS dump targets eventually failed.

This update fixes the problem and the **kexec-tools** utility no longer depends on the **ipcalc** tool for IP address and netmask calculation. As a result, the **kdump** works as expected when you use SSH or NFS dump targets.

(BZ#1931266)

Certain networking kernel drivers now properly display their version

The behavior for module versioning of many networking kernel drivers changed in RHEL 8.4. Consequently, those drivers did not display their version. Alternatively, after executing the **ethtool -i** command, the drivers displayed the **kernel** version instead of the **driver** version. This update fixes the bug by providing the kernel module strings. As a result, users can determine versions of the affected kernel drivers.

(BZ#1944639)

The hwloc commands now return correct data on single CPU Power9 and Power10 logical partitions

With the **hwloc** utility of version 2.2.0, any single-node Non-Uniform Memory Access (NUMA) system that ran a Power9 or Power10 CPU was considered to be "disallowed". Consequently, all **hwloc** commands did not work, because NODE0 (socket 0, CPU 0) was offline and the **hwloc** source code expected NODE0 to be online. The following error message was displayed:

```
Topology does not contain any NUMA node, aborting!
```

With this update, **hwloc** has been fixed so that its source code checks to see if NODE0 is online before querying it. If NODE0 is not online, the code proceeds to the next online NODE.

As a result, the **hwloc** command does not return any errors in the described scenario.

(BZ#1917560)

7.6. FILE SYSTEMS AND STORAGE

Records obtained from getaddrinfo() now include a default TTL

Previously, API did not convey time-to-live (TTL) information, which left TTL unset for address records obtained through **getaddrinfo()**, even if they were obtained from the DNS. As a consequence, the **key.dns_resolver** upcall program did not set an expiry time on **dns_resolver** records, unless the records included a component obtained directly from the DNS, such as an SRV or AFSDB record. With this update, records from **getaddrinfo()** now include a default TTL of 10 minutes to prevent an unset expiry time.

(BZ#1661674)

7.7. HIGH AVAILABILITY AND CLUSTERS

The ocf:heartbeat:pgsql resource agent and some third-party agents no longer fail to stop during a shutdown process

In the RHEL 8.4 GA release, Pacemaker's **crm_mon** command-line tool was modified to display a "shutting down" message rather than the usual cluster information when Pacemaker starts to shut down. As a consequence, shutdown progress, such as the stopping of resources, could not be monitored. In this situation, resource agents that parse **crm_mon** output in their stop operation (such as the **ocf:heartbeat:pgsql** agent distributed with the resource-agents package, or some custom or third-party agents) could fail to stop, leading to cluster problems. This bug has been fixed, and the described problem no longer occurs.

(BZ#1948620)

7.8. DYNAMIC PROGRAMMING LANGUAGES, WEB AND DATABASE SERVERS

pyodbc works again with MariaDB 10.3

The **pyodbc** module did not work with the **MariaDB 10.3** server included in the RHEL 8.4 release. The root cause in the **mariadb-connector-odbc** package has been fixed, and **pyodbc** now works with **MariaDB 10.3** as expected.

Note that earlier versions of the **MariaDB 10.3** server and the **MariaDB 10.5** server were not affected by this problem.

(BZ#1944692)

7.9. COMPILERS AND DEVELOPMENT TOOLS

GCC Toolset 11: GCC 11 now defaults to DWARF 4

While upstream GCC 11 defaults to using the DWARF 5 debugging format, GCC of GCC Toolset 11 defaults to DWARF 4 to stay compatible with RHEL 8 components, for example, **rpmbuild**.

(BZ#1974402)

The tunables framework now parses GLIBC_TUNABLES correctly

Previously, the tunables framework did not parse the **GLIBC_TUNABLES** environment variable correctly for non-setuid children of setuid programs. As a consequence, in some cases all tunables remained in non-setuid children of setuid programs. With this update, tunables in the **GLIBC_TUNABLES** environment variable are correctly parsed. As a result, only a restricted subset of identified tunables are now inherited by non-setuid children of setuid programs.

(BZ#1934155)

The semctl system call wrapper in glibc now treats SEM_STAT_ANY like SEM_STAT

Previously, the **semctl** system call wrapper in **glibc** did not treat the kernel argument **SEM_STAT_ANY** like **SEM_STAT**. As a result, **glibc** did not pass the address of the result object **struct semid_ds** to the

kernel, so that the kernel failed to update it. With this update, **glibc** now treats **SEM_STAT_ANY** like **SEM_STAT**, and as a result, applications can obtain **struct semid_ds** data using **SEM_STAT_ANY**.

(BZ#1912670)

Glibc now includes definitions for IPPROTO_ETHERNET, IPPROTO_MPTCP, and INADDR_ALLSNOOPERS_GROUP

Previously, the **Glibc** system library headers (**/usr/include/netinet/in.h**) did not include definitions of **IPPROTO_ETHERNET**, **IPPROTO_MPTCP**, and **INADDR_ALLSNOOPERS_GROUP**. As a consequence, applications needing these definitions failed to compile. With this update, the system library headers now include the new network constant definitions for **IPPROTO_ETHERNET**, **IPPROTO_MPTCP**, and **INADDR_ALLSNOOPERS_GROUP** resulting in correctly compiling applications.

(BZ#1930302)

gcc rebased to version 8.5

The GNU Compiler Collection (GCC) has been rebased to upstream version 8.5, which provides a number of bug fixes over the previous version.

(BZ#1946758)

Incorrect file decryption using OpenSSL aes-cbc mode

The OpenSSL EVP **aes-cbc** mode did not decrypt files correctly, because it expects to handle padding while the Go CryptoBlocks interface expects full blocks. This issue has been fixed by disabling padding before executing EVP operations in OpenSSL.

(BZ#1979100)

7.10. IDENTITY MANAGEMENT

FreeRADIUS no longer incorrectly generating default certificates when the bootstrap script is run

A bootstrap script runs each time FreeRADIUS is started. Previously, this script generated new testing certificates in the **/etc/raddb/certs** directory and as a result, the FreeRADIUS server sometimes failed to start as these testing certificates were invalid. For example, the certificates might have expired. With this update, the bootstrap script checks the **/etc/raddb/certs** directory and if it contains any testing or customer certificates, the script is not run and the FreeRADIUS server should start correctly.

Note that the testing certificates are only for testing purposes during the configuration of FreeRADIUS and should not be used in a real environment. The bootstrap script should be deleted once the users' certificates are used.

(BZ#1954521)

FreeRADIUS no longer fails to create a core dump file

Previously, FreeRADIUS did not create a core dump file when **allow_core_dumps** was set to **yes**. Consequently, no core dump files were created if any process failed. With this update, when you set **allow_core_dumps** to **yes**, FreeRADIUS now creates a core dump file if any process fails.

(BZ#1977572)

SSSD correctly evaluates the default setting for the Kerberos keytab name in /etc/krb5.conf

Previously, if you defined a non-standard location for your **krb5.keytab** file, SSSD did not use this location and used the default **/etc/krb5.keytab** location instead. As a result, when you tried to log into the system, the login failed as the **/etc/krb5.keytab** contained no entries.

With this update, SSSD now evaluates the **default_keytab_name** variable in the **/etc/krb5.conf** and uses the location specified by this variable. SSSD only uses the default **/etc/krb5.keytab** location if the **default_keytab_name** variable is not set.

(BZ#1737489)

Running sudo commands no longer exports the KRB5CCNAME environment variable

Previously, after running **sudo** commands, the environment variable **KRB5CCNAME** pointed to the Kerberos credential cache of the original user, which might not be accessible to the target user. As a result Kerberos related operations might fail as this cache is not accessible. With this update, running **sudo** commands no longer sets the **KRB5CCNAME** environment variable and the target user can use their default Kerberos credential cache.

(BZ#1879869)

Kerberos now only requests permitted encryption types

Previously, RHEL did not apply permitted encryption types specified in the **permitted_enctypes** parameter in the **/etc/krb5.conf** file if the **default_tgs_enctypes** or **default_tkt_enctypes** parameters were not set. Consequently, Kerberos clients were able to request deprecated cipher suites, such as RC4, which might cause other processes to fail. With this update, RHEL applies the encryption types set in **permitted_enctypes** to the default encryption types as well, and processes can only request permitted encryption types.

If you use Red Hat Identity Management (IdM) and want to set up a trust with Active Directory (AD), note that the RC4 cipher suite, which is deprecated in RHEL 8, is the default encryption type for users, services, and trusts between AD domains in an AD forest. You can use one of the following options:

- (Preferred): Enable strong AES encryption types in AD. For details, see the AD DS: Security: Kerberos "Unsupported etype" error when accessing a resource in a trusted domain Microsoft article.
- Use the **update-crypto-policies --set DEFAULT:AD-SUPPORT** command on RHEL hosts that should be members of an AD domain to enable the deprecated RC4 encryption type for backwards compatibility with AD.

(BZ#2005277)

The replication session update speed is now enhanced

Previously, when the changelog contained larger updates, the replication session started from the beginning of the changelog. This slowed the session down. The using of a small buffer to store the update from a changelog during the replication session caused this. With this update, the replication session checks that the buffer is large enough to store the update at the starting point. The replication session starts sending updates immediately.

(BZ#1898541)

The database indexes created by plug-ins are now enabled

Previously, when a server plug-in created its own database indexes, you had to enable those indexes manually. With this update, the indexes are enabled immediately after creation by default.

(BZ#1951020)

7.11. RED HAT ENTERPRISE LINUX SYSTEM ROLES

Role tasks no longer change when running the same output

Previously, several of the role tasks would report as **CHANGED** when running the same input once again, even if there were no changes. Consequently, the role was not acting idempotent. To fix the issue, perform the following actions:

- Check if configuration variables change before applying them. You can use the option **--check** for this verification.
- Do not add a **Last Modified: $date** header to the configuration file.

As a result, the role tasks are idempotent.

(BZ#1960375)

relayhost parameter no longer incorrectly defined in the Postfix documentation

Previously, the **relayhost** parameter of the Postfix RHEL system role was defined as **relay_host** in the **doc /usr/share/doc/rhel-system-roles/postfix/README.md** documentation provided by **rhel-system-roles**. This update fixes the issue and the **relayhost** parameter is now correctly defined in the **Postfix** documentation.

(BZ#1866544)

Postfix RHEL system role README.md no longer missing variables under the "Role Variables" section

Previously, the **Postfix** RHEL system role variables, such as **postfix_check**, **postfix_backup**, **postfix_backup_multiple** were not available under the "Role Variables" section. Consequently, users were not able to consult the Postfix role documentation. This update adds role variable documentation to the **Postfix** README section. The role variables are documented and available for users in the **doc/usr/share/doc/rhel-system-roles/postfix/README.md** documentation provided by **rhel-system-roles**.

(BZ#1961858)

Postfix role README no longer uses plain role name

Previously, the examples provided in the **/usr/share/ansible/roles/rhel-system-roles.postfix/README.md** used the plain version of the role name, **postfix**, instead of using **rhel-system-roles.postfix**. Consequently, users would consult the documentation and incorrectly use the plain role name instead of Full Qualified Role Name (FQRN). This update fixes the issue, and the documentation contains examples with the FQRN, **rhel-system-roles.postfix**, enabling users to correctly write playbooks.

(BZ#1958963)

The output log of timesync only reports harmful errors

Previously, the **timesync** RHEL system role used the **ignore_errors** directive with separate checking for task failure in many tasks. Consequently, the output log of the successful role run was full of harmless errors. The users were safe to ignore those errors, but still they were distressing to see. In this update, the relevant tasks have been rewritten not to use **ignore_errors**. As a result, the output log is now clean, and only role-stopping errors are reported.

(BZ#1938014)

The requirements.txt file no longer missing in the Ansible collection

Previously, the **requirements.txt** file, responsible for specifying the python dependencies, was missing in the Ansible collection. This fix adds the missing file with the correct dependencies at the **/usr/share/ansible/collections/ansible_collections/redhat/rhel_system_roles/requirements.tx** path.

(BZ#1954747)

Traceback no longer observed when set type: partition for storage_pools

Previously, when setting the variable **type** as **partition** for **storage_pools** in a playbook, running this playbook would fail and indicate **traceback**. This update fixes the issue and the **Traceback** error no longer appears.

(BZ#1854187)

SElinux role no longer perform unnecessary reloads

Previously, the **SElinux** role would not check if changes were actually applied before reloading the **SElinux** policy. As a consequence, the **SElinux** policy was being reloaded unnecessarily, which had an impact on the system resources. With this fix, the **SElinux** role now uses ansible handlers and conditionals to ensure that the policy is only reloaded if there is a change. As a result, the **SElinux** role runs much faster.

(BZ#1757869)

sshd role no longer fails to start with the installed sshd_config file on the RHEL6 host.

Previously, when a managed node was running RHEL6, the version of OpenSSH did not support "Match all" in the Match criteria, which was added by the install task. As a consequence, **sshd** failed to start with the installed **sshd_config** file on the RHEL6 host. This update fixes the issue by replacing "Match all" with "Match address *" for the RHEL6 **sshd_config** configuration file, as the criteria is supported in the version of OpenSSH. As a result, the **sshd** RHEL system role successfully starts with the installed **sshd_config** file on the RHEL6 host.

(BZ#1990947)

The SSHD role name in README.md examples no longer incorrect

Previously, in the sshd **README.md** file, the examples reference calling the role with the **willshersystems.sshd** name. This update fixes the issue, and now the example references correctly refers to the role as "rhel_system_roles.sshd".

(BZ#1952090)

The key/certs source files are no longer copied when tls is false

Previously, in the **logging** RHEL system role elasticsearch output, if the **key/certs** source files path on the control host were configured in the playbook, they would be copied to the managed hosts, even if **tls**

was set to **false**. Consequently, if the **key**/**cert** file paths were configured and **tls** was set to **false**, the command would fail, because the copy source files did not exist. This update fixes the issue, and copying the **key**/**certs** is executed only when the **tls** param is set to **true**.

(BZ#1994580)

Task to enable logging for targeted hosts in the metric role now works

Previously, a bug in the **metric** RHEL system role prevented referring to targeted hosts in the **enabling the performance metric logging** task. Consequently, the control file for performance metric logging was not generated. This update fixes the issue, and now the targeted hosts are correctly referred to. As a result, the control file is successfully created, enabling the performance metric logging execution.

(BZ#1967335)

sshd_hostkey_group and sshd_hostkey_mode variables now configurable in the playbook

Previously, the **sshd_hostkey_group** and **sshd_hostkey_mode** variables were unintentionally defined in both **defaults** and **vars** files. Consequently, users were unable to configure those variables in the playbook. With this fix, the **sshd_hostkey_group** is renamed to **__sshd_hostkey_group** and **sshd_hostkey_mode** to **__sshd_hostkey_mode** for defining the constant value in the **vars** files. In the **default** file, **sshd_hostkey_group** is set to **__sshd_hostkey_group** and **sshd_hostkey_mode** to **__sshd_hostkey_mode**. As a result, users can now configure the **sshd_hostkey_group** and **sshd_hostkey_mode** variables in the playbook.

(BZ#1966711)

RHEL system roles internal links in README.md are no longer broken

Previously, the internal links available in the **README.md** files were broken. Consequently, if a user clicked a specific section documentation link, it would not redirect users to the specific **README.md** section. This update fixes the issue and now the internal links point users to the correct section.

(BZ#1962976)

7.12. RHEL IN CLOUD ENVIRONMENTS

nm-cloud-setup utility now sets the correct default route on Microsoft Azure

Previously, on Microsoft Azure, the **nm-cloud-setup** utility failed to detect the correct gateway of the cloud environment. As a consequence, the utility set an incorrect default route, and connectivity failed. This update fixes the problem. As a result, **nm-cloud-setup** utility now sets the correct default route on Microsoft Azure.

(BZ#1912236)

SSH keys are now generated correctly on EC2 instances created from a backup AMI

Previously, when creating a new Amazon EC2 instance of RHEL 8 from a backup Amazon Machine Image (AMI), **cloud-init** deleted existing SSH keys on the VM but did not create new ones. Consequently, the VM in some cases could not connect to the host.

This problem has been fixed for newly created RHEL 8.5 VMs. For VMs that were upgraded from RHEL 8.4 or earlier, you must work around the issue manually.

To do so, edit the **cloud.cfg** file and changing the **ssh_genkeytypes: ~** line to **ssh_genkeytypes: ['rsa', 'ecdsa', 'ed25519']**. This makes it possible for SSH keys to be deleted and generated correctly when provisioning a RHEL 8 VM in the described circumstances.

(BZ#1957532)

RHEL 8 running on AWS ARM64 instances can now reach the specified network speed

When using RHEL 8 as a guest operating system in a virtual machine (VM) that runs on an Amazon Web Services (AWS) ARM64 instance, the VM previously had lower than expected network performance when the **iommu.strict=1** kernel parameter was used or when no **iommu.strict** parameter was defined.

This problem no longer occurs in RHEL 8.5 Amazon Machine Images (AMIs) provided by Red Hat. In other types of images, you can work around the issue by changing the parameter to **iommu.strict=0**. This includes:

- RHEL 8.4 and earlier images
- RHEL 8.5 images upgraded from an earlier version using **yum update**
- RHEL 8.5 images not provided by Red Hat

(BZ#1836058)

Core dumping RHEL 8 virtual machines to a remote machine on Azure now works more reliably

Previously, using the **kdump** utility to save the core dump file of a RHEL 8 virtual machine (VM) on a Microsoft Azure hypervisor to a remote machine did not work correctly when the VM was using a NIC with enabled accelerated networking. As a consequence, the dump file was saved after approximately 200 seconds, instead of immediately. In addition, the following error message was logged on the console before the dump file is saved.

```
device (eth0): linklocal6: DAD failed for an EUI-64 address
```

With this update, the underlying code has been fixed, and in the described circumstances, dump files are now saved immediately.

(BZ#1854037)

Hibernating RHEL 8 guests now works correctly when FIPS mode is enabled

Previously, it was not possible to hibernate a virtual machine (VM) that was using RHEL 8 as its guest operating system if the VM was using FIPS mode. The underlying code has been fixed and the affected VMs can now hibernate correctly.

(BZ#1934033, BZ#1944636)

7.13. CONTAINERS

UBI 9-Beta containers can run on RHEL 7 and 8 hosts

Previously, the UBI 9-Beta container images had an incorrect seccomp profile set in the **containers-common** package. As a consequence, containers were not able to deal with certain system calls causing a failure. With this update, the problem has been fixed.

(BZ#2019901)

CHAPTER 8. TECHNOLOGY PREVIEWS

This part provides a list of all Technology Previews available in Red Hat Enterprise Linux 8.5.

For information on Red Hat scope of support for Technology Preview features, see Technology Preview Features Support Scope.

8.1. SHELLS AND COMMAND-LINE TOOLS

ReaR available on the 64-bit IBM Z architecture as a Technology Preview

Basic Relax and Recover (ReaR) functionality is now available on the 64-bit IBM Z architecture as a Technology Preview. You can create a ReaR rescue image on IBM Z only in the z/VM environment. Backing up and recovering logical partitions (LPARs) has not been tested.

The only output method currently available is Initial Program Load (IPL). IPL produces a kernel and an initial ramdisk (initrd) that can be used with the **zIPL** bootloader.

For more information, see Using a ReaR rescue image on the 64-bit IBM Z architecture .

(BZ#1868421)

8.2. NETWORKING

KTLS available as a Technology Preview

RHEL provides Kernel Transport Layer Security (KTLS) as a Technology Preview. KTLS handles TLS records using the symmetric encryption or decryption algorithms in the kernel for the AES-GCM cipher. KTLS also provides the interface for offloading TLS record encryption to Network Interface Controllers (NICs) that support this functionality.

(BZ#1570255)

AF_XDP available as a Technology Preview

Address Family eXpress Data Path (**AF_XDP**) socket is designed for high-performance packet processing. It accompanies **XDP** and grants efficient redirection of programmatically selected packets to user space applications for further processing.

(BZ#1633143)

XDP features that are available as Technology Preview

Red Hat provides the usage of the following eXpress Data Path (XDP) features as unsupported Technology Preview:

- Loading XDP programs on architectures other than AMD and Intel 64-bit. Note that the **libxdp** library is not available for architectures other than AMD and Intel 64-bit.
- The XDP hardware offloading.

(BZ#1889737)

Multi-protocol Label Switching for TC available as a Technology Preview

The Multi-protocol Label Switching (MPLS) is an in-kernel data-forwarding mechanism to route traffic flow across enterprise networks. In an MPLS network, the router that receives packets decides the

further route of the packets based on the labels attached to the packet. With the usage of labels, the MPLS network has the ability to handle packets with particular characteristics. For example, you can add **tc filters** for managing packets received from specific ports or carrying specific types of traffic, in a consistent way.

After packets enter the enterprise network, MPLS routers perform multiple operations on the packets, such as **push** to add a label, **swap** to update a label, and **pop** to remove a label. MPLS allows defining actions locally based on one or multiple labels in RHEL. You can configure routers and set traffic control (**tc**) filters to take appropriate actions on the packets based on the MPLS label stack entry (**lse**) elements, such as **label**, **traffic class**, **bottom of stack**, and **time to live**.

For example, the following command adds a filter to the *enp0s1* network interface to match incoming packets having the first label *12323* and the second label *45832*. On matching packets, the following actions are taken:

- the first MPLS TTL is decremented (packet is dropped if TTL reaches 0)
- the first MPLS label is changed to *549386*
- the resulting packet is transmitted over *enp0s2*, with destination MAC address *00:00:5E:00:53:01* and source MAC address *00:00:5E:00:53:02*

```
# tc filter add dev enp0s1 ingress protocol mpls_uc flower mpls lse depth 1 label 12323 lse
depth 2 label 45832 \
action mpls dec_ttl pipe \
action mpls modify label 549386 pipe \
action pedit ex munge eth dst set 00:00:5E:00:53:01 pipe \
action pedit ex munge eth src set 00:00:5E:00:53:02 pipe \
action mirred egress redirect dev enp0s2
```

(BZ#1814836, BZ#1856415)

act_mpls module available as a Technology Preview

The **act_mpls** module is now available in the **kernel-modules-extra** rpm as a Technology Preview. The module allows the application of Multiprotocol Label Switching (MPLS) actions with Traffic Control (TC) filters, for example, push and pop MPLS label stack entries with TC filters. The module also allows the Label, Traffic Class, Bottom of Stack, and Time to Live fields to be set independently.

(BZ#1839311)

The systemd-resolved service is now available as a Technology Preview

The **systemd-resolved** service provides name resolution to local applications. The service implements a caching and validating DNS stub resolver, an Link-Local Multicast Name Resolution (LLMNR), and Multicast DNS resolver and responder.

Note that, even if the **systemd** package provides **systemd-resolved**, this service is an unsupported Technology Preview.

(BZ#1906489)

The nispor package is now available as a Technology Preview

The **nispor** package is now available as a Technology Preview, which is a unified interface for Linux network state querying. It provides a unified way to query all running network status through the python and C api, and rust crate. **nispor** works as the dependency in the **nmstate** tool.

You can install the **nispor** package as a dependency of **nmstate** or as an individual package.

- To install **nispor** as an individual package, enter:

```
# yum install nispor
```

- To install **nispor** as a dependency of **nmstate**, enter:

```
# yum install nmstate
```

  nispor is listed as the dependency.

For more information on using **nispor**, refer to **/usr/share/doc/nispor/README.md** file.

(BZ#1848817)

8.3. KERNEL

The kexec fast reboot feature is available as Technology Preview

The **kexec fast reboot** feature continues to be available as a Technology Preview. **kexec fast reboot** significantly speeds the boot process by allowing the kernel to boot directly into the second kernel without passing through the Basic Input/Output System (BIOS) first. To use this feature:

1. Load the **kexec** kernel manually.
2. Reboot the operating system.

(BZ#1769727)

The accel-config package available as a Technology Preview

The **accel-config** package is now available on Intel **EM64T** and **AMD64** architectures as a Technology Preview. This package helps in controlling and configuring data-streaming accelerator (DSA) sub-system in the Linux Kernel. Also, it configures devices via **sysfs** (pseudo-filesystem), saves and loads the configuration in the **json** format.

(BZ#1843266)

SGX available as a Technology Preview

Software Guard Extensions(SGX) is an Intel® technology for protecting software code and data from disclosure and modification. The RHEL kernel partially supports SGX v1 and v1.5. The version 1 enables platforms using the **Flexible Launch Control** mechanism to use the SGX technology.

(BZ#1660337)

eBPF available as a Technology Preview

Extended Berkeley Packet Filter (eBPF)is an in-kernel virtual machine that allows code execution in the kernel space, in the restricted sandbox environment with access to a limited set of functions.

The virtual machine includes a new system call **bpf()**, which supports creating various types of maps, and also allows to load programs in a special assembly-like code. The code is then loaded to the kernel and translated to the native machine code with just-in-time compilation. Note that the **bpf()** syscall can be successfully used only by a user with the **CAP_SYS_ADMIN** capability, such as the root user. See the **bpf(2)** manual page for more information.

The loaded programs can be attached onto a variety of points (sockets, tracepoints, packet reception) to receive and process data.

There are numerous components shipped by Red Hat that utilize the **eBPF** virtual machine. Each component is in a different development phase, and thus not all components are currently fully supported. All components are available as a Technology Preview, unless a specific component is indicated as supported.

The following notable **eBPF** components are currently available as a Technology Preview:

- **bpftrace**, a high-level tracing language that utilizes the **eBPF** virtual machine.
- **AF_XDP**, a socket for connecting the **eXpress Data Path (XDP)** path to user space for applications that prioritize packet processing performance.

(BZ#1559616)

The Intel data streaming accelerator driver for kernel is available as a Technology Preview

The Intel data streaming accelerator driver (IDXD) for the kernel is currently available as a Technology Preview. It is an Intel CPU integrated accelerator and supports a shared work queue with process address space ID (pasid) submission and shared virtual memory (SVM).

(BZ#1837187)

Soft-RoCE available as a Technology Preview

Remote Direct Memory Access (RDMA) over Converged Ethernet (RoCE) is a network protocol which implements RDMA over Ethernet. Soft-RoCE is the software implementation of RoCE which supports two protocol versions, RoCE v1 and RoCE v2. The Soft-RoCE driver, **rdma_rxe**, is available as an unsupported Technology Preview in RHEL 8.

(BZ#1605216)

The stmmac driver is available as a Technology Preview

Red Hat provides the usage of **stmmac** for Intel® Elkhart Lake systems on a chip (SoCs) as an unsupported Technology Preview.

(BZ#1905243)

8.4. FILE SYSTEMS AND STORAGE

File system DAX is now available for ext4 and XFS as a Technology Preview

In Red Hat Enterprise Linux 8, file system DAX is available as a Technology Preview. DAX provides a means for an application to directly map persistent memory into its address space. To use DAX, a system must have some form of persistent memory available, usually in the form of one or more Non-Volatile Dual In-line Memory Modules (NVDIMMs), and a file system that supports DAX must be created

on the NVDIMM(s). Also, the file system must be mounted with the **dax** mount option. Then, an **mmap** of a file on the dax-mounted file system results in a direct mapping of storage into the application's address space.

(BZ#1627455)

OverlayFS

OverlayFS is a type of union file system. It enables you to overlay one file system on top of another. Changes are recorded in the upper file system, while the lower file system remains unmodified. This allows multiple users to share a file-system image, such as a container or a DVD-ROM, where the base image is on read-only media.

OverlayFS remains a Technology Preview under most circumstances. As such, the kernel logs warnings when this technology is activated.

Full support is available for OverlayFS when used with supported container engines (**podman**, **cri-o**, or **buildah**) under the following restrictions:

- OverlayFS is supported for use only as a container engine graph driver or other specialized use cases, such as squashed **kdump** initramfs. Its use is supported primarily for container COW content, not for persistent storage. You must place any persistent storage on non-OverlayFS volumes. You can use only the default container engine configuration: one level of overlay, one lowerdir, and both lower and upper levels are on the same file system.
- Only XFS is currently supported for use as a lower layer file system.

Additionally, the following rules and limitations apply to using OverlayFS:

- The OverlayFS kernel ABI and user-space behavior are not considered stable, and might change in future updates.
- OverlayFS provides a restricted set of the POSIX standards. Test your application thoroughly before deploying it with OverlayFS. The following cases are not POSIX-compliant:
  - Lower files opened with **O_RDONLY** do not receive **st_atime** updates when the files are read.
  - Lower files opened with **O_RDONLY**, then mapped with **MAP_SHARED** are inconsistent with subsequent modification.
  - Fully compliant **st_ino** or **d_ino** values are not enabled by default on RHEL 8, but you can enable full POSIX compliance for them with a module option or mount option.
    To get consistent inode numbering, use the **xino=on** mount option.

    You can also use the **redirect_dir=on** and **index=on** options to improve POSIX compliance. These two options make the format of the upper layer incompatible with an overlay without these options. That is, you might get unexpected results or errors if you create an overlay with **redirect_dir=on** or **index=on**, unmount the overlay, then mount the overlay without these options.
- To determine whether an existing XFS file system is eligible for use as an overlay, use the following command and see if the **ftype=1** option is enabled:

```
# xfs_info /mount-point | grep ftype
```

- SELinux security labels are enabled by default in all supported container engines with OverlayFS.
- Several known issues are associated with OverlayFS in this release. For details, see *Non-standard behavior* in the Linux kernel documentation.

For more information about OverlayFS, see the Linux kernel documentation.

(BZ#1690207)

Stratis is now available as a Technology Preview

Stratis is a new local storage manager. It provides managed file systems on top of pools of storage with additional features to the user.

Stratis enables you to more easily perform storage tasks such as:

- Manage snapshots and thin provisioning
- Automatically grow file system sizes as needed
- Maintain file systems

To administer Stratis storage, use the **stratis** utility, which communicates with the **stratisd** background service.

Stratis is provided as a Technology Preview.

For more information, see the Stratis documentation: Setting up Stratis file systems.

RHEL 8.3 updated Stratis to version 2.1.0. For more information, see Stratis 2.1.0 Release Notes.

(JIRA:RHELPLAN-1212)

Setting up a Samba server on an IdM domain member is provided as a Technology Preview

With this update, you can now set up a Samba server on an Identity Management (IdM) domain member. The new **ipa-client-samba** utility provided by the same-named package adds a Samba-specific Kerberos service principal to IdM and prepares the IdM client. For example, the utility creates the **/etc/samba/smb.conf** with the ID mapping configuration for the **sss** ID mapping back end. As a result, administrators can now set up Samba on an IdM domain member.

Due to IdM Trust Controllers not supporting the Global Catalog Service, AD-enrolled Windows hosts cannot find IdM users and groups in Windows. Additionally, IdM Trust Controllers do not support resolving IdM groups using the Distributed Computing Environment / Remote Procedure Calls (DCE/RPC) protocols. As a consequence, AD users can only access the Samba shares and printers from IdM clients.

For details, see Setting up Samba on an IdM domain member.

(JIRA:RHELPLAN-13195)

NVMe/TCP is available as a Technology Preview

Accessing and sharing Nonvolatile Memory Express (NVMe) storage over TCP/IP networks (NVMe/TCP) and its corresponding **nvme-tcp.ko** and **nvmet-tcp.ko** kernel modules have been added as a Technology Preview.

The use of NVMe/TCP as either a storage client or a target is manageable with tools provided by the **nvme-cli** and **nvmetcli** packages.

The NVMe/TCP target Technology Preview is included only for testing purposes and is not currently planned for full support.

(BZ#1696451)

8.5. HIGH AVAILABILITY AND CLUSTERS

Pacemaker podman bundles available as a Technology Preview

Pacemaker container bundles now run on Podman, with the container bundle feature being available as a Technology Preview. There is one exception to this feature being Technology Preview: Red Hat fully supports the use of Pacemaker bundles for Red Hat Openstack.

(BZ#1619620)

Heuristics in corosync-qdevice available as a Technology Preview

Heuristics are a set of commands executed locally on startup, cluster membership change, successful connect to **corosync-qnetd**, and, optionally, on a periodic basis. When all commands finish successfully on time (their return error code is zero), heuristics have passed; otherwise, they have failed. The heuristics result is sent to **corosync-qnetd** where it is used in calculations to determine which partition should be quorate.

(BZ#1784200)

New fence-agents-heuristics-ping fence agent

As a Technology Preview, Pacemaker now supports the **fence_heuristics_ping** agent. This agent aims to open a class of experimental fence agents that do no actual fencing by themselves but instead exploit the behavior of fencing levels in a new way.

If the heuristics agent is configured on the same fencing level as the fence agent that does the actual fencing but is configured before that agent in sequence, fencing issues an **off** action on the heuristics agent before it attempts to do so on the agent that does the fencing. If the heuristics agent gives a negative result for the **off** action it is already clear that the fencing level is not going to succeed, causing Pacemaker fencing to skip the step of issuing the **off** action on the agent that does the fencing. A heuristics agent can exploit this behavior to prevent the agent that does the actual fencing from fencing a node under certain conditions.

A user might want to use this agent, especially in a two-node cluster, when it would not make sense for a node to fence the peer if it can know beforehand that it would not be able to take over the services properly. For example, it might not make sense for a node to take over services if it has problems reaching the networking uplink, making the services unreachable to clients, a situation which a ping to a router might detect in that case.

(BZ#1775847)

Automatic removal of location constraint following resource move available as a Technology Preview

When you execute the **pcs resource move** command, this adds a constraint to the resource to prevent it from running on the node on which it is currently running. A new **--autodelete** option for the **pcs resource move** command is now available as a Technology Preview. When you specify this option, the

location constraint that the command creates is automatically removed once the resource has been moved.

(BZ#1847102)

8.6. IDENTITY MANAGEMENT

Identity Management JSON-RPC API available as Technology Preview

An API is available for Identity Management (IdM). To view the API, IdM also provides an API browser as a Technology Preview.

Previously, the IdM API was enhanced to enable multiple versions of API commands. These enhancements could change the behavior of a command in an incompatible way. Users are now able to continue using existing tools and scripts even if the IdM API changes. This enables:

- Administrators to use previous or later versions of IdM on the server than on the managing client.
- Developers can use a specific version of an IdM call, even if the IdM version changes on the server.

In all cases, the communication with the server is possible, regardless if one side uses, for example, a newer version that introduces new options for a feature.

For details on using the API, see Using the Identity Management API to Communicate with the IdM Server (TECHNOLOGY PREVIEW).

(BZ#1664719)

DNSSEC available as Technology Preview in IdM

Identity Management (IdM) servers with integrated DNS now support DNS Security Extensions (DNSSEC), a set of extensions to DNS that enhance security of the DNS protocol. DNS zones hosted on IdM servers can be automatically signed using DNSSEC. The cryptographic keys are automatically generated and rotated.

Users who decide to secure their DNS zones with DNSSEC are advised to read and follow these documents:

- DNSSEC Operational Practices, Version 2
- Secure Domain Name System (DNS) Deployment Guide
- DNSSEC Key Rollover Timing Considerations

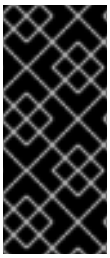
Note that IdM servers with integrated DNS use DNSSEC to validate DNS answers obtained from other DNS servers. This might affect the availability of DNS zones that are not configured in accordance with recommended naming practices.

(BZ#1664718)

ACME available as a Technology Preview

The Automated Certificate Management Environment (ACME) service is now available in Identity Management (IdM) as a Technology Preview. ACME is a protocol for automated identifier validation and certificate issuance. Its goal is to improve security by reducing certificate lifetimes and avoiding manual processes from certificate lifecycle management.

In RHEL, the ACME service uses the Red Hat Certificate System (RHCS) PKI ACME responder. The RHCS ACME subsystem is automatically deployed on every certificate authority (CA) server in the IdM deployment, but it does not service requests until the administrator enables it. RHCS uses the **acmeIPAServerCert** profile when issuing ACME certificates. The validity period of issued certificates is 90 days. Enabling or disabling the ACME service affects the entire IdM deployment.



IMPORTANT

It is recommended to enable ACME only in an IdM deployment where all servers are running RHEL 8.4 or later. Earlier RHEL versions do not include the ACME service, which can cause problems in mixed-version deployments. For example, a CA server without ACME can cause client connections to fail, because it uses a different DNS Subject Alternative Name (SAN).

WARNING

Currently, RHCS does not remove expired certificates. Because ACME certificates expire after 90 days, the expired certificates can accumulate and this can affect performance.

- To enable ACME across the whole IdM deployment, use the **ipa-acme-manage enable** command:

```
# ipa-acme-manage enable
The ipa-acme-manage command was successful
```

- To disable ACME across the whole IdM deployment, use the **ipa-acme-manage disable** command:

```
# ipa-acme-manage disable
The ipa-acme-manage command was successful
```

- To check whether the ACME service is installed and if it is enabled or disabled, use the **ipa-acme-manage status** command:

```
# ipa-acme-manage status
ACME is enabled
The ipa-acme-manage command was successful
```

(JIRA:RHELPLAN-58596)

8.7. DESKTOP

GNOME for the 64-bit ARM architecture available as a Technology Preview

The GNOME desktop environment is now available for the 64-bit ARM architecture as a Technology Preview. This enables administrators to configure and manage servers from a graphical user interface (GUI) remotely, using the VNC session.

As a consequence, new administration applications are available on the 64-bit ARM architecture. For example: **Disk Usage Analyzer** (**baobab**), **Firewall Configuration** (**firewall-config**), **Red Hat Subscription Manager** (**subscription-manager**), or the **Firefox** web browser. Using **Firefox**, administrators can connect to the local Cockpit daemon remotely.

(JIRA:RHELPLAN-27394, BZ#1667225, BZ#1667516, BZ#1724302)

GNOME desktop on IBM Z is available as a Technology Preview

The GNOME desktop, including the Firefox web browser, is now available as a Technology Preview on the IBM Z architecture. You can now connect to a remote graphical session running GNOME using VNC to configure and manage your IBM Z servers.

(JIRA:RHELPLAN-27737)

8.8. GRAPHICS INFRASTRUCTURES

VNC remote console available as a Technology Preview for the 64-bit ARM architecture

On the 64-bit ARM architecture, the Virtual Network Computing (VNC) remote console is available as a Technology Preview. Note that the rest of the graphics stack is currently unverified for the 64-bit ARM architecture.

(BZ#1698565)

8.9. RED HAT ENTERPRISE LINUX SYSTEM ROLES

HA Cluster RHEL system role available as a Technology Preview

The High Availability Cluster (HA Cluster) role is now available as a Technology Preview. Currently, the following notable configurations are available:

- Configuring nodes, fence device, resources, resource groups, and resource clones including meta attributes and resource operations
- Configuring cluster properties
- Configuring multi-link clusters
- Configuring custom cluster names and node names
- Configuring whether clusters start automatically on boot
- Configuring a basic corosync cluster and pacemaker cluster properties, stonith and resources.

The **ha_cluster** system role does not currently support constraints. Running the role after constraints are configured manually will remove the constraints, as well as any configuration not supported by the role.

The **ha_cluster** system role does not currently support SBD.

(BZ#1893743, BZ#1978726)

8.10. VIRTUALIZATION

AMD SEV and SEV-ES for KVM virtual machines

As a Technology Preview, RHEL 8 provides the Secure Encrypted Virtualization (SEV) feature for AMD EPYC host machines that use the KVM hypervisor. If enabled on a virtual machine (VM), SEV encrypts the VM's memory to protect the VM from access by the host. This increases the security of the VM.

In addition, the enhanced Encrypted State version of SEV (SEV-ES) is also provided as Technology Preview. SEV-ES encrypts all CPU register contents when a VM stops running. This prevents the host from modifying the VM's CPU registers or reading any information from them.

Note that SEV and SEV-ES work only on the 2nd generation of AMD EPYC CPUs (codenamed Rome) or later. Also note that RHEL 8 includes SEV and SEV-ES encryption, but not the SEV and SEV-ES security attestation.

(BZ#1501618, BZ#1501607, JIRA:RHELPLAN-7677)

Intel vGPU

As a Technology Preview, it is now possible to divide a physical Intel GPU device into multiple virtual devices referred to as **mediated devices**. These mediated devices can then be assigned to multiple virtual machines (VMs) as virtual GPUs. As a result, these VMs share the performance of a single physical Intel GPU.

Note that only selected Intel GPUs are compatible with the vGPU feature.

In addition, it is possible to enable a VNC console operated by Intel vGPU. By enabling it, users can connect to a VNC console of the VM and see the VM's desktop hosted by Intel vGPU. However, this currently only works for RHEL guest operating systems.

(BZ#1528684)

Creating nested virtual machines

Nested KVM virtualization is provided as a Technology Preview for KVM virtual machines (VMs) running on Intel, AMD64, and IBM Z systems hosts with RHEL 8. With this feature, a RHEL 7 or RHEL 8 VM that runs on a physical RHEL 8 host can act as a hypervisor, and host its own VMs.

(JIRA:RHELPLAN-14047, JIRA:RHELPLAN-24437)

Select Intel network adapters now support SR-IOV in RHEL guests on Hyper-V

As a Technology Preview, Red Hat Enterprise Linux guest operating systems running on a Hyper-V hypervisor can now use the single-root I/O virtualization (SR-IOV) feature for Intel network adapters supported by the **ixgbevf** and **iavf** drivers. This feature is enabled when the following conditions are met:

- SR-IOV support is enabled for the network interface controller (NIC)
- SR-IOV support is enabled for the virtual NIC
- SR-IOV support is enabled for the virtual switch
- The virtual function (VF) from the NIC is attached to the virtual machine

The feature is currently supported with Microsoft Windows Server 2019 and 2016.

(BZ#1348508)

ESXi hypervisor and SEV-ES available as a Technology Preview for RHEL VMs

As a Technology Preview, in RHEL 8.4 and later, you can enable the AMD Secure Encrypted Virtualization-Encrypted State (SEV-ES) to secure RHEL virtual machines (VMs) on VMware's ESXi hypervisor, versions 7.0.2 and later.

(BZ#1904496)

Sharing files between hosts and VMs using virtiofs

As a Technology Preview, RHEL 8 now provides the virtio file system (**virtiofs**). Using **virtiofs**, you can efficiently share files between your host system and its virtual machines (VM).

(BZ#1741615)

KVM virtualization is usable in RHEL 8 Hyper-V virtual machines

As a Technology Preview, nested KVM virtualization can now be used on the Microsoft Hyper-V hypervisor. As a result, you can create virtual machines on a RHEL 8 guest system running on a Hyper-V host.

Note that currently, this feature only works on Intel and AMD systems. In addition, nested virtualization is in some cases not enabled by default on Hyper-V. To enable it, see the following Microsoft documentation:

https://docs.microsoft.com/en-us/virtualization/hyper-v-on-windows/user-guide/nested-virtualization

(BZ#1519039)

8.11. CONTAINERS

Toolbox is available as a Technology Preview

Previously, the Toolbox utility was based on RHEL CoreOS github.com/coreos/toolbox. With this release, Toolbox has been replaced with github.com/containers/toolbox.

(JIRA:RHELPLAN-77238)

The podman-machine command is unsupported

The **podman-machine** command for managing virtual machines, is available only as a Technology Preview. Instead, run Podman directly from the command line.

(JIRA:RHELDOCS-16861)

CHAPTER 9. DEPRECATED FUNCTIONALITY

This part provides an overview of functionality that has been *deprecated* in Red Hat Enterprise Linux 8.

Deprecated devices are fully supported, which means that they are tested and maintained, and their support status remains unchanged within Red Hat Enterprise Linux 8. However, these devices will likely not be supported in the next major version release, and are not recommended for new deployments on the current or future major versions of RHEL.

For the most recent list of deprecated functionality within a particular major release, see the latest version of release documentation. For information about the length of support, see Red Hat Enterprise Linux Life Cycle and Red Hat Enterprise Linux Application Streams Life Cycle .

A package can be deprecated and not recommended for further use. Under certain circumstances, a package can be removed from the product. Product documentation then identifies more recent packages that offer functionality similar, identical, or more advanced to the one deprecated, and provides further recommendations.

For information regarding functionality that is present in RHEL 7 but has been *removed* in RHEL 8, see Considerations in adopting RHEL 8 .

For information regarding functionality that is present in RHEL 8 but has been removed in RHEL 9, see Considerations in adopting RHEL 9 .

9.1. INSTALLER AND IMAGE CREATION

Several Kickstart commands and options have been deprecated

Using the following commands and options in RHEL 8 Kickstart files will print a warning in the logs:

- **auth** or **authconfig**
- **device**
- **deviceprobe**
- **dmraid**
- **install**
- **lilo**
- **lilocheck**
- **mouse**
- **multipath**
- **bootloader --upgrade**
- **ignoredisk --interactive**
- **partition --active**
- **reboot --kexec**

Where only specific options are listed, the base command and its other options are still available and not deprecated.

For more details and related changes in Kickstart, see the Kickstart changes section of the *Considerations in adopting RHEL 8* document.

(BZ#1642765)

The --interactive option of the ignoredisk Kickstart command has been deprecated

Using the **--interactive option** in future releases of Red Hat Enterprise Linux will result in a fatal installation error. It is recommended that you modify your Kickstart file to remove the option.

(BZ#1637872)

The Kickstart autostep command has been deprecated

The **autostep** command has been deprecated. The related section about this command has been removed from the RHEL 8 documentation.

(BZ#1904251)

The lorax-composer back end for Image Builder is deprecated in RHEL 8

The **lorax-composer** back end for Image Builder is considered deprecated. It will only receive selected fixes for the rest of the Red Hat Enterprise Linux 8 lifecycle and will be omitted from future major releases. Red Hat recommends that you uninstall **lorax-composer** and install the **osbuild-composer** back end instead.

See Composing a customized RHEL system image for more details.

(BZ#1893767)

9.2. SOFTWARE MANAGEMENT

rpmbuild --sign is deprecated

With this update, the **rpmbuild --sign** command has become deprecated. Using this command in future releases of Red Hat Enterprise Linux can result in an error. It is recommended that you use the **rpmsign** command instead.

(BZ#1688849)

9.3. SHELLS AND COMMAND-LINE TOOLS

The OpenEXR component has been deprecated

The **OpenEXR** component has been deprecated. Hence, the support for the **EXR** image format has been dropped from the **imagecodecs** module.

(BZ#1886310)

The dump utility from the dump package has been deprecated

The **dump** utility used for backup of file systems has been deprecated and will not be available in RHEL 9.

In RHEL 9, Red Hat recommends using the **bacula**, **tar** or **dd** backup utility, based on type of usage, which provides full and safe backups on ext2, ext3, and ext4 file systems.

Note that the **restore** utility from the **dump** package remains available and supported in RHEL 9 and is available as the **restore** package.

(BZ#1997366)

The hidepid=n mount option is not supported in RHEL 8 systemd

The mount option **hidepid=n**, which controls who can access information in **/proc/[pid]** directories, is not compatible with **systemd** infrastructure provided in RHEL 8.

In addition, using this option might cause certain services started by **systemd** to produce SELinux AVC denial messages and prevent other operations from completing.

For more information, see the related Is mounting /proc with "hidepid=2" recommended with RHEL7 and RHEL8?.

(BZ#2038929)

9.4. SECURITY

NSS SEED ciphers are deprecated

The Mozilla Network Security Services (**NSS**) library will not support TLS cipher suites that use a SEED cipher in a future release. To ensure smooth transition of deployments that rely on SEED ciphers when NSS removes support, Red Hat recommends enabling support for other cipher suites.

Note that SEED ciphers are already disabled by default in RHEL.

(BZ#1817533)

TLS 1.0 and TLS 1.1 are deprecated

The TLS 1.0 and TLS 1.1 protocols are disabled in the **DEFAULT** system-wide cryptographic policy level. If your scenario, for example, a video conferencing application in the Firefox web browser, requires using the deprecated protocols, switch the system-wide cryptographic policy to the **LEGACY** level:

```
# update-crypto-policies --set LEGACY
```

For more information, see the Strong crypto defaults in RHEL 8 and deprecation of weak crypto algorithms Knowledgebase article on the Red Hat Customer Portal and the **update-crypto-policies(8)** man page.

(BZ#1660839)

DSA is deprecated in RHEL 8

The Digital Signature Algorithm (DSA) is considered deprecated in Red Hat Enterprise Linux 8. Authentication mechanisms that depend on DSA keys do not work in the default configuration. Note that **OpenSSH** clients do not accept DSA host keys even in the **LEGACY** system-wide cryptographic policy level.

(BZ#1646541)

SSL2 Client Hello has been deprecated in NSS

The Transport Layer Security (**TLS**) protocol version 1.2 and earlier allow to start a negotiation with a **Client Hello** message formatted in a way that is backward compatible with the Secure Sockets Layer (**SSL**) protocol version 2. Support for this feature in the Network Security Services (**NSS**) library has been deprecated and it is disabled by default.

Applications that require support for this feature need to use the new **SSL_ENABLE_V2_COMPATIBLE_HELLO** API to enable it. Support for this feature may be removed completely in future releases of Red Hat Enterprise Linux 8.

(BZ#1645153)

TPM 1.2 is deprecated

The Trusted Platform Module (TPM) secure cryptoprocessor standard version was updated to version 2.0 in 2016. TPM 2.0 provides many improvements over TPM 1.2, and it is not backward compatible with the previous version. TPM 1.2 is deprecated in RHEL 8, and it might be removed in the next major release.

(BZ#1657927)

crypto-policies derived properties are now deprecated

With the introduction of scopes for **crypto-policies** directives in custom policies, the following derived properties have been deprecated: **tls_cipher**, **ssh_cipher**, **ssh_group**, **ike_protocol**, and **sha1_in_dnssec**. Additionally, the use of the **protocol** property without specifying a scope is now deprecated as well. See the **crypto-policies(7)** man page for recommended replacements.

(BZ#2011208)

Runtime disabling SELinux using /etc/selinux/config is now deprecated

Runtime disabling SELinux using the **SELINUX=disabled** option in the **/etc/selinux/config** file has been deprecated. In RHEL 9, when you disable SELinux only through **/etc/selinux/config**, the system starts with SELinux enabled but with no policy loaded.

If your scenario really requires to completely disable SELinux, Red Hat recommends disabling SELinux by adding the **selinux=0** parameter to the kernel command line as described in the Changing SELinux modes at boot time section of the Using SELinux title.

(BZ#1932222)

The ipa SELinux module removed from selinux-policy

The **ipa** SELinux module has been removed from the **selinux-policy** package because it is no longer maintained. The functionality is now included in the **ipa-selinux** subpackage.

If your scenario requires the use of types or interfaces from the **ipa** module in a local SELinux policy, install the **ipa-selinux** package.

(BZ#1461914)

9.5. NETWORKING

Network scripts are deprecated in RHEL 8

Network scripts are deprecated in Red Hat Enterprise Linux 8 and they are no longer provided by default. The basic installation provides a new version of the **ifup** and **ifdown** scripts which call the NetworkManager service through the **nmcli** tool. In Red Hat Enterprise Linux 8, to run the **ifup** and the **ifdown** scripts, NetworkManager must be running.

Note that custom commands in **/sbin/ifup-local**, **ifdown-pre-local** and **ifdown-local** scripts are not executed.

If any of these scripts are required, the installation of the deprecated network scripts in the system is still possible with the following command:

```
~]# yum install network-scripts
```

The **ifup** and **ifdown** scripts link to the installed legacy network scripts.

Calling the legacy network scripts shows a warning about their deprecation.

(BZ#1647725)

The dropwatch tool is deprecated

The **dropwatch** tool has been deprecated. The tool will not be supported in future releases, thus it is not recommended for new deployments. As a replacement of this package, Red Hat recommends to use the **perf** command line tool.

For more information on using the **perf** command line tool, see the Getting started with Perf section on the Red Hat customer portal or the **perf** man page.

(BZ#1929173)

The cgdcbxd package is deprecated

Control group data center bridging exchange daemon (**cgdcbxd**) is a service to monitor data center bridging (DCB) netlink events and manage the **net_prio control** group subsystem. Starting with RHEL 8.5, the **cgdcbxd** package is deprecated and will be removed in the next major RHEL release.

(BZ#2006665)

The xinetd service has been deprecated

The **xinetd** service has been deprecated and will be removed in RHEL 9. As a replacement, use **systemd**. For further details, see How to convert xinetd service to systemd .

(BZ#2009113)

The term slaves is deprecated in the nmstate API

Red Hat is committed to using conscious language. Therefore the **slaves** term is deprecated in the Nmstate API. Use the term **port** when you use **nmstatectl**.

(JIRA:RHELDOCS-17641)

9.6. KERNEL

Kernel live patching now covers all RHEL minor releases

Since RHEL 8.1, kernel live patches have been provided for selected minor release streams of RHEL covered under the Extended Update Support (EUS) policy to remediate Critical and Important Common Vulnerabilities and Exposures (CVEs). To accommodate the maximum number of concurrently covered kernels and use cases, the support window for each live patch will be decreased from 12 to 6 months for every minor, major and zStream version of the kernel. It means that on the day a kernel live patch is released, it will cover every minor release and scheduled errata kernel delivered in the past 6 months. For example, 8.4.x will have a one-year support window, but 8.4.x+1 will have 6 months.

For more information about this feature, see Applying patches with kernel live patching .

For details about available kernel live patches, see Kernel Live Patch life cycles .

(BZ#1958250)

Installing RHEL for Real Time 8 using diskless boot is now deprecated

Diskless booting allows multiple systems to share a root file system via the network. While convenient, diskless boot is prone to introducing network latency in realtime workloads. With a future minor update of RHEL for Real Time 8, the diskless booting feature will no longer be supported.

(BZ#1748980)

The Linux **firewire** sub-system and its associated user-space components are deprecated in RHEL 8

The **firewire** sub-system provides interfaces to use and maintain any resources on the IEEE 1394 bus. In RHEL 9, **firewire** will no longer be supported in the **kernel** package. Note that **firewire** contains several user-space components provided by the **libavc1394**, **libdc1394**, **libraw1394** packages. These packages are subject to the deprecation as well.

(BZ#1871863)

The **rdma_rxe** Soft-RoCE driver is deprecated

Software Remote Direct Memory Access over Converged Ethernet (Soft-RoCE), also known as RXE, is a feature that emulates Remote Direct Memory Access (RDMA). In RHEL 8, the Soft-RoCE feature is available as an unsupported Technology Preview. However, due to stability issues, this feature has been deprecated and will be removed in RHEL 9.

(BZ#1878207)

9.7. FILE SYSTEMS AND STORAGE

VDO write modes other than **async** are deprecated

VDO supports several write modes in RHEL 8:

- **sync**
- **async**
- **async-unsafe**
- **auto**

Starting with RHEL 8.4, the following write modes are deprecated:

sync

Devices above the VDO layer cannot recognize if VDO is synchronous, and consequently, the devices cannot take advantage of the VDO **sync** mode.

async-unsafe

VDO added this write mode as a workaround for the reduced performance of **async** mode, which complies to Atomicity, Consistency, Isolation, and Durability (ACID). Red Hat does not recommend **async-unsafe** for most use cases and is not aware of any users who rely on it.

auto

This write mode only selects one of the other write modes. It is no longer necessary when VDO supports only a single write mode.

These write modes will be removed in a future major RHEL release.

The recommended VDO write mode is now **async**.

For more information on VDO write modes, see Selecting a VDO write mode.

(JIRA:RHELPLAN-70700)

NFSv3 over UDP has been disabled

The NFS server no longer opens or listens on a User Datagram Protocol (UDP) socket by default. This change affects only NFS version 3 because version 4 requires the Transmission Control Protocol (TCP).

NFS over UDP is no longer supported in RHEL 8.

(BZ#1592011)

cramfs has been deprecated

Due to lack of users, the **cramfs** kernel module is deprecated. **squashfs** is recommended as an alternative solution.

(BZ#1794513)

VDO manager has been deprecated

The python-based VDO management software has been deprecated and will be removed from RHEL 9. In RHEL 9, it will be replaced by the LVM-VDO integration. Therefore, it is recommended to create VDO volumes using the **lvcreate** command.

The existing volumes created using the VDO management software can be converted using the **/usr/sbin/lvm_import_vdo** script, provided by the **lvm2** package. For more information on the LVM-VDO implementation, see Introduction to VDO on LVM.

(BZ#1949163)

The elevator kernel command line parameter is deprecated

The **elevator** kernel command line parameter was used in earlier RHEL releases to set the disk scheduler for all devices. In RHEL 8, the parameter is deprecated.

The upstream Linux kernel has removed support for the **elevator** parameter, but it is still available in RHEL 8 for compatibility reasons.

Note that the kernel selects a default disk scheduler based on the type of device. This is typically the

optimal setting. If you require a different scheduler, Red Hat recommends that you use **udev** rules or the Tuned service to configure it. Match the selected devices and switch the scheduler only for those devices.

For more information, see Setting the disk scheduler.

(BZ#1665295)

LVM mirror is deprecated

The LVM **mirror** segment type is now deprecated. Support for **mirror** will be removed in a future major release of RHEL.

Red Hat recommends that you use LVM RAID 1 devices with a segment type of **raid1** instead of **mirror**. The **raid1** segment type is the default RAID configuration type and replaces **mirror** as the recommended solution.

To convert **mirror** devices to **raid1**, see Converting a mirrored LVM device to a RAID1 logical volume .

LVM **mirror** has several known issues. For details, see known issues in file systems and storage .

(BZ#1827628)

peripety is deprecated

The **peripety** package is deprecated since RHEL 8.3.

The Peripety storage event notification daemon parses system storage logs into structured storage events. It helps you investigate storage issues.

(BZ#1871953)

9.8. HIGH AVAILABILITY AND CLUSTERS

pcs commands that support the clufter tool have been deprecated

The **pcs** commands that support the **clufter** tool for analyzing cluster configuration formats have been deprecated. These commands now print a warning that the command has been deprecated and sections related to these commands have been removed from the **pcs** help display and the **pcs(8)** man page.

The following commands have been deprecated:

- **pcs config import-cman** for importing CMAN / RHEL6 HA cluster configuration
- **pcs config export** for exporting cluster configuration to a list of **pcs** commands which recreate the same cluster

(BZ#1851335)

9.9. COMPILERS AND DEVELOPMENT TOOLS

libdwarf has been deprecated

The **libdwarf** library has been deprecated in RHEL 8. The library will likely not be supported in future major releases. Instead, use the **elfutils** and **libdw** libraries for applications that wish to process ELF/DWARF files.

Alternatives for the **libdwarf-tools dwarfdump** program are the **binutils readelf** program or the **elfutils eu-readelf** program, both used by passing the **--debug-dump** flag.

(BZ#1920624)

The gdb.i686 packages are deprecated

In RHEL 8.1, the 32-bit versions of the GNU Debugger (GDB), **gdb.i686**, were shipped due to a dependency problem in another package. Because RHEL 8 does not support 32-bit hardware, the **gdb.i686** packages are deprecated since RHEL 8.4. The 64-bit versions of GDB, **gdb.x86_64**, are fully capable of debugging 32-bit applications.

If you use **gdb.i686**, note the following important issues:

- The **gdb.i686** packages will no longer be updated. Users must install **gdb.x86_64** instead.
- If you have **gdb.i686** installed, installing **gdb.x86_64** will cause **dnf** to report **package gdb-8.2-14.el8.x86_64 obsoletes gdb < 8.2-14.el8 provided by gdb-8.2-12.el8.i686**. This is expected. Either uninstall **gdb.i686** or pass **dnf** the **--allowerasing** option to remove **gdb.i686** and install **gdb.x8_64**.
- Users will no longer be able to install the **gdb.i686** packages on 64-bit systems, that is, those with the **libc.so.6()(64-bit)** packages.

(BZ#1853140)

9.10. IDENTITY MANAGEMENT

openssh-ldap has been deprecated

The **openssh-ldap** subpackage has been deprecated in Red Hat Enterprise Linux 8 and will be removed in RHEL 9. As the **openssh-ldap** subpackage is not maintained upstream, Red Hat recommends using SSSD and the **sss_ssh_authorizedkeys** helper, which integrate better with other IdM solutions and are more secure.

By default, the SSSD **ldap** and **ipa** providers read the **sshPublicKey** LDAP attribute of the user object, if available. Note that you cannot use the default SSSD configuration for the **ad** provider or IdM trusted domains to retrieve SSH public keys from Active Directory (AD), since AD does not have a default LDAP attribute to store a public key.

To allow the **sss_ssh_authorizedkeys** helper to get the key from SSSD, enable the **ssh** responder by adding **ssh** to the **services** option in the **sssd.conf** file. See the **sssd.conf(5)** man page for details.

To allow **sshd** to use **sss_ssh_authorizedkeys**, add the **AuthorizedKeysCommand /usr/bin/sss_ssh_authorizedkeys** and **AuthorizedKeysCommandUser nobody** options to the **/etc/ssh/sshd_config** file as described by the **sss_ssh_authorizedkeys(1)** man page.

(BZ#1871025)

DES and 3DES encryption types have been removed

Due to security reasons, the Data Encryption Standard (DES) algorithm has been deprecated and disabled by default since RHEL 7. With the recent rebase of Kerberos packages, single-DES (DES) and triple-DES (3DES) encryption types have been removed from RHEL 8.

If you have configured services or users to only use DES or 3DES encryption, you might experience service interruptions such as:

- Kerberos authentication errors
- **unknown enctype** encryption errors
- Kerberos Distribution Centers (KDCs) with DES-encrypted Database Master Keys (**K/M**) fail to start

Perform the following actions to prepare for the upgrade:

1. Check if your KDC uses DES or 3DES encryption with the **krb5check** open source Python scripts. See krb5check on GitHub.
2. If you are using DES or 3DES encryption with any Kerberos principals, re-key them with a supported encryption type, such as Advanced Encryption Standard (AES). For instructions on re-keying, see Retiring DES from MIT Kerberos Documentation.
3. Test independence from DES and 3DES by temporarily setting the following Kerberos options before upgrading:
    a. In **/var/kerberos/krb5kdc/kdc.conf** on the KDC, set **supported_enctypes** and do not include **des** or **des3**.
    b. For every host, in **/etc/krb5.conf** and any files in **/etc/krb5.conf.d**, set **allow_weak_crypto** to **false**. It is false by default.
    c. For every host, in **/etc/krb5.conf** and any files in **/etc/krb5.conf.d**, set **permitted_enctypes**, **default_tgs_enctypes**, and **default_tkt_enctypes**, and do not include **des** or **des3**.
4. If you do not experience any service interruptions with the test Kerberos settings from the previous step, remove them and upgrade. You do not need those settings after upgrading to the latest Kerberos packages.

(BZ#1877991)

Standalone use of the ctdb service has been deprecated

Since RHEL 8.4, customers are advised to use the **ctdb** clustered Samba service only when both of the following conditions apply:

- The **ctdb** service is managed as a **pacemaker** resource with the resource-agent **ctdb**.
- The **ctdb** service uses storage volumes that contain either a GlusterFS file system provided by the Red Hat Gluster Storage product or a GFS2 file system.

The stand-alone use case of the **ctdb** service has been deprecated and will not be included in a next major release of Red Hat Enterprise Linux. For further information on support policies for Samba, see the Knowledgebase article Support Policies for RHEL Resilient Storage - ctdb General Policies .

(BZ#1916296)

Indirect AD integration with IdM via WinSync has been deprecated

WinSync is no longer actively developed in RHEL 8 due to several functional limitations:

- WinSync supports only one Active Directory (AD) domain.
- Password synchronization requires installing additional software on AD Domain Controllers.

For a more robust solution with better resource and security separation, Red Hat recommends using a **cross-forest trust** for indirect integration with Active Directory. See the Indirect integration documentation.

(JIRA:RHELPLAN-100400)

Running Samba as a PDC or BDC is deprecated

The classic domain controller mode that enabled administrators to run Samba as an NT4-like primary domain controller (PDC) and backup domain controller (BDC) is deprecated. The code and settings to configure these modes will be removed in a future Samba release.

As long as the Samba version in RHEL 8 provides the PDC and BDC modes, Red Hat supports these modes only in existing installations with Windows versions which support NT4 domains. Red Hat recommends not setting up a new Samba NT4 domain, because Microsoft operating systems later than Windows 7 and Windows Server 2008 R2 do not support NT4 domains.

If you use the PDC to authenticate only Linux users, Red Hat suggests migrating to Red Hat Identity Management (IdM) that is included in RHEL subscriptions. However, you cannot join Windows systems to an IdM domain. Note that Red Hat continues supporting the PDC functionality IdM uses in the background.

Red Hat does not support running Samba as an AD domain controller (DC).

(BZ#1926114)

The SSSD version of libwbclient has been removed

The SSSD implementation of the **libwbclient** package was deprecated in RHEL 8.4. As it cannot be used with recent versions of Samba, the SSSD implementation of **libwbclient** has now been removed.

(BZ#1947671)

The SMB1 protocol is deprecated in Samba

Starting with Samba 4.11, the insecure Server Message Block version 1 (SMB1) protocol is deprecated and will be removed in a future release.

To improve the security, by default, SMB1 is disabled in the Samba server and client utilities.

Jira:RHELDOCS-16612

9.11. DESKTOP

The libgnome-keyring library has been deprecated

The **libgnome-keyring** library has been deprecated in favor of the **libsecret** library, as **libgnome-keyring** is not maintained upstream, and does not follow the necessary cryptographic policies for RHEL. The new **libsecret** library is the replacement that follows the necessary security standards.

(BZ#1607766)

9.12. GRAPHICS INFRASTRUCTURES

AGP graphics cards are no longer supported

Graphics cards using the Accelerated Graphics Port (AGP) bus are not supported in Red Hat Enterprise Linux 8. Use the graphics cards with PCI-Express bus as the recommended replacement.

(BZ#1569610)

Motif is deprecated

The Motif widget toolkit is now deprecated. Development in the upstream Motif community is inactive.

The following Motif packages are deprecated, including their development and debugging variants:

- **motif**
- **motif-static**
- **openmotif**
- **openmotif21**
- **openmotif22**

Red Hat recommends using the GTK toolkit as a replacement. GTK is more maintainable and provides new features compared to Motif.

(JIRA:RHELPLAN-98983)

9.13. THE WEB CONSOLE

The web console no longer supports incomplete translations

The RHEL web console no longer provides translations for languages that have translations available for less than 50 % of the Console's translatable strings. If the browser requests translation to such a language, the user interface will be in English instead.

(BZ#1666722)

9.14. RED HAT ENTERPRISE LINUX SYSTEM ROLES

The **geoipupdate** package has been deprecated

The **geoipupdate** package requires a third-party subscription and it also downloads proprietary content. Therefore, the **geoipupdate** package has been deprecated, and will be removed in the next major RHEL version.

(BZ#1874892)

9.15. VIRTUALIZATION

SPICE has been deprecated

The SPICE remote display protocol has become deprecated. As a result, SPICE will remain supported in RHEL 8, but Red Hat recommends using alternate solutions for remote display streaming:

- For remote console access, use the VNC protocol.
- For advanced remote display functions, use third party tools such as RDP, HP RGS, or Mechdyne TGX.

Note that the **QXL** graphics device, which is used by SPICE, has become deprecated as well.

(BZ#1849563)

virsh iface-* commands have become deprecated

The **virsh iface-*** commands, such as **virsh iface-start** and **virsh iface-destroy**, are now deprecated, and will be removed in a future major version of RHEL. In addition, these commands frequently fail due to configuration dependencies.

Therefore, it is recommended not to use **virsh iface-*** commands for configuring and managing host network connections. Instead, use the NetworkManager program and its related management applications, such as **nmcli**.

(BZ#1664592)

virt-manager has been deprecated

The Virtual Machine Manager application, also known as **virt-manager**, has been deprecated. The RHEL web console, also known as **Cockpit**, is intended to become its replacement in a subsequent release. It is, therefore, recommended that you use the web console for managing virtualization in a GUI. Note, however, that some features available in **virt-manager** may not be yet available in the RHEL web console.

(JIRA:RHELPLAN-10304)

Virtual machine snapshots are not properly supported in RHEL 8

The current mechanism of creating virtual machine (VM) snapshots has been deprecated, as it is not working reliably. As a consequence, it is recommended not to use VM snapshots in RHEL 8.

(BZ#1686057)

The Cirrus VGA virtual GPU type has been deprecated

With a future major update of Red Hat Enterprise Linux, the **Cirrus VGA** GPU device will no longer be supported in KVM virtual machines. Therefore, Red Hat recommends using the **stdvga** or **virtio-vga** devices instead of **Cirrus VGA**.

(BZ#1651994)

KVM on IBM POWER has been deprecated

Using KVM virtualization on IBM POWER hardware has become deprecated. As a result, KVM on IBM POWER is still supported in RHEL 8, but will become unsupported in a future major release of RHEL.

(JIRA:RHELPLAN-71200)

SecureBoot image verification using SHA1-based signatures is deprecated

Performing SecureBoot image verification using SHA1-based signatures on UEFI (PE/COFF) executables has become deprecated. Instead, Red Hat recommends using signatures based on the SHA2 algorithm, or later.

(BZ#1935497)

9.16. SUPPORTABILITY

The -s split option is no longer supported with the -f option

When providing files to **Red Hat Support** by uploading them to **Red Hat Secure FTP**, you can run the **redhat-support-tool addattachment -f** command. Due to infrastructure changes, however, you can no longer use the **-s** option with this command for splitting big files into parts and uploading them to **Red Hat Secure FTP**.

(BZ#2013335)

The redhat-support-tool diagnose <file_or_directory> command has been deprecated

The **Red Hat Support Tool** no longer supports the **redhat-support-tool diagnose <file_or_directory>** command previously used for advanced diagnostic services for files or directories. The **redhat-support-tool diagnose** command continues to support the plain text analysis.

(BZ#2019786)

9.17. CONTAINERS

The Podman varlink-based API v1.0 has been removed

The Podman varlink-based API v1.0 was deprecated in a previous release of RHEL 8. Podman v2.0 introduced a new Podman v2.0 RESTful API. With the release of Podman v3.0, the varlink-based API v1.0 has been completely removed.

(JIRA:RHELPLAN-45858)

container-tools:1.0 has been deprecated

The **container-tools:1.0** module has been deprecated and will no longer receive security updates. It is recommended to use a newer supported stable module stream, such as **container-tools:2.0** or **container-tools:3.0**.

(JIRA:RHELPLAN-59825)

9.18. DEPRECATED PACKAGES

This section lists packages that have been deprecated and will probably not be included in a future major release of Red Hat Enterprise Linux.

For changes to packages between RHEL 7 and RHEL 8, see Changes to packages in the *Considerations in adopting RHEL 8* document.

The following packages have been deprecated and remain supported until the end of life of RHEL 8:

- 389-ds-base-legacy-tools
- adobe-source-sans-pro-fonts
- adwaita-qt

- amanda
- amanda-client
- amanda-libs
- amanda-server
- ant-contrib
- antlr3
- antlr32
- aopalliance
- apache-commons-collections
- apache-commons-compress
- apache-commons-exec
- apache-commons-jxpath
- apache-commons-parent
- apache-ivy
- apache-parent
- apache-resource-bundles
- apache-sshd
- apiguardian
- assertj-core
- authd
- auto
- autoconf213
- autogen
- base64coder
- batik
- bea-stax
- bea-stax-api
- bind-sdb
- bouncycastle

- bsh
- buildnumber-maven-plugin
- byaccj
- cal10n
- cbi-plugins
- cdparanoia
- cdparanoia-devel
- cdparanoia-libs
- cdrdao
- cmirror
- codehaus-parent
- codemodel
- compat-exiv2-026
- compat-guile18
- compat-libpthread-nonshared
- compat-openssl10
- compat-sap-c++-10
- createrepo_c-devel
- ctags
- ctags-etags
- custodia
- dbus-c++
- dbus-c++-devel
- dbus-c++-glib
- dbxtool
- dirsplit
- dleyna-connector-dbus
- dleyna-core
- dleyna-renderer

- dleyna-server
- dnssec-trigger
- dptfxtract
- drpm
- drpm-devel
- dvd+rw-tools
- dyninst-static
- eclipse-ecf
- eclipse-emf
- eclipse-license
- ed25519-java
- ee4j-parent
- elfutils-devel-static
- elfutils-libelf-devel-static
- enca
- enca-devel
- environment-modules-compat
- evince-browser-plugin
- exec-maven-plugin
- farstream02
- felix-osgi-compendium
- felix-osgi-core
- felix-osgi-foundation
- felix-parent
- file-roller
- fipscheck
- fipscheck-devel
- fipscheck-lib
- firewire

- forge-parent
- fuse-sshfs
- fusesource-pom
- future
- gamin
- gamin-devel
- gavl
- gcc-toolset-10
- gcc-toolset-10-annobin
- gcc-toolset-10-binutils
- gcc-toolset-10-binutils-devel
- gcc-toolset-10-build
- gcc-toolset-10-dwz
- gcc-toolset-10-dyninst
- gcc-toolset-10-dyninst-devel
- gcc-toolset-10-elfutils
- gcc-toolset-10-elfutils-debuginfod-client
- gcc-toolset-10-elfutils-debuginfod-client-devel
- gcc-toolset-10-elfutils-devel
- gcc-toolset-10-elfutils-libelf
- gcc-toolset-10-elfutils-libelf-devel
- gcc-toolset-10-elfutils-libs
- gcc-toolset-10-gcc
- gcc-toolset-10-gcc-c++
- gcc-toolset-10-gcc-gdb-plugin
- gcc-toolset-10-gcc-gfortran
- gcc-toolset-10-gdb
- gcc-toolset-10-gdb-doc
- gcc-toolset-10-gdb-gdbserver

- gcc-toolset-10-libasan-devel
- gcc-toolset-10-libatomic-devel
- gcc-toolset-10-libitm-devel
- gcc-toolset-10-liblsan-devel
- gcc-toolset-10-libquadmath-devel
- gcc-toolset-10-libstdc++-devel
- gcc-toolset-10-libstdc++-docs
- gcc-toolset-10-libtsan-devel
- gcc-toolset-10-libubsan-devel
- gcc-toolset-10-ltrace
- gcc-toolset-10-make
- gcc-toolset-10-make-devel
- gcc-toolset-10-perftools
- gcc-toolset-10-runtime
- gcc-toolset-10-strace
- gcc-toolset-10-systemtap
- gcc-toolset-10-systemtap-client
- gcc-toolset-10-systemtap-devel
- gcc-toolset-10-systemtap-initscript
- gcc-toolset-10-systemtap-runtime
- gcc-toolset-10-systemtap-sdt-devel
- gcc-toolset-10-systemtap-server
- gcc-toolset-10-toolchain
- gcc-toolset-10-valgrind
- gcc-toolset-10-valgrind-devel
- gcc-toolset-9
- gcc-toolset-9-annobin
- gcc-toolset-9-build
- gcc-toolset-9-perftools

- gcc-toolset-9-runtime
- gcc-toolset-9-toolchain
- GConf2
- GConf2-devel
- genisoimage
- genwqe-tools
- genwqe-vpd
- genwqe-zlib
- genwqe-zlib-devel
- geoipupdate
- geronimo-annotation
- geronimo-jms
- geronimo-jpa
- geronimo-parent-poms
- gfbgraph
- gflags
- gflags-devel
- glassfish-annotation-api
- glassfish-el
- glassfish-fastinfoset
- glassfish-jaxb-core
- glassfish-jaxb-txw2
- glassfish-jsp
- glassfish-jsp-api
- glassfish-legal
- glassfish-master-pom
- glassfish-servlet-api
- glew-devel
- glib2-fam

- glog
- glog-devel
- gmock
- gmock-devel
- gnome-boxes
- gnome-menus-devel
- gnome-online-miners
- gnome-shell-extension-disable-screenshield
- gnome-shell-extension-horizontal-workspaces
- gnome-shell-extension-no-hot-corner
- gnome-shell-extension-window-grouper
- gnome-themes-standard
- gnupg2-smime
- gobject-introspection-devel
- google-gson
- gphoto2
- gssntlmssp
- gtest
- gtest-devel
- gtkmm24
- gtkmm24-devel
- gtkmm24-docs
- gtksourceview3
- gtksourceview3-devel
- gtkspell
- gtkspell-devel
- gtkspell3
- guile
- gutenprint-gimp

- gvfs-afc
- gvfs-afp
- gvfs-archive
- hawtjni
- highlight-gui
- hivex-devel
- hostname
- hplip-gui
- httpcomponents-project
- icedax
- icu4j
- idm-console-framework
- iptables
- ipython
- isl
- isl-devel
- isorelax
- istack-commons-runtime
- istack-commons-tools
- iwl3945-firmware
- iwl4965-firmware
- iwl6000-firmware
- jacoco
- jaf
- jakarta-oro
- janino
- jansi-native
- jarjar
- java_cup

- java-atk-wrapper
- javacc
- javacc-maven-plugin
- javaewah
- javaparser
- javapoet
- javassist
- jaxen
- jboss-annotations-1.2-api
- jboss-interceptors-1.2-api
- jboss-logmanager
- jboss-parent
- jctools
- jdepend
- jdependency
- jdom
- jdom2
- jetty
- jffi
- jflex
- jgit
- jline
- jnr-netdb
- jolokia-jvm-agent
- js-uglify
- jsch
- json_simple
- jss-javadoc
- jtidy

- junit5
- jvnet-parent
- jzlib
- kernel-cross-headers
- ksc
- ldapjdk-javadoc
- lensfun
- lensfun-devel
- libaec
- libaec-devel
- libappindicator-gtk3
- libappindicator-gtk3-devel
- libavc1394
- libblocksruntime
- libcacard
- libcacard-devel
- libcgroup
- libchamplain
- libchamplain-devel
- libchamplain-gtk
- libcroco
- libcroco-devel
- libcxl
- libcxl-devel
- libdap
- libdap-devel
- libdazzle-devel
- libdbusmenu
- libdbusmenu-devel

- libdbusmenu-doc
- libdbusmenu-gtk3
- libdbusmenu-gtk3-devel
- libdc1394
- libdnet
- libdnet-devel
- libdv
- libdwarf
- libdwarf-devel
- libdwarf-static
- libdwarf-tools
- libepubgen-devel
- libertas-sd8686-firmware
- libertas-usb8388-firmware
- libertas-usb8388-olpc-firmware
- libgdither
- libGLEW
- libgovirt
- libguestfs-benchmarking
- libguestfs-devel
- libguestfs-gfs2
- libguestfs-gobject
- libguestfs-gobject-devel
- libguestfs-java
- libguestfs-java-devel
- libguestfs-javadoc
- libguestfs-man-pages-ja
- libguestfs-man-pages-uk
- libguestfs-tools

- libguestfs-tools-c
- libhugetlbfs
- libhugetlbfs-devel
- libhugetlbfs-utils
- libIDL
- libIDL-devel
- libidn
- libiec61883
- libindicator-gtk3
- libindicator-gtk3-devel
- libiscsi-devel
- libjose-devel
- libldb-devel
- liblogging
- libluksmeta-devel
- libmcpp
- libmemcached
- libmetalink
- libmodulemd1
- libmongocrypt
- libmtp-devel
- libmusicbrainz5
- libmusicbrainz5-devel
- libnbd-devel
- liboauth
- liboauth-devel
- libpfm-static
- libpng12
- libpurple

- libpurple-devel
- libraw1394
- libsass
- libsass-devel
- libselinux-python
- libsqlite3x
- libtalloc-devel
- libtar
- libtdb-devel
- libtevent-devel
- libunwind
- libusal
- libvarlink
- libvirt-admin
- libvirt-bash-completion
- libvirt-daemon-driver-storage-gluster
- libvirt-daemon-driver-storage-iscsi-direct
- libvirt-devel
- libvirt-docs
- libvirt-gconfig
- libvirt-gobject
- libvirt-lock-sanlock
- libvncserver
- libwinpr-devel
- libwmf
- libwmf-devel
- libwmf-lite
- libXNVCtrl
- libyami

- log4j12
- lorax-composer
- lua-guestfs
- lucene
- mailman
- mailx
- make-devel
- maven-antrun-plugin
- maven-assembly-plugin
- maven-clean-plugin
- maven-dependency-analyzer
- maven-dependency-plugin
- maven-doxia
- maven-doxia-sitetools
- maven-install-plugin
- maven-invoker
- maven-invoker-plugin
- maven-parent
- maven-plugins-pom
- maven-reporting-api
- maven-reporting-impl
- maven-scm
- maven-script-interpreter
- maven-shade-plugin
- maven-shared
- maven-verifier
- maven2
- meanwhile
- mercurial

- metis
- metis-devel
- mingw32-bzip2
- mingw32-bzip2-static
- mingw32-cairo
- mingw32-expat
- mingw32-fontconfig
- mingw32-freetype
- mingw32-freetype-static
- mingw32-gstreamer1
- mingw32-harfbuzz
- mingw32-harfbuzz-static
- mingw32-icu
- mingw32-libjpeg-turbo
- mingw32-libjpeg-turbo-static
- mingw32-libpng
- mingw32-libpng-static
- mingw32-libtiff
- mingw32-libtiff-static
- mingw32-openssl
- mingw32-readline
- mingw32-sqlite
- mingw32-sqlite-static
- mingw64-adwaita-icon-theme
- mingw64-bzip2
- mingw64-bzip2-static
- mingw64-cairo
- mingw64-expat
- mingw64-fontconfig

- mingw64-freetype
- mingw64-freetype-static
- mingw64-gstreamer1
- mingw64-harfbuzz
- mingw64-harfbuzz-static
- mingw64-icu
- mingw64-libjpeg-turbo
- mingw64-libjpeg-turbo-static
- mingw64-libpng
- mingw64-libpng-static
- mingw64-libtiff
- mingw64-libtiff-static
- mingw64-nettle
- mingw64-openssl
- mingw64-readline
- mingw64-sqlite
- mingw64-sqlite-static
- modello
- mojo-parent
- mongo-c-driver
- mousetweaks
- mozjs52
- mozjs52-devel
- mozjs60
- mozjs60-devel
- mozvoikko
- msv-javadoc
- msv-manual
- munge-maven-plugin

- nbd
- nbdkit-devel
- nbdkit-example-plugins
- nbdkit-gzip-plugin
- ncompress
- net-tools
- netcf
- netcf-devel
- netcf-libs
- network-scripts
- nkf
- nss_nis
- nss-pam-ldapd
- objectweb-asm
- objectweb-pom
- ocaml-bisect-ppx
- ocaml-camlp4
- ocaml-camlp4-devel
- ocaml-lwt
- ocaml-mmap
- ocaml-ocplib-endian
- ocaml-ounit
- ocaml-result
- ocaml-seq
- opencv-contrib
- opencv-core
- opencv-devel
- openhpi
- openhpi-libs

- OpenIPMI-perl
- openssh-cavs
- openssh-ldap
- openssl-ibmpkcs11
- opentest4j
- os-maven-plugin
- pakchois
- pandoc
- paranamer
- parfait
- parfait-examples
- parfait-javadoc
- pcp-parfait-agent
- pcp-pmda-rpm
- pcsc-lite-doc
- peripety
- perl-B-Debug
- perl-B-Lint
- perl-Class-Factory-Util
- perl-Class-ISA
- perl-DateTime-Format-HTTP
- perl-DateTime-Format-Mail
- perl-File-CheckTree
- perl-homedir
- perl-libxml-perl
- perl-Locale-Codes
- perl-Mozilla-LDAP
- perl-NKF
- perl-Object-HashBase-tools

- perl-Package-DeprecationManager
- perl-Pod-LaTeX
- perl-Pod-Plainer
- perl-prefork
- perl-String-CRC32
- perl-SUPER
- perl-Sys-Virt
- perl-tests
- perl-YAML-Syck
- phodav
- pidgin
- pidgin-devel
- pidgin-sipe
- pinentry-emacs
- pinentry-gtk
- pipewire0.2-devel
- pipewire0.2-libs
- plexus-ant-factory
- plexus-bsh-factory
- plexus-cli
- plexus-component-api
- plexus-component-factories-pom
- plexus-components-pom
- plexus-i18n
- plexus-interactivity
- plexus-pom
- plexus-velocity
- plymouth-plugin-throbgress
- powermock

- ptscotch-mpich
- ptscotch-mpich-devel
- ptscotch-mpich-devel-parmetis
- ptscotch-openmpi
- ptscotch-openmpi-devel
- purple-sipe
- python-nss-doc
- python-redis
- python-schedutils
- python-slip
- python-varlink
- python2-mock
- python3-click
- python3-cpio
- python3-custodia
- python3-flask
- python3-gevent
- python3-gobject-base
- python3-hivex
- python3-html5lib
- python3-hypothesis
- python3-ipatests
- python3-itsdangerous
- python3-jwt
- python3-libguestfs
- python3-mock
- python3-networkx-core
- python3-nose
- python3-nss

- python3-openipmi
- python3-pillow
- python3-pydbus
- python3-pymongo
- python3-pyOpenSSL
- python3-pytoml
- python3-reportlab
- python3-schedutils
- python3-scons
- python3-semantic_version
- python3-syspurpose
- python3-virtualenv
- python3-webencodings
- python3-werkzeug
- qemu-kvm-block-gluster
- qemu-kvm-block-iscsi
- qemu-kvm-tests
- qpdf
- qpid-proton
- qrencode
- qrencode-devel
- qrencode-libs
- qt5-qtcanvas3d
- qt5-qtcanvas3d-examples
- rarian
- rarian-compat
- re2c
- redhat-menus
- redhat-support-lib-python

- redhat-support-tool
- reflections
- regexp
- relaxngDatatype
- rhsm-gtk
- rpm-plugin-prioreset
- rsyslog-udpspoof
- ruby-hivex
- ruby-libguestfs
- rubygem-abrt
- rubygem-abrt-doc
- rubygem-mongo
- rubygem-mongo-doc
- samba-pidl
- samba-test
- samba-test-libs
- sane-frontends
- sanlk-reset
- scala
- scotch
- scotch-devel
- SDL_sound
- selinux-policy-minimum
- sendmail
- sgabios
- sgabios-bin
- shrinkwrap
- sisu-mojos
- SLOF

- sonatype-oss-parent
- sonatype-plugins-parent
- sparsehash-devel
- spec-version-maven-plugin
- spice
- spice-client-win-x64
- spice-client-win-x86
- spice-glib
- spice-glib-devel
- spice-gtk
- spice-gtk-tools
- spice-gtk3
- spice-gtk3-devel
- spice-gtk3-vala
- spice-parent
- spice-protocol
- spice-qxl-wddm-dod
- spice-server-devel
- spice-streaming-agent
- spice-vdagent-win-x64
- spice-vdagent-win-x86
- sssd-libwbclient
- stax-ex
- stax2-api
- stringtemplate
- stringtemplate4
- subscription-manager-initial-setup-addon
- subscription-manager-migration
- subscription-manager-migration-data

- subversion-javahl
- SuperLU
- SuperLU-devel
- supermin-devel
- swig
- swig-doc
- swig-gdb
- system-storage-manager
- testng
- timedatex
- treelayout
- trousers
- tycho
- uglify-js
- univocity-output-tester
- univocity-parsers
- usbguard-notifier
- usbredir-devel
- utf8cpp
- uthash
- velocity
- vinagre
- vino
- virt-dib
- virt-p2v-maker
- vm-dump-metrics-devel
- weld-parent
- wodim
- woodstox-core

- xdelta
- xmlgraphics-commons
- xmlstreambuffer
- xinetd
- xorg-x11-apps
- xorg-x11-drv-qxl
- xorg-x11-server-Xspice
- xpp3
- xsane-gimp
- xsom
- xz-java
- yajl-devel
- yp-tools
- ypbind
- ypserv

9.19. DEPRECATED AND UNMAINTAINED DEVICES

This section lists devices (drivers, adapters) that

- continue to be supported until the end of life of RHEL 8 but will likely not be supported in future major releases of this product and are not recommended for new deployments. Support for devices other than those listed remains unchanged. These are **deprecated** devices.
- are available but are no longer being tested or updated on a routine basis in RHEL 8. Red Hat may fix serious bugs, including security bugs, at its discretion. These devices should no longer be used in production, and it is likely they will be disabled in the next major release. These are **unmaintained** devices.

PCI device IDs are in the format of *vendor:device:subvendor:subdevice*. If no device ID is listed, all devices associated with the corresponding driver have been deprecated. To check the PCI IDs of the hardware on your system, run the **lspci -nn** command.

Table 9.1. Deprecated devices

Device ID	Driver	Device name
	bnx2	QLogic BCM5706/5708/5709/5716 Driver
	hpsa	Hewlett-Packard Company: Smart Array Controllers

Device ID	Driver	Device name
0x10df:0x0724	lpfc	Emulex Corporation: OneConnect FCoE Initiator (Skyhawk)
0x10df:0xe200	lpfc	Emulex Corporation: LPe15000/LPe16000 Series 8Gb/16Gb Fibre Channel Adapter
0x10df:0xf011	lpfc	Emulex Corporation: Saturn: LightPulse Fibre Channel Host Adapter
0x10df:0xf015	lpfc	Emulex Corporation: Saturn: LightPulse Fibre Channel Host Adapter
0x10df:0xf100	lpfc	Emulex Corporation: LPe12000 Series 8Gb Fibre Channel Adapter
0x10df:0xfc40	lpfc	Emulex Corporation: Saturn-X: LightPulse Fibre Channel Host Adapter
0x10df:0xe220	be2net	Emulex Corporation: OneConnect NIC (Lancer)
0x1000:0x005b	megaraid_sas	Broadcom / LSI: MegaRAID SAS 2208 [Thunderbolt]
0x1000:0x006E	mpt3sas	Broadcom / LSI: SAS2308 PCI-Express Fusion-MPT SAS-2
0x1000:0x0080	mpt3sas	Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2
0x1000:0x0081	mpt3sas	Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2
0x1000:0x0082	mpt3sas	Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2
0x1000:0x0083	mpt3sas	Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2
0x1000:0x0084	mpt3sas	Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2
0x1000:0x0085	mpt3sas	Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2
0x1000:0x0086	mpt3sas	Broadcom / LSI: SAS2308 PCI-Express Fusion-MPT SAS-2
0x1000:0x0087	mpt3sas	Broadcom / LSI: SAS2308 PCI-Express Fusion-MPT SAS-2
	myri10ge	Myricom 10G driver (10GbE)
	netxen_nic	QLogic/NetXen (1/10) GbE Intelligent Ethernet Driver

Device ID	Driver	Device name
0x1077:0x2031	qla2xxx	QLogic Corp.: ISP8324-based 16Gb Fibre Channel to PCI Express Adapter
0x1077:0x2532	qla2xxx	QLogic Corp.: ISP2532-based 8Gb Fibre Channel to PCI Express HBA
0x1077:0x8031	qla2xxx	QLogic Corp.: 8300 Series 10GbE Converged Network Adapter (FCoE)
	qla3xxx	QLogic ISP3XXX Network Driver v2.03.00-k5
0x1924:0x0803	sfc	Solarflare Communications: SFC9020 10G Ethernet Controller
0x1924:0x0813	sfc	Solarflare Communications: SFL9021 10GBASE-T Ethernet Controller
	Soft-RoCE (rdma_rxe)	
	HNS-RoCE	

Table 9.2. Unmaintained devices

Device ID	Driver	Device name
	e1000	Intel® PRO/1000 Network Driver
	mptbase	Fusion MPT SAS Host driver
	mptsas	Fusion MPT SAS Host driver
	mptscsih	Fusion MPT SCSI Host driver
	mptspi	Fusion MPT SAS Host driver
0x1000:0x0071 [a]	megaraid_sas	Broadcom / LSI: MR SAS HBA 2004
0x1000:0x0073 [a]	megaraid_sas	Broadcom / LSI: MegaRAID SAS 2008 [Falcon]

Device ID	Driver	Device name
0x1000:0x0079 [a]	megaraid_sas	Broadcom / LSI: MegaRAID SAS 2108 [Liberator]

[a] Disabled in RHEL 8.0, re-enabled in RHEL 8.4 due to customer requests.

CHAPTER 10. KNOWN ISSUES

This part describes known issues in Red Hat Enterprise Linux 8.5.

10.1. INSTALLER AND IMAGE CREATION

GUI installation might fail if an attempt to unregister using the CDN is made before the repository refresh is completed

Since RHEL 8.2, when registering your system and attaching subscriptions using the Content Delivery Network (CDN), a refresh of the repository metadata is started by the GUI installation program. The refresh process is not part of the registration and subscription process, and as a consequence, the **Unregister** button is enabled in the **Connect to Red Hat** window. Depending on the network connection, the refresh process might take more than a minute to complete. If you click the **Unregister** button before the refresh process is completed, the GUI installation might fail as the unregister process removes the CDN repository files and the certificates required by the installation program to communicate with the CDN.

To work around this problem, complete the following steps in the GUI installation after you have clicked the **Register** button in the **Connect to Red Hat** window:

1. From the **Connect to Red Hat** window, click **Done** to return to the **Installation Summary** window.
2. From the **Installation Summary** window, verify that the **Installation Source** and **Software Selection** status messages in italics are not displaying any processing information.
3. When the Installation Source and Software Selection categories are ready, click **Connect to Red Hat**.
4. Click the **Unregister** button.

After performing these steps, you can safely unregister the system during the GUI installation.

(BZ#1821192)

Registration fails for user accounts that belong to multiple organizations

Currently, when you attempt to register a system with a user account that belongs to multiple organizations, the registration process fails with the error message **You must specify an organization for new units**.

To work around this problem, you can either:

- Use a different user account that does not belong to multiple organizations.
- Use the **Activation Key** authentication method available in the Connect to Red Hat feature for GUI and Kickstart installations.
- Skip the registration step in Connect to Red Hat and use Subscription Manager to register your system post-installation.

(BZ#1822880)

The USB CD-ROM drive is not available as an installation source in Anaconda

Installation fails when the USB CD-ROM drive is the source for it and the Kickstart **ignoredisk --only-use=** command is specified. In this case, Anaconda cannot find and use this source disk.

To work around this problem, use the **harddrive --partition=sdX --dir=**/ command to install from USB CD-ROM drive. As a result, the installation does not fail.

(BZ#1914955)

The auth and authconfig Kickstart commands require the AppStream repository

The **authselect-compat** package is required by the **auth** and **authconfig** Kickstart commands during installation. Without this package, the installation fails if **auth** or **authconfig** are used. However, by design, the **authselect-compat** package is only available in the AppStream repository.

To work around this problem, verify that the BaseOS and AppStream repositories are available to the installer or use the **authselect** Kickstart command during installation.

(BZ#1640697)

The reboot --kexec and inst.kexec commands do not provide a predictable system state

Performing a RHEL installation with the **reboot --kexec** Kickstart command or the **inst.kexec** kernel boot parameters do not provide the same predictable system state as a full reboot. As a consequence, switching to the installed system without rebooting can produce unpredictable results.

Note that the **kexec** feature is deprecated and will be removed in a future release of Red Hat Enterprise Linux.

(BZ#1697896)

Network access is not enabled by default in the installation program

Several installation features require network access, for example, registration of a system using the Content Delivery Network (CDN), NTP server support, and network installation sources. However, network access is not enabled by default, and as a result, these features cannot be used until network access is enabled.

To work around this problem, add **ip=dhcp** to boot options to enable network access when the installation starts. Optionally, passing a Kickstart file or a repository located on the network using boot options also resolves the problem. As a result, the network-based installation features can be used.

(BZ#1757877)

Hard drive partitioned installations with iso9660 filesystem fails

You cannot install RHEL on systems where the hard drive is partitioned with the **iso9660** filesystem. This is due to the updated installation code that is set to ignore any hard disk containing a **iso9660** file system partition. This happens even when RHEL is installed without using a DVD.

To workaround this problem, add the following script in the kickstart file to format the disc before the installation starts.

Note: Before performing the workaround, backup the data available on the disk. The **wipefs** command formats all the existing data from the disk.

```
%pre
wipefs -a /dev/sda
%end
```

As a result, installations work as expected without any errors.

(BZ#1929105)

IBM Power systems with HASH MMU mode fail to boot with memory allocation failures

IBM Power Systems with **HASH memory allocation unit (MMU)** mode support **kdump** up to a maximum of 192 cores. Consequently, the system fails to boot with memory allocation failures if **kdump** is enabled on more than 192 cores. This limitation is due to RMA memory allocations during early boot in **HASH MMU** mode. To work around this problem, use the **Radix MMU** mode with **fadump** enabled instead of using **kdump**.

(BZ#2028361)

Adding the same username in both blueprint and Kickstart files causes Edge image installation to fail

To install a RHEL for Edge image, users must create a blueprint to build a **rhel-edge-container image** and also create a Kickstart file to install the RHEL for Edge image. When a user adds the same username, password, and SSH key in both the blueprint and the Kickstart file, the RHEL for Edge image installation fails. Currently, there is no workaround.

(BZ#1951964)

The new osbuild-composer back end does not replicate the blueprint state from lorax-composer on upgrades

Image Builder users that are upgrading from the **lorax-composer** back end to the new **osbuild-composer** back end, blueprints can disappear. As a result, once the upgrade is complete, the blueprints do not display automatically. To work around this problem, perform the following steps.

Prerequisites

- You have the **composer-cli** CLI utility installed.

Procedure

1. Run the command to load the previous **lorax-composer** based blueprints into the new **osbuild-composer** back end:

```
$ for blueprint in $(find /var/lib/lorax/composer/blueprints/git/workspace/master -name
'*.toml'); do composer-cli blueprints push "${blueprint}"; done
```

As a result, the same blueprints are now available in **osbuild-composer** back end.

Additional resources

- For more details about this Known Issue, see the Image Builder blueprints are no longer present following an update to Red Hat Enterprise Linux 8.3 article.

(BZ#1897383)

Unexpected SELinux policies on systems where Anaconda is running as an application

When Anaconda is running as an application on an already installed system (for example to perform another installation to an image file using the **–image** anaconda option), the system is not prohibited to modify the SELinux types and attributes during installation. As a consequence, certain elements of SELinux policy might change on the system where Anaconda is running. To work around this problem, do not run Anaconda on the production system and execute it in a temporary virtual machine. So that the SELinux policy on a production system is not modified. Running anaconda as part of the system installation process such as installing from **boot.iso** or **dvd.iso** is not affected by this issue.

(BZ#2050140)

10.2. SUBSCRIPTION MANAGEMENT

syspurpose addons have no effect on the subscription-manager attach --auto output.

In Red Hat Enterprise Linux 8, four attributes of the **syspurpose** command-line tool have been added: **role**,**usage**, **service_level_agreement** and **addons**. Currently, only **role**, **usage** and **service_level_agreement** affect the output of running the **subscription-manager attach --auto** command. Users who attempt to set values to the **addons** argument will not observe any effect on the subscriptions that are auto-attached.

(BZ#1687900)

10.3. SOFTWARE MANAGEMENT

libdnf-devel upgrade fails if the CodeReady Linux Builder repository is not available on the system

The **libdnf-devel** package has been moved from the BaseOS to CodeReady Linux Builder repository. Consequently, upgrading **libdnf-devel** fails if the CodeReady Linux Builder repository is not available on the system.

To work around this problem, enable the CodeReady Linux Builder repository, or remove the **libdnf-devel** package prior to the upgrade.

(BZ#1960616)

cr_compress_file_with_stat() can cause a memory leak

The **createrepo_c** library has the API **cr_compress_file_with_stat()** function. This function is declared with **char **dst** as a second parameter. Depending on its other parameters, **cr_compress_file_with_stat()** either uses **dst** as an input parameter, or uses it to return an allocated string. This unpredictable behavior can cause a memory leak, because it does not inform the user when to free **dst** contents.

To work around this problem, a new API **cr_compress_file_with_stat_v2** function has been added, which uses the **dst** parameter only as an input. It is declared as **char *dst**. This prevents memory leak.

Note that the **cr_compress_file_with_stat_v2** function is temporary and will be present only in RHEL 8. Later, **cr_compress_file_with_stat()** will be fixed instead.

(BZ#1973588)

10.4. SHELLS AND COMMAND-LINE TOOLS

coreutils might report misleading EPERM error codes

GNU Core Utilities (**coreutils**) started using the **statx()** system call. If a **seccomp** filter returns an EPERM error code for unknown system calls, **coreutils** might consequently report misleading EPERM error codes because EPERM can not be distinguished from the actual *Operation not permitted* error returned by a working **statx()** syscall.

To work around this problem, update the **seccomp** filter to either permit the **statx()** syscall, or to return an ENOSYS error code for syscalls it does not know.

(BZ#2030661)

10.5. INFRASTRUCTURE SERVICES

Postfix TLS fingerprint algorithm in the FIPS mode needs to be changed to SHA-256

By default in RHEL 8, **postfix** uses MD5 fingerprints with the TLS for backward compatibility. But in the FIPS mode, the MD5 hashing function is not available, which may cause TLS to incorrectly function in the default postfix configuration. To workaround this problem, the hashing function needs to be changed to SHA-256 in the postfix configuration file.

For more details, see the related Knowledgebase article Fix postfix TLS in the FIPS mode by switching to SHA-256 instead of MD5.

(BZ#1711885)

The brltty package is not multilib compatible

It is not possible to have both 32-bit and 64-bit versions of the **brltty** package installed. You can either install the 32-bit (**brltty.i686**) or the 64-bit (**brltty.x86_64**) version of the package. The 64-bit version is recommended.

(BZ#2008197)

10.6. SECURITY

File permissions of /etc/passwd- are not aligned with the CIS RHEL 8 Benchmark 1.0.0

Because of an issue with the CIS Benchmark, the remediation of the SCAP rule that ensures permissions on the **/etc/passwd-** backup file configures permissions to **0644**. However, the **CIS Red Hat Enterprise Linux 8 Benchmark 1.0.0** requires file permissions **0600** for that file. As a consequence, the file permissions of **/etc/passwd-** are not aligned with the benchmark after remediation.

(BZ#1858866)

libselinux-python is available only through its module

The **libselinux-python** package contains only Python 2 bindings for developing SELinux applications and it is used for backward compatibility. For this reason, **libselinux-python** is no longer available in the default RHEL 8 repositories through the **dnf install libselinux-python** command.

To work around this problem, enable both the **libselinux-python** and **python27** modules, and install the **libselinux-python** package and its dependencies with the following commands:

```
# dnf module enable libselinux-python
# dnf install libselinux-python
```

Alternatively, install **libselinux-python** using its install profile with a single command:

```
# dnf module install libselinux-python:2.8/common
```

As a result, you can install **libselinux-python** using the respective module.

(BZ#1666328)

udica processes UBI 8 containers only when started with --env container=podman

The Red Hat Universal Base Image 8 (UBI 8) containers set the **container** environment variable to the **oci** value instead of the **podman** value. This prevents the **udica** tool from analyzing a container JavaScript Object Notation (JSON) file.

To work around this problem, start a UBI 8 container using a **podman** command with the **--env container=podman** parameter. As a result, **udica** can generate an SELinux policy for a UBI 8 container only when you use the described workaround.

(BZ#1763210)

Negative effects of the default logging setup on performance

The default logging environment setup might consume 4 GB of memory or even more and adjustments of rate-limit values are complex when **systemd-journald** is running with **rsyslog**.

See the Negative effects of the RHEL default logging setup on performance and their mitigations Knowledgebase article for more information.

(JIRA:RHELPLAN-10431)

SELINUX=disabled in /etc/selinux/config does not work properly

Disabling SELinux using the **SELINUX=disabled** option in the **/etc/selinux/config** results in a process in which the kernel boots with SELinux enabled and switches to disabled mode later in the boot process. This might cause memory leaks.

To work around this problem, disable SELinux by adding the **selinux=0** parameter to the kernel command line as described in the Changing SELinux modes at boot time section of the Using SELinux title if your scenario really requires to completely disable SELinux.

(JIRA:RHELPLAN-34199)

crypto-policies incorrectly allow Camellia ciphers

The RHEL 8 system-wide cryptographic policies should disable Camellia ciphers in all policy levels, as stated in the product documentation. However, the Kerberos protocol enables the ciphers by default.

To work around the problem, apply the **NO-CAMELLIA** subpolicy:

```
# update-crypto-policies --set DEFAULT:NO-CAMELLIA
```

In the previous command, replace **DEFAULT** with the cryptographic level name if you have switched from **DEFAULT** previously.

As a result, Camellia ciphers are correctly disallowed across all applications that use system-wide crypto policies only when you disable them through the workaround.

(BZ#1919155)

Using multiple labeled IPsec connections with IKEv2 do not work correctly

When Libreswan uses the **IKEv2** protocol, security labels for IPsec do not work correctly for more than one connection. As a consequence, Libreswan using labeled IPsec can establish only the first connection, but cannot establish subsequent connections correctly. To use more than one connection, use the **IKEv1** protocol.

(BZ#1934859)

Smart-card provisioning process through OpenSC pkcs15-init does not work properly

The **file_caching** option is enabled in the default OpenSC configuration, and the file caching functionality does not handle some commands from the **pkcs15-init** tool properly. Consequently, the smart-card provisioning process through OpenSC fails.

To work around the problem, add the following snippet to the **/etc/opensc.conf** file:

```
app pkcs15-init {
        framework pkcs15 {
                use_file_caching = false;
        }
}
```

The smart-card provisioning through **pkcs15-init** only works if you apply the previously described workaround.

(BZ#1947025)

Connections to servers with SHA-1 signatures do not work with GnuTLS

SHA-1 signatures in certificates are rejected by the GnuTLS secure communications library as insecure. Consequently, applications that use GnuTLS as a TLS backend cannot establish a TLS connection to peers that offer such certificates. This behavior is inconsistent with other system cryptographic libraries.

To work around this problem, upgrade the server to use certificates signed with SHA-256 or stronger hash, or switch to the LEGACY policy.

(BZ#1628553)

OpenSSL in FIPS mode accepts only specific D-H parameters

In FIPS mode, TLS clients that use OpenSSL return a **bad dh value** error and abort TLS connections to servers that use manually generated parameters. This is because OpenSSL, when configured to work in compliance with FIPS 140-2, works only with Diffie-Hellman parameters compliant to NIST SP 800-56A rev3 Appendix D (groups 14, 15, 16, 17, and 18 defined in RFC 3526 and with groups defined in RFC 7919). Also, servers that use OpenSSL ignore all other parameters and instead select known parameters of similar size. To work around this problem, use only the compliant groups.

(BZ#1810911)

IKE over TCP connections do not work on custom TCP ports

The **tcp-remoteport** Libreswan configuration option does not work properly. Consequently, an IKE over TCP connection cannot be established when a scenario requires specifying a non-default TCP port.

(BZ#1989050)

Conflict in SELinux Audit rules and SELinux boolean configurations

If the Audit rule list includes an Audit rule that contains a **subj_*** or **obj_*** field, and the SELinux boolean configuration changes, setting the SELinux booleans causes a deadlock. As a consequence, the system stops responding and requires a reboot to recover. To work around this problem, disable all Audit rules containing the **subj_*** or **obj_*** field, or temporarily disable such rules before changing SELinux booleans.

With the release of the RHSA-2021:2168 advisory, the kernel handles this situation properly and no longer deadlocks.

(BZ#1924230)

systemd cannot execute commands from arbitrary paths

The **systemd** service cannot execute commands from **/home/user/bin** arbitrary paths because the SELinux policy package does not include any such rule. Consequently, the custom services that are executed on non-system paths fail and eventually log the Access Vector Cache (AVC) denial audit messages when SELinux denied access. To work around this problem, do one of the following:

- Execute the command using a **shell** script with the **-c** option. For example,

  ```
  bash -c command
  ```

- Execute the command from a common path using **/bin**, **/sbin**, **/usr/sbin**, **/usr/local/bin**, and **/usr/local/sbin** common directories.

(BZ#1860443)

Certain sets of interdependent rules in SSG can fail

Remediation of **SCAP Security Guide** (SSG) rules in a benchmark can fail due to undefined ordering of rules and their dependencies. If two or more rules need to be executed in a particular order, for example, when one rule installs a component and another rule configures the same component, they can run in the wrong order and remediation reports an error. To work around this problem, run the remediation twice, and the second run fixes the dependent rules.

(BZ#1750755)

Installation with the Server with GUI or Workstation software selections and CIS security profile is not possible

The CIS security profile is not compatible with the **Server with GUI** and **Workstation** software selections. As a consequence, a RHEL 8 installation with the **Server with GUI** software selection and CIS profile is not possible. An attempted installation using the CIS profile and either of these software selections will generate the error message:

```
package xorg-x11-server-common has been added to the list of excluded packages, but it can't be removed from the current software selection without breaking the installation.
```

To work around the problem, do not use the CIS security profile with the **Server with GUI** or **Workstation** software selections.

(BZ#1843932)

Kickstart uses org_fedora_oscap instead of com_redhat_oscap in RHEL 8

The Kickstart references the Open Security Content Automation Protocol (OSCAP) Anaconda add-on as **org_fedora_oscap** instead of **com_redhat_oscap** which might cause confusion. That is done to preserve backward compatibility with Red Hat Enterprise Linux 7.

(BZ#1665082)

usbguard-notifier logs too many error messages to the Journal

The **usbguard-notifier** service does not have inter-process communication (IPC) permissions for connecting to the **usbguard-daemon** IPC interface. Consequently, **usbguard-notifier** fails to connect to the interface, and it writes a corresponding error message to the Journal. Because **usbguard-notifier** starts with the **--wait** option, which ensures that **usbguard-notifier** attempts to connect to the IPC interface each second after a connection failure, by default, the log contains an excessive amount of these messages soon.

To work around the problem, allow a user or a group under which **usbguard-notifier** is running to connect to the IPC interface. For example, the following error message contains the UID and GID values for the GNOME Display Manager (GDM):

```
IPC connection denied: uid=42 gid=42 pid=8382, where uid and gid 42 = gdm
```

To grant the missing permissions to the **gdm** user, use the **usbguard** command and restart the **usbguard** daemon:

```
# usbguard add-user gdm --group --devices listen
# systemctl restart usbguard
```

After granting the missing permissions, the error messages no longer appear in the log.

(BZ#2000000)

Certain rsyslog priority strings do not work correctly

Support for the **GnuTLS** priority string for **imtcp** that allows fine-grained control over encryption is not complete. Consequently, the following priority strings do not work properly in **rsyslog**:

```
NONE:+VERS-ALL:-VERS-TLS1.3:+MAC-ALL:+DHE-RSA:+AES-256-GCM:+SIGN-RSA-
SHA384:+COMP-ALL:+GROUP-ALL
```

To work around this problem, use only correctly working priority strings:

```
NONE:+VERS-ALL:-VERS-TLS1.3:+MAC-ALL:+ECDHE-RSA:+AES-128-CBC:+SIGN-RSA-
SHA1:+COMP-ALL:+GROUP-ALL
```

As a result, current configurations must be limited to the strings that work correctly.

(BZ#1679512)

10.7. NETWORKING

The nm-cloud-setup service removes manually-configured secondary IP addresses from interfaces

Based on the information received from the cloud environment, the **nm-cloud-setup** service configures network interfaces. Disable **nm-cloud-setup** to manually configure interfaces. However, in certain cases, other services on the host can configure interfaces as well. For example, these services could add secondary IP addresses. To avoid that **nm-cloud-setup** removes secondary IP addresses:

1. Stop and disable the **nm-cloud-setup** service and timer:

```
# systemctl disable --now nm-cloud-setup.service nm-cloud-setup.timer
```

2. Display the available connection profiles:

```
# nmcli connection show
```

3. Reactive the affected connection profiles:

```
# nmcli connection up "<profile_name>"
```

As a result, the service no longer removes manually-configured secondary IP addresses from interfaces.

(BZ#2132754)

NetworkManager does not support activating bond and team ports in a specific order

NetworkManager activates interfaces alphabetically by interface names. However, if an interface appears later during the boot, for example, because the kernel needs more time to discover it, NetworkManager activates this interface later. NetworkManager does not support setting a priority on bond and team ports. Consequently, the order in which NetworkManager activates ports of these devices is not always predictable. To work around this problem, write a dispatcher script.

For an example of such a script, see the corresponding comment in the ticket.

(BZ#1920398)

Systems with the IPv6_rpfilter option enabled experience low network throughput

Systems with the **IPv6_rpfilter** option enabled in the **firewalld.conf** file currently experience suboptimal performance and low network throughput in high traffic scenarios, such as 100-Gbps links. To work around the problem, disable the **IPv6_rpfilter** option. To do so, add the following line in the **/etc/firewalld/firewalld.conf** file.

```
IPv6_rpfilter=no
```

As a result, the system performs better, but also has reduced security.

(BZ#1871860)

10.8. KERNEL

Reloading an identical crash extension may cause segmentation faults

When you load a copy of an already loaded crash extension file, it might trigger a segmentation fault. Currently, the crash utility detects if an original file has been loaded. Consequently, due to two identical files co-existing in the crash utility, a namespace collision occurs, which triggers the crash utility to cause a segmentation fault.

You can work around the problem by loading the crash extension file only once. As a result, segmentation faults no longer occur in the described scenario.

(BZ#1906482)

vmcore capture fails after memory hot-plug or unplug operation

After performing the memory hot-plug or hot-unplug operation, the event comes after updating the device tree which contains memory layout information. Thereby the **makedumpfile** utility tries to access a non-existent physical address. The problem appears if all of the following conditions meet:

- A little-endian variant of IBM Power System runs RHEL 8.
- The **kdump** or **fadump** service is enabled on the system.

Consequently, the capture kernel fails to save **vmcore** if a kernel crash is triggered after the memory hot-plug or hot-unplug operation.

To work around this problem, restart the **kdump** service after hot-plug or hot-unplug:

```
# systemctl restart kdump.service
```

As a result, **vmcore** is successfully saved in the described scenario.

(BZ#1793389)

Debug kernel fails to boot in crash capture environment on RHEL 8

Due to the memory-intensive nature of the debug kernel, a problem occurs when the debug kernel is in use and a kernel panic is triggered. As a consequence, the debug kernel is not able to boot as the capture kernel, and a stack trace is generated instead. To work around this problem, increase the crash kernel memory as required. As a result, the debug kernel boots successfully in the crash capture environment.

(BZ#1659609)

Allocating crash kernel memory fails at boot time

On certain Ampere Altra systems, allocating the crash kernel memory during boot fails when the 32-bit region is disabled in BIOS settings. Consequently, the **kdump** service fails to start. This is caused by memory fragmentation in the region below 4 GB with no fragment being large enough to contain the crash kernel memory.

To work around this problem, enable the 32-bit memory region in BIOS as follows:

1. Open the BIOS settings on your system.
2. Open the **Chipset** menu.
3. Under **Memory Configuration**, enable the **Slave 32-bit** option.

As a result, crash kernel memory allocation within the 32-bit region succeeds and the **kdump** service works as expected.

(BZ#1940674)

kdump fails on some KVM virtual machines using default crash kernel memory

On some KVM virtual machines **kdump** fails when using the default amount of memory for **kdump** to capture the kernel crash dump. Consequently, the crash kernel displays the following error:

```
/bin/sh: error while loading shared libraries: libtinfo.so.6: cannot open shared object file: No such file or directory
```

To workaround this problem, increase the **crashkernel=** option by a minimum of 32M to fit the size requirement for kdump. For example, the final value must be the sum of current value and 32M.

In the case of the **crashkernel=auto** parameter:

1. Check the current memory size, and increase the size by 32M as follows:

```
echo $(($(cat /sys/kernel/kexec_crash_size)/1048576+32))M
```

2. Configure the kernel **crashkernel** parameter to **crashkernel=x**, where **x** is the increased size.

(BZ#2004000)

The QAT manager leaves no spare device for LKCF

The Intel® QuickAssist Technology (QAT) manager (**qatmgr**) is a user space process, which by default uses all QAT devices in the system. As a consequence, there are no QAT devices left for the Linux Kernel Cryptographic Framework (LKCF). There is no need to work around this situation, as this behavior is expected and a majority of users will use acceleration from the user space.

(BZ#1920086)

The kernel ACPI driver reports it has no access to a PCIe ECAM memory region

The Advanced Configuration and Power Interface (ACPI) table provided by firmware does not define a memory region on the PCI bus in the Current Resource Settings (_CRS) method for the PCI bus device. Consequently, the following warning message occurs during the system boot:

```
[    2.817152] acpi PNP0A08:00: [Firmware Bug]: ECAM area [mem 0x30000000-0x31ffffff] not reserved in ACPI namespace
[    2.827911] acpi PNP0A08:00: ECAM at [mem 0x30000000-0x31ffffff] for [bus 00-1f]
```

However, the kernel is still able to access the **0x30000000-0x31ffffff** memory region, and can assign that memory region to the PCI Enhanced Configuration Access Mechanism (ECAM) properly. You can verify that PCI ECAM works correctly by accessing the PCIe configuration space over the 256 byte offset with the following output:

```
03:00.0 Non-Volatile memory controller: Sandisk Corp WD Black 2018/PC SN720 NVMe SSD (prog-if 02 [NVM Express])
 ...
        Capabilities: [900 v1] L1 PM Substates
                L1SubCap: PCI-PM_L1.2- PCI-PM_L1.1- ASPM_L1.2+ ASPM_L1.1- L1_PM_Substates+
                        PortCommonModeRestoreTime=255us PortTPowerOnTime=10us
```

```
L1SubCtl1: PCI-PM_L1.2- PCI-PM_L1.1- ASPM_L1.2- ASPM_L1.1-
        T_CommonMode=0us LTR1.2_Threshold=0ns
L1SubCtl2: T_PwrOn=10us
```

As a result, you can ignore the warning message.

For more information about the problem, see the "Firmware Bug: ECAM area **mem 0x30000000-0x31ffffff** not reserved in ACPI namespace" appears during system boot solution.

(BZ#1868526)

The tuned-adm profile powersave command causes the system to become unresponsive

Executing the **tuned-adm profile powersave** command leads to an unresponsive state of the Penguin Valkyrie 2000 2-socket systems with the older Thunderx (CN88xx) processors. Consequently, reboot the system to resume working. To work around this problem, avoid using the **powersave** profile if your system matches the mentioned specifications.

(BZ#1609288)

Using irqpoll causes vmcore generation failure

Due to an existing problem with the **nvme** driver on the 64-bit ARM architecture that run on the Amazon Web Services (AWS) cloud platforms, causes **vmcore** generation failure when you provide the **irqpoll** kernel command line parameter to the first kernel. Consequently, no **vmcore** file is dumped in the **/var/crash/** directory upon a kernel crash. To work around this problem:

1. Append **irqpoll** to **KDUMP_COMMANDLINE_REMOVE** in the **/etc/sysconfig/kdump** file.

```
KDUMP_COMMANDLINE_REMOVE="hugepages hugepagesz slub_debug quiet
log_buf_len swiotlb"
```

2. Remove **irqpoll** from **KDUMP_COMMANDLINE_APPEND** in the **/etc/sysconfig/kdump** file.

```
KDUMP_COMMANDLINE_APPEND="irqpoll nr_cpus=1 reset_devices
cgroup_disable=memory udev.children-max=2 panic=10 swiotlb=noforce novmcoredd"
```

3. Restart the **kdump** service:

```
systemctl restart kdump
```

As a result, the first kernel boots correctly and the **vmcore** file is expected to be captured upon the kernel crash.

Note that the **kdump** service can use a significant amount of crash kernel memory to dump the **vmcore** file. Ensure that the capture kernel has sufficient memory available for the **kdump** service.

For related information on this Known Issue, see the The irqpoll kernel command line parameter might cause vmcore generation failure article.

(BZ#1654962)

The HP NMI watchdog does not always generate a crash dump

In certain cases, the **hpwdt** driver for the HP NMI watchdog is not able to claim a non-maskable interrupt (NMI) generated by the HPE watchdog timer because the NMI was instead consumed by the **perfmon** driver.

The missing NMI is initiated by one of two conditions:

1. The **Generate NMI** button on the Integrated Lights-Out (iLO) server management software. This button is triggered by a user.

2. The **hpwdt** watchdog. The expiration by default sends an NMI to the server.

Both sequences typically occur when the system is unresponsive. Under normal circumstances, the NMI handler for both these situations calls the **kernel panic()** function and if configured, the **kdump** service generates a **vmcore** file.

Because of the missing NMI, however, **kernel panic()** is not called and **vmcore** is not collected.

In the first case (1.), if the system was unresponsive, it remains so. To work around this scenario, use the virtual **Power** button to reset or power cycle the server.

In the second case (2.), the missing NMI is followed 9 seconds later by a reset from the Automated System Recovery (ASR).

The HPE Gen9 Server line experiences this problem in single-digit percentages. The Gen10 at an even smaller frequency.

(BZ#1602962)

Connections fail when attaching a virtual function to virtual machine

Pensando network cards that use the **ionic** device driver silently accept VLAN tag configuration requests and attempt configuring network connections while attaching network virtual functions (**VF**) to a virtual machine (**VM**). Such network connections fail as this feature is not yet supported by the card's firmware.

(BZ#1930576)

The OPEN MPI library may trigger run-time failures with default PML

In OPEN Message Passing Interface (OPEN MPI) implementation 4.0.x series, Unified Communication X (UCX) is the default point-to-point communicator (PML). The later versions of OPEN MPI 4.0.x series deprecated **openib** Byte Transfer Layer (BTL).

However, OPEN MPI, when run over a **homogeneous** cluster (same hardware and software configuration), UCX still uses **openib** BTL for MPI one-sided operations. As a consequence, this may trigger execution errors. To work around this problem:

- Run the **mpirun** command using following parameters:

```
-mca btl openib -mca pml ucx -x UCX_NET_DEVICES=mlx5_ib0
```

where,

- The **-mca btl openib** parameter disables **openib** BTL

- The **-mca pml ucx** parameter configures OPEN MPI to use **ucx** PML.

- The **x UCX_NET_DEVICES=** parameter restricts UCX to use the specified devices

The OPEN MPI, when run over a **heterogeneous** cluster (different hardware and software configuration), it uses UCX as the default PML. As a consequence, this may cause the OPEN MPI jobs to run with erratic performance, unresponsive behavior, or crash failures. To work around this problem, set the UCX priority as:

- Run the **mpirun** command using following parameters:

```
-mca pml_ucx_priority 5
```

As a result, the OPEN MPI library is able to choose an alternative available transport layer over UCX.

(BZ#1866402)

The Solarflare fails to create maximum number of virtual functions (VFs)

The Solarflare NICs fail to create a maximum number of VFs due to insufficient resources. You can check the maximum number of VFs that a PCIe device can create in the **/sys/bus/pci/devices/PCI_ID/sriov_totalvfs** file. To workaround this problem, you can either adjust the number of VFs or the VF MSI interrupt value to a lower value, either from **Solarflare Boot Manager** on startup, or using Solarflare **sfboot** utility. The default VF MSI interrupt value is **8**.

- To adjust the VF MSI interrupt value using **sfboot**:

```
# sfboot vf-msix-limit=2
```

NOTE

Adjusting VF MSI interrupt value affects the VF performance.

For more information about parameters to be adjusted accordingly, see the **Solarflare Server Adapter user guide**.

(BZ#1971506)

10.9. HARDWARE ENABLEMENT

The default 7 4 1 7 printk value sometimes causes temporary system unresponsiveness

The default **7 4 1 7 printk** value allows for better debugging of the kernel activity. However, when coupled with a serial console, this **printk** setting can cause intense I/O bursts that can lead to a RHEL system becoming temporarily unresponsive. To work around this problem, we have added a new **optimize-serial-console** TuneD profile, which reduces the default **printk** value to **4 4 1 7**. Users can instrument their system as follows:

```
# tuned-adm profile throughput-performance optimize-serial-console
```

Having a lower **printk** value persistent across a reboot reduces the likelihood of system hangs.

Note that this setting change comes at the expense of losing the extra debugging information.

(JIRA:RHELPLAN-28940)

10.10. FILE SYSTEMS AND STORAGE

Limitations of LVM writecache

The **writecache** LVM caching method has the following limitations, which are not present in the **cache** method:

- You cannot name a **writecache** logical volume when using **pvmove** commands.
- You cannot use logical volumes with **writecache** in combination with thin pools or VDO.

The following limitation also applies to the **cache** method:

- You cannot resize a logical volume while **cache** or **writecache** is attached to it.

(JIRA:RHELPLAN-27987, BZ#1798631, BZ#1808012)

LVM mirror devices that store a LUKS volume sometimes become unresponsive

Mirrored LVM devices with a segment type of **mirror** that store a LUKS volume might become unresponsive under certain conditions. The unresponsive devices reject all I/O operations.

To work around the issue, Red Hat recommends that you use LVM RAID 1 devices with a segment type of **raid1** instead of **mirror** if you need to stack LUKS volumes on top of resilient software-defined storage.

The **raid1** segment type is the default RAID configuration type and replaces **mirror** as the recommended solution.

To convert **mirror** devices to **raid1**, see Converting a mirrored LVM device to a RAID1 device .

(BZ#1730502)

The /boot file system cannot be placed on LVM

You cannot place the **/boot** file system on an LVM logical volume. This limitation exists for the following reasons:

- On EFI systems, the *EFI System Partition* conventionally serves as the **/boot** file system. The uEFI standard requires a specific GPT partition type and a specific file system type for this partition.
- RHEL 8 uses the *Boot Loader Specification* (BLS) for system boot entries. This specification requires that the **/boot** file system is readable by the platform firmware. On EFI systems, the platform firmware can read only the **/boot** configuration defined by the uEFI standard.
- The support for LVM logical volumes in the GRUB 2 boot loader is incomplete. Red Hat does not plan to improve the support because the number of use cases for the feature is decreasing due to standards such as uEFI and BLS.

Red Hat does not plan to support **/boot** on LVM. Instead, Red Hat provides tools for managing system snapshots and rollback that do not need the **/boot** file system to be placed on an LVM logical volume.

(BZ#1496229)

LVM no longer allows creating volume groups with mixed block sizes

LVM utilities such as **vgcreate** or **vgextend** no longer allow you to create volume groups (VGs) where the physical volumes (PVs) have different logical block sizes. LVM has adopted this change because file systems fail to mount if you extend the underlying logical volume (LV) with a PV of a different block size.

To re-enable creating VGs with mixed block sizes, set the **allow_mixed_block_sizes=1** option in the **lvm.conf** file.

(BZ#1768536)

The GRUB retries to access the disk after initial failures during boot

Sometimes, Storage Area Networks (SANs) fail to acknowledge the **open** and **read** disk calls. Previously, the GRUB tool used to enter into the **grub_rescue** prompt resulting in the boot failure. With this update, GRUB retries to access the disk up to 20 times after the initial call to open and read the disk fails. If the GRUB tool is still unable to open or read the disk after these attempts, it will enter into the **grub_rescue** mode.

(BZ#1987087)

XFS quota warnings are triggered too often

Using the quota timer results in quota warnings triggering too often, which causes soft quotas to be enforced faster than they should. To work around this problem, do not use soft quotas, which will prevent triggering warnings. As a result, the amount of warning messages will not enforce soft quota limit anymore, respecting the configured timeout.

(BZ#2059262)

10.11. DYNAMIC PROGRAMMING LANGUAGES, WEB AND DATABASE SERVERS

MariaDB 10.5 does not warn about dropping a non-existent table when the OQGraph plug-in is enabled

When the **OQGraph** storage engine plug-in is loaded to the **MariaDB 10.5** server, **MariaDB** does not warn about dropping a non-existent table. In particular, when the user attempts to drop a non-existent table using the **DROP TABLE** or **DROP TABLE IF EXISTS** SQL commands, **MariaDB** neither returns an error message nor logs a warning.

Note that the **OQGraph** plug-in is provided by the **mariadb-oqgraph-engine** package, which is not installed by default.

(BZ#1944653)

PAM plug-in version 1.0 does not work in MariaDB

MariaDB 10.3 provides the Pluggable Authentication Modules (PAM) plug-in version 1.0. **MariaDB 10.5** provides the plug-in versions 1.0 and 2.0, version 2.0 is the default.

The **MariaDB** PAM plug-in version 1.0 does not work in RHEL 8. To work around this problem, use the PAM plug-in version 2.0 provided by the **mariadb:10.5** module stream.

(BZ#1942330)

getpwnam() might fail when called by a 32-bit application

When a user of NIS uses a 32-bit application that calls the **getpwnam()** function, the call fails if the **nss_nis.i686** package is missing. To work around this problem, manually install the missing package by using the **yum install nss_nis.i686** command.

(BZ#1803161)

Symbol conflicts between OpenLDAP libraries might cause crashes in httpd

When both the **libldap** and **libldap_r** libraries provided by OpenLDAP are loaded and used within a single process, symbol conflicts between these libraries might occur. Consequently, Apache **httpd** child processes using the PHP **ldap** extension might terminate unexpectedly if the **mod_security** or **mod_auth_openidc** modules are also loaded by the **httpd** configuration.

Since the RHEL 8.3 update to the Apache Portable Runtime (APR) library, you can work around the problem by setting the **APR_DEEPBIND** environment variable, which enables the use of the **RTLD_DEEPBIND** dynamic linker option when loading **httpd** modules. When the **APR_DEEPBIND** environment variable is enabled, crashes no longer occur in **httpd** configurations that load conflicting libraries.

(BZ#1819607)

10.12. COMPILERS AND DEVELOPMENT TOOLS

Using CryptBlocks multiple times over the same input stream leads to incorrect encryption

When Go FIPS mode is enabled, AES CBC CryptBlocks incorrectly re-initializes the initialization vector. As a result, using CryptBlocks multiple times over the input stream encrypts files incorrectly. To work around this issue, do not reinitialize IV in the **aes-cbc** interface. This action allows files to be encrypted correctly.

(BZ#1972825)

10.13. IDENTITY MANAGEMENT

Windows Server 2008 R2 and earlier no longer supported

In RHEL 8.4 and later, Identity Management (IdM) does not support establishing trust to Active Directory with Active Directory domain controllers running Windows Server 2008 R2 or earlier versions. RHEL IdM now requires SMB encryption when establishing the trust relationship, which is only available with Windows Server 2012 or later.

(BZ#1971061)

Using the cert-fix utility with the --agent-uid pkidbuser option breaks Certificate System

Using the **cert-fix** utility with the **--agent-uid pkidbuser** option corrupts the LDAP configuration of Certificate System. As a consequence, Certificate System might become unstable and manual steps are required to recover the system.

(BZ#1729215)

FreeRADIUS silently truncates Tunnel-Passwords longer than 249 characters

If a Tunnel-Password is longer than 249 characters, the FreeRADIUS service silently truncates it. This may lead to unexpected password incompatibilities with other systems.

To work around the problem, choose a password that is 249 characters or fewer.

(BZ#1723362)

The /var/log/lastlog sparse file on IdM hosts can cause performance problems

During the IdM installation, a range of 200,000 UIDs from a total of 10,000 possible ranges is randomly selected and assigned. Selecting a random range in this way significantly reduces the probability of conflicting IDs in case you decide to merge two separate IdM domains in the future.

However, having high UIDs can create problems with the **/var/log/lastlog** file. For example, if a user with the UID of 1280000008 logs in to an IdM client, the local **/var/log/lastlog** file size increases to almost 400 GB. Although the actual file is sparse and does not use all that space, certain applications are not designed to identify sparse files by default and may require a specific option to handle them. For example, if the setup is complex and a backup and copy application does not handle sparse files correctly, the file is copied as if its size was 400 GB. This behavior can cause performance problems.

To work around this problem:

- In case of a standard package, refer to its documentation to identify the option that handles sparse files.
- In case of a custom application, ensure that it is able to manage sparse files such as **/var/log/lastlog** correctly.

(JIRA:RHELPLAN-59111)

FIPS mode does not support using a shared secret to establish a cross-forest trust

Establishing a cross-forest trust using a shared secret fails in FIPS mode because NTLMSSP authentication is not FIPS-compliant. To work around this problem, authenticate with an Active Directory (AD) administrative account when establishing a trust between an IdM domain with FIPS mode enabled and an AD domain.

(BZ#1924707)

FreeRADIUS server fails to run in FIPS mode

By default, in FIPS mode, OpenSSL disables the use of the MD5 digest algorithm. As the RADIUS protocol requires MD5 to encrypt a secret between the RADIUS client and the RADIUS server, this causes the FreeRADIUS server to fail in FIPS mode.

To work around this problem, follow these steps:

Procedure

1. Create the environment variable, **RADIUS_MD5_FIPS_OVERRIDE** for the **radiusd** service:

```
systemctl edit radiusd

[Service]
Environment=RADIUS_MD5_FIPS_OVERRIDE=1
```

2. To apply the change, reload the **systemd** configuration and start the **radiusd** service:

```
# systemctl daemon-reload
# systemctl start radiusd
```

3. To run FreeRADIUS in debug mode:

```
# RADIUS_MD5_FIPS_OVERRIDE=1 radiusd -X
```

Note that though FreeRADIUS can run in FIPS mode, this does not mean that it is FIPS compliant as it uses weak ciphers and functions when in FIPS mode.

For more information on configuring FreeRADIUS authentication in FIPS mode, see How to configure FreeRADIUS authentication in FIPS mode.

(BZ#1958979)

Actions required when running Samba as a print server

With this update, the **samba** package no longer creates the **/var/spool/samba/** directory. If you use Samba as a print server and use **/var/spool/samba/** in the **[printers]** share to spool print jobs, SELinux prevents Samba users from creating files in this directory. Consequently, print jobs fail and the **auditd** service logs a **denied** message in **/var/log/audit/audit.log**. To avoid this problem after updating your system to RHEL 8.5:

1. Search the **[printers]** share in the **/etc/samba/smb.conf** file.
2. If the share definition contains **path = /var/spool/samba/**, update the setting and set the **path** parameter to **/var/tmp/**.
3. Restart the **smbd** service:

```
# systemctl restart smbd
```

If you newly installed Samba on RHEL 8.5, no action is required. The default **/etc/samba/smb.conf** file provided by the **samba-common** package on RHEL 8.5 already uses the **/var/tmp/** directory to spool print jobs.

(BZ#2009213)

The default keyword for enabled ciphers in the NSS does not work in conjunction with other ciphers

In Directory Server you can use the **default** keyword to refer to the default ciphers enabled in the network security services (NSS). However, if you want to enable the default ciphers and additional ones using the command line or web console, Directory Server fails to resolve the **default** keyword. As a consequence, the server enables only the additionally specified ciphers and logs the following error:

```
Security Initialization - SSL alert: Failed to set SSL cipher preference information: invalid ciphers <default,+__cipher_name__>: format is +cipher1,-cipher2... (Netscape Portable Runtime error 0 - no error)
```

As a workaround, specify all ciphers that are enabled by default in NSS including the ones you want to additionally enable.

(BZ#1817505)

Potential risk when using the default value for ldap_id_use_start_tls option

When using **ldap://** without TLS for identity lookups, it can pose a risk for an attack vector. Particularly a man-in-the-middle (MITM) attack which could allow an attacker to impersonate a user by altering, for example, the UID or GID of an object returned in an LDAP search.

Currently, the SSSD configuration option to enforce TLS, **ldap_id_use_start_tls**, defaults to **false**. Ensure that your setup operates in a trusted environment and decide if it is safe to use unencrypted communication for **id_provider = ldap**. Note **id_provider = ad** and **id_provider = ipa** are not affected as they use encrypted connections protected by SASL and GSSAPI.

If it is not safe to use unencrypted communication, enforce TLS by setting the **ldap_id_use_start_tls** option to **true** in the **/etc/sssd/sssd.conf** file. The default behavior is planned to be changed in a future release of RHEL.

(JIRA:RHELPLAN-155168)

SSSD retrieves incomplete list of members if the group size exceeds 1500 members

During the integration of SSSD with Active Directory, SSSD retrieves incomplete group member lists when the group size exceeds 1500 members. This issue occurs because Active Directory's MaxValRange policy, which restricts the number of members retrievable in a single query, is set to 1500 by default.

To work around this problem, change the MaxValRange setting in Active Directory to accommodate larger group sizes.

(JIRA:RHELDOCS-19603)

10.14. DESKTOP

Disabling flatpak repositories from Software Repositories is not possible

Currently, it is not possible to disable or remove **flatpak** repositories in the Software Repositories tool in the GNOME Software utility.

(BZ#1668760)

Drag-and-drop does not work between desktop and applications

Due to a bug in the **gnome-shell-extensions** package, the drag-and-drop functionality does not currently work between desktop and applications. Support for this feature will be added back in a future release.

(BZ#1717947)

Generation 2 RHEL 8 virtual machines sometimes fail to boot on Hyper-V Server 2016 hosts

When using RHEL 8 as the guest operating system on a virtual machine (VM) running on a Microsoft Hyper-V Server 2016 host, the VM in some cases fails to boot and returns to the GRUB boot menu. In addition, the following error is logged in the Hyper-V event log:

> The guest operating system reported that it failed with the following error code: 0x1E

This error occurs due to a UEFI firmware bug on the Hyper-V host. To work around this problem, use Hyper-V Server 2019 as the host.

(BZ#1583445)

Current limitations of Flatpak

You can install certain applications using the **Flatpak** package manager. However, **Flatpak** is currently missing certain functions or features. Notably:

- **Flatpak** is missing CVEs and changelog functionality parity. Using the **GNOME Software** application for **Flatpak** applications currently provides no information about the respective package or any CVEs.
- GPG key checking is disabled by default when adding Red Hat **Flatpak remote** repositories.
- **Flatpak** applications do not have unique icons. In **Gnome Software**, an application shows both the **rpm** and **Flatpak** versions. As a workaround, you can find the application origin by clicking **Show Details** on the respective icon.
- **Flatpak** applications are unable to process Kerberos tickets.
- Printing from **Flatpak** applications is currently unavailable.
- Red Hat **Flatpak remote** is not automatically added. To enable them, follow the instructions in the product documentation: Enabling the Red Hat Flatpak remote

(JIRA:RHELPLAN-100230)

10.15. GRAPHICS INFRASTRUCTURES

Multiple HDR displays on a single MST topology may not power on

On systems using NVIDIA Turing GPUs with the **nouveau** driver, using a **DisplayPort** hub (such as a laptop dock) with multiple monitors which support HDR plugged into it may result in failure to turn on. This is due to the system erroneously thinking there is not enough bandwidth on the hub to support all of the displays.

(BZ#1812577)

radeon fails to reset hardware correctly

The **radeon** kernel driver currently does not reset hardware in the kexec context correctly. Instead, **radeon** falls over, which causes the rest of the **kdump** service to fail.

To work around this problem, disable **radeon** in **kdump** by adding the following line to the **/etc/kdump.conf** file:

```
dracut_args --omit-drivers "radeon"
force_rebuild 1
```

Restart the machine and **kdump**. After starting **kdump**, the **force_rebuild 1** line may be removed from the configuration file.

Note that in this scenario, no graphics will be available during **kdump**, but **kdump** will work successfully.

(BZ#1694705)

GUI in ESXi might crash due to low video memory

The graphical user interface (GUI) on RHEL virtual machines (VMs) in the VMware ESXi 7.0.1 hypervisor with vCenter Server 7.0.1 requires a certain amount of video memory. If you connect multiple consoles or

high-resolution monitors to the VM, the GUI requires least 16 MB of video memory. If you start the GUI with less video memory, the GUI might terminate unexpectedly.

To work around the problem, configure the hypervisor to assign at least 16 MB of video memory to the VM. As a result, the GUI on the VM no longer crashes.

(BZ#1910358)

VNC Viewer displays wrong colors with the 16-bit color depth on IBM Z

The VNC Viewer application displays wrong colors when you connect to a VNC session on an IBM Z server with the 16-bit color depth.

To work around the problem, set the 24-bit color depth on the VNC server. With the **Xvnc** server, replace the **-depth 16** option with **-depth 24** in the **Xvnc** configuration.

As a result, VNC clients display the correct colors but use more network bandwidth with the server.

(BZ#1886147)

Matrox GPU with a VGA display shows no output

Your display might show no graphical output if you use the following system configuration:

- A GPU in the Matrox MGA G200 family
- A display connected over the VGA controller
- UEFI switched to legacy mode

As a consequence, you cannot use or install RHEL on this configuration.

To work around the problem, use the following procedure:

1. Boot the system to the boot loader menu.
2. Add the **nomodeset** option to the kernel command line.

As a result, RHEL boots and shows graphical output as expected, but the maximum resolution is limited.

(BZ#1953926)

Unable to run graphical applications using sudo command

When trying to run graphical applications as a user with elevated privileges, the application fails to open with an error message. The failure happens because **Xwayland** is restricted by the **Xauthority** file to use regular user credentials for authentication.

To work around this problem, use the **sudo -E** command to run graphical applications as a **root** user.

(BZ#1673073)

Hardware acceleration is not supported on ARM

Built-in graphics drivers do not support hardware acceleration or the Vulkan API on the 64-bit ARM architecture.

To enable hardware acceleration or Vulkan on ARM, install the proprietary Nvidia driver.

(JIRA:RHELPLAN-57914)

10.16. VIRTUALIZATION

Hot unplugging an IBMVFC device on PowerVM fails

When using a virtual machine (VM) with a RHEL 8 guest operating system on the PowerVM hypervisor, attempting to remove an IBM Power Virtual Fibre Channel (IBMVFC) device from the running VM currently fails. Instead, it displays an **outstanding translation** error.

To work around this problem, remove the IBMVFC device when the VM is shut down.

(BZ#1959020)

IBM POWER hosts may crash when using the ibmvfc driver

When running RHEL 8 on a PowerVM logical partition (LPAR), a variety of errors may currently occur due to problems with the **ibmvfc** driver. As a consequence, the host's kernel may panic under certain circumstances, such as:

- Using the Live Partition Mobility (LPM) feature
- Resetting a host adapter
- Using SCSI error handling (SCSI EH) functions

(BZ#1961722)

Using perf kvm record on IBM POWER Systems can cause the VM to crash

When using a RHEL 8 host on the little-endian variant of IBM POWER hardware, using the **perf kvm record** command to collect trace event samples for a KVM virtual machine (VM) in some cases results in the VM becoming unresponsive. This situation occurs when:

- The **perf** utility is used by an unprivileged user, and the **-p** option is used to identify the VM - for example **perf kvm record -e trace_cycles -p 12345**.
- The VM was started using the **virsh** shell.

To work around this problem, use the **perf kvm** utility with the **-i** option to monitor VMs that were created using the **virsh** shell. For example:

```
# perf kvm record -e trace_imc/trace_cycles/  -p <guest pid> -i
```

Note that when using the **-i** option, child tasks do not inherit counters, and threads will therefore not be monitored.

(BZ#1924016)

Attaching LUN devices to virtual machines using virtio-blk does not work

The q35 machine type does not support transitional virtio 1.0 devices, and RHEL 8 therefore lacks support for features that were deprecated in virtio 1.0. In particular, it is not possible on a RHEL 8 host to send SCSI commands from virtio-blk devices. As a consequence, attaching a physical disk as a LUN device to a virtual machine fails when using the virtio-blk controller.

Note that physical disks can still be passed through to the guest operating system, but they should be configured with the **device='disk'** option rather than **device='lun'**.

(BZ#1777138)

Virtual machines with iommu_platform=on fail to start on IBM POWER

RHEL 8 currently does not support the **iommu_platform=on** parameter for virtual machines (VMs) on IBM POWER system. As a consequence, starting a VM with this parameter on IBM POWER hardware results in the VM becoming unresponsive during the boot process.

(BZ#1910848)

Windows Server 2016 virtual machines with Hyper-V enabled fail to boot when using certain CPU models

Currently, it is not possible to boot a virtual machine (VM) that uses Windows Server 2016 as the guest operating system, has the Hyper-V role enabled, and uses one of the following CPU models:

- **EPYC-IBPB**
- **EPYC**

To work around this problem, use the **EPYC-v3** CPU model, or manually enable the **xsaves** CPU flag for the VM.

(BZ#1942888)

Migrating a POWER9 guest from a RHEL 7-ALT host to RHEL 8 fails

Currently, migrating a POWER9 virtual machine from a RHEL 7-ALT host system to RHEL 8 becomes unresponsive with a **Migration status: active** status.

To work around this problem, disable Transparent Huge Pages (THP) on the RHEL 7-ALT host, which enables the migration to complete successfully.

(BZ#1741436)

Using virt-customize sometimes causes guestfs-firstboot to fail

After modifying a virtual machine (VM) disk image using the **virt-customize** utility, the **guestfs-firstboot** service in some cases fails due to incorrect SELinux permissions. This causes a variety of problems during VM startup, such as failing user creation or system registration.

To avoid this problem, add the **--selinux-relabel** option to the **virt-customize** command.

(BZ#1554735)

Deleting a forward interface from a macvtap virtual network resets all connection counts of this network

Currently, deleting a forward interface from a **macvtap** virtual network with multiple forward interfaces also resets the connection status of the other forward interfaces of the network. As a consequence, the connection information in the live network XML is incorrect. Note, however, that this does not affect the functionality of the virtual network. To work around the issue, restart the **libvirtd** service on your host.

(BZ#1332758)

Virtual machines with SLOF fail to boot in netcat interfaces

When using a netcat (**nc**) interface to access the console of a virtual machine (VM) that is currently waiting at the Slimline Open Firmware (SLOF) prompt, the user input is ignored and VM stays unresponsive. To work around this problem, use the **nc -C** option when connecting to the VM, or use a telnet interface instead.

(BZ#1974622)

Mounting virtiofs directories fails in certain circumstances on RHEL 8 guests

Currently, when using the **virtiofs** feature to provide a host directory to a virtual machine (VM), mounting the directory on the VM fails with an "Operation not supported" error if the VM is using a RHEL 8.4 kernel but a RHEL 8.5 **selinux-policy** package.

To work around this issue, reboot the guest and boot it into the latest available kernel on the guest.

(BZ#1995558)

Virtual machines sometimes fail to start when using many virtio-blk disks

Adding a large number of virtio-blk devices to a virtual machine (VM) may exhaust the number of interrupt vectors available in the platform. If this occurs, the VM's guest OS fails to boot, and displays a **dracut-initqueue[392]: Warning: Could not boot** error.

(BZ#1719687)

SMT CPU topology is not detected by VMs when using host passthrough mode on AMD EPYC

When a virtual machine (VM) boots with the CPU host passthrough mode on an AMD EPYC host, the **TOPOEXT** CPU feature flag is not present. Consequently, the VM is not able to detect a virtual CPU topology with multiple threads per core. To work around this problem, boot the VM with the EPYC CPU model instead of host passthrough.

(BZ#1740002)

10.17. RHEL IN CLOUD ENVIRONMENTS

Setting static IP in a RHEL 8 virtual machine on a VMware host does not work

Currently, when using RHEL 8 as a guest operating system of a virtual machine (VM) on a VMware host, the DatasourceOVF function does not work correctly. As a consequence, if you use the **cloud-init** utility to set the VM's network to static IP and then reboot the VM, the VM's network will be changed to DHCP.

(BZ#1750862)

kdump sometimes does not start on Azure and Hyper-V

On RHEL 8 guest operating systems hosted on the Microsoft Azure or Hyper-V hypervisors, starting the **kdump** kernel in some cases fails when post-exec notifiers are enabled.

To work around this problem, disable crash kexec post notifiers:

```
# echo N > /sys/module/kernel/parameters/crash_kexec_post_notifiers
```

(BZ#1865745)

The SCSI host address sometimes changes when booting a Hyper-V VM with multiple guest disks

Currently, when booting a RHEL 8 virtual machine (VM) on the Hyper-V hypervisor, the host portion of the *Host, Bus, Target, Lun* (HBTL) SCSI address in some cases changes. As a consequence, automated tasks set up with the HBTL SCSI identification or device node in the VM do not work consistently. This occurs if the VM has more than one disk or if the disks have different sizes.

To work around the problem, modify your kickstart files, using one of the following methods:

Method 1: Use persistent identifiers for SCSI devices.

You can use for example the following powershell script to determine the specific device identifiers:

```
# Output what the /dev/disk/by-id/<value> for the specified hyper-v virtual disk.
# Takes a single parameter which is the virtual disk file.
# Note: kickstart syntax works with and without the /dev/ prefix.
param (
    [Parameter(Mandatory=$true)][string]$virtualdisk
)

$what = Get-VHD -Path $virtualdisk
$part = $what.DiskIdentifier.ToLower().split('-')

$p = $part[0]
$s0 = $p[6] + $p[7] + $p[4] + $p[5] + $p[2] + $p[3] + $p[0] + $p[1]

$p = $part[1]
$s1 =  $p[2] + $p[3] + $p[0] + $p[1]

[string]::format("/dev/disk/by-id/wwn-0x60022480{0}{1}{2}", $s0, $s1, $part[4])
```

You can use this script on the hyper-v host, for example as follows:

```
PS C:\Users\Public\Documents\Hyper-V\Virtual hard disks> .\by-id.ps1 .\Testing_8\disk_3_8.vhdx
/dev/disk/by-id/wwn-0x60022480e00bc367d7fd902e8bf0d3b4
PS C:\Users\Public\Documents\Hyper-V\Virtual hard disks> .\by-id.ps1 .\Testing_8\disk_3_9.vhdx
/dev/disk/by-id/wwn-0x600224807270e09717645b1890f8a9a2
```

Afterwards, the disk values can be used in the kickstart file, for example as follows:

```
part / --fstype=xfs --grow --asprimary --size=8192 --ondisk=/dev/disk/by-id/wwn-
0x600224807270e09717645b1890f8a9a2
part /home --fstype="xfs" --grow --ondisk=/dev/disk/by-id/wwn-
0x60022480e00bc367d7fd902e8bf0d3b4
```

As these values are specific for each virtual disk, the configuration needs to be done for each VM instance. It may, therefore, be useful to use the **%include** syntax to place the disk information into a separate file.

Method 2: Set up device selection by size.

A kickstart file that configures disk selection based on size must include lines similar to the following:

-

```
...

# Disk partitioning information is supplied in a file to kick start
%include /tmp/disks

...

# Partition information is created during install using the %pre section
%pre --interpreter /bin/bash --log /tmp/ks_pre.log

 # Dump whole SCSI/IDE disks out sorted from smallest to largest ouputting
 # just the name
 disks=(`lsblk -n -o NAME -I -b -x SIZE -d -I 8,3`) || exit 1

 # We are assuming we have 3 disks which will be used
 # and we will create some variables to represent
 d0=${disks[0]}
 d1=${disks[1]}
 d2=${disks[2]}

 echo "part /home --fstype="xfs" --ondisk=$d2 --grow" >> /tmp/disks
 echo "part swap --fstype="swap" --ondisk=$d0 --size=4096" >> /tmp/disks
 echo "part / --fstype="xfs" --ondisk=$d1 --grow" >> /tmp/disks
 echo "part /boot --fstype="xfs" --ondisk=$d1 --size=1024" >> /tmp/disks

%end
```

(BZ#1906870)

10.18. SUPPORTABILITY

redhat-support-tool does not work with the FUTURE crypto policy

Because a cryptographic key used by a certificate on the Customer Portal API does not meet the requirements by the **FUTURE** system-wide cryptographic policy, the **redhat-support-tool** utility does not work with this policy level at the moment.

To work around this problem, use the **DEFAULT** crypto policy while connecting to the Customer Portal API.

(BZ#1802026)

10.19. CONTAINERS

Rootless containers with fuse-overlayfs do not recognize removed files

In RHEL 8.4 and earlier, rootless images and containers were created or stored using the fuse-overlayfs file system. Using such images and containers in RHEL 8.5 and later might introduce problems for unprivileged users using the overlayfs implementation provided by the kernel and who had removed files or directories from a container or from an image in RHEL 8.4. This issue does not apply to containers created by the root account.

For example, files or directories that are to be removed from a container or from an image are marked as such using the whiteout format when using the fuse-overlayfs file system. However, due to differences in the format, the kernel overlayfs implementation does not recognize the whiteout format created by

fuse-overlayfs. As a result, any removed files or directories still appear. This problem does not apply to containers that were created by the root account.

To work around this problem, use one of the following options:

1. Remove all of the unprivileged user's containers and images using the **podman unshare rm -rf $HOME/.local/share/containers/*** command. When a user next runs Podman, the **$HOME/.local/share/containers** directory is recreated, and they will need to recreate their containers.

2. Continue to run the **podman** command as a rootless user. The first time an updated version of **podman** is invoked on the system, it scans all of the files in the **$HOME/.local/share/containers** directory, and detects whether or not to use fuse-overlayfs. Podman records the result of the scan so that it will not re-run the scan later. As a result, the removed files do not appear.

The time required to detect if fuse-overlayfs is still necessary is dependent on the number of files and directories in the containers and images that need to be scanned.

(JIRA:RHELPLAN-92741)

Running systemd within an older container image does not work

Running systemd within an older container image, for example, **centos:7**, does not work:

```
$ podman run --rm -ti centos:7 /usr/lib/systemd/systemd
 Storing signatures
 Failed to mount cgroup at /sys/fs/cgroup/systemd: Operation not permitted
 [!!!!!!] Failed to mount API filesystems, freezing.
```

To work around this problem, use the following commands:

```
# mkdir /sys/fs/cgroup/systemd
# mount none -t cgroup -o none,name=systemd /sys/fs/cgroup/systemd
# podman run --runtime /usr/bin/crun --annotation=run.oci.systemd.force_cgroup_v1=/sys/fs/cgroup -
-rm -ti centos:7 /usr/lib/systemd/systemd
```

(JIRA:RHELPLAN-96940)

Container images signed with a Beta GPG key can not be pulled

Currently, when you try to pull RHEL Beta container images, **podman** exits with the error message: **Error: Source image rejected: None of the signatures were accepted**. The images fail to be pulled due to current builds being configured to not trust the RHEL Beta GPG keys by default.

As a workaround, ensure that the Red Hat Beta GPG key is stored on your local system and update the existing trust scope with the **podman image trust set** command for the appropriate beta namespace.

If you do not have the Beta GPG key stored locally, you can pull it by running the following command:

```
sudo wget -O /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-beta
https://www.redhat.com/security/data/f21541eb.txt
```

To add the Beta GPG key as trusted to your namespace, use one of the following commands:

```
$ sudo podman image trust set -f /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-beta
registry.access.redhat.com/namespace
```

and

```
$ sudo podman image trust set -f /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-beta
registry.redhat.io/namespace
```

Replace *namespace* with *ubi9-beta* or *rhel9-beta*.

(BZ#2020301)

CHAPTER 11. INTERNATIONALIZATION

11.1. RED HAT ENTERPRISE LINUX 8 INTERNATIONAL LANGUAGES

Red Hat Enterprise Linux 8 supports the installation of multiple languages and the changing of languages based on your requirements.

- East Asian Languages - Japanese, Korean, Simplified Chinese, and Traditional Chinese.
- European Languages - English, German, Spanish, French, Italian, Portuguese, and Russian.

The following table lists the fonts and input methods provided for various major languages.

Language	Default Font (Font Package)	Input Methods
English	dejavu-sans-fonts	
French	dejavu-sans-fonts	
German	dejavu-sans-fonts	
Italian	dejavu-sans-fonts	
Russian	dejavu-sans-fonts	
Spanish	dejavu-sans-fonts	
Portuguese	dejavu-sans-fonts	
Simplified Chinese	google-noto-sans-cjk-ttc-fonts, google-noto-serif-cjk-ttc-fonts	ibus-libpinyin, libpinyin
Traditional Chinese	google-noto-sans-cjk-ttc-fonts, google-noto-serif-cjk-ttc-fonts	ibus-libzhuyin, libzhuyin
Japanese	google-noto-sans-cjk-ttc-fonts, google-noto-serif-cjk-ttc-fonts	ibus-kkc, libkkc
Korean	google-noto-sans-cjk-ttc-fonts, google-noto-serif-cjk-ttc-fonts	ibus-hangul, libhangul

11.2. NOTABLE CHANGES TO INTERNATIONALIZATION IN RHEL 8

RHEL 8 introduces the following changes to internationalization compared to RHEL 7:

- Support for the **Unicode 11** computing industry standard has been added.
- Internationalization is distributed in multiple packages, which allows for smaller footprint installations. For more information, see Using langpacks.

- A number of **glibc** locales have been synchronized with Unicode Common Locale Data Repository (CLDR).

APPENDIX A. LIST OF TICKETS BY COMPONENT

Bugzilla and JIRA IDs are listed in this document for reference. Bugzilla bugs that are publicly accessible include a link to the ticket.

Component	Tickets
389-ds-base	BZ#1898541, BZ#1951020, BZ#1938239, BZ#1947044, BZ#1626633, BZ#1812286, BZ#1850664, BZ#1944494, BZ#1895460, BZ#1817505
NetworkManager	BZ#1912236, BZ#1899372, BZ#1942331, BZ#1934465, BZ#1548825, BZ#1920398
SLOF	BZ#1910848
accel-config	BZ#1843266
accountsservice	BZ#1812788
anaconda	BZ#1914955, BZ#1931069, BZ#1903786, BZ#1954408, BZ#1821192, BZ#1822880, BZ#1929105, BZ#1897657
ansible-collection-redhat-rhel_mgmt	BZ#1843859
apr	BZ#1819607
bpftrace	BZ#1944716
brltty	BZ#2008197
chrony	BZ#1939295, BZ#1895003
cloud-init	BZ#1957532, BZ#1750862
cmake	BZ#1957947
cockpit	BZ#1666722
container-tools-rhel8-module	BZ#2009153
containers-common	BZ#2020301, BZ#2019901
coreutils	BZ#2030661
corosync-qdevice	BZ#1784200

Component	Tickets
crash	BZ#1906482
createrepo_c	BZ#1973588
crypto-policies	BZ#1960266, BZ#1876846, BZ#1933016, BZ#1919155, BZ#1660839
distribution	BZ#1953991, BZ#1657927
dotnet6.0	BZ#2022794
dracut	BZ#1929201
dwz	BZ#1948709
dyninst	BZ#1933893, BZ#1957942
edk2	BZ#1741615, BZ#1935497
elfutils	BZ#1933890, BZ#1957225
fence-agents	BZ#1775847
firewalld	BZ#1872702, BZ#1492722, BZ#1871860
freeradius	BZ#1954521, BZ#1977572, BZ#1723362, BZ#1958979
gcc-toolset-11-gdb	BZ#1954332
gcc-toolset-11	BZ#1953094
gcc	BZ#1974402, BZ#1946758, BZ#1946782, BZ#1927516, BZ#1979715
gdb	BZ#1854784, BZ#1853140
glibc	BZ#1934155, BZ#1912670, BZ#1930302
gnome-shell-extensions	BZ#1717947
gnome-shell	BZ#1935261, BZ#1651378
gnome-software	BZ#1668760
gnutls	BZ#1965445, BZ#1956783, BZ#1628553

Component	Tickets
go-toolset	BZ#1938071
golang	BZ#1979100, BZ#1972825
grafana-container	BZ#1971557
grafana-pcp	BZ#1921190
grafana	BZ#1921191
grub2	BZ#1583445
hwloc	BZ#1917560
ipa	BZ#1924707, BZ#1664719, BZ#1664718
ipmitool	BZ#1951480
kernel	BZ#1944639, BZ#1907271, BZ#1902543, BZ#1959772, BZ#1954363, BZ#1924230, BZ#1954024, BZ#1837389, BZ#1570255, BZ#1938339, BZ#1865745, BZ#1836058, BZ#1906870, BZ#1934033, BZ#1924016, BZ#1942888, BZ#1868526, BZ#1812577, BZ#1694705, BZ#1910358, BZ#1953926, BZ#1730502, BZ#1930576, BZ#1609288, BZ#1793389, BZ#1654962, BZ#1666538, BZ#1602962, BZ#1940674, BZ#1920086, BZ#1971506, BZ#1605216, BZ#1519039, BZ#1627455, BZ#1501618, BZ#1633143, BZ#1814836, BZ#1696451, BZ#1348508, BZ#1839311, BZ#1783396, JIRA:RHELPLAN-57712, BZ#1837187, BZ#1904496, BZ#1660337, BZ#1905243, BZ#1878207, BZ#1665295, BZ#1871863, BZ#1569610, BZ#1794513
kexec-tools	BZ#1922951, BZ#1879558, BZ#1854037, BZ#1931266, BZ#2004000
krb5	BZ#1956388, BZ#1877991
libcomps	BZ#1960616
libgcrypt	BZ#1976137
libgnome-keyring	BZ#1607766
libguestfs	BZ#1554735
libmodulemd	BZ#1894573, BZ#1984402
librepo	BZ#1814383

Component	Tickets
libreswan	BZ#1958968, BZ#1934058, BZ#1934859, BZ#1989050
libselinux-python-2.8-module	BZ#1666328
libservicelog	BZ#1844430
libvirt	BZ#1664592, BZ#1332758, BZ#1528684
linuxptp	BZ#1895005
llvm-toolset	BZ#1927937
lsvpd	BZ#1844428
lvm2	BZ#1899214, BZ#1496229, BZ#1768536
mariadb-connector-odbc	BZ#1944692
mariadb	BZ#1944653, BZ#1942330
mesa	BZ#1886147
modulemd-tools	BZ#1924850
mutt	BZ#1912614
net-snmp	BZ#1919714
nfs-utils	BZ#1868087, BZ#1592011
nginx	BZ#1945671
nispor	BZ#1848817
nodejs-16-container	BZ#2001020
nss_nis	BZ#1803161
nss	BZ#1817533, BZ#1645153
opal-prd	BZ#1921665

Component	Tickets
opencryptoki	BZ#1919223
opencv	BZ#1886310
openmpi	BZ#1866402
opensc	BZ#1947025
openscap	BZ#1959570, BZ#1953092, BZ#1966612
openslp	BZ#1965649
openssl	BZ#1810911
osbuild-composer	BZ#1945238, BZ#1937854, BZ#1915351, BZ#1951964
oscap-anaconda-addon	BZ#1691305, BZ#1674001, BZ#1843932, BZ#1665082
pacemaker	BZ#1948620, BZ#1443666
papi	BZ#1908126
pcp-container	BZ#1974912
pcp	BZ#1922040, BZ#1879350, BZ#1629455
pcs	BZ#1839637, BZ#1872378, BZ#1909901, BZ#1885293, BZ#1290830, BZ#1619620, BZ#1847102, BZ#1851335
pg_repack	BZ#1967193
php	BZ#1944110
pki-core	BZ#1729215
podman	JIRA:RHELPLAN-77542, JIRA:RHELPLAN-77241, BZ#1934480, JIRA:RHELPLAN-77238, JIRA:RHELPLAN-77489, JIRA:RHELPLAN-92741
postfix	BZ#1711885
powertop	BZ#1834722

Component	Tickets
ppc64-diag	BZ#1779206
pykickstart	BZ#1637872
qatlib	BZ#1920237
qemu-kvm	BZ#1740002, BZ#1719687, BZ#1651994
quota	BZ#1945408
rear	BZ#1983013, BZ#1930662, BZ#1958247, BZ#1988493, BZ#1958222, BZ#1983003, BZ#1747468, BZ#1868421
redhat-release	BZ#1935177
redhat-support-tool	BZ#1802026
restore	BZ#1997366
rhel-system-roles	BZ#1960375, BZ#1866544, BZ#1961858, BZ#1958963, BZ#1938014, BZ#1954747, BZ#1854187, BZ#1757869, BZ#1990947, BZ#1952090, BZ#1994580, BZ#1967335, BZ#1966711, BZ#1962976, BZ#1938016, BZ#1986463, BZ#1970664, BZ#1970642, BZ#1848683, BZ#1938020, BZ#1938023, BZ#1957849, BZ#1959649, BZ#1939711, BZ#1943679, BZ#1882475, BZ#1876315, BZ#1894642, BZ#1989199, BZ#1893743
rpm	BZ#1938928, BZ#1688849
rsyslog	BZ#1891458, BZ#1932795, BZ#1679512, JIRA:RHELPLAN-10431
rt-tests	BZ#1954387
ruby	BZ#1938942
rust-toolset	BZ#1945805
samba	BZ#1944657, BZ#2009213, JIRA:RHELPLAN-13195, Jira:RHELDOCS-16612
scap-security-guide	BZ#1857179, BZ#1946252, BZ#1955373, BZ#1966577, BZ#1970137, BZ#1993056, BZ#1993197, BZ#1876483, BZ#1955183, BZ#1843913, BZ#1858866, BZ#1750755
selinux-policy	BZ#1994096, BZ#1860443, BZ#1931848, BZ#1947841, BZ#1461914

Component	Tickets
socat	BZ#1947338
sos	BZ#1928679
spice	BZ#1849563
squid	BZ#1964384
sssd	BZ#1737489, BZ#1879869, BZ#1949149, BZ#1627112, BZ#1947671
systemtap	BZ#1933889, BZ#1957944
tboot	BZ#1947839
tesseract	BZ#1826085
tss2	BZ#1822073
tuned	BZ#1951992
udftools	BZ#1882531
udica	BZ#1763210
usbguard	BZ#2000000
valgrind	BZ#1933891, BZ#1957226
vdo	BZ#1949163
wayland	BZ#1673073
xfsprogs	BZ#1949743
xorg-x11-server	BZ#1698565

Component	Tickets
other	BZ#2005277, BZ#1839151, JIRA:RHELPLAN-89566, JIRA:RHELPLAN-92473, JIRA:RHELPLAN-96640, JIRA:RHELPLAN-97145, BZ#1935686, BZ#1986007, JIRA:RHELPLAN-75166, JIRA:RHELPLAN-76515, JIRA:RHELPLAN-57941, JIRA:RHELPLAN-85064, JIRA:RHELPLAN-87877, JIRA:RHELPLAN-75164, BZ#2011448, JIRA:RHELPLAN-99040, JIRA:RHELPLAN-99049, JIRA:RHELPLAN-99043, JIRA:RHELPLAN-99044, JIRA:RHELPLAN-99148, JIRA:RHELPLAN-61867, BZ#2013853, BZ#1957316, JIRA:RHELPLAN-79074, BZ#2019318, JIRA:RHELPLAN-59528, JIRA:RHELPLAN-95056, BZ#1971061, BZ#1959020, BZ#1897383, BZ#1961722, BZ#1777138, BZ#1640697, BZ#1659609, BZ#1687900, BZ#1697896, BZ#1757877, BZ#1741436, JIRA:RHELPLAN-59111, JIRA:RHELPLAN-27987, JIRA:RHELPLAN-28940, JIRA:RHELPLAN-34199, JIRA:RHELPLAN-57914, JIRA:RHELPLAN-96940, BZ#1987087, BZ#1974622, BZ#1995558, BZ#2028361, BZ#1690207, JIRA:RHELPLAN-1212, BZ#1559616, BZ#1889737, BZ#1812552, JIRA:RHELPLAN-14047, BZ#1769727, JIRA:RHELPLAN-27394, JIRA:RHELPLAN-27737, BZ#1906489, JIRA:RHELPLAN-58596, BZ#1642765, JIRA:RHELPLAN-10304, BZ#1646541, BZ#1647725, BZ#1932222, BZ#1686057, BZ#1748980, BZ#1958250, JIRA:RHELPLAN-71200, BZ#1827628, JIRA:RHELPLAN-45858, BZ#1871025, BZ#1871953, BZ#1874892, BZ#1893767, BZ#1916296, JIRA:RHELPLAN-100400, BZ#1926114, BZ#1904251, BZ#2011208, JIRA:RHELPLAN-59825, BZ#1920624, JIRA:RHELPLAN-70700, BZ#1929173, BZ#2006665, JIRA:RHELPLAN-98983, BZ#2013335, BZ#2019786, BZ#2009113, BZ#2038929

APPENDIX B. REVISION HISTORY

0.3-6

Wed Nov 26 2025, Valentina Adshirova (vaashiro@redhat.com)

- Moved an Enhancement BZ#1922312 (File systems and storage).
- Moved an Enhancement BZ#1945408 (File systems and storage).

0.3-5

Thu Jan 30 2025, Gabriela Fialová (gfialova@redhat.com)

- Added an Known Issue JIRA:RHELDOCS-19603 (IdM SSSD)

0.3-4

Wed Dec 4 2024, Gabriela Fialová (gfialova@redhat.com)

- Updated the Customer Portal labs section
- Updated the Installation section

0.3-3

Wed Jun 10 2024, Gabriela Fialova (gfialova@redhat.com)

- Added an enhancement in BZ#1922312 (File systems and storage).

0.3-2

Thu May 9 2024, Brian Angelica (bangelic@redhat.com)

- Updated a tech preview in BZ#1690207.

0.3-1

Thu May 9 2024, Gabriela Fialova (gfialova@redhat.com)

- Updated a known issue BZ#1730502 (Storage).

0.3-0

Thu Feb 29 2024, Lucie Vařáková (lvarakova@redhat.com)

- Added a deprecated functionality JIRA:RHELDOCS-17641 (Networking).

0.2-9

Fri Nov 10 2023, Gabriela Fialová (gfialova@redhat.com)

- Updated the module on Providing Feedback on RHEL Documentation.

0.2-8

Tue Nov 7 2023, Gabriela Fialová (gfialova@redhat.com)

- Fix broken links.

0.2-7

Fri Oct 13 2023, Gabriela Fialová (gfialova@redhat.com)

- Added a tech preview JIRA:RHELDOCS-16861 (Containers).

0.2-6

September 8 2023, Marc Muehlfeld (mmuehlfeld@redhat.com)

- Added a deprecated functionality release note JIRA:RHELDOCS-16612 (Samba).

0.2-5

Wed Jun 7 2023, Lucie Vařáková (lvarakova@redhat.com)

- Added a new feature JIRA:RHELPLAN-159143 (Identity Management).

0.2-4

Thu Apr 27 2023, Gabriela Fialová (gfialova@redhat.com)

- Added a known issue JIRA:RHELPLAN-155168 (Identity Management).

0.2-3

Thu Apr 13 2023, Gabriela Fialová (gfialova@redhat.com)

- Fixed 2 broken links in DFs and KIs.

0.2-2

Mon Jan 30 2023, Lucie Vařáková (lvarakova@redhat.com)

- Added a new feature BZ#2164986 (Networking).

0.2-1

Thu Dec 08 2022, Marc Muehlfeld (mmuehlfeld@redhat.com)

- Added a known issue BZ#2132754 (Networking).

0.2-0

Fri Jul 29, Lucie Vařáková (lvarakova@redhat.com)

- Added bug fix BZ#1661674 (File systems and storage).

0.1-9

Thu Jun 09, Lucie Vařáková (lmanasko@redhat.com)

- Added known issue BZ#2059262 (File systems and storage).
- Added bug fix BZ#1940468 (Shells and command-line tools).

0.1-8

Fri Apr 29, Lenka Špačková (lspackova@redhat.com)

- Updated Deprecated functionality introduction.

- Fixed typo in BZ#1605216.
- Fixed broken links.

0.1-7

Wed Apr 27, 2022, Gabriela Fialová (gfialova@redhat.com)

- Added BZ#2050140 into Known Issues (Installer).

0.1-6

Fri Apr 1, 2022, Gabriela Fialová (gfialova@redhat.com)

- Added JIRA:RHELPLAN-57712 moved from Technology previews to Enhancements (Networking).

0.1-5

Tue Mar 22, 2022, Lucie Maňásková (lmanasko@redhat.com)

- Added JIRA:RHELPLAN-100230 to known issues (Desktop).

0.1-5

Mon Mar 21, 2022, Jaroslav Klech (jklech@redhat.com)

- Removed BZ#1666538 from Known Issues (Kernel).

0.1-4

Thu Mar 17, 2022, Jaroslav Klech (jklech@redhat.com)

- Removed BZ#1947839 from Known Issues (Kernel).

0.1-3

Tue Feb 15, 2022, Lucie Maňásková (lmanasko@redhat.com)

- Added bug fixes BZ#1934033 (RHEL in cloud environments) and BZ#2019901 (Containers).
- Added deprecated functionalities BZ#1997366 and BZ#2038929 (Shells and command-line tools), BZ#2009113 (Networking), BZ#1871863 (Kernel), BZ#1794513 (File systems and storage), and BZ#1664592 (Virtualization).
- Other minor updates.

0.1-2

Fri Feb 04 2022, Jaroslav Klech (jklech@redhat.com)

- Updated the list of deprecated packages.
- Added deprecated functionality BZ#1871863 (Kernel).
- Added deprecated functionality BZ#2038929 (Shells and command-line tools).

0.1-1

Thu Feb 03 2022, Gabriela Fialová (gfialova@redhat.com)

- Added deprecated functionality BZ#2009113 (Networking).
- Added deprecated functionality BZ#1794513 (File systems and storage).

0.1-0

Tue Feb 01 2022, Lucie Maňásková (lmanasko@redhat.com)

- Added deprecated functionality BZ#1997366 (Shells and command-line tools).
- Changed BZ#1664592 from a known issue to deprecated functionality (Virtualization).

0.0-9

Thu Jan 27 2022, Lucie Maňásková (lmanasko@redhat.com)

- Added BZ#2030661 to known issues (Shells and command-line tools).
- Updated the list of deprecated devices.

0.0-8

Mon Jan 17 2022, Lucie Maňásková (lmanasko@redhat.com)

- Added BZ#2009153 to new features (Containers).
- Added BZ#2028361 to known issues (Installer and image creation).
- Updated the list of deprecated devices.

0.0-7

Tue Dec 21 2021, Lenka Špačková (lspackova@redhat.com)

- Added information about the Soft-RoCE driver, **rdma_rxe**, to Technology Previews BZ#1605216 and Deprecated Functionality BZ#1878207 (Kernel).
- Moved the **ubi8/nodejs-16** and **ubi8/nodejs-16-minimal** container images BZ#2001020 from Technology Previews to fully supported features (Containers).

0.0-6

Thu Dec 16 2021, Lenka Špačková (lspackova@redhat.com)

- Moved the **nodejs:16** module stream BZ#1953991 from Technology Previews to fully supported features (Dynamic programming languages, web and database servers).

0.0-5

Fri Dec 10 2021, Lucie Maňásková (lmanasko@redhat.com)

- Added deprecated functionality BZ#1827628 (File systems and storage).
- Added BZ#1654962 to known issues (Kernel).
- Other minor updates.

0.0-4

Mon Nov 22 2021, Lucie Maňásková (lmanasko@redhat.com)

- Updated new feature BZ#1922951 (Kernel).
- Added new feature BZ#1934480 (Containers).
- Other minor updates.

0.0-3

Fri Nov 19 2021, Lucie Maňásková (lmanasko@redhat.com)

- Added BZ#1959772 and BZ#1954363 to bug fixes (Kernel).
- Added BZ#1977572 to bug fixes (Identity Management).
- Added BZ#2022794 to new features (Compilers and development tools).
- Added information about changes to external kernel parameters.

0.0-2

Wed Nov 17 2021, Prerana Sharma (presharm@redhat.com)

- Added BZ#1944716 (bpftrace) in Appendix A.

0.0-1

Wed Nov 10 2021, Lucie Maňásková (lmanasko@redhat.com)

- Release of the Red Hat Enterprise Linux 8.5 Release Notes.

0.0-0

Wed Oct 06 2021, Lucie Maňásková (lmanasko@redhat.com)

- Release of the Red Hat Enterprise Linux 8.5 Beta Release Notes.