Red Hat Enterprise Linux 9

Considerations in adopting RHEL 9

Key differences between RHEL 8 and RHEL 9

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Abstract

This document provides an overview of changes in RHEL 9 since RHEL 8 to help you evaluate an upgrade to RHEL 9.

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CHAPTER 1. PREFACE

This document provides an overview of differences between two major versions of Red Hat Enterprise Linux: RHEL 8 and RHEL 9. It provides a list of changes relevant for evaluating an upgrade to RHEL 9 rather than an exhaustive list of all alterations.

For details regarding RHEL 9 usage, see the RHEL 9 product documentation .

For guidance regarding an in-place upgrade from RHEL 8 to RHEL 9, see Upgrading from RHEL 8 to RHEL 9.

For information about major differences between RHEL 7 and RHEL 8, see Considerations in adopting RHEL 8.

Capabilities and limits of Red Hat Enterprise Linux 9 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 9, including licenses and application compatibility levels.

Application compatibility levels are explained in the Red Hat Enterprise Linux 9: Application Compatibility Guide document.

CHAPTER 2. ARCHITECTURES

Red Hat Enterprise Linux 9 is distributed with the kernel version 5.14, which provides support for the following architectures at the minimum required version:

- AMD and Intel 64-bit architectures (x86-64-v2)
- The 64-bit ARM architecture (ARMv8.0-A)
- IBM Power Systems, Little Endian (POWER9)
- 64-bit IBM Z (z14)

Make sure you purchase the appropriate subscription for each architecture.

Additional resources

- Get Started with Red Hat Enterprise Linux - additional architectures

CHAPTER 3. REPOSITORIES

Red Hat Enterprise Linux 9 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 more information, see the Scope of Coverage Details document.

Content in the AppStream repository includes additional user-space applications, runtime languages, and databases in support of the varied workloads and use cases.

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.

Additional resources

- Package manifest

CHAPTER 4. APPLICATION STREAMS

Multiple versions of user-space components are delivered as Application Streams and updated more frequently than the core operating system packages. This provides greater flexibility to customize RHEL without impacting the underlying stability of the platform or specific deployments.

Each Application Stream component has a given life cycle, either the same as RHEL 9 or shorter. For RHEL life cycle information, see Red Hat Enterprise Linux Life Cycle and Red Hat Enterprise Linux Application Streams Life Cycle.

Application Streams are available in the following formats:

- the familiar RPM format
- as an extension to the RPM format called modules
- as Software Collections
- as Flatpaks.

RHEL 9 improves the Application Streams experience by providing initial Application Stream versions that can be installed as RPM packages using the traditional **dnf install** command.

NOTE

Certain initial Application Streams in the RPM format have a shorter life cycle than Red Hat Enterprise Linux 9.

Some additional Application Stream versions will be distributed as modules with a shorter life cycle in future minor RHEL 9 releases. It is recommended to review the Red Hat Enterprise Linux Application Stream Lifecycle definitions for any content life cycle considerations.

Always determine what version of an Application Stream you want to install and make sure to review the Red Hat Enterprise Linux Application Stream Lifecycle first.

Content that needs rapid updating, such as alternate compilers and container tools, is available in rolling streams that will not provide alternative versions in parallel. Rolling streams can be packaged as RPMs or modules.

For information about Application Streams available in RHEL 9 and their application compatibility level, see the Package manifest. Application compatibility levels are explained in the Red Hat Enterprise Linux 9: Application Compatibility Guide document.

Additional resources

- Red Hat Enterprise Linux Life Cycle
- Red Hat Enterprise Linux Application Stream Lifecycle
- Red Hat Enterprise Linux 9: Application Compatibility Guide
- Managing software with the DNF tool
- Package manifest

CHAPTER 5. CLOUD

The following chapters contain the most notable changes to public cloud platforms between RHEL 8 and RHEL 9:

5.1. NOTABLE CHANGES TO AZURE

TDX support is available a Technology Preview for RHEL on Azure

The Intel Trust Domain Extension (TDX) feature can as a Technology Preview now be used in RHEL 9.4 guest operating systems. If the host system supports TDX, you can deploy hardware-isolated RHEL 9 virtual machines (VMs), called trust domains (TDs). As a result, you will be able to create a CVM image with SecureBoot enabled on the Azure platform.

5.2. NOTABLE CHANGES TO GCP

TDX support is available a Technology Preview for RHEL on GCP

The Intel Trust Domain Extension (TDX) feature can as a Technology Preview now be used in RHEL 9.4 guest operating systems. If the host system supports TDX, you can deploy hardware-isolated RHEL 9 virtual machines (VMs), called trust domains (TDs). With this enhancement, you can use the Intel Trust Domain Extension (TDX) feature in RHEL 9.4 on Google Cloud Platform.

CHAPTER 6. CONTAINERS

The following chapter contains the most notable changes to containers between RHEL 8 and RHEL 9.

6.1. NOTABLE CHANGES TO CONTAINERS

The container-tools meta-package is now available

The **container-tools** RPM meta-package, which includes Podman, Buildah, Skopeo, CRIU, Udica, and all required libraries, is available in RHEL 9. The stable streams are not available on RHEL 9. To receive stable access to Podman, Buildah, Skopeo, and others, use the RHEL EUS subscription.

To install the **container-tools** meta-package:

- Install the **container-tools** meta-package:

```
$ sudo dnf install container-tools
```

Improved control group performance

The previous version of control groups, cgroup version 1 (cgroup v1), caused performance problems with a variety of applications. The latest release of control groups, cgroup version 2 (cgroup v2) enables system administrators to limit resources for any application without causing performance problems.

In RHEL 9, the new version of control groups, cgroups v2, is enabled by default.

Podman now supports secure short names

Short-name aliases for images can now be configured in the **registries.conf** file in the **[aliases]** table. The short-names modes are:

- Enforcing: If no matching alias is found during the image pull, Podman prompts the user to choose one of the unqualified-search registries. If the selected image is pulled successfully, Podman automatically records a new short-name alias in the **$HOME/.cache/containers/short-name-aliases.conf** file (rootless user) and in the **/var/cache/containers/short-name-aliases.conf** (root user). If the user cannot be prompted (for example, stdin or stdout are not a TTY), Podman fails. Note that the **short-name-aliases.conf** file has precedence over **registries.conf** file if both specify the same alias. The enforcing mode is default in RHEL 9.

- Permissive: Similar to enforcing mode, but Podman does not fail if the user cannot be prompted. Instead, Podman searches in all unqualified-search registries in the given order. Note that no alias is recorded. The permissive mode is default in RHEL 8.

Example:

```
unqualified-search-registries=["registry.fedoraproject.org", "quay.io"]
[aliases]
"fedora"="registry.fedoraproject.org/fedora"
```

Default container registries in registries.conf

You can find the list of container registries in the **/etc/containers/registries.conf** file as a root user and in **$HOME/.config/containers/registries.conf** as a non-root user. By changing the **registries.conf** file, you can change the default system-wide search settings.

For RHEL 8, the **unqualified-search-registries** is:

```
unqualified-search-registries = ["registry.access.redhat.com", "registry.redhat.io", "docker.io"]
short-name-mode = "permissive"
```

For RHEL 9, the **unqualified-search-registries** is:

```
unqualified-search-registries = ["registry.access.redhat.com", "registry.redhat.io", "docker.io"]
short-name-mode = "enforcing"
```

Default OCI runtime change

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 when the user only has group access.

- The default container runtime in RHEL 8 is **runc**.
- The default container runtime in RHEL 9 is **crun**.

Running RHEL 9 containers on a RHEL 7 host is not supported

Running RHEL 9 containers on a RHEL 7 host is not supported.

For more information, see Red Hat Enterprise Linux Container Compatibility Matrix .

Default network stacks

Podman uses CNI as the default network stack in RHEL 8 and Netavark as the default network stack in fresh installs of RHEL 9.

If you perform an in-place upgrade from RHEL 8 to RHEL 9, Podman's network stack is set as:

- Netavark if the **network_backend** parameter in the **/etc/containers/containers.conf** file is not set or if you manually upgraded Podman's network stack in RHEL 8 to Netavark.
- CNI if there are containers, images, pods, or networks presented when Podman is first run after an upgrade. You can then manually upgrade to the new Netavark network stack. For instructions on how to switch between the CNI and Netavark network stacks, see 8.6 Switching network stack from CNI to Netavark and 8.7 Switching the network stack from Netavark to CNI.

Red Hat recommends explicitly specifying the **network_backend** parameter to ensure that the correct backend is selected.

WARNING

You cannot migrate the existing containers to a different network stack system using the **podman container checkpoint** and the **podman container restore** commands. If you want to switch from the CNI network stack to the Netavark network stack, recreate the container from the container image.

CHAPTER 7. COMPILERS AND DEVELOPMENT TOOLS

The following chapter contains the most notable changes to compilers and development tools between RHEL 8 and RHEL 9.

7.1. NOTABLE CHANGES TO GLIBC

All threading APIs now merged into libc.so.6

In RHEL 8, the system threading library, **libpthread.so**, was a distinct library. In RHEL 9, all threading APIs have been merged into the core C library **libc.so.6**. Moving threading into the core C library enables the library to support threads by default. With a single file the in-place upgrade process is also made smoother since the thread APIs and core C, POSIX and BSD APIs are all updated at the same time (no distinct libraries).

Developers can continue to use the **-lpthread** option when linking threaded applications, but it is no longer necessary.

Historically, libraries used a weak reference to **pthread_create** or **pthread_cancel** to detect if processes could possibly be multi-threaded. Since this check now always succeeds, because **libpthread.so** is now in the core C library, libraries should use the **__libc_single_threaded** symbol for this instead.

The libdl library now merged into libc.so.6

In RHEL 8, the **libdl** library was a distinct library. In RHEL 9, the **libdl** library has been merged into the core C library **libc.so.6**. This means that interposing the **dlsym** function is now much more difficult. Applications that need to control the way how symbol resolution works should switch to the auditor (**LD_AUDIT**) interfaces.

Name Service Switch service plugins for dns and files now merged into libc.so.6

In RHEL 8, the Name Service Switch (NSS) services for **files** and **dns**, which provides data to user and group identity management APIs, was a distinct plugin. In RHEL 9, the plugins have been merged into the core C library **libc.so.6.** Moving the **files** and **dns** service providers ensures that applications that need to cross a mount namespace boundary (for example, enter a container) can do so knowing that NSS **files** and **dns** access services are always loaded at process startup.

When calling user and group APIs, where those APIs depend on an **nsswitch.conf** that references **files** or **dns**, developers can expect those services to always be present and provide the underlying service data.

CHAPTER 8. DESKTOP

The following chapter contains the most notable changes to desktop between RHEL 8 and RHEL 9.

8.1. NOTABLE CHANGES TO DESKTOP

GNOME updated to version 40

The GNOME environment is now updated from GNOME 3.28 to GNOME 40 with many new features.

GNOME 40 includes a new and improved **Activities Overview** design. This gives the overview a more coherent look, and provides an improved experience for navigating the system and launching applications. Workspaces are now arranged horizontally, and the window overview and application grid are accessed vertically.

Other improvements to GNOME include:

- The performance and resource usage of GNOME has been significantly improved.
- The visual style, including the user interface, the login screen, the icons, and the desktop, has been refreshed.
- GNOME applications no longer use the application menu, which was available from the top panel. The functionality is now located in a primary menu within the application window.
- The **Settings** application has been redesigned.
- Screen sharing and remote desktop sessions have been improved.
- If you use the proprietary NVIDIA drivers, you can now launch applications using the discrete GPU:
  a. Open the overview.
  b. Right-click the application icon in the dash.
  c. Select the **Launch on Discrete GPU** item in the menu.
- The **Power Off / Log Out** menu now includes the **Suspend** option and a new **Restart** option, which can reboot the system to the boot loader menu when you hold **Alt**.
- Flatpak applications now update automatically.
- You can now group application icons in the overview together into folders using drag and drop.
- The **Terminal** application now supports right-to-left and bi-directional text.
- The **Pointer Location** accessibility feature now works in the Wayland session. When the feature is enabled, pressing **Ctrl** highlights the pointer location on the screen.
- GNOME Shell extensions are now managed by the **Extensions** application, rather than **Software**. The **Extensions** application handles updating extensions, configuring extension preferences, and removing or disabling extensions.
- The notifications popover now includes a **Do Not Disturb** button. When the button enabled, notifications do not appear on the screen.

- System dialogs that require a password now have an option to reveal the password text by clicking the eye (▌) icon.
- The **Software** application now automatically detects metered networks, such as mobile data networks. When the current network is metered, **Software** pauses updates in order to reduce data usage.
- Each connected display can now use a different refresh rate in the Wayland session.
- Fractional display scaling is available as an experimental option. It includes several preconfigured fractional ratios.
  To enable the experimental fractional scaling, add the **scale-monitor-framebuffer** value to the list of enabled experimental features:

```
$ gsettings set \
        org.gnome.mutter experimental-features \
        "['scale-monitor-framebuffer']"
```

  As a result, fractional scaling options are accessible on the **Display** panel in **Settings**.

NOTE

If the command fails with the following error:

```
error: Failed to execute child process “dbus-launch” (No such file or directory)
```

Install the **dbus-launch** package and repeat the command.

For more details on the changes in GNOME, see versions 3.30 to 40.0 in Release Notes.

X.org Server is now deprecated

The **X.org** display server is deprecated, and will be removed in a future major RHEL release. The default desktop session is now the **Wayland** session in most cases.

The **X11** protocol remains fully supported using the **XWayland** back end. As a result, applications that require **X11** can run in the **Wayland** session.

Red Hat is working on resolving the remaining problems and gaps in the **Wayland** session.

You can switch your user session back to the **X.org** back end. For more information, see Selecting GNOME environment and display protocol.

The Wayland session is now the default with NVIDIA drivers

When using the NVIDIA drivers, the desktop session now selects the Wayland display protocol by default, if the driver configuration supports Wayland. In previous RHEL releases, the NVIDIA drivers always disabled Wayland.

To enable Wayland with the NVIDIA drivers on your system, add the following options to the kernel command line:

- **nvidia-drm.modeset=1**
- **NVreg_PreserveVideoMemoryAllocations=1**

Note that Wayland has been the default display protocol with other graphics drivers since RHEL 8.0.

Under certain conditions, the NVIDIA drivers disable the Wayland display protocol and revert to the X.org display server:

- If the version of the NVIDIA driver is lower than 470.
- If the system is a laptop that uses hybrid graphics.
- If you have not enabled the required NVIDIA driver options.
- If the NVIDIA driver has not installed the required **systemd** services.

Additionally, Wayland is enabled but the desktop session uses X.org by default if the version of the NVIDIA driver is lower than 510.

Currently, the Wayland session with the NVIDIA drivers is still incomplete and presents certain known issues. Red Hat is actively working with NVIDIA to address these gaps and problems across the GPU stack.

X.Org X11 video drivers have been replaced by modesetting

The following X.Org X11 video drivers have been removed and replaced by the generic **modesetting** driver:

- **xorg-x11-drv-ati**
- **xorg-x11-drv-intel**
- **xorg-x11-drv-nouveau**
- **xorg-x11-drv-qxl**
- **xorg-x11-drv-vesa**

GPUs supported by RHEL now automatically use the **modesetting** driver.

If you apply a custom X.Org configuration for any of the removed drivers in RHEL 8 or earlier, your configuration will have no effect in RHEL 9. Before upgrading to RHEL 9, check your X.Org configuration files and directories, such as **/etc/X11/xorg.conf.d/**.

This change does not affect the proprietary NVIDIA driver, which is not maintained by Red Hat.

PipeWire is now the default audio service

The **PipeWire** service now manages all audio output and input. **PipeWire** replaces the **PulseAudio** service in general use cases and the **JACK** service in professional use cases. The system now redirects audio from applications that use **PulseAudio**, **JACK**, or the **ALSA** framework into **PipeWire**.

Benefits of **PipeWire** over the previous solutions include:

- A unified solution for consumer and professional users
- A flexible, modular architecture
- High performance and low latency, similar to the **JACK** service
- Isolation between audio clients for better security

You no longer have to configure the **JACK** service for applications that use it. All **JACK** applications now work in the default RHEL configuration.

PulseAudio is still available in RHEL, and you can enable it instead of **PipeWire**. For details, see Switching from PipeWire to PulseAudio .

GNOME Boxes have been removed

The GNOME Boxes application has been removed from RHEL 9. Boxes used the SPICE system to connect to virtual machines (VMs). In RHEL 9, SPICE is no longer available, and as a consequence, Boxes have also been removed.

If you require Boxes, Red Hat suggests to install Boxes from the Flathub repository: Boxes on Flathub. This version of Boxes continues to use SPICE, and as a result, it supports the missing features listed previously.

WARNING

Flathub is a community repository. Red Hat provides no support or guarantees for Boxes installed from Flathub.

For more information about SPICE in RHEL 9, see the SPICE section.

Power profiles are available in GNOME

You can now switch between several power profiles in the **Power** panel of **Settings** in the GNOME environment. The power profiles optimize various system settings for the selected goal.

The following power profiles are available:

Performance

Optimizes for high system performance and reduces battery life. This profile is only available on certain selected system configurations.

Balanced

Provides standard system performance and power consumption. This is the default profile.

Power Saver

Increases battery life and reduces system performance. This profile activates automatically on low battery.

Your power profile configuration persists across system reboots.

The power profiles functionality is available from the **power-profiles-daemon** package, which is installed by default.

Lightweight, single-application environment

For graphical use cases that only present a single application, a lightweight user interface (UI) is now available.

You can start GNOME in a single-application session, also known as kiosk mode. In this session, GNOME displays only a full-screen window of an application that you have configured.

The single-application session is significantly less resource intensive than the standard GNOME session.

For more information, see Restricting the session to a single application .

Language support is now provided by langpacks

Support for various languages is now available from **langpacks** packages. You can customize the level of language support that you want to install using the following package names, where ***code*** is the short ISO code for the language, such as **es** for Spanish:

langpacks-core-*code*

Provides a basic language support, including:

- The **glibc** locale
- The default font
- The default input method if the language requires it

langpacks-core-font-*code*

Provides only the default font for the language.

langpacks-*code*

Provides the complete language support, including the following in addition to the basic language support:

- Translations
- Spell checker dictionaries
- Additional fonts

Motif has been deprecated

The Motif widget toolkit has been deprecated in RHEL, because development in the upstream Motif community is inactive.

The following Motif packages have been deprecated, including their development and debugging variants:

- **motif**
- **openmotif**
- **openmotif21**
- **openmotif22**

Additionally, the **motif-static** package has been removed.

Red Hat recommends using the GTK toolkit as a replacement. GTK is more maintainable and provides new features compared to Motif.

Several bitmap fonts have been removed

The following bitmap font packages have been removed:

- **bitmap-console-fonts**
- **bitmap-fixed-fonts**
- **bitmap-fonts-compat**
- **bitmap-lucida-typewriter-fonts**

Red Hat has decided to remove these fonts because bitmap fonts have a limited pixel size. When you try to set a font size that is unavailable, the text might display in a different size or a different font, possibly a scalable one. This also decreases the rendering quality of bitmap fonts and disrupts the user experience.

Additionally, the **fontconfig** system ignores the Portable Compiled Format (PCF), one of the major bitmap font formats, because it contains no metadata to estimate the language coverage.

Note that the **bitmap-fangsongti-fonts** bitmap font package continues to be available to support the Lorax tool.

No Sign In button on the login screen

The login screen has been redesigned in this release. As a consequence, the login screen no longer includes a **Sign In** button, which was present in previous RHEL releases.

To confirm your password, press **Enter** instead.

Note also that the login options button (⚙) is now located in the lower-right corner of the screen.

TigerVNC is deprecated

The TigerVNC remote desktop solution is now deprecated. It will be removed in a future major RHEL release and replaced by a different remote desktop solution.

TigerVNC provides the server and client implementation of the Virtual Network Computing (VNC) protocol in RHEL 9.

The following packages are deprecated:

- **tigervnc**
- **tigervnc-icons**
- **tigervnc-license**
- **tigervnc-selinux**
- **tigervnc-server**
- **tigervnc-server-minimal**
- **tigervnc-server-module**

The **Connections** application (**gnome-connections**) continues to be supported as an alternative VNC client, but it does not provide a VNC server.

CHAPTER 9. DYNAMIC PROGRAMMING LANGUAGES, WEB SERVERS, DATABASE SERVERS

The following chapter contains the most notable changes to dynamic programming languages, web servers, and database servers between RHEL 8 and RHEL 9.

9.1. NOTABLE CHANGES TO DYNAMIC PROGRAMMING LANGUAGES, WEB AND DATABASE SERVERS

Initial Application Streams versions in RHEL 9

RHEL 9 improves the Application Streams experience by providing initial Application Stream versions that can be installed as RPM packages using the traditional **dnf install** command.

RHEL 9.0 provides the following dynamic programming languages:

- **Node.js 16**
- **Perl 5.32**
- **PHP 8.0**
- **Python 3.9**
- **Ruby 3.0**

RHEL 9.0 includes the following version control systems:

- **Git 2.31**
- **Subversion 1.14**

The following web servers are distributed with RHEL 9.0:

- **Apache HTTP Server 2.4**
- **nginx 1.20**

The following proxy caching servers are available:

- **Varnish Cache 6.6**
- **Squid 5.2**

RHEL 9.0 offers the following database servers:

- **MariaDB 10.5**
- **MySQL 8.0**
- **PostgreSQL 13**
- **Redis 6.2**

Some additional Application Stream versions will be distributed as modules with a shorter life cycle in future minor RHEL 9 releases.

Major differences in the Python ecosystem since RHEL 8

The unversioned **python** command

The unversioned form of the **python** command (**/usr/bin/python**) is available in the **python-unversioned-command** package. On some systems, this package is not installed by default. To install the unversioned form of the **python** command manually, use the **dnf install /usr/bin/python** command.

In RHEL 9, the unversioned form of the **python** command points to the default Python 3.9 version and it is an equivalent to the **python3** and **python3.9** commands. In RHEL 9, you cannot configure the unversioned command to point to a different version than Python 3.9.

The **python** command is intended for interactive sessions. In production, it is recommended to use **python3**, **python3.9**, or **python3.11** explicitly.

You can uninstall the unversioned **python** command by using the **dnf remove /usr/bin/python** command.

If you need a different **python** or **python3** command, you can create custom symlinks in **/usr/local/bin** or **~/.local/bin**, or use a Python virtual environment.

Several other unversioned commands are available, such as **/usr/bin/pip** in the **python3-pip** package. In RHEL 9, all unversioned commands point to the default Python 3.9 version.

Architecture-specific Python **wheels**

Architecture-specific Python **wheels** built on RHEL 9 newly adhere to the upstream architecture naming, which allows customers to build their Python **wheels** on RHEL 9 and install them on non-RHEL systems. Python **wheels** built on previous releases of RHEL are forward compatible and can be installed on RHEL 9. Note that this affects only **wheels** containing Python extensions, which are built for each architecture, not Python **wheels** with pure Python code, which is not architecture-specific.

Notable changes to **libdb**

RHEL 8 and RHEL 9 currently provide Berkeley DB (**libdb**) version 5.3.28, which is distributed under the LGPLv2 license. The upstream Berkeley DB version 6 is available under the AGPLv3 license, which is more restrictive.

The **libdb** package is deprecated as of RHEL 9 and might not be available in future major RHEL releases. Cryptographic algorithms have been removed from **libdb** in RHEL 9. Multiple **libdb** dependencies have been removed from RHEL 9.

Users of **libdb** are advised to migrate to a different key-value database. For more information, see the Knowledgebase article Available replacements for the deprecated Berkeley DB (libdb) in RHEL .

Tomcat available since RHEL 9.2

RHEL 9.2 introduces the Apache Tomcat server version 9. Tomcat is the servlet container that is used in the official Reference Implementation for the Java Servlet and JavaServer Pages technologies. The Java Servlet and JavaServer Pages specifications are developed by Sun under the Java Community Process. Tomcat is developed in an open and participatory environment and released under the Apache Software License version 2.0.

CHAPTER 10. EDGE

The following chapter contains the most notable changes to RHEL Edge between RHEL 8 and RHEL 9.

10.1. RHEL FOR EDGE

This version introduces the following enhancements over the previous versions.

Ability to add SQL backend for storing and querying FDO Owner Vouchers as Technology Preview

With this Technology Preview, you can select an SQL datastore in the FDO servers options, along with credentials and other parameters, to store the Owner Vouchers for the following FDO servers:

- **manufacturer-server**
- **onboarding-server**
- **rendezvous-server**

Ability to build FIPS enabled RHEL for Edge images

During the image provisioning, you can build FIPS enabled images for the following RHEL for Edge image types:

- **edge-installer**
- **edge-simplified-installer**
- **edge-raw-image**
- **edge-ami**
- **edge-vsphere**

Support to build RHEL for Edge AMI images

You have support to build **.ami** images for RHEL for Edge, customize the blueprint with Ignition to inject the credentials into the image during boot, and upload the **.ami** image to AWS and boot an EC2 instance in AWS.

Support to build RHEL for Edge VMDK images

You can also build RHEL for RHEL for Edge VMDK images, customize the blueprint with Ignition to inject the credentials into the image during the initial boot, and load the image on vSphere and boot the image in a VM vSphere.

Support for RHEL for Edge minimal raw image that boots on 64-bit ARM architectures

The RHEL for Edge minimal raw image type now supports the 64-bit ARM architecture, and AMD and Intel 64-bit architectures.

New FIDO Device Onboarding Servers container images available

The following FIDO Device Onboarding Servers container images available in Red Hat Container Catalog:

- **rhel9/fdo-manufacturing-server**

- **rhel9/fdo-owner-onboarding-server**
- **rhel9/fdo-rendezvous-server**
- **rhel9/fdo-serviceinfo-api-server**

RHEL for Edge Simplified images have support to the Ignition provisioning utility

You can customize your blueprints configuration with the Ignition provisioning utility to create your RHEL for Edge images. The Ignition injects the user configuration into the images at an early stage of the boot process. During the first boot into the system, the Ignition utility reads its configuration either from a remote URL or a file embedded in the Simplified Installer image and applies that configuration into the image.

The FDO customization in blueprints is now optional

You are no longer required to add the FDO customization section in blueprints to build a Simplified Installer image.

Support to specify the user configuration directly in blueprints for the following images:

- Simplified Installer images
- FDO images
- Ignition images
- You can create RHEL for Edge Simplified Installer images with RHEL image builder GUI

Previously, the Simplified Installer images could be created only by using the command-line interface.

Support for automatic provisioning and onboarding RHEL for Edge images using FDO

You have support for automatic provisioning and onboarding RHEL for Edge images using the FDO (FIDO device onboarding) process. With this, you can build a RHEL for Edge Simplified Installer image, provision it to a RHEL for Edge image. Then, you can use the FDO process to automatically provision and onboard your Edge devices, exchange data with other devices and systems connected on the networks.

Support to **rpm-ostree** upgrades from RHEL 8 to RHEL 9

You can upgrade RHEL 8 systems to RHEL 9 using **rpm-ostree rebase**.

Support to auto-rollbacks

The health checks run during the boot process and can determine if the nodes are functioning properly. If the health checks fail, a counter tracks the number of attempts and the node uses **rpm-ostree** to rollback the update. Podman automatically rollbacks the container if a new application version exits when the update fails.

Support to build a RHEL for Edge Simplified Installer image

You can use RHEL image builder to build a **RHEL for Edge Simplified Installer**image. It enables an unattended installation to a device, and provisioning the image to a RHEL for Edge image.

Support to build a RHEL for Edge Raw image

You can also build RHEL for **RHEL for Edge Raw image**. These are compressed raw images, which consist of a file that contains a partition layout with an existing deployed **OSTree** commit in it. The RHEL for Edge Raw Images can be used to flash on a hard disk drive or boot on a virtual machine.

The RHEL 9 for Edge minimal installation is much smaller

The RHEL 9 for Edge minimal installation is much smaller, when compared with RHEL 8:

Minimal RHEL 8 install	Minimal RHEL 9 install	Minimal RHEL 9 install (with firmware & Podman)
302 rpms	244 rpms	292 rpms
1.1G of disk	652M of disk	863M of disk

Supported RHEL for Edge image types

With RHEL for Edge, you can compose customized RHEL (rpm-ostree) images using RHEL image builder, and then remotely install and manage the images on Edge servers.

The following image types are supported in RHEL 9:

- RHEL for Edge Commit (.tar)
- RHEL for Edge Container (.tar)
- RHEL for Edge Installer (.iso)
- RHEL for Edge Raw Image (.raw.xz)
- RHEL for Edge Simplified Installer (.iso)

Supported RHEL for Edge image names

Previously, the image types were prefixed by **rhel-**. This prefix was removed, but the previous image names, such as **rhel-edge-container** and **rhel-edge-installer** still work as aliases to the new names. These names are considered deprecated and may be removed completely in future versions. The following RHEL for Edge image names are supported in RHEL 9:

- edge-commit
- edge-container
- edge-installer

CHAPTER 11. FILE SYSTEMS AND STORAGE

The following chapters contain the most notable changes to file systems and storage between RHEL 8 and RHEL 9.

11.1. FILE SYSTEMS

The XFS filesystem now supports bigtime and inobtcount features

The XFS filesystem now supports two new on-disk features, each of which is enabled by default by **mkfs.xfs** in RHEL 9. These two new features are:

- Timestamp support beyond the year 2038 (**bigtime**).
- Inode btree counters (**inobtcount**), to reduce mount time on large filesystems.

As a result of this update, filesystems created with default **mkfs.xfs** parameters will not be mountable on RHEL 8 systems.

To create a new filesystem that will be compatible with the RHEL 8 kernel, disable these new features by adding **-m bigtime=0,inobtcount=0** to the **mkfs.xfs** command line. A filesystem created in this way will not support timestamps beyond the year 2038.

A filesystem created in RHEL 8 which does not support these features may be upgraded using the **xfs_admin** utility on the unmounted block device containing the filesystem. It is recommended to check the filesystem for consistency prior to this operation. The command will also cause an **xfs_repair** to be run on the device after the change.

To enable **bigtime** support:

- **xfs_admin -O bigtime=1 /dev/device**

To enable inode btree counters:

- **xfs_admin -O inobtcount=1 /dev/device**

To enable both at the same time:

- **xfs_admin -O bigtime=1,inobtcount=1 /dev/device**

See the **xfs_admin(8)** man page for details.

The exFAT filesystem is now supported in RHEL 9

The exFAT filesystem is now supported in RHEL 9. This is a filesystem designed for external USB storage and interoperability and data exchange with other operating systems. The filesystem is not intended as a general-purpose, performant, or scalable Linux filesystem. An exFAT filesystem may be created by installing the **exfatprogs** package and using the **mkfs.exfat utility**.

See the **mkfs.exfat(8)** man page for details.

ext4 filesystem now supports timestamps beyond the year 2038

The ext4 filesystem is now supporting timestamps beyond the year 2038. This feature is fully automatic and does not require any user action to leverage it. The only requirement is that the inode size is larger than 128 bytes, which it is by default.

New nfsv4-client-utils package

New package **nfsv4-client-utils**, which contains a minimal set of the demons and tool required to support only NFSv4 has been added. This is a replacement for the standard **nfs-utils** package.

GFS2 file systems are now created with format version 1802

GFS2 file systems in RHEL 9 are created with format version 1802. This enables the following features:

- Extended attributes in the **trusted** namespace ("trusted.* xattrs") are recognized by **gfs2** and **gfs2-utils**.
- The **rgrplvb** option is active by default. This allows **gfs2** to attach updated resource group data to DLM lock requests, so the node acquiring the lock does not need to update the resource group information from disk. This improves performance in some cases.

File systems created with the new format version will not be able to be mounted under earlier RHEL versions and older versions of the **fsck.gfs2** utility will not be able to check them.

Users can create a file system with the older format version by running the **mkfs.gfs2** command with the option **-o format=1801**.

Users can upgrade the format version of an older file system running **tunegfs2 -r 1802** ***device*** on an unmounted file system. Downgrading the format version is not supported.

Options in Samba utilities have been renamed and removed for a consistent user experience

The Samba utilities have been improved to provide a consistent command-line interface. These improvements include renamed and removed options. Therefore, to avoid problems after the update, review your scripts that use Samba utilities, and update them, if necessary.

Samba 4.15 introduces the following changes to the Samba utilities:

- Previously, Samba command-line utilities silently ignored unknown options. To prevent unexpected behavior, the utilities now consistently reject unknown options.
- Several command-line options now have a corresponding **smb.conf** variable to control their default value. See the man pages of the utilities to identify if a command-line option has an **smb.conf** variable name.
- By default, Samba utilities now log to standard error (**stderr**). Use the **--debug-stdout** option to change this behavior.
- The **--client-protection=off|sign|encrypt** option has been added to the common parser.
- The following options have been renamed in all utilities:
  - **--kerberos** to **--use-kerberos=required|desired|off**
  - **--krb5-ccache** to **--use-krb5-ccache=*CCACHE***
  - **--scope** to **--netbios-scope=*SCOPE***
  - **--use-ccache** to **--use-winbind-ccache**
- The following options have been removed from all utilities:
  - **-e** and **--encrypt**

- **-C** removed from **--use-winbind-ccache**
- **-i** removed from **--netbios-scope**
- **-S** and **--signing**

- To avoid duplicate options, certain options have been removed or renamed from the following utilities:
  - **ndrdump**: **-l** is no longer available for **--load-dso**
  - **net**: **-l** is no longer available for **--long**
  - **sharesec**: **-V** is no longer available for **--viewsddl**
  - **smbcquotas**: **--user** has been renamed to **--quota-user**
  - **nmbd**: **--log-stdout** has been renamed to **--debug-stdout**
  - **smbd**: **--log-stdout** has been renamed to **--debug-stdout**
  - **winbindd**: **--log-stdout** has been renamed to **--debug-stdout**

cramfs module has been removed

Due to lack of users, the **cramfs** kernel module is removed. **squashfs** is recommended as an alternative solution.

Mandatory file locking support has been removed from RHEL 9

Mandatory file locking is no longer supported in RHEL 9 and later versions. The **mand** mount option is ignored by this kernel and its use generates a warning in the system log.

NFSv2 is no longer supported

RHEL 9 NFS client and server no longer support NFSv2.

Stratis storage manager is now available

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

- Manage snapshots and thin provisioning
- Automatically grow file system sizes as needed
- Maintain file systems
- Pool Level Encryption
- TMP2 and NBDE Support

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

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

DAX mount option and reflink are now compatible

Reflinked files are now generally compatible with DAX mode. The file system DAX mount option **-o dax=always** is compatible with reflink-enabled file systems. Files that were reflinked can be set to DAX mode using inode flags. For more information see the **xfs(5)** man page.

11.2. STORAGE

NVMe-FC Boot from SAN is now fully supported

The Non-volatile Memory Express (NVMe) over Fibre Channel (NVMe/FC) Boot, which was introduced in Red Hat Enterprise Linux 9.2 as a Technology Preview, is now fully supported. Some NVMe/FC host bus adapters support a NVMe/FC boot capability. For more information on programming a Host Bus Adapter (HBA) to enable NVMe/FC boot capability, see the NVMe/FC host bus adapter manufacturer's documentation.

Converting a standard LV to a thin LV by using lvconvert is now possible

By specifying a standard logical volume (LV) as a thin pool data volume, you can now convert a standard LV to a thin LV by using the **lvconvert** command. With this update, you can convert existing LVs to use the thin provisioning facility.

Integrity targets now generate Audit events

The integrity target now generates Audit events. You can use these Audit events for logging of additional security-relevant event types.

dm-verity now supports forward error correction

The **dm-verity** target now supports forward error correction (FEC). With FEC, you can use pre-generated error correction data to recover from corrupted blocks.

NVMe native multipathing is now enabled by default

Non-volatile Memory Express (NVMe) native multipathing is enabled by default in Red Hat Enterprise Linux 9 and is the recommended multipathing solution. You can now configure multipathing on NVMe without using the DM Multipath framework. NVMe native multipathing provides higher performance.

The default kernel setting for the **nvme_core.multipath** option is now set to **Y**, which means that native NVMe multipathing is enabled.

VDO Management software has been removed

The python-based VDO Management software is no longer available in RHEL 9. Instead of this software, use the LVM-VDO implementation for managing VDO volumes.

Multiple write policies from VDO has been removed

VDO no longer has multiple write policies. VDO now uses the **async** write policy exclusively. The 'sync' and 'async-unsafe' write policies have been removed.

Stratis storage manager is now available

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

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

- Maintain file systems
- Pool Level Encryption
- TMP2 and NBDE Support

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

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

CHAPTER 12. HARDWARE ENABLEMENT

The following chapters contain the most notable changes to hardware enablement between RHEL 8 and RHEL 9.

12.1. UNMAINTAINED HARDWARE SUPPORT

The following devices (drivers, adapters) are available but are no longer tested or updated on a routine basis in Red Hat Enterprise Linux 9. Red Hat may fix serious bugs, including security bugs, at its discretion. These devices should no longer be used in production, and it is possible they will be disabled in the next major release.

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 are unmaintained. To check the PCI IDs of the hardware on your system, run the **lspci -nn** command.

Device ID	Driver	Device name
	dl2k	
	hdlc_fr	
	arp_tables	
	ip_set	
	ip_tables	
	ip6_tables	
	nft_compat	
	siw	
	rdma_rxe	
	usnic_verbs	
	vmw_pvrdma	
	hfi1	

Device ID	Driver	Device name
	bnx2	QLogic BCM5706/5708/5709/5716 Driver
	e1000	Intel® PRO/1000 Network Driver
	hpsa	Hewlett-Packard Company: Smart Array Controllers
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)
0x1000:0x0071	megaraid_sas	Broadcom / LSI: MR SAS HBA 2004
0x1000:0x0073	megaraid_sas	Broadcom / LSI: MegaRAID SAS 2008 [Falcon]
0x1000:0x0079	megaraid_sas	Broadcom / LSI: MegaRAID SAS 2108 [Liberator]
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

Device ID	Driver	Device name
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
	mptbase	Fusion MPT SAS Host driver
	mptsas	Fusion MPT SAS Host driver
	mptscsih	Fusion MPT SCSI Host driver
	mptspi	Fusion MPT SAS Host driver
	myri10ge	Myricom 10G driver (10GbE)
	netxen_nic	QLogic/NetXen (1/10) GbE Intelligent Ethernet Driver
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
0x177d:0xa01e	nicpf	Cavium ThunderX NIC PF driver
0x177d:0xa034	nicvf	Cavium ThunderX NIC VF driver
0x177d:0x0011	nicvf	Cavium ThunderX NIC VF driver

Device ID	Driver	Device name
	nvmet-fc	NVMe/Fabrics FC target driver
	nvmet_tcp	NVMe/TCP target driver

12.2. REMOVED HARDWARE SUPPORT

The following devices (drivers, adapters) have been removed from RHEL 9.

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 are unmaintained. To check the PCI IDs of the hardware on your system, run the **lspci -nn** command.

Device ID	Driver	Device name
	Soft-RoCE (rdma_rxe)	
	HNS-RoCE	HNS GE/10GE/25GE/50GE/100GE RDMA Network Controller
	liquidio	Cavium LiquidIO Intelligent Server Adapter Driver
	liquidio_vf	Cavium LiquidIO Intelligent Server Adapter Virtual Function Driver
aarch64:Ampere:Potenza		Ampere eMAG
aarch64:APM:Potenza		Applied Micro X-Gene
ppc64le:ibm:4d:*		Power8
ppc64le:ibm:4b:*		Power8E
ppc64le:ibm:4c:*		Power8NVL
s390x:ibm:2964:*		z13
s390x:ibm:2965:*		z13s

Device ID	Driver	Device name
v4l/dvb		television and video capture devices

CHAPTER 13. HIGH AVAILABILITY AND CLUSTERS

The following chapter contains the most notable changes to high availability and clusters between RHEL 8 and RHEL 9.

13.1. NOTABLE CHANGES TO HIGH AVAILABILITY AND CLUSTERS

pcs commands that support the clufter tool have been removed

The **pcs** commands that support the **clufter** tool for analyzing cluster configuration formats have been removed. The following commands have been removed:

- **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

pcs suppport for OCF Resource Agent API 1.1 standard

The **pcs** command-line interface now supports OCF 1.1 resource and STONITH agents. As part of the implementation of this support, any agent's metadata must comply with the OCF schema, whether the agent is an OCF 1.0 or OCF 1.1 agent. If an agent's metadata does not comply with the OCF schema, **pcs** considers the agent invalid and will not create or update a resource of the agent unless the **--force** option is specified. The **pcsd** Web UI and **pcs** commands for listing agents now omit agents with invalid metadata from the listing.

New pcs parsing requires meta keyword when specifying clone meta attributes

To ensure consistency in the **pcs** command format, configuring clone meta attributes with the **pcs resource clone**, **pcs resource promotable**, and **pcs resource create** commands without specifying the **meta** keyword is now deprecated.

Previously, the **meta** keyword was ignored in the **pcs resource clone** and **pcs resource promotable** commands. In the **pcs resource create** command, however, the meta attributes specified after the **meta** keyword when it followed the **clone** keyword were assigned to the resource rather than to the clone. With this updated parsing algorithm, meta attributes specified after the **meta** keyword when it follows the **clone** keyword are assigned to the clone. To maintain compatibility with existing scripts which rely on the older format, you must specify the **--future** command option to enable this new argument processing when creating a cloned resource with the **pcs resource create** command.

The following command now creates a resource with the meta attribute **mv=v1** and a clone with the meta attribute **mv=v2**:

pcs resource create dummy1 ocf:pacemaker:Dummy meta m1=v1 clone meta m2=v2 --future

CHAPTER 14. IDENTITY MANAGEMENT

The following chapters contain the most notable changes to Identity Management (IdM) between RHEL 8 and RHEL 9.

14.1. NEW FEATURES

A new passwordless authentication method is available in SSSD

As of RHEL 9.4, you can enable and configure passwordless authentication in SSSD to use a biometric device that is compatible with the FIDO2 specification, for example a YubiKey. You must register the FIDO2 token in advance and store this registration information in the user account in RHEL IdM, Active Directory, or an LDAP store. RHEL implements FIDO2 compatibility with the **libfido2** library, which currently only supports USB-based tokens.

Identity Management API is now fully supported

As of RHEL 9.3, the Identity Management (IdM) API is a fully supported feature.

Users can use existing tools and scripts even if the IdM API is enhanced to enable multiple versions of API commands. These enhancements do not change the behavior of a command in an incompatible way. This has the following benefits:

- Administrators can 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.

The communication with the server is possible, regardless if one side uses, for example, a newer version that introduces new options for a feature.

NOTE

While IdM API provides a JSON-RPC interface, this type of access is not supported. Red Hat recommends accessing the API with Python instead. Using Python automates important parts such as the metadata retrieval from the server, which allows listing all available commands.

Identity Management installation packages have been demodularized

Previously in RHEL 8, IdM packages were distributed as modules, which required you to enable a stream and install the profile that corresponds to your desired installation. IdM installation packages have been demodularized in RHEL 9, so you can use the following dnf commands to install IdM server packages:

- For a server without integrated DNS services:

```
# dnf install ipa-server
```

- For a server with integrated DNS services:

```
# dnf install ipa-server ipa-server-dns
```

The SSSD implicit files provider domain is disabled by default

The SSSD implicit **files** provider domain, which retrieves user information from local files such as **/etc/shadow** and group information from **/etc/groups**, is now disabled by default.

To retrieve user and group information from local files with SSSD:

1. Configure SSSD. Choose one of the following options:

   a. Explicitly configure a local domain with the **id_provider=files** option in the **sssd.conf** configuration file.

   ```
   [domain/local]
   id_provider=files
   ...
   ```

   b. Enable the **files** provider by setting the **enable_files_domain=true** option in the **sssd.conf** configuration file.

   ```
   [sssd]
   enable_files_domain = true
   ```

2. Configure the name services switch.

   ```
   # authselect enable-feature with-files-provider
   ```

New realm configuration template for KDC enabling FIPS 140-3-compliant key encryption

This update provides a new, **EXAMPLE.COM**, example realm configuration in the **/var/kerberos/krb5kdc/kdc.conf** file. It brings two changes:

- The FIPS 140-3-compliant **AES HMAC SHA-2** family is added to the list of supported types for key encryption.
- The encryption type of the KDC master key is switched from **AES 256 HMAC SHA-1** to **AES 256 HMAC SHA-384**.

WARNING

This update is about standalone MIT realms. Do not change the Kerberos Distribution Center (KDC) configuration in RHEL Identity Management.

Using the new configuration template is recommended for new realms. The template does not affect any realm already deployed. If you are planning to upgrade the configuration of your realm according to the template, consider the following points:

For upgrading the master key, changing the setting in the KDC configuration is not enough. Follow the process described in the MIT Kerberos documentation.

Adding the **AES HMAC SHA-2** family to the supported types for key encryption is safe at any point because it does not affect existing entries in the KDC. Keys will be generated only when creating new principals or when renewing credentials. Note that keys of this new type cannot be generated based on existing keys. To make these new encryption types available for a certain principal, its credentials have to be renewed, which means renewing keytabs for service principals too.

The only case where principals should not feature an **AES HMAC SHA-2** key is the Active Directory (AD) cross-realm ticket-granting ticket (TGT) ones. Because AD does not implement RFC8009, it does not use the **AES HMAC SHA-2** encryption types family. Therefore, a cross-realm TGS-REQ using an **AES HMAC SHA-2**-encrypted cross-realm TGT would fail. The best way to keep the MIT Kerberos client from using **AES HMAC SHA-2** against AD is to not provide **AES HMAC SHA-2** keys for the AD cross-realm principals. To do so, ensure that you create the cross-realm TGT entries with an explicit list of key encryption types that are all supported by AD:

```
kadmin.local <<EOF
add_principal +requires_preauth -e aes256-cts-hmac-sha1-96,aes128-cts-hmac-sha1-96 -pw
[password] krbtgt/[MIT realm]@[AD realm]
add_principal +requires_preauth -e aes256-cts-hmac-sha1-96,aes128-cts-hmac-sha1-96 -pw
[password] krbtgt/[AD realm]@[MIT realm]
EOF
```

To ensure the MIT Kerboros clients use the **AES HMAC SHA-2** encryption types, you must also set these encryption types as **permitted** in both the client and the KDC configuration. On RHEL, this setting is managed by the crypto-policy system. For example, on RHEL 9, hosts using the **DEFAULT** crypto-policy allow **AES HMAC SHA-2** and **AES HMAC SHA-1** encrypted tickets, while hosts using the **FIPS** crypto-policy only accept **AES HMAC SHA-2** ones.

Improved SSSD multi-threaded performance

Previously, SSSD serialized parallel requests from multi-threaded applications, such as Red Hat Directory Server and Identity Management. Starting with RHEL 9.1, all SSSD client libraries, such as **nss** and **pam**, do not serialize requests, therefore allowing requests from multiple threads to be executed in parallel for better performance.

To enable the previous behavior of serialization, set the environment variable **SSS_LOCKFREE** to **NO**.

14.2. KNOWN ISSUES

Users without SIDs cannot log in to IdM after an upgrade

After upgrading your Identity Management (IdM) replica to RHEL 9.2, the IdM Kerberos Distribution Centre (KDC) might fail to issue ticket-granting tickets (TGTs) to users who do not have Security Identifiers (SIDs) assigned to their accounts. Consequently, the users cannot log in to their accounts.

To work around the problem, generate SIDs by running the following command as an IdM administrator on another IdM replica in the topology:

```
# ipa config-mod --enable-sid --add-sids
```

Afterward, if users still cannot log in, examine the Directory Server error log. You might have to adjust ID ranges to include user POSIX identities.

Adding a RHEL 9 replica in FIPS mode to an IdM deployment in FIPS mode that was initialized with RHEL 8.6 or earlier fails

The default RHEL 9 FIPS cryptographic policy aiming to comply with FIPS 140-3 does not allow the use of the AES HMAC-SHA1 encryption types' key derivation function as defined by RFC3961, section 5.1.

This constraint does not allow you to add a RHEL 9 IdM replica in FIPS mode to a RHEL 8 IdM environment in FIPS mode in which the first server was installed on a RHEL 8.6 or earlier systems. This is because there are no common encryption types between RHEL 9 and the previous RHEL versions, which

commonly use the AES HMAC-SHA1 encryption types but do not use the AES HMAC-SHA2 encryption types.

To work around the problem, enable the use of AES HMAC-SHA1 on the RHEL 9 replica:

```
# update-crypto-policies --set FIPS:AD-SUPPORT
```

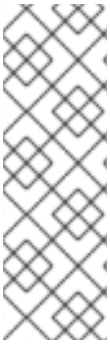
By setting the cryptographic policy to **FIPS:AD-SUPPORT**, you are adding the following encryption types to the list of already allowed encryption types that comply with FIPS 140-3:

- aes256-cts:normal
- aes256-cts:special
- aes128-cts:normal
- aes128-cts:special

As a result, adding the RHEL 9 replica to the IdM deployment proceeds correctly.

NOTE

There is ongoing work to provide a procedure to generate missing AES HMAC-SHA2-encrypted Kerberos keys on RHEL 7 and RHEL 8 servers. This will achieve FIPS 140-3 compliance on the RHEL 9 replica. However, this process cannot be fully automated, because the design of Kerberos key cryptography makes it impossible to convert existing keys to different encryption types. The only way is to ask users to renew their passwords.



NOTE

You can view the encryption type of your IdM master key by entering the following command on the first IdM server in the RHEL 8 deployment:

```
# kadmin.local getprinc K/M | grep -E '^Key:'
```

If the string in the output contains the **sha1** term, you must enable the use of AES HMAC-SHA1 on the RHEL 9 replica.

WARNING

Microsoft's Active Directory implementation does not yet support any of the RFC8009 Kerberos encryption types that use SHA-2 HMAC. If you have an IdM-AD trust configured, FIPS:AD-SUPPORT crypto subpolicy use is therefore required even if the encryption type of your IdM master key is **aes256-cts-hmac-sha384-192**.

14.3. RELOCATED PACKAGES

ansible-freeipa is now available in the AppStream repository with all dependencies

Previously in RHEL 8.5 and earlier, before installing the **ansible-freeipa** package, you first had to enable the Ansible repository and install the **ansible** package. In RHEL 9, you can install **ansible-freeipa** without any preliminary steps. Installing **ansible-freeipa** automatically installs **ansible-core** as a dependency. Both packages are available in the **rhel-9-for-x86_64-appstream-rpms** repository.

ansible-freeipa in RHEL 9 contains all the modules that it contained in RHEL 8.5 and earlier.

Clustered Samba packages are now available from the Resilient Storage and Gluster Samba Repository

The **ctdb** clustered Samba packages are now available from the Resilient Storage and Gluster Samba Repository. Previously in RHEL 8, clustered Samba packages were available from the BaseOS repository.

14.4. REMOVED FUNCTIONALITY

The nss-pam-ldapd package has been removed

The **nss-pam-ldapd** package has been removed from RHEL. Red Hat recommends migrating to SSSD and its **ldap** provider, which fully replaces the functionality of the **nslcd** service. SSSD has features that specifically address the needs of **nss-pam-ldapd** users, such as:

- hosts databases
- networks databases
- services databases

NIS packages have been removed

The following Network Information Service (NIS) components have been removed from RHEL:

- **nss_nis**
- **yp-tools**
- **ypbind**
- **ypserv**

There is no direct replacement with fully compatible features because the NIS technology is based on outdated design patterns and is no longer considered secure.

Red Hat recommends using RHEL Identity Management and SSSD instead.

The openssh-ldap package has been removed

As the **openssh-ldap** subpackage is not maintained upstream, it has been removed from RHEL. 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 following options to the **/etc/ssh/sshd_config** file as described by the **sss_ssh_authorizedkeys(1)** man page:

```
AuthorizedKeysCommand /usr/bin/sss_ssh_authorizedkeys
AuthorizedKeysCommandUser nobody
```

The custodia package has been removed

The **custodia** package has been integrated into Red Hat Identity Management in RHEL 9 and is no longer shipped as a separate service.

The gssntlmssp package has been removed

As Windows New Technology LAN Manager (NTLM) is considered insecure, the **gssntlmssp** package has been removed.

The nsslapd-conntablesize configuration parameter has been removed from 389-ds-base

The **nsslapd-conntablesize** configuration parameter has been removed from the **389-ds-base** package in RHEL 9.3. Previously, the **nsslapd-conntablesize** configuration attribute specified the size of the connection table that managed established connections. With the introduction of the multi-listener feature, which improves the management of established connections, Directory Server now calculates the size of the connection table dynamically. This also resolves issues, when the connection table size was set too low and it affected the number of connections the server was able to support. Starting with RHEL 9.3, use only **nsslapd-maxdescriptors** and **nsslapd-reservedescriptors** attributes to manage the number of TCP/IP connections Directory Server can support.

Limited support for FreeRADIUS

In RHEL 9, the following external authentication modules are not supported as part of the FreeRADIUS offering:

- The MySQL, PostgreSQL, SQlite, and unixODBC database connectors
- The **Perl** language module
- The REST API module

NOTE

The PAM authentication module and other authentication modules that are provided as part of the base package are not affected.

You can find replacements for the removed modules in community-supported packages, for example in the Fedora project.

In addition, the scope of support for the **freeradius** package is now limited to the following use cases:

- Using FreeRADIUS as an authentication provider with Identity Management (IdM) as the backend source of authentication. The authentication is happening through the **krb5** and LDAP authentication packages or as PAM authentication in the main FreeRADIUS package.
- Using FreeRADIUS to provide a source-of-truth for authentication in IdM, through the **Python 3** authentication package.

In contrast to these removals, Red Hat is now strengthening its support of the following external authentication modules with FreeRADIUS:

- Authentication based on **krb5** and LDAP
- **Python 3** authentication

The focus on these integration options is in close alignment with the strategic direction of Red Hat IdM.

CHAPTER 15. INFRASTRUCTURE SERVICES

The following chapter contains the most notable changes to infrastructure services between RHEL 8 and RHEL 9.

15.1. NOTABLE CHANGES TO INFRASTRUCTURE SERVICES

Support for Berkeley DB dynamic back end has been removed

With this release, the **Berkeley DB** (**libdb**) dynamic back end is no longer supported. The **named-sdb** build is no longer provided. You can use the **DLZ loadable plugins** for each back end, for example, **sqlite3** or **mysql**. Those plugins are not built or shipped and have to be built from the source.

The mod_php module provided with PHP for use with the Apache HTTP Server has been removed

The **mod_php** module provided with PHP for use with the Apache HTTP Server is no longer available in RHEL 9.

Since RHEL 8, PHP scripts are run using the FastCGI Process Manager (**php-fpm**) by default. For more information, see Using PHP with the Apache HTTP Server.

CHAPTER 16. INSTALLER AND IMAGE CREATION

The following chapters contain the most notable changes to installer and image creation between RHEL 8 and RHEL 9.

16.1. INSTALLER

Anaconda activates network automatically for interactive installations

Anaconda now activates the network automatically when performing interactive installation, without requiring users to manually activate it in the network spoke. This update does not change the installation experience for Kickstart installations and installations using the **ip=** boot option.

New options to Lock root account and Allow root SSH login with password

RHEL 9 adds following new options to the root password configuration screen:

- **Lock root account**: To lock the root access to the machine.
- **Allow root SSH login with password**: To enable password-based SSH root logins.

During Kickstart installations, you can enable root access via SSH with password by using the **--allow-ssh** option of the **rootpw** Kickstart command. For more information, see rootpw (required).

Licensing, system, and user setting configuration screens have been disabled post standard installation

Previously, RHEL users configured Licensing, System (Subscription manager), and User Settings prior to **gnome-initial-setup** and **login** screens. Starting with RHEL 9, the initial setup screens have been disabled by default to improve user experience. If you must run the initial setup for user creation or license display, install the following packages based on the requirements.

1. To install initial setup packages:

```
# dnf install initial-setup initial-setup-gui
```

2. To enable initial setup after the next reboot of the system.

```
# systemctl enable initial-setup
```

3. Reboot the system to view initial setup.

For Kickstart installations, add **initial-setup-gui** to the packages section and enable the **initial-setup** service.

```
firstboot --enable
%packages
@^graphical-server-environment
initial-setup-gui
%end
```

The rhsm command for machine provisioning through Kickstart for Satellite is now available

The **rhsm** command replaces the **%post** scripts for machine provisioning on RHEL 9. The **rhsm**

command helps with all provisioning tasks such as registering the system, attaching RHEL subscriptions, and installing from a Satellite instance. For more information, see the Registering and installing RHEL from Satellite using Kickstart section in the Performing an advanced RHEL installation guide.

New Kickstart command - timesource

The new **timesource** Kickstart command is optional and it helps to set NTP, NTS servers, and NTP pools that provide time data. It also helps to control enabling or disabling the NTP services on the system. The **--ntpservers** option from the timezone command has been deprecated and has been replaced with this new command.

Support for Anaconda boot arguments without inst. prefix is no longer available

Anaconda boot arguments without the **inst.** prefix have been deprecated since RHEL 7. Support for these boot arguments has been removed in RHEL 9. To continue using these options, use the **inst.** prefix

For example, to force the installation program to run in the **text** mode instead of the **graphical** mode, use the following option:

```
inst.text
```

Removed Kickstart commands and options

The following Kickstart commands and options have been removed from RHEL 9. Using them in Kickstart files causes an error.

- **device**
- **deviceprobe**
- **dmraid**
- **install** - use the subcommands or methods directly as commands
- **multipath**
- **bootloader --upgrade**
- **ignoredisk --interactive**
- **partition --active**
- **harddrive --biospart**
- **autostep**

Where only specific options and values are listed, the base command and its other options are still available and not removed.

Removed boot options

The following boot options have been removed from Red Hat Enterprise Linux:

- **inst.zram**
  RHEL 9 does not support the **zram** service. See the **zram-generator(8)** man page for more information.

- **inst.singlelang**
  The single language mode is not supported on RHEL 9.

- **inst.loglevel**
  The log level is always set to debug.

16.2. IMAGE CREATION

This version introduces the following enhancements over the previous versions.

Blueprints now support adding a tailoring file for scap security profile

Starting with 9.4, RHEL image builder supports OpenSCAP customizations in the blueprint by adding a tailoring file for scap security profile. You can add customized tailoring options for a profile to the **osbuild-composer** blueprint customizations by using the following options:

- **selected** for the list of rules that you want to add.

- **unselected** for the list of rules that you want to remove.

When you build an image from the blueprint customized with tailoring file for scap security profile, it creates a tailoring file with a new tailoring profile ID and saves it to the image as **/usr/share/xml/osbuild-oscap-tailoring/tailoring.xml**. The new profile ID will have **_osbuild_tailoring** appended as a suffix to the base profile, for example, **xccdf_org.ssgproject.content_profile_cis_osbuild_tailoring**, if you use the **cis** base profile.

AWS EC2 images now support both BIOS and UEFI boot

This update extends the AWS EC2 AMD or Intel 64-bit architecture **.ami** images created by RHEL image builder to support UEFI boot, in addition to the legacy BIOS boot.

Support to build VMware VSphere (OVA)

RHEL image builder can build VMware VSphere Open Virtual Appliance (OVA) files that you can deploy more easily to VMware vSphere by using the vSphere GUI client.

A new and improved way to create blueprints and images in the RHEL image builder web console

With the new unified version of the image builder tool, you can much more easily create blueprints and images. Notable enhancements include the following:

- You can now use all the customizations previously supported only in the command-line interface, such as kernel, file system, firewall, locale, and other customizations, in the image builder web console.

- You can import, export, and save blueprints in the **.JSON** or **.TOML** format.

Ability to create images with support to different partitioning modes

With RHEL image builder, you can build VMware VSphere Open Virtual Appliance (OVA) files. You can deploy such files to VMware vSphere by using the vSphere GUI client .

Filesystem customization policy changes in image builder

The following policy changes are in place when using the RHEL image builder filesystem customization in blueprints:

- You can set the`mountpoint` and minimum partition **minsize** entries in the blueprint.
- The following image types do not support filesystem customizations:
  - **image-installer**
  - **edge-installer**
  - **edge-simplified-installer**
- The following image types do not create partitioned operating systems images.
  - **edge-commit**
  - **edge-container**
  - **tar**
  - **container**
    Customizing the filesystem of such images has no result.
- The blueprint now supports the **mountpoint** customization for the **tpm** directory and its sub-directories.

RHEL image builder supports creating customized files and directories in the /etc directory

With the new`[[customizations.files]]` and the **[[customizations.directories]]** blueprint customizations, you can create customized files and directories in the **/etc** image directory. Currently, these customizations are only available in the **/etc** directory. You can use the customizations for all available image types, except image types that deploy OSTree commits, such as:

- **edge-raw-image**
- **edge-installer**
- **edge-simplified-installer**

.vhd images built with RHEL image builder now have support for 64-bit ARM

You can now build **.vhd** images using image builder and upload them to the Microsoft Azure cloud.

RHEL image builder supports customized file system partitions on LVM

With support for customized file system partitions on LVM, if you add any file system customization to your system, the file systems are converted to an LVM partition.

RHEL image builder now supports file system configuration

As of Red Hat Enterprise Linux 9.0, Image Builder provides support for users to specify a custom filesystem configuration in blueprints to create images with a specific disk layout, instead of using the default layout configuration.

RHEL image builder can create bootable ISO Installer images

You can use image uilder GUI and CLI to create bootable ISO Installer images. These images consist of a tar file that contains a root file system which you can use to install directly to a bare metal server.

CHAPTER 17. KERNEL

The following chapters contain the most notable changes to kernel between RHEL 8 and RHEL 9.

17.1. NOTABLE CHANGES TO KDUMP MEMORY ALLOCATION

The **kexec-tools** package now supports the default **crashkernel** memory reservation values for RHEL 9

The **kexec-tools** package now maintains the default **crashkernel** memory reservation values. The **kdump** service uses the default value to reserve the **crashkernel** memory for each kernel. This implementation also improves memory allocation for **kdump** when a system has less than 4GB of available memory.

If the memory reserved by the default **crashkernel** value is not sufficient on your system, you can increase the **crashkernel** parameter using the default value as a reference.

To query the default **crashkernel** value:

```
$ kdumpctl get-default-crashkernel
```

Note that the **crashkernel=auto** option in the boot command line is no longer supported on RHEL 9 and later releases.

For more information, see the **/usr/share/doc/kexec-tools/crashkernel-howto.txt** file.

17.2. NOTABLE CHANGES TO THE RHEL FOR REAL TIME KERNEL

The TPM 1.2 secure cryptoprocessor is no longer supported on RHEL 9

The Trusted Platform Module (TPM) secure cryptoprocessor version 1.2 has been removed and is no longer supported on RHEL 9 and later versions. TPM 2.0 replaces TPM 1.2 and provides many improvements over TPM 1.2. TPM 2.0 is not backward compatible.

Note that for applications that require support for TPM 1.2, Red Hat recommends that you use RHEL 8.

Dynamic preemptive scheduling enabled on ARM, AMD, and Intel 64-bit architectures

Using Dynamic Scheduling, you can change the preemption mode of the kernel at boot or runtime instead of compile time. With dynamic preemptive handling, you can override the default preemption model to improve scheduling latency.

The **/sys/kernel/debug/sched/preempt** file contains the current setting that supports runtime modification. Using the **DYNAMIC_PREEMPT** option, set the **preempt=** variable at boot to either **none**, **voluntary** or **full**. The **voluntary** preemption is the default.

A new command line interface has been added to the **tuna** tool

The **tuna** tool now provides a command line interface with more standardized menu of commands and options that is easier to use and maintain. The new command line interface is based on the **argparse** parsing module. With this enhancement, you can perform the following tasks:

- Change the attributes of the application and kernel threads.
- Operate on interrupt requests (IRQs) by name or number.

- Operate on tasks or threads by using the process identifier.
- Specify CPUs and sets of CPUs with the CPU or the socket number.

By using the **tuna -h** command, you can print the command line arguments and their corresponding options. For each command, there are optional arguments, which you can view with the **tuna [command] -h** command.

The runtime verification mechanism available for real-time kernel

Runtime verification is a lightweight and rigorous method to check the behavioral equivalence between system events and its formal specifications. Runtime verification has monitors integrated in the kernel that attach to **tracepoints**. If a state deviates from defined specifications, the runtime verification program activates reactors to inform or enable a reaction such as capturing the event in the log file or a system shutdown to avoid failure propagation in an extreme case.

For more information see, Optimizing RHEL 9 for Real Time for low latency operation .

CONFIG_RT_GROUP_SCHED is disabled in RHEL 9

In RHEL 8, the default control group was **cgroups v1**, and you could specify CPU bandwidth for realtime tasks on a per **cgroup** basis by using control files, for example, **/sys/fs/cgroup/cpu,cpuacct/cpu.rt_period_us** and **/sys/fs/cgroup/cpu,cpuacct/cpu.rt_runtime_us**. However, in RHEL 9, the **CONFIG_RT_GROUP_SCHED** kernel configuration option is disabled because **cgroups v2** is the default control group and the equivalent control files do not exist for the **cgroups v2** CPU controller. Note that the **/proc/sys/kernel/sched_rt_runtime_us** and **/proc/sys/kernel/sched_rt_period_us** global settings are still available, and you can use them with the **stalld** background process to prevent CPU time starvation.

17.3. NOTABLE CHANGES TO KERNEL

The 64k page size kernel

In addition to the RHEL 9 for ARM kernel which supports 4k pages, Red Hat now offers an optional kernel package that supports 64k pages: **kernel-64k**.

The 64k page size kernel is a useful option for large datasets on ARM platforms. It enables better performance for some types of memory- and CPU-intensive operations.

You must choose page size on 64-bit ARM architecture systems at the time of installation. You can install **kernel-64k** only by Kickstart by adding the **kernel-64k** package to the package list in the **Kickstart** file.

For more information about installing **kernel-64k**, see Performing an advanced RHEL 9 installation .

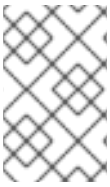
cgroup-v2 enabled by default in RHEL 9

The control groups version 2 (**cgroup-v2**) feature implements a single hierarchy model that simplifies the management of control groups. Also, it ensures that a process can only be a member of a single control group at a time. Deep integration with **systemd** improves the end-user experience when configuring resource control on a RHEL system.

Development of new features is mostly done for **cgroup-v2**, which has some features that are missing in **cgroup-v1**. Similarly, **cgroup-v1** contains some legacy features that are missing in **cgroup-v2**. Also, the control interfaces are different. Therefore, third party software with direct dependency on **cgroup-v1** may not run properly in the **cgroup-v2** environment.

To use **cgroup-v1**, you need to add the following parameters to the kernel command-line:

```
systemd.unified_cgroup_hierarchy=0
systemd.legacy_systemd_cgroup_controller
```

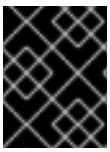


NOTE

Both **cgroup-v1** and **cgroup-v2** are fully enabled in the kernel. There is no default control group version from the kernel point of view, and is decided by **systemd** to mount at startup.

Kernel changes potentially affecting third party kernel modules

Linux distributions with a kernel version prior to 5.9 supported exporting GPL functions as non-GPL functions. As a result, users could link proprietary functions to GPL kernel functions through the **shim** mechanism. With this release, the RHEL kernel incorporates upstream changes that enhance the ability of RHEL to enforce GPL by rebuffing **shim**.



IMPORTANT

Partners and independent software vendors (ISVs) should test their kernel modules with an early version of RHEL 9 to ensure their compliance with GPL.

Core scheduling is supported in RHEL 9

With the core scheduling functionality users can prevent tasks that should not trust each other from sharing the same CPU core. Likewise, users can define groups of tasks that can share a CPU core.

These groups can be specified:

- To improve security by mitigating some cross-Symmetric Multithreading (SMT) attacks
- To isolate tasks that need a whole core. For example for tasks in real-time environments, or for tasks that rely on specific processor features such as Single Instruction, Multiple Data (SIMD) processing

For more information, see Core Scheduling.

The kernelopts environment variable has been removed in RHEL 9

In RHEL 8, the kernel command-line parameters for systems using the GRUB2 bootloader were defined in the **kernelopts** environment variable. This variable was stored in the **/boot/grub2/grubenv** file for each kernel boot entry. However, storing the kernel command-line parameters using **kernelopts** was not robust. Therefore, Red Hat removed **kernelopts** and the kernel command-line parameters are now stored in the Boot Loader Specification (BLS) snippet, instead of in the **/boot/loader/entries/*<KERNEL_BOOT_ENTRY>*.conf** file.

Red Hat protects kernel symbols only for minor releases

Red Hat guarantees that a kernel module will continue to load in all future updates within an Extended Update Support (EUS) release, only if you compile the kernel module using protected kernel symbols. There is no kernel Application Binary Interface (ABI) guarantee between minor releases of RHEL 9.

17.4. NOTABLE CHANGES TO BOOT LOADER

Boot loader menu hidden by default

Boot loader menu hidden by default

Starting with RHEL 9.1, the GRUB boot loader is now configured to hide the boot menu by default if RHEL is the only installed operating system and if the previous boot succeeded. This results in a smoother boot experience on such systems.

To access the boot menu, use one of the following options:

- Repeatedly press **Esc** after booting the system.
- Repeatedly press **F8** after booting the system.
- Hold **Shift** during boot.

To disable this function and configure the boot loader menu to display by default, use the following command:

```
# grub2-editenv - unset menu_auto_hide
```

Boot loader configuration files are unified across CPU architectures

Configuration files for the GRUB boot loader are now stored in the **/boot/grub2/** directory on all supported CPU architectures. The **/boot/efi/EFI/redhat/grub.cfg** file, which GRUB previously used as the main configuration file on UEFI systems, now simply loads the **/boot/grub2/grub.cfg** file.

This change simplifies the layout of the GRUB configuration file, improves user experience, and provides the following notable benefits:

- You can boot the same installation with either EFI or legacy BIOS.
- You can use the same documentation and commands for all architectures.
- GRUB configuration tools are more robust, because they no longer rely on symbolic links and they do not have to handle platform-specific cases.
- The usage of the GRUB configuration files is aligned with images generated by CoreOS Assembler (COSA) and OSBuild.
- The usage of the GRUB configuration files is aligned with other Linux distributions.

RHEL no longer boots on 32-bit UEFI

Support for the 32-bit UEFI firmware was removed from the GRUB and **shim** boot loaders. As a consequence, RHEL 9 requires a 64-bit UEFI, and can no longer boot on 64-bit systems that use a 32-bit UEFI.

The following packages have been removed as part of this change:

- **grub2-efi-ia32**
- **grub2-efi-ia32-cdboot**
- **grub2-efi-ia32-modules**
- **shim-ia32**

CHAPTER 18. NETWORKING

The following chapters contain the most notable changes to networking between RHEL 8 and RHEL 9.

18.1. KERNEL

WireGuard VPN is available as a Technology Preview

WireGuard, which Red Hat provides as an unsupported Technology Preview, is a high-performance VPN solution that runs in the Linux kernel. It uses modern cryptography and is easier to configure than other VPN solutions. Additionally, the small code-basis of WireGuard reduces the surface for attacks and, therefore, improves the security.

For further details, see Setting up a WireGuard VPN.

The PRP and HSR protocols are available as a Technology Preview

Starting with RHEL 9.3, the **hsr** kernel module is available as an unsupported Technology Preview. The module provides the following protocols:

- Parallel Redundancy Protocol (PRP)
- High-availability Seamless Redundancy (HSR)

The IEC 62439-3 standard defines these protocols, and you can use this feature to configure zero-loss redundancy in Ethernet networks.

Segment Routing over IPv6 (SRv6) is available as a Technology Preview

The RHEL 9.3 kernel provides Segment Routing over IPv6 (SRv6) as an unsupported Technology Preview. You can use this functionality to optimize traffic flows in edge computing or to improve network programmability in data centers. However, the most significant use case is the end-to-end (E2E) network slicing in 5G deployment scenarios. In that area, the SRv6 protocol provides you with the programmable custom network slices and resource reservations to address network requirements for specific applications or services. At the same time, the solution can be deployed on a single-purpose appliance, and it satisfies the need for a smaller computational footprint.

NetworkManager and the Nmstate API support MACsec hardware offload

You can use both NetworkManager and the Nmstate API to enable MACsec hardware offload if the hardware supports this feature. As a result, you can offload MACsec operations, such as encryption, from the CPU to the network interface card.

Note that this feature is an unsupported Technology Preview.

18.2. NETWORK TYPES

Network teams are deprecated

The **teamd** service and the **libteam** library are deprecated in Red Hat Enterprise Linux 9 and will be removed in the next major release. As a replacement, configure a bond instead of a network team.

Red Hat focuses its efforts on kernel-based bonding to avoid maintaining two features, bonds and teams, that have similar functions. The bonding code has a high customer adoption, is robust, and has an active community development. As a result, the bonding code receives enhancements and updates.

For details about how to migrate a team to a bond, see Migrating a network team configuration to network bond.

18.3. NETWORKMANAGER

NetworkManager stores new network configurations in a key file format

Previously, NetworkManager stored new network configurations to **/etc/sysconfig/network-scripts/** in the **ifcfg** format. Starting with RHEL 9.0, RHEL stores new network configurations at **/etc/NetworkManager/system-connections/** in a key file format. The connections for which the configurations are stored to **/etc/sysconfig/network-scripts/** in the old format still work uninterrupted. Modifications in existing profiles continue updating the older files.

If Red Hat adds support for more connection profile properties, note that these properties work only in profiles in keyfile format.

The WEP Wi-Fi connection method has been removed

The insecure wired equivalent privacy (WEP) Wi-Fi connection method has been removed from RHEL 9. For secure Wi-Fi connections, use the Wi-Fi Protected Access 3 (WPA3) or WPA2 connection methods.

18.4. MPTCP

The mptcpd service is available

With this update the **mptcpd** service is available for usage. It is a user space based **MPTCP** path manager with integrated **mptcpize** tool.

The **mptcpd** service provides the simplified automatic configuration of the **MPTCP`paths. It benefits with better reliability of the `MPTCP** socket in case of network failure or reconfiguration.

Now you can use the **mptcpize** tool to enable the **MPTCP** protocol on the existing **systemd** units without additional external dependencies.

18.5. FIREWALL

The ipset and iptables-nft packages have been deprecated

The **ipset** and **iptables-nft** packages have been deprecated in RHEL. The **iptables-nft** package contains different tools such as **iptables**, **ip6tables**, **ebtables** and **arptables**. These tools will no longer receive new features and using them for new deployments is not recommended. As a replacement, it is recommended to use the **nft** command line tool provided by the **nftables** package. Existing setups should migrate to **nft** when possible.

For more information about migrating to nftables, see Migrating from iptables to nftables , as well as the **iptables-translate(8)** and **ip6tables-translate(8)** man pages.

The unsupported xt_u32 Netfilter module has been removed

RHEL 8 contained the unsupported **xt_u32** module, which enabled **iptables** users to match arbitrary 32 bits in the packet header or payload. This module has been removed from RHEL 9. As a replacement, use the **nftables** packet filtering framework. If no native match exists in **nftables**, use the raw payload matching feature of **nftables**. For details, see the **raw payload expression** section in the **nft(8)** man page.

18.6. INFINIBAND AND RDMA NETWORKS

The ibdev2netdev script has been removed from RHEL 9

ibdev2netdev was a helper utility that was able to display all the associations between network devices and Remote Direct Memory Access (RDMA) adapter ports. Previously, Red Hat was including **ibdev2netdev** in the **rdma-core** package. From Red Hat Enterprise Linux 9, **ibdev2netdev** has been removed and replaced by the **rdmatool** utility. Now, the **iproute** package includes **rdmatool**.

18.7. REMOVED FUNCTIONALITY

RHEL 9 does not contain the legacy network scripts

RHEL 9 does not contain the **network-scripts** package that provided the deprecated legacy network scripts in RHEL 8. To configure network connections in RHEL 9, use NetworkManager. For details, see the Configuring and managing networking documentation.

The unsupported xt_u32 Netfilter module has been removed

RHEL 8 contained the unsupported **xt_u32** module, which enabled **iptables** users to match arbitrary 32 bits in the packet header or payload. This module has been removed from RHEL 9. As a replacement, use the **nftables** packet filtering framework. If no native match exists in **nftables**, use the raw payload matching feature of **nftables**. For details, see the **raw payload expression** section in the **nft(8)** man page.

Data Encryption Standard (DES) algorithm is not available for net-snmp communication in Red Hat Enterprise Linux 9

In previous versions of RHEL, DES was used as an encryption algorithm for secure communication between net-snmp clients and servers. In RHEL 9, the DES algorithm isn't supported by the OpenSSL library. The algorithm is marked as insecure and hence the DES support for net-snmp has been removed.

CHAPTER 19. PERFORMANCE

The following chapter contains the most notable changes to performance between RHEL 8 and RHEL 9.

19.1. NOTABLE CHANGES TO PERFORMANCE

Performance Co-Pilot rebased to version 6.0

Starting in RHEL 9.2, **Performance Co-Pilot** (**PCP**) has been updated to version 6.0. Notable improvements include:

1. Version 3 PCP archive support:
   This includes support for instance domain change-deltas, Y2038-safe timestamps, nanosecond-precision timestamps, arbitrary timezones support, and 64-bit file offsets used throughout for larger (beyond 2GB) individual volumes.

   This feature is currently opt-in via the **PCP_ARCHIVE_VERSION** setting in the **/etc/pcp.conf** file.

   Version 2 archives remain the default.

2. Only OpenSSL is used throughout PCP. Mozilla NSS/NSPR use has been dropped:
   This impacts **libpcp**, **PMAPI** clients and **PMCD** use of encryption. These elements are now configured and used consistently with **pmproxy** HTTPS support and **redis-server**, which were both already using OpenSSL.

3. New nanosecond precision timestamp **PMAPI** calls for **PCP** library interfaces that make use of timestamps.
   These are all optional, and full backward compatibility is preserved for existing tools.

4. The following tools and services have been updated:

   pcp2elasticsearch

   Implemented authentication support.

   pcp-dstat

   Implemented support for the **top-alike** plugins.

   pcp-htop

   Updated to the latest stable upstream release.

   pmseries

   Added **sum**, **avg**, **stdev**, **nth_percentile**, **max_inst**, **max_sample**, **min_inst** and **min_sample** functions.

   pmdabpf

   Added CO-RE (Compile Once - Run Everywhere) modules and support for AMD64, Intel 64-bit, 64-bit ARM, and IBM Power Systems.

   pmdabpftrace

   Moved example autostart scripts to the **/usr/share** directory.

   pmdadenki

   Added support for multiple active batteries.

   pmdalinux

   Updates for the latest **/proc/net/netstat** changes.

pmdaopenvswitch

Added additional interface and coverage statistics.

pmproxy

Request parameters can now be sent in the request body.

pmieconf

Added several **pmie** rules for Open vSwitch metrics.

pmlogger_farm

Added a default configuration file for farm loggers.

pmlogger_daily_report

Some major efficiency improvements.

The sadf(1) tool now generates PCP archives from native sadc(1) archives

Starting in RHEL 9, the **sadf(1)** tool provided by the **sysstat** package can generate PCP archives from native **sadc(1)** archives.

By default, when the **-** flag is used with **sadc(1)**, **sadc(1)** writes the data to the standard system activity daily data file. This file is named **saDD** and is located in the **/var/log/sa** directory by default. Conversely, when no input datafile is specified, the **sadf(1)** tool uses the standard system activity daily data file to generate archives. Pass numbers as an argument to tell **sadf(1)** to generate archives from data recorded that specified number of days in the past.

- To generate a PCP archive from an **sadc(1)** archive recorded 2 days ago, run:

```
# sadf -l -O pcparchive=/tmp/recording -2
```

- To show a list of metrics in the PCP archive generated from an **sadc(1)** archive archive, run:

```
$ pminfo --archive /tmp/recording
Disk.dev.avactive
Disk.dev.read
Disk.dev.write
Disk.dev.blkread
[...]
```

- To show the timespace of the archive and hostname of the PCP archive generated from an **sadc(1)** archive

```
$ pmdumplog --label /tmp/recording
Log Label (Log Format Version 2)
Performance metrics from host shard
        commencing Tue Jul 20 00:10:30.642477 2021
        ending     Wed Jul 21 00:10:30.222176 2021
```

- You can then analyze the PCP archive generated from an **sadc(1)** archive by using PCP commands, for example:

```
$ pmchart --archive /tmp/recording
```

New PCP PMDA - pmdabpf

RHEL 9 is distributed with the **pcp-pmda-bpf** package, which provides the **pmdabpf** Performance Co-Pilot (PCP) Performance Metric Domain Agent (PMDA).

The **pmdabpf** PMDA extracts live performance data from **eBPF** programs utilizing **BPF CO-RE** (Compile Once - Run Everywhere), that is **libbpf** and **BTF**.

CHAPTER 20. SECURITY

The following chapters contain the most notable changes to security between RHEL 8 and RHEL 9.

20.1. SECURITY COMPLIANCE

CIS and DISA STIG profiles provided as DRAFT

The profiles based on benchmarks from the Center for Internet Security (CIS) and Defence Industry Security Association Security Technical Implementation Guides (DISA STIG) are provided as DRAFT because the issuing authorities have not yet published an official benchmark for RHEL 9. In addition, the OSSP profile is in DRAFT because it is being implemented.

For a complete list of profiles available in RHEL 9, see SCAP Security Guide profiles supported in RHEL 9.

OpenSCAP no longer supports SHA-1 and MD5

Due to removal of SHA-1 and MD5 hash functions in Red Hat Enterprise Linux 9, support for OVAL **filehash_test** has been removed from OpenSCAP. Also, support for SHA-1 and MD5 hash functions has been removed from OVAL **filehash58_test** implementation in OpenSCAP. As a result, OpenSCAP evaluates rules in SCAP content that use the OVAL **filehash_test** as **notchecked**. In addition, OpenSCAP returns **notchecked** also when evaluating OVAL **filehash58_test** with the **hash_type** element within **filehash58_object** set to **SHA-1** or **MD5**.

To update your OVAL content, rewrite the affected SCAP content so that it uses **filehash58_test** instead of **filehash_test** and use one of **SHA-224**, **SHA-256**, **SHA-384**, **SHA-512** in the **hash_type** element within **filehash58_object**.

OpenSCAP uses the data stream file instead of the XCCDF file

The SCAP source data stream file (**ssg-rhel9-ds.xml**) contains all the data that in previous versions of RHEL were contained in the XCCDF file (**ssg-rhel9-xccdf.xml**). The SCAP source data stream is a container file that includes all the components (XCCDF, OVAL, CPE) needed to perform a compliance scan. Using the SCAP source data stream instead of XCCDF has been recommended since RHEL 7. In previous versions of RHEL, the data in the XCCDF file and SCAP source data stream was duplicated. In RHEL 9, this duplication is removed to reduce the RPM package size. If your scenario requires using separate files instead of the data stream, you can split the data stream file by using this command: **# oscap ds sds-split /usr/share/xml/scap/ssg/content/ssg-rhel9-ds.xml output_directory**.

20.2. CRYPTO-POLICIES, RHEL CORE CRYPTOGRAPHIC COMPONENTS, AND PROTOCOLS

Continuing SHA-1 deprecation

In RHEL 9, SHA-1 usage for signatures is restricted in the DEFAULT system-wide cryptographic policy. Except for HMAC, SHA-1 is no longer allowed in TLS, DTLS, SSH, IKEv2, DNSSEC, and Kerberos protocols. Individual applications not controlled by the RHEL system-wide crypto policies are also moving away from using SHA-1 hashes in RHEL 9.

If your scenario requires the use of SHA-1 for verifying existing or third-party cryptographic signatures, you can enable it by entering the following command:

```
# update-crypto-policies --set DEFAULT:SHA1
```

Alternatively, you can switch the system-wide crypto policies to the **LEGACY** policy. Note that **LEGACY** also enables many other algorithms that are not secure. See the Re-enabling SHA-1 section in the RHEL 9 Security hardening document for more information.

For solutions of compatibility problems with systems that still require SHA-1, see the following KCS articles:

- SSH from RHEL 9 to RHEL 6 systems does not work
- Packages signed with SHA-1 cannot be installed or upgraded
- Failed connection with SSH servers and clients that do not support the 'server-sig-algs' extension
- DNSSEC records signed with RSASHA1 fail to verify

Algorithms disabled in all policy levels

The following algorithms are disabled in the **LEGACY**, **DEFAULT** and **FUTURE** crypto policies provided with RHEL 9:

- TLS older than version 1.2 (since RHEL 9, was < 1.0 in RHEL 8)
- DTLS older than version 1.2 (since RHEL 9, was < 1.0 in RHEL 8)
- DH with parameters < 2048 bits (since RHEL 9, was < 1024 bits in RHEL 8)
- RSA with key size < 2048 bits (since RHEL 9, was < 1024 bits in RHEL 8)
- DSA (since RHEL 9, was < 1024 bits in RHEL 8)
- 3DES (since RHEL 9)
- RC4 (since RHEL 9)
- FFDHE-1024 (since RHEL 9)
- DHE-DSS (since RHEL 9)
- Camellia (since RHEL 9)
- ARIA
- SEED
- IDEA
- Integrity-only cipher suites
- TLS CBC mode cipher suites using SHA-384 HMAC
- AES-CCM8
- All ECC curves incompatible with TLS 1.3, including secp256k1
- IKEv1 (since RHEL 8)
- NSEC3DSA in the BIND configuration (since RHEL 9.2)

WARNING

If your scenario requires a policy that has been disabled, you can enable it by applying a custom cryptographic policy or by an explicit configuration of individual applications, but the resulting configuration will not be supported.

Changes to TLS

In RHEL 9, TLS configuration is performed using the system-wide cryptographic policies mechanism. TLS versions below 1.2 are not supported anymore. **DEFAULT**, **FUTURE** and **LEGACY** cryptographic policies allow only TLS 1.2 and 1.3. See Using system-wide cryptographic policies for more information.

The default settings provided by libraries included in RHEL 9 are secure enough for most deployments. The TLS implementations use secure algorithms where possible while not preventing connections from or to legacy clients or servers. Apply hardened settings in environments with strict security requirements where legacy clients or servers that do not support secure algorithms or protocols are not expected or allowed to connect.

The Extended Master Secret TLS Extension is now enforced on FIPS-enabled systems

With the release of the RHSA-2023:3722 advisory, the TLS **Extended Master Secret** (EMS) extension (RFC 7627) is mandatory for TLS 1.2 connections on FIPS-enabled RHEL 9 systems. This is in accordance with FIPS-140-3 requirements. TLS 1.3 is not affected.

Legacy clients that do not support EMS or TLS 1.3 now cannot connect to FIPS servers running on RHEL 9. Similarly, RHEL 9 clients in FIPS mode cannot connect to servers that only support TLS 1.2 without EMS. This in practice means that these clients cannot connect to servers on RHEL 6, RHEL 7 and non-RHEL legacy operating systems. This is because the legacy 1.0.x versions of OpenSSL do not support EMS or TLS 1.3.

SCP not supported in RHEL 9

The secure copy protocol (SCP) protocol is no longer supported because it is difficult to secure. It has already caused security issues, for example CVE-2020-15778. In RHEL 9, SCP is replaced by the SSH File Transfer Protocol (SFTP) by default.

WARNING

By default, SSH cannot connect from RHEL 9 systems to older systems (for example, RHEL 6) or from older systems to RHEL 9. This is because the cryptographic algorithms used in older versions are now considered insecure. If your scenario requires connecting with older systems, you can either use the ECDSA and ECDH algorithms as keys on the legacy system or use the legacy cryptographic policy on the RHEL 9 system. For additional details, see the solutions SSH from RHEL 9 to RHEL 6 systems does not work and Failed connection with SSH servers and clients that do not support the server-sig-algs extension.

Interoperability of FIPS:OSPP hosts impacted due to CNSA 1.0

The **OSPP** subpolicy has been aligned with Commercial National Security Algorithm (CNSA) 1.0. This affects the interoperability of hosts that use the **FIPS:OSPP** policy-subpolicy combination, with the following major aspects:

- Minimum RSA key size is mandated at 3072 bits.
- Algorithm negotiations no longer support AES-128 ciphers, the secp256r1 elliptic curve, and the FFDHE-2048 group.

OpenSSH root password login disabled by default

The default configuration of OpenSSH in RHEL 9 disallows users to log in as **root** with a password to prevent attackers from gaining access through brute-force attacks on passwords.

OpenSSH further enforces SHA-2

As part of the effort to migrate further from the less secure SHA-1 message digest for cryptographic purposes, the following changes were made in OpenSSH:

- Added a check on **sshd** startup whether using SHA-1 is configured on the system. If it is not available, OpenSSH does not try to use SHA-1 for operations. This eliminates loading DSS keys when they are present and also enforces advertising **rsa-sha2** combinations when they are available.
- On SSH private key conversion, OpenSSH explicitly uses SHA-2 for testing RSA keys.
- When SHA-1 signatures are unavailable on the server side, **sshd** uses SHA-2 to confirm host key proof. This might be incompatible with clients on RHEL 8 and earlier versions.
- When the SHA-1 algorithm is unavailable on the client side, OpenSSH uses SHA-2.
- On the client side, OpenSSH permits SHA-2-based key proofs from the server when SHA-1 was used in key proof request or when the hash algorithm is not specified (assuming default). This is aligned with the already present exception for RSA certificates, and allows connecting by using modern algorithms when supported.

GnuTLS requires EMS with TLS 1.2 in FIPS mode

To comply with the FIPS-140-3 standard, GnuTLS servers and clients require the Extended Master Secret (EMS) extension (RFC 7627) for all TLS 1.2 connections negotiated in FIPS mode. If your scenario requires preserving compatibility with older servers and clients that do not support EMS and you cannot use TLS 1.3, you can apply the **NO-ENFORCE-EMS** system-wide cryptographic subpolicy:

```
# update-crypto-policies --set FIPS:NO-ENFORCE-EMS
```

WARNING

If you allow TLS 1.2 connections without EMS, your system no longer meets the FIPS-140-3 requirements.

GnuTLS no longer supports TPM 1.2

The GnuTLS library no longer supports the Trusted Platform Module (TPM) 1.2 technology. Your applications using TPM through the GnuTLS API must support TPM 2.0.

GnuTLS support for GOST has been removed

In RHEL 8, the GOST ciphers have been disabled through the system-wide cryptographic policies. In RHEL 9, support for these ciphers has been removed from the GnuTLS library.

cyrus-sasl now uses GDBM instead of Berkeley DB

The **cyrus-sasl** package is now built without the **libdb** dependency, and the **sasldb** plugin uses the GDBM database format instead of Berkeley DB. To migrate your existing Simple Authentication and Security Layer (SASL) databases stored in the old Berkeley DB format, use the **cyrusbdb2current** tool with the following syntax:

```
$ cyrusbdb2current <sasldb_path> <new_path>
```

NSS now enforce EMS in FIPS mode

The Network Security Services (NSS) libraries now contain the **TLS-REQUIRE-EMS** policy to require the Extended Master Secret (EMS) extension (RFC 7627) for all TLS 1.2 connections as mandated by the FIPS 140-3 standard. NSS use the new policy when the system-wide cryptographic policies are set to **FIPS**.

If your scenario requires interoperating with legacy systems without support for EMS or TLS 1.3, you can apply the **NO-ENFORCE-EMS** system-wide cryptographic subpolicy. Such a change violates the FIPS-140-3 requirements.

NSS no longer support DBM and pk12util defaults changed

The Network Security Services (NSS) libraries no longer support the DBM file format for the trust database. In RHEL 8, the SQLite file format became the default format, and the existing DBM databases were opened on read-only mode and automatically converted to SQLite. Before you upgrade to RHEL 9, update all trust databases from DBM to SQLite.

See the Updating NSS databases from DBM to SQLite procedure for detailed instructions.

NSS pk12util no longer uses DES-3 and SHA-1 by default

The **pk12util** tool now uses the AES and SHA-256 algorithms instead of DES-3 and SHA-1 by default when exporting private keys.

Note that SHA-1 is disabled by the default system-wide cryptographic policy for all signatures in RHEL 9.

NSS no longer support RSA keys shorter than 1023 bits

The update of the Network Security Services (NSS) libraries changes the minimum key size for all RSA operations from 128 to 1023 bits. This means that NSS no longer perform the following functions:

- Generate RSA keys shorter than 1023 bits.
- Sign or verify RSA signatures with RSA keys shorter than 1023 bits.
- Encrypt or decrypt values with RSA key shorter than 1023 bits.

OpenSSL ENGINE extension API is not supported in FIPS mode

The legacy extension system to OpenSSL, the ENGINE API, is not compatible with the new provider API. Therefore, applications that depend on functionality provided by OpenSSL engines, such as the **openssl-pkcs11** and **openssl-ibmca** modules, cannot be used in FIPS mode.

FIPS mode in OpenSSL must be enabled to work correctly

If you are using non-default values in the **openssl.cnf** configuration file with FIPS mode enabled, and especially when using a third-party FIPS provider, add **fips=yes** to the **openssl.cnf** file.

OpenSSL does not accept explicit curve parameters in FIPS mode

Elliptic curve cryptography parameters, private keys, public keys, and certificates that specified explicit curve parameters no longer work in FIPS mode. Specifying the curve parameters using ASN.1 object identifiers, which use one of the FIPS-approved curves, still works in FIPS mode.

Libreswan now requests ESN by default

In Libreswan, the default value for the configuration option **esn=** has changed from **no** to **either**. This means that when initiating connections, Libreswan requests the use of Extended Serial Number (ESN) by default. In particular, when hardware offload is used, this new behavior prevents certain network interface cards (NIC) from establishing IPsec connection if they do not support ESN. To disable ESN, set **esn=** to **no** and the **replay_window=** option to a value of 32 or lower. For example:

```
esn=no
replay_window=32
```

The **replay_window=** option is necessary because a different mechanism uses ESN for anti-replay protection with window sizes larger than 32.

20.3. SELINUX

Support for disabling SELinux through /etc/selinux/config has been removed

With the RHEL 9.0 release, support for disabling SELinux through the **SELINUX=disabled** option in the **/etc/selinux/config** file has been removed from the kernel. When you disable SELinux only through **/etc/selinux/config**, the system starts with SELinux enabled but with no policy loaded, and SELinux security hooks remain registered in the kernel. This means that SELinux disabled by using **/etc/selinux/config** still requires some system resources, and you should instead disable SELinux by using the kernel command line in all performance-sensitive scenarios.

Furthermore, the Anaconda installation program and the corresponding man pages have been updated to reflect this change. This change also enables read-only-after-initialization protection for the Linux Security Module (LSM) hooks.

If your scenario requires disabling SELinux, add the **selinux=0** parameter to your kernel command line.

See the Remove support for SELinux run-time disable Fedora wiki page for more information.

Additional services confined in the SELinux policy

The RHEL 9.3 release added additional rules to the SELinux policy that confine the following **systemd** services:

- **qat**
- **systemd-pstore**

- **boothd**
- **fdo-manufacturing-server**
- **fdo-rendezvous-server**
- **fdo-client-linuxapp**
- **fdo-owner-onboarding-server**

As a result, these services do not run with the **unconfined_service_t** SELinux label anymore, and run successfully in SELinux enforcing mode.

The glusterd SELinux module moved to a separate glusterfs-selinux package

With this update, the **glusterd** SELinux module is maintained in the separate **glusterfs-selinux** package. The module is therefore no longer part of the **selinux-policy** package. For any actions that concern the **glusterd** module, install and use the **glusterfs-selinux** package.

CHAPTER 21. SHELLS AND COMMAND-LINE TOOLS

The following chapters contain the most notable changes to shells and command-line tools between RHEL 8 and RHEL 9.

21.1. NOTABLE CHANGES TO SYSTEM MANAGEMENT

Data Encryption Standard (DES) algorithm is not available for net-snmp communication in Red Hat Enterprise Linux 9

In previous versions of RHEL, DES was used as an encryption algorithm for secure communication between net-snmp clients and servers. In RHEL 9, the DES algorithm isn't supported by the OpenSSL library. The algorithm is marked as insecure and the DES support for net-snmp has therefore been removed.

The ABRT tool has been removed

The Automatic Bug Reporting Tool (ABRT) for detecting and reporting application crashes is not available in RHEL 9.

As a replacement, use the **systemd-coredump** tool to log and store core dumps, which are automatically generated files after a program crashes.

The hidepid=n mount option is not supported in RHEL 9 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 9.

In addition, using this option might cause certain services started by **systemd** to produce SELinux AVC denial messages and prevent other operations from being completed.

The dump utility from the dump package has been removed

The **dump** utility used for backup of file systems has been deprecated in Red Hat Enterprise Linux 8 and is not available in RHEL 9.

In RHEL 9, Red Hat recommends using the **tar**, or **dd** as a backup tool for ext2, ext3, and ext4 file systems. The **dump** utility will be a part of the EPEL 9 repository.

Note that the **restore** utility from the **dump** package remains available and supported in RHEL 9 and is available as the **restore** package.

RHEL 9 does not contain ReaR crontab

The **/etc/cron.d/rear** crontab in the **rear** package, which runs **rear mkrescue** after the disk layout changes, has been removed in RHEL 9.

If you relied on the **/etc/cron.d/rear** crontab to run **rear mkrescue**, you can manually configure periodic runs of ReaR instead.

NOTE

The **rear** package in RHEL contains the following examples for scheduling jobs:

- the **/usr/share/doc/rear/rear.cron** example crontab
- the **/usr/share/doc/rear/rear.{service,timer}** example systemd unit

Do not use these examples without site-specific modifications or other actions to take updated backups for system recovery. You must take regular backups in addition to re-creating the rescue image. The steps to take a backup depend on the local configuration. If you run the **rear mkrescue** command without taking an updated backup at the same time, the system recovery process would use a previous backup that might be inconsistent with the saved layout.

21.2. NOTABLE CHANGES TO COMMAND-LINE TOOLS

Support for the raw command-line tool has been removed

With this release, the **raw** (**/usr/bin/raw**) command-line tool has been removed from the **util-linux** package, because Linux kernel does not support **raw** devices since version 5.14.

Currently, there is no replacement available.

cgroupsv1 is deprecated in RHEL 9

cgroups is a kernel subsystem used for process tracking, system resource allocation and partitioning. Systemd service manager supports booting in the **cgroups v1** mode and in **cgroups v2** mode. In Red Hat Enterprise Linux 9, the default mode is **v2**. In the next major release, systemd will not support booting in the **cgroups v1** mode and only **cgroups v2** mode will be available.

The lsb-release binary is not available in RHEL 9

The information in the **/etc/os-release** file was previously available by calling the **lsb-release** binary. This binary was included in the **redhat-lsb** package, which was removed in RHEL 9. Now, you can display information about the operating system, such as the distribution, version, code name, and associated metadata, by reading the **/etc/os-release** file. This file is provided by Red Hat and any changes to it are overwritten with each update of the **redhat-release** package. The format of the file is **KEY=VALUE**, and you can safely source the data for a shell script.

CHAPTER 22. SOFTWARE MANAGEMENT

The following chapter contains the most notable changes to software management between RHEL 8 and RHEL 9.

22.1. NOTABLE CHANGES TO SOFTWARE MANAGEMENT

Package management with DNF/YUM

In Red Hat Enterprise Linux 9, software installation is ensured by **DNF**. Red Hat continues to support the usage of the **yum** term for consistency with previous major versions of RHEL. If you type **dnf** instead of **yum**, the command works as expected because both are aliases for compatibility.

Although RHEL 8 and RHEL 9 are based on **DNF**, they are compatible with **YUM** used in RHEL 7.

For more information, see Managing software with the DNF tool.

Notable RPM features and changes

Red Hat Enterprise Linux 9 is distributed with RPM version 4.16. This version introduces many enhancements over its previous versions.

Notable features include:

- New SPEC features, most notably:
  - Fast macro-based dependency generators
    It is now possible to define dependency generators as regular RPM macros. This is especially useful in combination with the embedded Lua interpreter (**%{lua:...}**) because it enables writing sophisticated yet fast generators and avoiding redundant forking and executing a shell script.

    Example:

    ```
    %__foo_provides()    %{basename:%{1}}
    ```

  - The **%generate_buildrequires** section that enables generating dynamic build dependencies
    Additional build dependencies can now be generated programmatically at RPM build time, using the newly available **%generate_buildrequires** section. This is useful when packaging software written in a language in which a specialized utility is commonly used to determine run-time or build-time dependencies, such as Rust, Golang, Node.js, Ruby, Python or Haskell.

  - Meta (unordered) dependencies
    A new dependency qualifier called **meta** enables expressing dependencies that are not specifically install-time or run-time dependencies. This is useful for avoiding unnecessary dependency loops that could otherwise arise from the normal dependency ordering, such as when specifying the dependencies of a meta package.

    Example:

    ```
    Requires(meta): <pkgname>
    ```

  - Native version comparison in expressions

It is now possible to compare arbitrary version strings in expressions by using the newly supported **v"..."** format.

Example:

```
%if v"%{python_version}" < v"3.9"
```

- Caret version operator, opposite of tilde
  The new caret (**^**) operator can be used to express a version that is higher than the base version. It is a complement to the existing tilde (~) operator which has the opposite semantics.

- **%elif**, **%elifos** and **%elifarch** statements

- Optional automatic patch and source numbering
  Patch: and **Source:** tags without a number are now automatically numbered based on the order in which they are listed.

- **%autopatch** now accepts patch ranges
  The **%autopatch** macro now accepts the **-m** and **-M** parameters to limit the minimum and maximum patch number to apply, respectively.

- **%patchlist** and **%sourcelist** sections
  It is now possible to list patch and source files without preceding each item with the respective **Patch**: and **Source:** tags by using the newly added **%patchlist** and **%sourcelist** sections.

- A more intuitive way to declare build conditionals
  Starting from RHEL 9.2, you can use the new **%bcond** macro to build conditionals. The **%bcond** macro takes a build conditional name and the default value as arguments. Compared to the old **%bcond_with** and **%bcond_without** macros, **%bcond** is easier to understand and allows you to calculate the default value at build time. The default value can be any numeric expression.

  Example:

  - To create a **gnutls** build conditional, enabled by default:

    ```
    %bcond gnutls 1
    ```

  - To create a **bootstrap** build conditional, disabled by default:

    ```
    %bcond bootstrap 0
    ```

  - To create an **openssl** build conditional, defaulting to opposite of **gnutls**:

    ```
    %bcond openssl %{without gnutls}
    ```

- The RPM database is now based on the **sqlite** library. Read-only support for **BerkeleyDB** databases has been retained for migration and query purposes.

- A new **rpm-plugin-audit** plug-in for issuing audit log events on transactions, previously built into RPM itself

- Increased parallelism in package builds

There have been numerous improvements to the way the package build process is parallelized. These improvements involve various buildroot policy scripts and sanity checks, file classification, and subpackage creation and ordering. As a result, package builds on multiprocessor systems, particularly for large packages, should now be faster and more efficient.

- Enforced UTF-8 validation of header data at build-time

- RPM now supports the Zstandard (**zstd**) compression algorithm
  In RHEL 9, the default RPM compression algorithm has switched to Zstandard (**zstd**). As a result, packages now install faster, which can be especially noticeable during large transactions.

CHAPTER 23. SUBSCRIPTION MANAGEMENT

The following chapter contains the most notable changes to subscription management between RHEL 8 and RHEL 9.

23.1. NOTABLE CHANGES TO SUBSCRIPTION MANAGEMENT

Merged system purpose commands under the subscription-manager syspurpose command

Previously, there were two different commands to set system purpose attributes; **syspurpose** and **subscription-manager**. To unify all the system purpose attributes under one module, all the **addons**, **role**, **service-level**, and **usage** commands from subscription-manager have been moved to the new submodule, **subscription-manager syspurpose**.

Existing **subscription-manager** commands outside the new submodule are deprecated. The separate package (**python3-syspurpose**) that provides the **syspurpose** command line tool has been removed in RHEL 9.

This update provides a consistent way to view, set, and update all system purpose attributes using a single command of subscription-manager. This command replaces all the existing system purpose commands with their equivalent versions available as a new subcommand. For example, **subscription-manager role --set SystemRole** becomes **subscription-manager syspurpose role --set SystemRole** and so on.

For complete information about the new commands, options, and other attributes, see the **SYSPURPOSE OPTIONS** section in the **subscription-manager** man page or Configuring system purpose using the subscription manager command line tool.

virt-who now uses /etc/virt-who.conf for global options instead of /etc/sysconfig/virt-who

In RHEL 9, the global options for the **virt-who** utility on your system are stored in the **/etc/virt-who.conf** file. Therefore, the **/etc/sysconfig/virt-who** file is not being used any more, and has been removed.

CHAPTER 24. SYSTEM ROLES

The following chapter contains the most notable changes to system roles between RHEL 8 and RHEL 9.

24.1. PERFORMING SYSTEM ADMINISTRATION TASKS WITH RHEL SYSTEM ROLES

As of Red Hat Enterprise Linux 9.0 General Availability (GA) release, RHEL system roles includes the **ansible-core 2.12** package. This is a version of Ansible that has only the core functionality - that is, it does not include modules such as **blivet** for the **storage** role, **gobject** for the **network** role, and plugins such as **json_query**.

With RHEL system roles, you can take advantage of a configuration interface to remotely manage multiple RHEL systems. As an option to the traditional RHEL system roles format, you can benefit from **Ansible Collections**, available in the Automation Hub only for Ansible Automation Platform Customers or via **RPM** package, available for RHEL users.

RHEL system roles support

Support for the following roles are available:

- The **cockpit** RHEL system role. You can automate the deployment and configuration of the web console and, thus, be able to manage your RHEL systems from a web browser.
- The **firewall** RHEL system role.
- The **ha_cluster** RHEL system role, formerly presented as a Technology Preview, is now fully supported.
- The **nbde_client** RHEL system role now supports servers with static IP addresses.
- The Microsoft SQL (**microsoft.sql.server**) role for Microsoft SQL Server. It simplifies and automates the configuration of RHEL with recommended settings for MSSQL Server workloads. Currently, the SQL Server does not support running on RHEL 9. You can only run the role on a RHEL 9 control node to manage the SQL Server on RHEL 7 and RHEL 8.
- The **VPN** RHEL system role, to configure VPN connections on RHEL systems by using Red Hat Ansible Automation Platform. Users can use it to set up host-to-host, network-to-network, VPN Remote Access Server, and Mesh configurations.
- The **IPMI** modules, to automate hardware management interfaces available in the **rhel_mgmt** Collection.

To learn more about the RHEL system roles, see the documentation title Administration and configuration tasks using system roles in RHEL.

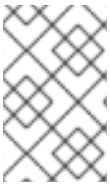
Support for Ansible Engine 2.9 is no longer available in RHEL 9

Ansible Engine 2.9 is no longer available in Red Hat Enterprise Linux 9. Playbooks that previously ran on **Ansible Engine 2.9** might generate error messages related to missing plugins or modules. If your use case for Ansible falls outside of the limited scope of support for Ansible Core provided in RHEL, contact Red Hat to discuss the available offerings.

RHEL system roles now uses Ansible Core

As of the RHEL 9 General Availability release, **Ansible Core** is provided with a limited scope of support to enable RHEL supported automation use cases. **Ansible Core** is available in the AppStream

repository for RHEL. For details on the scope of support, refer to Scope of support for the Ansible Core package included in the RHEL 9 AppStream.



NOTE

As of Red Hat Enterprise Linux 9.0, the scope of support for Ansible Core in the RHEL AppStream is limited to any Ansible playbooks, roles, and modules that are included with or generated by a Red Hat product, such as RHEL system roles.

The deprecated **--token** option of the **subscription-manager register** command will stop working at the end of November 2024

The default entitlement server, **subscription.rhsm.redhat.com**, will no longer be allowing token-based authentication from the end of November 2024. As a result, the deprecated **--token=<TOKEN>** option of the **subscription-manager register** command will no longer be a supported authentication method. As a consequence, if you use **subscription-manager register --token=<TOKEN>**, the registration will fail with the following error message:

```
Token authentication not supported by the entitlement server
```

To register your system, use other supported authorization methods, such as including paired options **--username** / **--password** OR **--org** / **--activationkey** with the **subscription-manager register** command.

RHEL system roles can be used to manage multiple different versions of RHEL

You can use RHEL system roles as a consistent interface to manage different versions of RHEL. This can help to ease the transition between major versions of RHEL.

CHAPTER 25. VIRTUALIZATION

The following chapters contain the most notable changes to virtualization between RHEL 8 and RHEL 9.

25.1. NOTABLE CHANGES TO KVM

KVM virtualization is no longer supported on IBM POWER

Red Hat Kernel-based Virtual Machine (KVM) for RHEL 9.0 and later is not supported on IBM POWER hardware.

KVM virtualization fully supported on 64-bit ARM architecture

In RHEL 9.4 and later, creating KVM virtual machines on systems that use 64-bit ARM (also known as AArch64) CPUs is fully supported. Note, however, that certain virtualization features and functionalities that are available on AMD64 and Intel 64 systems might work differently or be unsupported on 64-bit ARM systems.

For details, see How virtualization on ARM 64 differs from AMD 64 and Intel 64 .

VM machine types based on RHEL 7.5 and earlier are unsupported

In RHEL 9, virtual machines (VMs) no longer support machine types based on RHEL 7.5 and earlier. These also include **pc-i440fx-rhel7.5.0** and earlier machine types, which were default in earlier major versions of RHEL. As a consequence, attempting to start a VM with such machine types on a RHEL 9 host fails with an **unsupported configuration** error. If you encounter this problem after upgrading your host to RHEL 9, see the Red Hat KnowledgeBase .

RHEL 9 still supports the **pc-i440fx-rhel7.6.0** machine type. However, RHEL will remove support for all **i440x** machine types in a future major update.

25.2. NOTABLE CHANGES TO LIBVIRT

Modular libvirt daemons

In RHEL 9, the **libvirt** library uses modular daemons that handle individual virtualization driver sets on your host. For example, the **virtqemud** daemon handles QEMU drivers. This makes it possible to fine-grain a variety of tasks that involve virtualization drivers, such as resource load optimization and monitoring.

In addition, the monolithic libvirt daemon, **libvirtd**, has become deprecated. However, if you upgrade from RHEL 8 to RHEL 9, your host will still use **libvirtd**, which you can continue using in RHEL 9.

Nevertheless, Red Hat recommends enabling modular **libvirt** daemons instead. For instructions, see the Enabling modular libvirt daemons document.

Note, however, that if you switch to using modular **libvirt** daemons, pre-configured tasks that use **libvirtd** will stop working.

External snapshots for virtual machines

RHEL 9.4 and later supports the external snapshot mechanism for virtual machines (VMs), which replaces the previously deprecated internal snapshot mechanism. As a result, you can create, delete, and revert to VM snapshots that are fully supported. External snapshots work more reliably both in the command-line interface and in the RHEL web console. This also applies to snapshots of running VMs, known as live snapshots.

Note, however, that some commands and utilities might still create internal snapshots. To verify that your snapshot is fully supported, ensure that it is configured as **external**. For example:

```
# virsh snapshot-dumpxml VM-name snapshot-name | grep external
<disk name='vda' snapshot='external' type='file'>
```

virsh iface-* commands are now unsupported

The **virsh iface-*** commands, such as **virsh iface-start** and **virsh iface-destroy**, are no longer supported in RHEL 9. Due to the removal of the **netcf** package, the majority of them do not work. To create and modify network interfaces, use **NetworkManager** utilities, such as **nmcli**.

25.3. NOTABLE CHANGES TO QEMU

QEMU no longer includes the SGA option ROM

In RHEL 9, the Serial Graphics Adapter (SGA) option ROM has been replaced by an equivalent functionality in SeaBIOS. However, if your virtual machine (VM) configuration uses the following XML fragament, this change will not affect your VM functionality.

```
<bios useserial='yes'/>
```

TPM passthrough has been removed

It is no longer possible to assign a physical Trusted Platform Module (TPM) device using the passthrough back end to a VM on RHEL 9. Note that this was an unsupported feature in RHEL 8. Instead, use the vTPM functionality, which uses the emulator back end, and is fully supported.

Other unsupported devices

QEMU no longer supports the following virtual devices:

- The Cirrus graphics device. The default graphics devices are now set to **stdvga** on BIOS-based machines and **bochs-display** on UEFI-based machines.
- The **ac97** audio device. In RHEL 9, **libvirt** uses the **ich9** device instead.

Intel vGPU removed

The packages required for the Intel vGPU feature were removed in RHEL 9.3.

Previously, as a Technology Preview, it was possible to divide a physical Intel GPU device into multiple virtual devices referred to as **mediated devices**. These mediated devices could then be assigned to multiple virtual machines (VMs) as virtual GPUs.

Since RHEL 9.3, you cannot use this feature.

25.4. NOTABLE CHANGES TO SPICE

SPICE has become unsupported

In RHEL 9, the SPICE remote display protocol is no longer supported. QXL, the graphics device used by SPICE, has also become unsupported. On a RHEL 9 host, VMs configured to use SPICE or QXL fail to start and instead display an **unsupported configuration** error.

Instead of SPICE, Red Hat recommends using alternate solutions for remote display streaming:

- For remote console access, use the **VNC** protocol. However, note that certain features available on SPICE are currently unsupported or do not work well on VNC. This includes:
  - Smart card sharing from the host to the VM (It is now supported only by third party remote visualization solutions.)
  - Audio playback from the VM to the host
  - Automated VM screen resizing
  - USB redirection from the host to the VM
  - Drag & drop file transfer from the host to the VM
  - In addition, **VNC** cannot be used by the GNOME Boxes application. As a consequence, Boxes is currently not available in RHEL 9.
- For advanced remote display functions, use third party tools such as RDP, HP ZCentral Remote Boost, or Mechdyne TGX.

For graphical VMs hosted on RHEL 9, Red Hat recommends using the **virtio-vga** and **virtio-gpu** virtual graphics cards.

For more information on how to switch a VM from the SPICE protocol to **VNC**, see the Knowledgebase article Unable to define, create or start a Virtual Machine using spice or qxl in RHEL 9 KVM .

CHAPTER 26. THE WEB CONSOLE

The following chapter contains the most notable changes to the web console between RHEL 8 and RHEL 9.

26.1. CHANGES TO THE RHEL WEB CONSOLE

Remote root login disabled on new installations of RHEL 9.2 and later

Due to security reasons, on new installations of RHEL 9.2 and newer, it is not possible to connect to the web console from a remote machine as a root user.

To enable the remote root login:

1. As a root user, open the **/etc/cockpit/disallowed-users** file in a text editor.
2. Remove the **root** user line from the file.
3. Save your changes.

APPENDIX A. CHANGES TO PACKAGES

The following chapters contain changes to packages between RHEL 8 and RHEL 9, as well as changes between minor releases of RHEL 9.

A.1. NEW PACKAGES

The following packages were added in RHEL 9:

Package	Repository	New in
389-ds-base-devel	rhel9-CRB	RHEL 9.3
a52dec	rhel9-AppStream	RHEL 9.0
adobe-source-code-pro-fonts	rhel9-AppStream	RHEL 9.1
afterburn	rhel9-AppStream	RHEL 9.0
afterburn-dracut	rhel9-AppStream	RHEL 9.0
alsa-plugins-pulseaudio	rhel9-AppStream	RHEL 9.1
alternatives	rhel9-BaseOS	RHEL 9.0
anaconda-install-img-deps	rhel9-AppStream	RHEL 9.0
anaconda-widgets-devel	rhel9-CRB	RHEL 9.1
ant-junit5	rhel9-AppStream	RHEL 9.0
anthy-unicode	rhel9-AppStream	RHEL 9.0
anthy-unicode-devel	rhel9-CRB	RHEL 9.1
appstream	rhel9-AppStream	RHEL 9.0
appstream-compose	rhel9-CRB	RHEL 9.0
appstream-compose-devel	rhel9-CRB	RHEL 9.0
appstream-devel	rhel9-CRB	RHEL 9.0
appstream-qt	rhel9-CRB	RHEL 9.0
appstream-qt-devel	rhel9-CRB	RHEL 9.0

Package	Repository	New in
aspnetcore-runtime-7.0	rhel9-AppStream	RHEL 9.1
aspnetcore-runtime-8.0	rhel9-AppStream	RHEL 9.4
aspnetcore-targeting-pack-7.0	rhel9-AppStream	RHEL 9.1
aspnetcore-targeting-pack-8.0	rhel9-AppStream	RHEL 9.4
autoconf-latest	rhel9-AppStream	RHEL 9.4
autoconf271	rhel9-AppStream	RHEL 9.4
autocorr-dsb	rhel9-AppStream	RHEL 9.0
autocorr-el	rhel9-AppStream	RHEL 9.0
autocorr-hsb	rhel9-AppStream	RHEL 9.0
autocorr-vro	rhel9-AppStream	RHEL 9.0
avahi-glib-devel	rhel9-CRB	RHEL 9.3
avahi-tools	rhel9-AppStream	RHEL 9.3
babel-doc	rhel9-CRB	RHEL 9.0
bind-dnssec-doc	rhel9-AppStream	RHEL 9.0
bind-dnssec-utils	rhel9-AppStream	RHEL 9.0
bind-doc	rhel9-CRB	RHEL 9.1
binutils-gold	rhel9-BaseOS	RHEL 9.0
blas64	rhel9-CRB	RHEL 9.3
blas64_	rhel9-CRB	RHEL 9.0
bmc-snmp-proxy	rhel9-AppStream	RHEL 9.0
boost-b2	rhel9-CRB	RHEL 9.0
boost-contract	rhel9-AppStream	RHEL 9.0
boost-doctools	rhel9-CRB	RHEL 9.0

Package	Repository	New in
boost-json	rhel9-AppStream	RHEL 9.0
boost-nowide	rhel9-AppStream	RHEL 9.0
bootc	rhel9-AppStream	RHEL 9.4
bootupd	rhel9-AppStream	RHEL 9.0
Box2D	rhel9-AppStream	RHEL 9.0
butane	rhel9-AppStream	RHEL 9.0
byte-buddy	rhel9-AppStream	RHEL 9.0
byte-buddy-agent	rhel9-CRB	RHEL 9.0
byteman-bmunit	rhel9-AppStream	RHEL 9.0
catatonit	rhel9-CRB	RHEL 9.1
capstone	rhel9-AppStream	RHEL 9.2
capstone-devel	rhel9-CRB	RHEL 9.2
capstone-java	rhel9-CRB	RHEL 9.2
cdrskin	rhel9-AppStream	RHEL 9.0
cepces	rhel9-AppStream	RHEL 9.4
cepces-certmonger	rhel9-AppStream	RHEL 9.4
cepces-selinux	rhel9-AppStream	RHEL 9.4
cifs-utils-devel	rhel9-CRB	RHEL 9.2
cldr-emoji-annotation-dtd	rhel9-AppStream	RHEL 9.0
clevis-pin-tpm2	rhel9-AppStream	RHEL 9.0
cockpit-ostree	rhel9-AppStream	RHEL 9.3
compat-hesiod	rhel9-AppStream	RHEL 9.0
compat-openssl11	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
compat-paratype-pt-sans-fonts-f33-f34	rhel9-AppStream	RHEL 9.0
compat-sap-c++-12	rhel9-SAP	RHEL 9.2
composefs	rhel9-AppStream	RHEL 9.4
composefs-libs	rhel9-AppStream	RHEL 9.4
console-login-helper-messages	rhel9-AppStream	RHEL 9.0
console-login-helper-messages-issuegen	rhel9-AppStream	RHEL 9.0
console-login-helper-messages-motdgen	rhel9-AppStream	RHEL 9.0
console-login-helper-messages-profile	rhel9-AppStream	RHEL 9.0
console-setup	rhel9-AppStream	RHEL 9.0
container-tools	rhel9-AppStream	RHEL 9.0
cups-printerapp	rhel9-AppStream	RHEL 9.0
curl-minimal	rhel9-BaseOS	RHEL 9.0
cxl-cli	rhel9-AppStream	RHEL 9.2
cxl-devel	rhel9-CRB	RHEL 9.2
cxl-libs	rhel9-AppStream	RHEL 9.2
cyrus-imapd-libs	rhel9-AppStream	RHEL 9.0
dbus-broker	rhel9-BaseOS	RHEL 9.0
dbus-python-devel	rhel9-CRB	RHEL 9.4
ddiskit	rhel9-AppStream	RHEL 9.0
debugedit	rhel9-AppStream	RHEL 9.0
dejavu-lgc-sans-mono-fonts	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
dejavu-lgc-serif-fonts	rhel9-AppStream	RHEL 9.0
docbook5-style-xsl	rhel9-AppStream	RHEL 9.0
docbook5-style-xsl-extensions	rhel9-AppStream	RHEL 9.0
dotnet-apphost-pack-7.0	rhel9-AppStream	RHEL 9.1
dotnet-apphost-pack-8.0	rhel9-AppStream	RHEL 9.4
dotnet-hostfxr-7.0	rhel9-AppStream	RHEL 9.1
dotnet-hostfxr-8.0	rhel9-AppStream	RHEL 9.4
dotnet-runtime-7.0	rhel9-AppStream	RHEL 9.1
dotnet-runtime-8.0	rhel9-AppStream	RHEL 9.4
dotnet-sdk-7.0	rhel9-AppStream	RHEL 9.1
dotnet-sdk-7.0-source-built-artifacts	rhel9-CRB	RHEL 9.1
dotnet-sdk-8.0	rhel9-AppStream	RHEL 9.4
dotnet-sdk-8.0-source-built-artifacts	rhel9-CRB	RHEL 9.4
dotnet-targeting-pack-7.0	rhel9-AppStream	RHEL 9.1
dotnet-targeting-pack-8.0	rhel9-AppStream	RHEL 9.4
dotnet-templates-7.0	rhel9-AppStream	RHEL 9.1
dotnet-templates-8.0	rhel9-AppStream	RHEL 9.4
double-conversion	rhel9-AppStream	RHEL 9.0
double-conversion-devel	rhel9-CRB	RHEL 9.1
drgn	rhel9-AppStream	RHEL 9.4
ecj	rhel9-AppStream	RHEL 9.2
edk2-tools	rhel9-CRB	RHEL 9.2

Package	Repository	New in
edk2-tools-doc	rhel9-CRB	RHEL 9.2
efs-utils	rhel9-AppStream	RHEL 9.4
efs-utils-selinux	rhel9-AppStream	RHEL 9.4
egl-utils	rhel9-AppStream	RHEL 9.1
emacs-auctex	rhel9-AppStream	RHEL 9.0
emacs-cython-mode	rhel9-CRB	RHEL 9.0
espeak-ng-devel	rhel9-CRB	RHEL 9.3
evince-previewer	rhel9-AppStream	RHEL 9.0
evince-thumbnailer	rhel9-AppStream	RHEL 9.0
evolution-data-server-ui	rhel9-AppStream	RHEL 9.4
evolution-data-server-ui-devel	rhel9-AppStream	RHEL 9.4
exfatprogs	rhel9-BaseOS	RHEL 9.0
expect-devel	rhel9-CRB	RHEL 9.4
fapolicyd-dnf-plugin	rhel9-AppStream	RHEL 9.0
fdk-aac-free	rhel9-AppStream	RHEL 9.0
fdk-aac-free-devel	rhel9-CRB	RHEL 9.1
fence-agents-openstack	rhel9-HighAvailability	RHEL 9.0
festival	rhel9-AppStream	RHEL 9.0
festival-data	rhel9-AppStream	RHEL 9.0
festvox-slt-arctic-hts	rhel9-AppStream	RHEL 9.0
fido2-tools	rhel9-AppStream	RHEL 9.4
fio-engine-dev-dax	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
fio-engine-http	rhel9-AppStream	RHEL 9.0
fio-engine-libaio	rhel9-AppStream	RHEL 9.0
fio-engine-libpmem	rhel9-AppStream	RHEL 9.0
fio-engine-nbd	rhel9-AppStream	RHEL 9.0
fio-engine-pmemblk	rhel9-AppStream	RHEL 9.0
fio-engine-rados	rhel9-AppStream	RHEL 9.0
fio-engine-rbd	rhel9-AppStream	RHEL 9.0
fio-engine-rdma	rhel9-AppStream	RHEL 9.0
firefox-x11	rhel9-AppStream	RHEL 9.2
flashrom	rhel9-AppStream	RHEL 9.0
flexiblas	rhel9-AppStream	RHEL 9.0
flexiblas-devel	rhel9-CRB	RHEL 9.0
flexiblas-netlib	rhel9-AppStream	RHEL 9.0
flexiblas-netlib64	rhel9-CRB	RHEL 9.0
flexiblas-openblas-openmp	rhel9-AppStream	RHEL 9.0
flexiblas-openblas-openmp64	rhel9-CRB	RHEL 9.0
fonts-filesystem	rhel9-BaseOS	RHEL 9.0
fonts-rpm-macros	rhel9-CRB	RHEL 9.0
fonts-srpm-macros	rhel9-AppStream	RHEL 9.0
freeglut-devel	rhel9-AppStream	RHEL 9.1
freeradius-mysql	rhel9-CRB	RHEL 9.2
freeradius-perl	rhel9-CRB	RHEL 9.2

Package	Repository	New in
freeradius-postgresql	rhel9-CRB	RHEL 9.2
freeradius-rest	rhel9-CRB	RHEL 9.2
freeradius-sqlite	rhel9-CRB	RHEL 9.2
freeradius-unixODBC	rhel9-CRB	RHEL 9.2
frr-selinux	rhel9-AppStream	RHEL 9.2
fstrm-utils	rhel9-CRB	RHEL 9.0
fwupd-plugin-flashrom	rhel9-AppStream	RHEL 9.0
gawk-all-langpacks	rhel9-AppStream	RHEL 9.0
gcc-plugin-annobin	rhel9-AppStream	RHEL 9.0
gcc-toolset-12	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-annobin-annocheck	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-annobin-docs	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-annobin-plugin-gcc	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-binutils	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-binutils-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-binutils-gold	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-build	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-dwz	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-gcc	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-gcc-c++	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-gcc-gfortran	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-gcc-plugin-annobin	rhel9-AppStream	RHEL 9.2
gcc-toolset-12-gcc-plugin-devel	rhel9-AppStream	RHEL 9.1

Package	Repository	New in
gcc-toolset-12-gdb	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libasan-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libatomic-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libgccjit	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libgccjit-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libgccjit-docs	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libitm-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-liblsan-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libquadmath-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libstdc++-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libstdc++-docs	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libtsan-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-libubsan-devel	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-offload-nvptx	rhel9-AppStream	RHEL 9.1
gcc-toolset-12-runtime	rhel9-AppStream	RHEL 9.1
gcc-toolset-13	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-annobin-annocheck	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-annobin-docs	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-annobin-plugin-gcc	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-binutils	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-binutils-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-binutils-gold	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-dwz	rhel9-AppStream	RHEL 9.3

Package	Repository	New in
gcc-toolset-13-gcc	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-gcc-c++	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-gcc-gfortran	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-gcc-plugin-annobin	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-gcc-plugin-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-gdb	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libasan-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libatomic-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libgccjit	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libgccjit-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libitm-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-liblsan-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libquadmath-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libstdc++-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libstdc++-docs	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libtsan-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-libubsan-devel	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-offload-nvptx	rhel9-AppStream	RHEL 9.3
gcc-toolset-13-runtime	rhel9-AppStream	RHEL 9.3
gcr-base	rhel9-AppStream	RHEL 9.0
gdb-minimal	rhel9-AppStream	RHEL 9.0
gedit-plugin-sessionsaver	rhel9-AppStream	RHEL 9.0
gedit-plugin-synctex	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
gegl04-devel-docs	rhel9-AppStream	RHEL 9.0
gegl04-tools	rhel9-AppStream	RHEL 9.0
glade	rhel9-AppStream	RHEL 9.0
glibc-doc	rhel9-AppStream	RHEL 9.0
glibc-langpack-ckb	rhel9-BaseOS	RHEL 9.0
glibc-langpack-mnw	rhel9-BaseOS	RHEL 9.0
glslang	rhel9-AppStream	RHEL 9.0
glslang-devel	rhel9-CRB	RHEL 9.1
glslc	rhel9-AppStream	RHEL 9.0
glusterfs-cloudsync-plugins	rhel9-AppStream	RHEL 9.0
gnome-connections	rhel9-AppStream	RHEL 9.0
gnome-devel-docs	rhel9-AppStream	RHEL 9.0
gnome-extensions-app	rhel9-AppStream	RHEL 9.0
gnome-kiosk	rhel9-AppStream	RHEL 9.0
gnome-kiosk-script-session	rhel9-AppStream	RHEL 9.1
gnome-kiosk-search-appliance	rhel9-AppStream	RHEL 9.1
gnome-shell-extension-background-logo	rhel9-AppStream	RHEL 9.0
gnome-shell-extension-custom-menu	rhel9-AppStream	RHEL 9.3
gnome-shell-extension-dash-to-panel	rhel9-AppStream	RHEL 9.4
gnome-software-devel	rhel9-CRB	RHEL 9.3
gnome-themes-extra	rhel9-AppStream	RHEL 9.0
gnome-tour	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
gnu-efi-compat	rhel9-CRB	RHEL 9.0
go-filesystem	rhel9-AppStream	RHEL 9.0
go-rpm-macros	rhel9-AppStream	RHEL 9.0
go-rpm-templates	rhel9-AppStream	RHEL 9.0
golang-github-cpuguy83-md2man	rhel9-CRB	RHEL 9.2
google-carlito-fonts	rhel9-AppStream	RHEL 9.0
google-crosextra-caladea-fonts	rhel9-AppStream	RHEL 9.3
google-noto-sans-mono-fonts	rhel9-AppStream	RHEL 9.0
google-noto-sans-sinhala-vf-fonts	rhel9-AppStream	RHEL 9.0
google-noto-sans-symbols2-fonts	rhel9-CRB	RHEL 9.1
google-noto-serif-gurmukhi-vf-fonts	rhel9-AppStream	RHEL 9.0
google-noto-serif-sinhala-vf-fonts	rhel9-AppStream	RHEL 9.0
gpsd-minimal	rhel9-AppStream	RHEL 9.3
gpsd-minimal-clients	rhel9-AppStream	RHEL 9.3
grafana-selinux	rhel9-AppStream	RHEL 9.4
graphene	rhel9-AppStream	RHEL 9.0
graphene-devel	rhel9-AppStream	RHEL 9.0
graphviz-ruby	rhel9-AppStream	RHEL 9.4
gstreamer1-plugins-base-tools	rhel9-AppStream	RHEL 9.2
gstreamer1-rtsp-server	rhel9-AppStream	RHEL 9.3
gtk-vnc2-devel	rhel9-CRB	RHEL 9.4
gtk3-devel-docs	rhel9-CRB	RHEL 9.1

Package	Repository	New in
gtk4	rhel9-AppStream	RHEL 9.0
gtk4-devel	rhel9-AppStream	RHEL 9.0
gtksourceview4	rhel9-AppStream	RHEL 9.0
gtksourceview4-devel	rhel9-CRB	RHEL 9.1
guestfs-tools	rhel9-AppStream	RHEL 9.0
gvisor-tap-vsock	rhel9-AppStream	RHEL 9.4
gvnc-devel	rhel9-CRB	RHEL 9.4
ha-cloud-support	rhel9-HighAvailability	RHEL 9.0
ha-openstack-support	rhel9-AppStream	RHEL 9.0
highcontrast-icon-theme	rhel9-AppStream	RHEL 9.0
hivex-libs	rhel9-AppStream	RHEL 9.0
ht-caladea-fonts	rhel9-AppStream	RHEL 9.0
httpd-core	rhel9-AppStream	RHEL 9.1
hunspell-filesystem	rhel9-AppStream	RHEL 9.0
hwdata-devel	rhel9-CRB	RHEL 9.3
hyphen-eo	rhel9-AppStream	RHEL 9.0
ibus-anthy	rhel9-AppStream	RHEL 9.0
ibus-anthy-python	rhel9-AppStream	RHEL 9.0
idm-jss	rhel9-AppStream	RHEL 9.1
idm-jss-tomcat	rhel9-AppStream	RHEL 9.4
idm-ldapjdk	rhel9-AppStream	RHEL 9.1
idm-pki-acme	rhel9-AppStream	RHEL 9.1

Package	Repository	New in
idm-pki-base	rhel9-AppStream	RHEL 9.1
idm-pki-ca	rhel9-AppStream	RHEL 9.1
idm-pki-est	rhel9-AppStream	RHEL 9.2
idm-pki-java	rhel9-AppStream	RHEL 9.1
idm-pki-kra	rhel9-AppStream	RHEL 9.1
idm-pki-server	rhel9-AppStream	RHEL 9.1
idm-pki-tools	rhel9-AppStream	RHEL 9.1
idm-tomcatjss	rhel9-AppStream	RHEL 9.1
ignition	rhel9-AppStream	RHEL 9.0
ignition-edge	rhel9-AppStream	RHEL 9.2
ignition-validate	rhel9-AppStream	RHEL 9.2
imath	rhel9-AppStream	RHEL 9.0
imath-devel	rhel9-CRB	RHEL 9.0
inih	rhel9-BaseOS	RHEL 9.0
inih-devel	rhel9-CRB	RHEL 9.1
initscripts-rename-device	rhel9-BaseOS	RHEL 9.0
initscripts-service	rhel9-BaseOS	RHEL 9.0
iptables-nft	rhel9-BaseOS	RHEL 9.0
iptables-nft-services	rhel9-AppStream	RHEL 9.0
jakarta-activation	rhel9-AppStream	RHEL 9.0
jakarta-activation2	rhel9-AppStream	RHEL 9.2
jakarta-annotations	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
jakarta-mail	rhel9-AppStream	RHEL 9.0
jakarta-servlet	rhel9-CRB	RHEL 9.0
jasper	rhel9-AppStream	RHEL 9.0
jasper-utils	rhel9-AppStream	RHEL 9.0
java-21-openjdk	rhel9-AppStream	RHEL 9.3
java-21-openjdk-demo	rhel9-AppStream	RHEL 9.3
java-21-openjdk-demo-fastdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-demo-slowdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-devel	rhel9-AppStream	RHEL 9.3
java-21-openjdk-devel-fastdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-devel-slowdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-fastdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-headless	rhel9-AppStream	RHEL 9.3
java-21-openjdk-headless-fastdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-headless-slowdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-javadoc	rhel9-AppStream	RHEL 9.3
java-21-openjdk-javadoc-zip	rhel9-AppStream	RHEL 9.3
java-21-openjdk-jmods	rhel9-AppStream	RHEL 9.3
java-21-openjdk-jmods-fastdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-jmods-slowdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-slowdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-src	rhel9-AppStream	RHEL 9.3
java-21-openjdk-src-fastdebug	rhel9-CRB	RHEL 9.3

Package	Repository	New in
java-21-openjdk-src-slowdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-static-libs	rhel9-AppStream	RHEL 9.3
java-21-openjdk-static-libs-fastdebug	rhel9-CRB	RHEL 9.3
java-21-openjdk-static-libs-slowdebug	rhel9-CRB	RHEL 9.3
javapackages-generators	rhel9-CRB	RHEL 9.0
jaxb-api	rhel9-AppStream	RHEL 9.0
jaxb-api4	rhel9-AppStream	RHEL 9.2
jaxb-codemodel	rhel9-AppStream	RHEL 9.2
jaxb-core	rhel9-AppStream	RHEL 9.2
jaxb-dtd-parser	rhel9-AppStream	RHEL 9.2
jaxb-istack-commons-runtime	rhel9-AppStream	RHEL 9.2
jaxb-istack-commons-tools	rhel9-AppStream	RHEL 9.2
jaxb-relaxng-datatype	rhel9-AppStream	RHEL 9.2
jaxb-rngom	rhel9-AppStream	RHEL 9.2
jaxb-runtime	rhel9-AppStream	RHEL 9.2
jaxb-txw2	rhel9-AppStream	RHEL 9.2
jaxb-xjc	rhel9-AppStream	RHEL 9.2
jaxb-xsom	rhel9-AppStream	RHEL 9.2
jbigkit	rhel9-AppStream	RHEL 9.0
jbig2dec-devel	rhel9-CRB	RHEL 9.2
jigawatts-javadoc	rhel9-AppStream	RHEL 9.0
jitterentropy	rhel9-BaseOS	RHEL 9.0
jitterentropy-devel	rhel9-CRB	RHEL 9.0

Package	Repository	New in
jmc	rhel9-CRB	RHEL 9.2
jna-contrib	rhel9-AppStream	RHEL 9.0
kasumi-common	rhel9-AppStream	RHEL 9.0
kasumi-unicode	rhel9-AppStream	RHEL 9.0
kernel-debug-devel-matched	rhel9-AppStream	RHEL 9.0
kernel-devel-matched	rhel9-AppStream	RHEL 9.0
kernel-debug-modules-core	rhel9-BaseOS	RHEL 9.2
kernel-debug-uki-virt	rhel9-BaseOS	RHEL 9.2
kernel-modules-core	rhel9-BaseOS	RHEL 9.2
kernel-rt-debug-modules-core	rhel9-NFV	RHEL 9.2
kernel-rt-modules-core	rhel9-NFV	RHEL 9.2
kernel-srpm-macros	rhel9-AppStream	RHEL 9.0
kernel-uki-virt	rhel9-BaseOS	RHEL 9.2
keylime	rhel9-AppStream	RHEL 9.1
keylime-agent-rust	rhel9-AppStream	RHEL 9.1
keylime-base	rhel9-AppStream	RHEL 9.1
keylime-registrar	rhel9-AppStream	RHEL 9.1
keylime-selinux	rhel9-AppStream	RHEL 9.1
keylime-tenant	rhel9-AppStream	RHEL 9.1
keylime-verifier	rhel9-AppStream	RHEL 9.1
khmer-os-battambang-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-bokor-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-content-fonts	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
khmer-os-fasthand-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-freehand-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-handwritten-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-metal-chrieng-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-muol-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-muol-fonts-all	rhel9-AppStream	RHEL 9.0
khmer-os-muol-pali-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-siemreap-fonts	rhel9-AppStream	RHEL 9.0
khmer-os-system-fonts	rhel9-AppStream	RHEL 9.0
ksmtuned	rhel9-AppStream	RHEL 9.0
lame	rhel9-AppStream	RHEL 9.0
langpacks-bo	rhel9-AppStream	RHEL 9.0
langpacks-core-af	rhel9-AppStream	RHEL 9.0
langpacks-core-am	rhel9-AppStream	RHEL 9.0
langpacks-core-ar	rhel9-AppStream	RHEL 9.0
langpacks-core-as	rhel9-AppStream	RHEL 9.0
langpacks-core-ast	rhel9-AppStream	RHEL 9.0
langpacks-core-be	rhel9-AppStream	RHEL 9.0
langpacks-core-bg	rhel9-AppStream	RHEL 9.0
langpacks-core-bn	rhel9-AppStream	RHEL 9.0
langpacks-core-bo	rhel9-AppStream	RHEL 9.0
langpacks-core-br	rhel9-AppStream	RHEL 9.0
langpacks-core-bs	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
langpacks-core-ca	rhel9-AppStream	RHEL 9.0
langpacks-core-cs	rhel9-AppStream	RHEL 9.0
langpacks-core-cy	rhel9-AppStream	RHEL 9.0
langpacks-core-da	rhel9-AppStream	RHEL 9.0
langpacks-core-de	rhel9-AppStream	RHEL 9.0
langpacks-core-dz	rhel9-AppStream	RHEL 9.0
langpacks-core-el	rhel9-AppStream	RHEL 9.0
langpacks-core-en	rhel9-AppStream	RHEL 9.0
langpacks-core-en_GB	rhel9-AppStream	RHEL 9.0
langpacks-core-eo	rhel9-AppStream	RHEL 9.0
langpacks-core-es	rhel9-AppStream	RHEL 9.0
langpacks-core-et	rhel9-AppStream	RHEL 9.0
langpacks-core-eu	rhel9-AppStream	RHEL 9.0
langpacks-core-fa	rhel9-AppStream	RHEL 9.0
langpacks-core-fi	rhel9-AppStream	RHEL 9.0
langpacks-core-font-af	rhel9-AppStream	RHEL 9.0
langpacks-core-font-am	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ar	rhel9-AppStream	RHEL 9.0
langpacks-core-font-as	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ast	rhel9-AppStream	RHEL 9.0
langpacks-core-font-be	rhel9-AppStream	RHEL 9.0
langpacks-core-font-bg	rhel9-AppStream	RHEL 9.0
langpacks-core-font-bn	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
langpacks-core-font-bo	rhel9-AppStream	RHEL 9.0
langpacks-core-font-br	rhel9-AppStream	RHEL 9.0
langpacks-core-font-bs	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ca	rhel9-AppStream	RHEL 9.0
langpacks-core-font-cs	rhel9-AppStream	RHEL 9.0
langpacks-core-font-cy	rhel9-AppStream	RHEL 9.0
langpacks-core-font-da	rhel9-AppStream	RHEL 9.0
langpacks-core-font-de	rhel9-AppStream	RHEL 9.0
langpacks-core-font-dz	rhel9-AppStream	RHEL 9.0
langpacks-core-font-el	rhel9-AppStream	RHEL 9.0
langpacks-core-font-en	rhel9-AppStream	RHEL 9.0
langpacks-core-font-eo	rhel9-AppStream	RHEL 9.0
langpacks-core-font-es	rhel9-AppStream	RHEL 9.0
langpacks-core-font-et	rhel9-AppStream	RHEL 9.0
langpacks-core-font-eu	rhel9-AppStream	RHEL 9.0
langpacks-core-font-fa	rhel9-AppStream	RHEL 9.0
langpacks-core-font-fi	rhel9-AppStream	RHEL 9.0
langpacks-core-font-fr	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ga	rhel9-AppStream	RHEL 9.0
langpacks-core-font-gl	rhel9-AppStream	RHEL 9.0
langpacks-core-font-gu	rhel9-AppStream	RHEL 9.0
langpacks-core-font-he	rhel9-AppStream	RHEL 9.0
langpacks-core-font-hi	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
langpacks-core-font-hr	rhel9-AppStream	RHEL 9.0
langpacks-core-font-hu	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ia	rhel9-AppStream	RHEL 9.0
langpacks-core-font-id	rhel9-AppStream	RHEL 9.0
langpacks-core-font-is	rhel9-AppStream	RHEL 9.0
langpacks-core-font-it	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ja	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ka	rhel9-AppStream	RHEL 9.0
langpacks-core-font-kk	rhel9-AppStream	RHEL 9.0
langpacks-core-font-km	rhel9-AppStream	RHEL 9.0
langpacks-core-font-kn	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ko	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ku	rhel9-AppStream	RHEL 9.0
langpacks-core-font-lt	rhel9-AppStream	RHEL 9.0
langpacks-core-font-lv	rhel9-AppStream	RHEL 9.0
langpacks-core-font-mai	rhel9-AppStream	RHEL 9.0
langpacks-core-font-mk	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ml	rhel9-AppStream	RHEL 9.0
langpacks-core-font-mr	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ms	rhel9-AppStream	RHEL 9.0
langpacks-core-font-my	rhel9-AppStream	RHEL 9.0
langpacks-core-font-nb	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ne	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
langpacks-core-font-nl	rhel9-AppStream	RHEL 9.0
langpacks-core-font-nn	rhel9-AppStream	RHEL 9.0
langpacks-core-font-nr	rhel9-AppStream	RHEL 9.0
langpacks-core-font-nso	rhel9-AppStream	RHEL 9.0
langpacks-core-font-or	rhel9-AppStream	RHEL 9.0
langpacks-core-font-pa	rhel9-AppStream	RHEL 9.0
langpacks-core-font-pl	rhel9-AppStream	RHEL 9.0
langpacks-core-font-pt	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ro	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ru	rhel9-AppStream	RHEL 9.0
langpacks-core-font-si	rhel9-AppStream	RHEL 9.0
langpacks-core-font-sk	rhel9-AppStream	RHEL 9.0
langpacks-core-font-sl	rhel9-AppStream	RHEL 9.0
langpacks-core-font-sq	rhel9-AppStream	RHEL 9.0
langpacks-core-font-sr	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ss	rhel9-AppStream	RHEL 9.0
langpacks-core-font-sv	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ta	rhel9-AppStream	RHEL 9.0
langpacks-core-font-te	rhel9-AppStream	RHEL 9.0
langpacks-core-font-th	rhel9-AppStream	RHEL 9.0
langpacks-core-font-tn	rhel9-AppStream	RHEL 9.0
langpacks-core-font-tr	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ts	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
langpacks-core-font-uk	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ur	rhel9-AppStream	RHEL 9.0
langpacks-core-font-ve	rhel9-AppStream	RHEL 9.0
langpacks-core-font-vi	rhel9-AppStream	RHEL 9.0
langpacks-core-font-xh	rhel9-AppStream	RHEL 9.0
langpacks-core-font-yi	rhel9-AppStream	RHEL 9.0
langpacks-core-font-zh_CN	rhel9-AppStream	RHEL 9.0
langpacks-core-font-zh_HK	rhel9-AppStream	RHEL 9.0
langpacks-core-font-zh_TW	rhel9-AppStream	RHEL 9.0
langpacks-core-font-zu	rhel9-AppStream	RHEL 9.0
langpacks-core-fr	rhel9-AppStream	RHEL 9.0
langpacks-core-ga	rhel9-AppStream	RHEL 9.0
langpacks-core-gl	rhel9-AppStream	RHEL 9.0
langpacks-core-gu	rhel9-AppStream	RHEL 9.0
langpacks-core-he	rhel9-AppStream	RHEL 9.0
langpacks-core-hi	rhel9-AppStream	RHEL 9.0
langpacks-core-hr	rhel9-AppStream	RHEL 9.0
langpacks-core-hu	rhel9-AppStream	RHEL 9.0
langpacks-core-ia	rhel9-AppStream	RHEL 9.0
langpacks-core-id	rhel9-AppStream	RHEL 9.0
langpacks-core-is	rhel9-AppStream	RHEL 9.0
langpacks-core-it	rhel9-AppStream	RHEL 9.0
langpacks-core-ja	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
langpacks-core-ka	rhel9-AppStream	RHEL 9.0
langpacks-core-kk	rhel9-AppStream	RHEL 9.0
langpacks-core-km	rhel9-AppStream	RHEL 9.0
langpacks-core-kn	rhel9-AppStream	RHEL 9.0
langpacks-core-ko	rhel9-AppStream	RHEL 9.0
langpacks-core-ku	rhel9-AppStream	RHEL 9.0
langpacks-core-lt	rhel9-AppStream	RHEL 9.0
langpacks-core-lv	rhel9-AppStream	RHEL 9.0
langpacks-core-mai	rhel9-AppStream	RHEL 9.0
langpacks-core-mk	rhel9-AppStream	RHEL 9.0
langpacks-core-ml	rhel9-AppStream	RHEL 9.0
langpacks-core-mr	rhel9-AppStream	RHEL 9.0
langpacks-core-ms	rhel9-AppStream	RHEL 9.0
langpacks-core-my	rhel9-AppStream	RHEL 9.0
langpacks-core-nb	rhel9-AppStream	RHEL 9.0
langpacks-core-ne	rhel9-AppStream	RHEL 9.0
langpacks-core-nl	rhel9-AppStream	RHEL 9.0
langpacks-core-nn	rhel9-AppStream	RHEL 9.0
langpacks-core-nr	rhel9-AppStream	RHEL 9.0
langpacks-core-nso	rhel9-AppStream	RHEL 9.0
langpacks-core-or	rhel9-AppStream	RHEL 9.0
langpacks-core-pa	rhel9-AppStream	RHEL 9.0
langpacks-core-pl	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
langpacks-core-pt	rhel9-AppStream	RHEL 9.0
langpacks-core-pt_BR	rhel9-AppStream	RHEL 9.0
langpacks-core-ro	rhel9-AppStream	RHEL 9.0
langpacks-core-ru	rhel9-AppStream	RHEL 9.0
langpacks-core-si	rhel9-AppStream	RHEL 9.0
langpacks-core-sk	rhel9-AppStream	RHEL 9.0
langpacks-core-sl	rhel9-AppStream	RHEL 9.0
langpacks-core-sq	rhel9-AppStream	RHEL 9.0
langpacks-core-sr	rhel9-AppStream	RHEL 9.0
langpacks-core-ss	rhel9-AppStream	RHEL 9.0
langpacks-core-sv	rhel9-AppStream	RHEL 9.0
langpacks-core-ta	rhel9-AppStream	RHEL 9.0
langpacks-core-te	rhel9-AppStream	RHEL 9.0
langpacks-core-th	rhel9-AppStream	RHEL 9.0
langpacks-core-tn	rhel9-AppStream	RHEL 9.0
langpacks-core-tr	rhel9-AppStream	RHEL 9.0
langpacks-core-ts	rhel9-AppStream	RHEL 9.0
langpacks-core-uk	rhel9-AppStream	RHEL 9.0
langpacks-core-ur	rhel9-AppStream	RHEL 9.0
langpacks-core-ve	rhel9-AppStream	RHEL 9.0
langpacks-core-vi	rhel9-AppStream	RHEL 9.0
langpacks-core-xh	rhel9-AppStream	RHEL 9.0
langpacks-core-yi	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
langpacks-core-zh_CN	rhel9-AppStream	RHEL 9.0
langpacks-core-zh_HK	rhel9-AppStream	RHEL 9.0
langpacks-core-zh_TW	rhel9-AppStream	RHEL 9.0
langpacks-core-zu	rhel9-AppStream	RHEL 9.0
langpacks-dz	rhel9-AppStream	RHEL 9.0
langpacks-eo	rhel9-AppStream	RHEL 9.0
langpacks-ka	rhel9-AppStream	RHEL 9.0
langpacks-km	rhel9-AppStream	RHEL 9.0
langpacks-ku	rhel9-AppStream	RHEL 9.0
langpacks-my	rhel9-AppStream	RHEL 9.0
langpacks-yi	rhel9-AppStream	RHEL 9.0
langpacks-zh_HK	rhel9-AppStream	RHEL 9.0
lapack64	rhel9-CRB	RHEL 9.3
lapack64_	rhel9-CRB	RHEL 9.0
ldns-doc	rhel9-CRB	RHEL 9.1
ldns-utils	rhel9-CRB	RHEL 9.1
liba52-devel	rhel9-CRB	RHEL 9.0
libabigail	rhel9-CRB	RHEL 9.2
libadwaita	rhel9-AppStream	RHEL 9.4
libadwaita-devel	rhel9-CRB	RHEL 9.4
libasan8	rhel9-AppStream	RHEL 9.1
libblkio	rhel9-AppStream	RHEL 9.3
libblkio-devel	rhel9-CRB	RHEL 9.3

Package	Repository	New in
libblockdev-nvme	rhel9-AppStream	RHEL 9.2
libblockdev-tools	rhel9-AppStream	RHEL 9.0
libbpf-tools	rhel9-AppStream	RHEL 9.0
libbrotli	rhel9-BaseOS	RHEL 9.0
libburn-doc	rhel9-AppStream	RHEL 9.0
libcbor	rhel9-BaseOS	RHEL 9.0
libcdr-devel	rhel9-CRB	RHEL 9.2
libdecor	rhel9-AppStream	RHEL 9.0
libdecor-devel	rhel9-CRB	RHEL 9.0
libdhash-devel	rhel9-CRB	RHEL 9.1
libdnf-plugin-subscription-manager	rhel9-BaseOS	RHEL 9.0
libdvdnav-devel	rhel9-CRB	RHEL 9.2
libeconf	rhel9-BaseOS	RHEL 9.0
libell	rhel9-AppStream	RHEL 9.0
libestr-devel	rhel9-CRB	RHEL 9.1
libfastjson-devel	rhel9-CRB	RHEL 9.3
libfdt-static	rhel9-CRB	RHEL 9.1
libfido2	rhel9-BaseOS	RHEL 9.0
libfido2-devel	rhel9-CRB	RHEL 9.0
libfl-static	rhel9-CRB	RHEL 9.0
libfreehand-devel	rhel9-CRB	RHEL 9.2
libgccjit	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
libgccjit-devel	rhel9-AppStream	RHEL 9.0
libgpiod	rhel9-AppStream	RHEL 9.1
libgpiod-c++	rhel9-AppStream	RHEL 9.1
libgpiod-devel	rhel9-AppStream	RHEL 9.1
libgpiod-utils	rhel9-AppStream	RHEL 9.1
libhandy	rhel9-AppStream	RHEL 9.0
libi2c-devel	rhel9-CRB	RHEL 9.1
libi2cd	rhel9-AppStream	RHEL 9.1
libi2cd-devel	rhel9-AppStream	RHEL 9.1
libical-glib	rhel9-AppStream	RHEL 9.0
libical-glib-devel	rhel9-AppStream	RHEL 9.0
libisoburn-doc	rhel9-AppStream	RHEL 9.0
libisofs-doc	rhel9-AppStream	RHEL 9.0
libjcat	rhel9-BaseOS	RHEL 9.0
libjcat-devel	rhel9-CRB	RHEL 9.0
libkdumpfile	rhel9-AppStream	RHEL 9.4
libknet1-compress-zstd-plugin	rhel9-HighAvailability	RHEL 9.0
libldac	rhel9-AppStream	RHEL 9.0
liblognorm-devel	rhel9-CRB	RHEL 9.3
libmemcached-awesome	rhel9-CRB	RHEL 9.0
libmemcached-awesome-devel	rhel9-CRB	RHEL 9.0
libmemcached-awesome-tools	rhel9-CRB	RHEL 9.0

Package	Repository	New in
libmpeg2	rhel9-AppStream	RHEL 9.0
libmpeg2-devel	rhel9-CRB	RHEL 9.2
libmspub-devel	rhel9-CRB	RHEL 9.2
libmypaint	rhel9-AppStream	RHEL 9.0
libnetapi	rhel9-BaseOS	RHEL 9.2
libnetapi-devel	rhel9-CRB	RHEL 9.2
libnvme	rhel9-BaseOS	RHEL 9.1
libnvme-devel	rhel9-CRB	RHEL 9.1
libotr	rhel9-AppStream	RHEL 9.0
libotr-devel	rhel9-CRB	RHEL 9.0
libpagemaker-devel	rhel9-CRB	RHEL 9.2
libperf	rhel9-CRB	RHEL 9.3
libpmem2	rhel9-AppStream	RHEL 9.0
libpmem2-debug	rhel9-AppStream	RHEL 9.0
libpmem2-devel	rhel9-AppStream	RHEL 9.0
libqrtr-glib	rhel9-BaseOS	RHEL 9.0
libqxp-devel	rhel9-CRB	RHEL 9.2
librabbitmq-tools	rhel9-AppStream	RHEL 9.0
libradospp-devel	rhel9-CRB	RHEL 9.0
librelp-devel	rhel9-CRB	RHEL 9.3
libreoffice	rhel9-AppStream	RHEL 9.2
libreoffice-help-eo	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
libreoffice-langpack-eo	rhel9-AppStream	RHEL 9.0
libreoffice-langpack-fy	rhel9-AppStream	RHEL 9.0
libsane-airscan	rhel9-AppStream	RHEL 9.0
libsbc	rhel9-AppStream	RHEL 9.0
libsepol-utils	rhel9-AppStream	RHEL 9.1
libshaderc	rhel9-AppStream	RHEL 9.0
libshaderc-devel	rhel9-CRB	RHEL 9.1
libsmartcols-devel	rhel9-CRB	RHEL 9.2
libsndfile-utils	rhel9-AppStream	RHEL 9.0
libss-devel	rhel9-CRB	RHEL 9.4
libstoragemgmt-devel	rhel9-CRB	RHEL 9.1
libstoragemgmt-nfs-plugin	rhel9-AppStream	RHEL 9.0
libstoragemgmt-targetd-plugin	rhel9-AppStream	RHEL 9.0
libtimezonemap-devel	rhel9-CRB	RHEL 9.4
libtracecmd	rhel9-BaseOS	RHEL 9.0
libtracecmd-devel	rhel9-CRB	RHEL 9.0
libtraceevent	rhel9-BaseOS	RHEL 9.0
libtraceevent-devel	rhel9-CRB	RHEL 9.0
libtracefs	rhel9-BaseOS	RHEL 9.0
libtracefs-devel	rhel9-CRB	RHEL 9.0
libtracker-sparql	rhel9-AppStream	RHEL 9.0
libtsan2	rhel9-AppStream	RHEL 9.1

Package	Repository	New in
liburing-devel	rhel9-CRB	RHEL 9.3
libvala	rhel9-CRB	RHEL 9.0
libvala-devel	rhel9-CRB	RHEL 9.0
libvdpau-trace	rhel9-AppStream	RHEL 9.0
libverto-libev	rhel9-BaseOS	RHEL 9.0
libvirt-client-qemu	rhel9-CRB	RHEL 9.2
libvirt-daemon-common	rhel9-AppStream	RHEL 9.3
libvirt-daemon-lock	rhel9-AppStream	RHEL 9.3
libvirt-daemon-log	rhel9-AppStream	RHEL 9.3
libvirt-daemon-plugin-lockd	rhel9-AppStream	RHEL 9.3
libvirt-daemon-plugin-sanlock	rhel9-CRB	RHEL 9.3
libvirt-daemon-proxy	rhel9-AppStream	RHEL 9.3
libvma-utils	rhel9-AppStream	RHEL 9.0
libwebp-tools	rhel9-CRB	RHEL 9.2
libwmf-devel	rhel9-CRB	RHEL 9.1
libwpe	rhel9-AppStream	RHEL 9.0
libwpe-devel	rhel9-CRB	RHEL 9.1
libxcrypt-compat	rhel9-AppStream	RHEL 9.0
libxcvt	rhel9-AppStream	RHEL 9.2
libxcvt-devel	rhel9-CRB	RHEL 9.2
libxdp-devel	rhel9-CRB	RHEL 9.1
libxdp-static	rhel9-CRB	RHEL 9.1

Package	Repository	New in
libzip-tools	rhel9-AppStream	RHEL 9.4
libzmf-devel	rhel9-CRB	RHEL 9.2
linux-firmware-whence	rhel9-BaseOS	RHEL 9.0
lld-test	rhel9-AppStream	RHEL 9.0
lmdb	rhel9-CRB	RHEL 9.0
lorax-docs	rhel9-AppStream	RHEL 9.0
low-memory-monitor	rhel9-AppStream	RHEL 9.0
lua-rpm-macros	rhel9-AppStream	RHEL 9.0
lua-srpm-macros	rhel9-AppStream	RHEL 9.0
man-db-cron	rhel9-AppStream	RHEL 9.2
mariadb-connector-c-doc	rhel9-CRB	RHEL 9.0
mariadb-connector-c-test	rhel9-CRB	RHEL 9.0
marshalparser	rhel9-CRB	RHEL 9.1
maven-openjdk21	rhel9-AppStream	RHEL 9.4
maven-surefire-provider-junit5	rhel9-CRB	RHEL 9.0
mecab-devel	rhel9-CRB	RHEL 9.3
memcached-selinux	rhel9-AppStream	RHEL 9.0
mesa-demos	rhel9-AppStream	RHEL 9.0
mingw-qemu-ga-win	rhel9-AppStream	RHEL 9.3
mingw-w64-tools	rhel9-CRB	RHEL 9.2
mingw32-libgcc	rhel9-CRB	RHEL 9.1
mingw32-libstdc++	rhel9-CRB	RHEL 9.3

Package	Repository	New in
mingw32-pcre2	rhel9-CRB	RHEL 9.4
mingw32-pcre2-static	rhel9-CRB	RHEL 9.4
mingw32-srvany	rhel9-AppStream	RHEL 9.0
mingw64-libgcc	rhel9-CRB	RHEL 9.1
mingw64-libstdc++	rhel9-CRB	RHEL 9.3
mingw64-pcre2	rhel9-CRB	RHEL 9.4
mingw64-pcre2-static	rhel9-CRB	RHEL 9.4
mkfontscale	rhel9-AppStream	RHEL 9.0
mkpasswd	rhel9-AppStream	RHEL 9.1
mod_jk	rhel9-AppStream	RHEL 9.0
mod_lua	rhel9-AppStream	RHEL 9.0
mod_proxy_cluster	rhel9-AppStream	RHEL 9.0
mpdecimal	rhel9-AppStream	RHEL 9.2
mpdecimal++	rhel9-CRB	RHEL 9.2
mpdecimal-devel	rhel9-CRB	RHEL 9.2
mpdecimal-doc	rhel9-CRB	RHEL 9.2
mpich-autoload	rhel9-AppStream	RHEL 9.0
mptcpd	rhel9-AppStream	RHEL 9.0
mypaint-brushes	rhel9-AppStream	RHEL 9.0
mythes-eo	rhel9-AppStream	RHEL 9.0
nbdkit-srpm-macros	rhel9-CRB	RHEL 9.1
netronome-firmware	rhel9-BaseOS	RHEL 9.0
nfs-utils-coreos	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
nfsv4-client-utils	rhel9-AppStream	RHEL 9.1
nginx-core	rhel9-AppStream	RHEL 9.1
nmstate-devel	rhel9-CRB	RHEL 9.1
nmstate-static	rhel9-CRB	RHEL 9.1
nodejs-devel	rhel9-AppStream	RHEL 9.1
nodejs-libs	rhel9-AppStream	RHEL 9.0
nodejs-packaging	rhel9-AppStream	RHEL 9.1
nodejs-packaging-bundler	rhel9-AppStream	RHEL 9.1
npth-devel	rhel9-CRB	RHEL 9.0
nss_wrapper-libs	rhel9-AppStream	RHEL 9.1
nvme-stas	rhel9-AppStream	RHEL 9.1
ocaml-brlapi	rhel9-CRB	RHEL 9.1
ocaml-calendar	rhel9-CRB	RHEL 9.1
ocaml-calendar-devel	rhel9-CRB	RHEL 9.1
ocaml-camomile	rhel9-CRB	RHEL 9.1
ocaml-camomile-data	rhel9-CRB	RHEL 9.1
ocaml-camomile-devel	rhel9-CRB	RHEL 9.1
ocaml-csexp	rhel9-CRB	RHEL 9.1
ocaml-csexp-devel	rhel9-CRB	RHEL 9.1
ocaml-csv	rhel9-CRB	RHEL 9.1
ocaml-csv-devel	rhel9-CRB	RHEL 9.1
ocaml-curses	rhel9-CRB	RHEL 9.1
ocaml-curses-devel	rhel9-CRB	RHEL 9.1

Package	Repository	New in
ocaml-docs	rhel9-CRB	RHEL 9.1
ocaml-dune	rhel9-CRB	RHEL 9.1
ocaml-dune-devel	rhel9-CRB	RHEL 9.1
ocaml-dune-doc	rhel9-CRB	RHEL 9.1
ocaml-dune-emacs	rhel9-CRB	RHEL 9.1
ocaml-fileutils	rhel9-CRB	RHEL 9.1
ocaml-fileutils-devel	rhel9-CRB	RHEL 9.1
ocaml-gettext	rhel9-CRB	RHEL 9.1
ocaml-gettext-devel	rhel9-CRB	RHEL 9.1
ocaml-libvirt	rhel9-CRB	RHEL 9.1
ocaml-libvirt-devel	rhel9-CRB	RHEL 9.1
ocaml-ocamlbuild-doc	rhel9-CRB	RHEL 9.1
ocaml-source	rhel9-CRB	RHEL 9.1
ocaml-xml-light	rhel9-CRB	RHEL 9.1
ocaml-xml-light-devel	rhel9-CRB	RHEL 9.1
open-vm-tools-salt-minion	rhel9-AppStream	RHEL 9.1
open-vm-tools-test	rhel9-AppStream	RHEL 9.0
openblas-serial	rhel9-AppStream	RHEL 9.0
openexr	rhel9-AppStream	RHEL 9.0
openexr-devel	rhel9-CRB	RHEL 9.0
openexr-libs	rhel9-AppStream	RHEL 9.0
openldap-compat	rhel9-BaseOS	RHEL 9.0
openmpi-java	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
openslp-devel	rhel9-CRB	RHEL 9.0
openslp-server	rhel9-AppStream	RHEL 9.0
openssl-fips-provider	rhel9-BaseOS	RHEL 9.4
osbuild-depsolve-dnf	rhel9-AppStream	RHEL 9.4
pam-docs	rhel9-AppStream	RHEL 9.0
pam_wrapper	rhel9-CRB	RHEL 9.1
passt	rhel9-AppStream	RHEL 9.2
passt-selinux	rhel9-AppStream	RHEL 9.2
pbzip2	rhel9-AppStream	RHEL 9.0
pcp-geolocate	rhel9-AppStream	RHEL 9.4
pcp-pmda-bpf	rhel9-AppStream	RHEL 9.0
pcp-pmda-farm	rhel9-AppStream	RHEL 9.4
pcp-pmda-resctrl	rhel9-AppStream	RHEL 9.4
pcre2-syntax	rhel9-BaseOS	RHEL 9.0
pcre2-tools	rhel9-CRB	RHEL 9.4
perl-BSD-Resource	rhel9-AppStream	RHEL 9.0
perl-Cyrus	rhel9-AppStream	RHEL 9.0
perl-DBD-MariaDB	rhel9-AppStream	RHEL 9.0
perl-ldns	rhel9-CRB	RHEL 9.1
perl-Mail-AuthenticationResults	rhel9-AppStream	RHEL 9.0
perl-Module-Signature	rhel9-AppStream	RHEL 9.0
perl-Net-CIDR-Lite	rhel9-AppStream	RHEL 9.0
perl-Net-DNS-Nameserver	rhel9-CRB	RHEL 9.2

Package	Repository	New in
perl-XString	rhel9-CRB	RHEL 9.0
pf-bb-config	rhel9-AppStream	RHEL 9.2
php-libguestfs	rhel9-CRB	RHEL 9.1
pinentry-tty	rhel9-AppStream	RHEL 9.0
pipewire-alsa	rhel9-AppStream	RHEL 9.0
pipewire-gstreamer	rhel9-AppStream	RHEL 9.0
pipewire-jack-audio-connection-kit	rhel9-AppStream	RHEL 9.0
pipewire-jack-audio-connection-kit-devel	rhel9-AppStream	RHEL 9.0
pipewire-jack-audio-connection-kit-libs	rhel9-AppStream	RHEL 9.4
pipewire-module-x11	rhel9-AppStream	RHEL 9.3
pipewire-pulseaudio	rhel9-AppStream	RHEL 9.0
pki-jackson-annotations	rhel9-AppStream	RHEL 9.0
pki-jackson-core	rhel9-AppStream	RHEL 9.0
pki-jackson-databind	rhel9-AppStream	RHEL 9.0
pki-jackson-jaxrs-json-provider	rhel9-AppStream	RHEL 9.0
pki-jackson-jaxrs-providers	rhel9-AppStream	RHEL 9.0
pki-jackson-module-jaxb-annotations	rhel9-AppStream	RHEL 9.0
pki-resteasy	rhel9-AppStream	RHEL 9.3
pki-resteasy-client	rhel9-AppStream	RHEL 9.0
pki-resteasy-core	rhel9-AppStream	RHEL 9.0
pki-resteasy-jackson2-provider	rhel9-AppStream	RHEL 9.0
pki-resteasy-servlet-initializer	rhel9-AppStream	RHEL 9.4

Package	Repository	New in
plotnetcfg	rhel9-CRB	RHEL 9.0
pmix-pmi	rhel9-AppStream	RHEL 9.0
pmix-pmi-devel	rhel9-CRB	RHEL 9.0
pmix-tools	rhel9-AppStream	RHEL 9.0
poppler-data-devel	rhel9-CRB	RHEL 9.2
poppler-glib-doc	rhel9-CRB	RHEL 9.4
postfix-lmdb	rhel9-AppStream	RHEL 9.3
postgresql-docs	rhel9-CRB	RHEL 9.1
postgresql-private-devel	rhel9-CRB	RHEL 9.0
postgresql-private-libs	rhel9-AppStream	RHEL 9.0
postgresql-static	rhel9-CRB	RHEL 9.1
postgresql-test-rpm-macros	rhel9-AppStream	RHEL 9.2
postgresql-upgrade-devel	rhel9-CRB	RHEL 9.1
power-profiles-daemon	rhel9-AppStream	RHEL 9.0
procps-ng-devel	rhel9-CRB	RHEL 9.2
pt-sans-fonts	rhel9-AppStream	RHEL 9.0
pybind11-devel	rhel9-CRB	RHEL 9.0
pyparsing-doc	rhel9-CRB	RHEL 9.0
pyproject-rpm-macros	rhel9-CRB	RHEL 9.0
pyproject-srpm-macros	rhel9-AppStream	RHEL 9.2
python-dateutil-doc	rhel9-CRB	RHEL 9.0
python-packaging-doc	rhel9-CRB	RHEL 9.0
python-sphinx-doc	rhel9-CRB	RHEL 9.0

Package	Repository	New in
python-sphinx_rtd_theme-doc	rhel9-CRB	RHEL 9.0
python-unversioned-command	rhel9-AppStream	RHEL 9.0
python3	rhel9-BaseOS	RHEL 9.0
python3-alembic	rhel9-AppStream	RHEL 9.1
python3-appdirs	rhel9-AppStream	RHEL 9.0
python3-awscrt	rhel9-AppStream	RHEL 9.4
python3-babeltrace	rhel9-CRB	RHEL 9.1
python3-botocore	rhel9-AppStream	RHEL 9.4
python3-cairo-devel	rhel9-CRB	RHEL 9.1
python3-capstone	rhel9-CRB	RHEL 9.2
python3-cepces	rhel9-AppStream	RHEL 9.4
python3-debug	rhel9-CRB	RHEL 9.0
python3-devel	rhel9-AppStream	RHEL 9.0
python3-dnf-plugin-leaves	rhel9-AppStream	RHEL 9.3
python3-dnf-plugin-modulesync	rhel9-AppStream	RHEL 9.1
python3-dnf-plugin-show-leaves	rhel9-AppStream	RHEL 9.3
python3-file-magic	rhel9-AppStream	RHEL 9.0
python3-flit-core	rhel9-CRB	RHEL 9.4
python3-gluster	rhel9-AppStream	RHEL 9.0
python3-gobject-base-noarch	rhel9-BaseOS	RHEL 9.1
python3-gobject-devel	rhel9-CRB	RHEL 9.0
python3-greenlet	rhel9-AppStream	RHEL 9.1
python3-greenlet-devel	rhel9-CRB	RHEL 9.3

Package	Repository	New in
python3-i2c-tools	rhel9-AppStream	RHEL 9.1
python3-idm-pki	rhel9-AppStream	RHEL 9.1
python3-imath	rhel9-AppStream	RHEL 9.0
python3-iniconfig	rhel9-CRB	RHEL 9.0
python3-keylime	rhel9-AppStream	RHEL 9.1
python3-lark-parser	rhel9-AppStream	RHEL 9.1
python3-lasso	rhel9-AppStream	RHEL 9.2
python3-ldns	rhel9-CRB	RHEL 9.1
python3-libevdev	rhel9-AppStream	RHEL 9.0
python3-libfdt	rhel9-CRB	RHEL 9.1
python3-libgpiod	rhel9-AppStream	RHEL 9.1
python3-libnvme	rhel9-AppStream	RHEL 9.1
python3-net-snmp	rhel9-AppStream	RHEL 9.0
python3-pacemaker	rhel9-HighAvailability	RHEL 9.3
python3-pefile	rhel9-AppStream	RHEL 9.3
python3-prompt-toolkit	rhel9-AppStream	RHEL 9.4
python3-psutil-tests	rhel9-CRB	RHEL 9.0
python3-pybind11	rhel9-CRB	RHEL 9.0
python3-pycdlib	rhel9-AppStream	RHEL 9.0
python3-pyelftools	rhel9-AppStream	RHEL 9.0
python3-pyrsistent	rhel9-AppStream	RHEL 9.0
python3-pytest-subtests	rhel9-CRB	RHEL 9.0
python3-pytest-timeout	rhel9-CRB	RHEL 9.0

Package	Repository	New in
python3-readthedocs-sphinx-ext	rhel9-CRB	RHEL 9.0
python3-requests+security	rhel9-AppStream	RHEL 9.0
python3-requests+socks	rhel9-AppStream	RHEL 9.0
python3-requests-gssapi	rhel9-AppStream	RHEL 9.0
python3-resolvelib	rhel9-AppStream	RHEL 9.0
python3-ruamel-yaml	rhel9-CRB	RHEL 9.0
python3-ruamel-yaml-clib	rhel9-CRB	RHEL 9.0
python3-samba-dc	rhel9-BaseOS	RHEL 9.2
python3-samba-devel	rhel9-CRB	RHEL 9.2
python3-samba-test	rhel9-CRB	RHEL 9.2
python3-scapy	rhel9-AppStream	RHEL 9.0
python3-scour	rhel9-AppStream	RHEL 9.0
python3-setuptools_scm+toml	rhel9-CRB	RHEL 9.0
python3-sphinx-latex	rhel9-CRB	RHEL 9.0
python3-sphinxcontrib-applehelp	rhel9-CRB	RHEL 9.0
python3-sphinxcontrib-devhelp	rhel9-CRB	RHEL 9.0
python3-sphinxcontrib-htmlhelp	rhel9-CRB	RHEL 9.0
python3-sphinxcontrib-httpdomain	rhel9-CRB	RHEL 9.0
python3-sphinxcontrib-jsmath	rhel9-CRB	RHEL 9.0
python3-sphinxcontrib-qthelp	rhel9-CRB	RHEL 9.0
python3-sphinxcontrib-serializinghtml	rhel9-CRB	RHEL 9.0
python3-sqlalchemy	rhel9-AppStream	RHEL 9.1
python3-toml	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
python3-tomli	rhel9-AppStream	RHEL 9.3
python3-tornado	rhel9-AppStream	RHEL 9.1
python3-urllib-gssapi	rhel9-AppStream	RHEL 9.0
python3-virt-firmware	rhel9-AppStream	RHEL 9.2
python3-volume_key	rhel9-AppStream	RHEL 9.0
python3-wcwidth	rhel9-CRB	RHEL 9.0
python3-websockets	rhel9-AppStream	RHEL 9.4
python3.11	rhel9-AppStream	RHEL 9.2
python3.11-attrs	rhel9-CRB	RHEL 9.2
python3.11-cffi	rhel9-AppStream	RHEL 9.2
python3.11-charset-normalizer	rhel9-AppStream	RHEL 9.2
python3.11-cryptography	rhel9-AppStream	RHEL 9.2
python3.11-Cython	rhel9-CRB	RHEL 9.2
python3.11-debug	rhel9-CRB	RHEL 9.2
python3.11-devel	rhel9-AppStream	RHEL 9.2
python3.11-idle	rhel9-CRB	RHEL 9.2
python3.11-idna	rhel9-AppStream	RHEL 9.2
python3.11-iniconfig	rhel9-CRB	RHEL 9.2
python3.11-libs	rhel9-AppStream	RHEL 9.2
python3.11-lxml	rhel9-AppStream	RHEL 9.2
python3.11-mod_wsgi	rhel9-AppStream	RHEL 9.2
python3.11-numpy	rhel9-AppStream	RHEL 9.2

Package	Repository	New in
python3.11-numpy-f2py	rhel9-AppStream	RHEL 9.2
python3.11-packaging	rhel9-CRB	RHEL 9.2
python3.11-pip	rhel9-AppStream	RHEL 9.2
python3.11-pip-wheel	rhel9-AppStream	RHEL 9.2
python3.11-pluggy	rhel9-CRB	RHEL 9.2
python3.11-ply	rhel9-AppStream	RHEL 9.2
python3.11-psycopg2	rhel9-AppStream	RHEL 9.2
python3.11-psycopg2-debug	rhel9-CRB	RHEL 9.2
python3.11-psycopg2-tests	rhel9-CRB	RHEL 9.2
python3.11-pybind11	rhel9-CRB	RHEL 9.2
python3.11-pybind11-devel	rhel9-CRB	RHEL 9.2
python3.11-pycparser	rhel9-AppStream	RHEL 9.2
python3.11-PyMySQL	rhel9-AppStream	RHEL 9.2
python3.11-PyMySQL+rsa	rhel9-AppStream	RHEL 9.2
python3.11-pyparsing	rhel9-CRB	RHEL 9.2
python3.11-pysocks	rhel9-AppStream	RHEL 9.2
python3.11-pytest	rhel9-CRB	RHEL 9.2
python3.11-pyyaml	rhel9-AppStream	RHEL 9.2
python3.11-requests	rhel9-AppStream	RHEL 9.2
python3.11-requests+security	rhel9-AppStream	RHEL 9.2
python3.11-requests+socks	rhel9-AppStream	RHEL 9.2
python3.11-scipy	rhel9-AppStream	RHEL 9.2

Package	Repository	New in
python3.11-semantic_version	rhel9-CRB	RHEL 9.2
python3.11-setuptools	rhel9-AppStream	RHEL 9.2
python3.11-setuptools-rust	rhel9-CRB	RHEL 9.2
python3.11-setuptools-wheel	rhel9-AppStream	RHEL 9.2
python3.11-six	rhel9-AppStream	RHEL 9.2
python3.11-test	rhel9-CRB	RHEL 9.2
python3.11-tkinter	rhel9-AppStream	RHEL 9.2
python3.11-urllib3	rhel9-AppStream	RHEL 9.2
python3.11-wheel	rhel9-AppStream	RHEL 9.2
python3.11-wheel-wheel	rhel9-CRB	RHEL 9.2
python3.12	rhel9-AppStream	RHEL 9.4
python3.12-cffi	rhel9-AppStream	RHEL 9.4
python3.12-charset-normalizer	rhel9-AppStream	RHEL 9.4
python3.12-cryptography	rhel9-AppStream	RHEL 9.4
python3.12-Cython	rhel9-CRB	RHEL 9.4
python3.12-debug	rhel9-CRB	RHEL 9.4
python3.12-devel	rhel9-AppStream	RHEL 9.4
python3.12-flit-core	rhel9-CRB	RHEL 9.4
python3.12-idle	rhel9-CRB	RHEL 9.4
python3.12-idna	rhel9-AppStream	RHEL 9.4
python3.12-iniconfig	rhel9-CRB	RHEL 9.4
python3.12-libs	rhel9-AppStream	RHEL 9.4

Package	Repository	New in
python3.12-lxml	rhel9-AppStream	RHEL 9.4
python3.12-mod_wsgi	rhel9-AppStream	RHEL 9.4
python3.12-numpy	rhel9-AppStream	RHEL 9.4
python3.12-numpy-f2py	rhel9-AppStream	RHEL 9.4
python3.12-packaging	rhel9-CRB	RHEL 9.4
python3.12-pip	rhel9-AppStream	RHEL 9.4
python3.12-pip-wheel	rhel9-AppStream	RHEL 9.4
python3.12-pluggy	rhel9-CRB	RHEL 9.4
python3.12-ply	rhel9-AppStream	RHEL 9.4
python3.12-psycopg2	rhel9-AppStream	RHEL 9.4
python3.12-psycopg2-debug	rhel9-CRB	RHEL 9.4
python3.12-psycopg2-tests	rhel9-CRB	RHEL 9.4
python3.12-pybind11	rhel9-CRB	RHEL 9.4
python3.12-pybind11-devel	rhel9-CRB	RHEL 9.4
python3.12-pycparser	rhel9-AppStream	RHEL 9.4
python3.12-PyMySQL	rhel9-AppStream	RHEL 9.4
python3.12-PyMySQL+rsa	rhel9-AppStream	RHEL 9.4
python3.12-pytest	rhel9-CRB	RHEL 9.4
python3.12-pyyaml	rhel9-AppStream	RHEL 9.4
python3.12-requests	rhel9-AppStream	RHEL 9.4
python3.12-scipy	rhel9-AppStream	RHEL 9.4
python3.12-scipy-tests	rhel9-CRB	RHEL 9.4

Package	Repository	New in
python3.12-semantic_version	rhel9-CRB	RHEL 9.4
python3.12-setuptools	rhel9-AppStream	RHEL 9.4
python3.12-setuptools-rust	rhel9-CRB	RHEL 9.4
python3.12-setuptools-wheel	rhel9-CRB	RHEL 9.4
python3.12-test	rhel9-CRB	RHEL 9.4
python3.12-tkinter	rhel9-AppStream	RHEL 9.4
python3.12-urllib3	rhel9-AppStream	RHEL 9.4
python3.12-wheel	rhel9-AppStream	RHEL 9.4
python3.12-wheel-wheel	rhel9-CRB	RHEL 9.4
qatlib-service	rhel9-AppStream	RHEL 9.1
qemu-ga-win	rhel9-AppStream	RHEL 9.0
qemu-kvm-audio-pa	rhel9-AppStream	RHEL 9.0
qemu-kvm-block-blkio	rhel9-AppStream	RHEL 9.3
qemu-kvm-device-display-virtio-gpu	rhel9-AppStream	RHEL 9.0
qemu-kvm-device-display-virtio-gpu-gl	rhel9-AppStream	RHEL 9.0
qemu-kvm-device-display-virtio-gpu-pci	rhel9-AppStream	RHEL 9.0
qemu-kvm-device-display-virtio-gpu-pci-gl	rhel9-AppStream	RHEL 9.0
qemu-kvm-device-display-virtio-vga	rhel9-AppStream	RHEL 9.0
qemu-kvm-device-display-virtio-vga-gl	rhel9-AppStream	RHEL 9.0
qemu-kvm-device-usb-host	rhel9-AppStream	RHEL 9.0
qemu-kvm-device-usb-redirect	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
qemu-kvm-tools	rhel9-AppStream	RHEL 9.0
qemu-kvm-ui-egl-headless	rhel9-AppStream	RHEL 9.0
qemu-pr-helper	rhel9-AppStream	RHEL 9.0
qpdf	rhel9-CRB	RHEL 9.1
qpdf-devel	rhel9-CRB	RHEL 9.2
qt5	rhel9-AppStream	RHEL 9.0
qt5-doc	rhel9-AppStream	RHEL 9.0
qt5-qt3d-doc	rhel9-AppStream	RHEL 9.0
qt5-qtbase-doc	rhel9-AppStream	RHEL 9.0
qt5-qtcharts-doc	rhel9-AppStream	RHEL 9.0
qt5-qtconnectivity-doc	rhel9-AppStream	RHEL 9.0
qt5-qtdatavis3d-doc	rhel9-AppStream	RHEL 9.0
qt5-qtdeclarative-doc	rhel9-AppStream	RHEL 9.0
qt5-qtgamepad-doc	rhel9-AppStream	RHEL 9.0
qt5-qtgraphicaleffects-doc	rhel9-AppStream	RHEL 9.0
qt5-qtimageformats-doc	rhel9-AppStream	RHEL 9.0
qt5-qtlocation-doc	rhel9-AppStream	RHEL 9.0
qt5-qtmultimedia-doc	rhel9-AppStream	RHEL 9.0
qt5-qtpurchasing-doc	rhel9-AppStream	RHEL 9.0
qt5-qtquickcontrols-doc	rhel9-AppStream	RHEL 9.0
qt5-qtquickcontrols2-doc	rhel9-AppStream	RHEL 9.0
qt5-qtremoteobjects-doc	rhel9-AppStream	RHEL 9.0
qt5-qtscript-doc	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
qt5-qtscxml-doc	rhel9-AppStream	RHEL 9.0
qt5-qtsensors-doc	rhel9-AppStream	RHEL 9.0
qt5-qtserialbus-doc	rhel9-AppStream	RHEL 9.0
qt5-qtserialport-doc	rhel9-AppStream	RHEL 9.0
qt5-qtspeech-doc	rhel9-AppStream	RHEL 9.0
qt5-qtsvg-doc	rhel9-AppStream	RHEL 9.0
qt5-qttools-doc	rhel9-AppStream	RHEL 9.0
qt5-qtvirtualkeyboard-doc	rhel9-AppStream	RHEL 9.0
qt5-qtwayland-doc	rhel9-AppStream	RHEL 9.0
qt5-qtwebchannel-doc	rhel9-AppStream	RHEL 9.0
qt5-qtwebsockets-doc	rhel9-AppStream	RHEL 9.0
qt5-qtwebview-doc	rhel9-AppStream	RHEL 9.0
qt5-qtx11extras-doc	rhel9-AppStream	RHEL 9.0
qt5-qtxmlpatterns-doc	rhel9-AppStream	RHEL 9.0
realtime-setup	rhel9-NFV	RHEL 9.0
realtime-tests	rhel9-AppStream	RHEL 9.0
redhat-display-fonts	rhel9-AppStream	RHEL 9.0
redhat-cloud-client-configuration	rhel9-AppStream	RHEL 9.1
redhat-mono-fonts	rhel9-AppStream	RHEL 9.0
redhat-sb-certs	rhel9-CRB	RHEL 9.0
redhat-text-fonts	rhel9-AppStream	RHEL 9.0
resource-agents-cloud	rhel9-HighAvailability	RHEL 9.0
restore	rhel9-BaseOS	RHEL 9.0

Package	Repository	New in
rhc-devel	rhel9-CRB	RHEL 9.1
rhel-net-naming-sysattrs	rhel9-BaseOS	RHEL 9.4
rpm-plugin-audit	rhel9-BaseOS	RHEL 9.0
rpm-sign-libs	rhel9-BaseOS	RHEL 9.0
rsyslog-logrotate	rhel9-AppStream	RHEL 9.0
rtla	rhel9-AppStream	RHEL 9.2
ruby-bundled-gems	rhel9-AppStream	RHEL 9.1
rubygem-racc	rhel9-AppStream	RHEL 9.4
rubygem-thread_order	rhel9-CRB	RHEL 9.0
rust-analyzer	rhel9-AppStream	RHEL 9.2
rv	rhel9-AppStream	RHEL 9.3
s390utils	rhel9-AppStream	RHEL 9.4
s390utils-se-data	rhel9-AppStream	RHEL 9.4
s-nail	rhel9-AppStream	RHEL 9.0
samba-dc-libs	rhel9-BaseOS	RHEL 9.2
samba-dcerpc	rhel9-BaseOS	RHEL 9.2
samba-ldb-ldap-modules	rhel9-BaseOS	RHEL 9.2
samba-tools	rhel9-BaseOS	RHEL 9.2
samba-usershares	rhel9-BaseOS	RHEL 9.2
sane-airscan	rhel9-AppStream	RHEL 9.0
sdl12-compat	rhel9-AppStream	RHEL 9.0
sdl12-compat-devel	rhel9-CRB	RHEL 9.0
setxkbmap	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
sid	rhel9-AppStream	RHEL 9.0
sid-base-libs	rhel9-AppStream	RHEL 9.0
sid-iface-libs	rhel9-AppStream	RHEL 9.0
sid-log-libs	rhel9-AppStream	RHEL 9.0
sid-mod-block-blkid	rhel9-AppStream	RHEL 9.0
sid-mod-block-dm-mpath	rhel9-AppStream	RHEL 9.0
sid-mod-dummies	rhel9-AppStream	RHEL 9.0
sid-resource-libs	rhel9-AppStream	RHEL 9.0
sid-tools	rhel9-AppStream	RHEL 9.0
sip6	rhel9-AppStream	RHEL 9.1
speech-tools-libs	rhel9-AppStream	RHEL 9.0
ssh-key-dir	rhel9-AppStream	RHEL 9.0
sssd-idp	rhel9-AppStream	RHEL 9.1
sssd-passkey	rhel9-BaseOS	RHEL 9.4
stratisd-tools	rhel9-AppStream	RHEL 9.3
sudo-python-plugin	rhel9-AppStream	RHEL 9.0
synce4l	rhel9-AppStream	RHEL 9.2
sysprof-capture-devel	rhel9-AppStream	RHEL 9.0
systemd-boot-unsigned	rhel9-CRB	RHEL 9.2
systemd-oomd	rhel9-BaseOS	RHEL 9.0
systemd-resolved	rhel9-BaseOS	RHEL 9.0
systemd-rpm-macros	rhel9-BaseOS	RHEL 9.0
tesseract-langpack-eng	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
tesseract-tessdata-doc	rhel9-AppStream	RHEL 9.0
tex-preview	rhel9-AppStream	RHEL 9.0
texlive-alphalph	rhel9-AppStream	RHEL 9.0
texlive-atbegshi	rhel9-AppStream	RHEL 9.0
texlive-attachfile2	rhel9-AppStream	RHEL 9.0
texlive-atveryend	rhel9-AppStream	RHEL 9.0
texlive-auxhook	rhel9-AppStream	RHEL 9.0
texlive-bigintcalc	rhel9-AppStream	RHEL 9.0
texlive-bitset	rhel9-AppStream	RHEL 9.0
texlive-bookmark	rhel9-AppStream	RHEL 9.0
texlive-catchfile	rhel9-AppStream	RHEL 9.0
texlive-colorprofiles	rhel9-AppStream	RHEL 9.0
texlive-dehyph	rhel9-AppStream	RHEL 9.0
texlive-epstopdf-pkg	rhel9-AppStream	RHEL 9.0
texlive-etexcmds	rhel9-AppStream	RHEL 9.0
texlive-etoc	rhel9-AppStream	RHEL 9.0
texlive-footnotehyper	rhel9-AppStream	RHEL 9.0
texlive-gettitlestring	rhel9-AppStream	RHEL 9.0
texlive-gnu-freefont	rhel9-CRB	RHEL 9.0
texlive-grfext	rhel9-AppStream	RHEL 9.0
texlive-grffile	rhel9-AppStream	RHEL 9.0
texlive-hanging	rhel9-AppStream	RHEL 9.0
texlive-hobsub	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
texlive-hologo	rhel9-AppStream	RHEL 9.0
texlive-hycolor	rhel9-AppStream	RHEL 9.0
texlive-hyphenex	rhel9-AppStream	RHEL 9.0
texlive-ifplatform	rhel9-AppStream	RHEL 9.0
texlive-infwarerr	rhel9-AppStream	RHEL 9.0
texlive-intcalc	rhel9-AppStream	RHEL 9.0
texlive-kvdefinekeys	rhel9-AppStream	RHEL 9.0
texlive-kvoptions	rhel9-AppStream	RHEL 9.0
texlive-kvsetkeys	rhel9-AppStream	RHEL 9.0
texlive-l3backend	rhel9-AppStream	RHEL 9.0
texlive-latexbug	rhel9-AppStream	RHEL 9.0
texlive-letltxmacro	rhel9-AppStream	RHEL 9.0
texlive-listofitems	rhel9-AppStream	RHEL 9.0
texlive-ltxcmds	rhel9-AppStream	RHEL 9.0
texlive-luahbtex	rhel9-AppStream	RHEL 9.0
texlive-lwarp	rhel9-AppStream	RHEL 9.0
texlive-minitoc	rhel9-AppStream	RHEL 9.0
texlive-modes	rhel9-AppStream	RHEL 9.0
texlive-newfloat	rhel9-AppStream	RHEL 9.0
texlive-newunicodechar	rhel9-AppStream	RHEL 9.0
texlive-notoccite	rhel9-AppStream	RHEL 9.0
texlive-obsolete	rhel9-AppStream	RHEL 9.0
texlive-pdfcolmk	rhel9-AppStream	RHEL 9.0

Package	Repository	New in
texlive-pdfescape	rhel9-AppStream	RHEL 9.0
texlive-pdflscape	rhel9-AppStream	RHEL 9.0
texlive-pdftexcmds	rhel9-AppStream	RHEL 9.0
texlive-ragged2e	rhel9-AppStream	RHEL 9.0
texlive-refcount	rhel9-AppStream	RHEL 9.0
texlive-rerunfilecheck	rhel9-AppStream	RHEL 9.0
texlive-sansmathaccent	rhel9-AppStream	RHEL 9.0
texlive-stackengine	rhel9-AppStream	RHEL 9.0
texlive-stringenc	rhel9-AppStream	RHEL 9.0
texlive-texlive-scripts-extra	rhel9-AppStream	RHEL 9.0
texlive-translator	rhel9-AppStream	RHEL 9.0
texlive-ucharcat	rhel9-AppStream	RHEL 9.0
texlive-uniquecounter	rhel9-AppStream	RHEL 9.0
texlive-wasy-type1	rhel9-AppStream	RHEL 9.0
texlive-zref	rhel9-AppStream	RHEL 9.0
tomcat	rhel9-AppStream	RHEL 9.2
tomcat-admin-webapps	rhel9-AppStream	RHEL 9.2
tomcat-docs-webapp	rhel9-AppStream	RHEL 9.2
tomcat-el-3.0-api	rhel9-AppStream	RHEL 9.2
tomcat-jsp-2.3-api	rhel9-AppStream	RHEL 9.2
tomcat-lib	rhel9-AppStream	RHEL 9.2
tomcat-servlet-4.0-api	rhel9-AppStream	RHEL 9.2
tomcat-webapps	rhel9-AppStream	RHEL 9.2

Package	Repository	New in
totem-video-thumbnailer	rhel9-AppStream	RHEL 9.0
tpm2-pkcs11	rhel9-AppStream	RHEL 9.0
tpm2-pkcs11-tools	rhel9-AppStream	RHEL 9.0
tuned-profiles-postgresql	rhel9-AppStream	RHEL 9.1
tuned-profiles-spectrumscale	rhel9-AppStream	RHEL 9.0
twolame	rhel9-AppStream	RHEL 9.0
uchardet	rhel9-CRB	RHEL 9.0
uchardet-devel	rhel9-CRB	RHEL 9.1
uki-direct	rhel9-AppStream	RHEL 9.4
unbound-devel	rhel9-CRB	RHEL 9.1
unifdef	rhel9-CRB	RHEL 9.3
uresourced	rhel9-AppStream	RHEL 9.0
usbredir-server	rhel9-AppStream	RHEL 9.2
utf8proc-devel	rhel9-CRB	RHEL 9.0
util-linux-core	rhel9-BaseOS	RHEL 9.0
uuid-c++	rhel9-AppStream	RHEL 9.0
uuid-dce	rhel9-AppStream	RHEL 9.0
virt-p2v	rhel9-AppStream	RHEL 9.0
virt-win-reg	rhel9-AppStream	RHEL 9.0
virtiofsd	rhel9-AppStream	RHEL 9.0
voikko-fi	rhel9-AppStream	RHEL 9.0
vulkan-utility-libraries-devel	rhel9-CRB	RHEL 9.4
vulkan-volk-devel	rhel9-AppStream	RHEL 9.4

Package	Repository	New in
WALinuxAgent-cvm	rhel9-CRB	RHEL 9.3
wayland-utils	rhel9-AppStream	RHEL 9.0
waypipe	rhel9-AppStream	RHEL 9.0
wireguard-tools	rhel9-AppStream	RHEL 9.0
wireless-regdb	rhel9-BaseOS	RHEL 9.0
wireplumber	rhel9-AppStream	RHEL 9.0
wireplumber-libs	rhel9-AppStream	RHEL 9.0
wpebackend-fdo	rhel9-AppStream	RHEL 9.0
wpebackend-fdo-devel	rhel9-CRB	RHEL 9.1
xcb-util-cursor	rhel9-AppStream	RHEL 9.4
xcb-util-cursor-devel	rhel9-AppStream	RHEL 9.4
xdg-dbus-proxy	rhel9-AppStream	RHEL 9.0
xdg-desktop-portal-gnome	rhel9-AppStream	RHEL 9.1
xfsprogs-xfs_scrub	rhel9-AppStream	RHEL 9.0
xhtml2fo-style-xsl	rhel9-AppStream	RHEL 9.0
xkbcomp	rhel9-AppStream	RHEL 9.0
xmlstarlet	rhel9-AppStream	RHEL 9.1
xmlto-tex	rhel9-AppStream	RHEL 9.0
xmlto-xhtml	rhel9-AppStream	RHEL 9.0
xmvn-tools	rhel9-CRB	RHEL 9.0
xorg-x11-server-source	rhel9-CRB	RHEL 9.1

Package	Repository	New in
xxhash	rhel9-AppStream	RHEL 9.1
xxhash-devel	rhel9-CRB	RHEL 9.1
xxhash-doc	rhel9-CRB	RHEL 9.1
xxhash-libs	rhel9-AppStream	RHEL 9.1
yara	rhel9-AppStream	RHEL 9.1
yara-devel	rhel9-CRB	RHEL 9.1
zram-generator	rhel9-AppStream	RHEL 9.0

A.2. PACKAGE REPLACEMENTS

The following table lists packages that were replaced, renamed, merged, or split:

Original package(s)	New package(s)	Changed since	Note
apache-commons-lang (javapackages-tools:201801), apache-commons-lang3 (javapackages-tools:201801)	apache-commons-lang3	RHEL 9.0	
apache-commons-lang (pki-deps:10.6), apache-commons-lang3 (maven:3.5, maven:3.6)	apache-commons-lang3	RHEL 9.0	
bind-libs-lite	bind-libs	RHEL 9.0	
bind-lite-devel	bind-devel	RHEL 9.0	
binutils	binutils, binutils-gold	RHEL 9.0	
clutter-gst2	clutter-gst3	RHEL 9.0	
crda	wireless-regdb	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
dnf-plugin-subscription-manager, subscription-manager	subscription-manager	RHEL 9.0	
evolution-data-server	evolution-data-server, evolution-data-server-ui	RHEL 9.4	
evolution-data-server-devel	evolution-data-server-devel, evolution-data-server-ui-devel	RHEL 9.4	
fapolicyd-dnf-plugin	rpm-plugin-fapolicyd	RHEL 9.1	
fio	fio, fio-engine-dev-dax, fio-engine-http, fio-engine-libaio, fio-engine-libpmem, fio-engine-nbd, fio-engine-pmemblk, fio-engine-rados, fio-engine-rbd, fio-engine-rdma	RHEL 9.0	
fio	fio, fio-engine-http, fio-engine-libaio, fio-engine-nbd, fio-engine-rados, fio-engine-rbd, fio-engine-rdma	RHEL 9.0	
flex-devel	libfl-static	RHEL 9.0	
fontpackages-devel	fonts-rpm-macros	RHEL 9.0	
fontpackages-filesystem	fonts-filesystem	RHEL 9.0	
gcc-toolset-12-binutils	gcc-toolset-13-binutils	RHEL 9.3	

Original package(s)	New package(s)	Changed since	Note
genisoimage	xorriso	RHEL 9.0	The **genisoimage** package has been replaced by the **xorriso** package, which now provides the **genisoimage** command.
glassfish-jaxb-api (pki-deps:10.6)	jaxb-api	RHEL 9.0	
glassfish-jaxb-runtime (pki-deps:10.6)	jaxb-impl	RHEL 9.0	
gnome-session-kiosk-session	gnome-kiosk	RHEL 9.0	
google-crosextra-caladea-fonts	ht-caladea-fonts	RHEL 9.0	
google-crosextra-carlito-fonts	google-carlito-fonts	RHEL 9.0	
google-noto-mono-fonts	google-noto-sans-mono-fonts	RHEL 9.0	
guava (maven:3.6), guava20 (maven:3.5)	guava	RHEL 9.0	
guava20 (javapackages-tools:201801)	guava	RHEL 9.0	
hesiod	compat-hesiod	RHEL 9.0	
ht-caladea-fonts	google-crosextra-caladea-fonts	RHEL 9.3	
httpcomponents-client (javapackages-tools:201801), jakarta-commons-httpclient (javapackages-tools:201801)	httpcomponents-client	RHEL 9.0	The **jakarta-commons-httpclient** package has been replaced by the **httpcomponents-client** package, which has a slightly different API. You must port code changes from **jakarta-commons-httpclient** to **httpcomponents-client**.

Original package(s)	New package(s)	Changed since	Note
httpcomponents-client (maven:3.5, maven:3.6), jakarta-commons-httpclient (pki-deps:10.6)	httpcomponents-client	RHEL 9.0	
ibus-kkc	ibus-anthy	RHEL 9.0	
idm-pki-acme (pki-core:10.6)	pki-acme	RHEL 9.0	
idm-pki-base (pki-core:10.6)	pki-base	RHEL 9.0	
idm-pki-base-java (pki-core:10.6)	pki-base-java	RHEL 9.0	
idm-pki-ca (pki-core:10.6)	pki-ca	RHEL 9.0	
idm-pki-kra (pki-core:10.6)	pki-kra	RHEL 9.0	
idm-pki-server (pki-core:10.6)	pki-server	RHEL 9.0	
idm-pki-symkey (pki-core:10.6)	pki-symkey	RHEL 9.0	
idm-pki-tools (pki-core:10.6)	pki-tools	RHEL 9.0	
idm-tomcatjss	idm-jss-tomcat	RHEL 9.4	
ilmbase	imath, openexr-devel	RHEL 9.0	
initscripts	initscripts, initscripts-rename-device, initscripts-service	RHEL 9.0	
inkscape1	inkscape	RHEL 9.0	
inkscape1-docs	inkscape-docs	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
inkscape1-view	inkscape-view	RHEL 9.0	
ipa-client (idm:client), ipa-client (idm:DL1)	ipa-client	RHEL 9.0	
ipa-client-common (idm:client), ipa-client-common (idm:DL1)	ipa-client-common	RHEL 9.0	
ipa-client-epn (idm:client), ipa-client-epn (idm:DL1)	ipa-client-epn	RHEL 9.0	
ipa-client-samba (idm:client), ipa-client-samba (idm:DL1)	ipa-client-samba	RHEL 9.0	
ipa-common (idm:client), ipa-common (idm:DL1)	ipa-common	RHEL 9.0	
ipa-healthcheck-core (idm:client), ipa-healthcheck-core (idm:DL1)	ipa-healthcheck-core	RHEL 9.0	
ipa-selinux (idm:client), ipa-selinux (idm:DL1)	ipa-selinux	RHEL 9.0	
iptables, iptables-arptables, iptables-ebtables	iptables-nft	RHEL 9.0	
iptables-services	iptables-nft-services	RHEL 9.0	
istack-commons	jaxb-istack-commons	RHEL 9.0	
jackson-annotations (pki-deps:10.6)	pki-jackson-annotations	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
jackson-core (pki-deps:10.6)	pki-jackson-core	RHEL 9.0	
jackson-databind (pki-deps:10.6)	pki-jackson-databind	RHEL 9.0	
jackson-jaxrs-json-provider (pki-deps:10.6)	pki-jackson-jaxrs-json-provider	RHEL 9.0	
jackson-jaxrs-providers (pki-deps:10.6)	pki-jackson-jaxrs-providers	RHEL 9.0	
jackson-module-jaxb-annotations (pki-deps:10.6)	pki-jackson-module-jaxb-annotations	RHEL 9.0	
javamail (javapackages-tools:201801)	jakarta-mail	RHEL 9.0	The **javamail** package has been replaced with the **jakarta-mail** package, which is API-compatible. Code changes might be required to port from **javamail** to **jakarta-mail**.
jss, pki-symkey	idm-jss	RHEL 9.1	
kernel-abi-whitelists	kernel-abi-stablelists	RHEL 9.0	
khmeros-base-fonts	khmer-os-content-fonts, khmer-os-system-fonts	RHEL 9.0	
khmeros-battambang-fonts	khmer-os-battambang-fonts	RHEL 9.0	
khmeros-bokor-fonts	khmer-os-bokor-fonts	RHEL 9.0	
khmeros-handwritten-fonts	khmer-os-fasthand-fonts, khmer-os-freehand-fonts	RHEL 9.0	
khmeros-metal-chrieng-fonts	khmer-os-metal-chrieng-fonts	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
khmeros-muol-fonts	khmer-os-muol-fonts, khmer-os-muol-pali-fonts	RHEL 9.0	
khmeros-siemreap-fonts	khmer-os-siemreap-fonts	RHEL 9.0	
ldapjdk	idm-ldapjdk	RHEL 9.1	
libguestfs-tools (virt:rhel)	virt-win-reg	RHEL 9.0	
libguestfs-tools-c (virt:rhel)	guestfs-tools	RHEL 9.0	
libmemcached	libmemcached-awesome, libmemcached-awesome-tools	RHEL 9.0	The **libmemcached** library has been replaced by the **libmemcached-awesome** fork. The package has also been moved from the AppStream repository to the unsupported CodeReady Linux Builder repository.
libmemcached-devel	libmemcached-awesome-devel	RHEL 9.0	
libmemcached-libs	libmemcached-awesome	RHEL 9.0	
lorax-composer	osbuild-composer	RHEL 9.0	
mailx	s-nail	RHEL 9.0	The **mailx** mail processing system has been replaced by **s-nail**. The **s-nail** utility is compatible with **mailx** and adds numerous new features. The **mailx** package is no longer maintained in upstream.
maven-artifact-resolver (javapackages-tools:201801), maven-artifact-transfer (javapackages-tools:201801)	maven-artifact-transfer	RHEL 9.0	The **maven-artifact-resolver** package has been replaced by the **maven-artifact-transfer** package, which should be API-compatible. Code changes might be required to port from **maven-artifact-resolver** to **maven-artifact-transfer**.
mesa-khr-devel	libglvnd-devel	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
mesa-libGLES	libglvnd-gles	RHEL 9.0	
mesa-vulkan-devel	mesa-vulkan-drivers	RHEL 9.0	
metacity	gnome-kiosk	RHEL 9.0	The **metacity** package has been replaced with the **gnome-kiosk** package, which has similar functionality.
OpenEXR-libs	openexr	RHEL 9.0	
openssl-libs	openssl-fips-provider, openssl-libs	RHEL 9.4	
pacemaker	pacemaker, python3-pacemaker	RHEL 9.3	
paratype-pt-sans-fonts	pt-sans-fonts	RHEL 9.0	
perl (perl:5.24)	perl-AutoLoader, perl-AutoSplit, perl-autouse, perl-B, perl-base, perl-Benchmark, perl-blib, perl-Class-Struct, perl-Config-Extensions, perl-DBM_Filter, perl-debugger, perl-deprecate, perl-diagnostics, perl-DirHandle, perl-doc, perl-Dumpvalue, perl-DynaLoader, perl-encoding-warnings, perl-English, perl-ExtUtils-Constant, perl-Fcntl, perl-fields, perl-File-Basename, perl-File-Compare, perl-File-Copy, perl-File-DosGlob, perl-File-Find, perl-File-stat, perl-FileCache, perl-FileHandle, perl-filetest, perl-FindBin, perl-	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
	GDBM_File, perl-Hash-Util, perl-Hash-Util-FieldHash, perl-I18N-Collate, perl-I18N-Langinfo, perl-I18N-LangTags, perl-if, perl-interpreter, perl-IPC-Open3, perl-less, perl-lib, perl-libs, perl-locale, perl-meta-notation, perl-mro, perl-NDBM_File, perl-Net, perl-NEXT, perl-ODBM_File, perl-Opcode, perl-overload, perl-overloading, perl-ph, perl-Pod-Functions, perl-POSIX, perl-Safe, perl-Search-Dict, perl-SelectSaver, perl-sigtrap, perl-sort, perl-subs, perl-Symbol, perl-Sys-Hostname, perl-Term-Complete, perl-Term-ReadLine, perl-Text-Abbrev, perl-Thread, perl-Thread-Semaphore, perl-Tie, perl-Tie-File, perl-Tie-Memoize, perl-Tie-RefHash, perl-Time, perl-Unicode-UCD, perl-User-pwent, perl-vars, perl-vmsish		
perl-core (perl:5.24)	perl	RHEL 9.0	
perl-interpreter	perl-AutoLoader, perl-AutoSplit, perl-autouse, perl-B, perl-base, perl-Benchmark, perl-blib, perl-Class-	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
	Struct, perl-Config-Extensions, perl-DBM_Filter, perl-debugger, perl-deprecate, perl-diagnostics, perl-DirHandle, perl-doc, perl-Dumpvalue, perl-DynaLoader, perl-encoding-warnings, perl-English, perl-ExtUtils-Constant, perl-Fcntl, perl-fields, perl-File-Basename, perl-File-Compare, perl-File-Copy, perl-File-DosGlob, perl-File-Find, perl-File-stat, perl-FileCache, perl-FileHandle, perl-filetest, perl-FindBin, perl-GDBM_File, perl-Getopt-Std, perl-Hash-Util, perl-Hash-Util-FieldHash, perl-I18N-Collate, perl-I18N-Langinfo, perl-I18N-LangTags, perl-if, perl-interpreter, perl-IPC-Open3, perl-less, perl-lib, perl-locale, perl-meta-notation, perl-mro, perl-NDBM_File, perl-Net, perl-NEXT, perl-ODBM_File, perl-Opcode, perl-overload, perl-overloading, perl-ph, perl-Pod-Functions, perl-POSIX, perl-Safe, perl-Search-Dict, perl-SelectSaver, perl-sigtrap, perl-sort, perl-subs, perl-Symbol, perl-Sys-Hostname, perl-Term-Complete, perl-Term-		

Original package(s)	New package(s)	Changed since	Note
	ReadLine, perl-Text-Abbrev, perl-Thread, perl-Thread-Semaphore, perl-Tie, perl-Tie-File, perl-Tie-Memoize, perl-Tie-RefHash, perl-Time, perl-Unicode-UCD, perl-User-pwent, perl-vars, perl-vmsish		
php-pecl-xdebug	php-pecl-xdebug3	RHEL 9.0	
pipewire-jack-audio-connection-kit	pipewire-jack-audio-connection-kit, pipewire-jack-audio-connection-kit-libs	RHEL 9.4	
pki-acme	idm-pki-acme	RHEL 9.1	
pki-base	idm-pki-base	RHEL 9.1	
pki-base-java	idm-pki-java	RHEL 9.1	
pki-ca	idm-pki-ca	RHEL 9.1	
pki-kra	idm-pki-kra	RHEL 9.1	
pki-server	idm-pki-server	RHEL 9.1	
pki-tools	idm-pki-tools	RHEL 9.1	
platform-python, python2 (python27:2.7), python36 (python36:3.6), python38 (python38:3.8), python39 (python39:3.9)	python3	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
platform-python-debug, python2-debug (python27:2.7), python36-debug (python36:3.6), python38-debug (python38:3.8), python39-debug (python39-devel:3.9)	python3-debug	RHEL 9.0	
platform-python-devel, python2-devel (python27:2.7), python36-devel (python36:3.6), python38-devel (python38:3.8), python39-devel (python39:3.9)	python3-devel	RHEL 9.0	
platform-python-pip, python2-pip (python27:2.7), python3-pip, python38-pip (python38:3.8), python39-pip (python39:3.9)	python3-pip	RHEL 9.0	
platform-python-setuptools, python2-setuptools (python27:2.7), python3-setuptools, python38-setuptools (python38:3.8), python39-setuptools (python39:3.9)	python3-setuptools	RHEL 9.0	
podman (container-tools:rhel8), podman-manpages (container-tools:rhel8)	podman	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
podman-catatonit	podman	RHEL 9.2	The **podman-catatonit** package has been replaced by functionality within the **podman** package directly. Note that no additional subpackage is required.
podman-manpages (container-tools:rhel8)	podman	RHEL 9.0	
postgresql-upgrade-devel (postgresql:12), postgresql-upgrade-devel (postgresql:13)	postgresql-upgrade-devel	RHEL 9.0	
pulseaudio	pipewire-pulseaudio	RHEL 9.0	The **pulseaudio** server implementation has been replaced by the **pipewire-pulseaudio** implementation. Note that only the server implementation has been switched. The **pulseaudio** client libraries are still in use.
pygobject2 (gimp:2.8)	python3-gobject	RHEL 9.0	
pygobject2-codegen (gimp:2.8)	python3-gobject-base	RHEL 9.0	
pygobject2-devel (gimp:2.8)	python3-gobject-devel	RHEL 9.0	
pygobject3-devel	python3-gobject-devel	RHEL 9.0	
python2-attrs (python27:2.7), python3-attrs, python38-attrs (python38-devel:3.8), python39-attrs (python39-devel:3.9)	python3-attrs	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python2-babel (python27:2.7), python3-babel, python38-babel (python38:3.8)	python3-babel	RHEL 9.0	
python2-chardet (python27:2.7), python3-chardet, python38-chardet (python38:3.8), python39-chardet (python39:3.9)	python3-chardet	RHEL 9.0	
python2-Cython (python27:2.7), python3-Cython, python38-Cython (python38:3.8), python39-Cython (python39-devel:3.9)	python3-Cython	RHEL 9.0	
python2-dns (python27:2.7), python3-dns	python3-dns	RHEL 9.0	
python2-docutils (python27:2.7), python3-docutils	python3-docutils (python36:3.6)	RHEL 9.0	
python2-idna (python27:2.7), python38-idna (python38:3.8), python39-idna (python39:3.9)	python3-idna	RHEL 9.0	
python2-jinja2 (python27:2.7), python3-jinja2, python38-jinja2 (python38:3.8)	python3-jinja2	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python2-libs (python27:2.7), python3-libs, python38-libs (python38:3.8), python39-libs (python39:3.9)	python3-libs	RHEL 9.0	
python2-lxml (python27:2.7), python3-lxml, python38-lxml (python38:3.8), python39-lxml (python39:3.9)	python3-lxml	RHEL 9.0	
python2-markupsafe (python27:2.7), python3-markupsafe, python38-markupsafe (python38:3.8)	python3-markupsafe	RHEL 9.0	
python2-numpy (python27:2.7), python38-numpy (python38:3.8), python39-numpy (python39:3.9)	python3-numpy	RHEL 9.0	
python2-numpy-f2py (python27:2.7), python38-numpy-f2py (python38:3.8), python39-numpy-f2py (python39:3.9)	python3-numpy-f2py	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python2-pip-wheel (python27:2.7), python3-pip-wheel, python38-pip-wheel (python38:3.8), python39-pip-wheel (python39:3.9)	python3-pip-wheel	RHEL 9.0	
python2-pluggy (python27:2.7), python3-pluggy, python38-pluggy (python38-devel:3.8), python39-pluggy (python39-devel:3.9)	python3-pluggy	RHEL 9.0	
python2-psycopg2 (python27:2.7), python38-psycopg2 (python38:3.8), python39-psycopg2 (python39:3.9)	python3-psycopg2	RHEL 9.0	
python2-py (python27:2.7), python3-py, python38-py (python38-devel:3.8), python39-py (python39-devel:3.9)	python3-py	RHEL 9.0	
python2-pygments (python27:2.7), python3-pygments (python36:3.6)	python3-pygments	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python2-PyMySQL (python27:2.7), python3-PyMySQL (python36:3.6), python38-PyMySQL (python38:3.8), python39-PyMySQL (python39:3.9)	python3-PyMySQL	RHEL 9.0	
python2-pysocks (python27:2.7), python3-pysocks, python38-pysocks (python38:3.8), python39-pysocks (python39:3.9)	python3-pysocks	RHEL 9.0	
python2-pytest (python27:2.7), python3-pytest, python38-pytest (python38-devel:3.8), python39-pytest (python39-devel:3.9)	python3-pytest	RHEL 9.0	
python2-pytz (python27:2.7), python3-pytz, python38-pytz (python38:3.8)	python3-pytz	RHEL 9.0	
python2-pyyaml (python27:2.7), python3-pyyaml, python38-pyyaml (python38:3.8), python39-pyyaml (python39:3.9)	python3-pyyaml	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python2-requests (python27:2.7), python3-requests, python38-requests (python38:3.8), python39-requests (python39:3.9)	python3-requests	RHEL 9.0	
python2-rpm-macros (python27:2.7), python3-rpm-macros, python36-rpm-macros (python36:3.6), python38-rpm-macros (python38:3.8), python39-rpm-macros (python39:3.9)	python3-rpm-macros	RHEL 9.0	
python2-scipy (python27:2.7), python3-scipy (python36:3.6), python38-scipy (python38:3.8), python39-scipy (python39:3.9)	python3-scipy	RHEL 9.0	
python2-setuptools-wheel (python27:2.7), python3-setuptools-wheel, python38-setuptools-wheel (python38:3.8), python39-setuptools-wheel (python39:3.9)	python3-setuptools-wheel	RHEL 9.0	
python2-setuptools_scm (python27:2.7), python3-setuptools_scm	python3-setuptools_scm	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python2-six (python27:2.7), python3-six, python38-six (python38:3.8), python39-six (python39:3.9)	python3-six	RHEL 9.0	
python2-test (python27:2.7), python3-test, python38-test (python38:3.8), python39-test (python39:3.9)	python3-test	RHEL 9.0	
python2-tkinter (python27:2.7), python3-tkinter, python38-tkinter (python38:3.8), python39-tkinter (python39:3.9)	python3-tkinter	RHEL 9.0	
python2-urllib3 (python27:2.7), python3-urllib3, python38-urllib3 (python38:3.8), python39-urllib3 (python39:3.9)	python3-urllib3	RHEL 9.0	
python2-wheel (python27:2.7), python3-wheel (python36:3.6), python38-wheel (python38:3.8), python39-wheel (python39:3.9)	python3-wheel	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python2-wheel-wheel (python27:2.7), python3-wheel-wheel (python36:3.6), python38-wheel-wheel (python38:3.8), python39-wheel-wheel (python39:3.9)	python3-wheel-wheel	RHEL 9.0	
python3-idle, python38-idle (python38:3.8), python39-idle (python39:3.9)	python3-idle	RHEL 9.0	
python3-idm-pki (pki-core:10.6)	python3-pki	RHEL 9.0	
python3-ipaclient (idm:client), python3-ipaclient (idm:DL1)	python3-ipaclient	RHEL 9.0	
python3-ipalib (idm:client), python3-ipalib (idm:DL1)	python3-ipalib	RHEL 9.0	
python3-jwcrypto (idm:client), python3-jwcrypto (idm:DL1)	python3-jwcrypto	RHEL 9.0	
python3-magic	python3-file-magic	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python3-packaging, python38-packaging (python38-devel:3.8), python39-packaging (python39-devel:3.9)	python3-packaging	RHEL 9.0	
python3-pki	python3-idm-pki	RHEL 9.1	
python3-pyparsing, python38-pyparsing (python38-devel:3.8), python39-pyparsing (python39-devel:3.9)	python3-pyparsing	RHEL 9.0	
python3-pyusb (idm:client), python3-pyusb (idm:DL1)	python3-pyusb	RHEL 9.0	
python3-qrcode (idm:DL1, idm:client)	python3-qrcode-core	RHEL 9.0	
python3-yubico (idm:client), python3-yubico (idm:DL1)	python3-yubico	RHEL 9.0	
python38-cffi (python38:3.8), python39-cffi (python39:3.9)	python3-cffi	RHEL 9.0	
python38-cryptography (python38:3.8), python39-cryptography (python39:3.9)	python3-cryptography	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
python38-mod_wsgi (python38:3.8), python39-mod_wsgi (python39:3.9)	python3-mod_wsgi	RHEL 9.0	
python38-ply (python38:3.8), python39-ply (python39:3.9)	python3-ply	RHEL 9.0	
python38-psutil (python38:3.8), python39-psutil (python39:3.9)	python3-psutil	RHEL 9.0	
python38-pycparser (python38:3.8), python39-pycparser (python39:3.9)	python3-pycparser	RHEL 9.0	
python38-wcwidth (python38-devel:3.8), python39-wcwidth (python39-devel:3.9)	python3-wcwidth	RHEL 9.0	
python39-iniconfig (python39-devel:3.9)	python3-iniconfig	RHEL 9.0	
python39-toml (python39:3.9)	python3-toml	RHEL 9.0	
qatlib	qatlib, qatlib-service	RHEL 9.1	
qemu-kvm	ksmtuned, qemu-kvm	RHEL 9.0	
qemu-kvm-common (virt:rhel)	qemu-kvm-common, virtiofsd	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
resource-agents-aliyun, resource-agents-gcp	resource-agents-cloud	RHEL 9.0	
resteasy (pki-deps:10.6)	pki-resteasy-client, pki-resteasy-core, pki-resteasy-jackson2-provider, pki-resteasy-jaxb-provider	RHEL 9.0	
rng-tools	jitterentropy, jitterentropy-devel, rng-tools	RHEL 9.0	
rpm	rpm, rpm-plugin-audit	RHEL 9.0	
rpm-build-libs	rpm-build-libs, rpm-sign-libs	RHEL 9.0	
rsyslog	rsyslog, rsyslog-logrotate	RHEL 9.0	
rt-setup	realtime-setup	RHEL 9.0	
rt-setup	realtime-setup	RHEL 9.0	
rt-tests	realtime-tests	RHEL 9.0	
ruby-irb (ruby:2.5)	rubygem-irb	RHEL 9.0	
rubygem-did_you_mean (ruby:2.5, ruby:2.6)	ruby-default-gems	RHEL 9.0	
rubygem-openssl (ruby:2.5, ruby:2.6, ruby:2.7)	ruby-default-gems	RHEL 9.0	
s390utils-base	s390utils-base, s390utils-se-data	RHEL 9.4	
SDL	sdl12-compat	RHEL 9.0	
SDL-devel	sdl12-compat-devel	RHEL 9.0	

Original package(s)	New package(s)	Changed since	Note
texlive-ifetex, texlive-ifluatex, texlive-ifxetex	texlive-iftex	RHEL 9.0	
texlive-tetex	texlive-texlive-scripts	RHEL 9.0	
tomcatjss	idm-tomcatjss	RHEL 9.1	
trace-cmd	libtracecmd, libtracecmd-devel, trace-cmd	RHEL 9.0	
vala-devel	libvala-devel	RHEL 9.0	
wodim	cdrskin	RHEL 9.0	The **wodim** package has been replaced by the **cdrskin** package. The **cdrecord** executable provided by **cdrskin** is compatible with **cdrecord** provided by **wodim**.
xfsprogs	xfsprogs, xfsprogs-xfs_scrub	RHEL 9.0	
xinetd	systemd	RHEL 9.0	The **xinetd** package is not available in RHEL 9. Its functionality is now provided by **systemd**. For further details, see How to convert xinetd service to systemd.
xorg-x11-font-utils	mkfontscale	RHEL 9.0	
xorg-x11-xkb-utils	setxkbmap, xkbcomp	RHEL 9.0	

A.3. MOVED PACKAGES

The following packages were moved between repositories within RHEL 9:

Package	Original repository*	Current repository*	Changed since
aajohan-comfortaa-fonts	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
adobe-source-code-pro-fonts	rhel9-AppStream	rhel9-BaseOS	RHEL 9.2
alsa-sof-firmware	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
ant	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-antlr	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-apache-bcel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-apache-bsf	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-apache-oro	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-apache-regexp	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-apache-resolver	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-apache-xalan2	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-commons-logging	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-commons-net	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-javamail	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-jdepend	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-jmf	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-jsch	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-junit	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-lib	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-swing	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-testutil	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ant-xz	rhel8-CRB	rhel9-AppStream	RHEL 9.0
antlr-tool	rhel8-CRB	rhel9-AppStream	RHEL 9.0
apache-commons-cli	rhel8-CRB	rhel9-AppStream	RHEL 9.0
apache-commons-codec	rhel8-CRB	rhel9-AppStream	RHEL 9.0
apache-commons-collections	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
apache-commons-compress	rhel8-AppStream	rhel9-CRB	RHEL 9.0
apache-commons-io	rhel8-CRB	rhel9-AppStream	RHEL 9.0
apache-commons-lang3	rhel8-CRB	rhel9-AppStream	RHEL 9.0
apache-commons-logging	rhel8-CRB	rhel9-AppStream	RHEL 9.0
apache-commons-net	rhel8-CRB	rhel9-AppStream	RHEL 9.0
aspell	rhel8-AppStream	rhel9-CRB	RHEL 9.0
assertj-core	rhel8-CRB	rhel9-AppStream	RHEL 9.0
atinject	rhel8-CRB	rhel9-AppStream	RHEL 9.0
atlas-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
atlas-z14	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
audit-libs-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
augeas	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
augeas-libs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
autoconf-archive	rhel8-CRB	rhel9-AppStream	RHEL 9.0
avahi-glib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
bcel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
bind-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
blktrace	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
bluez-obexd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
boom-boot	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
boom-boot-conf	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
boom-boot-grub2	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
boost-numpy3	rhel8-CRB	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
boost-python3	rhel8-CRB	rhel9-AppStream	RHEL 9.0
brotli	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
bsdtar	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
bsf	rhel8-CRB	rhel9-AppStream	RHEL 9.0
bzip2-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
c-ares-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
cdi-api	rhel8-CRB	rhel9-AppStream	RHEL 9.0
checkpolicy	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
conntrack-tools	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
createrepo_c-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
criu-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
criu-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
cryptsetup-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
ctdb	rhel8-BaseOS	rhel9-ResilientStorage	RHEL 9.0
cyrus-sasl-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
cyrus-sasl-gs2	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
cyrus-sasl-ldap	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
cyrus-sasl-md5	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
cyrus-sasl-ntlm	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
daxctl	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
dbus-daemon	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
dbus-glib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
dlm-lib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
dracut-caps	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
dracut-live	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
dtc	rhel8-CRB	rhel9-AppStream	RHEL 9.0
dwarves	rhel8-CRB	rhel9-AppStream	RHEL 9.0
e2fsprogs-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
efivar	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
elfutils-debuginfod	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
elfutils-debuginfod-client-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
elfutils-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
elfutils-libelf-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
emacs-filesystem	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
evolution-data-server-doc	rhel8-CRB	rhel9-AppStream	RHEL 9.0
evolution-data-server-perl	rhel8-CRB	rhel9-AppStream	RHEL 9.0
evolution-data-server-tests	rhel8-CRB	rhel9-AppStream	RHEL 9.0
expat-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
expect	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
fence-agents-all	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-all	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-amt-ws	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-amt-ws	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
fence-agents-apc	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-apc	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-apc-snmp	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-apc-snmp	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-bladecenter	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-bladecenter	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-brocade	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-brocade	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-cisco-mds	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-cisco-mds	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-cisco-ucs	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-cisco-ucs	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-drac5	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-drac5	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-eaton-snmp	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
fence-agents-eaton-snmp	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-emerson	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-emerson	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-eps	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-eps	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-heuristics-ping	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-heuristics-ping	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-hpblade	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-hpblade	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-ibmblade	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-ibmblade	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-ifmib	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-ifmib	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-ilo-moonshot	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-ilo-moonshot	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
fence-agents-ilo-mp	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-ilo-mp	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-ilo-ssh	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-ilo-ssh	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-ilo2	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-ilo2	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-intelmodular	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-intelmodular	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-ipdu	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-ipdu	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-ipmilan	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-ipmilan	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-kdump	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-kdump	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-lpar	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
fence-agents-lpar	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-mpath	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-mpath	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-redfish	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-redfish	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-rhevm	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-rhevm	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-rsa	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-rsa	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-rsb	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-rsb	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-sbd	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-sbd	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-scsi	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-scsi	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
fence-agents-vmware-rest	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-vmware-rest	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-vmware-soap	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-vmware-soap	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-wti	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-wti	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
fence-agents-zvm	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
fence-agents-zvm	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
flite	rhel8-CRB	rhel9-AppStream	RHEL 9.0
fontconfig	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
fontconfig-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
freeipmi	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
freeipmi-bmc-watchdog	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
freeipmi-ipmidetectd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
freeipmi-ipmiseld	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
freetype-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
fstrm-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
fuse-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
fuse3	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
fuse3-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
fuse3-libs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
fxload	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
galera	rhel8-CRB	rhel9-AppStream	RHEL 9.0
gdbm	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
gdbm-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
gdisk	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
gdk-pixbuf2	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
geoclue2-demos	rhel8-AppStream	rhel9-CRB	RHEL 9.0
gettext-common-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
gettext-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
gfs2-utils	rhel8-BaseOS	rhel9-ResilientStorage	RHEL 9.0
ghostscript-doc	rhel8-CRB	rhel9-AppStream	RHEL 9.0
ghostscript-tools-dvipdf	rhel8-CRB	rhel9-AppStream	RHEL 9.0
glib2-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
glib2-doc	rhel8-CRB	rhel9-AppStream	RHEL 9.0
glib2-tests	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
glibc-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
glibc-gconv-extra	rhel8-AppStream	rhel9-BaseOS	RHEL 9.0
glibc-headers	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
glibc-locale-source	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
glusterfs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
glusterfs-client-xlators	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
glusterfs-fuse	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
glusterfs-libs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
glusterfs-rdma	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
gmp-c++	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
gmp-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
gnome-common	rhel8-CRB	rhel9-AppStream	RHEL 9.0
gnu-efi	rhel8-CRB	rhel9-AppStream	RHEL 9.0
gnupg2-smime	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
gobject-introspection-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
google-guice	rhel8-CRB	rhel9-AppStream	RHEL 9.0
google-roboto-slab-fonts	rhel8-CRB	rhel9-AppStream	RHEL 9.0
gperf	rhel8-CRB	rhel9-AppStream	RHEL 9.0
gpgmepp	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
graphviz-doc	rhel8-CRB	rhel9-AppStream	RHEL 9.0
graphviz-python3	rhel8-CRB	rhel9-AppStream	RHEL 9.0
groff	rhel8-CRB	rhel9-AppStream	RHEL 9.0
gsl-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
gsl-devel	rhel9-CRB	rhel9-AppStream	RHEL 9.1
gtkspell3	rhel8-AppStream	rhel9-CRB	RHEL 9.0
hamcrest	rhel8-CRB	rhel9-AppStream	RHEL 9.0
hivex	rhel8-CRB	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
hivex-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
httpcomponents-client	rhel8-CRB	rhel9-AppStream	RHEL 9.0
httpcomponents-core	rhel8-CRB	rhel9-AppStream	RHEL 9.0
hwloc-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
hyphen-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
icu	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
infiniband-diags	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
ipset-service	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
iptables-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
iputils-ninfod	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
jakarta-oro	rhel8-CRB	rhel9-AppStream	RHEL 9.0
jansi	rhel8-CRB	rhel9-AppStream	RHEL 9.0
jansson-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
javapackages-filesystem	rhel8-CRB	rhel9-AppStream	RHEL 9.0
javapackages-tools	rhel8-CRB	rhel9-AppStream	RHEL 9.0
jcl-over-slf4j	rhel8-CRB	rhel9-AppStream	RHEL 9.0
jdepend	rhel8-CRB	rhel9-AppStream	RHEL 9.0
jmc-core	rhel9-AppStream	rhel9-CRB	RHEL 9.2
jq	rhel9-AppStream	rhel9-BaseOS	RHEL 9.4
jsch	rhel8-CRB	rhel9-AppStream	RHEL 9.0
json-c-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
jsoup	rhel8-CRB	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
jsr-305	rhel8-CRB	rhel9-AppStream	RHEL 9.0
Judy	rhel8-CRB	rhel9-AppStream	RHEL 9.0
junit	rhel8-CRB	rhel9-AppStream	RHEL 9.0
jzlib	rhel8-CRB	rhel9-AppStream	RHEL 9.0
kabi-dw	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
kbd-legacy	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
kbd-legacy	rhel9-AppStream	rhel9-BaseOS	RHEL 9.3
kernel-cross-headers	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
kernel-debug-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
kernel-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
kernel-doc	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
kernel-headers	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
kernel-zfcpdump-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
keyutils-libs-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
krb5-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
ksc	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
lcms2-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libacl-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libaio-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libappstream-glib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libasan	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libatomic_ops	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libattr-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
libbabeltrace	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libblkid-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libcap-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libcap-ng-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libcap-ng-python3	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libcom_err-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libcurl-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libdatrie-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libdb-utils	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libdwarves1	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libedit-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
liberation-fonts	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
liberation-fonts-common	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
liberation-mono-fonts	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
liberation-narrow-fonts	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
liberation-sans-fonts	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
liberation-serif-fonts	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libev	rhel8-AppStream	rhel9-BaseOS	RHEL 9.0
libevent-doc	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libfabric	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libfdisk-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
libffi-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
libgcrypt-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libgomp-offload-nvptx	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libgpg-error-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libgudev-devel	rhel9-CRB	rhel9-AppStream	RHEL 9.3
libguestfs-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libguestfs-gobject	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libguestfs-gobject-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libguestfs-man-pages-ja	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libguestfs-man-pages-uk	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libguestfs-winsupport	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libica-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
libical	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libicu-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libiscsi	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libiscsi-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libiscsi-utils	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libitm	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libjose-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libkeepalive	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libldb-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
liblockfile	rhel9-AppStream	rhel9-BaseOS	RHEL 9.1
liblsan	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
libluksmeta-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libmaxminddb-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libmicrohttpd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libmng-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libmount-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libnbd	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libnbd-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libnetfilter_cthelper	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libnetfilter_cttimeout	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libnetfilter_queue	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libnl3-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libnsl2	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libocxl	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libogg-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libpmem-debug	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libpmemblk-debug	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libpmemlog-debug	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libpmemobj-debug	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libpmempool-debug	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libpng-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libpsl-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libpsm2	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
libqb	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libqb-devel	rhel8-BaseOS	rhel9-ResilientStorage	RHEL 9.0
libqb-devel	rhel8-BaseOS	rhel9-HighAvailability	RHEL 9.0
librabbitmq	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
librtas-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
libsecret	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libsecret-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libselinux-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libsepol-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libservicelog-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
libslirp-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libslirp-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libslirp-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libsoup	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libstemmer	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libstoragemgmt	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libstoragemgmt-arcconf-plugin	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libstoragemgmt-hpsa-plugin	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libstoragemgmt-local-plugin	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libstoragemgmt-megaraid-plugin	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libstoragemgmt-smis-plugin	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libstoragemgmt-udev	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
libtalloc-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
libtdb-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
libtevent-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
libthai-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libtirpc-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
libtool-ltdl	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libtool-ltdl-devel	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
libtool-ltdl-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libtool-ltdl-devel	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
libtsan	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libubsan	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
liburing	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libusb	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libusbx-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libuuid-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libverto-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libvirt	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-client	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-client-qemu	rhel9-CRB	rhel9-AppStream	RHEL 9.4
libvirt-daemon	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-config-network	rhel8-CRB	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
libvirt-daemon-config-nwfilter	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-interface	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-network	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-nodedev	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-nwfilter	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-secret	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-storage	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-storage-core	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-storage-disk	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-storage-iscsi	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-storage-logical	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-storage-mpath	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-daemon-driver-storage-scsi	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-dbus	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libvirt-docs	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libvirt-libs	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libvirt-lock-sanlock	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libvirt-nss	rhel8-CRB	rhel9-AppStream	RHEL 9.0
libwinpr-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libxcrypt-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libxslt	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libXxf86vm-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
libzfcphbaapi-docs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
libzip-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libzip-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libzip-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libzip-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
libzstd-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lksctp-tools-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lksctp-tools-doc	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lm_sensors	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lm_sensors-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lm_sensors-libs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
logwatch	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lua-guestfs	rhel8-AppStream	rhel9-CRB	RHEL 9.0
lua-posix	rhel8-CRB	rhel9-AppStream	RHEL 9.0
lvm2-dbusd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lvm2-lockd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lynx	rhel8-CRB	rhel9-AppStream	RHEL 9.0
lz4-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lzo-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
lzo-minilzo	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
m4	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
mariadb	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-backup	rhel8-CRB	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
mariadb-common	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mariadb-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mariadb-embedded	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-embedded-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mariadb-embedded-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mariadb-errmsg	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-gssapi-server	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-oqgraph-engine	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-server	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-server-galera	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-server-utils	rhel8-CRB	rhel9-AppStream	RHEL 9.0
mariadb-test	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mariadb-test	rhel8-AppStream	rhel9-CRB	RHEL 9.0
maven	rhel8-CRB	rhel9-AppStream	RHEL 9.0
maven-lib	rhel8-CRB	rhel9-AppStream	RHEL 9.0
maven-resolver	rhel8-CRB	rhel9-AppStream	RHEL 9.0
maven-shared-utils	rhel8-CRB	rhel9-AppStream	RHEL 9.0
maven-wagon	rhel8-CRB	rhel9-AppStream	RHEL 9.0
memstrack	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
memtest86+	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
mesa-libgbm-devel	rhel9-CRB	rhel9-AppStream	RHEL 9.3
mesa-libOSMesa	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
mobile-broadband-provider-info	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
multilib-rpm-config	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mvapich2-psm2-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mysql-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mysql-libs	rhel8-AppStream	rhel9-CRB	RHEL 9.0
mysql-test	rhel8-AppStream	rhel9-CRB	RHEL 9.0
nbdfuse	rhel8-CRB	rhel9-AppStream	RHEL 9.0
nbdkit-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
nbdkit-example-plugins	rhel8-AppStream	rhel9-CRB	RHEL 9.0
ncurses-c++-libs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
ncurses-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
ncurses-term	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
net-snmp-libs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
NetworkManager-config-connectivity-redhat	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
NetworkManager-dispatcher-routing-rules	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
NetworkManager-ovs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
NetworkManager-ppp	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
nginx-mod-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
nispor-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
nss_db	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
ntsysv	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
numactl-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
oniguruma	rhel9-AppStream	rhel9-BaseOS	RHEL 9.4
objectweb-asm	rhel8-CRB	rhel9-AppStream	RHEL 9.0
opa-address-resolution	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
opa-basic-tools	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
opa-fastfabric	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
opa-fm	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
opa-libopamgt	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
opal-firmware	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
opal-utils	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
openblas-openmp	rhel8-CRB	rhel9-AppStream	RHEL 9.0
openblas-threads	rhel8-AppStream	rhel9-CRB	RHEL 9.0
opencl-headers	rhel8-CRB	rhel9-AppStream	RHEL 9.0
opencsd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
OpenIPMI	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
OpenIPMI-lanserv	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
OpenIPMI-libs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
openldap-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
openssl-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
openssl-perl	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
openwsman-client	rhel8-AppStream	rhel9-CRB	RHEL 9.0
openwsman-python3	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
openwsman-python3	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
opus-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
ostree-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
owasp-java-encoder	rhel9-AppStream	rhel9-CRB	RHEL 9.2
p11-kit-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
p11-kit-server	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pacemaker-cluster-libs	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
pacemaker-cluster-libs	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
pacemaker-libs	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
pacemaker-libs	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
pacemaker-schemas	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0
pacemaker-schemas	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
pam-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pam_cifscreds	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pam_ssh_agent_auth	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
patch	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pciutils-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pcre-cpp	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pcre-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pcre-utf16	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
pcre-utf32	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pcre2-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pcre2-utf16	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
pcre2-utf32	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perf	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Algorithm-Diff	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Archive-Tar	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Carp	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Clone	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-Compress-Raw-Bzip2	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Compress-Raw-Zlib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-constant	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Data-Dumper	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Date-Manip	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-DBD-SQLite	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-DBI	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Digest-SHA1	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-Errno	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Exporter	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Exporter-Tiny	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-File-Path	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-File-Temp	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Getopt-Long	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
perl-hivex	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-HTTP-Tiny	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Importer	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-interpreter	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-IO	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-IO-Compress	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-IO-String	rhel8-AppStream	rhel9-CRB	RHEL 9.0
perl-IO-Zlib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-libs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-List-MoreUtils	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-List-MoreUtils-XS	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-macros	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Math-Complex	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-MIME-Base64	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-MIME-Charset	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-Module-Pluggable	rhel8-AppStream	rhel9-CRB	RHEL 9.0
perl-Module-Runtime	rhel8-AppStream	rhel9-CRB	RHEL 9.0
perl-parent	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Parse-Yapp	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
perl-PathTools	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Pod-Escapes	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Pod-Parser	rhel8-AppStream	rhel9-CRB	RHEL 9.0
perl-Pod-Parser	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
perl-Pod-Parser	rhel8-AppStream	rhel9-CRB	RHEL 9.0
perl-Pod-Parser	rhel8-AppStream	rhel9-CRB	RHEL 9.0
perl-Pod-Perldoc	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Pod-Simple	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Pod-Usage	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-podlators	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Scalar-List-Utils	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Socket	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Storable	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Sys-CPU	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Sys-MemInfo	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Term-ANSIColor	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Term-Cap	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Term-Size-Any	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-Term-Size-Perl	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-Term-Table	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-Text-Diff	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Text-ParseWords	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Text-Tabs+Wrap	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-threads	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-threads-shared	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
perl-Time-Local	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
perl-Unicode-LineBreak	rhel8-CRB	rhel9-AppStream	RHEL 9.0
perl-Unicode-Normalize	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
plexus-cipher	rhel8-CRB	rhel9-AppStream	RHEL 9.0
plexus-classworlds	rhel8-CRB	rhel9-AppStream	RHEL 9.0
plexus-containers-component-annotations	rhel8-CRB	rhel9-AppStream	RHEL 9.0
plexus-interpolation	rhel8-CRB	rhel9-AppStream	RHEL 9.0
plexus-sec-dispatcher	rhel8-CRB	rhel9-AppStream	RHEL 9.0
plexus-utils	rhel8-CRB	rhel9-AppStream	RHEL 9.0
plotutils	rhel8-CRB	rhel9-AppStream	RHEL 9.0
pmix-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
policycoreutils-dbus	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
policycoreutils-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
policycoreutils-python-utils	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
polkit-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
polkit-docs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
poppler-cpp	rhel8-CRB	rhel9-AppStream	RHEL 9.0
poppler-qt5	rhel9-CRB	rhel9-AppStream	RHEL 9.1
popt-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
postfix	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
postgresql-server-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
postgresql-server-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
postgresql-server-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
postgresql-server-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
postgresql-test	rhel8-AppStream	rhel9-CRB	RHEL 9.0
postgresql-test	rhel8-AppStream	rhel9-CRB	RHEL 9.0
postgresql-test	rhel8-AppStream	rhel9-CRB	RHEL 9.0
postgresql-test	rhel8-AppStream	rhel9-CRB	RHEL 9.0
powerpc-utils	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
ppc64-diag	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
protobuf-c	rhel8-AppStream	rhel9-BaseOS	RHEL 9.0
protobuf-c-compiler	rhel8-AppStream	rhel9-CRB	RHEL 9.0
protobuf-c-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
protobuf-compiler	rhel8-AppStream	rhel9-CRB	RHEL 9.0
ps_mem	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
publicsuffix-list	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python-cups-doc	rhel8-CRB	rhel9-AppStream	RHEL 9.0
python3-audit	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-boom	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-cffi	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-cffi	rhel9-AppStream	rhel9-BaseOS	RHEL 9.2
python3-configobj	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-cryptography	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-cryptography	rhel9-AppStream	rhel9-BaseOS	RHEL 9.2
python3-docutils	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
python3-gobject-base	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-hivex	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-idle	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-iniconfig	rhel9-CRB	rhel9-AppStream	RHEL 9.2
python3-ipatests	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-iscsi-initiator-utils	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-libnbd	rhel8-CRB	rhel9-AppStream	RHEL 9.0
python3-libproxy	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-libselinux	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-libsemanage	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-libstoragemgmt	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-libvirt	rhel8-CRB	rhel9-AppStream	RHEL 9.0
python3-markdown	rhel9-CRB	rhel9-BaseOS	RHEL 9.4
python3-oauthlib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-packaging	rhel8-CRB	rhel9-AppStream	RHEL 9.0
python3-pexpect	rhel8-AppStream	rhel9-BaseOS	RHEL 9.0
python3-pluggy	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-pluggy	rhel9-CRB	rhel9-AppStream	RHEL 9.2
python3-ply	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-ply	rhel9-AppStream	rhel9-BaseOS	RHEL 9.2
python3-policycoreutils	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-ptyprocess	rhel8-AppStream	rhel9-BaseOS	RHEL 9.0
python3-pwquality	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
python3-py	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-py	rhel9-CRB	rhel9-AppStream	RHEL 9.2
python3-pycparser	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-pycparser	rhel9-AppStream	rhel9-BaseOS	RHEL 9.2
python3-pygments	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-pytest	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-pytest	rhel9-CRB	rhel9-AppStream	RHEL 9.2
python3-pyverbs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-pywbem	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-requests-oauthlib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-rtslib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-ruamel-yaml	rhel9-CRB	rhel9-AppStream	RHEL 9.4
python3-ruamel-yaml-clib	rhel9-CRB	rhel9-AppStream	RHEL 9.4
python3-solv	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
python3-test	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
python3-test	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-wcwidth	rhel9-CRB	rhel9-AppStream	RHEL 9.1
python3-wheel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
python3-wheel-wheel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
qclib	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
qclib-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
qgpgme	rhel8-AppStream	rhel9-CRB	RHEL 9.0
qt5-qtquickcontrols2-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
qt5-qtserialbus-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
qt5-qtwayland-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
quota-doc	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
quota-nld	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
quota-rpc	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
quota-warnquota	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
rasdaemon	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
rdma-core-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
readline-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
redhat-indexhtml	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
redhat-logos	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
redhat-logos-httpd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
regexp	rhel8-CRB	rhel9-AppStream	RHEL 9.0
rpcgen	rhel8-CRB	rhel9-AppStream	RHEL 9.0
rpm-apidocs	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
rpm-cron	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
rpm-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
rpm-plugin-ima	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
rpm-plugin-syslog	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
rpm-plugin-systemd-inhibit	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
rsync-daemon	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
ruby-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
ruby-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
ruby-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
ruby-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
ruby-hivex	rhel8-AppStream	rhel9-CRB	RHEL 9.0
ruby-libguestfs	rhel8-AppStream	rhel9-CRB	RHEL 9.0
rubygem-mysql2-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
rubygem-mysql2-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
rubygem-mysql2-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
rubygem-mysql2-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
rubygem-pg-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
rubygem-pg-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
rubygem-pg-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
rubygem-pg-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
s390utils-base	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
samba-client	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
samba-krb5-printing	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
samba-pidl	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
samba-test	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
samba-test-libs	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
samba-winbind-clients	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
samba-winbind-krb5-locator	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
samba-winexe	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
sbd	rhel8-AppStream	rhel9-ResilientStorage	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
sbd	rhel8-AppStream	rhel9-HighAvailability	RHEL 9.0
SDL2	rhel8-CRB	rhel9-AppStream	RHEL 9.0
SDL2-devel	rhel8-CRB	rhel9-AppStream	RHEL 9.0
selinux-policy-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
sendmail-milter	rhel8-AppStream	rhel9-CRB	RHEL 9.0
sgabios	rhel8-CRB	rhel9-AppStream	RHEL 9.0
sgml-common	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
sgpio	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
shim-unsigned-aarch64	rhel8-CRB	rhel9-AppStream	RHEL 9.0
slf4j	rhel8-CRB	rhel9-AppStream	RHEL 9.0
slf4j-jdk14	rhel8-CRB	rhel9-AppStream	RHEL 9.0
smc-tools	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
sombok	rhel8-CRB	rhel9-AppStream	RHEL 9.0
speech-dispatcher-doc	rhel8-CRB	rhel9-AppStream	RHEL 9.0
spice-protocol	rhel8-AppStream	rhel9-CRB	RHEL 9.0
sqlite	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
sqlite-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
supermin-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
swig	rhel8-AppStream	rhel9-CRB	RHEL 9.0
swig	rhel8-AppStream	rhel9-CRB	RHEL 9.0
swig-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0
swig-doc	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
swig-gdb	rhel8-AppStream	rhel9-CRB	RHEL 9.0
swig-gdb	rhel8-AppStream	rhel9-CRB	RHEL 9.0
syslinux-tftpboot	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
systemd-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
systemd-journal-remote	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
target-restore	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
tcl	rhel8-AppStream	rhel9-CRB	RHEL 9.0
tcl-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
tcl-doc	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
tix	rhel8-AppStream	rhel9-CRB	RHEL 9.0
tmpwatch	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
tpm2-abrmd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
tpm2-abrmd-selinux	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
tpm2-tss-devel	rhel8-BaseOS	rhel9-CRB	RHEL 9.0
tuned-profiles-atomic	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
tuned-profiles-mssql	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
tuned-profiles-oracle	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
turbojpeg	rhel8-AppStream	rhel9-CRB	RHEL 9.0
unixODBC-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
usbredir-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
uuidd	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
varnish-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
velocity	rhel8-AppStream	rhel9-CRB	RHEL 9.0
vhostmd	rhel8-AppStream	rhel9-SAP-Solutions	RHEL 9.0
vhostmd	rhel8-AppStream	rhel9-SAP-NetWeaver	RHEL 9.0
vim-filesystem	rhel8-AppStream	rhel9-BaseOS	RHEL 9.0
virt-v2v-man-pages-ja	rhel8-AppStream	rhel9-CRB	RHEL 9.0
virt-v2v-man-pages-uk	rhel8-AppStream	rhel9-CRB	RHEL 9.0
vm-dump-metrics	rhel8-BaseOS	rhel9-SAP-Solutions	RHEL 9.0
vm-dump-metrics	rhel8-BaseOS	rhel9-SAP-NetWeaver	RHEL 9.0
volume_key-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
watchdog	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
web-assets-filesystem	rhel8-CRB	rhel9-AppStream	RHEL 9.0
xalan-j2	rhel8-CRB	rhel9-AppStream	RHEL 9.0
xcb-util-image-devel	rhel9-CRB	rhel9-AppStream	RHEL 9.4
xcb-util-renderutil-devel	rhel9-CRB	rhel9-AppStream	RHEL 9.4
xerces-j2	rhel8-CRB	rhel9-AppStream	RHEL 9.0
xfsprogs-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
xhtml1-dtds	rhel8-CRB	rhel9-AppStream	RHEL 9.0
xml-common	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
xml-commons-apis	rhel8-CRB	rhel9-AppStream	RHEL 9.0
xml-commons-resolver	rhel8-CRB	rhel9-AppStream	RHEL 9.0
xmlrpc-c	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
xmlrpc-c-client	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0

Package	Original repository*	Current repository*	Changed since
xorg-x11-drv-evdev-devel	rhel8-AppStream	rhel9-CRB	RHEL 9.0
xz-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
xz-java	rhel8-CRB	rhel9-AppStream	RHEL 9.0
xz-lzma-compat	rhel8-CRB	rhel9-AppStream	RHEL 9.0
zlib-devel	rhel8-BaseOS	rhel9-AppStream	RHEL 9.0
zstd	rhel8-AppStream	rhel9-BaseOS	RHEL 9.0

*This table uses abbreviated names for the repository ID. Use the following examples to help identify the full repository ID, where *<arch>* is the specific architecture:

- **rhel9-BaseOS:** rhel-9-for-*<arch>*-baseos-rpms, rhel-9-for-*<arch>*-baseos-eus-rpms, rhel-9-for-*<arch>*-baseos-e4s-rpms.
- **rhel9-AppStream:** rhel-9-for-*<arch>*-appstream-rpms, rhel-9-for-*<arch>*-appstream-eus-rpms, rhel-9-for-*<arch>*-appstream-e4s-rpms.
- **rhel9-CRB:** codeready-builder-for-rhel-9-*<arch>*-rpms, codeready-builder-for-rhel-9-*<arch>*-eus-rpms.
- **rhel9-SAP-Solutions:** rhel-9-for-*<arch>*-sap-solutions-rpms, rhel-9-for-*<arch>*-sap-solutions-eus-rpms, rhel-9-for-*<arch>*-sap-solutions-e4s-rpms.
- **rhel9-SAP-NetWeaver:** rhel-9-for-*<arch>*-sap-netweaver-rpms, rhel-9-for-*<arch>*-sap-netweaver-eus-rpms, rhel-9-for-*<arch>*-sap-netweaver-e4s-rpms.

A.4. REMOVED PACKAGES

The following packages are part of RHEL 8 but are not distributed with RHEL 9:

Package	Note
abrt	
abrt-addon-ccpp	
abrt-addon-kerneloops	
abrt-addon-pstoreoops	
abrt-addon-vmcore	
abrt-addon-xorg	

Package	Note
abrt-cli	
abrt-console-notification	
abrt-dbus	
abrt-desktop	
abrt-gui	
abrt-gui-libs	
abrt-libs	
abrt-tui	
adobe-source-sans-pro-fonts-3.02803.el9.noarch.rpm	
alsa-plugins-pulseaudio	
alsa-sof-firmware-debug	
amanda	
amanda-client	
amanda-libs	
amanda-server	
ant-apache-log4j	
ant-contrib	
ant-contrib-javadoc	
ant-javadoc	
ant-manual	
antlr-C++	
antlr-javadoc	

Package	Note
antlr-manual	
antlr3	
antlr32	
aopalliance	
aopalliance	
aopalliance-javadoc	
apache-commons-beanutils-javadoc	
apache-commons-cli-javadoc	
apache-commons-codec-javadoc	
apache-commons-collections-javadoc	
apache-commons-collections-testframework	
apache-commons-compress-javadoc	
apache-commons-exec	
apache-commons-exec-javadoc	
apache-commons-io-javadoc	
apache-commons-jxpath	
apache-commons-jxpath	
apache-commons-jxpath-javadoc	
apache-commons-lang-javadoc	

Package	Note
apache-commons-lang3-javadoc	
apache-commons-logging-javadoc	
apache-commons-net-javadoc	
apache-commons-parent	
apache-ivy	
apache-ivy-javadoc	
apache-parent	
apache-resource-bundles	
apache-sshd	
apiguardian	
aqute-bnd-javadoc	
arpwatch	
aspnetcore-runtime-3.0	
aspnetcore-runtime-3.1	
aspnetcore-runtime-5.0	
aspnetcore-targeting-pack-3.0	
aspnetcore-targeting-pack-3.1	
aspnetcore-targeting-pack-5.0	
assertj-core-javadoc	
atinject-javadoc	

Package	Note
atinject-tck	
authd	
auto	
autoconf213	
autogen	
autogen-libopts	
autogen-libopts-devel	
awscli	
base64coder	
bash-doc	
batik	
batik-css	
batik-util	
bcel-javadoc	
bea-stax	
bea-stax-api	
beust-jcommander-javadoc	
bind-export-devel	
bind-export-libs	
bind-pkcs11	Instead of the **named-pkcs11** service, append **-E pkcs11** to **named.service**. Use **pkcs11-tool** from the **opensc** package to manage **pkcs11** tokens or stored keys.
bind-pkcs11-devel	
bind-pkcs11-libs	

Package	Note
bind-pkcs11-utils	
bind-sdb	
bind-sdb-chroot	
bitmap-console-fonts	
bitmap-fixed-fonts	
bitmap-fonts-compat	
bitmap-lucida-typewriter-fonts	
bluez-hid2hci	
bnd-maven-plugin	
boost-jam	
boost-signals	
bouncycastle	
bpg-algeti-fonts	
bpg-chveulebrivi-fonts	
bpg-classic-fonts	
bpg-courier-fonts	
bpg-courier-s-fonts	
bpg-dedaena-block-fonts	
bpg-dejavu-sans-fonts	
bpg-elite-fonts	
bpg-excelsior-caps-fonts	
bpg-excelsior-condenced-fonts	

Package	Note
bpg-excelsior-fonts	
bpg-fonts-common	
bpg-glaho-fonts	
bpg-gorda-fonts	
bpg-ingiri-fonts	
bpg-irubaqidze-fonts	
bpg-mikhail-stephan-fonts	
bpg-mrgvlovani-caps-fonts	
bpg-mrgvlovani-fonts	
bpg-nateli-caps-fonts	
bpg-nateli-condenced-fonts	
bpg-nateli-fonts	
bpg-nino-medium-cond-fonts	
bpg-nino-medium-fonts	
bpg-sans-fonts	
bpg-sans-medium-fonts	
bpg-sans-modern-fonts	
bpg-sans-regular-fonts	
bpg-serif-fonts	
bpg-serif-modern-fonts	
bpg-ucnobi-fonts	
brlapi-java	

Package	Note
bsf-javadoc	
bsh	
bsh-javadoc	
bsh-manual	
buildnumber-maven-plugin	
byaccj	
byaccj-debuginfo	
byaccj-debugsource	
cal10n	
cal10n-javadoc	
cbi-plugins	
cdi-api-javadoc	
cdparanoia	
cdparanoia-devel	
cdparanoia-libs	
cdrdao	
celt051	
celt051-devel	
cgdcbxd	
cglib-javadoc	
clutter-devel	
clutter-doc	
clutter-gst3-devel	

Package	Note
clutter-gtk-devel	
cmirror	
codehaus-parent	
codemodel	
cogl-devel	
cogl-doc	
compat-exiv2-026	
compat-guile18	
compat-guile18-devel	
compat-hwloc1	
compat-libpthread-nonshared	
compat-libtiff3	
compat-openssl10	
compat-sap-c++-10	
compat-sap-c++-11	
compat-sap-c++-9	
crash-ptdump-command	
ctags	
ctags-etags	
culmus-keteryg-fonts	
culmus-shofar-fonts	
custodia	
cyrus-imapd-vzic	

Package	Note
dbus-c++	
dbus-c++-devel	
dbus-c++-glib	
dbxtool	
dejavu-fonts-common	
dhcp-libs	
directory-maven-plugin	
directory-maven-plugin-javadoc	
dirsplit	
dleyna-connector-dbus	
dleyna-core	
dleyna-renderer	
dleyna-server	
dnf-plugin-spacewalk	
dnssec-trigger	
dnssec-trigger-panel	
dotnet	
dotnet-apphost-pack-3.0	
dotnet-apphost-pack-3.1	
dotnet-apphost-pack-5.0	
dotnet-build-reference-packages	
dotnet-host-fxr-2.1	

Package	Note
dotnet-hostfxr-3.0	
dotnet-hostfxr-3.1	
dotnet-hostfxr-5.0	
dotnet-runtime-2.1	
dotnet-runtime-3.0	
dotnet-runtime-3.1	
dotnet-runtime-5.0	
dotnet-sdk-2.1	
dotnet-sdk-2.1.5xx	
dotnet-sdk-3.0	
dotnet-sdk-3.1	
dotnet-sdk-3.1-source-built-artifacts	
dotnet-sdk-5.0	
dotnet-sdk-5.0-source-built-artifacts	
dotnet-targeting-pack-3.0	
dotnet-targeting-pack-3.1	
dotnet-targeting-pack-5.0	
dotnet-templates-3.0	
dotnet-templates-3.1	
dotnet-templates-5.0	
dotnet5.0-build-reference-packages	

Package	Note
dptfxtract	
drpm	
drpm-devel	
dump	The **dump** package providing the **dump** utility has been removed. You can use the **tar**, **dd**, or **bacula** backup utility instead.
dvd+rw-tools	
dyninst-static	
easymock-javadoc	
eclipse-ecf	
eclipse-ecf-core	
eclipse-ecf-runtime	
eclipse-emf	
eclipse-emf-core	
eclipse-emf-runtime	
eclipse-emf-xsd	
eclipse-equinox-osgi	
eclipse-jdt	
eclipse-license	
eclipse-p2-discovery	
eclipse-pde	
eclipse-platform	
eclipse-swt	
ed25519-java	

Package	Note
ee4j-parent	
elfutils-devel-static	
elfutils-libelf-devel-static	
elinks	
emacs-terminal	
emoji-picker	
enca	
enca-devel	
environment-modules-compat	
evemu	
evemu-libs	
evince-browser-plugin	
exec-maven-plugin	
exec-maven-plugin-javadoc	
farstream02	
felix-gogo-command	
felix-gogo-runtime	
felix-gogo-shell	
felix-osgi-compendium	
felix-osgi-compendium-javadoc	
felix-osgi-core	

Package	Note
felix-osgi-core-javadoc	
felix-osgi-foundation	
felix-osgi-foundation-javadoc	
felix-parent	
felix-scr	
felix-utils-javadoc	
file-roller	
fipscheck	
fipscheck-devel	
fipscheck-lib	
fonts-tweak-tool	
forge-parent	
freeradius-mysql	
freeradius-perl	
freeradius-postgresql	
freeradius-sqlite	
freeradius-unixODBC	
frei0r-devel	
frei0r-plugins	
frei0r-plugins-opencv	
fuse-sshfs	
fusesource-pom	
future	

Package	Note
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	

Package	Note
gcc-toolset-10-gcc-gfortran	
gcc-toolset-10-gcc-plugin-devel	
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	

Package	Note
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-11	
gcc-toolset-11-annobin-annocheck	
gcc-toolset-11-annobin-docs	
gcc-toolset-11-annobin-plugin-gcc	
gcc-toolset-11-binutils	
gcc-toolset-11-binutils-devel	
gcc-toolset-11-build	
gcc-toolset-11-dwz	
gcc-toolset-11-dyninst	

Package	Note
gcc-toolset-11-dyninst-devel	
gcc-toolset-11-elfutils	
gcc-toolset-11-elfutils-debuginfod-client	
gcc-toolset-11-elfutils-debuginfod-client-devel	
gcc-toolset-11-elfutils-devel	
gcc-toolset-11-elfutils-libelf	
gcc-toolset-11-elfutils-libelf-devel	
gcc-toolset-11-elfutils-libs	
gcc-toolset-11-gcc	
gcc-toolset-11-gcc-c++	
gcc-toolset-11-gcc-gdb-plugin	
gcc-toolset-11-gcc-gfortran	
gcc-toolset-11-gcc-plugin-devel	
gcc-toolset-11-gdb	
gcc-toolset-11-gdb-doc	
gcc-toolset-11-gdb-gdbserver	
gcc-toolset-11-libasan-devel	
gcc-toolset-11-libatomic-devel	
gcc-toolset-11-libgccjit	
gcc-toolset-11-libgccjit-devel	

Package	Note
gcc-toolset-11-libgccjit-docs	
gcc-toolset-11-libitm-devel	
gcc-toolset-11-liblsan-devel	
gcc-toolset-11-libquadmath-devel	
gcc-toolset-11-libstdc++-devel	
gcc-toolset-11-libstdc++-docs	
gcc-toolset-11-libtsan-devel	
gcc-toolset-11-libubsan-devel	
gcc-toolset-11-ltrace	
gcc-toolset-11-make	
gcc-toolset-11-make-devel	
gcc-toolset-11-perftools	
gcc-toolset-11-runtime	
gcc-toolset-11-strace	
gcc-toolset-11-systemtap	
gcc-toolset-11-systemtap-client	
gcc-toolset-11-systemtap-devel	
gcc-toolset-11-systemtap-initscript	
gcc-toolset-11-systemtap-runtime	
gcc-toolset-11-systemtap-sdt-devel	

Package	Note
gcc-toolset-11-systemtap-server	
gcc-toolset-11-toolchain	
gcc-toolset-11-valgrind	
gcc-toolset-11-valgrind-devel	
gcc-toolset-12-annobin-annocheck	
gcc-toolset-12-annobin-docs	
gcc-toolset-12-annobin-plugin-gcc	
gcc-toolset-12-binutils-devel	
gcc-toolset-12-binutils-gold	
gcc-toolset-9	
gcc-toolset-9-annobin	
gcc-toolset-9-binutils	
gcc-toolset-9-binutils-devel	
gcc-toolset-9-build	
gcc-toolset-9-dwz	
gcc-toolset-9-dyninst	
gcc-toolset-9-dyninst-devel	
gcc-toolset-9-dyninst-doc	
gcc-toolset-9-dyninst-static	
gcc-toolset-9-dyninst-testsuite	
gcc-toolset-9-elfutils	

Package	Note
gcc-toolset-9-elfutils-devel	
gcc-toolset-9-elfutils-libelf	
gcc-toolset-9-elfutils-libelf-devel	
gcc-toolset-9-elfutils-libs	
gcc-toolset-9-gcc	
gcc-toolset-9-gcc-c++	
gcc-toolset-9-gcc-gdb-plugin	
gcc-toolset-9-gcc-gfortran	
gcc-toolset-9-gcc-plugin-devel	
gcc-toolset-9-gdb	
gcc-toolset-9-gdb-doc	
gcc-toolset-9-gdb-gdbserver	
gcc-toolset-9-libasan-devel	
gcc-toolset-9-libatomic-devel	
gcc-toolset-9-libitm-devel	
gcc-toolset-9-liblsan-devel	
gcc-toolset-9-libquadmath-devel	
gcc-toolset-9-libstdc++-devel	
gcc-toolset-9-libstdc++-docs	
gcc-toolset-9-libtsan-devel	

Package	Note
gcc-toolset-9-libubsan-devel	
gcc-toolset-9-ltrace	
gcc-toolset-9-make	
gcc-toolset-9-make-devel	
gcc-toolset-9-perftools	
gcc-toolset-9-runtime	
gcc-toolset-9-strace	
gcc-toolset-9-systemtap	
gcc-toolset-9-systemtap-client	
gcc-toolset-9-systemtap-devel	
gcc-toolset-9-systemtap-initscript	
gcc-toolset-9-systemtap-runtime	
gcc-toolset-9-systemtap-sdt-devel	
gcc-toolset-9-systemtap-server	
gcc-toolset-9-toolchain	
gcc-toolset-9-valgrind	
gcc-toolset-9-valgrind-devel	
GConf2	
GConf2-devel	
gegl	

Package	Note
genwqe-tools	
genwqe-vpd	
genwqe-zlib	
genwqe-zlib-devel	
geoipupdate	
geronimo-annotation	
geronimo-annotation	
geronimo-annotation-javadoc	
geronimo-jms	
geronimo-jms-javadoc	
geronimo-jpa	
geronimo-jpa-javadoc	
geronimo-parent-poms	
gfbgraph	
gflags	
gflags-devel	
glassfish-annotation-api	
glassfish-annotation-api	
glassfish-annotation-api-javadoc	
glassfish-el	
glassfish-fastinfoset	
glassfish-jaxb-core	

Package	Note
glassfish-jaxb-txw2	
glassfish-jsp	
glassfish-jsp-api	
glassfish-jsp-api	
glassfish-jsp-api-javadoc	
glassfish-legal	
glassfish-master-pom	
glassfish-servlet-api	
glassfish-servlet-api	
glassfish-servlet-api-javadoc	
glew-devel	
glib2-fam	
glog	
glog-devel	
gmock	
gmock-devel	
gnome-abrt	
gnome-boxes	
gnome-menus-devel	
gnome-online-miners	
gnome-shell-extension-dash-to-panel	
gnome-shell-extension-disable-screenshield	

Package	Note
gnome-shell-extension-horizontal-workspaces	
gnome-shell-extension-no-hot-corner	
gnome-shell-extension-window-grouper	
gnome-themes-standard	
gnu-free-fonts-common	
gnu-free-mono-fonts	
gnu-free-sans-fonts	
gnu-free-serif-fonts	
gnuplot	
gnuplot-common	
gnuplot-doc	
google-droid-kufi-fonts	
google-gson	
google-guice-javadoc	
google-noto-kufi-arabic-fonts	
google-noto-naskh-arabic-fonts	
google-noto-naskh-arabic-ui-fonts	
google-noto-nastaliq-urdu-fonts	
google-noto-sans-balinese-fonts	

Package	Note
google-noto-sans-bamum-fonts	
google-noto-sans-batak-fonts	
google-noto-sans-buginese-fonts	
google-noto-sans-buhid-fonts	
google-noto-sans-canadian-aboriginal-fonts	
google-noto-sans-cham-fonts	
google-noto-sans-cuneiform-fonts	
google-noto-sans-cypriot-fonts	
google-noto-sans-gothic-fonts	
google-noto-sans-gurmukhi-ui-fonts	
google-noto-sans-hanunoo-fonts	
google-noto-sans-inscriptional-pahlavi-fonts	
google-noto-sans-inscriptional-parthian-fonts	
google-noto-sans-javanese-fonts	
google-noto-sans-lepcha-fonts	
google-noto-sans-limbu-fonts	

Package	Note
google-noto-sans-linear-b-fonts	
google-noto-sans-lisu-fonts	
google-noto-sans-mandaic-fonts	
google-noto-sans-meetei-mayek-fonts	
google-noto-sans-mongolian-fonts	
google-noto-sans-myanmar-fonts	
google-noto-sans-myanmar-ui-fonts	
google-noto-sans-new-tai-lue-fonts	
google-noto-sans-ogham-fonts	
google-noto-sans-ol-chiki-fonts	
google-noto-sans-old-italic-fonts	
google-noto-sans-old-persian-fonts	
google-noto-sans-oriya-fonts	
google-noto-sans-oriya-ui-fonts	
google-noto-sans-phags-pa-fonts	
google-noto-sans-rejang-fonts	
google-noto-sans-runic-fonts	

Package	Note
google-noto-sans-samaritan-fonts	
google-noto-sans-saurashtra-fonts	
google-noto-sans-sundanese-fonts	
google-noto-sans-syloti-nagri-fonts	
google-noto-sans-syriac-eastern-fonts	
google-noto-sans-syriac-estrangela-fonts	
google-noto-sans-syriac-western-fonts	
google-noto-sans-tagalog-fonts	
google-noto-sans-tagbanwa-fonts	
google-noto-sans-tai-le-fonts	
google-noto-sans-tai-tham-fonts	
google-noto-sans-tai-viet-fonts	
google-noto-sans-tibetan-fonts	
google-noto-sans-tifinagh-fonts	
google-noto-sans-ui-fonts	
google-noto-sans-yi-fonts	
google-noto-serif-bengali-fonts	

Package	Note
google-noto-serif-devanagari-fonts	
google-noto-serif-gujarati-fonts	
google-noto-serif-kannada-fonts	
google-noto-serif-malayalam-fonts	
google-noto-serif-tamil-fonts	
google-noto-serif-telugu-fonts	
gphoto2	
gsl-devel	
gssntlmssp	
gtest	
gtest-devel	
gtkmm24	
gtkmm24-devel	
gtkmm24-docs	
gtksourceview3	
gtksourceview3-devel	
gtkspell	
gtkspell-devel	
guava20-javadoc	
guava20-testlib	

Package	Note
guice-assistedinject	
guice-bom	
guice-extensions	
guice-grapher	
guice-jmx	
guice-jndi	
guice-multibindings	
guice-parent	
guice-servlet	
guice-testlib	
guice-throwingproviders	
guile	
guile-devel	
gutenprint-libs-ui	
gutenprint-plugin	
gvfs-afc	
gvfs-afp	
gvfs-archive	
hamcrest-core	
hamcrest-core	
hamcrest-demo	
hamcrest-javadoc	

Package	Note
hawtjni	
hawtjni	
hawtjni	
hawtjni-javadoc	
hawtjni-runtime	
hawtjni-runtime	
HdrHistogram	
HdrHistogram-javadoc	
highlight-gui	
hplip-gui	
hspell	
httpcomponents-client-cache	
httpcomponents-client-javadoc	
httpcomponents-core-javadoc	
httpcomponents-project	
hwloc-plugins	
hyphen-fo	
hyphen-grc	
hyphen-hsb	
hyphen-ia	
hyphen-is	
hyphen-ku	

Package	Note
hyphen-mi	
hyphen-mn	
hyphen-sa	
hyphen-tk	
ibus-sayura	
ibus-table-devel	
ibus-table-tests	
ibus-typing-booster-tests	
icedax	
icu4j	
idm-console-framework	
ilmbase-devel	
ima-evm-utils0	
imake	
intel-gpu-tools	
ipython	
isl	
isl-devel	
isorelax	
isorelax-javadoc	
istack-commons-runtime	
istack-commons-tools	
ivy-local	

Package	Note
iwl3945-firmware	
iwl4965-firmware	
iwl6000-firmware	
jacoco	
jaf	
jaf-javadoc	
jakarta-commons-httpclient-demo	
jakarta-commons-httpclient-javadoc	
jakarta-commons-httpclient-manual	
jakarta-oro-javadoc	
janino	
jansi-javadoc	
jansi-native	
jansi-native	
jansi-native-javadoc	
jarjar	
java-1.8.0-ibm	
java-1.8.0-ibm-demo	
java-1.8.0-ibm-devel	
java-1.8.0-ibm-headless	
java-1.8.0-ibm-jdbc	

Package	Note
java-1.8.0-ibm-plugin	
java-1.8.0-ibm-src	
java-1.8.0-ibm-webstart	
java-1.8.0-openjdk-accessibility	
java-1.8.0-openjdk-accessibility-fastdebug	
java-1.8.0-openjdk-accessibility-slowdebug	
java-atk-wrapper	
java_cup	
java_cup-javadoc	
java_cup-manual	
javacc	
javacc-demo	
javacc-javadoc	
javacc-manual	
javacc-maven-plugin	
javacc-maven-plugin-javadoc	
javaewah	
javamail-javadoc	
javapackages-local	
javaparser	
javapoet	

Package	Note
javassist	
javassist	
javassist-javadoc	
javassist-javadoc	
jaxen	
jaxen-demo	
jaxen-javadoc	
jboss-annotations-1.2-api	
jboss-interceptors-1.2-api	
jboss-interceptors-1.2-api	
jboss-interceptors-1.2-api-javadoc	
jboss-logmanager	
jboss-parent	
jctools	
jdepend-demo	
jdepend-javadoc	
jdependency	
jdependency-javadoc	
jdom	
jdom-demo	
jdom-javadoc	
jdom2	

Package	Note
jdom2-javadoc	
jetty	
jetty-continuation	
jetty-http	
jetty-io	
jetty-security	
jetty-server	
jetty-servlet	
jetty-util	
jffi	
jflex	
jflex-javadoc	
jgit	
jline	
jline	
jline-javadoc	
jmc	
jmc-core-javadoc	
jnr-netdb	
jolokia-jvm-agent	
js-uglify	
jsch-javadoc	
json_simple	

Package	Note
jsoup-javadoc	
jsr-305-javadoc	
jss-javadoc	
jtidy	
jul-to-slf4j	
junit-javadoc	
junit-manual	
jvnet-parent	
jzlib-demo	
jzlib-javadoc	
khmeros-fonts-common	
kmod-redhat-oracleasm	
kurdit-unikurd-web-fonts	
kyotocabinet-libs	
ldapjdk-javadoc	
lensfun	
lensfun-devel	
lftp-scripts	
libaec	
libaec-devel	
libappindicator-gtk3	
libappindicator-gtk3-devel	
libasan6	

Package	Note
libatomic-static	
libavc1394	
libblocksruntime	
libcacard	
libcacard-devel	
libcgroup	
libcgroup-pam	
libcgroup-tools	
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	

Package	Note
libdnet	
libdnet-devel	
libdv	
libdv-devel	
libdwarf	The **libdwarf** package is not included in RHEL 9. The**elfutils** package provides similar functionality.
libdwarf-devel	
libdwarf-static	
libdwarf-tools	
libeasyfc	
libeasyfc-gobject	
libepubgen-devel	
libertas-sd8686-firmware	
libertas-usb8388-firmware	
libertas-usb8388-olpc-firmware	
libgdither	
libGLEW	
libgovirt	
libguestfs-benchmarking	
libguestfs-gfs2	
libguestfs-java	
libguestfs-java-devel	
libguestfs-javadoc	

Package	Note
libguestfs-tools	
libguestfs-tools-c	
libhugetlbfs	
libhugetlbfs-devel	
libhugetlbfs-utils	
libicu-doc	
libIDL	
libIDL-devel	
libidn	The **libidn** package (which implements the IDNA 2003 standard) is not included in RHEL 9. You can migrate applications to **libidn2**, which implements the IDNA 2008 standard and has a different feature set to **libidn**.
libidn-devel	
libiec61883	
libiec61883-devel	
libindicator-gtk3	
libindicator-gtk3-devel	
libiscsi-devel	
libkkc	
libkkc-common	
libkkc-data	
liblogging	
libmalaga	
libmcpp	

Package	Note
libmetalink	
libmodulemd1	The **libmodulemd1** package has been removed and is replaced by the **libmodulemd** package.
libmongocrypt	
libmpcdec	
libmpcdec-devel	
libmtp-devel	
libmusicbrainz5	
libmusicbrainz5-devel	
libnice	
libnice-devel	
libnice-gstreamer1	
liboauth	
liboauth-devel	
libocxl-docs	
libpfm-static	
libpng12	
libpsm2-compat	
libpurple	
libpurple-devel	
libraw1394	
libraw1394-devel	
libreport-plugin-mailx	

Package	Note
libreport-plugin-rhtsupport	
libreport-plugin-ureport	
libreport-rhel	
libreport-rhel-bugzilla	
librpmem	The **librpmem** package has been removed. Use the**librpma** package instead.
librpmem-debug	
librpmem-devel	
libsass	
libsass-devel	
libselinux-python	
libslirp-devel	
libsqlite3x	
libssh2-docs	
libtar	
libtpms-devel	
libunwind	
libusal	
libvarlink	
libverto-libevent	
libvirt-admin	
libvirt-bash-completion	

Package	Note
libvirt-daemon-driver-storage-gluster	
libvirt-daemon-driver-storage-iscsi-direct	
libvirt-gconfig	
libvirt-gobject	
libvirt-wireshark	
libvmem	
libvmem-debug	
libvmem-devel	
libvmmalloc	
libvmmalloc-debug	
libvmmalloc-devel	
libvncserver	
libwmf	
libwmf-devel	
libwmf-lite	
libXNVCtrl	
libXNVCtrl-devel	
libXvMC	
libXvMC-devel	
libXxf86misc	
libXxf86misc-devel	
libyami	

Package	Note
log4j-over-slf4j	
log4j12	
log4j12	
log4j12-javadoc	
log4j12-javadoc	
lohit-malayalam-fonts	
lohit-nepali-fonts	
lucene	
lucene-analysis	
lucene-analyzers-smartcn	
lucene-queries	
lucene-queryparser	
lucene-sandbox	
lz4-java	
lz4-java-javadoc	
mailman	
make-devel	
malaga	
malaga-suomi-voikko	
marisa	
marisa-devel	
maven-antrun-plugin	
maven-antrun-plugin-javadoc	

Package	Note
maven-archiver-javadoc	
maven-artifact	
maven-artifact-manager	
maven-artifact-resolver-javadoc	
maven-artifact-transfer-javadoc	
maven-assembly-plugin	
maven-assembly-plugin-javadoc	
maven-cal10n-plugin	
maven-clean-plugin	
maven-clean-plugin-javadoc	
maven-common-artifact-filters-javadoc	
maven-compiler-plugin-javadoc	
maven-dependency-analyzer	
maven-dependency-analyzer-javadoc	
maven-dependency-plugin	
maven-dependency-plugin-javadoc	
maven-dependency-tree-javadoc	
maven-doxia	
maven-doxia-core	

Package	Note
maven-doxia-javadoc	
maven-doxia-logging-api	
maven-doxia-module-apt	
maven-doxia-module-confluence	
maven-doxia-module-docbook-simple	
maven-doxia-module-fml	
maven-doxia-module-latex	
maven-doxia-module-rtf	
maven-doxia-module-twiki	
maven-doxia-module-xdoc	
maven-doxia-module-xhtml	
maven-doxia-modules	
maven-doxia-sink-api	
maven-doxia-sitetools	
maven-doxia-sitetools-javadoc	
maven-doxia-test-docs	
maven-doxia-tests	
maven-enforcer-javadoc	
maven-failsafe-plugin	
maven-file-management-javadoc	
maven-filtering-javadoc	

Package	Note
maven-hawtjni-plugin	
maven-install-plugin	
maven-install-plugin-javadoc	
maven-invoker	
maven-invoker-javadoc	
maven-invoker-plugin	
maven-invoker-plugin-javadoc	
maven-jar-plugin-javadoc	
maven-javadoc	
maven-local	
maven-model	
maven-monitor	
maven-parent	
maven-plugin-build-helper-javadoc	
maven-plugin-bundle-javadoc	
maven-plugin-descriptor	
maven-plugin-registry	
maven-plugin-testing-javadoc	
maven-plugin-testing-tools	
maven-plugin-tools-ant	
maven-plugin-tools-beanshell	
maven-plugin-tools-javadoc	

Package	Note
maven-plugin-tools-javadocs	
maven-plugin-tools-model	
maven-plugins-pom	
maven-profile	
maven-project	
maven-remote-resources-plugin-javadoc	
maven-reporting-api	
maven-reporting-api-javadoc	
maven-reporting-impl	
maven-reporting-impl-javadoc	
maven-resolver-api	
maven-resolver-api	
maven-resolver-connector-basic	
maven-resolver-connector-basic	
maven-resolver-impl	
maven-resolver-impl	
maven-resolver-javadoc	
maven-resolver-spi	
maven-resolver-spi	
maven-resolver-test-util	

Package	Note
maven-resolver-transport-classpath	
maven-resolver-transport-file	
maven-resolver-transport-http	
maven-resolver-transport-wagon	
maven-resolver-transport-wagon	
maven-resolver-util	
maven-resolver-util	
maven-resources-plugin-javadoc	
maven-scm	
maven-script	
maven-script-ant	
maven-script-beanshell	
maven-script-interpreter	
maven-script-interpreter-javadoc	
maven-settings	
maven-shade-plugin	
maven-shade-plugin-javadoc	
maven-shared	
maven-shared-incremental-javadoc	

Package	Note
maven-shared-io-javadoc	
maven-shared-utils-javadoc	
maven-source-plugin-javadoc	
maven-surefire-javadoc	
maven-surefire-report-parser	
maven-surefire-report-plugin	
maven-test-tools	
maven-toolchain	
maven-verifier-javadoc	
maven-wagon-file	
maven-wagon-file	
maven-wagon-ftp	
maven-wagon-http	
maven-wagon-http	
maven-wagon-http-lightweight	
maven-wagon-http-shared	
maven-wagon-http-shared	
maven-wagon-javadoc	
maven-wagon-provider-api	
maven-wagon-provider-api	
maven-wagon-providers	
maven2	

Package	Note
maven2	
maven2-javadoc	
meanwhile	
mercurial	
mercurial-hgk	
mesa-libGLES-devel	
mesa-vdpau-drivers	
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	

Package	Note
mingw32-libpng-static	
mingw32-libtiff	
mingw32-libtiff-static	
mingw32-openssl	
mingw32-readline	
mingw32-spice-vdagent	
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	

Package	Note
mingw64-libpng	
mingw64-libpng-static	
mingw64-libtiff	
mingw64-libtiff-static	
mingw64-nettle	
mingw64-openssl	
mingw64-readline	
mingw64-spice-vdagent	
mingw64-sqlite	
mingw64-sqlite-static	
mockito-javadoc	
modello	
modello-javadoc	
mojo-parent	
mongo-c-driver	
motif-static	
mousetweaks	
mozjs52	
mozjs52-devel	
mozjs60	
mozjs60-devel	
mozvoikko	
msv-javadoc	

Package	Note
msv-manual	
munge-maven-plugin	
munge-maven-plugin-javadoc	
mythes-lb	
mythes-mi	
mythes-ne	
nafees-web-naskh-fonts	
nbd-3.21-2.el9	
nbdkit-gzip-plugin	
nbdkit-plugin-python-common	
nbdkit-plugin-vddk	
nbdkit-tar-plugin	
ncompress	The **ncompress** package has been removed. You can use a different compressing tool, such as **gzip**, **zlib**, or **zstd**.
ncurses-compat-libs	
netcf	
netcf-devel	
netcf-libs	
network-scripts	
network-scripts-ppp	
nkf	
nodejs-devel	
nodejs-packaging	

Package	Note
nss-pam-ldapd	The **nss-pam-ldapd** package has been removed. You can use SSSD instead.
nss_nis	
objectweb-asm-javadoc	
objectweb-pom	
objenesis-javadoc	
ocaml-bisect-ppx	
ocaml-camlp4	
ocaml-camlp4-devel	
ocaml-lwt-5.3.0-7.el9	
ocaml-mmap-1.1.0-16.el9	
ocaml-ocplib-endian-1.1-5.el9	
ocaml-ounit-2.2.2-15.el9	
ocaml-result-1.5-7.el9	
ocaml-seq-0.2.2-4.el9	
opencryptoki-tpmtok	
opencv-contrib	
opencv-core	
opencv-devel	
OpenEXR-devel	
openhpi	
openhpi-libs	
OpenIPMI-perl	

Package	Note
openssh-cavs	
openssh-ldap	
openssl-ibmpkcs11	
os-maven-plugin	
os-maven-plugin-javadoc	
osgi-annotation-javadoc	
osgi-compendium-javadoc	
osgi-core-javadoc	
overpass-mono-fonts	
owasp-java-encoder-javadoc	
pakchois	
pandoc	
pandoc-common	
paps-libs	
paranamer	
paratype-pt-sans-caption-fonts	
parfait	
parfait-examples	
parfait-javadoc	
pcp-parfait-agent	
pcsc-lite-doc	
perl-B-Debug	

Package	Note
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-2.5-4.el9	

Package	Note
php-recode	
php-xmlrpc	
pidgin	
pidgin-devel	
pidgin-sipe	
pinentry-emacs	
pinentry-gtk	
pipewire0.2-devel	
pipewire0.2-libs	
platform-python-coverage	
plexus-ant-factory	
plexus-ant-factory-javadoc	
plexus-archiver-javadoc	
plexus-bsh-factory	
plexus-bsh-factory-javadoc	
plexus-build-api-javadoc	
plexus-cipher-javadoc	
plexus-classworlds-javadoc	
plexus-cli	
plexus-cli-javadoc	
plexus-compiler-extras	
plexus-compiler-javadoc	
plexus-compiler-pom	

Package	Note
plexus-component-api	
plexus-component-api-javadoc	
plexus-component-factories-pom	
plexus-components-pom	
plexus-containers-component-javadoc	
plexus-containers-component-metadata	
plexus-containers-container-default	
plexus-containers-javadoc	
plexus-i18n	
plexus-i18n-javadoc	
plexus-interactivity	
plexus-interactivity-api	
plexus-interactivity-javadoc	
plexus-interactivity-jline	
plexus-interpolation-javadoc	
plexus-io-javadoc	
plexus-languages-javadoc	
plexus-pom	
plexus-resources-javadoc	
plexus-sec-dispatcher-javadoc	

Package	Note
plexus-utils-javadoc	
plexus-velocity	
plexus-velocity-javadoc	
plymouth-plugin-throbgress	
pmreorder	
postgresql-test-rpm-macros	
powermock	
powermock-api-easymock	
powermock-api-mockito	
powermock-api-support	
powermock-common	
powermock-core	
powermock-javadoc	
powermock-junit4	
powermock-reflect	
powermock-testng	
prometheus-jmx-exporter	
prometheus-jmx-exporter-openjdk11	
ptscotch-mpich	
ptscotch-mpich-devel	
ptscotch-mpich-devel-parmetis	

Package	Note
ptscotch-openmpi	
ptscotch-openmpi-devel	
purple-sipe	
pygobject2-doc	
pygtk2	
pygtk2-codegen	
pygtk2-devel	
pygtk2-doc	
python-nose-docs	
python-nss-doc	
python-podman-api	
python-psycopg2-doc	
python-pymongo-doc	
python-redis	
python-schedutils	
python-slip	
python-sphinx-locale	
python-sqlalchemy-doc	
python-varlink	
python-virtualenv-doc	
python2-backports	
python2-backports-ssl_match_hostname	

Package	Note
python2-bson	
python2-coverage	
python2-docs	
python2-docs-info	
python2-funcsigs	
python2-gluster	
python2-ipaddress	
python2-iso8601	
python2-mock	
python2-nose	
python2-numpy-doc	
python2-psycopg2-debug	
python2-psycopg2-tests	
python2-pymongo	
python2-pymongo-gridfs	
python2-pytest-mock	
python2-sqlalchemy	
python2-tools	
python2-virtualenv	
python3-bson	
python3-click	
python3-coverage	

Package	Note
python3-cpio	
python3-custodia	
python3-docs	
python3-evdev	
python3-flask	
python3-gevent	
python3-html5lib	
python3-hypothesis	
python3-iso8601	
python3-itsdangerous	
python3-javapackages	
python3-jwt	
python3-mock	
python3-networkx-core	
python3-nose	
python3-nss	
python3-openipmi	The **python3-openipmi** package is no longer provided.**python3-pyghmi** has been introduced in order to provide a simpler Python API for the IPMI protocol, but the API is not compatible with the one of **python3-openipmi**.
python3-pexpect	
python3-pillow	
python3-pillow-devel	
python3-pillow-doc	

Package	Note
python3-pillow-tk	
python3-ptyprocess	
python3-pydbus	
python3-pymongo	
python3-pymongo-gridfs	
python3-pyOpenSSL	
python3-reportlab	
python3-schedutils	
python3-scons	
python3-semantic_version	
python3-slip	
python3-slip-dbus	
python3-sqlalchemy	The **python3-sqlalchemy** package has been removed. Customers must use Python connectors for MySQL or PostgreSQL directly. Python 3 database connector for MySQL is available in the **python3-PyMySQL** package. Python 3 database connector for PostgreSQL is available in the **python3-psycopg2** package.
python3-sure	
python3-syspurpose	
python3-unittest2	
python3-virtualenv	Use the **venv** module in Python 3 instead.
python3-webencodings	
python3-werkzeug	
python3-whoosh	
python38-asn1crypto	

Package	Note
python38-atomicwrites	
python38-more-itertools	
python38-numpy-doc	
python38-psycopg2-doc	
python38-psycopg2-tests	
python39-more-itertools	
python39-numpy-doc	
python39-psycopg2-doc	
python39-psycopg2-tests	
python39-pybind11	
python39-pybind11-devel	
qdox-javadoc	
qemu-kvm-block-gluster	
qemu-kvm-block-iscsi	
qemu-kvm-block-ssh	
qemu-kvm-device-display-virtio-gpu-gl	
qemu-kvm-device-display-virtio-gpu-pci-gl	
qemu-kvm-device-display-virtio-vga-gl	
qemu-kvm-hw-usbredir	
qemu-kvm-tests	
qemu-kvm-ui-spice	

Package	Note
qpdf	
qpdf-doc	
qperf	The **qperf** package has been removed. You can use the **perftest** or **iperf3** package instead.
qpid-proton	
qrencode	
qrencode-devel	
qrencode-libs	
qt5-qtcanvas3d	
qt5-qtcanvas3d-examples	
rarian	
rarian-compat	
re2c	
recode	
redhat-lsb	
redhat-lsb-core	
redhat-lsb-cxx	
redhat-lsb-desktop	
redhat-lsb-languages	
redhat-lsb-printing	
redhat-lsb-submod-multimedia	
redhat-lsb-submod-security	
redhat-menus	

Package	Note
redhat-support-lib-python	
redhat-support-tool	
reflections	
regexp-javadoc	
relaxngDatatype	
resteasy-javadoc	
rhsm-gtk	
rpm-plugin-prioreset	
rpmemd	
rubygem-abrt	
rubygem-abrt-doc	
rubygem-bson	
rubygem-bson-doc	
rubygem-bundler-doc	
rubygem-mongo	
rubygem-mongo-doc	
rubygem-net-telnet	
rubygem-xmlrpc	
s390utils-cmsfs	The **s390utils-cmsfs** package has been removed and is replaced by the **s390utils-cmsfs-fuse** package.
samyak-devanagari-fonts	
samyak-fonts-common	
samyak-gujarati-fonts	

Package	Note
samyak-malayalam-fonts	
samyak-odia-fonts	
samyak-tamil-fonts	
sane-frontends	The **sane-frontends** package has been removed. Its functionality is covered by the **scanimage** or **xsane** package.
sanlk-reset	
sat4j	
scala	
scotch	
scotch-devel	
SDL_sound	
selinux-policy-minimum	
shim-ia32	
shrinkwrap	
sil-padauk-book-fonts	
sisu-inject	
sisu-inject	
sisu-javadoc	
sisu-mojos	
sisu-mojos-javadoc	
sisu-plexus	
sisu-plexus	
skkdic	

Package	Note
slf4j-ext	
slf4j-javadoc	
slf4j-jcl	
slf4j-log4j12	
slf4j-manual	
slf4j-sources	
SLOF	
smc-anjalioldlipi-fonts	
smc-dyuthi-fonts	
smc-fonts-common	
smc-kalyani-fonts	
smc-raghumalayalam-fonts	
smc-suruma-fonts	
softhsm-devel	
sonatype-oss-parent	
sonatype-plugins-parent	
sos-collector	
sparsehash-devel	
spax	The **spax** package has been removed. You can use the**tar** and **cpio** commands instead.
spec-version-maven-plugin	
spec-version-maven-plugin-javadoc	
spice-0.14.3-4.el9	

Package	Note
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-qxl-wddm-dod	
spice-qxl-xddm	
spice-server	
spice-server-devel	
spice-streaming-agent	
spice-vdagent-win-x64	
spice-vdagent-win-x86	
star	
stax-ex	
stax2-api	
stringtemplate	
stringtemplate4	

Package	Note
subscription-manager-initial-setup-addon	
subscription-manager-migration	
subscription-manager-migration-data	
subversion-javahl	
SuperLU	
SuperLU-devel	
swtpm-devel	
swtpm-tools-pkcs11	
system-storage-manager	
systemd-tests	
tcl-brlapi	
testng	
testng-javadoc	
thai-scalable-laksaman-fonts	
tibetan-machine-uni-fonts	
timedatex	The **timedatex** package has been removed. The **systemd** package provides the **systemd-timedated** service, which replaces **timedatex**.
torque	
torque-devel	
torque-libs	
tpm-quote-tools	
tpm-tools	

Package	Note
tpm-tools-pkcs11	
treelayout	
trousers	
trousers-devel	
trousers-lib	
tuned-profiles-compat	
tuned-profiles-nfv-host-bin	
tuned-utils-systemtap	
tycho	
uglify-js	
unbound-devel	
univocity-output-tester	
usbguard-notifier	
utf8cpp	
uthash	
uthash-devel	
velocity-demo	
velocity-javadoc	
velocity-manual	
vinagre	
vino	
virt-dib	

Package	Note
virt-p2v-maker	
vm-dump-metrics-devel	
voikko-tools	
vorbis-tools	
weld-parent	
woodstox-core	
wqy-microhei-fonts	
wqy-unibit-fonts	
xalan-j2-demo	
xalan-j2-javadoc	
xalan-j2-manual	
xalan-j2-xsltc	
xbean-javadoc	
xdelta	
xerces-j2-demo	
xerces-j2-javadoc	
xinetd	
xml-commons-apis-javadoc	
xml-commons-apis-manual	
xml-commons-resolver-javadoc	
xmlgraphics-commons	
xmlstreambuffer	

Package	Note
xmlunit-javadoc	
xmvn-api	
xmvn-bisect	
xmvn-connector-aether	
xmvn-connector-ivy	
xmvn-install	
xmvn-javadoc	
xmvn-parent-pom	
xmvn-resolve	
xmvn-subst	
xmvn-tools-pom	
xorg-sgml-doctools	
xorg-x11-apps	
xorg-x11-docs	
xorg-x11-drv-ati	
xorg-x11-drv-intel	
xorg-x11-drv-nouveau	
xorg-x11-drv-qxl	
xorg-x11-drv-vesa	
xorg-x11-server-Xspice	
xorg-x11-xkb-utils-devel	
xpp3	
xsane-gimp	

Package	Note
xsom	
xz-java-javadoc	
yajl-devel	
yp-tools	
ypbind	
ypserv	
yum-rhn-plugin	
zsh-html	

A.5. PACKAGES WITH REMOVED SUPPORT

Certain packages in RHEL 9 are distributed through the CodeReady Linux Builder repository, which contains unsupported packages for use by developers.

The following packages are distributed in a supported repository in RHEL 8 and in the CodeReady Linux Builder repository RHEL 9:

NOTE

This list covers only packages that are supported in RHEL 8 but not in RHEL 9.

Package	RHEL 8 repository
apache-commons-collections	rhel8-AppStream
apache-commons-compress	rhel8-AppStream
aspell	rhel8-AppStream
bind-devel	rhel8-AppStream
createrepo_c-devel	rhel8-AppStream
fstrm-devel	rhel8-AppStream
gdbm	rhel8-BaseOS

Package	RHEL 8 repository
gdbm-devel	rhel8-BaseOS
geoclue2-demos	rhel8-AppStream
gobject-introspection-devel	rhel8-AppStream
gtkspell3	rhel8-AppStream
hivex-devel	rhel8-AppStream
kernel-cross-headers	rhel8-BaseOS
ksc	rhel8-BaseOS
libatomic_ops	rhel8-AppStream
libestr-devel	rhel8-AppStream
libfdisk-devel	rhel8-BaseOS
libguestfs-devel	rhel8-AppStream
libguestfs-gobject	rhel8-AppStream
libguestfs-gobject-devel	rhel8-AppStream
libguestfs-man-pages-ja	rhel8-AppStream
libguestfs-man-pages-uk	rhel8-AppStream
libica-devel	rhel8-BaseOS
libiscsi-devel	rhel8-AppStream
libjose-devel	rhel8-AppStream
libldb-devel	rhel8-BaseOS
libluksmeta-devel	rhel8-AppStream
libnbd-devel	rhel8-AppStream
libtalloc-devel	rhel8-BaseOS
libtdb-devel	rhel8-BaseOS

Package	RHEL 8 repository
libtevent-devel	rhel8-BaseOS
libvirt-devel	rhel8-AppStream
libvirt-docs	rhel8-AppStream
libvirt-lock-sanlock	rhel8-AppStream
libwinpr-devel	rhel8-AppStream
lua-guestfs	rhel8-AppStream
mariadb-devel	rhel8-AppStream
mariadb-embedded-devel	rhel8-AppStream
mariadb-test	rhel8-AppStream
multilib-rpm-config	rhel8-AppStream
mysql-devel	rhel8-AppStream
mysql-libs	rhel8-AppStream
mysql-test	rhel8-AppStream
nbdkit-devel	rhel8-AppStream
nbdkit-example-plugins	rhel8-AppStream
nginx-mod-devel	rhel8-AppStream
nss_db	rhel8-BaseOS
openblas-threads	rhel8-AppStream
perl-IO-String	rhel8-AppStream
perl-Module-Pluggable	rhel8-AppStream
perl-Module-Runtime	rhel8-AppStream
perl-Parse-Yapp	rhel8-BaseOS
postgresql-server-devel	rhel8-AppStream

Package	RHEL 8 repository
postgresql-test	rhel8-AppStream
postgresql-upgrade-devel	rhel8-AppStream
protobuf-c-compiler	rhel8-AppStream
protobuf-c-devel	rhel8-AppStream
protobuf-compiler	rhel8-AppStream
python3-gobject-base	rhel8-AppStream
python3-hivex	rhel8-AppStream
python3-ipatests	rhel8-AppStream
python3-libguestfs	rhel8-AppStream
qclib-devel	rhel8-BaseOS
ruby-hivex	rhel8-AppStream
ruby-libguestfs	rhel8-AppStream
samba-pidl	rhel8-BaseOS
samba-test	rhel8-BaseOS
samba-test-libs	rhel8-BaseOS
sendmail-milter	rhel8-AppStream
spice-protocol	rhel8-BaseOS
supermin-devel	rhel8-AppStream
swig	rhel8-AppStream
swig-doc	rhel8-AppStream
swig-gdb	rhel8-AppStream
turbojpeg	rhel8-AppStream
unixODBC-devel	rhel8-AppStream

Package	RHEL 8 repository
usbredir-devel	rhel8-AppStream
velocity	rhel8-AppStream