# Red Hat Enterprise Linux 9

## Considerations in adopting RHEL 9

Key differences between RHEL 8 and RHEL 9

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Key differences between RHEL 8 and RHEL 9

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## Abstract

The Considerations in adopting RHEL 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. KEY RESOURCES FOR EVALUATING AN UPGRADE TO RHEL 9

The Considerations in adopting RHEL 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. Review the following documents when considering the upgrade to RHEL 9:

- 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 guidance on how to install RHEL 9, see, Installing RHEL .
- For information about major differences between RHEL 7 and RHEL 8, see Considerations in adopting RHEL 8.
- For information about capabilities and limits of Red Hat Enterprise Linux 9 as compared to other versions of the system, see the Red Hat Enterprise Linux technology capabilities and limits Knowledgebase article.
- For information regarding the Red Hat Enterprise Linux life cycle, see Red Hat Enterprise Linux Life Cycle.
- For information about a package listing for RHEL 9, including licenses and application compatibility levels, see Package manifest.
- For information about application compatibility levels, see Red Hat Enterprise Linux 9: Application Compatibility Guide.

# 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.

# 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 GOOGLE CLOUD

### TDX support is available a Technology Preview for RHEL on Google Cloud

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.

# 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

### New artifact endpoints for Podman RESTFUL API

Podman RESTFUL API includes new artifact endpoints, enabling programmatic management of OCI artifacts. This enhancement simplifies integration of OCI artifact operations into existing systems and scripts.

### 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.

### The Podman v5.0 deprecations

In RHEL 9.5, the following is deprecated in Podman v5.0:

- The system connections and farm information stored in the **containers.conf** file are now read-only. The system connections and farm information will now be stored in the **podman.connections.json** file, managed only by Podman. Podman continues to support the old configuration options such as **[engine.service_destinations]** and the **[farms]** section. You can still add connections or farms manually if needed; however, it is not possible to delete a connection from the **containers.conf** file with the **podman system connection rm** command.
- The **slirp4netns** network mode is deprecated and will be removed in a future major release of RHEL. The **pasta** network mode is the default network mode for rootless containers.
- The cgroups v1 for rootless containers is deprecated and will be removed in a future major release of RHEL.

### The runc container runtime has been deprecated

The **runc** container runtime is deprecated and will be removed in a future major release of RHEL. The default container runtime is **crun**.

# 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 LLVM, RUST, AND GO

### LLVM Toolset updated to 19.1.7

LLVM Toolset has been updated to version 19.1.7.

Notable changes of the LLVM compiler:

- LLVM now uses debug records, a more efficient representation for debug information.

Notable updates of the Clang:

- C++14 sized deallocation is now enabled by default.
- C++17 support has been completed.
- Improvements to C++20 support, especially around modules, concepts, and Class Template Argument Deduction (CTAD) have been added.
- Improvements to C23, C2c, C23, and C2y support have been added.

For more information, see the LLVM release notes and Clang release notes.

LLVM Toolset is a rolling Application Stream, and only the latest version is supported. For more information, see the Red Hat Enterprise Linux Application Streams Life Cycle document.

### Rust Toolset rebased to version 1.84.0

Rust Toolset has been updated to version 1.84.0. Notable enhancements since the previously available version 1.79.0 include:

- The new **LazyCell** and **LazyLock** types delay the initialization until the first use. These extend the earlier **OnceCell** and **OnceLock** types with the initialization function included in each instance.
- The new sort implementations in the standard library improve the runtime performance and compile times. They also try to detect cases where a comparator is not producing a total order, making that panic instead of returning unsorted data.
- Precise capturing for opaque return types have been added. The new **use<..>** syntax specifies the generic parameters and lifetimes used in an **impl Trait** return type.
- Many new features for **const** code have been added, for example:
  - Floating point support
  - **const** immediates for inline assembly
  - References to statics
  - Mutable reference and pointers

- Many new features for **unsafe** code have been added, for example:
  - Strict provenance APIs
  - **&raw** pointer syntax
  - Safely addressing statics
  - Declaring safe items in unsafe **extern** blocks
- The Cargo dependency resolver is now version aware. If a dependency crate specifies its minimum supported Rust version, Cargo uses this information when it resolves the dependency graph instead of using the latest **semver**-compatible crate version.

Compatibility notes:

- The WebAssembly System Interface (WASI) target is changed from **rust-std-static-wasm32-wasi** to **rust-std-static-wasm32-wasip1**. You can select the WASI target also by using the **--target wasm32-wasip1** parameter on the command line. For more information, see the Changes to Rust's WASI targets upstream blog post.
- The split panic hook and panic handler arguments **core::panic::PanicInfo** and **std::panic::PanicInfo** are now different types.
- **extern "C"** functions now abort on uncaught panics. Use **extern "C-unwind"** instead to allow unwinding across ABI boundaries.

Rust Toolset is a rolling Application Stream, and Red Hat only supports the latest version. For more information, see the Red Hat Enterprise Linux Application Streams Life Cycle document.

### Go Toolset rebased to version 1.23

Go Toolset has been updated to version 1.23. Notable enhancements include:

- The **for-range** loop accepts iterator functions of the following types:
  - **func(func() bool)**
  - **func(func(K) bool)**
  - **func(func(K, V) bool)**
    Calls of the iterator argument function create the iteration values for the **for-range** loop.
    For reference links, see the upstream release notes.
- The Go Toolchain can collect usage and breakage statistics to help the Go team to understand how the Go Toolchain is used and working. By default, Go Telemetry does not upload telemetry data and stores it only locally. For further information, see the upstream Go Telemetry documentation.
- The **go vet** sub-command includes the **stdversion** analyzer which flags references to symbols that are too new for the version of Go you use in the referring file.
- The **cmd** and **cgo** features support the **-ldflags** option to pass flags to the C linker. The **go** command uses this flag automatically to avoid **argument list too long** errors when you use a very large **CGO_LDFLAGS** environment variable.

- The **trace** utility tolerates partially broken traces and attempts to recover the trace data. This is especially useful in case of crashes, because you can get the trace leading up to the crash.
- The traceback printed by the runtime after an unhandled panic or other fatal error carries indentation to distinguish the stack trace of the **goroutine** from the first **goroutine**.
- The compiler build time overhead of using profile-guided optimization was reduced to single-digit percentage.
- The new **-bindnow** linker flag enables immediate function binding when building a dynamically-linked ELF binary.
- The //**go:linkname** linker directive no longer refers to internal symbols in the standard library and the runtime that are not marked with //**go:linkname** on their definition.
- If a program no longer refers to a **Timer** or **Ticker**, garbage collection cleans them up immediately even if their **Stop** method has not been called. The timer channel associated with a **Timer** or **Ticker** is now unbuffered with capacity 0. This ensures that, every time a **Reset** or **Stop** method is called, no stale values are not sent or received after the call.
- The new **unique** package provides facilities for canonicalizing values, such as **interning** or **hash-consing**.
- The new **iter** package provides the basic definitions to work with user-defined iterators.
- The **slices** and **maps** packages introduce several new functions that work with iterators.
- The new **structs** package provides types for struct fields that modify properties of the containing struct type, such as memory layout.
- Minor changes are made in the following packages:
  - **archive/tar**
  - **crypto/tls**
  - **crypto/x509**
  - **database/sql**
  - **debug/elf**
  - **encoding/binary**
  - **go/ast**
  - **go/types**
  - **math/rand/v2**
  - **net**
  - **net/http**
  - **net/http/httptest**

- **net/netips**
- **path/filepath**
- **reflect**
- **runtime/debug**
- **runtime/pprof**
- **runtime/trace**
- **slices**
- **sync**
- **sync/atomic**
- **syscall**
- **testing/fstest**
- **text/template**
- **time**
- **unicode/utf16**

For more information, see the upstream release notes.

Go Toolset is a rolling Application Stream, and Red Hat supports only the latest version. For more information, see the Red Hat Enterprise Linux Application Streams Life Cycle document.

### 32-bit ARM and MIPS backends are removed from **llvm**

The **llvm** package in RHEL 9.7 removed the 32-bit ARM and MIPS backends. This change reduces build time and maintenance effort for the toolchain. If you require these backends, you should use alternative build targets or earlier package versions.

## 7.2. NOTABLE CHANGES TO PERFORMANCE TOOLS AND DEBUGGERS

### valgrind rebased to version 3.24.0

The **valgrind** suite has been updated to version 3.24.0. Notable enhancements include:

- The **--track-fds=yes** option now shows suppressible errors when using bad file descriptors, and the errors are written to the XML output. The warnings shown, if you do not use the option, are deprecated and will be removed in a future version.
- Error messages now support Ada name demangling.
- The **deflate-conversion** facility (z15/arch13) now supports the deflate compression call (DFLTCC) instruction on the IBM Z platform.

- On the IBM Z platform, **Valgrind** now supports the instructions provided by the message security assist (MSA) facility and its 1-9 extensions.
- **Valgrind** now supports the following new Linux system calls:
  - **open_tree**
  - **move_mount**
  - **fsopen**
  - **fsconfig**
  - **fsmount**
  - **fspick**
  - **landlock_create_ruleset**
  - **landlock_add_rule**
  - **landlock_restrict_self**

### libabigail rebased to version 2.6

The **libabigail** library has been updated to version 2.6. Notable changes include:

- Better support for Linux kernel module analysis by using the BPF Type Format (BTF) and Common Trace Format (CTF).
- Improved internal type comparison algorithms in the middle end.
- Improved logging in **abipkgdiff**, **abidw**, and **abilint** utilities.
- Numerous bug fixes.

For further changes, see the upstream release notes.

### elfutils rebased to version 0.192

The **elfutils** package has been updated to version 0.192. Notable improvements include:

- The **debuginfod** service can now perform a per-file signature verification to check the integrity by using the RPM Integrity Measurement Architecture (IMA) scheme from RHEL.
- A new **debuginfod** API was added to query server metadata, such as querying the build ID from a file name.
- **Debuginfod** server-side extraction of files from kernel **debuginfo** packages is now significantly faster.
- The **dwfl_set_sysroot**, **dwfl_frame_unwound_source**, and **dwfl_unwound_source_str** functions were added to the **libdw** library.
- The **eu-stacktrace** utility is available as a Technology Preview. For details, see xref:[Jira-RHELDOCS-19072].

### SystemTap rebased to version 5.2

The **SystemTap** tracing and probing tool has been updated to version 5.2.

A notable enhancement is the full activation of **debuginfod-metadata** based probes, based on **elfutils** 0.192. With this feature, you can write a **systemtap** script to target a full range of versions of a given binary or library by searching a **debuginfod** server for all matching names.

## 7.3. 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.

## 7.4. RED HAT BUILD OF OPENJDK

### Red Hat build of OpenJDK 17 is the default Java implementation since RHEL 9.5

The default RHEL 9 Java implementation is being changed from OpenJDK 11, which has reached its End Of Life (EOL), to OpenJDK 17. After this update, the **java-17-openjdk** packages, which provide the OpenJDK 17 Java Runtime Environment and the OpenJDK 17 Java Software Development Kit, will also provide the **java** and **java-devel** packages. For more information, see the OpenJDK documentation.

Existing packages in RHEL 9 that call **java/bin** or **java-openjdk/bin** directly will be immediately able to use OpenJDK 17.

Existing packages in RHEL 9 that require the **java** or **java-devel** packages directly, namely **tomcat** and **systemtap-runtime-java**, will pull the appropriate dependency automatically.

Ant, Maven, and packages that are using Java indirectly through the **javapackages-tools** package will be fully transitioned in an asynchronous update shortly after the general availability of RHEL 9.5.

If you need to install OpenJDK for the first time or if the default package is not installed through a dependency chain, use DNF:

```
# dnf install java-17-openjdk-devel
```

For more information, see Installing multiple minor versions of Red Hat build of OpenJDK on RHEL by using yum.

**IMPORTANT**

The current **java-11-openjdk** packages in RHEL 9 will not receive any further updates. However, Red Hat will provide Extended Life Cycle support (ELS) phase 1 with updates for Red Hat build of OpenJDK 11 until October 31, 2027. See Red Hat build of OpenJDK 11 Extended Lifecycle Support (ELS-1) Availability for details.

For information specific to the OpenJDK ELS program and the OpenJDK lifecycle, see the OpenJDK Life Cycle and Support Policy .

**NOTE**

If you have the **alternatives** command set to **manual** mode for **java** and related components, OpenJDK 11 will still be used after the update. To use OpenJDK 17 in this case, change the **alternatives** setting to **auto**, for example:

```
# alternatives --auto java
# alternatives --auto javac
```

Use the **alternatives --list** command to verify the settings.

## 7.5. .NET ON RHEL 9

### .NET 7.0 is no longer supported

.NET 7.0 reached its End Of Life (EOL) in May 2024. Use .NET 8.0 or later instead. For details about usage, see .NET 8.0 documentation. For information about the length of support, see the Red Hat Enterprise Linux Application Streams Life Cycle.

## 7.6. COMPATIBILITY BREAKING CHANGES IN COMPILERS AND DEVELOPMENT TOOLS

Compilers and development tools in RHEL 9 contain several changes that break compatibility with compilers and development tools in RHEL 8. These include library merges, macro changes, and symbol deprecations, and require code modifications and application updates.

### Non-constant PTHREAD_STACK_MIN, MINSIGSTKSZ, and SIGSTKSZ macros

In order to better support architectures that need a variable stack size for scalable vector registers, the constant value for the **PTHREAD_STACK_MIN**, **MINSIGSTKSZ**, and **SIGSTKSZ** macros have changed to a non-constant value, such as a **sysconf** call.

You can no longer use the **PTHREAD_STACK_MIN**, **MINSIGSTKSZ**, and **SIGSTKSZ** macros in a way that treats them like constant values. The value returned for the **PTHREAD_STACK_MIN**, **MINSIGSTKSZ**, and **SIGSTKSZ** macros is now of the long data type and might generate compiler warnings when compared against an unsigned value, such as **size_t**.

### Libraries merged into libc.so.6

With this update, the following libraries have been merged into the **libc** library to provide a smoother in-place-upgrade experience, support safe use of threading at any time by a process, and to simplify the internal implementation:

- **libpthread**
- **libdl**
- **libutil**
- **libanl**

Additionally, parts of the **libresolv** library have been moved into libc to support moving the Name Switch Service (NSS) files and Domain Name System (DNS) plugins directly into the **libc** library. The NSS files and DNS plugins are now directly built into the **libc** library and can be used during an upgrade or across a **chroot** or container boundary. Their use across a **chroot** or container boundary supports safely querying Identity Management (IdM) data from those sources.

### New location of zdump utility

**/usr/bin/zdump** is the new location of the **zdump** utility.

### Deprecation of sys_siglist, _sys_siglist, and sys_sigabbrev symbols

The **sys_siglist**, **_sys_siglist**, and **sys_sigabbrev** symbols are exported only as compatibility symbols to support old binaries. All programs should use the **strsignal** symbol instead.

Using the **sys_siglist**, **_sys_siglist**, and **sys_sigabbrev** symbols creates issues such as copy relocations and an error-prone Application Binary Interface (ABI) with no explicit bound checks for the array access.

This change might affect building from source for some package. To fix the issue, rewrite the program to use the **strsignal** symbol instead. For example:

```
#include <signal.h>
#include <stdio.h>

static const char *strsig (int sig)
{
  return sys_siglist[sig];
}

int main (int argc, char *argv[])
{
```

```
  printf ("%s\n", strsig (SIGINT));
  return 0;
}
```

should be adjusted to:

```
#include <signal.h>
#include <stdio.h>
#include <string.h>

static const char *strsig (int sig)
{
  return strsignal(sig);
}

int main (int argc, char *argv[])
{
  printf ("%s\n", strsig (SIGINT));
  return 0;
}
```

Or, to use the **glibc-2.32** GNU extensions **sigabbrev_np** or **sigdescr_np**,:

```
#define _GNU_SOURCE
#include <signal.h>
#include <stdio.h>
#include <string.h>

static const char *strsig (int sig)
{
  const char *r = sigdescr_np (sig);
  return r == NULL ? "Unknown signal" : r;
}

int main (int argc, char *argv[])
{
  printf ("%s\n", strsig (SIGINT));
  printf ("%s\n", strsig (-1));
  return 0;
}
```

Both extensions are async-signal-safe and multithread-safe.

### Deprecation of the sys_errlist, _sys_errlist, sys_nerr, and _sys_nerr symbols

The **sys_errlist**, **_sys_errlist**, **sys_nerr**, and **_sys_nerr** symbols are exported solely as compatibility symbols to support old binaries. All programs should use the **strerror** or **strerror_r** symbols instead.

Using the **sys_errlist**, **_sys_errlist**, **sys_nerr**, and **_sys_nerr** symbols creates issues such as copy relocations and an error-prone ABI with no explicit bound checks for the array access.

This change might affect building from source for some packages. To fix the problem, rewrite the program using the **strerror** or **strerror_r** symbols. For example:

```
#include <stdio.h>
```

```
#include <errno.h>

static const char *strerr (int err)
{
  if (err < 0 || err > sys_nerr)
    return "Unknown";
  return sys_errlist[err];
}

int main (int argc, char *argv[])
{
  printf ("%s\n", strerr (-1));
  printf ("%s\n", strerr (EINVAL));
  return 0;
}
```

should be adjusted to:

```
#include <stdio.h>
#include <errno.h>

static const char *strerr (int err)
{
  return strerror (err);
}

int main (int argc, char *argv[])
{
  printf ("%s\n", strerr (-1));
  printf ("%s\n", strerr (EINVAL));
  return 0;
}
```

Or, to use the **glibc-2.32** GNU extensions **strerrorname_np** or **strerrordesc_np**:

```
#define _GNU_SOURCE
#include <stdio.h>
#include <errno.h>
#include <string.h>

static const char *strerr (int err)
{
  const char *r = strerrordesc_np (err);
  return r == NULL ? "Unknown error" : r;
}

int main (int argc, char *argv[])
{
  printf ("%s\n", strerr (-1));
  printf ("%s\n", strerr (EINVAL));
  return 0;
}
```

Both extensions are async-signal-safe and multithread-safe.

### Userspace memory allocator, malloc, changes

The **mallwatch** and **tr_break** symbols are now deprecated and no longer used in the **mtrace** function. You can achieve similar functionality by using conditional breakpoints within **mtrace** functions from within GDB.

The **__morecore** and **__after_morecore_hook malloc** hooks and the default implementation, **__default_morecore**, have been removed from the API. Existing applications continue to link against these symbols but the interfaces no longer have any effect on **malloc**.

Debugging features in **malloc** such as the **MALLOC_CHECK_** environment variable (or the **glibc.malloc.check** tunable), **mtrace()**, and **mcheck()** have now been disabled by default in the main C library. To use these features, preload the new **libc_malloc_debug.so** debugging DSO.

The deprecated functions **malloc_get_state** and **malloc_set_state** have been moved from the core C library into the **libc_malloc_debug.so** library. Legacy applications that still use these functions must now preload the **libc_malloc_debug.so** library in their environment using the **LD_PRELOAD** environment variable.

The deprecated memory allocation hooks **__malloc_hook**, **__realloc_hook**, **__memalign_hook**, and **__free_hook** are now removed from the API. Compatibility symbols are present to support legacy programs, but new applications can no longer link to these symbols. These hooks no longer have any effect on **glibc** functionality. The **malloc** debugging DSO **libc_malloc_debug.so** currently supports hooks and can be preloaded to get this functionality back for older programs. However, this is a transitional measure and may be removed in a future release of the GNU C Library. You can port away from these hooks by writing and preloading your own **malloc** interposition library.

### Lazy binding failures terminate the process

If a lazy binding failure happens during the **dlopen** function, during the execution of an ELF constructor, the process is now terminated. Previously, the dynamic loader returned **NULL** from **dlopen** with the lazy binding error captured in a **dlerror** message. In general, this is unsafe because resetting the stack in an arbitrary function call is not possible.

### Deprecation of the stime function

The **stime** function is no longer available to newly linked binaries, and its declaration has been removed from **<time.h>**. Use the **clock_settime** function for programs that set the system time instead.

### popen and system functions do not run atfork handlers anymore

Although it is a possible POSIX violation, the POSIX rationale in **pthread_atfork** documentation regarding **atfork** handlers is to handle inconsistent mutex states after a fork call in a multi-threaded process. In both the **popen** and **system** functions there is no direct access to user-defined mutexes.

#### Deprecated features in the C++ standard library

- **std::string::reserve(n)** will no longer reduce the string's capacity if called with an argument that is less than the string's current capacity. A string's capacity can be reduced by calling **reserve()** with no arguments, but that form is deprecated. The equivalent **shrink_to_fit()** should be used instead.
- The non-standard **std::__is_nullptr_t** type trait was deprecated. The standard **std::is_null_pointer** trait should be used instead.

# 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.

### **power-profiles-daemon** is replaced with **tuned** in **gnome-control-center**

**gnome-control-center** replaced **power-profiles-daemon** with **tuned** for its power profiles, such as Power Saver, Balanced, and Performance. You can customize the **tuned** profiles used by GNOME Settings to control the system's power consumption. **Tuned** dynamically adjusts system parameters such as CPU frequency, display brightness, and USB auto-suspend based on the workload for effective power management and performance tuning.

# 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.

### The PostGIS extension is available for PostgreSQL

Starting with RHEL 9.7, the PostGIS extension is available for PostgreSQL. With this extension, PostgreSQL supports geographic objects, enabling spatial queries and analysis for Geographic Information System (GIS) applications, such as mapping, geolocation, and distance calculations within a relational database.

### 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.

### Differences between the **perl** and **perl-interpreter** packages

RHEL 9 provides both the **perl** and **perl-interpreter** packages. The **perl** package is suitable for development because it contains the full Perl upstream distribution in dependencies, including GCC. On production systems, use the **perl-interpreter** package, which contains the main **/usr/bin/perl** interpreter.

### 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

RHEL 9.6 introduces the following changes over the previous versions:

### Support to file system customization for the **simplified-installer** and **raw** images

You can add file system customizations to a blueprint when building the following image types:

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

### 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: You can add file system customizations to a blueprint when building the following image types:

- **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**
- **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.

### 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

### The **dnsmasq** package has been removed from RHEL for Edge

RHEL 9.6 and later releases of RHEL for Edge will no longer include the **dnsmasq** package by default. If you want to use this package, you must customize your blueprint with the **dnsmasq** package and use the blueprint to create your edge artifacts.

# 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 on your system.

### NFS with TLS is fully supported

Network File System (NFS) with Transport Layer Security (TLS), introduced in RHEL 9.4 as a Technology Preview, is now fully supported. This feature enhances NFS security by enabling TLS for Remote Procedure Call (RPC) traffic, ensuring encrypted communication between clients and servers. For details, see Configuring an NFS server with TLS support.

## 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. DEPRECATED HARDWARE SUPPORT

The following devices (drivers, adapters) are still tested and maintained, however they are planned to become unmaintained, and eventually disabled, in a future major release. These devices should not be used in new deployments, and a plan to replace them should be undertaken immediately.

**Table 12.1. Deprecated hardware support**

| Device ID | Driver | Device description |
|---|---|---|
| | aacraid | Dell PERC2, 2/Si, 3/Si, 3/Di, Adaptec Advanced Raid Products, HP NetRAID-4M, IBM ServeRAID & ICP SCSI driver |
| | af_key | PF_KEY sockets |
| | ahci_seattle | Seattle AHCI SATA platform driver |
| | ahci_xgene | APM X-Gene AHCI SATA driver |
| | arp_tables | ARP tables support |
| | bnx2fc | QLogic FCoE Driver |
| | bnx2i | QLogic NetXtreme II BCM5706/5708/5709/57710/57711/57712/57800/57810/57840 iSCSI Driver |
| | bnx2x | QLogic BCM57710/57711/57711E/57712/57712_MF/57800/57800_MF/57810/57810_MF/57840/57840_MF Driver |
| | cnic | QLogic cnic Driver |
| | ebtables | Ethernet Bridge tables (ebtables) support |
| | firewire_core | |
| | hisi_sas_main | HISILICON SAS controller driver |
| | ip_set | IP set support |
| | ip_tables | IP tables support (required for filtering/masq/NAT) |
| | ip6_tables | IP6 tables support (required for filtering) |

| Device ID | Driver | Device description |
|---|---|---|
| | nft_compat | Netfilter x_tables over nf_tables module |
| | qla4xxx | QLogic ISP4XXX and ISP82XX iSCSI Host Adapter |
| | team | Ethernet team driver support |

## 12.2. 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.

**Table 12.2. Unmaintained hardware support**

| Device ID | Driver | Device description |
|---|---|---|
| 0x10df:0xe220 | be2net | Emulex Corporation: OneConnect NIC (Lancer) |
| | bnx2 | QLogic BCM5706/5708/5709/5716 Driver |
| | dl2k | |
| | e1000 | Intel® PRO/1000 Network Driver |
| | hdlc_fr | |
| | 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 |

| Device ID | Driver | Device description |
|---|---|---|
| 0x10df:0xfc40 | lpfc | Emulex Corporation: Saturn-X: LightPulse Fibre Channel Host Adapter |
| 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] |
| 0x15B3:0x1003 | mlx4_core | Mellanox Technologies: MT27500 Family [ConnectX-3] |
| 0x15B3:0x1004 | mlx4_core | Mellanox Technologies: MT27500 Family [ConnectX-3 Virtual Function] |
| 0x15B3:0x1005 | mlx4_core | Mellanox Technologies: MT27510 Family [ConnectX-3] |
| 0x15B3:0x1006 | mlx4_core | Mellanox Technologies: MT27511 Family [ConnectX-3] |
| 0x15B3:0x1007 | mlx4_core | Mellanox Technologies: MT27520 Family [ConnectX-3 Pro] |
| 0x15B3:0x1008 | mlx4_core | Mellanox Technologies: MT27521 Family [ConnectX-3 Pro] |
| 0x15B3:0x1009 | mlx4_core | Mellanox Technologies: MT27530 Family [ConnectX-3 Pro] |
| 0x15B3:0x100a | mlx4_core | Mellanox Technologies: MT27531 Family [ConnectX-3 Pro] |
| 0x15B3:0x100b | mlx4_core | Mellanox Technologies: MT27540 Family [ConnectX-3 Pro] |
| 0x15B3:0x100c | mlx4_core | Mellanox Technologies: MT27541 Family [ConnectX-3 Pro] |
| 0x15B3:0x100d | mlx4_core | Mellanox Technologies: MT27550 Family [ConnectX-3 Pro] |
| 0x15B3:0x100e | mlx4_core | Mellanox Technologies: MT27551 Family [ConnectX-3 Pro] |
| 0x15B3:0x100f | mlx4_core | Mellanox Technologies: MT27560 Family [ConnectX-3 Pro] |
| 0x15B3:0x1010 | mlx4_core | Mellanox Technologies: MT27561 Family [ConnectX-3 Pro] |
| | mptbase | Fusion MPT SAS Host driver |
| | mptsas | Fusion MPT SAS Host driver |
| | mptscsih | Fusion MPT SCSI Host driver |

| Device ID | Driver | Device description |
|---|---|---|
| | mptspi | Fusion MPT SAS Host driver |
| 0x1000:0x006E | mpt3sas | Broadcom / LSI: SAS2308 PCI-Express Fusion-MPT SAS-2 |
| 0x1000:0x0080 | mpt3sas | Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2 |
| 0x1000:0x0081 | mpt3sas | Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2 |
| 0x1000:0x0082 | mpt3sas | Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2 |
| 0x1000:0x0083 | mpt3sas | Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2 |
| 0x1000:0x0084 | mpt3sas | Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2 |
| 0x1000:0x0085 | mpt3sas | Broadcom / LSI: SAS2208 PCI-Express Fusion-MPT SAS-2 |
| 0x1000:0x0086 | mpt3sas | Broadcom / LSI: SAS2308 PCI-Express Fusion-MPT SAS-2 |
| 0x1000:0x0087 | mpt3sas | Broadcom / LSI: SAS2308 PCI-Express Fusion-MPT SAS-2 |
| | myri10ge | Myricom 10G driver (10GbE) |
| | netxen_nic | QLogic/NetXen (1/10) GbE Intelligent Ethernet Driver |
| | nfp | Netronome NFP driver |
| | nicpf | Cavium ThunderX NIC PF driver |
| | nicvf | Cavium ThunderX NIC VF driver |
| | nvmet_fc | NVMe/Fabrics FC target driver |
| | nvmet_tcp | NVMe/TCP target 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 |

| Device ID | Driver | Device description |
|---|---|---|
| | rdma_rxe | |
| 0x1924:0x0803 | sfc | Solarflare Communications: SFC9020 10G Ethernet Controller |
| 0x1924:0x0813 | sfc | Solarflare Communications: SFL9021 10GBASE-T Ethernet Controller |
| | siw | Software iWARP Driver |
| | usnic_verbs | Cisco VIC (usNIC) Verbs Driver |
| | vmw_pvrdma | VMware Paravirtual RDMA driver |

## 12.3. 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.

**Table 12.3. Removed hardware support**

| Device ID | Driver | Device description |
|---|---|---|
| | 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 |

| Device ID | Driver | Device description |
|---|---|---|
| ppc64le:ibm:4c:* | | Power8NVL |
| s390x:ibm:2964:* | | z13 |
| s390x:ibm:2965:* | | z13s |
| 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.

### IdM-to-IdM migration is fully supported in IdM

IdM-to-IdM migration, previously available as a Technology Preview, is fully supported in RHEL 9.7. You can use the **ipa-migrate** command to migrate all IdM-specific data, such as SUDO rules, HBAC, DNA ranges, hosts, services, and more, from one IdM server to another. This can be useful, for example, when moving IdM from a development or staging environment into a production environment.

### 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
   ```

3. To restore caching and synchronization of user information, enable the integration between **shadow-utils** and **sssd_cache** by creating a symbolic link:

   ```
   # ln -s /usr/sbin/sss_cache /usr/sbin/sss_cache_shadow_utils
   ```

### 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**.

### ansible-freeipa now additionally provides the roles and modules as an Ansible collection in the ansible-freeipa-collection subpackage

To use the new collection:

1. Install the **ansible-freeipa-collection** subpackage.
2. Add the **freeipa.ansible_freeipa** prefix to the names of roles and modules. Use the fully-qualified names to follow Ansible recommendations. For example, to refer to the **ipahbacrule** module, use **freeipa.ansible_freeipa.ipahbacrule**.

You can simplify the use of the modules that are part of the **freeipa.ansible_freeipa** collection by applying **module_defaults**.

### HSM is now fully supported in IdM

Hardware Security Modules (HSM) are now fully supported in Identity Management (IdM). You can store your key pairs and certificates for your IdM Cerificate Authority (CA) and Key Recovery Authority (KRA) on an HSM. This adds physical security to the private key material.

IdM relies on the networking features of the HSM to share the keys between machines to create replicas. The HSM provides additional security without visibly affecting most IPA operations. When using low-level tooling the certificates and keys are handled differently but this is seamless for most users.

> **NOTE**
>
> Migration of an existing CA or KRA to an HSM-based setup is not supported. You need to reinstall the CA or KRA with keys on the HSM.

You need the following:

- A supported HSM
- The HSM Public-Key Cryptography Standard (PKCS) #11 library
- An available slot, token, and the token password

To install a CA or KRA with keys stored on an HSM, you must specify the token name and the path to the PKCS#11 library. For example:

```
ipa-server-install -r EXAMPLE.TEST -U --setup-dns --allow-zone-overlap --no-forwarders -N --auto-reverse --random-serial-numbers --token-name=HSM-TOKEN --token-library-path=/opt/nfast/toolkits/pkcs11/libcknfast.so --setup-kra
```

### **named** now uses OpenSSL to ensure DNSSEC validation

In RHEL 9, the **named** daemon in RHEL Identity Management (IdM) has adopted the OpenSSL PKCS#11 engine to secure DNS data with a digital signature to protect DNS from attacks. Previously in RHEL 8, IdM used a special version of the **bind** package, namely **bind-pkcs11**, for this purpose. Additionally, this update removes the **bind-pkcs11-utils** package. Use **pkcs11-tool** from the **opensc** package to manage PKCS#11 tokens or stored keys instead.

### Compatibility between the **ansible-freeipa** RPM and RH AAH collections

Starting with RHEL 9.7, the **freeipa.ansible_freeipa** collection subpackage that the **ansible-freeipa** RPM package provides is now compatible with the namespace and name of the **redhat.rhel_idm** collection provided by Red Hat Ansible Automation Hub (RH AAH). If you have installed the RPM collection subpackage, you can now run playbooks that reference the AAH roles and modules. Note that internally, the namespace and names from the RPM subpackage are used.

## 14.2. TECHNOLOGY PREVIEWS

### DNS over TLS (DoT) in IdM deployments is available as a Technology Preview

As of RHEL 9.6, encrypted DNS using DNS over TLS (DoT) is available as a Technology Preview in Identity Management (IdM) deployments. You can encrypt all DNS queries and responses between DNS clients and IdM DNS servers.

To start using this functionality, install the **ipa-server-encrypted-dns** package on IdM servers and replicas, and the **ipa-client-encrypted-dns** package on IdM clients. Administrators can enable DoT during the installation using the **--dns-over-tls** option.

IdM configures Unbound as a local caching resolver and BIND to receive DoT requests. This functionality is available through the command-line interface (CLI) and non-interactive installations of IdM.

The following options were added to installation utilities for IdM servers, replicas, clients, and the integrated DNS service:

- **--dot-forwarder** to specify an upstream DoT-enabled DNS server.
- **--dns-over-tls-key** and **--dns-over-tls-cert** to configure DoT certificates.
- **--dns-policy** to set a DNS security policy to either allow fallback to unencrypted DNS or enforce strict DoT usage.

By default, IdM uses the **relaxed** DNS policy, which allows fallback to unencrypted DNS. You can enforce encrypted-only communication by using the new **--dns-policy** option with the **enforced** setting.

You can also enable DoT on an existing IdM deployment by reconfiguring the integrated DNS service using **ipa-dns-install** with the new DoT options.

### Encrypted DNS with DoT is available in ansible-freeipa installations of IdM as a Technology Preview

You can use Ansible to ensure that all DNS queries and responses between DNS clients and Identity Management (IdM) DNS servers are encrypted. Starting with RHEL 9.7, encrypted DNS using DNS over TLS (DoT) is available as a Technology Preview in the **ansible-freeipa** package.

To enable DoT during a deployment of IdM by using **ansible-freeipa** use the following options:

- **ipaserver_dns_over_tls** with the **ipaserver** role for a new server.
- **ipareplica_dns_over_tls** with the **ipareplica** role for a replica.
- **dot_forwarder** to specify an upstream DoT-enabled DNS server.
- **dns_over_tls_key** and **dns_over_tls_cert** to configure DoT certificates.

Additionally, you can set the **dns_policy** variable to enforce DoT-only communication, overriding the default behavior that allows fallback to unencrypted DNS.

## 14.3. 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. For more information, see the AD Domain Users unable to login in to the FIPS-compliant environment KCS solution.

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.

## 14.4. 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.

## 14.5. 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 performed via the **krb5** or LDAP modules, or through the PAM module integrated into 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.

### The nsslapd-changelogcompactdb-interval parameter has been removed from the 389-ds-base package

Starting with RHEL 9.0, the Directory Server changelog was integrated into the main database. As a result, the **nsslapd-changelogcompactdb-interval** parameter no longer exists.

### The nsslapd-logging-hr-timestamps-enabled configuration parameter has been removed from the 389-ds-base package

The **nsslapd-logging-hr-timestamps-enabled** configuration parameter has been removed from the **389-ds-base** package in RHEL 9.6. Before this update, you could turn off the high resolution timestamps in Directory Server and the log files would have the following timestamps:

```
11/Feb/2025:20:30:48
```

Starting with RHEL 9.6, Directory Server log files use only high resolution timestamps:

```
11/Feb/2025:20:30:48.736142391
```

# 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.

### The BIND 9.18 is now supported in RHEL

**BIND 9.18** has been added in RHEL 9.5 in the new **bind9.18** package. The notable feature enhancements include the following:

- Added support for DNS over TLS (DoT) and DNS over HTTPS (DoH) in the `named`daemon
- Added support for both incoming and outgoing zone transfers over TLS
- Improved support for OpenSSL 3.0 interfaces
- New configuration options for tuning TCP and UDP send and receive buffers
- Various improvements to the **dig** utility

### Valkey 8 is now available

Valkey 8, an advanced key-value store, is now available in RHEL. It functions as a data structure server, allowing keys to store various data types, for example:

- Strings
- Hashes
- Lists
- Sets
- Sorted sets

Valkey is fully compatible with clients and serves as an alternative to Redis.

### SWIG 4.3.0 available in the CRB repository

The Simplified Wrapper and Interface Generator (SWIG) version 4.3.0 is now available in the CodeReady Linux Builder (CRB) repository. Notable changes include:

- Python Standard Template Library (STL) container wrappers now use the Python Iterator Protocol.
- SWIG now supports:
  - Python stable Application Binary Interface (ABI)
  - Python 3.12 and Python 3.13
  - Ruby 3.2 and Ruby 3.3
  - Tcl 9.0
  - PHP 8; support for PHP 7 has been removed.
- Support for the C++14 auto variable without trailing return type for the C++11 auto variable has been added.
- Constructors, destructors, and assignment operators have been fixed, including implicit, default, and deleted, and related non-assignable variable wrappers.
- A new Javascript generator targeting Node.js binary stable ABI Node-API is now available.
- Multiple deprecated features have been removed.
- Experimental support for C as a target language has been added.
- Handling of namespaces when using the **nspace** feature has been enhanced.
- The STL wrapper has been enhanced for the **std::unique_ptr**, **std::string_view**, **std::filesystem objects**.
- Support for C++17 fold expressions and C++11 trailing return types has been added.
- Handling of string and character literals has been improved.

Note that packages included in the CodeReady Linux Builder repository are unsupported.

# 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.

### 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
```

### Added Kickstart support for CA certificates to enable encrypted DNS configuration during installation

Support for the **%certificate** in the Kickstart file is added to enable the installation of CA certificates into the installer environment and the installed system. This simplifies the setup process and ensures that the encrypted DNS is operational after installation, reducing manual configuration and security gaps. The certificates are inlined in the Base64 ASCII format and imported through the **--dir** and **--filename** options. This enhancement facilitates encrypted DNS configuration as part of **Zero Trust Architecture** requirements. The encrypted DNS set up during installation ensures secure DNS resolution from the start, improving security and compliance in automated deployments. For more information, see Kickstart certificates section.

### 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

RHEL 9.6 introduces the following enhancements over the previous versions:

### RHEL image builder supports creating disk images with advanced partitioning

You can customize partitioning in your blueprints, including custom mount options, LVM-based partitions and LVM-based SWAP, and create disk images with advanced partitioning layout.

### You can inject your Kickstart files when creating ISO images

You can use the **[customization.installer]** blueprint customization field to inject your own Kickstart file when building ISO image. The customization enables you to choose an attended, partial, or fully unattended installation.

### Support to additional Edge image type creation

RHEL image builder now supports building RHEL for Edge for AWS **edge-ami** and Vmware VSphere **edge-vsphere**.

### Disk image partition table unification

Disk images created by using the RHEL image builder tool, such as **qcow2**,**ami**, **vhd**, **vsphere**, and **gce**, now have a separate boot with 1 GiB of space.

### 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 RHEL image builder 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.

### Support to additional Edge image type creation

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 on the command line, 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

### 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 Installing Kernel-64k on ARM.

### The TPM 1.2 secure cryptoprocessor is no longer supported in 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 compatible with previous versions.

Note that for applications that require support for TPM 1.2, use RHEL 8.

### 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 GRUB boot loader 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.

### Support for POSIX_FADV_NOREUSE advice is removed

Before RHEL 9.5, the kernel would ignore advice for **POSIX_FADV_NOREUSE**. From RHEL 9.5, support for this advice was introduced. However, implementing this advice significantly impacted the performance of applications that use the **MADV_RANDOM** advice. As a result, to preserve the RHEL 9 expected behavior for **MADV_RANDOM**, and the implementation for **POSIX_FADV_NOREUSE** is reverted.

From RHEL 9.6, the changes in the behavior of applications are:

- Applications that use **MADV_RANDOM** behave normally, similar to previous versions of RHEL.
- Applications that use **POSIX_FADV_NOREUSE** are not subject to any functional change, but **POSIX_FADV_NOREUSE** is not implemented in the kernel.

### The mce kernel boot parameter has been deprecated

In RHEL 9.3, the behavior of the **mce** kernel boot parameter has changed as a result of an upstream rebase. As a consequence, the tolerance level control functionality is deprecated and will be removed in a future major release.

## 17.4. NOTABLE CHANGES TO BOOT LOADER

### 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**

### Secure Boot shim signing for RHEL 9 on x86_64 and aarch64

Red Hat Enterprise Linux (RHEL) 9 requires a signed shim binary to support Secure Boot on x86_64 and aarch64 architectures. The shim functions as the initial bootloader, verifying and loading subsequent boot components if you enabled Secure Boot. If a signed and trusted shim is not available, RHEL 9 cannot boot on systems with Secure Boot enforced. This limitation might affect deployments in enterprise and cloud environments.

# CHAPTER 18. THE COMMAND-LINE ASSISTANT POWERED BY RHEL LIGHTSPEED IS NOW AVAILABLE IN RHEL

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

## 18.1. NOTABLE CHANGES TO THE COMMAND-LINE ASSISTANT POWERED BY RHEL LIGHTSPEED

RHEL 9.6 introduces the following changes over the previous versions:

### The optional AI tool command-line assistant powered by RHEL Lightspeed is now available in RHEL

You can install the command-line assistant and use the AI tool to interact with workflows to solve issues, to have access to knowledge from several Red Hat resources, implement new RHEL features, find information, and more.

### The command-line assistant powered by Red Hat Lightspeed available in a containerized version

You can run the command-line assistant in a completely disconnected, offline, or air-gapped environment, as it does not require any external network connectivity to operate locally on your workstation or on an individual RHEL system.

### The command-line assistant supports image mode for RHEL

You can customize your Containerfile to include the command-line-assistant package, create a disk image from a container image, and boot a system with that image. The system image has the command-line assistant preinstalled, and you can use it after you register your system with subscription-manager.

# CHAPTER 19. NETWORKING

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

## 19.1. 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.

## 19.2. 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.

## 19.3. 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.

### dhclient in NetworkManager is now deprecated

Instead of the default internal DHCP library, NetworkManager in RHEL 9 can be configured to use a DHCP client from the **dhclient** package. The option to use **dhclient** is now deprecated and results in a warning displayed at the NetworkManager startup. We recommend that you switch to the internal DHCP library. In RHEL 10, **dhclient** is no longer available and the applications configured to use **dhclient** now use the internal DHCP library instead.

## 19.4. 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.

## 19.5. 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 on your system.

## 19.6. 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**.

## 19.7. 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 on your system.

### 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.

### Functionality of the legacy-rx mode has been removed

The **iavf** driver had an alternative packet receive mode called **legacy-rx**. You could enable that mode using the **ethtool --set-priv-flags $INTERFACE legacy-rx on** command. With this update, the functionality of **legacy-rx** has been removed. The mode itself still exists, however setting it has no effect except emitting a warning message in the kernel log:

```
iavf private flag 'legacy-rx' is deprecated. Setting it has no effect.
```

You should remove the **legacy-rx** private flag on **iavf** interfaces from any scripts or configuration files that use this flag.

# CHAPTER 20. PERFORMANCE

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

## 20.1. 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**.

### RHEL is equipped with dyninst version 13.0.0

The **dyninst** framework is rebased to upstream version 13.0.0 This version offers the following list of enhancements:

- Improved support for AMD GPU binaries
- Improved parsing of x86 instructions and C++ DWARF constructs
  For more information, see the upstream documentation.

### RHEL is equipped with SystemTap version 5.3

SystemTap is rebased to version 5.3, and its multithreaded parsing capability improves startup performance by reducing initialization time by several seconds.

# CHAPTER 21. SECURITY

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

## 21.1. 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**.

## 21.2. 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 cryptographic 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 cryptographic 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 Red Hat Knowledgebase 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 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.

### OpenSSH servers now use /etc/ssh/sshd_config.d/ instead of the CRYPTO_POLICY= line in /etc/sysconfig/sshd

In RHEL 9, if you want to opt out of your SSH server from following the system-wide cryptographic policies, you must use the new **/etc/ssh/sshd_config.d/** drop-in directory. The **CRYPTO_POLICY=** directive in the **/etc/sysconfig/sshd** configuration file used for specifying allowed cryptographic algorithms and ciphers in RHEL 8 is now ignored. See the Examples of opting out of the system-wide cryptographic policies section in the Security hardening document and sshd ignores Ciphers, MACs, and KexAlgorithms in /etc/ssh/sshd_config on RHEL 9 for more information.

### 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.

### OpenSSL no longer creates X.509 v1 certificates

With the OpenSSL TLS toolkit 3.2.1 introduced in RHEL 9.5, you can no longer create certificates in the X.509 version 1 format using the **openssl** CA tool. The X.509 v1 format does not meet current web requirements.

### OpenSSL cipher suites no longer enable cipher suites with disabled hashes or MACs

Previously, applying custom cryptographic policies could leave certain TLS 1.3 cipher suites enabled even if their hashes or MACs were disabled, because the OpenSSL TLS 1.3-specific **Ciphersuites** option values were controlled only by the **ciphers** option of the cryptographic policy. With this update, **crypto-policies** takes more algorithms into account when deciding whether to enable a cipher suite. As a result, OpenSSL on systems with custom cryptographic policies might refuse to negotiate some of the previously enabled TLS 1.3 cipher suites in better accordance with the system configuration.

### 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.

### Encrypted DNS in RHEL is available as a Technology Preview

In RHEL 9.6, you can enable encrypted DNS to secure DNS communication that uses DNS-over-TLS (DoT). Encrypted DNS (eDNS) encrypts all DNS traffic end-to-end, with no fallback to insecure protocols, and aligns with Zero Trust Architecture (ZTA) principles.

To perform a new installation with eDNS, specify the DoT-enabled DNS server by using the kernel command line. This ensures encrypted DNS is active during the installation process, boot time, and on the installed system. If you require a custom CA certificate bundle, you can install it only by using the **%certificate** section in the Kickstart file. Currently, the custom CA bundle can be installed only through Kickstart installation.

On an existing system, configure NetworkManager to use a new DNS plugin, **dnsconfd**, which manages the local DNS resolver (unbound) for eDNS. Add kernel arguments to configure eDNS for the early boot process, and optionally install a custom CA bundle.

Additionally, Identity Management (IdM) deployments can also use encrypted DNS, with the integrated DNS server supporting DNS-over-TLS (DoT).

## 21.3. 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 22. 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.

## 22.1. 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.

## 22.2. 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.

### logrotate is started by systemd

Logrotate is the utility for managing the log files. Previously, it was initiated by a cron job that was configured in the **/etc/cron.daily/logrotate** file. In RHEL 9, the **logrotate** is started and managed by a **systemd** timer. You can find the corresponding **systemd** timer unit file in the **/usr/lib/systemd/system/logrotate.timer** file.

### GIMP rebased to 3.0.4

The GNU Image Manipulation Program (GIMP) has been rebased to upstream version 3.0.4 in RHEL 9.7.

# CHAPTER 23. SOFTWARE MANAGEMENT

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

## 23.1. NOTABLE CHANGES TO DNF

### Software management tools in Red Hat Enterprise Linux 9

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.

### Image mode for RHEL users can use **dnf --transient** to perform package transactions that reset on reboot

Previously, Image mode for RHEL users could transiently install, remove, and upgrade packages by running the **bootc usr-overlay** command to unlock the system and then make changes by running DNF commands. If you use **bootc usr-overlay**, when the system reboots, the **/usr** directory overlay disappears and all changes made to it will reset. Changes to other directories, including configuration in **/etc** and program state in **/var**, persist across reboots.

With RHEL 9.6, a new **--transient** flag and a new **persistence** configuration option are added to DNF to improve the user experience on bootc systems. You can skip the **bootc usr-overlay** step by using either of the following options:

- Use the **dnf --transient** command.
- Set the **persistence** option to **transient** in the **dnf.conf** file.

NOTE

Unlike when using **bootc usr-overlay**, **--transient** and **persistence=transient** ensure that the **/usr** directory remains read-only to other processes before, during, and after the transaction.

For example, to transiently install the **make** package, enter:

```
# dnf install --transient make
```

### DNF can verify RPMv6 signatures on RPM packages

Quantum-safe cryptography guarantees integrity and origin of software. However, in quantum computing, standard asymmetric cryptography algorithms, such as RSA, are no longer relevant. Starting from RHEL 9.7, you can use the new **multisig** DNF plugin to verify RPMv6 signatures on RPM packages, in addition to standard RPMv4 signatures. RPMv6 signatures can be based on quantum-safe algorithms, such as ML-DSA.

To verify RPMv6 signatures, you can install the **multisig** plugin through the **python3-dnf-plugin-multisig** RPM package.

NOTE

Successful verification is a prerequisite for installing, reinstalling, upgrading, or downgrading packages from a repository that has the **gpgcheck** option set to **True**.

## 23.2. NOTABLE CHANGES TO RPM

Red Hat Enterprise Linux 9 is distributed with RPM version 4.16.

### New SPEC features

In RHEL 9, RPM introduces multiple new SPEC features and enhancements over the previous version, 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}
    ```

- **%patch N** no longer applies a patch number 0
  Previously, when you used the **%patch N** syntax, where **N** is the number of a patch, the syntax also applied the patch number 0 (**Patch0**) in addition to the patch specified by **N**.

  In RHEL 9.6, the **%patch N** syntax has been fixed to only apply the patch number **N**.

  IMPORTANT

  If you use the **%patch** directive without a patch number specified, as a shorthand for **%patch 0**, **Patch0** is applied. However, a warning is printed that suggests you use the explicit syntax, for example, **%patch 0** or **%patch -P 0** instead of **%patch** to apply the **zero-th** patch.

### RPM database based on sqlite

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

### New rpm-plugin-audit plugin

With this update, you can use a new **rpm-plugin-audit** plugin 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

With this update, UTF-8 validation of header data is enforced at build-time.

### RPM 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.

### RPM records a checksum of the original package during installation

Starting from RHEL 9.7, RPM records the SHA256 and SHA512 digests of the entire **.rpm** package during its installation. You can then retrieve these digests from the RPM database to verify that the installed package corresponds to a specific **.rpm** file. As a result, you can improve the integrity of your RHEL system by retrospectively verifying that the installed package set matches, bit-by-bit, a known set of **.rpm** packages, such as the ones available in a DNF repository. To print the package digests of an installed package, use the following command:

```
$ rpm -q --qf "[%{packagedigestalgos:hashalgo} %{packagedigests}\n]" <package-name>
```

You can also customize which digest types are recorded in the database by configuring the new **%_pkgverify_digests** macro, for example:

```
%_pkgverify_digests 8:10
```

### RPM supports spec-local file attributes and dependency generators

File attributes and their dependency generators are usually shipped in separate packages that you must install prior to building a package that uses these attributes. However, you might need a file attribute to take effect during the build of the package that ships this attribute. You might also need the file attribute just for building the package, without shipping the attribute at all.

Starting from RHEL 9.7, you can register **spec**-local file attributes and generators by performing the following actions:

a. Define the **%_local_file_attrs** macro. **%_local_file_attrs** accepts a colon-separated list of new attribute names to register directly in your **spec** file.

b. Define one or more dependency generator macros for each attribute, such as **%__NAME_provides** or **%__NAME_path**, where **NAME** is the name of the local file attribute.

RPM then uses the file attributes for dependency generation when the **spec** file is built. As a result, you can create build-time file attributes that are not necessarily meant for installation.

For example, the following **spec** file snippet generates the provides for each packaged file by using the **foobar.sh** script bundled with your package's sources:

```
Source1: foobar.sh
[...]
```

```
%define _local_file_attrs foobar
%define foobar_provides %{SOURCE1} %define foobar_path .*
```

# CHAPTER 24. SUBSCRIPTION MANAGEMENT

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

## 24.1. 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.

### 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.

# CHAPTER 25. SYSTEM ROLES

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

## 25.1. 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 9 control nodes can only manage RHEL 7, RHEL 8, and RHEL 9 nodes

RHEL 9 contains **ansible-core** 2.14. This Ansible version supports managing RHEL 7, RHEL 8, and RHEL 9 nodes. To manage RHEL 10 nodes, you require a RHEL 10 control node.

#### New RHEL system roles

**sudo**

In RHEL 9.5, the **sudo** RHEL system role has been added to distribute **sudo** configurations in an automated manner to all managed nodes.
For more details, see the dedicated release note New **sudo** RHEL system role , or the resources in the **/usr/share/doc/rhel-system-role/sudo/** directory.

**gfs2**

In RHEL 9.5, the **gfs2** RHEL system role has been added to configure Global File System 2 (GFS2) in an automated manner on all managed nodes.
For more details, see the dedicated release note Support for configuring GFS2 file systems by using RHEL system roles, or the resources in the **/usr/share/doc/rhel-system-role/gfs2/** directory.

**aide**

In RHEL 9.6, the **aide** RHEL system role has been added to configure detecting of unauthorized changes in an automated manner on all managed nodes.
For more details, see the dedicated release note New RHEL system role: **aide**, or the resources in the **/usr/share/doc/rhel-system-role/aide/** directory.

### 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.

### 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.

### RHEL 8 moves to Maintenance Support phase

After the RHEL 8.10 release, RHEL 8 moved to the Maintenance Support phase and will no longer receive new features. As a result, starting with RHEL 9.5, new features will only be available in RHEL 9. Therefore, to get access to the latest enhancements use RHEL 9 for your RHEL system role control nodes.

# CHAPTER 26. VIRTUALIZATION

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

## 26.1. 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 solution Invalid virtual machines that used to work with RHEL 9 and newer hypervisors.

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.

## 26.2. 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 on the

command line 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**.

## 26.3. 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.

## 26.4. 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
  - Clipboard sharing between the host and the VM
  - Uninterrupted connection to VM during live migration
  - Dynamic resizing of the VM screen with the client window
  - 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 Red Hat Knowledgebase solution Unable to define, create or start a Virtual Machine using spice or qxl in RHEL 9 KVM.

# CHAPTER 27. THE WEB CONSOLE

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

## 27.1. 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 |
| 389-ds-base-snmp | rhel9-AppStream | RHEL 9.5 |
| 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 |
| ansible-freeipa-collection | rhel9-AppStream | RHEL 9.5 |
| ant-junit5 | rhel9-AppStream | RHEL 9.0 |
| ant-manual | rhel9-CRB | RHEL 9.6 |
| ant-openjdk11 | rhel9-AppStream | RHEL 9.6 |
| ant-openjdk17 | rhel9-AppStream | RHEL 9.6 |
| ant-openjdk21 | rhel9-AppStream | RHEL 9.6 |
| ant-openjdk8 | rhel9-AppStream | RHEL 9.6 |
| ant-unbound | rhel9-CRB | RHEL 9.6 |

| Package | Repository | New in |
|---|---|---|
| anthy-unicode | rhel9-AppStream | RHEL 9.0 |
| anthy-unicode-devel | rhel9-CRB | RHEL 9.1 |
| aopalliance | rhel9-AppStream | RHEL 9.6 |
| 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 |
| aspnetcore-runtime-7.0 | rhel9-AppStream | RHEL 9.1 |
| aspnetcore-runtime-8.0 | rhel9-AppStream | RHEL 9.4 |
| aspnetcore-runtime-9.0 | rhel9-AppStream | RHEL 9.5 |
| aspnetcore-runtime-10.0 | rhel9-AppStream | RHEL 9.7 |
| aspnetcore-runtime-dbg-8.0 | rhel9-AppStream | RHEL 9.5 |
| aspnetcore-runtime-dbg-9.0 | rhel9-AppStream | RHEL 9.5 |
| aspnetcore-runtime-dbg-10.0 | rhel9-AppStream | RHEL 9.7 |
| aspnetcore-targeting-pack-7.0 | rhel9-AppStream | RHEL 9.1 |
| aspnetcore-targeting-pack-8.0 | rhel9-AppStream | RHEL 9.4 |
| aspnetcore-targeting-pack-9.0 | rhel9-AppStream | RHEL 9.5 |
| aspnetcore-targeting-pack-10.0 | rhel9-AppStream | RHEL 9.7 |
| autoconf-latest | rhel9-AppStream | RHEL 9.4 |
| autoconf271 | rhel9-AppStream | RHEL 9.4 |
| autocorr-dsb | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| autocorr-el | rhel9-AppStream | RHEL 9.0 |
| autocorr-hsb | rhel9-AppStream | RHEL 9.0 |
| autocorr-vro | rhel9-AppStream | RHEL 9.0 |
| avahi-autoipd | rhel9-AppStream | RHEL 9.5 |
| avahi-glib-devel | rhel9-CRB | RHEL 9.3 |
| avahi-gobject | rhel9-CRB | RHEL 9.5 |
| avahi-gobject-devel | rhel9-CRB | RHEL 9.5 |
| avahi-tools | rhel9-AppStream | RHEL 9.3 |
| awscli2 | rhel9-AppStream | RHEL 9.5 |
| azure-vm-utils | rhel9-AppStream | RHEL 9.7 |
| babel-doc | rhel9-CRB | RHEL 9.0 |
| bind9.18 | rhel9-AppStream | RHEL 9.5 |
| bind9.18-chroot | rhel9-AppStream | RHEL 9.5 |
| bind9.18-devel | rhel9-CRB | RHEL 9.5 |
| bind9.18-dnssec-utils | rhel9-AppStream | RHEL 9.5 |
| bind9.18-doc | rhel9-CRB | RHEL 9.5 |
| bind9.18-dyndb-ldap | rhel9-AppStream | RHEL 9.6 |
| bind9.18-libs | rhel9-AppStream | RHEL 9.5 |
| bind9.18-utils | rhel9-AppStream | RHEL 9.5 |
| bind-dnssec-doc | rhel9-AppStream | RHEL 9.0 |
| bind-dnssec-utils | rhel9-AppStream | RHEL 9.0 |
| bind-doc | rhel9-CRB | RHEL 9.1 |
| bindgen-cli | rhel9-CRB | RHEL 9.7 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |
| cbindgen | rhel9-CRB | RHEL 9.7 |
| cdrskin | rhel9-AppStream | RHEL 9.0 |
| cepces | rhel9-AppStream | RHEL 9.4 |

| Package | Repository | New in |
|---|---|---|
| cepces-certmonger | rhel9-AppStream | RHEL 9.4 |
| cepces-selinux | rhel9-AppStream | RHEL 9.4 |
| cifs-utils-devel | rhel9-CRB | RHEL 9.2 |
| cjose-devel | rhel9-CRB | RHEL 9.5 |
| cldr-emoji-annotation-dtd | rhel9-AppStream | RHEL 9.0 |
| clevis-pin-pkcs11 | rhel9-AppStream | RHEL 9.6 |
| clevis-pin-tpm2 | rhel9-AppStream | RHEL 9.0 |
| cockpit-files | rhel9-AppStream | RHEL 9.5 |
| cockpit-leapp | rhel9-AppStream | RHEL 9.6 |
| cockpit-ostree | rhel9-AppStream | RHEL 9.3 |
| cockpit-ws-selinux | rhel9-BaseOS | RHEL 9.7 |
| compat-hesiod | rhel9-AppStream | RHEL 9.0 |
| command-line-assistant | rhel9-AppStream | RHEL 9.6 |
| command-line-assistant-selinux | rhel9-AppStream | RHEL 9.6 |
| compat-openssl11 | rhel9-AppStream | RHEL 9.0 |
| compat-paratype-pt-sans-fonts-f33-f34 | rhel9-AppStream | RHEL 9.0 |
| compat-sap-c++-12 | rhel9-SAP | RHEL 9.2 |
| compat-sap-c++-13 | rhel9-SAP | RHEL 9.5 |
| composefs | rhel9-AppStream | RHEL 9.4 |
| composefs-devel | rhel9-CRB | RHEL 9.6 |
| composefs-libs | rhel9-AppStream | RHEL 9.4 |
| console-login-helper-messages | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| containers-common-extra | rhel9-AppStream | RHEL 9.6 |
| 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 |
| dejavu-lgc-serif-fonts | rhel9-AppStream | RHEL 9.0 |
| dnf-bootc | rhel9-AppStream | RHEL 9.6 |
| dnsconfd | rhel9-AppStream | RHEL 9.6 |
| dnsconfd-dracut | rhel9-AppStream | RHEL 9.6 |

| Package | Repository | New in |
|---|---|---|
| dnsconfd-micro | rhel9-AppStream | RHEL 9.6 |
| dnsconfd-selinux | rhel9-AppStream | RHEL 9.6 |
| dnsconfd-unbound | rhel9-AppStream | RHEL 9.6 |
| 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-apphost-pack-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-apphost-pack-10.0 | rhel9-AppStream | RHEL 9.7 |
| dotnet-hostfxr-7.0 | rhel9-AppStream | RHEL 9.1 |
| dotnet-hostfxr-8.0 | rhel9-AppStream | RHEL 9.4 |
| dotnet-hostfxr-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-hostfxr-10.0 | rhel9-AppStream | RHEL 9.7 |
| dotnet-runtime-7.0 | rhel9-AppStream | RHEL 9.1 |
| dotnet-runtime-8.0 | rhel9-AppStream | RHEL 9.4 |
| dotnet-runtime-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-runtime-10.0 | rhel9-AppStream | RHEL 9.7 |
| dotnet-runtime-dbg-8.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-runtime-dbg-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-runtime-dbg-10.0 | rhel9-AppStream | RHEL 9.7 |
| dotnet-sdk-7.0 | rhel9-AppStream | RHEL 9.1 |
| dotnet-sdk-7.0-source-built-artifacts | rhel9-CRB | RHEL 9.1 |

| Package | Repository | New in |
|---|---|---|
| dotnet-sdk-8.0 | rhel9-AppStream | RHEL 9.4 |
| dotnet-sdk-8.0-source-built-artifacts | rhel9-CRB | RHEL 9.4 |
| dotnet-sdk-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-sdk-9.0-source-built-artifacts | rhel9-CRB | RHEL 9.5 |
| dotnet-sdk-10.0 | rhel9-AppStream | RHEL 9.7 |
| dotnet-sdk-10.0-source-built-artifacts | rhel9-CRB | RHEL 9.7 |
| dotnet-sdk-aot-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-sdk-aot-10.0 | rhel9-AppStream | RHEL 9.7 |
| dotnet-sdk-dbg-8.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-sdk-dbg-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-sdk-dbg-10.0 | rhel9-AppStream | RHEL 9.7 |
| dotnet-targeting-pack-7.0 | rhel9-AppStream | RHEL 9.1 |
| dotnet-targeting-pack-8.0 | rhel9-AppStream | RHEL 9.4 |
| dotnet-targeting-pack-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-targeting-pack-10.0 | rhel9-AppStream | RHEL 9.7 |
| dotnet-templates-7.0 | rhel9-AppStream | RHEL 9.1 |
| dotnet-templates-8.0 | rhel9-AppStream | RHEL 9.4 |
| dotnet-templates-9.0 | rhel9-AppStream | RHEL 9.5 |
| dotnet-templates-10.0 | rhel9-AppStream | RHEL 9.7 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| edk2-tools | rhel9-CRB | RHEL 9.2 |
| edk2-tools-doc | rhel9-CRB | RHEL 9.2 |
| egl-utils | rhel9-AppStream | RHEL 9.1 |
| egl-wayland-devel | rhel9-CRB | RHEL 9.5 |
| 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-nutanix-ahv | rhel9-AppStream | RHEL 9.7 |
| 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 |
| fftw-openmpi-devel | rhel9-AppStream | RHEL 9.6 |
| fftw-openmpi-libs | rhel9-AppStream | RHEL 9.6 |

| Package | Repository | New in |
|---|---|---|
| fftw-openmpi-libs-double | rhel9-AppStream | RHEL 9.6 |
| fftw-openmpi-libs-long | rhel9-AppStream | RHEL 9.6 |
| fftw-openmpi-libs-single | rhel9-AppStream | RHEL 9.6 |
| fftw-openmpi-static | rhel9-AppStream | RHEL 9.6 |
| fido2-tools | rhel9-AppStream | RHEL 9.4 |
| fio-engine-dev-dax | rhel9-AppStream | RHEL 9.0 |
| 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 |
| fips-provider-next | rhel9-AppStream | RHEL 9.7 |
| firefox-x11 | rhel9-AppStream | RHEL 9.2 |
| flashrom | rhel9-AppStream | RHEL 9.0 |
| flatpak-rpm-macros | rhel9-CRB | RHEL 9.6 |
| flatpak-runtime-config | rhel9-CRB | RHEL 9.6 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| flexiblas-openblas-openmp | rhel9-AppStream | RHEL 9.0 |
| flexiblas-openblas-openmp64 | rhel9-CRB | RHEL 9.0 |
| flexiblas-openblas-serial | rhel9-AppStream | RHEL 9.5 |
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| gcc-toolset-14 | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-annobin-annocheck | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-annobin-docs | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-annobin-plugin-gcc | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-binutils | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-binutils-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-binutils-gold | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-binutils-gprofng | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-dwz | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-gcc | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-gcc-c++ | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-gcc-gfortran | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-gcc-plugin-annobin | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-gcc-plugin-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libasan-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libatomic-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libgccjit | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libgccjit-devel | rhel9-AppStream | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| gcc-toolset-14-libitm-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-liblsan-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libquadmath-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libstdc++-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libstdc++-docs | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libtsan-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-libubsan-devel | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-offload-nvptx | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-14-runtime | rhel9-AppStream | RHEL 9.5 |
| gcc-toolset-15 | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-binutils | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-binutils-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-binutils-gold | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-binutils-gprofng | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-gcc | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-gcc-c++ | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-gcc-gfortran | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-gcc-plugin-annobin | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-gcc-plugin-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libasan-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libatomic-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libgccjit | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libgccjit-devel | rhel9-AppStream | RHEL 9.7 |

| Package | Repository | New in |
|---|---|---|
| gcc-toolset-15-libitm-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-liblsan-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libquadmath-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libstdc++-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libstdc++-docs | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libtsan-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-libubsan-devel | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-offload-nvptx | rhel9-AppStream | RHEL 9.7 |
| gcc-toolset-15-runtime | rhel9-AppStream | RHEL 9.7 |
| gcr-base | rhel9-AppStream | RHEL 9.0 |
| gdal | rhel9-AppStream | RHEL 9.7 |
| gdal-devel | rhel9-CRB | RHEL 9.7 |
| gdal-libs | rhel9-AppStream | RHEL 9.7 |
| gdb-minimal | rhel9-AppStream | RHEL 9.0 |
| gedit-plugin-sessionsaver | rhel9-AppStream | RHEL 9.0 |
| gedit-plugin-synctex | rhel9-AppStream | RHEL 9.0 |
| gegl04-devel-docs | rhel9-AppStream | RHEL 9.0 |
| gegl04-tools | rhel9-AppStream | RHEL 9.0 |
| geos | rhel9-AppStream | RHEL 9.7 |
| geos-devel | rhel9-CRB | RHEL 9.7 |
| glade | rhel9-AppStream | RHEL 9.0 |
| glibc-doc | rhel9-AppStream | RHEL 9.0 |
| glibc-langpack-ckb | rhel9-BaseOS | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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-shell-extension-move-notifications | rhel9-AppStream | RHEL 9.6 |
| gnome-software-devel | rhel9-CRB | RHEL 9.3 |
| gnome-themes-extra | rhel9-AppStream | RHEL 9.0 |
| gnome-tour | rhel9-AppStream | RHEL 9.0 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| golang-github-cpuguy83-md2man | rhel9-CRB | RHEL 9.2 |
| golang-race | rhel9-AppStream | RHEL 9.5 |
| google-carlito-fonts | rhel9-AppStream | RHEL 9.0 |
| google-crosextra-caladea-fonts | rhel9-AppStream | RHEL 9.3 |
| google-noto-kufi-arabic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-kufi-arabic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-music-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-naskh-arabic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-naskh-arabic-ui-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-naskh-arabic-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-naskh-arabic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-nastaliq-urdu-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-rashi-hebrew-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-rashi-hebrew-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-adlam-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-adlam-unjoined-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-adlam-unjoined-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-adlam-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-anatolian-hieroglyphs-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-anatolian-hieroglyphs-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-arabic-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-arabic-ui-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-arabic-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-arabic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-armenian-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-avestan-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-balinese-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-balinese-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-bamum-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-bamum-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-bassa-vah-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-bassa-vah-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-batak-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-bengali-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-bengali-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-bhaiksuki-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-buginese-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-buginese-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-buhid-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-buhid-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-canadian-aboriginal-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-canadian-aboriginal-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-carian-vf-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-caucasian-albanian-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-chakma-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-cham-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-cham-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-cherokee-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-cuneiform-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-cuneiform-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-cypriot-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-cypriot-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-deseret-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-devanagari-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-devanagari-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-display-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-display-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-duployan-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-egyptian-hieroglyphs-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-elbasan-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-elymaic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-elymaic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-ethiopic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-georgian-vf-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-gothic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-gothic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-grantha-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-gunjala-gondi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-gurmukhi-ui-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-gurmukhi-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-gurmukhi-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-hanifi-rohingya-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-hanifi-rohingya-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-hanunoo-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-hatran-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-hatran-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-hebrew-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-imperial-aramaic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-indic-siyaq-numbers-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-inscriptional-pahlavi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-inscriptional-parthian-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-javanese-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-kannada-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-kannada-vf-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-kayah-li-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-khmer-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-khmer-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-khojki-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-khudawadi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lao-looped-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lao-looped-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lao-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lao-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lepcha-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-limbu-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-linear-a-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-linear-a-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-linear-b-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-linear-b-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lisu-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lisu-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lycian-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-lydian-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-mahajani-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-malayalam-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-malayalam-vf-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-mandaic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-mandaic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-manichaean-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-marchen-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-marchen-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-masaram-gondi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-math-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-math-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-mayan-numerals-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-mayan-numerals-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-medefaidrin-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-medefaidrin-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-meetei-mayek-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-meeteimayek-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-mende-kikakui-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-meroitic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-miao-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-modi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-mongolian-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-mono-fonts | rhel9-AppStream | RHEL 9.0 |
| google-noto-sans-mono-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-mro-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-mro-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-multani-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-multani-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-myanmar-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-myanmar-ui-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-myanmar-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-myanmar-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-nabataean-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-nabataean-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-new-tai-lue-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-new-tai-lue-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-newa-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-nushu-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-ogham-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-ogham-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-ol-chiki-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-ol-chiki-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-old-hungarian-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-old-italic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-old-north-arabian-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-old-permic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-old-persian-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-old-sogdian-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-oriya-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-oriya-ui-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-osage-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-osmanya-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-pahawh-hmong-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-palmyrene-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-pau-cin-hau-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-phags-pa-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-phoenician-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-psalter-pahlavi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-rejang-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-runic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-runic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-samaritan-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-saurashtra-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-sharada-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-shavian-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-siddham-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-signwriting-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-sinhala-ui-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-sinhala-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-sinhala-vf-fonts | rhel9-AppStream | RHEL 9.0 |
| google-noto-sans-sogdian-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-sora-sompeng-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-sora-sompeng-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-soyombo-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-soyombo-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-sundanese-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-sundanese-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-syloti-nagri-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-symbols-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-symbols2-fonts | rhel9-CRB | RHEL 9.1 |
| google-noto-sans-syriac-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tagalog-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tagbanwa-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tagbanwa-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tai-le-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tai-tham-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-tai-tham-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tai-viet-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-takri-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-takri-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tamil-supplement-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tamil-supplement-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tamil-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tamil-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-telugu-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-telugu-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-thaana-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-thai-looped-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-thai-ui-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-thai-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-adrar-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-agraw-imazighen-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-ahaggar-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-air-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-apt-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-azawagh-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-sans-tifinagh-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-ghat-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-hawad-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-rhissa-ixa-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-sil-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tifinagh-tawellemmet-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-tirhuta-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-ugaritic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-vai-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-wancho-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-wancho-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-warang-citi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-warang-citi-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-yi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-yi-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-zanabazar-square-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sans-zanabazar-square-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-sansthai-looped-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-ahom-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-serif-armenian-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-balinese-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-bengali-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-bengali-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-devanagari-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-devanagari-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-display-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-display-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-dogra-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-ethiopic-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-ethiopic-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-georgian-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-grantha-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-gujarati-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-gujarati-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-gurmukhi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-gurmukhi-vf-fonts | rhel9-AppStream | RHEL 9.0 |
| google-noto-serif-hebrew-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-hebrew-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-kannada-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-kannada-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-khmer-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-khojki-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-serif-khojki-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-lao-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-malayalam-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-malayalam-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-myanmar-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-nyiakeng-puachue-hmong-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-nyiakeng-puachue-hmong-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-sinhala-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-sinhala-vf-fonts | rhel9-AppStream | RHEL 9.0 |
| google-noto-serif-tamil-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-tamil-slanted-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-tamil-slanted-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-tamil-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-tangut-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-tangut-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-telugu-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-telugu-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-thai-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-tibetan-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-tibetan-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-vf-fonts | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| google-noto-serif-yezidi-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-serif-yezidi-vf-fonts | rhel9-CRB | RHEL 9.5 |
| google-noto-traditional-nushu-fonts | rhel9-CRB | RHEL 9.5 |
| 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-bad-free-libs | rhel9-AppStream | RHEL 9.6 |
| 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 |
| 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 |
| gvisor-tap-vsock-gvforwarder | rhel9-AppStream | RHEL 9.6 |
| gvnc-devel | rhel9-CRB | RHEL 9.4 |
| ha-cloud-support | rhel9-HighAvailability | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| ibus-gtk4 | rhel9-CRB | RHEL 9.5 |
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| ignition | rhel9-AppStream | RHEL 9.0 |
| ignition-edge | rhel9-AppStream | RHEL 9.2 |
| ignition-grub | rhel9-AppStream | RHEL 9.7 |
| ignition-validate | rhel9-AppStream | RHEL 9.2 |
| image-builder | rhel9-AppStream | RHEL 9.7 |
| 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 |
| insights-client-ros | rhel9-AppStream | RHEL 9.5 |
| intel-lpmd | rhel9-AppStream | RHEL 9.5 |
| ipa-client-encrypted-dns | rhel9-AppStream | RHEL 9.6 |
| ipa-selinux-luna | rhel9-AppStream | RHEL 9.5 |
| ipa-selinux-nfast | rhel9-AppStream | RHEL 9.5 |
| ipa-server-encrypted-dns | rhel9-AppStream | RHEL 9.6 |
| 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 |
| jakarta-mail | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| java-21-openjdk-src-slowdebug | rhel9-CRB | RHEL 9.3 |

| Package | Repository | New in |
|---|---|---|
| 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-common | rhel9-CRB | RHEL 9.6 |
| javapackages-compat | rhel9-CRB | RHEL 9.6 |
| javapackages-generators | rhel9-CRB | RHEL 9.0 |
| javapackages-local-openjdk11 | rhel9-CRB | RHEL 9.6 |
| javapackages-local-openjdk17 | rhel9-CRB | RHEL 9.6 |
| javapackages-local-openjdk21 | rhel9-CRB | RHEL 9.6 |
| javapackages-local-openjdk8 | rhel9-CRB | RHEL 9.6 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |
| kernel-uki-virt-addons | rhel9-BaseOS | RHEL 9.5 |
| keylime | rhel9-AppStream | RHEL 9.1 |
| keylime-agent-rust | rhel9-AppStream | RHEL 9.1 |
| keylime-base | rhel9-AppStream | RHEL 9.1 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |
| ktls-utils | rhel9-BaseOS | RHEL 9.5 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| leapp | rhel9-AppStream | RHEL 9.6 |
| leapp-deps | rhel9-AppStream | RHEL 9.6 |
| leapp-upgrade-el9toel10 | rhel9-AppStream | RHEL 9.6 |
| leapp-upgrade-el9toel10-deps | rhel9-AppStream | RHEL 9.6 |
| leapp-upgrade-el9toel10-fapolicyd | rhel9-AppStream | RHEL 9.7 |
| ledmon-devel | rhel9-CRB | RHEL 9.5 |
| ledmon-libs | rhel9-BaseOS | RHEL 9.5 |
| 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 |
| libblockdev-nvme | rhel9-AppStream | RHEL 9.2 |
| libblockdev-tools | rhel9-AppStream | RHEL 9.0 |
| libbpf-tools | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| libbrotli | rhel9-BaseOS | RHEL 9.0 |
| libburn-doc | rhel9-AppStream | RHEL 9.0 |
| libbytesize-devel | rhel9-CRB | RHEL 9.5 |
| 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 |
| libev-devel | rhel9-CRB | RHEL 9.5 |
| 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 |
| libfprint-devel | rhel9-CRB | RHEL 9.5 |
| libfreehand-devel | rhel9-CRB | RHEL 9.2 |
| libgccjit | rhel9-AppStream | RHEL 9.0 |
| libgccjit-devel | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| libgfortran-static | rhel9-CRB | RHEL 9.6 |
| 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 |
| libiptcdata-devel | rhel9-CRB | RHEL 9.5 |
| 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 |
| libkdumpfile-devel | rhel9-AppStream | RHEL 9.5 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| libmemcached-awesome-tools | rhel9-CRB | RHEL 9.0 |
| 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 |
| libquadmath-static | rhel9-CRB | RHEL 9.6 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| libreoffice-help-eo | rhel9-AppStream | RHEL 9.0 |
| 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 |
| libvirt-ssh-proxy | rhel9-AppStream | RHEL 9.5 |
| 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 |
| lldpd-devel | rhel9-AppStream | RHEL 9.5 |
| llvm-filesystem | rhel9-AppStream | RHEL 9.7 |
| 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 |
| make-latest | rhel9-AppStream | RHEL 9.5 |
| make441 | rhel9-AppStream | RHEL 9.5 |
| 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-local-openjdk11 | rhel9-CRB | RHEL 9.6 |
| maven-local-openjdk17 | rhel9-CRB | RHEL 9.6 |
| maven-local-openjdk21 | rhel9-CRB | RHEL 9.6 |
| maven-local-openjdk8 | rhel9-CRB | RHEL 9.6 |
| maven-openjdk21 | rhel9-AppStream | RHEL 9.4 |
| maven-surefire-provider-junit5 | rhel9-CRB | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| maven-unbound | rhel9-AppStream | RHEL 9.6 |
| 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 |
| 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_auth_mellon-diagnostics | rhel9-CRB | RHEL 9.6 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| mysql-test-data | rhel9-AppStream | RHEL 9.6 |
| mythes-eo | rhel9-AppStream | RHEL 9.0 |
| nbdkit-selinux | rhel9-AppStream | RHEL 9.5 |
| nbdkit-srpm-macros | rhel9-CRB | RHEL 9.1 |
| netronome-firmware | rhel9-BaseOS | RHEL 9.0 |
| nfs-utils-coreos | rhel9-AppStream | RHEL 9.0 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| nvme-stas | rhel9-AppStream | RHEL 9.1 |
| ocaml-augeas | rhel9-CRB | RHEL 9.5 |
| ocaml-augeas-devel | rhel9-CRB | RHEL 9.5 |
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| opencryptoki-ccatok | rhel9-BaseOS | RHEL 9.6 |
| 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 |
| openslp-devel | rhel9-CRB | RHEL 9.0 |
| openslp-server | rhel9-AppStream | RHEL 9.0 |
| openssl-fips-provider | rhel9-BaseOS | RHEL 9.4 |
| openssl-fips-provider-so | rhel9-BaseOS | RHEL 9.5 |
| opentelemetry-collector | rhel9-AppStream | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| openwsman-perl | rhel9-ResilientStorage | RHEL 9.6 |
| openwsman-winrs | rhel9-ResilientStorage | RHEL 9.6 |
| 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-export-pcp2openmetrics | rhel9-AppStream | RHEL 9.5 |
| pcp-geolocate | rhel9-AppStream | RHEL 9.4 |
| pcp-pmda-amdgpu | rhel9-AppStream | RHEL 9.7 |
| pcp-pmda-bpf | rhel9-AppStream | RHEL 9.0 |
| pcp-pmda-farm | rhel9-AppStream | RHEL 9.4 |
| pcp-pmda-resctrl | rhel9-AppStream | RHEL 9.4 |
| pcp-pmda-uwsgi | rhel9-AppStream | RHEL 9.5 |
| 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-libxml-perl | rhel9-CRB | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| perl-XString | rhel9-CRB | RHEL 9.0 |
| pf-bb-config | rhel9-AppStream | RHEL 9.2 |
| pgvector | rhel9-AppStream | RHEL 9.5 |
| php-libguestfs | rhel9-CRB | RHEL 9.1 |
| php-pecl-redis6 | rhel9-AppStream | RHEL 9.6 |
| 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 |
| pkcs11-provider | rhel9-BaseOS | RHEL 9.7 |
| pki-jackson-annotations | rhel9-AppStream | RHEL 9.0 |
| pki-jackson-core | rhel9-AppStream | RHEL 9.0 |
| pki-jackson-databind | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |
| postgis | rhel9-AppStream | RHEL 9.7 |
| postgis-client | rhel9-AppStream | RHEL 9.7 |
| postgis-docs | rhel9-AppStream | RHEL 9.7 |
| postgis-upgrade | rhel9-AppStream | RHEL 9.7 |
| postgis-utils | rhel9-AppStream | RHEL 9.7 |
| postgresql-docs | rhel9-CRB | RHEL 9.1 |
| postgresql-private-devel | rhel9-CRB | RHEL 9.0 |
| postgresql-private-libs | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| pqrpm | rhel9-BaseOS | RHEL 9.7 |
| pqrpm-libs | rhel9-BaseOS | RHEL 9.7 |
| procps-ng-devel | rhel9-CRB | RHEL 9.2 |
| proj | rhel9-AppStream | RHEL 9.7 |
| proj-data | rhel9-AppStream | RHEL 9.7 |
| proj-devel | rhel9-CRB | RHEL 9.7 |
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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-colorama | rhel9-AppStream | RHEL 9.5 |
| 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-multisig | rhel9-BaseOS | RHEL 9.7 |
| 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 |
| python3-i2c-tools | rhel9-AppStream | RHEL 9.1 |
| python3-idm-pki | rhel9-AppStream | RHEL 9.1 |
| python3-imath | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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-leapp | rhel9-AppStream | RHEL 9.6 |
| 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 |
| python3-readthedocs-sphinx-ext | rhel9-CRB | RHEL 9.0 |
| python3-requests+security | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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-rust | rhel9-CRB | RHEL 9.6 |
| python3-setuptools_scm+toml | rhel9-CRB | RHEL 9.0 |
| python3-snapm | rhel9-AppStream | RHEL 9.6 |
| python3-snapm-doc | rhel9-AppStream | RHEL 9.6 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| python3-toml | rhel9-AppStream | RHEL 9.0 |
| 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 |
| python3.11-semantic_version | rhel9-CRB | RHEL 9.2 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| python3.12-lxml | rhel9-AppStream | RHEL 9.4 |
| python3.12-mod_wsgi | rhel9-AppStream | RHEL 9.4 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| qat-zstd-plugin | rhel9-AppStream | RHEL 9.6 |
| qat-zstd-plugin-devel | rhel9-AppStream | RHEL 9.6 |
| qat-zstd-plugin-static | rhel9-CRB | RHEL 9.6 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| qemu-kvm-device-usb-redirect | rhel9-AppStream | RHEL 9.0 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| qt5-qtscript-doc | rhel9-AppStream | RHEL 9.0 |
| 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 |
| rapidjson-devel | rhel9-AppStream | RHEL 9.6 |
| rapidjson-doc | rhel9-AppStream | RHEL 9.6 |
| 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-cloud-client-configuration-cdn | rhel9-AppStream | RHEL 9.6 |
| redhat-mono-fonts | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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-sequoia | rhel9-BaseOS | RHEL 9.7 |
| rpm-sequoia-devel | rhel9-CRB | RHEL 9.7 |
| rpm-sign-libs | rhel9-BaseOS | RHEL 9.0 |
| rsync-rrsync | rhel9-AppStream | RHEL 9.6 |
| rsyslog-logrotate | rhel9-AppStream | RHEL 9.0 |
| rtla | rhel9-AppStream | RHEL 9.2 |
| ruby-bundled-gems | rhel9-AppStream | RHEL 9.1 |
| rubygem-openwsman | rhel9-ResilientStorage | RHEL 9.6 |
| rubygem-racc | rhel9-AppStream | RHEL 9.4 |
| rubygem-thread_order | rhel9-CRB | RHEL 9.0 |
| rust-analyzer | rhel9-AppStream | RHEL 9.2 |
| rust-std-static-wasm32-wasip1 | rhel9-AppStream | RHEL 9.5 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| samba-dc-libs | rhel9-BaseOS | RHEL 9.2 |
| samba-dcerpc | rhel9-BaseOS | RHEL 9.2 |
| samba-gpupdate | rhel9-AppStream | RHEL 9.5 |
| 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 |
| sap-hana-ha | rhel9-SAPHANA | RHEL 9.6 |
| sdl12-compat | rhel9-AppStream | RHEL 9.0 |
| sdl12-compat-devel | rhel9-CRB | RHEL 9.0 |
| setxkbmap | rhel9-AppStream | RHEL 9.0 |
| sgx-common | rhel9-AppStream | RHEL 9.7 |
| sgx-enclave-prebuilt-common | rhel9-AppStream | RHEL 9.7 |
| sgx-enclave-prebuilt-ide-signed | rhel9-AppStream | RHEL 9.7 |
| sgx-enclave-prebuilt-pce-signed | rhel9-AppStream | RHEL 9.7 |
| sgx-enclave-prebuilt-tdqe-signed | rhel9-AppStream | RHEL 9.7 |
| sgx-libs | rhel9-AppStream | RHEL 9.7 |
| sgx-mpa | rhel9-AppStream | RHEL 9.7 |
| sgx-pckid-tool | rhel9-AppStream | RHEL 9.7 |
| sgx-rpm-macros | rhel9-CRB | RHEL 9.7 |
| sid | rhel9-AppStream | RHEL 9.0 |
| sid-base-libs | rhel9-AppStream | RHEL 9.0 |
| sid-iface-libs | rhel9-AppStream | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| snactor | rhel9-CRB | RHEL 9.6 |
| snapm | rhel9-AppStream | RHEL 9.6 |
| snpguest | rhel9-AppStream | RHEL 9.6 |
| snphost | rhel9-AppStream | RHEL 9.6 |
| source-highlight-devel | rhel9-CRB | RHEL 9.5 |
| 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 |
| system-reinstall-bootc | rhel9-AppStream | RHEL 9.6 |
| systemd-boot-unsigned | rhel9-CRB | RHEL 9.2 |
| systemd-oomd | rhel9-BaseOS | RHEL 9.0 |

| Package | Repository | New in |
|---|---|---|
| systemd-resolved | rhel9-BaseOS | RHEL 9.0 |
| systemd-rpm-macros | rhel9-BaseOS | RHEL 9.0 |
| systemd-ukify | rhel9-AppStream | RHEL 9.5 |
| systemtap-sdt-dtrace | rhel9-AppStream | RHEL 9.6 |
| tdx-qgs | rhel9-AppStream | RHEL 9.7 |
| tesseract-equ | rhel9-AppStream | RHEL 9.7 |
| tesseract-langpack-afr | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-amh | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ara | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-asm | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-aze | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-aze_cyrl | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-bel | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ben | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-bod | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-bos | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-bre | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-bul | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-cat | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ceb | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ces | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-chi_sim | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-chi_sim_vert | rhel9-AppStream | RHEL 9.6 |

| Package | Repository | New in |
|---|---|---|
| tesseract-langpack-chi_tra | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-chi_tra_vert | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-chr | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-cos | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-cym | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-dan | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-deu | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-div | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-dzo | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ell | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-eng | rhel9-AppStream | RHEL 9.0 |
| tesseract-langpack-enm | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-epo | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-est | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-eus | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-fao | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-fas | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-fil | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-fin | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-fra | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-frk | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-frm | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-fry | rhel9-AppStream | RHEL 9.6 |

| Package | Repository | New in |
|---|---|---|
| tesseract-langpack-gla | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-gle | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-glg | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-grc | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-guj | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-hat | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-heb | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-hin | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-hrv | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-hun | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-hye | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-iku | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ind | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-isl | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ita | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ita_old | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-jav | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-jpn | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-jpn_vert | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-kan | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-kat | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-kat_old | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-kaz | rhel9-AppStream | RHEL 9.6 |

| Package | Repository | New in |
|---|---|---|
| tesseract-langpack-khm | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-kir | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-kmr | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-kor | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-kor_vert | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-lao | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-lat | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-lav | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-lit | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ltz | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-mal | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-mar | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-mkd | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-mlt | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-mon | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-mri | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-msa | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-mya | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-nep | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-nld | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-nor | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-oci | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ori | rhel9-AppStream | RHEL 9.6 |

| Package | Repository | New in |
|---|---|---|
| tesseract-langpack-pan | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-pol | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-por | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-pus | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-que | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ron | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-rus | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-san | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-sin | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-slk | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-slv | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-snd | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-spa | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-spa_old | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-sqi | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-srp | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-srp_latn | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-sun | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-swa | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-swe | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-syr | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-tam | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-tat | rhel9-AppStream | RHEL 9.6 |

| Package | Repository | New in |
|---|---|---|
| tesseract-langpack-tel | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-tgk | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-tha | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-tir | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ton | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-tur | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-uig | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-ukr | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-urd | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-uzb | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-uzb_cyrl | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-vie | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-yid | rhel9-AppStream | RHEL 9.6 |
| tesseract-langpack-yor | rhel9-AppStream | RHEL 9.6 |
| tesseract-osd | rhel9-AppStream | RHEL 9.7 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| totem-video-thumbnailer | rhel9-AppStream | RHEL 9.0 |
| tpm2-pkcs11 | rhel9-AppStream | RHEL 9.0 |
| tpm2-pkcs11-tools | rhel9-AppStream | RHEL 9.0 |
| trustee-guest-components | rhel9-AppStream | RHEL 9.6 |
| tuned-ppd | rhel9-AppStream | RHEL 9.5 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| unbound-dracut | rhel9-AppStream | RHEL 9.6 |
| 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 |
| v8-12.4-devel | rhel9-AppStream | RHEL 9.5 |
| v8-13.6-devel | rhel9-AppStream | RHEL 9.7 |
| valgrind-docs | rhel9-AppStream | RHEL 9.7 |
| valgrind-gdb | rhel9-AppStream | RHEL 9.7 |
| valgrind-scripts | rhel9-AppStream | RHEL 9.7 |
| valkey | rhel9-AppStream | RHEL 9.7 |
| valkey-devel | rhel9-AppStream | RHEL 9.7 |

| Package | Repository | New in |
|---|---|---|
| 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 |
| WALinuxAgent-cvm | rhel9-CRB | RHEL 9.3 |
| wayland-utils | rhel9-AppStream | RHEL 9.0 |
| waypipe | rhel9-AppStream | RHEL 9.0 |
| webrtc-audio-processing-devel | rhel9-CRB | RHEL 9.5 |
| 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 |
| wsl-setup | rhel9-AppStream | RHEL 9.7 |
| 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 |

| Package | Repository | New in |
|---|---|---|
| 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-toolchain-openjdk11 | rhel9-CRB | RHEL 9.6 |
| xmvn-toolchain-openjdk17 | rhel9-CRB | RHEL 9.6 |
| xmvn-toolchain-openjdk21 | rhel9-CRB | RHEL 9.6 |
| xmvn-toolchain-openjdk8 | rhel9-CRB | RHEL 9.6 |
| xmvn-tools | rhel9-CRB | RHEL 9.0 |
| xorg-x11-server-source | rhel9-CRB | RHEL 9.1 |
| xorg-x11-server-Xwayland-devel | rhel9-CRB | RHEL 9.5 |
| 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 | |
| cockpit-bridge, cockpit-pcp | cockpit-bridge | RHEL 9.6 | |
| cockpit-ws | cockpit-ws, cockpit-ws-selinux | RHEL 9.7 | |
| crda | wireless-regdb | RHEL 9.0 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| hardlink | util-linux-core | 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**. |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| libvirt-lock-sanlock | libvirt-daemon-plugin-sanlock | RHEL 9.3 | |
| 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 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| openssl-libs | openssl-fips-provider, openssl-libs | RHEL 9.4 | |
| openwsman-python3, openwsman-python3 | openwsman-python3 | RHEL 9.6 | |
| 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-GDBM_File, perl-Getopt-Std, perl-Hash-Util, perl-Hash-Util-FieldHash, perl-I18N-Collate, perl- | RHEL 9.0 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| | 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-Struct, perl-Config-Extensions, perl-DBM_Filter, perl-debugger, perl-deprecate, perl-diagnostics, perl-DirHandle, perl-doc, perl-Dumpvalue, | RHEL 9.0 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| | 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-ReadLine, perl-Text-Abbrev, perl-Thread, perl-Thread-Semaphore, perl-Tie, perl-Tie-File, perl-Tie-Memoize, perl-Tie-RefHash, perl-Time, | | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| | 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, python36 (python36:3.6), python38 (python38:3.8), python39 (python39:3.9) | python3 | RHEL 9.0 | |
| platform-python-debug, python36-debug (python36:3.6), python38-debug (python38:3.8), python39-debug (python39-devel:3.9) | python3-debug | RHEL 9.0 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| platform-python-devel, python36-devel (python36:3.6), python38-devel (python38:3.8), python39-devel (python39:3.9) | python3-devel | RHEL 9.0 | |
| platform-python-pip, python3-pip, python38-pip (python38:3.8), python39-pip (python39:3.9) | python3-pip | RHEL 9.0 | |
| platform-python-setuptools, 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 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| python3-attrs, python38-attrs (python38-devel:3.8), python39-attrs (python39-devel:3.9) | python3-attrs | RHEL 9.0 | |
| python3-babel, python38-babel (python38:3.8) | python3-babel | RHEL 9.0 | |
| python3-cairo | python3-cairo | RHEL 9.0 | |
| python3-cairo-devel | python3-cairo-devel | RHEL 9.0 | |
| python3-chardet, python38-chardet (python38:3.8), python39-chardet (python39:3.9) | python3-chardet | RHEL 9.0 | |
| python3-Cython, python38-Cython (python38:3.8), python39-Cython (python39-devel:3.9) | python3-Cython | RHEL 9.0 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| python3-dns | python3-dns | RHEL 9.0 | |
| python3-docutils | python3-docutils (python36:3.6) | RHEL 9.0 | |
| python38-idna (python38:3.8), python39-idna (python39:3.9) | python3-idna | RHEL 9.0 | |
| python3-jinja2, python38-jinja2 (python38:3.8) | python3-jinja2 | RHEL 9.0 | |
| python3-libs, python38-libs (python38:3.8), python39-libs (python39:3.9) | python3-libs | RHEL 9.0 | |
| python3-lxml, python38-lxml (python38:3.8), python39-lxml (python39:3.9) | python3-lxml | RHEL 9.0 | |
| python3-markupsafe, python38-markupsafe (python38:3.8) | python3-markupsafe | RHEL 9.0 | |
| python38-numpy (python38:3.8), python39-numpy (python39:3.9) | python3-numpy | RHEL 9.0 | |
| 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 |
|---|---|---|---|
| python3-pip-wheel, python38-pip-wheel (python38:3.8), python39-pip-wheel (python39:3.9) | python3-pip-wheel | RHEL 9.0 | |
| python3-pluggy, python38-pluggy (python38-devel:3.8), python39-pluggy (python39-devel:3.9) | python3-pluggy | RHEL 9.0 | |
| python38-psycopg2 (python38:3.8), python39-psycopg2 (python39:3.9) | python3-psycopg2 | RHEL 9.0 | |
| python3-py, python38-py (python38-devel:3.8), python39-py (python39-devel:3.9) | python3-py | RHEL 9.0 | |
| python3-pygments (python36:3.6) | python3-pygments | RHEL 9.0 | |
| python3-PyMySQL (python36:3.6), python38-PyMySQL (python38:3.8), python39-PyMySQL (python39:3.9) | python3-PyMySQL | RHEL 9.0 | |
| python3-pysocks, python38-pysocks (python38:3.8), python39-pysocks (python39:3.9) | python3-pysocks | RHEL 9.0 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| python3-pytest, python38-pytest (python38-devel:3.8), python39-pytest (python39-devel:3.9) | python3-pytest | RHEL 9.0 | |
| python3-pytz, python38-pytz (python38:3.8) | python3-pytz | RHEL 9.0 | |
| python3-pyyaml, python38-pyyaml (python38:3.8), python39-pyyaml (python39:3.9) | python3-pyyaml | RHEL 9.0 | |
| python3-requests, python38-requests (python38:3.8), python39-requests (python39:3.9) | python3-requests | RHEL 9.0 | |
| 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 | |
| python3-scipy (python36:3.6), python38-scipy (python38:3.8), python39-scipy (python39:3.9) | python3-scipy | RHEL 9.0 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| python3-setuptools-wheel, python38-setuptools-wheel (python38:3.8), python39-setuptools-wheel (python39:3.9) | python3-setuptools-wheel | RHEL 9.0 | |
| python3-setuptools_scm | python3-setuptools_scm | RHEL 9.0 | |
| python3-six, python38-six (python38:3.8), python39-six (python39:3.9) | python3-six | RHEL 9.0 | |
| python3-test, python38-test (python38:3.8), python39-test (python39:3.9) | python3-test | RHEL 9.0 | |
| python3-tkinter, python38-tkinter (python38:3.8), python39-tkinter (python39:3.9) | python3-tkinter | RHEL 9.0 | |
| python3-urllib3, python38-urllib3 (python38:3.8), python39-urllib3 (python39:3.9) | python3-urllib3 | RHEL 9.0 | |
| 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 |
|---|---|---|---|
| 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 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| 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 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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-pybind11 (python39-devel:3.9) | python3-pybind11 | RHEL 9.0 | |
| python39-pybind11-devel (python39-devel:3.9) | pybind11-devel | RHEL 9.0 | |
| python39-toml (python39:3.9) | python3-toml | RHEL 9.0 | |
| qatlib | qatlib, qatlib-service | RHEL 9.1 | |
| qemu-ga-win | mingw-qemu-ga-win | RHEL 9.3 | |
| qemu-kvm | ksmtuned, qemu-kvm | RHEL 9.0 | |
| qemu-kvm-common (virt:rhel) | qemu-kvm-common, virtiofsd | RHEL 9.0 | |
| resource-agents-aliyun, resource-agents-gcp | resource-agents-cloud | RHEL 9.0 | |

| Original package(s) | New package(s) | Changed since | Note |
|---|---|---|---|
| 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 | |
| rsync | rsync, rsync-rrsync | RHEL 9.6 | |
| 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 | |
| util-linux | util-linux, util-linux-core | RHEL 9.0 | |
| vala-devel | libvala-devel | RHEL 9.0 | |
| valgrind | valgrind, valgrind-docs, valgrind-gdb, valgrind-scripts | RHEL 9.7 | |
| valgrind, valgrind-docs, valgrind-gdb, valgrind-scripts | valgrind | 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 more information, see the Red Hat Knowledgebase solution 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| boost-python3 | rhel8-CRB | rhel9-AppStream | RHEL 9.0 |
| bpftool | rhel9-BaseOS | rhel9-AppStream | RHEL 9.6 |
| 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 |
| cxl-libs | rhel9-AppStream | rhel9-BaseOS | RHEL 9.5 |
| cyrus-sasl-devel | rhel8-BaseOS | rhel9-AppStream | RHEL 9.0 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| expect | rhel8-BaseOS | rhel9-AppStream | RHEL 9.0 |
| fence-agents-aliyun | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-aliyun | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-all | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-all | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-all | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-all | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-amt-ws | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-amt-ws | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-amt-ws | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-amt-ws | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-apc | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-apc | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-apc | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-apc | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-apc-snmp | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-apc-snmp | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-apc-snmp | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-apc-snmp | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-bladecenter | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-bladecenter | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-bladecenter | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-bladecenter | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-brocade | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-brocade | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-brocade | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-brocade | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| 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-mds | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-cisco-mds | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-cisco-ucs | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-cisco-ucs | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-cisco-ucs | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-cisco-ucs | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-drac5 | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-drac5 | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-drac5 | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-drac5 | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-eaton-snmp | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-eaton-snmp | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-eaton-snmp | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-eaton-snmp | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-emerson | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-emerson | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-emerson | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-emerson | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-eps | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-eps | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-eps | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-eps | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-gce | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-gce | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-heuristics-ping | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-heuristics-ping | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-heuristics-ping | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-heuristics-ping | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-hpblade | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-hpblade | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-hpblade | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-hpblade | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ibmblade | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-ibmblade | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-ibmblade | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-ibmblade | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ifmib | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-ifmib | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-ifmib | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ifmib | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ilo-moonshot | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-ilo-moonshot | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-ilo-moonshot | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ilo-moonshot | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| 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-mp | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ilo-mp | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ilo-ssh | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-ilo-ssh | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-ilo-ssh | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ilo-ssh | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ilo2 | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-ilo2 | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-ilo2 | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ilo2 | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-intelmodular | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-intelmodular | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-intelmodular | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-intelmodular | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ipdu | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-ipdu | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-ipdu | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ipdu | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ipmilan | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-ipmilan | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-ipmilan | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-ipmilan | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-kdump | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-kdump | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-kdump | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-kdump | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-lpar | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-lpar | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-lpar | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-lpar | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-mpath | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-mpath | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-mpath | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-mpath | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-openstack | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-openstack | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-redfish | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-redfish | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-redfish | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-redfish | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-rhevm | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-rhevm | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-rhevm | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-rhevm | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-rsa | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-rsa | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-rsa | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-rsa | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-rsb | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-rsb | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-rsb | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-rsb | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-sbd | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-sbd | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-sbd | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-sbd | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-scsi | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-scsi | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-scsi | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-scsi | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| 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-rest | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-vmware-rest | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-vmware-soap | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-vmware-soap | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| fence-agents-vmware-soap | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-vmware-soap | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-wti | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-wti | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-wti | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-wti | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| fence-agents-zvm | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| fence-agents-zvm | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| fence-agents-zvm | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| fence-agents-zvm | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |
| gcc-plugin-devel | rhel9-CRB | rhel9-AppStream | RHEL 9.7 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| gtkspell3 | rhel8-AppStream | rhel9-CRB | RHEL 9.0 |
| hamcrest | rhel8-CRB | rhel9-AppStream | RHEL 9.0 |
| hivex | rhel8-CRB | rhel9-AppStream | RHEL 9.0 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| libfdisk-devel | rhel8-BaseOS | rhel9-CRB | RHEL 9.0 |
| libffi-devel | rhel8-BaseOS | rhel9-AppStream | RHEL 9.0 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| liblsan | rhel8-BaseOS | rhel9-AppStream | RHEL 9.0 |
| 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 | rhel9-AppStream | rhel9-BaseOS | RHEL 9.6 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| libXxf86vm-devel | rhel8-AppStream | rhel9-CRB | RHEL 9.0 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| mariadb | rhel8-CRB | rhel9-AppStream | RHEL 9.0 |
| mariadb-backup | rhel8-CRB | rhel9-AppStream | RHEL 9.0 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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-libs | rhel9-CRB | rhel9-AppStream | RHEL 9.7 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| openwsman-python3 | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| openwsman-python3 | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| openwsman-python3 | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| 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-cluster-libs | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| pacemaker-cluster-libs | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| pacemaker-libs | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| pacemaker-libs | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| pacemaker-libs | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| pacemaker-libs | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| pacemaker-schemas | rhel8-AppStream | rhel9-ResilientStorage | RHEL 9.0 |
| pacemaker-schemas | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| pacemaker-schemas | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| pacemaker-schemas | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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-perf | rhel9-BaseOS | rhel9-AppStream | RHEL 9.6 |
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| sbd | rhel8-AppStream | rhel9-HighAvailability | RHEL 9.0 |
| sbd | rhel9-ResilientStorage | rhel9-AppStream | RHEL 9.6 |
| sbd | rhel9-HighAvailability | rhel9-AppStream | RHEL 9.6 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| snappy-devel | rhel9-CRB | rhel9-AppStream | RHEL 9.5 |
| 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 |
| 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-boot-unsigned | rhel9-CRB | rhel9-AppStream | RHEL 9.5 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 |
| 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 |

| Package | Original repository* | Current repository* | Changed since |
|---|---|---|---|
| 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 | |
| abrt-cli | |
| abrt-console-notification | |
| abrt-dbus | |

| Package | Note |
| --- | --- |
| 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 | |
| antlr-manual | |
| antlr3 | |
| antlr32 | |

| Package | Note |
| --- | --- |
| 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 | |
| apache-commons-lang3-javadoc | |
| apache-commons-logging-javadoc | |

| Package | Note |
| --- | --- |
| 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 | |
| atinject-tck | |
| atlas-corei2 | |
| atlas-corei2-devel | |

| Package | Note |
| --- | --- |
| atlas-z14-devel | |
| authd | |
| auto | |
| autoconf213 | |
| autogen | |
| autogen-libopts | |
| autogen-libopts-devel | |
| avahi-ui | |
| avahi-ui-devel | |
| avahi-ui-gtk3 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| bpg-dejavu-sans-fonts | |
| bpg-elite-fonts | |
| bpg-excelsior-caps-fonts | |
| bpg-excelsior-condenced-fonts | |
| 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 | |

| Package | Note |
| --- | --- |
| bpg-serif-fonts | |
| bpg-serif-modern-fonts | |
| bpg-ucnobi-fonts | |
| brlapi-java | |
| 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 | |

| Package | Note |
| --- | --- |
| cglib-javadoc | |
| clutter-devel | |
| clutter-doc | |
| clutter-gst3-devel | |
| 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 | |

| Package | Note |
| --- | --- |
| culmus-keteryg-fonts | |
| culmus-shofar-fonts | |
| custodia | |
| cyrus-imapd-vzic | |
| 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 | |

| Package | Note |
| --- | --- |
| dotnet-apphost-pack-3.1 | |
| dotnet-apphost-pack-5.0 | |
| dotnet-build-reference-packages | |
| dotnet-host-fxr-2.1 | |
| 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 | |

| Package | Note |
| --- | --- |
| dotnet-templates-3.0 | |
| dotnet-templates-3.1 | |
| dotnet-templates-5.0 | |
| dotnet5.0-build-reference-packages | |
| 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 | |
| dyninst-testsuite | |
| 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 | |

| Package | Note |
| --- | --- |
| eclipse-p2-discovery | |
| eclipse-pde | |
| eclipse-platform | |
| eclipse-swt | |
| ed25519-java | |
| 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 | |

| Package | Note |
| --- | --- |
| felix-gogo-shell | |
| felix-osgi-compendium | |
| felix-osgi-compendium-javadoc | |
| felix-osgi-core | |
| 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 | |

| Package | Note |
| --- | --- |
| frei0r-plugins | |
| frei0r-plugins-opencv | |
| fuse-sshfs | |
| fusesource-pom | |
| future | |
| gamin | |
| gamin-devel | |
| gavl | |
| gcc-toolset-10 | |
| gcc-toolset-10-annobin | |
| gcc-toolset-10-binutils | |
| gcc-toolset-10-binutils-devel | |
| gcc-toolset-10-build | |
| gcc-toolset-10-dwz | |
| gcc-toolset-10-dyninst | |
| gcc-toolset-10-dyninst-devel | |
| gcc-toolset-10-elfutils | |
| gcc-toolset-10-elfutils-debuginfod-client | |
| gcc-toolset-10-elfutils-debuginfod-client-devel | |
| gcc-toolset-10-elfutils-devel | |
| gcc-toolset-10-elfutils-libelf | |

| Package | Note |
| --- | --- |
| gcc-toolset-10-elfutils-libelf-devel | |
| gcc-toolset-10-elfutils-libs | |
| gcc-toolset-10-gcc | |
| gcc-toolset-10-gcc-c++ | |
| gcc-toolset-10-gcc-gdb-plugin | |
| gcc-toolset-10-gcc-gfortran | |
| gcc-toolset-10-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 | |

| Package | Note |
| --- | --- |
| gcc-toolset-10-ltrace | |
| gcc-toolset-10-make | |
| gcc-toolset-10-make-devel | |
| gcc-toolset-10-perftools | |
| gcc-toolset-10-runtime | |
| gcc-toolset-10-strace | |
| gcc-toolset-10-systemtap | |
| gcc-toolset-10-systemtap-client | |
| gcc-toolset-10-systemtap-devel | |
| gcc-toolset-10-systemtap-initscript | |
| gcc-toolset-10-systemtap-runtime | |
| gcc-toolset-10-systemtap-sdt-devel | |
| gcc-toolset-10-systemtap-server | |
| gcc-toolset-10-toolchain | |
| gcc-toolset-10-valgrind | |
| gcc-toolset-10-valgrind-devel | |
| gcc-toolset-11 | |
| gcc-toolset-11-annobin-annocheck | |
| gcc-toolset-11-annobin-docs | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| gfbgraph | |
| gflags | |
| gflags-devel | |
| gimp-devel | |
| gimp-devel-tools | |
| glassfish-annotation-api | |
| glassfish-annotation-api | |
| glassfish-annotation-api-javadoc | |
| glassfish-el | |
| glassfish-fastinfoset | |
| glassfish-jaxb-core | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| guice-assistedinject | |
| guice-bom | |
| guice-extensions | |
| guice-grapher | |
| guice-jmx | |
| guice-jndi | |
| guice-multibindings | |

| Package | Note |
| --- | --- |
| 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 | |
| hawtjni | |
| hawtjni | |
| hawtjni | |
| hawtjni-javadoc | |
| hawtjni-runtime | |
| hawtjni-runtime | |
| HdrHistogram | |

| Package | Note |
| --- | --- |
| 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 | |
| hyphen-mi | |
| hyphen-mn | |
| hyphen-sa | |
| hyphen-tk | |
| ibus-sayura | |
| ibus-table-devel | |

| Package | Note |
| --- | --- |
| 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 | |
| iwl3945-firmware | |
| iwl4965-firmware | |
| iwl6000-firmware | |
| jacoco | |
| jaf | |
| jaf-javadoc | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| javassist | |
| javassist | |
| javassist-javadoc | |
| javassist-javadoc | |
| jaxen | |
| jaxen-demo | |

| Package | Note |
| --- | --- |
| 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 | |
| jdom2-javadoc | |
| jetty | |
| jetty-continuation | |
| jetty-http | |
| jetty-io | |
| jetty-security | |

| Package | Note |
| --- | --- |
| 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 | |
| jsoup-javadoc | |
| jsr-305-javadoc | |
| jss-javadoc | |
| jtidy | |
| jul-to-slf4j | |
| junit-javadoc | |

| Package | Note |
| --- | --- |
| junit-manual | |
| jvnet-parent | |
| jzlib-demo | |
| jzlib-javadoc | |
| khmeros-fonts-common | |
| kmod-redhat-oracleasm | |
| kurdit-unikurd-web-fonts | |
| kyotocabinet-libs | |
| ldapjdk-javadoc | |
| leapp-upgrade-el8toel9 | |
| leapp-upgrade-el8toel9-deps | |
| lensfun | |
| lensfun-devel | |
| lftp-scripts | |
| libaec | |
| libaec-devel | |
| libappindicator-gtk3 | |
| libappindicator-gtk3-devel | |
| libasan6 | |
| libatomic-static | |
| libavc1394 | |
| libblocksruntime | |
| libcacard | |

| Package | Note |
| --- | --- |
| 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 | |
| libdc1394 | |
| libdnet | |
| libdnet-devel | |
| libdv | |

| Package | Note |
| --- | --- |
| 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 | |
| libev-libevent-devel | |
| libev-source | |
| libgdither | |
| libGLEW | |
| libgovirt | |
| libguestfs-benchmarking | |
| libguestfs-gfs2 | |
| libguestfs-java | |
| libguestfs-java-devel | |
| libguestfs-javadoc | |
| libguestfs-tools | |

| Package | Note |
| --- | --- |
| 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 | |
| libmetalink | |

| Package | Note |
| --- | --- |
| 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 | |
| liboggz | |
| 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 | |
| libucil | |
| libucil-devel | |
| libunicap | |
| libunicap-devel | |
| libunwind | |
| libusal | |
| libvarlink | |

| Package | Note |
| --- | --- |
| libverto-libevent | |
| libvirt-admin | |
| libvirt-bash-completion | |
| 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 | |

| Package | Note |
| --- | --- |
| libXxf86misc | |
| libXxf86misc-devel | |
| libyami | |
| 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 | |

| Package | Note |
| --- | --- |
| marisa | |
| marisa-devel | |
| maven-antrun-plugin | |
| maven-antrun-plugin-javadoc | |
| 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 | |

| Package | Note |
| --- | --- |
| maven-dependency-plugin-javadoc | |
| maven-dependency-tree-javadoc | |
| maven-doxia | |
| maven-doxia-core | |
| 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 | |

| Package | Note |
| --- | --- |
| maven-doxia-tests | |
| maven-enforcer-javadoc | |
| maven-failsafe-plugin | |
| maven-file-management-javadoc | |
| maven-filtering-javadoc | |
| 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 | |

| Package | Note |
| --- | --- |
| maven-plugin-registry | |
| maven-plugin-testing-javadoc | |
| maven-plugin-testing-tools | |
| maven-plugin-tools-ant | |
| maven-plugin-tools-beanshell | |
| maven-plugin-tools-javadoc | |
| 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 | |

| Package | Note |
| --- | --- |
| maven-resolver-impl | |
| maven-resolver-javadoc | |
| maven-resolver-spi | |
| maven-resolver-spi | |
| maven-resolver-test-util | |
| 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 | |

| Package | Note |
| --- | --- |
| maven-shade-plugin | |
| maven-shade-plugin-javadoc | |
| maven-shared | |
| maven-shared-incremental-javadoc | |
| 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 | |

| Package | Note |
| --- | --- |
| maven-wagon-provider-api | |
| maven-wagon-provider-api | |
| maven-wagon-providers | |
| maven2 | |
| 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 | |

| Package | Note |
| --- | --- |
| mingw32-icu | |
| mingw32-libjpeg-turbo | |
| mingw32-libjpeg-turbo-static | |
| mingw32-libpng | |
| 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 | |

| Package | Note |
| --- | --- |
| mingw64-harfbuzz-static | |
| mingw64-icu | |
| mingw64-libjpeg-turbo | |
| mingw64-libjpeg-turbo-static | |
| mingw64-libpng | |
| mingw64-libpng-static | |
| mingw64-libtiff | |
| mingw64-libtiff-static | |
| mingw64-nettle | |
| mingw64-openssl | |
| mingw64-readline | |
| mingw64-spice-vdagent | |
| mingw64-sqlite | |
| mingw64-sqlite-static | |
| mockito-javadoc | |
| modello | |
| modello-javadoc | |
| mojo-parent | |
| mongo-c-driver | |
| motif-static | |
| mousetweaks | |
| mozjs52 | |

| Package | Note |
| --- | --- |
| mozjs52-devel | |
| mozjs60 | |
| mozjs60-devel | |
| mozvoikko | |
| msv-javadoc | |
| 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 | |

| Package | Note |
| --- | --- |
| network-scripts | |
| network-scripts-ppp | |
| nkf | |
| nodejs-devel | |
| nodejs-packaging | |
| 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 | |
| openblas-Rblas | |
| opencryptoki-tpmtok | |
| opencv | |

| Package | Note |
| --- | --- |
| opencv-contrib | |
| opencv-core | |
| opencv-devel | |
| OpenEXR-devel | |
| openhpi | |
| openhpi-libs | |
| OpenIPMI-perl | |
| openjpeg2-devel-docs | |
| 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 | |

| Package | Note |
| --- | --- |
| paranamer | |
| paratype-pt-sans-caption-fonts | |
| parfait | |
| parfait-examples | |
| parfait-javadoc | |
| pcp-parfait-agent | |
| pcsc-lite-doc | |
| perl-B-Debug | |
| perl-B-Lint | |
| perl-Class-Factory-Util | |
| perl-Class-ISA | |
| perl-DateTime-Format-HTTP | |
| perl-DateTime-Format-Mail | |
| perl-File-CheckTree | |
| perl-homedir | |
| perl-libxml-perl | |
| perl-Locale-Codes | |
| perl-Mozilla-LDAP | |
| perl-NKF | |
| perl-Object-HashBase-tools | |
| perl-Package-DeprecationManager | |

| Package | Note |
| --- | --- |
| 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 | |
| php-json | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| python2-psycopg2-tests | |
| python2-pymongo | |
| python2-pymongo-gridfs | |
| python2-pytest-mock | |
| python2-sqlalchemy | |
| python2-tools | |
| python2-virtualenv | |
| python3-avahi | |
| python3-bson | |
| python3-click | |
| python3-coverage | |
| python3-cpio | |
| python3-custodia | |
| python3-docs | |
| python3-evdev | |
| python3-flask | |
| python3-gevent | |
| python3-html5lib | |
| python3-httplib2 | |
| python3-hypothesis | |
| python3-iso8601 | |
| python3-itsdangerous | |
| python3-javapackages | |

| Package | Note |
| --- | --- |
| python3-jwt | |
| python3-libuser | |
| 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 | |
| python3-pillow-tk | |
| python3-ptyprocess | |
| python3-pydbus | |
| python3-pymongo | |
| python3-pymongo-gridfs | |
| python3-pyOpenSSL | |
| python3-reportlab | |
| python3-schedutils | |
| python3-scons | |
| python3-semantic_version | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| 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 | |
| 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 | |

| Package | Note |
| --- | --- |
| rarian-compat | |
| re2c | |
| recode | |
| recode-devel | |
| 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 | |
| redhat-support-lib-python | |
| redhat-support-tool | |
| reflections | |
| regexp-javadoc | |
| relaxngDatatype | |
| resteasy-javadoc | |
| rhsm-gtk | |
| rpm-plugin-prioreset | |
| rpmemd | |

| Package | Note |
| --- | --- |
| rubygem-abrt | |
| rubygem-abrt-doc | |
| rubygem-bson | |
| rubygem-bson-doc | |
| rubygem-bundler-doc | |
| rubygem-mongo | |
| rubygem-mongo-doc | |
| rubygem-net-telnet | |
| rubygem-xmlrpc | |
| rust-std-static-wasm32-wasi | |
| 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 | |
| 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 | |
| sblim-gather | |

| Package | Note |
| --- | --- |
| sblim-gather-provider | |
| 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 | |
| slf4j-ext | |
| slf4j-javadoc | |
| slf4j-jcl | |
| slf4j-log4j12 | |
| slf4j-manual | |
| slf4j-sources | |

| Package | Note |
| --- | --- |
| 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 | |
| spice-client-win-x64 | |
| spice-client-win-x86 | |
| spice-glib | |
| spice-glib-devel | |
| spice-gtk | |
| spice-gtk-tools | |

| Package | Note |
| --- | --- |
| 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 | |
| subscription-manager-initial-setup-addon | |
| subscription-manager-migration | |
| subscription-manager-migration-data | |
| subversion-javahl | |
| SuperLU | |

| Package | Note |
| --- | --- |
| 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 | |
| tpm-tools-pkcs11 | |
| treelayout | |
| trousers | |
| trousers-devel | |
| trousers-lib | |
| tuned-profiles-compat | |

| Package | Note |
| --- | --- |
| 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 | |
| virt-p2v-maker | |
| vm-dump-metrics-devel | |
| voikko-tools | |
| vorbis-tools | |
| weld-parent | |
| woodstox-core | |
| wqy-microhei-fonts | |

| Package | Note |
| --- | --- |
| 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 | |
| xmlunit-javadoc | |
| xmvn-api | |
| xmvn-bisect | |
| xmvn-connector-aether | |
| xmvn-connector-ivy | |
| xmvn-install | |
| xmvn-javadoc | |

| Package | Note |
| --- | --- |
| 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 | |
| xsom | |
| xz-java-javadoc | |
| yajl-devel | |
| yp-tools | |
| ypbind | |
| ypserv | |
| yum-rhn-plugin | |

| Package | Note |
| --- | --- |
| 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 |
| gdbm-devel | rhel8-BaseOS |
| geoclue2-demos | rhel8-AppStream |
| gobject-introspection-devel | rhel8-AppStream |
| gsl-devel | rhel8-AppStream |
| gtkspell3 | rhel8-AppStream |
| hivex-devel | rhel8-AppStream |

| Package | RHEL 8 repository |
|---|---|
| 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 |
| libmng-devel | rhel8-AppStream |
| libnbd-devel | rhel8-AppStream |
| libslirp-devel | rhel8-AppStream |
| libtalloc-devel | rhel8-BaseOS |
| libtdb-devel | rhel8-BaseOS |
| libtevent-devel | rhel8-BaseOS |
| libvirt-devel | rhel8-AppStream |
| libvirt-docs | rhel8-AppStream |

| Package | RHEL 8 repository |
|---|---|
| libvirt-lock-sanlock | rhel8-AppStream |
| libwinpr-devel | rhel8-AppStream |
| libzip-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 |
| openwsman-client | 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 |
| postgresql-test | rhel8-AppStream |

| Package | RHEL 8 repository |
| --- | --- |
| 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 |
| qgpgme | rhel8-AppStream |
| 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 |
| tix | rhel8-AppStream |
| turbojpeg | rhel8-AppStream |

| Package | RHEL 8 repository |
| --- | --- |
| unixODBC-devel | rhel8-AppStream |
| usbredir-devel | rhel8-AppStream |
| velocity | rhel8-AppStream |
| volume_key-devel | rhel8-AppStream |