Oracle Linux 9

Release Notes for Oracle Linux 9.7

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Oracle Linux 9 Release Notes for Oracle Linux 9.7,

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Preface

Oracle Linux 9: Release Notes for Oracle Linux 9.7 provides information about the new features and known issues in the Oracle Linux 9.7 release. The information applies to both x86_64 and 64-bit Arm (aarch64) architectures. This document might be updated after first publication.

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About Oracle Linux 9

The current Oracle Linux 9 release contains new features and enhancements that improve performance in different areas including automation and management, security and compliance, container management, and developer tools. These enhancements are especially designed to make the OS adaptable to different types of deployment such as on-premises installations, hybrid deployments that combine on-premises and cloud installations, and full cloud deployment.

> **Important**
>
> Upgrading from an Oracle Linux Developer Preview release to its later official version is not supported. If you're running the Developer Preview version, you must reinstall the official Oracle Linux release upon its general availability.

System Requirements and Limitations

To check whether a specific hardware is supported on the current Oracle Linux 9 release, see the Hardware Certification List at https://linux.oracle.com/hardware-certifications. Note that as hardware becomes available and validated, the hardware is added to the list.

CPU, memory, disk and file system limits for all Oracle Linux releases are described in Oracle Linux: Limits.

Available Architectures

The release is available for installation on the following platforms:

- Intel® 64-bit (x86_64) (x86-64-v2)
- AMD 64-bit (x86_64) (x86-64-v2)
- 64-bit Arm (aarch64) (Arm v8.0-A)

  The Arm platform runs only with Unbreakable Enterprise Kernel Release (UEK).

Shipped Kernels

For the x86_64 platform, the current Oracle Linux 9 release ships with the following kernel packages:

- **`kernel-uek-6.12.0-105.51.5`** (Unbreakable Enterprise Kernel 8 Update 1 (UEK 8U1)) (Default)
- **`kernel-5.14.0-611.5.1`** (Red Hat Compatible Kernel (RHCK))

For new installations, UEK 8 is automatically enabled and installed. It also becomes the default kernel on first boot.

In the case of updates, switching to UEK R8 isn't automatic. If you're upgrading from any prior update release of Oracle Linux 9 that has UEK R7 as default, the system continues to run with the kernel that's already installed. See UEK R8 Default Kernel Handling for more information.

For the aarch64 platform, Oracle Linux ships with the UEK kernel only.

The Oracle Linux release is tested as a bundle, as shipped on the installation media image. When installed from the installation media image, the kernel's version included in the image is the minimum version that's supported. Downgrading kernel packages isn't supported, unless recommended by Oracle Support.

About the Unbreakable Enterprise Kernel

The Unbreakable Enterprise Kernel (UEK) is a Linux kernel built by Oracle and supported through Oracle Linux support. UEK is tested on Arm (aarch64), Intel® x86, and AMD x86 (x86_64) platforms. Each release contains added features, bug fixes, and updated drivers to provide support for key functional requirements, improve performance, and optimize the kernel for use on Oracle products such as Oracle's Engineered Systems, Oracle Cloud Infrastructure, and large enterprise deployments for Oracle customers.

Typically, a UEK release contains changes to the kernel ABI relative to a previous UEK release. These changes require recompilation of third-party kernel modules on the system. To minimize impact on interoperability during releases, the Oracle Linux team works with third-party vendors regarding hardware and software that have dependencies on kernel modules. Thus, before installing the latest UEK release, verify its support status with the application vendor.

The kernel ABI for a UEK release remains unchanged in all later updates to the initial release.

The kernel source code for UEK is available after the initial release through a public git source code repository at https://github.com/oracle/linux-uek.

For more information about UEK such as tutorials, notices, and release notes of different UEK versions, go to Unbreakable Enterprise Kernel documentation.

User Space Compatibility

Oracle Linux maintains user space compatibility with Red Hat Enterprise Linux (RHEL) that's independent of the kernel version that underlies the OS. Existing applications in user space continue to run unmodified on UEK with no required recertifications for Oracle Linux certified applications.

Obtaining Installation Images

The following installation images for the current Oracle Linux 9 release are available:

- Full ISO of Oracle Linux for typical on-premises installations
- Boot ISO of Oracle Linux for network installations
- Boot ISO of the official UEK release for installing on hardware which is supported only on UEK
- Source DVDs

You can download these images from the following locations. Note that the images in these locations are for both the x86_64 and aarch64 platforms, unless indicated otherwise:

- Oracle Linux yum server at https://yum.oracle.com/oracle-linux-downloads.html

For more information managing and updating software on Oracle Linux systems, see Oracle Linux: Managing Software on Oracle Linux.

- Oracle Software Delivery Cloud at https://edelivery.oracle.com

To prepare a downloaded image for installing Oracle Linux, see Oracle Linux 9: Installing Oracle Linux.

> **Note**
>
> Aside from installation ISO images, you can also use Oracle Linux images to create compute instances on Oracle Cloud Infrastructure. For information about these images, see the release notes for the specific image that you're using on the *Oracle Cloud Infrastructure Documentation* page.
>
> To use Oracle Linux on Oracle Cloud Infrastructure, see https://docs.oracle.com/iaas/oracle-linux/home.htm.

For information about the available ISO images for the three most recent updates to the Oracle Linux releases, see https://yum.oracle.com/oracle-linux-isos.html.

Upgrading From Previous Oracle Linux Releases

You can upgrade an Oracle Linux 8 system to the Oracle Linux 9 release by using the `leapp` utility.

For step-by-step instructions and information about any known issues that might arise when upgrading the system, see Oracle Linux 9: Upgrading Systems With Leapp.

Upgrading From Previous Oracle Linux Update Releases

You can upgrade an Oracle Linux 9 system from a previous update level to the current update level by running the `sudo dnf update` command.

After performing a system update where many packages are updated, we recommend that you reboot the system. System functionality might become unstable if core packages are updated and the system isn't restarted to load the most recent updates. You can check whether a system requires a restart by running:

```
dnf needs-restarting -r
```

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New Features and Changes

Unless indicated otherwise, the following new features, major enhancements, bug fixes, and other changes that are introduced in this release of Oracle Linux 9 apply to both the x86_64 and 64-bit Arm (aarch64) platforms.

Installation and Boot

The following features, enhancements, and changes related to installation and boot are introduced in this release of Oracle Linux 9.

New Boot Menu Entry for `fips=1` Added to ISO Installations

A new boot menu entry enables the `fips=1` kernel option for ISO installations to simplify FIPS compliance.

The DVD and Boot ISO image installations provide a new boot menu entry for setting the `fips=1` kernel boot option. Enabling FIPS mode during the Oracle Linux installation ensures that the system generates all keys with FIPS-approved algorithms and continuous monitoring tests in place. By using this boot option, you start the installation with the `fips=1` kernel parameter to target the system's compliance with Federal Information Processing Standards (FIPS) 140 requirements.

UEK R8 Default Kernel Handling

If you're performing a fresh Oracle Linux 9.7 installation from an ISO image, then after the installation completes, the UEK R8 kernel is automatically enabled.

UEK R8 Update 1 includes many new features including security and performance enhancements. For more details, see Unbreakable Enterprise Kernel 8 Update 1: Release Notes (6.12.0-100).

If you select RHCK as the default kernel instead of UEK, ensure that you disable UEK yum repositories or ULN channels. For more information about switching to RHCK, see Oracle Linux 9: Managing Kernels and System Boot.

In the case of updates, switching to UEK R8 isn't automatic. If you're upgrading from a prior update release of Oracle Linux 9, the system continues to run with the kernel that's already installed.

If the system is using UEK R7, you can upgrade to UEK R8 by using the following instructions:

- **Updating by using yum**

  When you update to Oracle Linux 9.7, the previous kernel is preserved. At the same time, the UEK R8 yum repository is also added to the system yum configuration. To move to the latest kernel, run the following commands:

  ```
  sudo dnf config-manager --disable ol9_UEKR7
  sudo dnf config-manager --enable ol9_UEKR8
  ```

```
sudo dnf install -y kernel-uek
sudo dnf update
```

- **Updating by using ULN**

  Similar to the previous scenario, the previous kernel is preserved. However, system subscriptions might change as a result. Sign in to https://linux.oracle.com, and update the system channel subscriptions to enable the `ol9_x86_64_UEKR8` or `ol9_aarch64_UEKR8`, as required. After you have updated the system channel subscriptions, run:

  ```
  sudo dnf install -y kernel-uek
  sudo dnf update
  ```

After setting the default kernel, you can further configure kernel boot parameters so that these parameters are applied at every system boot. For instructions, see Oracle Linux 9: Managing Kernels and System Boot.

Operating System and Software Management

The following features, enhancements, and changes related to the OS and software management are introduced in this Oracle Linux 9 release.

`dnf4` Can Run DNF Commands

Oracle Linux 9.7 provides the `dnf4` alias for `dnf`. Previous releases included a `dnf3` alias. In Oracle Linux 9.7, you can use either `dnf` or `dnf4` to run DNF commands, offering users the option to specify the tool explicitly for compatibility or preference.

`createrepo_c` Handles Zstandard Compression

`createrepo_c` now handles Zstandard (zstd) compression for metadata. This enhancement optimizes repository creation and distribution, offering better compression ratios and faster decompression for Oracle Linux package management.

Security

The following features, enhancements, and changes related to security are introduced in this Oracle Linux 9 release.

NSS Updated to 3.112

With Oracle Linux 9.7, the NSS cryptographic toolkit packages are updated to upstream version 3.112 with many improvements and fixes.

See https://firefox-source-docs.mozilla.org/security/nss/releases/index.html for more information.

Notably:

- This update adds support for the Module-Lattice-Based Digital Signature Algorithm (ML-DSA), a post-quantum cryptography (PQC) standard.
- You can take advantage of hybrid SSL support with the MLKEM1024 key encapsulation mechanism.

`crypto-policies` Include Post-Quantum Cryptography

Oracle Linux 9.7 introduces a PQ subpolicy in `crypto-policies` that enables post-quantum cryptography. Notable changes include:

- DEFAULT, FUTURE, and FIPS policies now prioritize hybrid Module-Lattice-Based Key-Encapsulation Mechanism (ML-KEM) and pure Module-Lattice-Based Digital Signature Standard (ML-DSA) post-quantum cryptographic algorithms for maximum security.
- ML-DSA-44, ML-DSA-65, and ML-DSA-87 PQC algorithms are enabled for NSS TLS connections in all cryptographic policies with the PQ subpolicy.
- The PQ subpolicy also enables the mlkem768x25519, secp256r1mlkem768, and secp384r1mlkem1024 hybrid ML-KEM groups for NSS TLS negotiations.
- PQC algorithms are enabled for the Sequoia PGP tool in all policies with the PQ subpolicy.
- New OpenSSL group selection syntax prioritizes post-quantum groups if you enable the PQ subpolicy.

You can apply the PQ subpolicy, for example, by running `update-crypto-policies --set DEFAULT:PQ`.

You can apply the FIPS PQ subpolicy if the system is in FIPS mode, by running `update-crypto-policies --set FIPS:PQ`.

OpenSSL Updated to 3.5

With Oracle Linux 9.7, OpenSSL is updated to version 3.5. You can now improve security for TLS connections and cryptographic operations in Oracle Linux environments, preparing systems for a quantum-safe future.

The following notable changes are available in this update:

- Includes ML-KEM, ML-DSA, SLH-DSA post-quantum algorithms.
- Hybrid ML-KEM algorithms are added to the default TLS group list.
- QUIC transport protocol is available.
- SHAKE-128 and SHAKE-256 implementations no longer have a default digest length.
- Clients can send multiple key shares in TLS 1.3 connections.

OpenSSL `SSLKEYLOGFILE` Environment Variable For Debugging

With Oracle Linux 9.7, use the `SSLKEYLOGFILE` environment variable to instruct OpenSSL to log TLS connection secrets to a file.

> **⚠ Caution**
>
> Only enable this feature in test or debug environments. Logging key material can introduce security risks.

Hybrid ML-KEM Cryptography Works in FIPS Mode

Oracle Linux 9.7 adds FIPS mode support for hybrid Module-Lattice-Based Key Encapsulation Mechanism (ML-KEM), so OpenSSL uses both classical and post-quantum algorithms for key exchanges.

`crypto-policies` Support Ed25519 in NSS

`crypto-policies` in Oracle Linux 9.7 now enable Ed25519 in DEFAULT, LEGACY, and FUTURE policies for NSS, so you can use this efficient elliptic curve algorithm.

`rpm-sequoia` Package for Quantum-Resistant RPM Signatures

With Oracle Linux 9.7, you can use the `rpm-sequoia` package to verify RPM packages with post-quantum cryptographic algorithms such as ML-DSA for enhanced security.

RPM signatures with PQ certificates can be verified using extra `pqrpm` package. You can use the DNF `multisig` plugin once the you have run the `pqrpm rpmkeys` setup utility. Only RPMs signed with a regular signature and the additional PQ signature pass validation.

SCAP Security Guide Updated to 0.1.78

Oracle Linux 9.7 updates the SCAP Security Guide to version 0.1.78 and delivers updated profiles for PCI-DSS, HIPAA, and other standards.

Notable updates include:

- DISA STIG updated to V2R5 for Oracle Linux 8, and DISA STIG updated to V1R2 for Oracle Linux 9
- The `auditd_freq` rule correctly honors the XCCDF variable.
- Added support for systemd drop-in files for coredump rules
- Updated a regular expression to match .so files in rules relating to library dirs.
- Updated `accounts_passwords_pam_faillock` related rules to support only newer Oracle Linux versions
- Improved detection of the retry option in password complexity.

SELinux Assigns `diagnostic_device_t type` to `/dev/diag`

Oracle Linux 9.7 now includes the `diagnostic_device_t type` for `/dev/diag` in the SELinux policy. This type lets you control access to the device for diagnostics.

This change increases security by restricting `/dev/diag` to appropriate SELinux contexts in Oracle Linux systems.

SELinux Policy Adds Rules for `qgs` Daemon

Oracle Linux 9.7 introduces a new `qgs_t type` and access rules for the `qgs` daemon in the SELinux policy, which lets the daemon operate securely in TDX confidential VM environments.

With these rules, SELinux can control access for `qgs` in Oracle Linux, strengthening security for confidential computing deployments.

Three Services Removed from SELinux Permissive Mode

In Oracle Linux 9.7, the SELinux domains for `powerprofiles_t`, `samba_bgqd_t`, and `switcheroo_control_t` now run in enforcing mode and no longer operate in permissive mode.

This update provides full SELinux enforcement for these services, which previously ran in permissive mode as a temporary measure.

`tuned-ppd` Confined in SELinux Policy

The `tuned-ppd` SELinux policy is updated to confine the `tuned-ppd` service. The service previously ran with the `unconfined_service_t` SELinux label. With this update, the service is no longer unconfined and runs successfully in SELinux enforcing mode.

`fips-provider-next` Package Added

The `fips-provider-next` package is offered as a technology preview of the next version of the FIPS provider. This package might be submitted to the National Institute of Standards and Technology (NIST) for future validation. The `openssl-fips-provider` remains the validated FIPS provider.

To switch to the `fips-provider-next`, run the following command:

```
sudo dnf swap openssl-fips-provider fips-provider-next --allowerasing --
disablerepo=ol9_baseos_latest
```

Keylime Updated to Version 7.12.1

Oracle Linux 9.7 updates Keylime to version 7.12.1.

See https://github.com/keylime/keylime/releases/tag/v7.12.1 for more information.

`openCryptoki` Updated to Version 3.25.0

Version 3.25.0 of the `openCryptoki` packages is now available.

See https://github.com/opencryptoki/opencryptoki/releases/tag/v3.25.0 for more information.

File Systems and Storage

The following features, enhancements, and changes related to file systems and storage are introduced in this Oracle Linux 9 release.

Multipathd Supports File-Based Sockets for Container Communication

Multipathd can use file-based sockets for communication from containers to the host daemon. The `multipathd` daemon listens on a socket file at `/run/multipathd.socket` and also the abstract namespace socket. You can bind-mount the socket into a container, letting it interact with the host's `multipathd` daemon more easily.

This feature improves container integration for storage management, so you can monitor and configure multipath devices from inside containers without extra networking. Device paths stay consistent across container boundaries.

Mount `/run/multipathd.socket` in the container and use standard multipath tools, such as `multipath -ll`, to query or manage devices from within the container.

Dynamic Programming Languages, Web and Database Servers

The following features, enhancements, and changes related to programming languages, web servers, and database servers are introduced in this Oracle Linux 9 release.

Valkey 8 now Available in Oracle Linux

Oracle Linux 9.7 includes Valkey 8, a high-performance key-value store compatible with Redis clients, supporting strings, hashes, lists, sets, and sorted sets. You can store strings, hashes, lists, sets, and sorted sets efficiently using its in-memory engine with options for disk persistence.

Compilers and Development Tools

The following features, enhancements, and changes related to compilers and development tools are introduced in this Oracle Linux 9 release.

`dyninst` Framework Updated to 13.0.0

`dyninst` 13.0.0 improves AMD GPU binary support and x86 instruction/C++ DWARF parsing for better runtime instrumentation.

GCC Toolset 15 is now Available

Oracle Linux 9.7 provides `gcc-toolset-15`, which includes current GCC and related utilities so you can build, test, and deploy applications using the latest compiler technology.

SystemTap Updated to Version 5.3

SystemTap 5.3 features multithreaded parsing for faster initialization.

See https://sourceware.org/systemtap/wiki/SystemTapReleases for more information.

`valgrind` Upgraded to Version 3.25.1

`valgrind` is upgraded to 3.25.1.

See https://valgrind.org/docs/manual/dist.news.html for more information.

Oracle Linux 9.7 splits `valgrind` into subpackages for core, scripts, GDB integration, and documentation, providing selective installation of required components.

This modular approach reduces footprint and improves management for users focusing on specific `valgrind` features in Oracle Linux development workflows.

`elfutils` Updated to Version 0.193

`elfutils` is updated to version 0.193.

llvm-toolset Updated to LLVM 20

The `llvm-toolset` is upgraded to LLVM 20.

See https://releases.llvm.org/20.1.0/docs/ReleaseNotes.html.

`gdb` is Updated to Version 16.3

Oracle Linux 9.7 updates `gdb` to version 16.3.

Rust Toolset Updated to Version 1.88.0

Oracle Linux 9.7 includes Rust Toolset version 1.88.0, which brings Rust 2024 Edition, let chains, intrinsics in safe Rust, async closures, trait upcasting, and Cargo cache cleaning.

See https://blog.rust-lang.org/2025/06/26/Rust-1.88.0/ for more information.

Rust Toolset is a rolling Application Stream. Oracle only supports the latest version. For more details, see Oracle Linux: Product Life Cycle Information.

Containers

The following features, enhancements, and changes related to containers are introduced in this Oracle Linux 9 release.

The Container Tools Packages have been Updated

The Container Tools RPM meta-package is now updated and includes Podman v5.6, Buildah v1.41.0, and Skopeo 1.20.0.

See https://github.com/containers/podman/releases, https://github.com/containers/buildah/releases, and https://github.com/containers/skopeo/releases for more information.

Cockpit Web Console

The following features, enhancements, and changes related to the Cockpit web console are introduced in this Oracle Linux 9 release.

Cockpit Updated to Version 344

Oracle Linux 9.7 updates the `cockpit` packages to version 344. Notable updates include:

- A redesigned user interface based on PatternFly 6
- SMART technology support and Stratis 3.8+ pool format in Storage
- Improved graphical VNC, control VNC, and serial consoles in Virtual Machines
- IPv6 support for WireGuard VPNs in Networking

- Easy branding of web console pages using the `branding.css` file

cockpit-ws-selinux Subpackage Added

Oracle Linux 9.7 now provides the SELinux policy for `cockpit_ws` processes in a separate `cockpit-ws-selinux` subpackage to prevent failures in the web console on systems where SELinux isn't installed. The change helps to avoid unnecessary package dependencies. See `cockpit_ws_selinux(8)` for details.

3 Technology Preview

The following items are available as technical previews in this release of Oracle Linux. Note that some items listed apply to Red Hat Compatible Kernel (RHCK) and might already be available in UEK.

Security

The following features for security are available as technology preview.

KTLS

Oracle Linux 9 provides kernel Transport Layer Security (KTLS) as a technology preview.

The Linux Kernel TLS (KTLS) handles TLS records for the AES-GCM cipher. KTLS also provides the interface for offloading TLS record encryption to NICs that support this functionality.

OpenSSL 3.0 is able to use KTLS if the `enable-ktls` configuration option is used during compiling.

The updated `gnutls` packages can use KTLS for accelerating data transfer on encrypted channels. To enable KTLS, add the `tls.ko` kernel module using the `modprobe` command, and create a new configuration file `/etc/crypto-policies/local.d/gnutls-ktls.txt` for the system-wide cryptographic policies with the following content:

```
[global]
ktls = true
```

Note that `gnutls` doesn't permit you to update traffic keys through TLS `KeyUpdate` messages, which impacts the security of AES-GCM ciphersuites.

QUIC Protocol in OpenSSL

OpenSSL clients can use the QUIC transport layer network protocol as a technical preview.

`io_uring` Asynchronous I/O Interface

Although available, the `io_uring` asynchronous I/O interface is disabled in RHCK by default. To enable the feature, set the `kernel.io_uring_disabled` variable to any one of the following values when running the `sysctl` command:

- `0`: All processes can create `io_uring` instances as usual.
- `1`: Creating `io_uring` is disabled for unprivileged processes. With this setting, the `io_uring_setup` fails with the `-EPERM` error. It only successfully completes if the calling process is privileged by the `CAP_SYS_ADMIN` capability. However, existing `io_uring` instances can still be used.

- 2 (default): Creating `io_uring` creation is disabled for all processes. With this setting, the `io_uring_setup` always fails with `-EPERM`. However, existing `io_uring` instances can still be used.

To use this feature, an updated version of the SELinux policy to enable the `mmap` system call on anonymous inodes is also required.

Note that `io_uring` support has been available in UEK from UEK R6U3.

Infrastructure Services

The following features for infrastructure services are available as technology previews.

Socket API for TuneD

The socket API for TuneD maps one-to-one with the D-Bus API and provides an alternative communication method for cases where D-Bus isn't available. With the socket API, you can control the TuneD daemon to optimize the performance, and change the values of various tuning parameters. The socket API is disabled by default. You can enable it in the `tuned-main.conf` file.

Networking

The following networking features are available as technology previews.

`gpsd-minimal`

The `gpsd-minimal` package is available as a technical preview. `gpsd` is a service daemon that mediates access to a GPS sensor connected to the host computer by serial or USB interface, making its data on the location, course, and velocity of the sensor available to be queried on TCP port 2947 of the host computer.

WireGuard

WireGuard is a VPN solution that has improved security features and is easily configurable.

Note that WireGuard is fully supported in UEK. See Oracle Linux: Configuring Virtual Private Networks for more information on using WireGuard on Oracle Linux.

`systemd-resolved` Service

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

PRP and HSR

The `hsr` kernel module is included with RHCK to provide the following protocols as a technology preview:

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

IPsec Packet Offloading

In RHCK, complete IPsec encapsulation can be offloaded to a Network Interface Controller (NIC) to reduce workload. This functionality is offered as a technology preview.

Various Modem Network Drivers

Oracle Linux provides modem drivers in RHCK with limited functionality as a technology preview:

- Qualcomm MHI WWAM MBIM - Telit FN990Axx
- Intel IPC over Shared Memory (IOSM) - Intel XMM 7360 LTE Advanced
- Mediatek t7xx (WWAN) - Fibocom FM350GL
- Intel IPC over Shared Memory (IOSM) - Fibocom L860GL modem

Segment Routing Over IPv6

Segment Routing over IPv6 (SRv6) is available as a technology preview in RHCK. SRv6 can improve traffic flows in edge computing and provides a mechanism to program network slicing and resource reservation.

Kernel

The following kernel features are available as technology previews for RHCK.

Soft iWarp

Soft-iWARP (`siw`) is an Internet Wide-area RDMA Protocol (iWARP) software kernel driver. The driver implements the iWARP protocol suite over the TCP/IP network stack. The suite is implemented in software. Therefore, it doesn't require an RDMA hardware. The protocol suite enables a system with a standard Ethernet adapter to connect to an iWARP adapter or to another system that already has `siw` installed.

Note that from Oracle Linux 9.5, this driver is deprecated.

File Systems and Storage

The following features that are related to file systems and storage are available as technology preview.

`nvme-stas` Package

The `nvme-stas` package, which is a Central Discovery Controller (CDC) client for Linux, handles the following functionalities:

- Asynchronous Event Notifications (AEN)
- Automated NVMe subsystem connection controls
- Error handling and reporting
- Automatic (`zeroconf`) and Manual configuration.

This package consists of two daemons, Storage Appliance Finder (`stafd`) and Storage Appliance Connector (`stacd`).

Compilers and Development Tools

The following features for compilers and development tools are available as technology previews.

`jmc-core` and `owasp-java-encoder`

`jmc-core` is a library that provides core APIs for Java Development Kit (JDK) Mission Control, including APIs for:

- Parsing and writing Java Flight Recording files
- Discovering Java Virtual Machines (JVMs) through the Java Discovery Protocol (JDP)

The `owasp-java-encoder` package provides a collection of high-performance low-overhead contextual encoders for Java.

The packages are available in the Oracle Linux 9 CodeReady Builder repository, which is unsupported, and which you must explicitly enable.

Flexible Array Conversion Warning-Suppression in `libabigail` Available As a Technology Preview

When comparing binaries, you can suppress warnings related to fake flexible arrays that were converted to true flexible arrays by using the following suppression specification:

- - - type_kind = struct has_size_change = true
- - -has_strict_flexible_array_data_member_conversion = true

This features is available as a technology preview.

Virtualization

The following virtualization features are available as technology previews.

Nested VMs

Nested KVM virtualization is provided as a technology preview for KVM virtual machines (VMs) running on Oracle Linux 9.

SEV and SEV-ES

The Secure Encrypted Virtualization (SEV) feature is provided for AMD EPYC host machines that use the KVM hypervisor. It encrypts a virtual machine's memory and protects the VM from access by the host.

SEV's enhanced Encrypted State version (SEV-ES) encrypts all CPU register contents when a VM stops running, thus preventing the host from modifying the VM's CPU registers or reading any information from them.

Note that SEV is supported in UEK.

4
Deprecated Features

This chapter lists features and functionalities that are deprecated in Oracle Linux 9. While these features might be included and operative in the release, support isn't guaranteed in future major releases. Thus, these features must not be used in new Oracle Linux 9 deployments.

Installation

The following installation related features and functionalities are deprecated in Oracle Linux 9.

Kickstart Commands

- `timezone --ntpservers`
- `timezone --nontp`
- `logging --level`
- `%packages --excludeWeakdeps`
- `%packages --instLangs`
- `%anaconda`
- `pwpolicy`
- `nvdimm`

Even though specific options are listed as deprecated, the base command and the other options remain available and operative. If you use a deprecated command in kickstart files, warnings are generated in the logs. To change deprecated command warnings to errors, set the `inst.ksstrict` boot option.

`initial-setup` Package

Instead of using this package, use the `gnome-initial-setup` package as a replacement.

`inst.geoloc` Boot Option Values `provider_hostip` And `provider_fedora_geoip`

The `provider_hostip` and `provider_fedora_geoip` values for the `inst.geoloc=` boot option are deprecated. You can use the `geolocation_provider=URL` option to set the required geolocation in the installation program configuration file, if required. Use the `inst.geoloc=0` option to disable the geolocation.

Anaconda Screenshots

Capturing screenshots of the Anaconda GUI by using a global hotkey is deprecated.

Anaconda Help

The built-in documentation from spokes and hubs of all Anaconda user interfaces that was available during Anaconda installation is deprecated. The interface is self-documented and the Oracle Linux 9: Installing Oracle Linux can be used for further assistance.

Software Management

The following software management related features and functionalities are deprecated in Oracle Linux 9.

DNF `debug` plugin

The DNF `debug` plugin, which includes the `dnf debug-dump` and `dnf debug-restore` commands, is deprecated.

DNF `libreport`

The DNF `libreport` library is deprecated.

Shell and Command Line

The following shell and command line related features and functionalities are deprecated in Oracle Linux 9.

`dump` Utility

The `dump` utility that's included in the `dump` package is deprecated.

You can alternatively use the `tar` or `dd` to achieve similar functionality.

Note that the `restore` utility, originally included in the `dump` package, remains available in Oracle Linux 9 and can be installed by using the `restore` package.

Bacula Sqlite Backend Database

The use of a SQLite backend database for the Bacula backup utility is deprecated. Bacula can use a MySQL backend database and you can migrate existing deployments to MySQL. Avoid using SQLite for new deployments of the Bacula backup utility.

TMPDIR Variable in the ReaR Configuration File

Exporting using the `TMPDIR` environment variable in the `/etc/rear/local.conf` or `/etc/rear/site.conf` ReaR configuration files, is deprecated.

Instead, you can specify a custom directory for ReaR temporary files by exporting the variable in the shell environment before executing ReaR. For example, run the `export TMPDIR=…` statement and then run the `rear` command in the same shell session or script.

Security

The following security related features and functionalities are deprecated in Oracle Linux 9.

Unprivileged Access to `dmesg` Output

Unprivileged access to `dmesg` output is deprecated and will be removed in a future release of UEK 8 and might be removed in a future release of Oracle Linux. Use the `sudo` command to escalate to administrator privileges when running the `dmesg` command. See Oracle Linux 9: Enhancing System Security for more information on how to restrict access to kernel ring buffer messages as good security practice.

OVAL Data Format

The Open Vulnerability Assessment Language (OVAL) data format used by the OpenSCAP suite is deprecated. Declarative security data is now provided in the Common Security Advisory Framework (CSAF) format, which is the successor of OVAL.

Using `update-ca-trust` Without Arguments

Using the `update-ca-trust` command without arguments to update the CA trust store is deprecated. Use the `update-ca-trust extract` command to update the CA trust store.

Configuring STunnel Clients to Use the Trusted Root CA Files

The option to configure STunnel Clients `CAFiles` directive to point to a file that contains trusted root certificates in the BEGIN TRUSTED CERTIFICATE format. If you use `CAfile = /etc/pki/tls/certs/ca-bundle.trust.crt`, change the location to `CAfile = /etc/pki/tls/certs/ca-bundle.crt`.

NSS Deprecated Algorithms

The following algorithms are deprecated in the Network Security Services (NSS) cryptographic library.

- Digital Signature Algorithm (DSA)
- SEED

Use RSA, ECDSA, SHB-DSA, ML-DSA, or FN-DSA instead.

`pam_ssh_agent_auth`

`pam_ssh_agent_auth` is deprecated.

`scap-workbench`

`scap-workbench` is deprecated.

`oscap-anaconda-addon`

`oscap-anaconda-addon` is deprecated.

`/etc/system-fips`

The `/etc/system-fips` file, that was used to indicate FIPS mode is removed. To install Oracle Linux in FIPS mode, add the `fips=1` parameter to the kernel command line during the system installation. You can check whether Oracle Linux operates in FIPS mode by using the `fips-mode-setup --check` command.

`libcrypt.so.1`

The `libcrypt.so.1` library is deprecated.

SHA-1 Algorithm

The SHA1 algorithm is deprecated in Oracle Linux 9. Digital signatures using SHA-1 hash algorithm are no longer considered secure and therefore not allowed on Oracle Linux 9 systems by default. Oracle Linux 9 has been updated to avoid using SHA-1 in security-related use cases.

However, the HMAC-SHA1 message authentication code and the Universal Unique Identifier (UUID) values can still be created by using SHA-1.

In cases where you need SHA-1 to verify existing or third party cryptographic signatures, you can enable SHA-1 as follows:

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

As an alternative, you can switch the systemwide crypto policies to the `LEGACY` policy. However, this policy also enables other algorithms that are not secure, and therefore risks making the system vulnerable.

Furthermore, use of the SHA-1 algorithm at `SECLEVEL=2` is deprecated in OpenSSL.

SCP Protocol

In the `scp` utility, secure copy protocol (SCP) is replaced by the SSH File Transfer Protocol (SFTP) by default. Likewise, SCP is deprecated in the `libssh` library.

Oracle Linux 9 doesn't use SCP in the OpenSSH suite.

OpenSSL Cryptographic Algorithms

- MD2
- MD4
- MDC2
- Whirlpool
- RIPEMD160
- Blowfish
- CAST
- DES

- IDEA
- RC2
- RC4
- RC5
- SEED
- PBKDF1

The implementations of these algorithms have been moved to the legacy provider in OpenSSL

For instructions on how to load the legacy provider and enable support for the deprecated algorithms, see the `/etc/pki/tls/openssl.cnf` configuration file.

Digest-MD5

The Digest-MD5 authentication mechanism in the Simple Authentication Security Layer (SASL) framework is deprecated.

`/etc/system-fips` File

The `/etc/system-fips` file was used to indicate the FIPS mode in the system. This file is removed in Oracle Linux 9.

To install Oracle Linux 9 in FIPS mode, add the `fips=1` parameter to the kernel command line during the system installation. To check whether Oracle Linux 9 is operating in FIPS mode, use the `fips-mode-setup --check` command.

`libcrypt.so.1`

The `libcrypt.so.1` cryptogarhic library is deprecated.

`fapolicyd.rules` File

The `/etc/fapolicyd/fapolicyd.rules` file is deprecated. You can store policy rules for `fapolicyd` in the `/etc/fapolicyd/rules.d/` directory. The `fagenrules` script merges all component rule files in this directory to the `/etc/fapolicyd/compiled.rules` file.

Rules in `/etc/fapolicyd/fapolicyd.trust` continue to be processed by `fapolicyd` for backward compatibility.

OpenSSL RSA Encryption Without Padding

RSA encryption without padding for OpenSSL in FIPS mode is no longer accepted. However, key encapsulation with RSA (RSASVE) which doesn't use padding continues to be supported for OpenSSL.

OpenSSL Engines API

The Engines API is deprecated in the OpenSSL 3.0 TLS toolkit. Use the `pkcs11-provider` Providers API instead. Equally use of the OpenSSL Engines API in Stunnel is deprecated.

openssl-pkcs11

The openssl-pkcs11 (engine_pkcs11) package, which relates to the deprecated OpenSSL Engins API, is now deprecated. Use the pkcs11-provider package instead.

Networking

The following network related features and functionalities are deprecated in Oracle Linux 9.

Soft-iWarp

Soft-iWarp, which was available as a technology preview in previous releases of Oracle Linux 9, is deprecated.

Network Teams

The teamd service, and the libteam library, and support for configuring network teams are deprecated in favor of network bonds. You should use network bonds instead, which have similar functions as teams, and which would receive enhancements and updates.

dhcp-client Package

The dhcp-client package and the dhclient tool that it contained are deprecated in favor of the internal DHCP client library built into NetworkManager.

firewalld Lockdown

The lockdown feature in firewalld is deprecated because it can't prevent processes that are running as root from adding themselves to the allow list.

/etc/sysconfig/network-scripts File

Network configurations profiles used to be in ifcfg format and stored in the /etc/sysconfig/network-scripts directory. This format is deprecated. In Oracle Linux 9, new network configurations are stored in /etc/NetworkManager/system-connections in keyfile format. This format works with all the connection settings provided by NetworkManager.

However, information in the /etc/sysconfig/network-scripts remain operative, and modifications to existing profiles continue to update the older files.

iptables Framework

With the deprecation of the iptables framework, the iptables backend and the direct interface are also deprecated.

Therefore, the following packages are also deprecated:

- iptables-devel
- iptables-libs
- iptables-nft

- `iptables-nft-services`
- `iptables-utils`

As an alternative to using `direct interface`, use the native features in `firewalld` to configure the required rules.

PF_KEYv2 Kernel API

The `PF_KEYv2` API is used to configure kernel IPsec implementation. However, this API isn't maintained upstream. Therefore, this API is deprecated. Instead, use the `netlink` API as a replacement.

Network Manager `nmcli` Language Changes

Because Oracle is fully committed to diversity and inclusion, the Network Manager `connection.master`, `connection.slave-type`, and `connection.autoconnect-slaves` connection property names are deprecated. They are retained for backward compatibility. However, consider using the following replacement terms instead:

- Instead of `connection.master`, use `connection.controller`
- Instead of `connection.slave-type`, use `connection.port-type`
- Instead of `connection.autoconnect-slaves` use `connection.autoconnect-ports`

TigerVNC

The TigerVNC remote desktop solution is deprecated.

The following packages are deprecated:

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

The `gnome-connections` application can be used as an alternative VNC client, but it doesn't provide a VNC server.

Future remote desktop solutions are likely to use Remote Desktop Protocol (RDP).

Kernel

The following kernel related features and functionalities are deprecated in Oracle Linux 9.

`crashkernel=auto` Option

The `crashkernel=auto` option is deprecated and no longer supported on Oracle Linux 9 and is also unsupported for UEK R7 and later. Some platforms, such as the Raspberry Pi have

maximum limits for `crashkernel` memory reservation and these must be specified explicitly. This option will be removed in a future UEK release.

Asynchronous Transfer Mode

Asynchronous Transfer Mode (ATM) encapsulation enables Layer-2 (Point-to-Point Protocol, Ethernet) or Layer-3 (IP) connectivity for the ATM Adaptation Layer 5 (AAL-5). Currently, these protocols are used only in chipsets that use ADSL technology, which are being phased out.

`kexec_load` in `kexec_tools`

The `kexec_load` system call for `kexec-tools` is deprecated.

The `kexec_file_load` system call replaces `kexec_load` and is the default system call.

`cgroupsv1`

`cgroupsv1` is deprecated in Oracle Linux 9 in favor of `cgroupsv2`. See Oracle Linux 9: Managing the System With systemd and Oracle Linux 9: Managing Kernels and System Boot for more information on using cgroups.

File Systems and Storage

The following features and functionalities related to file systems and storage are deprecated in Oracle Linux 9.

`lsscsi` NVMe

Using `lsscsi` to list information about Non-Volatile Memory Express (NVMe) devices is deprecated. Use `nvme-cli`, `lsblk`, and `blkid` instead.

sg3_utils NVMe

Using any of the tools in the `sg3_utils` package to work with Non-Volatile Memory Express (NVMe) devices is deprecated. Use `nvme-cli` instead.

`lvm2-activation-generator`

The `lvm2-activation-generator` program is deprecated, together with its generated services as follows:

- `lvm2-activation`
- `lvm2-activation-early`
- `lvm2-activation-net`

The `lvm.conf event_activation` that used to activate these services no longer works. The only method that is used for automatic activation of volume groups is event based activation.

PMDK Library

The Persistent Memory Development Kit (`pmdk`) is a collection of libraries and tools for simplifying the management and access of persistent memory devices. This set of libraries are deprecated, including the `-debuginfo` packages.

The following list of `pmdk`-related binary packages, including the `nvml` source package, have been deprecated:

- `libpmem`
- `libpmem-devel`
- `libpmem-debug`
- `libpmem2`
- `libpmem2-devel`
- `libpmem2-debug`
- `libpmemblk`
- `libpmemblk-devel`
- `libpmemblk-debug`
- `libpmemlog`
- `libpmemlog-devel`
- `libpmemlog-debug`
- `libpmemobj`
- `libpmemobj-devel`
- `libpmemobj-debug`
- `libpmempool`
- `libpmempool-devel`
- `libpmempool-debug`
- `pmempool`
- `daxio`
- `pmreorder`
- `pmdk-convert`
- `libpmemobj++`
- `libpmemobj++-devel`
- `libpmemobj++-doc`

`md-linear` and `md-faulty` MD RAID Kernel Modules

The following MD RAID kernel modules have been deprecated:

- `CONFIG_MD_LINEAR` or `md-linear`: Concatenates multiple drives so that when a single member disk becomes full, data is written to the next disk until all disks are full.

- `CONFIG_MD_FAULTY` or `md-faulty`: Tests a block device that occasionally returns read or write errors for testing purposes.

Virtual Data Optimizer Parameters in `sysfs`

Virtual Data Optimizer (VDO) parameters that appears in `sysfs` have been deprecated except for the `log_level` parameter. These include the following:

- All `kvdo` module-level `sysfs` parameters
- All individual `dm-vdo` `sysfs` parameters targets specific to VDO

Parameters that are common to all DM targets don't change. Configuration values for `dm-vdo` targets, which are set by updating the removed module-level parameters, can no longer be changed.

You can no longer access statistics and configuration values for `dm-vdo` targets using `sysfs`. However, these values are accessible using `dmsetup message stats`, `dmsetup status`, and `dmsetup table` dmsetup commands.

High Availability

The following high availability related features and functionalities are deprecated in Oracle Linux 9.

Several Pacemaker Configuration Options

Several Pacemaker configuration options are deprecated.

- Configuring a `score` parameter in order constraints
- Use of the `rkt` container engine in bundles
- Use of `upstart` and `nagios` resources
- The `monthdays`, `weekdays`, `weekyears`, `yearsdays` and `moon` date specification options when configuring Pacemaker rules
- The `yearsdays` and `moon` duration options for configuring Pacemaker rules

The `pcs` command emits a warning when a system is configured to use any of the deprecated features or options.

Dynamic Programming Languages, Web and Database Servers

The following features and functionalities that are related to dynamic programming, web, and database servers are deprecated in Oracle Linux 9.

Berkeley DB (`libdb`)

Deprecation of the Berkely DB (`libdb`) package includes the removal of cryptographic algorithms and dependencies. Users of `libdb` should migrate to a different key-value database.

Compilers and Development

The following compiler and development related features and functionalities are deprecated in Oracle Linux 9.

Redis in Grafana, PCP, and `grafana-pcp`

Use of Redis in Grafana, PCP, and `grafana-pcp` is deprecated and will be replaced with Valkey.

`llvm-doc` HTML Content

The HTML content in the `llvm-doc` package is deprecated. See the content at https://llvm.org/.

Keys Smaller Than 2048-bits in OpenSSL

OpenSSL 3.0 has deprecated keys smaller than 2048 bits. Keys smaller than 2048 bits might not work in FIPS mode.

Some PKCS1 v1.5 modes

Some`PKCS1` v1.5 modes aren't approved in FIPS-140-3 for encryption and are disabled.

32-bit `multilib` Linking

Linking against 32-bit `multilib` packages (*.i686 packages) are deprecated.

Identity Management and Authentication

The following identity management and authentication features and functionalities are deprecated in Oracle Linux 9.

PAM Console

`pam_console` module is deprecated. It grants file permissions and authentication to users logged in at the physical console or terminals, and adjusts these privileges based on console login status and user presence.

BDB backend (in 389-ds-base)

Berkeley Database (BDB) backend is deprecated in `389-ds-base` package, the 389 Directory Server. As a replacement, Directory Server can now create instances with Lightning Memory-Mapped Database (LMDB) available as a Technology Preview.

sss_ssh_knownhostsproxy

`sss_ssh_knownhostsproxy`, a utility in the System Security Services Daemon (SSSD) package, is deprecated.

libsss_simpleifp

`libsss_simpleifp` that provides the `libsss_simpleifp.so` library is deprecated.

SSSD Files Provider

The SSSD `files` provider, which retrieves user information from local files such as `/etc/shadow` and group information from `/etc/groups`, is deprecated and disabled by default in Oracle Linux 9.

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 `enable_files_domain=true` in the `sssd.conf` configuration file.

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

2. Configure the name services switch.

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

OpenLDAP Utility Options

The OpenLDAP project has deprecated the `-h` and `-p` options in its utilities, and recommends using the `-H` option instead to specify the LDAP URI.

`nsslapd-idlistscanlimit` Parameter and Default Value

Because of optimizations to filter reordering, the `nsslapd-idlistscanlimit` parameter results in having a negative impact on search performance and is therefore deprecated. Further, the parameter's default value is changed to `2147483646`

SMB1 Protocol

Beginning with Samba 4.11, the Server Message Block version 1 (SMB1) protocol is deprecated because of its insecure features. By default, this protocol is disabled in both Samba server and client utilities.

Virtualization

The following virtualization related features and functionalities are deprecated in Oracle Linux 9.

Signatures Using SHA-1

The use of SHA1-based signatures to perform SecureBoot image verification on UEFI (PE/COFF) executables is deprecated. Instead, use signatures that are based on SHA-2 or later.

Virtual Machine Manager

In place of the deprecated Virtual Machine Manager (`virt-manager`), use the web console, otherwise known as Cockpit.

Virtual Machine Snapshots

Support for creating snapshots of VMs is limited only to those that do not use UEFI firmware. However, the operation might cause the QEMU monitor to become blocked and affects hypervisor operations.

As an alternative, use external snapshots.

`libvirtd` Daemon

As a replacement of the deprecated `libvirtd` daemon, use the modular daemons in the `libvirt` library. For example, the `virtqemud` handles QEMU drivers.

Virtual Floppy Driver

The `isa-fdc` driver controls virtual floppy disk devices. To ensure compatibility with migrated virtual machines (VMs), you should not use floppy disk devices in virtual machines that you subsequently host on Oracle Linux 9.

`qcow2-v2` Format

For virtual disk images, use the `qcow2-v3` format instead.

Legacy CPU Models

The following legacy CPU models are deprecated for use in VMs:

- For Intel® : models prior to Intel® Xeon 55xx and 75xx Processor families (also known as Nehalem)
- For AMD: models prior to AMD Opteron G4

To check whether a VM is using a deprecated CPU model, use the `virsh dominfo` command, and look for a line similar to the following in the `Messages` section:

```
tainted: use of deprecated configuration settings
deprecated configuration: CPU model 'i486'
```

RDMA-based Live Migration

In this release, RDMA-based live migration of virtual machines is deprecated.

Windows 8 and Windows Server 2012 Guest Operating System

The following Windows versions are deprecated as a guest operating system:

- Windows 8
- Windows 8.1
- Windows Server 2012
- Windows Server 2012 R2

These are deprecated because they are no longer supported by Microsoft.

NIC Device Drivers for iPXE

The following device drivers are deprecated:

- All device drivers in the `ipxe-roms` subpackage
- The following binary files from `ipxe-bootimgs-x86`:
  - /usr/share/ipxe/ipxe-i386.efi
  - /usr/share/ipxe/ipxe-x86_64.efi
  - /usr/share/ipxe/ipxe.dsk
  - /usr/share/ipxe/ipxe.iso
  - /usr/share/ipxe/ipxe.lkrn
  - /usr/share/ipxe/ipxe.usb

Use the following binary files from the `ipxe-bootimgs` package to provide NIC device drivers for iPXE network boot:

- /usr/share/ipxe/ipxe-snponly-x86_64.efi
- /usr/share/ipxe/undionly.kpxe

Intel vGPU

Dividing select Intel vGPUs into multiple virtual GPUs and assigning them to VMs is no longer supported.

pmem Device Passthrough

The non-volatile memory library (`nvml`) packages are deprecated. When they are removed in a future release, you will be unable to pass persistent memory (`pmem`) devices to VMs. You also will be unable to configure emulated NVDIMM devices backed by volatile memory or files as persistent, but the devices will remain available.

Containers

The following features and functionalities that are related to containers are deprecated in Oracle Linux 9.

`containers.conf` for System Connections

The `containers.conf` file is read-only for Podman commands. The system connections and farm information must 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's not possible to delete a connection from the `containers.conf` file with the `podman system connection rm` command.

`slirp4net`

The `slirp4netns` network mode is deprecated. The `pasta` network mode is the default network mode for rootless containers.

`cgroupsv1` in Rootless Containers

Using `cgroupsv1` for rootless containers is deprecated.

Note that `cgroupsv1` is deprecated on Oracle Linux 9. See `cgroupsv1` .

`runc` Container Runtime

The `runc` container runtime is deprecated. The default container runtime is `crun`.

`pasta` as a Network Name

Using `pasta` as a network name value is deprecated.

BoltDB Database Backend

The BoltDB database backend is deprecated in favor of the SQLite database backend.

Oracle Linux 9 Containers on Oracle Linux 7 Hosts

Creating Oracle Linux 9 containers on an Oracle Linux 7 host is unsupported. Attempts to deploy this configuration might succeed, but isn't guaranteed.

SHA-1 Algorithm Within Podman

Support for using the SHA-11 algorithm to generate the filename of the rootless network namespace is removed in Podman. You should restart rootless containers that were configured by using Podman earlier than version 4.1.1. Restarting these containers rather than just using `slirp4netns` ensures that these containers and join the network and connect with containers that were created with upgraded Podman versions.

CNI Network Stack

The Container Network Interface (CNI) network stack is deprecated. You can use the Netavark network stack with Podman and other Open Container Initiative (OCI) container management

applications. The Netavark network stack for Podman is also compatible with advanced Docker functionalities.

Deprecated Packages

The support status of deprecated packages remains unchanged within Oracle Linux 9. For more information about the length of support, see Oracle Linux: Product Life Cycle Information.

The following packages are deprecated in Oracle Linux 9:

- aacraid
- aajohan-comfortaa-fonts
- adwaita-gtk2-theme
- adwaita-gtk2-theme
- adwaita-qt5
- af_key
- anaconda-user-help
- anaconda-user-help
- ant-javamail
- apr-util-bdb
- aspnetcore-runtime-7.0
- aspnetcore-targeting-pack-6.0
- aspnetcore-targeting-pack-7.0
- atkmm
- atlas
- atlas-devel
- atlas-z14
- atlas-z15
- authselect-compat
- autoconf271
- autoconf-latest
- autocorr-af
- autocorr-bg
- autocorr-ca
- autocorr-cs
- autocorr-da
- autocorr-de
- autocorr-dsb
- autocorr-el
- autocorr-en

- autocorr-es
- autocorr-fa
- autocorr-fi
- autocorr-fr
- autocorr-ga
- autocorr-hr
- autocorr-hsb
- autocorr-hu
- autocorr-is
- autocorr-it
- autocorr-ja
- autocorr-ko
- autocorr-lb
- autocorr-lt
- autocorr-mn
- autocorr-nl
- autocorr-pl
- autocorr-pt
- autocorr-ro
- autocorr-ru
- autocorr-sk
- autocorr-sl
- autocorr-sr
- autocorr-sv
- autocorr-tr
- autocorr-vi
- autocorr-vro
- autocorr-zh
- babl
- bind9.18-libs
- bitmap-fangsongti-fonts
- bnx2
- bnx2fc
- bnx2i
- bogofilter
- Box2D
- brasero-nautilus

- cairomm
- cheese
- cheese-libs
- clucene-contribs-lib
- clucene-core
- clutter
- clutter-gst3
- clutter-gtk
- cnic
- cogl
- compat-hesiod
- compat-locales-sap
- compat-locales-sap-common
- compat-openssl11
- compat-paratype-pt-sans-fonts-f33-f34
- compat-sap-c++-12
- compat-sap-c++-13
- containernetworking-plugins
- containers-common-extra
- culmus-aharoni-clm-fonts
- culmus-caladings-clm-fonts
- culmus-david-clm-fonts
- culmus-drugulin-clm-fonts
- culmus-ellinia-clm-fonts
- culmus-fonts-common
- culmus-frank-ruehl-clm-fonts
- culmus-hadasim-clm-fonts
- culmus-miriam-clm-fonts
- culmus-miriam-mono-clm-fonts
- culmus-nachlieli-clm-fonts
- culmus-simple-clm-fonts
- culmus-stamashkenaz-clm-fonts
- culmus-stamsefarad-clm-fonts
- culmus-yehuda-clm-fonts
- curl-minimal
- daxio
- dbus-glib

- dbus-glib-devel
- devhelp
- devhelp-libs
- dhcp-client
- dhcp-common
- dhcp-relay
- dhcp-server
- dotnet-apphost-pack-6.0
- dotnet-apphost-pack-7.0
- dotnet-hostfxr-6.0
- dotnet-hostfxr-7.0
- dotnet-runtime-6.0
- dotnet-runtime-7.0
- dotnet-sdk-6.0
- dotnet-sdk-7.0
- dotnet-targeting-pack-6.0
- dotnet-targeting-pack-7.0
- dotnet-templates-6.0
- dotnet-templates-7.0
- double-conversion
- efs-utils
- enchant
- enchant-devel
- eog
- evince
- evince-libs
- evince-nautilus
- evince-previewer
- evince-thumbnailer
- evolution
- evolution-bogofilter
- evolution-data-server-ui
- evolution-data-server-ui-devel
- evolution-devel
- evolution-ews
- evolution-ews-langpacks
- evolution-help

- evolution-langpacks
- evolution-mapi
- evolution-mapi-langpacks
- evolution-pst
- evolution-spamassassin
- festival
- festival-data
- festvox-slt-arctic-hts
- firefox
- firefox
- firefox-x11
- firewire-core
- flite
- flite-devel
- fltk
- flute
- fontawesome-fonts
- gc
- gcr-base
- gedit
- gedit-plugin-bookmarks
- gedit-plugin-bracketcompletion
- gedit-plugin-codecomment
- gedit-plugin-colorpicker
- gedit-plugin-colorschemer
- gedit-plugin-commander
- gedit-plugin-drawspaces
- gedit-plugin-findinfiles
- gedit-plugin-joinlines
- gedit-plugin-multiedit
- gedit-plugins
- gedit-plugins-data
- gedit-plugin-sessionsaver
- gedit-plugin-smartspaces
- gedit-plugin-synctex
- gedit-plugin-terminal
- gedit-plugin-textsize

- gedit-plugin-translate
- gedit-plugin-wordcompletion
- ghc-srpm-macros
- ghostscript-x11
- git-p4
- glade
- glade-libs
- glibmm24
- gl-manpages
- gnome-backgrounds
- gnome-backgrounds-extras
- gnome-common
- gnome-logs
- gnome-photos
- gnome-photos-tests
- gnome-screenshot
- gnome-session-xsession
- gnome-shell-extension-panel-favorites
- gnome-shell-extension-updates-dialog
- gnome-terminal
- gnome-terminal-nautilus
- gnome-themes-extra
- gnome-tweaks
- gnome-video-effects
- google-noto-cjk-fonts-common
- google-noto-sans-cjk-ttc-fonts
- google-noto-sans-khmer-ui-fonts
- google-noto-sans-lao-ui-fonts
- google-noto-sans-thai-ui-fonts
- gspell
- gtk2
- gtk2-devel
- gtk2-devel-docs
- gtk2-immodules
- gtk2-immodule-xim
- gtkmm30
- gtksourceview4

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- sac
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- sgabios
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- tigervnc-license
- tigervnc-selinux
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- tigervnc-server-minimal
- tigervnc-server-module
- tracer-common
- ucs-miscfixed-fonts
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- usbredir-server
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- xorg-x11-drv-vmware
- xorg-x11-drv-wacom
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- xsane-common
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- xxhash-libs
- yelp
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- `yp-tools`
- `zhongyi-song-fonts`

5
Known Issues

This chapter describes known issues that you may encounter when installing and using the Oracle Linux 9 software. Unless indicated otherwise, the issues apply to both x86_64 and aarch64 systems. Information that pertains only to a specific platform is also noted accordingly.

Installation Issues

The following are known installation issues for Oracle Linux 9.

(aarch64) Minimum XFS File System Size During Install Is 300 MB

The more recent version of the `xfsprogs` package that's included on the Oracle Linux 9.7 ISO for Arm platforms sets a minimum XFS file system size of 300 MB. This limit isn't applied when installing on x86_64 platforms.

Because the x86_64 ISO includes RHCK, an earlier version of `xfsprogs` is available to maintain compatibility. On aarch64, only UEK is available and a newer version of `xfsprogs` is included. The 300 MB limit is set by the newer version of `xfsprogs` included with UEK 8.

(Bug 37832961)

Virtualization Issues

The following are known virtualization issues for Oracle Linux 9

KVM Virtual Machines Panic When Started on Oracle Linux 9 Hosts

The `glibc` version that's included with Oracle Linux 9 checks for compatibility between a system's CPU and new architectures that are supported. A system might pass the compatibility check. However, the CPU flags that are set on the system after passing the check might be unknown to the KVM virtual machines that are hosted on that system. Consequently, the VMs panic when they're booted.

To work around this issue, run the following command:

```
virsh edit vm-name
```

Then, add the following declaration in the virtual machine's XML file:

```
<cpu mode='host-model' check='partial'/>
```

The `check` parameter's `partial` setting sets `libvirt` to check the VM's CPU specification before starting a domain. However, the rest of the checking remains on the hypervisor, which can still provide a different virtual CPU.

(Bug ID 34224821)

Virtual Machines Fail to Start at Boot Because the `virbr0` Interface Isn't Available

After reboot, the `virbr0` network interface might be missing, which can prevent virtual machines from automatically starting up after boot.

The libvirt daemons on Oracle Linux 9 are modular to handle atomic features within the virtualization environment and are started and run as required, and stopped after two minutes of inactivity. The daemon responsible for setting up the networking interfaces for libvirt is `virtnetworkd`. This service isn't automatically started when a virtual machine is started.

To work around this issue, enable the `virtnetworkd` service so that the service starts at boot:

```
sudo systemctl enable --now virtnetworkd
```

(Bug ID 34237540)

Kernel Issues

The following are known kernel issues in Oracle Linux 9.

Kdump Might Fail on Some AMD Hardware

Kdump might fail on some AMD hardware that's running the current Oracle Linux release. Impacted hardware includes the AMD EPYC CPU servers.

To work around this issue, modify the `/etc/sysconfig/kdump` configuration file and remove the `iommu=off` command line option from the `KDUMP_COMMANDLINE_APPEND` variable. Restart the `kdump` service for the changes to take effect.

This issue appears to affect systems running RHCK.

(Bug ID 31274238, 34211826, 34312626)

(aarch64) Some GUI Elements Aren't Displayed During Installation and Boot Using VGA Output

During installations on the Arm platform, the Oracle Linux installer doesn't display some GUI elements, such as the progress update screen, on VGA output. Output is displayed on the serial console, instead.

Additionally, if you install Oracle Linux with GUI on an encrypted disk, for example, by choosing Server with GUI during the installation stage, and VGA is enabled, the password prompt doesn't appear on the VGA output at system boot, and consequently, the boot process can't be completed. The prompt appears only on a serial console, and therefore, you would need to switch to a serial console to provide the password there.

This issue is specific to systems on the Arm platform only and occurs regardless of whether you are using secure boot or non secure boot. Further, the issue applies to Oracle Linux 8 or Oracle Linux 9 systems that use UEKR6 and UEKR7. The issue occurs wherever Plymouth graphical elements are loaded in the GUI.

To resolve these GUI issues and to cause these elements to display on VGA output without using a serial console, add `plymouth.ignore-serial-consoles` to the kernel command line in the GRUB configuration. For instructions, see Oracle Linux 9: Managing Kernels and System Boot.

(Bug ID 35034465 and 35270637)

Certain SEV Guest Configurations Might Cause Hypervisor CPU Soft-Lockup Warnings

On older generation AMD systems that are based on the AMD Rome processors, such as E2 and E3 systems, a guest with more than 350GB memory that's configured to use Secure Encrypted Virtualization (SEV) memory encryption can trigger a CPU soft-lockup warning on the hypervisor host during guest boot or shutdown operations.

The time that's needed to flush the pinned memory that's being encrypted is proportional to the amount of guest memory. However, with larger amounts of memory in excess of 350GB, the time on the CPU to flush the memory becomes excessive, which consequently triggers a warning. After the memory is flushed, the hypervisor resumes normal operations.

Newer systems that are based on the AMD Milan processor, such as E4 systems, have hardware support that can minimize the time required for flushing the memory. Therefore, the CPU soft-hang issue isn't encountered.

As a workaround, if a SEV enabled guest with more then 350GB of memory is required, create the guest on a system that's based on the AMD Milan processor. If you are using systems with the AMD Rome processor, limit the guest memory to less than 350GB if the guest is configured with SEV memory encryption.

(Bug ID 34050377)

Systems With Btrfs Fail to Boot in FIPS Mode

When booted in FIPS mode, a system using Btrfs fails with the following message:

```
FATAL: FIPS integrity test failed
Refusing to continue
```

(Bug ID 36028061)

Leapp Upgrade Messages About Unmounted `/proc` File System

Warning messages are displayed in the package installation logs during Leapp preupgrade and Leapp upgrade:

```
/proc/ is not mounted. This is not a supported mode of operation. Please fix
your invocation environment to mount /proc/ and /sys/ properly. Proceeding anyway.
Your mileage may vary.
```

During upgrade `/proc` is mounted in a temporary chroot as part of the preparation for the upgrade rootfs. This process is normal and the warning messages aren't indicative of any real problem. You can ignore warning messages about the `/proc` file system.

(Bug ID 36512929)

Openssl Tool Returns Unable to Print EC Key in FIPS Mode

When FIPS mode is enabled on a system, the openssl tool is unable to print an Elliptic Curve (EC) key, when using the following command:

```
openssl ec -in ecp256.pem -noout -text
```

The command fails with the message:

```
unable to print EC key
```

Explicitly loading the `fips` provider when running the command works around this issue, for example:

```
openssl ec -provider=fips -in ecp256.pem  -noout -text
```

(Bug ID 37290712)

6 Package Changes From the Upstream Release

The following sections list the changes to binary and source packages from the upstream release.

Changes to Binary Packages

This section contains information about the removed, modified, and new **binary** packages in this release. For information about the **source** package changes, see Changes to Source Packages.

Added Binary Packages for BaseOS by Oracle

The following binary packages have been added to BaseOS by Oracle:

- `bcache-tools`
- `btrfs-progs`
- `dtrace`
- `iwl3945-firmware`
- `iwl4965-firmware`
- `iwl6000-firmware`
- `iwlax2xx-firmware`
- `kernel-uek`
- `kernel-uek-core`
- `kernel-uek-debug`
- `kernel-uek-debug-core`
- `kernel-uek-debug-devel`
- `kernel-uek-debug-modules`
- `kernel-uek-debug-modules-core`
- `kernel-uek-debug-modules-desktop`
- `kernel-uek-debug-modules-extra`
- `kernel-uek-debug-modules-extra-netfilter`
- `kernel-uek-debug-modules-usb`
- `kernel-uek-debug-modules-wireless`
- `kernel-uek-devel`
- `kernel-uek-doc`

- kernel-uek-modules
- kernel-uek-modules-core
- kernel-uek-modules-desktop
- kernel-uek-modules-extra
- kernel-uek-modules-extra-netfilter
- kernel-uek-modules-usb
- kernel-uek-modules-wireless
- libertas-sd8686-firmware
- libertas-usb8388-firmware
- libertas-usb8388-olpc-firmware
- linux-firmware-core
- liquidio-firmware
- NetworkManager-config-connectivity-oracle
- ocfs2-tools
- oracle-backgrounds
- oracle-indexhtml
- oraclelinux-release
- oraclelinux-release-el9
- oracle-logos
- oracle-logos-httpd
- oracle-logos-ipa

Added Binary Packages for AppStream by Oracle

The following binary packages have been added to AppStream by Oracle:

- dnf-plugin-spacewalk
- dtrace-devel
- dtrace-testsuite
- libblockdev-btrfs
- pcp-pmda-rocestat
- python3-dnf-plugin-spacewalk
- python3-dnf-plugin-ulninfo
- python3-hwdata
- python3-pyOpenSSL
- python3-rhn-check
- python3-rhn-client-tools
- python3-rhnlib
- python3-rhn-setup

- python3-rhn-setup-gnome
- rhn-check
- rhn-client-tools
- rhnlib
- rhnsd
- rhn-setup
- rhn-setup-gnome

Added Binary Packages for CodeReady Linux Builder by Oracle

The following binary packages have been added to CodeReady Linux Builder by Oracle:

- oraclelinux-sb-certs

Modified BaseOS Binary Packages

The following binary packages from the BaseOS upstream release have been modified:

- alternatives
- audispd-plugins
- audispd-plugins-zos
- audit
- audit-libs
- autofs
- binutils
- binutils-gold
- biosdevname
- chkconfig
- chrony
- cockpit
- cockpit-bridge
- cockpit-doc
- cockpit-system
- cockpit-ws
- cockpit-ws-selinux
- coreutils
- coreutils-common
- coreutils-single
- dbus
- dbus-common
- dbus-libs

- dbus-tools
- dnf
- dnf-automatic
- dnf-data
- dnf-plugins-core
- dracut
- dracut-config-generic
- dracut-config-rescue
- dracut-network
- dracut-squash
- dracut-tools
- efibootmgr
- efi-filesystem
- firewalld
- firewalld-filesystem
- fwupd
- glibc
- glibc-all-langpacks
- glibc-common
- glibc-gconv-extra
- glibc-langpack-aa
- glibc-langpack-af
- glibc-langpack-agr
- glibc-langpack-ak
- glibc-langpack-am
- glibc-langpack-an
- glibc-langpack-anp
- glibc-langpack-ar
- glibc-langpack-as
- glibc-langpack-ast
- glibc-langpack-ayc
- glibc-langpack-az
- glibc-langpack-be
- glibc-langpack-bem
- glibc-langpack-ber
- glibc-langpack-bg
- glibc-langpack-bhb

- glibc-langpack-bho
- glibc-langpack-bi
- glibc-langpack-bn
- glibc-langpack-bo
- glibc-langpack-br
- glibc-langpack-brx
- glibc-langpack-bs
- glibc-langpack-byn
- glibc-langpack-ca
- glibc-langpack-ce
- glibc-langpack-chr
- glibc-langpack-ckb
- glibc-langpack-cmn
- glibc-langpack-crh
- glibc-langpack-cs
- glibc-langpack-csb
- glibc-langpack-cv
- glibc-langpack-cy
- glibc-langpack-da
- glibc-langpack-de
- glibc-langpack-doi
- glibc-langpack-dsb
- glibc-langpack-dv
- glibc-langpack-dz
- glibc-langpack-el
- glibc-langpack-en
- glibc-langpack-eo
- glibc-langpack-es
- glibc-langpack-et
- glibc-langpack-eu
- glibc-langpack-fa
- glibc-langpack-ff
- glibc-langpack-fi
- glibc-langpack-fil
- glibc-langpack-fo
- glibc-langpack-fr
- glibc-langpack-fur

- glibc-langpack-fy
- glibc-langpack-ga
- glibc-langpack-gd
- glibc-langpack-gez
- glibc-langpack-gl
- glibc-langpack-gu
- glibc-langpack-gv
- glibc-langpack-ha
- glibc-langpack-hak
- glibc-langpack-he
- glibc-langpack-hi
- glibc-langpack-hif
- glibc-langpack-hne
- glibc-langpack-hr
- glibc-langpack-hsb
- glibc-langpack-ht
- glibc-langpack-hu
- glibc-langpack-hy
- glibc-langpack-ia
- glibc-langpack-id
- glibc-langpack-ig
- glibc-langpack-ik
- glibc-langpack-is
- glibc-langpack-it
- glibc-langpack-iu
- glibc-langpack-ja
- glibc-langpack-ka
- glibc-langpack-kab
- glibc-langpack-kk
- glibc-langpack-kl
- glibc-langpack-km
- glibc-langpack-kn
- glibc-langpack-ko
- glibc-langpack-kok
- glibc-langpack-ks
- glibc-langpack-ku
- glibc-langpack-kw

- glibc-langpack-ky
- glibc-langpack-lb
- glibc-langpack-lg
- glibc-langpack-li
- glibc-langpack-lij
- glibc-langpack-ln
- glibc-langpack-lo
- glibc-langpack-lt
- glibc-langpack-lv
- glibc-langpack-lzh
- glibc-langpack-mag
- glibc-langpack-mai
- glibc-langpack-mfe
- glibc-langpack-mg
- glibc-langpack-mhr
- glibc-langpack-mi
- glibc-langpack-miq
- glibc-langpack-mjw
- glibc-langpack-mk
- glibc-langpack-ml
- glibc-langpack-mn
- glibc-langpack-mni
- glibc-langpack-mnw
- glibc-langpack-mr
- glibc-langpack-ms
- glibc-langpack-mt
- glibc-langpack-my
- glibc-langpack-nan
- glibc-langpack-nb
- glibc-langpack-nds
- glibc-langpack-ne
- glibc-langpack-nhn
- glibc-langpack-niu
- glibc-langpack-nl
- glibc-langpack-nn
- glibc-langpack-nr
- glibc-langpack-nso

- glibc-langpack-oc
- glibc-langpack-om
- glibc-langpack-or
- glibc-langpack-os
- glibc-langpack-pa
- glibc-langpack-pap
- glibc-langpack-pl
- glibc-langpack-ps
- glibc-langpack-pt
- glibc-langpack-quz
- glibc-langpack-raj
- glibc-langpack-ro
- glibc-langpack-ru
- glibc-langpack-rw
- glibc-langpack-sa
- glibc-langpack-sah
- glibc-langpack-sat
- glibc-langpack-sc
- glibc-langpack-sd
- glibc-langpack-se
- glibc-langpack-sgs
- glibc-langpack-shn
- glibc-langpack-shs
- glibc-langpack-si
- glibc-langpack-sid
- glibc-langpack-sk
- glibc-langpack-sl
- glibc-langpack-sm
- glibc-langpack-so
- glibc-langpack-sq
- glibc-langpack-sr
- glibc-langpack-ss
- glibc-langpack-st
- glibc-langpack-sv
- glibc-langpack-sw
- glibc-langpack-szl
- glibc-langpack-ta

- glibc-langpack-tcy
- glibc-langpack-te
- glibc-langpack-tg
- glibc-langpack-th
- glibc-langpack-the
- glibc-langpack-ti
- glibc-langpack-tig
- glibc-langpack-tk
- glibc-langpack-tl
- glibc-langpack-tn
- glibc-langpack-to
- glibc-langpack-tpi
- glibc-langpack-tr
- glibc-langpack-ts
- glibc-langpack-tt
- glibc-langpack-ug
- glibc-langpack-uk
- glibc-langpack-unm
- glibc-langpack-ur
- glibc-langpack-uz
- glibc-langpack-ve
- glibc-langpack-vi
- glibc-langpack-wa
- glibc-langpack-wae
- glibc-langpack-wal
- glibc-langpack-wo
- glibc-langpack-xh
- glibc-langpack-yi
- glibc-langpack-yo
- glibc-langpack-yue
- glibc-langpack-yuw
- glibc-langpack-zh
- glibc-langpack-zu
- glibc-minimal-langpack
- grub2-common
- grub2-efi-aa64-modules
- grub2-efi-x64

- grub2-efi-x64-cdboot
- grub2-efi-x64-modules
- grub2-pc
- grub2-pc-modules
- grub2-tools
- grub2-tools-efi
- grub2-tools-extra
- grub2-tools-minimal
- grubby
- initscripts
- initscripts-rename-device
- initscripts-service
- iputils
- irqbalance
- iscsi-initiator-utils
- iscsi-initiator-utils-iscsiuio
- iwl1000-firmware
- iwl100-firmware
- iwl105-firmware
- iwl135-firmware
- iwl2000-firmware
- iwl2030-firmware
- iwl3160-firmware
- iwl3945-firmware
- iwl4965-firmware
- iwl5000-firmware
- iwl5150-firmware
- iwl6000-firmware
- iwl6000g2a-firmware
- iwl6000g2b-firmware
- iwl6050-firmware
- iwl7260-firmware
- iwlax2xx-firmware
- kexec-tools
- kmod
- kmod-kvdo
- kmod-libs

- krb5-libs
- krb5-pkinit
- krb5-server
- krb5-server-ldap
- krb5-workstation
- libatomic
- libblkid
- libdb
- libdnf
- libertas-sd8686-firmware
- libertas-sd8787-firmware
- libertas-usb8388-firmware
- libertas-usb8388-olpc-firmware
- libfdisk
- libgcc
- libgfortran
- libgomp
- libipa_hbac
- libkadm5
- libkcapi
- libkcapi-hmaccalc
- libmount
- libnfsidmap
- libnsl
- libquadmath
- libreport-filesystem
- libsmartcols
- libsss_autofs
- libsss_certmap
- libsss_idmap
- libsss_nss_idmap
- libsss_simpleifp
- libsss_sudo
- libstdc++
- libuuid
- linux-firmware
- linux-firmware-core

- linux-firmware-whence
- liquidio-firmware
- mcelog
- mdadm
- microcode_ctl
- netconsole-service
- netronome-firmware
- NetworkManager
- NetworkManager-adsl
- NetworkManager-bluetooth
- NetworkManager-config-connectivity-oracle
- NetworkManager-config-server
- NetworkManager-initscripts-updown
- NetworkManager-libnm
- NetworkManager-team
- NetworkManager-tui
- NetworkManager-wifi
- NetworkManager-wwan
- nfs-utils
- nscd
- nvmetcli
- openssh
- openssh-clients
- openssh-keycat
- openssh-server
- openssl
- openssl-fips-provider
- openssl-fips-provider-so
- openssl-libs
- os-prober
- pam
- pcre2
- pcre2-syntax
- polkit
- polkit-libs
- procps-ng
- procps-ng-i18n

- python3
- python3-cffi
- python3-chardet
- python3-configshell
- python3-cryptography
- python3-dmidecode
- python3-dnf
- python3-dnf-plugin-multisig
- python3-dnf-plugin-post-transaction-actions
- python3-dnf-plugins-core
- python3-dnf-plugin-versionlock
- python3-firewall
- python3-hawkey
- python3-idna
- python3-libdnf
- python3-libipa_hbac
- python3-libs
- python3-libsss_nss_idmap
- python3-ply
- python3-pycparser
- python3-pysocks
- python3-pyyaml
- python3-six
- python3-sss
- python3-sssdconfig
- python3-sss-murmur
- readonly-root
- redhat-release
- rhel-net-naming-sysattrs
- selinux-policy
- selinux-policy-doc
- selinux-policy-mls
- selinux-policy-sandbox
- selinux-policy-targeted
- shim-x64
- sos
- sos-audit

- sssd
- sssd-ad
- sssd-client
- sssd-common
- sssd-common-pac
- sssd-dbus
- sssd-ipa
- sssd-kcm
- sssd-krb5
- sssd-krb5-common
- sssd-ldap
- sssd-nfs-idmap
- sssd-passkey
- sssd-polkit-rules
- sssd-proxy
- sssd-tools
- sssd-winbind-idmap
- systemd
- systemd-container
- systemd-libs
- systemd-oomd
- systemd-pam
- systemd-resolved
- systemd-rpm-macros
- systemd-udev
- tuned
- tuned-profiles-cpu-partitioning
- unzip
- util-linux
- util-linux-core
- util-linux-user
- vim-filesystem
- vim-minimal
- yum
- yum-utils

Modified Binary Packages for CodeReady Linux Builder by Oracle

The following binary packages to CodeReady Linux Builder by Oracle have been modified:

- anaconda-widgets-devel
- bind-devel
- bind-doc
- crash-devel
- cups-filters-devel
- dotnet-sdk-10.0-source-built-artifacts
- dotnet-sdk-6.0-source-built-artifacts
- dotnet-sdk-7.0-source-built-artifacts
- dotnet-sdk-8.0-source-built-artifacts
- dotnet-sdk-9.0-source-built-artifacts
- edk2-aarch64
- edk2-tools
- edk2-tools-doc
- expect-devel
- fwupd-devel
- gdm-devel
- gdm-pam-extensions-devel
- glibc-benchtests
- glibc-nss-devel
- glibc-static
- java-11-openjdk-demo-fastdebug
- java-11-openjdk-demo-slowdebug
- java-11-openjdk-devel-fastdebug
- java-11-openjdk-devel-slowdebug
- java-11-openjdk-fastdebug
- java-11-openjdk-headless-fastdebug
- java-11-openjdk-headless-slowdebug
- java-11-openjdk-jmods-fastdebug
- java-11-openjdk-jmods-slowdebug
- java-11-openjdk-slowdebug
- java-11-openjdk-src-fastdebug
- java-11-openjdk-src-slowdebug
- java-11-openjdk-static-libs-fastdebug

- java-11-openjdk-static-libs-slowdebug
- java-17-openjdk-demo-fastdebug
- java-17-openjdk-demo-slowdebug
- java-17-openjdk-devel-fastdebug
- java-17-openjdk-devel-slowdebug
- java-17-openjdk-fastdebug
- java-17-openjdk-headless-fastdebug
- java-17-openjdk-headless-slowdebug
- java-17-openjdk-jmods-fastdebug
- java-17-openjdk-jmods-slowdebug
- java-17-openjdk-slowdebug
- java-17-openjdk-src-fastdebug
- java-17-openjdk-src-slowdebug
- java-17-openjdk-static-libs-fastdebug
- java-17-openjdk-static-libs-slowdebug
- java-1.8.0-openjdk-demo-fastdebug
- java-1.8.0-openjdk-demo-slowdebug
- java-1.8.0-openjdk-devel-fastdebug
- java-1.8.0-openjdk-devel-slowdebug
- java-1.8.0-openjdk-fastdebug
- java-1.8.0-openjdk-headless-fastdebug
- java-1.8.0-openjdk-headless-slowdebug
- java-1.8.0-openjdk-slowdebug
- java-1.8.0-openjdk-src-fastdebug
- java-1.8.0-openjdk-src-slowdebug
- java-21-openjdk-demo-fastdebug
- java-21-openjdk-demo-slowdebug
- java-21-openjdk-devel-fastdebug
- java-21-openjdk-devel-slowdebug
- java-21-openjdk-fastdebug
- java-21-openjdk-headless-fastdebug
- java-21-openjdk-headless-slowdebug
- java-21-openjdk-jmods-fastdebug
- java-21-openjdk-jmods-slowdebug
- java-21-openjdk-slowdebug
- java-21-openjdk-src-fastdebug
- java-21-openjdk-src-slowdebug

- java-21-openjdk-static-libs-fastdebug
- java-21-openjdk-static-libs-slowdebug
- kmod-devel
- libdb-cxx
- libdb-cxx-devel
- libdb-devel-doc
- libdb-sql
- libdb-sql-devel
- libdnf-devel
- libfdisk-devel
- libgfortran-static
- libguestfs-devel
- libguestfs-gobject
- libguestfs-gobject-devel
- libguestfs-man-pages-ja
- libguestfs-man-pages-uk
- libnfsidmap-devel
- libquadmath-static
- librados-devel
- libradospp-devel
- librbd-devel
- libreoffice-sdk
- libreoffice-sdk-doc
- libsmartcols-devel
- libsss_nss_idmap-devel
- libstdc++-static
- libudisks2-devel
- libvirt-daemon-plugin-sanlock
- libvirt-devel
- libvirt-docs
- lua-guestfs
- munge-devel
- NetworkManager-libnm-devel
- nss_db
- nss_hesiod
- ocaml-libguestfs
- ocaml-libguestfs-devel

- OpenIPMI-devel
- PackageKit-glib-devel
- pcre2-tools
- php-libguestfs
- procps-ng-devel
- python3.11-debug
- python3.11-idle
- python3.11-test
- python3.12-debug
- python3.12-idle
- python3.12-test
- python3-debug
- python3-idle
- python3-ipatests
- python3-mpich
- python3-psutil-tests
- python3-test
- python-packaging-doc
- ruby-libguestfs
- sanlock-devel
- sendmail-milter
- sendmail-milter-devel
- tog-pegasus-devel
- virt-v2v-man-pages-ja
- virt-v2v-man-pages-uk
- WALinuxAgent-cvm

Modified AppStream Binary Packages

The following binary packages from the AppStream upstream release have been modified:

- anaconda
- anaconda-core
- anaconda-dracut
- anaconda-gui
- anaconda-install-env-deps
- anaconda-install-img-deps
- anaconda-tui
- anaconda-user-help

- anaconda-widgets
- aspnetcore-runtime-10.0
- aspnetcore-runtime-6.0
- aspnetcore-runtime-7.0
- aspnetcore-runtime-8.0
- aspnetcore-runtime-9.0
- aspnetcore-runtime-dbg-10.0
- aspnetcore-runtime-dbg-8.0
- aspnetcore-runtime-dbg-9.0
- aspnetcore-targeting-pack-10.0
- aspnetcore-targeting-pack-6.0
- aspnetcore-targeting-pack-7.0
- aspnetcore-targeting-pack-8.0
- aspnetcore-targeting-pack-9.0
- audit-libs-devel
- autocorr-af
- autocorr-bg
- autocorr-ca
- autocorr-cs
- autocorr-da
- autocorr-de
- autocorr-dsb
- autocorr-el
- autocorr-en
- autocorr-es
- autocorr-fa
- autocorr-fi
- autocorr-fr
- autocorr-ga
- autocorr-hr
- autocorr-hsb
- autocorr-hu
- autocorr-is
- autocorr-it
- autocorr-ja
- autocorr-ko
- autocorr-lb

- autocorr-lt
- autocorr-mn
- autocorr-nl
- autocorr-pl
- autocorr-pt
- autocorr-ro
- autocorr-ru
- autocorr-sk
- autocorr-sl
- autocorr-sr
- autocorr-sv
- autocorr-tr
- autocorr-vi
- autocorr-vro
- autocorr-zh
- bind
- bind9.18-dyndb-ldap
- bind-chroot
- bind-dnssec-doc
- bind-dnssec-utils
- bind-libs
- bind-license
- bind-utils
- binutils-devel
- blivet-data
- boom-boot
- boom-boot-conf
- buildah
- buildah-tests
- clang-resource-filesystem
- cloud-init
- cockpit-composer
- cockpit-machines
- cockpit-packagekit
- cockpit-session-recording
- cockpit-storaged
- compat-libgfortran-48

- containers-common
- containers-common-extra
- container-tools
- cpp
- crash
- cups-filters
- cups-filters-libs
- dbus-daemon
- dbus-devel
- dbus-x11
- ddiskit
- delve
- dnf-bootc
- dotnet-apphost-pack-10.0
- dotnet-apphost-pack-6.0
- dotnet-apphost-pack-7.0
- dotnet-apphost-pack-8.0
- dotnet-apphost-pack-9.0
- dotnet-host
- dotnet-hostfxr-10.0
- dotnet-hostfxr-6.0
- dotnet-hostfxr-7.0
- dotnet-hostfxr-8.0
- dotnet-hostfxr-9.0
- dotnet-runtime-10.0
- dotnet-runtime-6.0
- dotnet-runtime-7.0
- dotnet-runtime-8.0
- dotnet-runtime-9.0
- dotnet-runtime-dbg-10.0
- dotnet-runtime-dbg-8.0
- dotnet-runtime-dbg-9.0
- dotnet-sdk-10.0
- dotnet-sdk-6.0
- dotnet-sdk-7.0
- dotnet-sdk-8.0
- dotnet-sdk-9.0

- dotnet-sdk-aot-10.0
- dotnet-sdk-aot-9.0
- dotnet-sdk-dbg-10.0
- dotnet-sdk-dbg-8.0
- dotnet-sdk-dbg-9.0
- dotnet-targeting-pack-10.0
- dotnet-targeting-pack-6.0
- dotnet-targeting-pack-7.0
- dotnet-targeting-pack-8.0
- dotnet-targeting-pack-9.0
- dotnet-templates-10.0
- dotnet-templates-6.0
- dotnet-templates-7.0
- dotnet-templates-8.0
- dotnet-templates-9.0
- dracut-caps
- dracut-live
- edk2-ovmf
- efi-srpm-macros
- expect
- fapolicyd
- fapolicyd-selinux
- fips-provider-next
- firefox
- firefox-x11
- firewall-applet
- firewall-config
- fwupd-plugin-flashrom
- galera
- gcc
- gcc-c++
- gcc-gfortran
- gcc-offload-nvptx
- gcc-plugin-annobin
- gcc-plugin-devel
- gcc-toolset-12-gcc
- gcc-toolset-12-gcc-c++

- gcc-toolset-12-gcc-gfortran
- gcc-toolset-12-gcc-plugin-annobin
- gcc-toolset-12-gcc-plugin-devel
- gcc-toolset-12-libasan-devel
- gcc-toolset-12-libatomic-devel
- gcc-toolset-12-libgccjit
- gcc-toolset-12-libgccjit-devel
- gcc-toolset-12-libgccjit-docs
- gcc-toolset-12-libitm-devel
- gcc-toolset-12-liblsan-devel
- gcc-toolset-12-libquadmath-devel
- gcc-toolset-12-libstdc++-devel
- gcc-toolset-12-libstdc++-docs
- gcc-toolset-12-libtsan-devel
- gcc-toolset-12-libubsan-devel
- gcc-toolset-12-offload-nvptx
- gcc-toolset-13-binutils
- gcc-toolset-13-binutils-devel
- gcc-toolset-13-binutils-gold
- gdb
- gdb-doc
- gdb-gdbserver
- gdb-headless
- gdb-minimal
- gdm
- glibc-devel
- glibc-doc
- glibc-headers
- glibc-locale-source
- glibc-utils
- gnome-session
- gnome-session-wayland-session
- gnome-session-xsession
- gnome-shell-extension-background-logo
- gpsd-minimal
- gpsd-minimal-clients
- httpd

- httpd-core
- httpd-devel
- httpd-filesystem
- httpd-manual
- httpd-tools
- idm-pki-acme
- idm-pki-base
- idm-pki-ca
- idm-pki-java
- idm-pki-kra
- idm-pki-server
- idm-pki-tools
- image-builder
- initial-setup
- initial-setup-gui
- ipa-client
- ipa-client-common
- ipa-client-encrypted-dns
- ipa-client-epn
- ipa-client-samba
- ipa-common
- ipa-selinux
- ipa-selinux-luna
- ipa-selinux-nfast
- ipa-server
- ipa-server-common
- ipa-server-dns
- ipa-server-encrypted-dns
- ipa-server-trust-ad
- iputils-ninfod
- java-11-openjdk
- java-11-openjdk-demo
- java-11-openjdk-devel
- java-11-openjdk-headless
- java-11-openjdk-javadoc
- java-11-openjdk-javadoc-zip
- java-11-openjdk-jmods

- java-11-openjdk-src
- java-11-openjdk-static-libs
- java-17-openjdk
- java-17-openjdk-demo
- java-17-openjdk-devel
- java-17-openjdk-headless
- java-17-openjdk-javadoc
- java-17-openjdk-javadoc-zip
- java-17-openjdk-jmods
- java-17-openjdk-src
- java-17-openjdk-static-libs
- java-1.8.0-openjdk
- java-1.8.0-openjdk-demo
- java-1.8.0-openjdk-devel
- java-1.8.0-openjdk-headless
- java-1.8.0-openjdk-javadoc
- java-1.8.0-openjdk-javadoc-zip
- java-1.8.0-openjdk-src
- java-21-openjdk
- java-21-openjdk-demo
- java-21-openjdk-devel
- java-21-openjdk-headless
- java-21-openjdk-javadoc
- java-21-openjdk-javadoc-zip
- java-21-openjdk-jmods
- java-21-openjdk-src
- java-21-openjdk-static-libs
- kernel-rpm-macros
- kernel-srpm-macros
- krb5-devel
- ksh
- libasan
- libblkid-devel
- libblockdev
- libblockdev-btrfs
- libblockdev-crypto
- libblockdev-dm

- libblockdev-fs
- libblockdev-kbd
- libblockdev-loop
- libblockdev-lvm
- libblockdev-lvm-dbus
- libblockdev-mdraid
- libblockdev-mpath
- libblockdev-nvdimm
- libblockdev-nvme
- libblockdev-part
- libblockdev-plugins-all
- libblockdev-swap
- libblockdev-tools
- libblockdev-utils
- libdb-devel
- libdb-utils
- libgccjit
- libgccjit-devel
- libgomp-offload-nvptx
- libguestfs
- libguestfs-appliance
- libguestfs-bash-completion
- libguestfs-inspect-icons
- libguestfs-rescue
- libguestfs-rsync
- libguestfs-xfs
- libitm
- libitm-devel
- liblsan
- libmount-devel
- libquadmath-devel
- librados2
- librbd1
- libreoffice
- libreoffice-base
- libreoffice-calc
- libreoffice-core

- libreoffice-data
- libreoffice-draw
- libreoffice-emailmerge
- libreoffice-filters
- libreoffice-gdb-debug-support
- libreoffice-graphicfilter
- libreoffice-gtk3
- libreoffice-help-ar
- libreoffice-help-bg
- libreoffice-help-bn
- libreoffice-help-ca
- libreoffice-help-cs
- libreoffice-help-da
- libreoffice-help-de
- libreoffice-help-dz
- libreoffice-help-el
- libreoffice-help-en
- libreoffice-help-eo
- libreoffice-help-es
- libreoffice-help-et
- libreoffice-help-eu
- libreoffice-help-fi
- libreoffice-help-fr
- libreoffice-help-gl
- libreoffice-help-gu
- libreoffice-help-he
- libreoffice-help-hi
- libreoffice-help-hr
- libreoffice-help-hu
- libreoffice-help-id
- libreoffice-help-it
- libreoffice-help-ja
- libreoffice-help-ko
- libreoffice-help-lt
- libreoffice-help-lv
- libreoffice-help-nb
- libreoffice-help-nl

- libreoffice-help-nn
- libreoffice-help-pl
- libreoffice-help-pt-BR
- libreoffice-help-pt-PT
- libreoffice-help-ro
- libreoffice-help-ru
- libreoffice-help-si
- libreoffice-help-sk
- libreoffice-help-sl
- libreoffice-help-sv
- libreoffice-help-ta
- libreoffice-help-tr
- libreoffice-help-uk
- libreoffice-help-zh-Hans
- libreoffice-help-zh-Hant
- libreoffice-impress
- libreofficekit
- libreoffice-langpack-af
- libreoffice-langpack-ar
- libreoffice-langpack-as
- libreoffice-langpack-bg
- libreoffice-langpack-bn
- libreoffice-langpack-br
- libreoffice-langpack-ca
- libreoffice-langpack-cs
- libreoffice-langpack-cy
- libreoffice-langpack-da
- libreoffice-langpack-de
- libreoffice-langpack-dz
- libreoffice-langpack-el
- libreoffice-langpack-en
- libreoffice-langpack-eo
- libreoffice-langpack-es
- libreoffice-langpack-et
- libreoffice-langpack-eu
- libreoffice-langpack-fa
- libreoffice-langpack-fi

- libreoffice-langpack-fr
- libreoffice-langpack-fy
- libreoffice-langpack-ga
- libreoffice-langpack-gl
- libreoffice-langpack-gu
- libreoffice-langpack-he
- libreoffice-langpack-hi
- libreoffice-langpack-hr
- libreoffice-langpack-hu
- libreoffice-langpack-id
- libreoffice-langpack-it
- libreoffice-langpack-ja
- libreoffice-langpack-kk
- libreoffice-langpack-kn
- libreoffice-langpack-ko
- libreoffice-langpack-lt
- libreoffice-langpack-lv
- libreoffice-langpack-mai
- libreoffice-langpack-ml
- libreoffice-langpack-mr
- libreoffice-langpack-nb
- libreoffice-langpack-nl
- libreoffice-langpack-nn
- libreoffice-langpack-nr
- libreoffice-langpack-nso
- libreoffice-langpack-or
- libreoffice-langpack-pa
- libreoffice-langpack-pl
- libreoffice-langpack-pt-BR
- libreoffice-langpack-pt-PT
- libreoffice-langpack-ro
- libreoffice-langpack-ru
- libreoffice-langpack-si
- libreoffice-langpack-sk
- libreoffice-langpack-sl
- libreoffice-langpack-sr
- libreoffice-langpack-ss

- libreoffice-langpack-st
- libreoffice-langpack-sv
- libreoffice-langpack-ta
- libreoffice-langpack-te
- libreoffice-langpack-th
- libreoffice-langpack-tn
- libreoffice-langpack-tr
- libreoffice-langpack-ts
- libreoffice-langpack-uk
- libreoffice-langpack-ve
- libreoffice-langpack-xh
- libreoffice-langpack-zh-Hans
- libreoffice-langpack-zh-Hant
- libreoffice-langpack-zu
- libreoffice-math
- libreoffice-ogltrans
- libreoffice-opensymbol-fonts
- libreoffice-pdfimport
- libreoffice-pyuno
- libreoffice-ure
- libreoffice-ure-common
- libreoffice-wiki-publisher
- libreoffice-writer
- libreoffice-x11
- libreoffice-xsltfilter
- libreport
- libreport-anaconda
- libreport-cli
- libreport-gtk
- libreport-plugin-bugzilla
- libreport-plugin-reportuploader
- libreport-web
- libreswan
- libstdc++-devel
- libstdc++-docs
- libtsan
- libubsan

- libudisks2
- libuuid-devel
- libvirt
- libvirt-client
- libvirt-client-qemu
- libvirt-daemon
- libvirt-daemon-common
- libvirt-daemon-config-network
- libvirt-daemon-config-nwfilter
- libvirt-daemon-driver-interface
- libvirt-daemon-driver-network
- libvirt-daemon-driver-nodedev
- libvirt-daemon-driver-nwfilter
- libvirt-daemon-driver-qemu
- libvirt-daemon-driver-secret
- libvirt-daemon-driver-storage
- libvirt-daemon-driver-storage-core
- libvirt-daemon-driver-storage-disk
- libvirt-daemon-driver-storage-iscsi
- libvirt-daemon-driver-storage-logical
- libvirt-daemon-driver-storage-mpath
- libvirt-daemon-driver-storage-rbd
- libvirt-daemon-driver-storage-scsi
- libvirt-daemon-kvm
- libvirt-daemon-lock
- libvirt-daemon-log
- libvirt-daemon-plugin-lockd
- libvirt-daemon-proxy
- libvirt-libs
- libvirt-nss
- libvirt-ssh-proxy
- libxslt
- libxslt-devel
- lorax
- lorax-docs
- lorax-lmc-novirt
- lorax-lmc-virt

- lorax-templates-generic
- lorax-templates-rhel
- mecab-ipadic
- mecab-ipadic-EUCJP
- mod_ldap
- mod_lua
- mod_proxy_html
- mod_session
- mod_ssl
- mpich
- mpich-autoload
- mpich-devel
- mpich-doc
- munge
- munge-libs
- net-snmp
- net-snmp-agent-libs
- net-snmp-devel
- net-snmp-libs
- net-snmp-perl
- net-snmp-utils
- netstandard-targeting-pack-2.1
- NetworkManager-cloud-setup
- NetworkManager-dispatcher-routing-rules
- NetworkManager-ovs
- NetworkManager-ppp
- nfs-utils-coreos
- nfsv4-client-utils
- nginx
- nginx-all-modules
- nginx-core
- nginx-filesystem
- nginx-mod-devel
- nginx-mod-http-image-filter
- nginx-mod-http-perl
- nginx-mod-http-xslt-filter
- nginx-mod-mail

- nginx-mod-stream
- npm
- ntsysv
- opa-address-resolution
- opa-basic-tools
- opa-fastfabric
- opa-fm
- opa-libopamgt
- OpenIPMI
- OpenIPMI-lanserv
- OpenIPMI-libs
- openssh-askpass
- openssl-devel
- openssl-perl
- open-vm-tools
- open-vm-tools-desktop
- open-vm-tools-salt-minion
- open-vm-tools-sdmp
- open-vm-tools-test
- osbuild
- osbuild-composer
- osbuild-composer-core
- osbuild-composer-worker
- osbuild-depsolve-dnf
- osbuild-luks2
- osbuild-lvm2
- osbuild-ostree
- osbuild-selinux
- osinfo-db
- pacemaker-cluster-libs
- pacemaker-libs
- pacemaker-schemas
- PackageKit
- PackageKit-command-not-found
- PackageKit-glib
- PackageKit-gstreamer-plugin
- PackageKit-gtk3-module

- pam-devel
- pam-docs
- pam_ssh_agent_auth
- pcp
- pcp-conf
- pcp-devel
- pcp-doc
- pcp-export-pcp2elasticsearch
- pcp-export-pcp2graphite
- pcp-export-pcp2influxdb
- pcp-export-pcp2json
- pcp-export-pcp2openmetrics
- pcp-export-pcp2spark
- pcp-export-pcp2xml
- pcp-export-pcp2zabbix
- pcp-export-zabbix-agent
- pcp-geolocate
- pcp-gui
- pcp-import-collectl2pcp
- pcp-import-ganglia2pcp
- pcp-import-iostat2pcp
- pcp-import-mrtg2pcp
- pcp-import-sar2pcp
- pcp-libs
- pcp-libs-devel
- pcp-pmda-activemq
- pcp-pmda-amdgpu
- pcp-pmda-apache
- pcp-pmda-bash
- pcp-pmda-bcc
- pcp-pmda-bind2
- pcp-pmda-bonding
- pcp-pmda-bpf
- pcp-pmda-bpftrace
- pcp-pmda-cifs
- pcp-pmda-cisco
- pcp-pmda-dbping

- pcp-pmda-denki
- pcp-pmda-dm
- pcp-pmda-docker
- pcp-pmda-ds389
- pcp-pmda-ds389log
- pcp-pmda-elasticsearch
- pcp-pmda-farm
- pcp-pmda-gfs2
- pcp-pmda-gluster
- pcp-pmda-gpfs
- pcp-pmda-gpsd
- pcp-pmda-hacluster
- pcp-pmda-haproxy
- pcp-pmda-infiniband
- pcp-pmda-json
- pcp-pmda-libvirt
- pcp-pmda-lio
- pcp-pmda-lmsensors
- pcp-pmda-logger
- pcp-pmda-lustre
- pcp-pmda-lustrecomm
- pcp-pmda-mailq
- pcp-pmda-memcache
- pcp-pmda-mic
- pcp-pmda-mongodb
- pcp-pmda-mounts
- pcp-pmda-mssql
- pcp-pmda-mysql
- pcp-pmda-named
- pcp-pmda-netcheck
- pcp-pmda-netfilter
- pcp-pmda-news
- pcp-pmda-nfsclient
- pcp-pmda-nginx
- pcp-pmda-nvidia-gpu
- pcp-pmda-openmetrics
- pcp-pmda-openvswitch

- pcp-pmda-oracle
- pcp-pmda-pdns
- pcp-pmda-perfevent
- pcp-pmda-podman
- pcp-pmda-postfix
- pcp-pmda-postgresql
- pcp-pmda-rabbitmq
- pcp-pmda-redis
- pcp-pmda-resctrl
- pcp-pmda-rocestat
- pcp-pmda-roomtemp
- pcp-pmda-rsyslog
- pcp-pmda-samba
- pcp-pmda-sendmail
- pcp-pmda-shping
- pcp-pmda-slurm
- pcp-pmda-smart
- pcp-pmda-snmp
- pcp-pmda-sockets
- pcp-pmda-statsd
- pcp-pmda-summary
- pcp-pmda-systemd
- pcp-pmda-trace
- pcp-pmda-unbound
- pcp-pmda-uwsgi
- pcp-pmda-weblog
- pcp-pmda-zimbra
- pcp-pmda-zswap
- pcp-selinux
- pcp-system-tools
- pcp-testsuite
- pcp-zeroconf
- pcre2-devel
- pcre2-utf16
- pcre2-utf32
- perl-PCP-LogImport
- perl-PCP-LogSummary

- perl-PCP-MMV
- perl-PCP-PMDA
- perl-Sys-Guestfs
- perl-XML-Parser
- pesign
- plymouth
- plymouth-core-libs
- plymouth-graphics-libs
- plymouth-plugin-fade-throbber
- plymouth-plugin-label
- plymouth-plugin-script
- plymouth-plugin-space-flares
- plymouth-plugin-two-step
- plymouth-scripts
- plymouth-system-theme
- plymouth-theme-charge
- plymouth-theme-fade-in
- plymouth-theme-script
- plymouth-theme-solar
- plymouth-theme-spinfinity
- plymouth-theme-spinner
- podman
- podman-docker
- podman-plugins
- podman-remote
- podman-tests
- polkit-devel
- polkit-docs
- postgresql
- postgresql-contrib
- postgresql-docs
- postgresql-plperl
- postgresql-plpython3
- postgresql-pltcl
- postgresql-private-devel
- postgresql-private-libs
- postgresql-server

- postgresql-server-devel
- postgresql-static
- postgresql-test
- postgresql-test-rpm-macros
- postgresql-upgrade
- postgresql-upgrade-devel
- pykickstart
- python3.11
- python3.11-devel
- python3.11-libs
- python3.11-tkinter
- python3.12
- python3.12-devel
- python3.12-libs
- python3.12-tkinter
- python3-attrs
- python3-audit
- python3-bind
- python3-blivet
- python3-blockdev
- python3-boom
- python3-devel
- python3-dnf-plugin-leaves
- python3-dnf-plugin-modulesync
- python3-dnf-plugin-show-leaves
- python3-idm-pki
- python3-ipaclient
- python3-ipalib
- python3-ipaserver
- python3-iscsi-initiator-utils
- python3-kickstart
- python3-libguestfs
- python3-libmount
- python3-libreport
- python3-net-snmp
- python3-osbuild
- python3-packaging

- python3-pcp
- python3-psutil
- python3-psycopg2
- python3-PyMySQL
- python3-rtslib
- python3-sanlock
- python3-tkinter
- python3-toml
- python3-virt-firmware
- python-unversioned-command
- rasdaemon
- rear
- redhat-rpm-config
- redis
- redis-devel
- redis-doc
- rhel-system-roles
- rpmdevtools
- rsyslog
- rsyslog-crypto
- rsyslog-doc
- rsyslog-elasticsearch
- rsyslog-gnutls
- rsyslog-gssapi
- rsyslog-kafka
- rsyslog-logrotate
- rsyslog-mmaudit
- rsyslog-mmfields
- rsyslog-mmjsonparse
- rsyslog-mmkubernetes
- rsyslog-mmnormalize
- rsyslog-mmsnmptrapd
- rsyslog-mysql
- rsyslog-omamqp1
- rsyslog-openssl
- rsyslog-pgsql
- rsyslog-relp

- rsyslog-snmp
- rsyslog-udpspoof
- sanlock
- sanlock-lib
- scap-security-guide
- scap-security-guide-doc
- selinux-policy-devel
- sendmail
- sendmail-cf
- sendmail-doc
- setroubleshoot
- setroubleshoot-plugins
- setroubleshoot-server
- sssd-idp
- sysstat
- systemd-boot-unsigned
- systemd-devel
- systemd-journal-remote
- systemd-ukify
- systemtap
- systemtap-client
- systemtap-devel
- systemtap-exporter
- systemtap-initscript
- systemtap-runtime
- systemtap-runtime-java
- systemtap-runtime-python3
- systemtap-runtime-virtguest
- systemtap-runtime-virthost
- systemtap-sdt-devel
- systemtap-sdt-dtrace
- systemtap-server
- target-restore
- thunderbird
- tog-pegasus
- tog-pegasus-libs
- tuned-gtk

- tuned-ppd
- tuned-profiles-atomic
- tuned-profiles-mssql
- tuned-profiles-oracle
- tuned-profiles-postgresql
- tuned-profiles-spectrumscale
- tuned-utils
- udisks2
- udisks2-iscsi
- udisks2-lsm
- udisks2-lvm2
- uki-direct
- uuidd
- v8-12.4-devel
- vim-common
- vim-enhanced
- vim-X11
- virt-p2v
- virt-top
- virt-v2v
- virt-v2v-bash-completion
- WALinuxAgent
- WALinuxAgent-udev
- xsane
- xsane-common

Removed BaseOS Binary Packages

The following binary packages from the BaseOS upstream release have been removed:

- kpatch
- kpatch-dnf
- libdnf-plugin-subscription-manager
- python3-cloud-what
- python3-subscription-manager-rhsm
- redhat-release-eula
- rhsm-icons
- subscription-manager
- subscription-manager-cockpit

- subscription-manager-plugin-ostree
- subscription-manager-rhsm-certificates

Removed AppStream Binary Packages

The following binary packages from the AppStream upstream release have been removed:

- ansible-collection-microsoft-sql
- ansible-collection-redhat-rhel_mgmt
- cockpit-leapp
- command-line-assistant
- command-line-assistant-selinux
- insights-client
- insights-client-ros
- leapp
- leapp-deps
- leapp-upgrade-el9toel10
- leapp-upgrade-el9toel10-deps
- leapp-upgrade-el9toel10-fapolicyd
- libreport-rhel-anaconda-bugzilla
- NetworkManager-config-connectivity-redhat
- opentelemetry-collector
- python3-leapp
- realtime-tests
- redhat-backgrounds
- redhat-cloud-client-configuration
- redhat-cloud-client-configuration-cdn
- redhat-indexhtml
- redhat-logos
- redhat-logos-httpd
- redhat-logos-ipa
- rhc
- rhc-worker-playbook
- s390utils
- s390utils-se-data
- toolbox
- toolbox-tests
- virtio-win
- virt-who

Removed CodeReady Linux Builder Binary Packages

The following binary packages from the CodeReady Linux Builder upstream release have been removed:

- `redhat-sb-certs`
- `rhc-devel`
- `snactor`

Changes to Source Packages

This section contains information about the removed, modified, and new **source** packages in this release. For information about the **binary** package changes, see Changes to Binary Packages.

Added Source Packages for BaseOS by Oracle

The following source packages have been added to the BaseOS by Oracle:

- `bcache-tools`
- `btrfs-progs`
- `dtrace`
- `kernel-uek`
- `ocfs2-tools`
- `oracle-indexhtml`
- `oraclelinux-release`
- `oraclelinux-release-el9`
- `oracle-logos`

Added Source Packages for AppStream by Oracle

The following source packages have been added to AppStream by Oracle:

- `dnf-plugin-spacewalk`
- `dtrace`
- `pyOpenSSL`
- `python3-dnf-plugin-ulninfo`
- `python-hwdata`
- `rhn-client-tools`
- `rhnlib`
- `rhnsd`

Modified BaseOS Source Packages

The following source packages from the BaseOS upstream release have been modified:

- audit
- autofs
- binutils
- biosdevname
- chkconfig
- chrony
- cockpit
- coreutils
- dbus
- dnf
- dnf-plugins-core
- dracut
- efibootmgr
- efi-rpm-macros
- firewalld
- fwupd
- gcc
- glibc
- grub2
- grubby
- initscripts
- iputils
- irqbalance
- iscsi-initiator-utils
- kexec-tools
- kmod
- kmod-kvdo
- krb5
- libdb
- libdnf
- libkcapi
- libreport
- linux-firmware

- mcelog
- mdadm
- microcode_ctl
- NetworkManager
- nfs-utils
- nvmetcli
- openssh
- openssl
- openssl-fips-provider
- os-prober
- pam
- pcre2
- polkit
- procps-ng
- python3.9
- python-cffi
- python-chardet
- python-configshell
- python-cryptography
- python-dmidecode
- python-idna
- python-ply
- python-pycparser
- python-pysocks
- python-six
- PyYAML
- redhat-release
- selinux-policy
- shim
- sos
- sssd
- systemd
- tuned
- unzip
- util-linux
- vim

Modified AppStream Source Packages

The following source packages from the AppStream upstream release have been modified:

- anaconda
- anaconda-user-help
- audit
- bind
- bind9.18-dyndb-ldap
- binutils
- boom-boot
- buildah
- ceph
- chkconfig
- clang
- cloud-init
- cockpit
- cockpit-composer
- cockpit-machines
- cockpit-session-recording
- compat-libgfortran-48
- containers-common
- container-tools
- crash
- cups-filters
- dbus
- ddiskit
- delve
- dnf
- dnf-plugins-core
- dotnet10.0
- dotnet6.0
- dotnet7.0
- dotnet8.0
- dotnet9.0
- dracut
- edk2

- efi-rpm-macros
- expect
- fapolicyd
- fips-provider-next
- firefox
- firewalld
- fwupd
- galera
- gcc
- gcc-toolset-12-gcc
- gcc-toolset-13-binutils
- gdb
- gdm
- glibc
- gnome-session
- gnome-shell-extension-background-logo
- gpsd-minimal
- httpd
- image-builder
- initial-setup
- ipa
- iputils
- iscsi-initiator-utils
- java-11-openjdk
- java-17-openjdk
- java-1.8.0-openjdk
- java-21-openjdk
- kernel-srpm-macros
- krb5
- ksh
- libblockdev
- libdb
- libguestfs
- libreoffice
- libreport
- libreswan
- libvirt

- libxslt
- lorax
- lorax-templates-rhel
- mecab-ipadic
- mpich
- munge
- net-snmp
- NetworkManager
- nfs-utils
- nginx
- nodejs
- opa-ff
- opa-fm
- OpenIPMI
- openssh
- openssl
- open-vm-tools
- osbuild
- osbuild-composer
- osinfo-db
- pacemaker
- PackageKit
- pam
- pcp
- pcre2
- perl-XML-Parser
- pesign
- pki-core
- plymouth
- podman
- polkit
- postgresql
- pykickstart
- python3.11
- python3.12
- python3.9
- python-attrs

- python-blivet
- python-packaging
- python-psutil
- python-psycopg2
- python-PyMySQL
- python-rtslib
- python-toml
- python-virt-firmware
- rasdaemon
- rear
- redhat-rpm-config
- redis
- rhel-system-roles
- rpmdevtools
- rsyslog
- sanlock
- scap-security-guide
- selinux-policy
- sendmail
- setroubleshoot
- setroubleshoot-plugins
- sssd
- sysstat
- systemd
- systemtap
- thunderbird
- tog-pegasus
- tuned
- udisks2
- util-linux
- vim
- virt-p2v
- virt-top
- virt-v2v
- WALinuxAgent
- xsane

Modified Source Packages for CodeReady Linux Builder by Oracle

The following binary packages to CodeReady Linux Builder by Oracle have been modified:

- anaconda
- bind
- ceph
- crash
- cups-filters
- dotnet10.0
- dotnet6.0
- dotnet7.0
- dotnet8.0
- dotnet9.0
- edk2
- expect
- fwupd
- gcc
- gdm
- glibc
- ipa
- java-11-openjdk
- java-17-openjdk
- java-1.8.0-openjdk
- java-21-openjdk
- kmod
- libdb
- libdnf
- libguestfs
- libreoffice
- libvirt
- mpich
- munge
- NetworkManager
- nfs-utils
- OpenIPMI
- PackageKit

- pcre2
- procps-ng
- python3.11
- python3.12
- python3.9
- python-packaging
- python-psutil
- sanlock
- sendmail
- sssd
- tog-pegasus
- udisks2
- util-linux
- virt-v2v
- WALinuxAgent

Removed BaseOS Source Packages

The following source packages from the BaseOS upstream release have been removed:

- kpatch
- subscription-manager
- subscription-manager-cockpit
- subscription-manager-rhsm-certificates

Removed AppStream Source Packages

The following source packages from the AppStream upstream release have been removed:

- ansible-collection-microsoft-sql
- ansible-collection-redhat-rhel_mgmt
- cockpit-leapp
- command-line-assistant
- insights-client
- leapp
- opentelemetry-collector
- realtime-tests
- redhat-cloud-client-configuration
- redhat-indexhtml
- redhat-logos
- rhc

- rhc-worker-playbook
- s390utils
- toolbox
- virtio-win
- virt-who