Oracle Linux 8

Release Notes for Oracle Linux 8.7

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Contents

Preface

1   About Oracle Linux 8

2   New Features and Changes

3 Technology Preview

4 Deprecated Features

5 Known Issues

6   Package Changes from the Upstream Release

Preface

Oracle Linux 8: Release Notes for Oracle Linux 8.7 provides information about the new features and known issues in the Oracle Linux 8.7 release. The information applies to both x86_64 and 64-bit Arm (aarch64) architectures. This document might be updated after it is released.

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

Documentation Accessibility

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For information about the accessibility of the Oracle Help Center, see the Oracle Accessibility Conformance Report at https://www.oracle.com/corporate/accessibility/templates/t2-11535.html.

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Diversity and Inclusion

Oracle is fully committed to diversity and inclusion. Oracle respects and values having a diverse workforce that increases thought leadership and innovation. As part of our initiative to build a more inclusive culture that positively impacts our employees,

customers, and partners, we are working to remove insensitive terms from our products and documentation. We are also mindful of the necessity to maintain compatibility with our customers' existing technologies and the need to ensure continuity of service as Oracle's offerings and industry standards evolve. Because of these technical constraints, our effort to remove insensitive terms is ongoing and will take time and external cooperation.

1
About Oracle Linux 8

The current Oracle Linux 8 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 operating system adaptable to different types of deployment from strictly on-premises installations, hybrid deployments that combine on-premises and cloud installations, and full cloud deployment.

System Requirements and Limitations

To determine whether your hardware is supported on the current Oracle Linux 8 release, check the Hardware Certification List at https://linux.oracle.com/hardware-certifications. Note that hardware is listed as it becomes available and is validated.

Note that Oracle Linux 8 for the aarch64 platform is primarily engineered for use with Ampere™ eMAG™-based EVK platform and the Marvell ThunderX2® processor. Other hardware may be supported and added to the Hardware Certification List in future.

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

Available Architectures

The release is available on the following platforms:

- Intel 64-bit (x86_64)
- AMD 64-bit (x86_64)
- 64-bit Arm (aarch64)

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

Shipped Kernels

On the x86_64 platform, Oracle Linux 8.7 release ships with the following default kernel packages:

- `kernel-4.18.0-425.3.1.el8` (Red Hat Compatible Kernel (RHCK))
- `kernel-uek-5.15.0-3.60.5.1.el8uek` (Unbreakable Enterprise Kernel Release 7 (UEK R7))

For new installations, the UEK R7 is automatically enabled and installed. It also becomes the default kernel on first boot.

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

> **❗ Important:**
>
> If you are upgrading from a previous Oracle Linux 8 version, the kernel is not automatically upgraded to UEK R7. See Installation and Update Changes.

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 is supported. Downgrading kernel packages is not 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 additional 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 closely 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 your application vendor.

The kernel ABI for a UEK release remains unchanged in all subsequent 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 is independent of the kernel version that underlies the operating system. Existing applications in user space continue to run unmodified on UEK R6 and UEK R7, with no required recertifications for RHEL certified applications.

Obtaining Installation Images

The following installation images for the current Oracle Linux 8 release are available:

- Full ISO of Oracle Linux for typical on-premise installations

- Boot ISO of Oracle Linux for network installations

- Boot ISO of the supported UEK release for installing on hardware that 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 Software Delivery Cloud at https://edelivery.oracle.com

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

To prepare a downloaded image for installing Oracle Linux, see Oracle Linux 8: Installing Oracle Linux.

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

For developers who are making use of the Raspberry Pi hardware platform, Oracle provides an unsupported developer release image, which includes the firmware that is required to boot this platform. For more information about making use of the Raspberry Pi hardware platform, see Install Oracle Linux on a Raspberry Pi.

> **✎ Note:**
>
> Aside from installation ISOs, 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 are 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.

Upgrading From Oracle Linux 7 to Oracle Linux 8

You can upgrade an Oracle Linux 7 system to the latest Oracle Linux 8 release by using the `leapp` utility. For step-by-step instructions, as well as information about any known issues that you might encounter when upgrading your system, see Oracle Linux 8: Performing System Upgrades With Leapp.

Installing Oracle-Supported RDMA Packages

Oracle Linux 8 releases earlier than Oracle Linux 8.7 ship with UEK R6 as the default kernel.

Starting with Oracle Linux 8.5, you also have the option of installing UEK R7. From Oracle Linux 8.7 onward, UEK R7 is the default kernel.

Oracle provides Remote Direct Memory Access (RDMA) packages for use with UEK R6 and UEK R7. The RDMA feature enables direct memory access between two systems that are connected by a network. RDMA facilitates high-throughput and low-latency networking in clusters.

To use RDMA features, you must first install the Oracle-supported RDMA packages. To do so, ensure that your system is subscribed to the appropriate channels on ULN or that you have enabled the appropriate repositories on the Oracle Linux yum server.

RDMA With UEK R6

If you are subscribed to ULN, enable the following channels:

- `ol8_x86_64_UEKR6`
- `ol8_x86_64_baseos_latest`
- `ol8_x86_64_appstream`
- `ol8_x86_64_UEKR6_RDMA`

Note that if your system is newly registered on ULN, it is already subscribed to the `ol8_x86_64_UEKR6`, `ol8_x86_64_baseos_latest`, and `ol8_x86_64_appstream` channels by default. However, you must explicitly subscribe to the `ol8_x86_64_UEKR6_RDMA` channel prior to installing RDMA packages.

If you are using the Oracle Linux yum server, enable the following repositories:

- `ol8_UEKR6`
- `ol8_baseos_latest`
- `ol8_appstream`
- `ol8_UEKR6_RDMA`

Note that if your system already uses the Oracle Linux yum server, the `ol8_UEKR6`, `ol8_baseos_latest`, and `ol8_appstream` repositories are enabled by default. However, you must explicitly enable the `ol8_UEKR6_RDMA` repository prior to installing RDMA packages.

For additional information about RDMA, including any known issues, see *Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 6 Update 3*.

RDMA With UEK R7

If you are subscribed to ULN, enable the following channels:

- `ol8_x86_64_UEKR7`
- `ol8_x86_64_baseos_latest`
- `ol8_x86_64_appstream`
- `ol8_x86_64_UEKR7_RDMA`

Note that if your system is newly registered on ULN, it is already subscribed to the `ol8_x86_64_UEKR6`, `ol8_x86_64_baseos_latest`, and `ol8_x86_64_appstream` channels by default. You should disable `ol8_x86_64_UEKR6` and then explicitly subscribe to the `ol8_x86_64_UEKR7_RDMA` and `ol8_x86_64_UEKR7_RDMA` channels prior to installing RDMA packages.

If you are using the Oracle Linux yum server, enable the following repositories:

- `ol8_UEKR7`
- `ol8_baseos_latest`
- `ol8_appstream`
- `ol8_UEKR7_RDMA`

Note that if your system already uses the Oracle Linux yum server, the `ol8_UEKR6`, `ol8_baseos_latest`, and `ol8_appstream` repositories are enabled by default. You should disable `ol8_UEKR6` and then explicitly subscribe to the `ol8_UEKR7_RDMA` and `ol8_UEKR7_RDMA` repositories prior to installing RDMA packages.

For additional information about RDMA, including any known issues, see *Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 7*.

2

New Features and Changes

This chapter describes the new features, major enhancements, bug fixes, and other changes that are included in this release of Oracle Linux 8.

Installation and Update Changes

- **Instructions when performing system updates**

    If you are performing a fresh Oracle Linux 8.7 installation from an ISO image, then after the installation completes, the UEK R7 kernel is automatically enabled. However, if the system has been registered on ULN, then the UEK R6 ULN channel is enabled by default. See UEK R7 ULN Channel Not Enabled After ULN Registration for instructions on the steps to complete in this case.

    UEK R7 includes many new features including security and performance enhancements. For more details, see Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 7 (5.15.0-0.30).

    If you choose to use RHCK as your default kernel instead of UEK, ensure that you disable UEK repositories or channels on yum or ULN, respectively. For more information about switching to RHCK, see *Managing Kernels and System Boot* in Oracle Linux 8: Managing Core System Configuration.

    In the case of updates, switching to UEK R7 is not automatic. If you are upgrading from a prior release of Oracle Linux 8, your system will continue to run with the kernel that is already installed.

    If your system is currently using UEK R6, the following provides instructions for upgrading to UEK R7:

    - **Updating by using yum**

        When you update to Oracle Linux 8.7, the previous kernel is preserved. At the same time, the UEK R7 yum repository is also added to your configuration. To move to the latest kernel, run the following commands, depending on the platform you are using:

        * On x86_64 systems:

            ```
            sudo dnf config-manager --disable ol8_UEKR6
            sudo dnf config-manager --enable ol8_UEKR7
            sudo dnf install -y kernel-uek
            sudo dnf update
            ```

        * On aarch64 systems:

            ```
            sudo dnf config-manager -enable ol8_UEKR7
            sudo dnf install -y kernel-uek
            sudo dnf update
            ```

    - **Updating by using ULN**

        Similar to the previous scenario, the previous kernel is preserved. However, your subscriptions might change as a result. You should log in to https://linux.oracle.com and ensure that the channels that are enabled as well as disabled match what you intend for the updated kernel.

– **Users of the aarch64 platform**

In the UEK R7 implementation, the default base page size has changed from 64 KB to 4 KB. Therefore, updating to UEK R7 might require additional preparations especially in connection with prior existing file systems. See the section *Information About Upgrading From a Previous Oracle Linux or UEK Release to UEK R7* in Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 7 (5.15.0-0.30).

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 8: Managing Core System Configuration.

Operating System and Software Management

The following operating system and software management features and enhancements are introduced in Oracle Linux 8.7:

- **Maximum error file size option available in Rsyslog**

  You can now specify a byte-size value for the new `action.errorfile.maxsize` option, which prevents the Rsyslog error file from exceeding the specified size. Once the maximum file size is reached, further writes are prevented to protect the system from excessive file system usage.

Shells and Command-Line Tools

The following shells and command-line interface (CLI) tools features and improvements are introduced in Oracle Linux 8.7:

- **The `xmlstarlet` package is available in a supported repository**

  The `xmlstarlet` package was previously available in the `ol8_developer_EPEL` repository, but is now available in the supported `ol8_appstream` repository. This package contains utilities that are frequently used on the command line to perform common operations on XML files that other command line tools are unable to do easily by taking advantage of XPath syntax to properly locate, add or modify information within the file.

Compilers and Development Toolsets

Oracle Linux 8.7 introduces the following features, enhancements, and changes to compilers and development toolsets.

- **Rust Toolset is updated to version 1.62.1**

  – You can now use tuple, slice, and struct patterns as the left-hand side of an assignment. For example, a tuple assignment can swap two variables:

  ```
  (a, b) = (b, a);
  ```

  Note that destructuring assignments with operators such as `+=` are not allowed.

  – Inline assembly is available on x86_64 and aarch64 using the `core::arch::asm!` macro.

- Enums can derive the `Default` trait with an explicitly annotated `#[default]` variant.

- An optimized `futex`-based implementation is used for `Mutex`, `CondVar`, and `RwLock`, to replace pthreads.

- Custom exit codes from `main`, including user-defined types that use the `Termination` trait, can be used.

- Cargo supports more control over dependency features. The `dep:` prefix can refer to an optional dependency without exposing that as a feature, and a `?` only enables a dependency feature if that dependency is enabled elsewhere, like `package-name?/feature-name`.

- A new `cargo add` sub-command for adding dependencies to `Cargo.toml` is available.

For more details, please see consecutive upstream release announcements, including Rust 1.59.0, Rust 1.60.0,Rust 1.61.0,Rust 1.62.0 and Rust 1.62.1.

- **LLVM Toolset is updated to version 14.0.0**

  - On 64-bit x86, support for `AVX512-FP16` instructions has been added.

  - Support for the Armv9-A, Armv9.1-A and Armv9.2-A architectures has been added.

  This version also includes the following changes in `clang`:

  - `if consteval` for `C++2b` is now implemented.

  - `AVX512-FP16` instructions have been added for the x86_64 architecture.

  - The `-E -P` preprocessor output now always omits blank lines, matching GCC behavior. Previously, up to 8 consecutive blank lines could appear in the output.

  - Support `-Wdeclaration-after-statement` with `C99` and later standards, and not just C89, matching GCC's behavior. A notable use case is supporting style guides that forbid mixing declarations and code, but want to move to newer C standards.

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

- **Maven 3.8 is now available as a new module stream**

  Maven 3.8 as a new `maven:3.8` module stream.

GCC Toolset 12

Oracle Linux 8.7 provides the GCC Toolset 12, which is an Application Stream that is distributed in the form of a Software Collection in the `AppStream` repository. The GCC Toolset is similar to the Oracle Linux Developer Toolset. See #unique_22 for additional information about changes to compilers and developer toolsets in this release.

The following notable updates to tooling are included in the GCC Toolset 12:

- **GCC Toolset 12 supports `_FORTIFY_SOURCE` level 3**

  Use the `-D_FORTIFY_SOURCE=3` in the compiler command line when building with GCC version 12 or later to improve coverage of source code fortification and the security of your applications.

- **`binutils` updated to version 2.38**

  The `binutils` package now supports options that display or warn about the presence of multibyte characters, making it easier to create software that is compatible with a wide range of languages.

The `readelf` and `objdump` tools automatically follow links to separate `debuginfo` files, making it easier to debug programs. This behavior can be disabled by using the `--debug-dump=no-follow-links` option for `readelf` or the `--dwarf=no-follow-links` option for `objdump`.

- **Annobin updated to version 10.79**

  A new command line option for `annocheck` tells it to avoid using the `debuginfod` service if it is unable to find debug information in another way. This option can help improve performance if the `debuginfod` server is unavailable. Binaries built by the Rust 1.18 compiler are now supported by `annocheck`. Annobin sources can alternatively be built using `meson` and `ninja` if these tools are preferred over `configure` and `make`.

- **`gdb` updated to version 11.2**

  This update includes many changes to functionality including the addition of several new commands and options as well as several feature enhancements. For a complete list of updates, see the GDB upstream release notes at https://sourceware.org/git/gitweb.cgi?p=binutils-gdb.git;a=blob_plain;f=gdb/NEWS;hb=gdb-11.2-release.

GCC Toolset 12 is available as an Application Stream within the `AppStream` repository, in the form of a Software Collection.

To install this toolset, use the following command:

```
sudo dnf install gcc-toolset-12
```

If you previously installed this toolset, use the following command to upgrade to the latest version:

```
sudo dnf upgrade gcc-toolset-12
```

To run a tool from GCC Toolset 12, use the following command:

```
scl enable gcc-toolset-12 tool
```

The following command initiates a shell session, where tool versions from the GCC Toolset 12 take precedence over system versions of the same tools:

```
scl enable gcc-toolset-12 bash
```

Database

This release of Oracle Linux 8 ships with version 8.0 of the MySQL database software.

Dynamic Programming Languages, Web and Database Servers

Oracle Linux 8.7 includes several feature changes and improvements for dynamic programming languages and web and database servers. Note that this release also introduces several new and improved module streams:

- **Ruby 3.1.2 available as a new module stream**

Ruby 3.1.2 is available in a new `ruby:3.1` module stream. This version of Ruby includes several enhancements and performance improvements over the `ruby:3.0` module stream, including:

– An auto-complete feature and a documentation dialog included in the `Interactive Ruby` (IRB) utility.

– New `debug` and `error_highlight` gems to provide improved performance, more functionality and more granular control.

– Values in the hash literal data types and keyword arguments can now be omitted

– Parentheses can now be omitted in one-line pattern matching and the pin operator (^) now accepts an expression in pattern matching.

– YJIT, a new experimental in-process Just-in-Time (JIT) compiler, is now available on the AMD and Intel 64-bit architectures

– The Method Based Just-in-Time Compiler (MJIT) includes several performance improvements including an increase in the default maximum JIT cache value for large workloads like Rails.

• **Mercurial 6.2 available as a new module stream**

Mercurial 6.2 is now available as a new `mercurial:6.2` module stream. This version includes several notable changes when compared to the `mercurial:4.8` module stream, including:

– Python 2 is no longer compatible with this version of Mercurial. Mercurial is compatible with Python 3.6 or later.

– A new `-i` option, which enables you to delete ignored files instead of untracked files is available for the `hg purge` and `hg clean` commands.

– The `--from <revision>` and `--to <revision>` arguments can now be used with the `hg diff` and `hg extdiff` commands and a new internal merge utility, `internal:mergediff`, is now available.

– New repositories use The Zstandard (ZSTD) compression by default.

– A new way of specifying required extensions is now available that makes it impossible for Mercurial to start if the required extensions are not found.

– A new `mercurial-chg` utility is available, which provides a C wrapper for the `hg` command. When you use the `chg` command, the wrapper is used to provide significant performance improvements.

File Systems and Storage

Oracle Linux 8.7 provides the following file systems and storage features, enhancements, and changes:

• **Btrfs removed from RHCK.** The Btrfs file system is removed from RHCK in Oracle Linux 8. As such, you cannot create or mount Btrfs file systems when using this kernel. Also, note that any Btrfs user space packages that are provided are not supported with RHCK.

> **✎ Note:**
>
> Support for the Btrfs file system is enabled in UEK R7 and UEK R6. Starting with Oracle Linux 8.3, you have the option to create a Btrfs root file system during an installation, as well as select Btrfs as the file system type when formatting devices. See Oracle Linux 8: Installing Oracle Linux for more information about this feature.
>
> For more information about managing a Btrfs root file system, see Oracle Linux 8: Managing Local File Systems.
>
> For changes that have been made to Btrfs in UEK R6, see Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 6 Update 3 (5.4.17-2136).
>
> For changes to Btrfs in UEK R7, see Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 7 (5.15.0-0.30).

- **OCFS2 removed from RHCK.** The Oracle Cluster File System version 2 (OCFS2) file system is removed from RHCK in Oracle Linux 8. As such, you cannot create or mount OCFS2 file systems when using this kernel. Also, any OCFS2 user space packages that are provided are not supported with RHCK.

> **✎ Note:**
>
> OCFS2 is fully supported with UEK R6 and UEK R7 in Oracle Linux 8.7.

- **`nfsrahead` utility added**

  The `nfsrahead` utility, used to modify the `readahead` value for NFS mounts, is now available. This utility can help to improve NFS performance.

- **`rpcctl` command displays SunRPC connection information**

  The `rpcctl` command now displays and allows you to show information, add and remove objects in the SunRPC `sysfs` files.

- **Device Mapper Multipath configuration can be configured per protocol**

  You can now configure Device Mapper multipath device paths on a per-protocol basis, allowing for the optimal configuration of multipath devices accessible through multiple protocols. Edit the `multipath.conf` file to specify protocol override configuration.

```
overrides {
        protocol {
                type "scsi:fcp"
                dev_loss_tmo 70
                fast_io_fail_tmo 10
                eh_deadline 360
        }
        protocol {
                type "scsi:iscsi"
                fast_io_fail 120
        }
}
```

The mandatory `type` attribute is used to match path devices for the protocol. The `type` attribute can be set to: `scsi:fcp`, `scsi:spi`, `scsi:ssa`, `scsi:sbp`, `scsi:srp`, `scsi:iscsi`, `scsi:sas`, `scsi:adt`, `scsi:ata`, `scsi:unspec`, `ccw`, `cciss`, `nvme`, or `undef`. The path device protocol can be determined by running: `multipathd show paths format "%d %P"`. Attributes in a matching protocol subsection take precedence over attributes in the rest of the overrides section. If there are multiple matching protocol subsections, later entries take precedence.

High Availability and Clusters

The following high availability and clustering features are included in Oracle Linux 8.7:

- **`pcs stonith update-scsi-devices` allows updates to multipath SCSI devices without restarting the cluster**

  The `pcs stonith update-scsi-devices` command can be used to update fencing on a cluster by using multipath devices without requiring a restart of other cluster resources running on the same node. For example:

  ```
  sudo pcs stonith update-scsi-devices <mpath-fence-dev> set <device-path>
  sudo pcs stonith update-scsi-devices <mpath-fence-dev> add <device-path>
  sudo pcs stonith update-scsi-devices <mpath-fence-dev> remove <device-path>...
  ```

- **Pacemaker clusters have UUIDs**

  The `pcs` command generates a UUID that you can use to uniquely identify the cluster when it is created. The UUID is displayed when you run the `pcs cluster config [show]` command. You can add a UUID to an existing cluster or regenerate a UUID if one already exists by running `pcs cluster config uuid generate`.

- **The `multiple-active` resource parameter now accepts a value of `stop_unexpected`**

  The `multiple-active` resource parameter determines recovery behavior when a resource is active on more than one node when it should not be. By default, this situation requires a full restart of the resource, even if the resource is running successfully where it should be. With this update, the `multiple-active` resource parameter accepts a value of `stop_unexpected`, which allows you to specify that only unexpected instances of a multiply-active resource are stopped. It is the user's responsibility to verify that the service and its resource agent can function with extra active instances without requiring a full restart.

- **Pacemaker `allow-unhealthy-node` resource meta-attribute added**

  The `allow-unhealthy-node` resource meta-attribute can be set to `true` to ensure that the resource is not forced off a node due to degraded node health. This feature allows the health agent to continue to run on an unhealthy node so that the cluster is able to automatically detect when the node becomes healthy again, before moving resources back to the node.

- **Pacemaker includes Access Control Lists (ACLs) for system groups**

  In addition to the ACLs that were previously allows for individual users, Pacemaker includes ACLs for system groups to facilitate role-based access controls. The `pcs acl group` command can now be used to apply ACLs to system groups. For example, to create a read-only ACL for the *pcs_ro_group* system group:

  ```
  sudo pcs acl group create pcs_ro_group readonly
  ```

- **Pacemaker `--output-format=cmd` option generates command line output to recreate fence devices and resources**

Use the `--output-format=cmd` option when running the `pcs stonith config` command to generate output of the `pcs` commands that you must run on a different system to reconfigure fence devices. You can also use this option with the `pcs resource config` command to get a list of command to run to reconfigure resources on an alternate system.

Infrastructure Services

Oracle Linux 8.7 introduces several version updates to infrastructure and command-line tools, including the following features:

- **`samba` rebased to version 4.16.1**

  The `samba` packages have been upgraded to upstream version 4.16.1, which provides bug fixes and enhancements over the previous version:

  - By default, the `smbd` process automatically starts the new `samba-dcerpcd` process on demand to serve Distributed Computing Environment / Remote Procedure Calls (DCERPC). Note that Samba 4.16 and later always requires `samba-dcerpcd` to use DCERPC. If you disable the `rpc start on demand helpers` setting in the `[global]` section in the `/etc/samba/smb.conf` file, you must create a `systemd` service unit to run `samba-dcerpcd` in standalone mode.

  - The Cluster Trivial Database (CTDB) `recovery master` role has been renamed to `leader`. As a result, the following `ctdb` sub-commands have been renamed:

    * `recmaster` to `leader`

    * `setrecmasterrole` to `setleaderrole`

  - The CTDB `recovery lock` configuration has been renamed to `cluster lock`.

  - CTDB now uses leader broadcasts and an associated timeout to determine if an election is required.

  Note that the server message block version 1 (SMB1) protocol is deprecated since Samba 4.11 and will be removed in a future release.

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

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

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

Security

Oracle Linux 8.7 introduces the following security features, enhancements, and changes:

- **NSS no longer supports RSA keys shorter than 1023 bits**

  Network Security Services (NSS) libraries are updated to set the minimum key size for all RSA operations from 128 to 1023 bits. NSS can no longer generate,

sign or verify or encypt or decrypt information with RSA keys shorter than 1023 bits.

- **SCAP Security Guide updated to 0.1.63**

  The SCAP Security Guide (SSG) provides new compliance rules for `sysctl`, `grub2`, `pam_pwquality`, and build time kernel configuration.

- **STIG profile in Oracle Linux 8 is better aligned with DISA STIG**

  A DISA STIG profile for Oracle Linux 8 is included in the `scap-security-guide` package. This profile is aligned to DISA Oracle Linux 8 STIG V1R3 and covers new or updated rules related to the handling of account passwords, password quality, checking of home partition mount points, and the configurations of `sysctl`. These updated rules ensure greater compliance with the DISA's STIG requirements.

- **`scap-security-guide` rules for mount options no longer fail if `/tmp` and `/var/tmp` partitions do not exist**

  SSG rules that previously reported a `fail` result if the `/tmp` and `/var/tmp` partitions did not exist on a system have been updated to only report a failure if the partitions exist but the system has the wrong mount options.

- **`fapolicyd` is updated to 1.1.3**

  The `fapolicyd` software framework is updated to version 1.1.3 to include several enhancements including a change to use the OpenSSL library as the cryptographic engine for hash computation and a facility to allow rules to match the parent process ID (PPID) of a subject. A fix to the `fagenrules --load` command is also included.

- **`opencryptoki` is updated to version 3.18.0**

  This version includes the following improvements:

  – Default to Federal Information Processing Standards (FIPS) compliant token data format (tokversion = 3.12).

  – Enabled restricting usage of mechanisms and keys using a global policy.

  – Enabled statistics counting of mechanism usage.

  – The `ICA/EP11` tokens can use `libica` library version 4.

  – The `p11sak` tool allows setting different attributes for public and private keys.

  – The `C_GetMechanismList` does not return `CKR_BUFFER_TOO_SMALL` in the EP11 token.

Virtualization

The following virtualization features, enhancements, and changes are introduced in Oracle Linux 8.7:

- **`open-vm-tools` updated to 12.0.5**

  In this updated version of the open source implementation of VMware Tools, support has been added for the Salt Minion tool which is managed through guest OS variables.

- **ESXi hypervisor and SEV-ES is now supported**

  If you are running Oracle Linux 8.4 or later on VMware's ESXi hypervisor, you can now enable the AMD Secure Encrypted Virtualization-Encrypted State (SEV-ES) feature to secure your virtual machines. This feature was previously introduced as a Technology Preview, but is now fully supported.

3

Technology Preview

For the Red Hat Compatible Kernel in the current Oracle Linux 8 release, the following features are under technology preview:

kexec Fast Reboot

The `kexec fast reboot` feature is available as a technology preview feature in Oracle Linux 8. This feature significantly speeds up the boot process by enabling the kernel to boot directly into the second kernel without having to first pass through the Basic Input/Output System (BIOS). To use this feature, load the `kexec` module first, then reboot the system.

SGX Available

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

DAX File System Available

In this release, the DAX file system is available as a Technology Preview for the ext4 and XFS file systems. DAX enables an application to directly map persistent memory into its address space. The system must have some form of persistent memory available to use DAX. Persistent memory can be in the form of one or more Non-Volatile Dual In-line Memory Modules (NVDIMMs). In addition, a file system that supports DAX must be created on the NVDIMMs; the file system must be mounted with the `dax` mount option. Then, an `mmap` of a file on the dax-mounted file system results in a direct mapping of storage into the application's address space.

NVMe/TCP available

NVMe over Fabrics TCP host and the target drivers are included in RHCK as a technology preview in this release.

> ✏️ **Note:**
>
> Support for NVMe/TCP is already available in Unbreakable Enterprise Kernel Release 6.

4

Deprecated Features

This chapter lists features and functionalities that are deprecated in Oracle Linux 8. While these features might be currently included and operative in the release, support is not guaranteed in future major releases. Thus, they should not be used in new Oracle Linux 8 deployments.

Installation

The following installation related features and functionalities are deprecated in Oracle Linux 8.

Kickstart Commands

- `auth` or `authconfig`
- `device`
- `deviceprobe`
- `dmraid`
- `install`
- `lilo`
- `lilocheck`
- `mouse`
- `multipath`
- `bootloader --upgrade`
- `ignoredisk --interactive`

  Using the `--interactive` option causes a fatal installation error. You must remove this option from your kickstart files.

- `partition --active`
- `reboot --kexec`

Even though specific options are listed as deprecated, the base command and the other options remain available and operative.

Software Management

The following features and functionalities related to software management are deprecated in Oracle Linux 8.

rpmbuild --sign

Using `rpmbuild --sign` can cause a fatal error in the system. Use the `rpmsign` command instead.

kernelopts Environment Variable

The `kernelopts` environment variable stores the defined kernel command line parameters for systems that use the GRUB2 bootloader. The variable was stored in the `/boot/grub2/grubenv` file for each kernel boot entry. The variable is deprecated and kernel command line parameters are stored in the Boot Loader Specification (BLS) snippet as a replacement.

Shells and Command Lines

The following shell and command line components are deprecated in Oracle Linux 8.

OpenEXR

As a consequence of the OpenEXR deprecation, the `EXR` image format is no longer supported in the `imagecodex` module.

Dump Utility

With this removal of support for the `dump` utility, use other commands to back up file systems, for example, `tar`, `dd`, or `bacula`.

The `restore` component of the `dump` package remains supported and available as a separate `restore` package.

ABRT Tool

The Automatic Bug Reporting Tool (ABRT) is used to detect and report application crashes. Instead of this tool, use the `systemd-coredump` tool for logging and storing core dumps that are generated when program crash.

ReaR Crontab

The `/etc/cron.d/rear` crontab is deprecated in the `rear` package. The crontab utility monitors for any changes in the disk layout and runs `rear mkrescue` if changes are detected. If you require the `rear` functionality, configure the ReaR utility to run periodically.

SQLite in Bacula

Support is deprecated for SQLite as a database backend of the Bacula backup system. You should migrate to one of the backends that Bacula supports, such as PostgreSQL or MySQL.

hidepid=n Option

As a `mount` option, `hidepid=n` controls access to `/proc/[pip]`. The option is incompatible with the `systemd` infrastructure and might cause certain `systemd` services to generate SELinux AVC denial messages, which would inhibit completion of other operations.

udev Utility

The deprecated `/usr/lib/udev/rename_device` tool for renaming network devices should no longer be used in this release.

row Command

Use of the deprecated `/usr/bin/row` command in future Oracle Linux releases might generate errors.

Security

The following security related features and functionalities are deprecated in Oracle Linux 8.

NSS SEED Ciphers

Support for TLS cipher suites that use a SEED cipher is deprecated in the Network Security Services (NSS) library from Mozilla. If your setup relies on SEED ciphers, you should enable support for other cipher suites in preparation for the complete removal of SEED ciphers from NSS.

TLS 1.0 and TLS 1.1

These two protocols are disabled in the `DEFAULT` system-wide cryptographic policy level. If you require these protocols, switch the policy to the `LEGACY` level as follows:

```
sudo update-crypto-policies --set LEGACY
```

DSA

Authentication mechanisms that are based on the deprecated Digital Signature Algorithm (DSA) keys no longer work in the default configuration. OpenSSH clients do not accept DSA host keys even when the system-wide cryptographic policy level is set to `LEGACY`.

SSL2 Client Hello

Secure Socket Layer 2's `Client Hello` message used to be supported by earlier versions of the Transport Layer Security (TLS) protocol. Being deprecated in the NSS library, this feature is now disabled by default.

If your application requires support for `Client Hello`, enable the feature by using the `SSL_ENABLE_V2_COMPATIBLE_HELLO` API.

TPM 1.2

The Trusted Platform Module (TPM) is updated to 2.0 with multiple improvements. However, the updated version is not backward compatible with earlier versions. Consequently, version 1.2 is deprecated.

crypto-policies

The introduction of scopes for `crypto-policies` directives in custom policies has resulted in the deprecation of the following derived properties of `crypto-policies`:

- `tls_cipher`

- `ssh_cipher`

- `ssh_group`

- `ike_protocol`

- `sha1_in_dnssec`

Use of the `protocol` property now requires a scope. For more information, see the `crypto-policieis(7)` manual page.

Runtime disabling of SELinux

Setting the `SELINUX=disabled` option in `/etc/selinux/config` to disable SELinux at runtime has deprecated support. If you use only this option to disable SELinux, then SELinux remains enabled but with no loaded policy.

To completely disable SELinux, add the `selinux=0` parameter to the kernel command line.

ipa SELinux module

This module is no longer maintained and hence removed from the `selinux-policy` package. The functionality is now included in the `ipa-selinux` package.

fapolicyd.rules

Policies for allowing and denying execution rules used to be specified in the `/etc/fapolicyd/fapolicyd.rules` file. This file is being replaced by files inside the `/etc/fapolicyd/rules.d` directory.

The `fagenrules` script now merges all component rule files in this directory to the `/etc/fapolicyd/compiled.rules` file. Rules in `/etc/fapolicyd/fapolicyd.trust` are still processed by the `fapolicyd` framework but only for ensuring backward compatibility.

Networking

The following network related features and functionalities are deprecated in Oracle Linux 8.

Network Scripts

Network scripts are no longer available by default. New versions of `ifup` and `ifdown` scripts call the NetworkManager service through the `nmcli` tools. Therefore, to run these scripts in Oracle Linux 8, the NetworkManager service must be running.

Other commands in `/sbin/ifup-local`, `ifdown-pre-local`, and `ifdown-local` scripts are ignored. If you manually install the legacy `network-scripts` package and use the scripts, a warning is displayed about their deprecated state.

dropwatch Tool

Instead of the `dropwatch` tool, use the the replacement `perf` command line tool in future Oracle Linux deployments, which provides the same functionality.

cgdcbxd Package

The deprecated control group data center bridging exchange daemon (`cgdcbxd`) monitors data center bridging (DCB) netlink events and manages the `net_prio control` gropu subsystem. Support for this feature might be removed.

xinetd Service

The `xinetd` service is replaced by `systemd`.

WEP Wi-Fi Connection

Instead of using this connection method, use the Wi-Fi Protected Access 3 (WPA3) or WPA2 connection methods.

xt_u32 Module

The `xt_32` module enables users to match arbitrary 32 bits in the packet header or payload for their `iptables`. Because this module is unsupported, migrate to the `nftables` packet filtering framework.

First, change your firewall to use `iptables` with native matches to incrementally replace individual rules. Then, use the `iptables-translate` command and accompanying utilities to migrate to `nftables`. If the `iptables` rules have no native match in `nftables`, use the raw payload matching feature of `nftables` instead.

For more information, aee the *raw payload expression* section in the `nft(8)` manual page.

Kernel

The following kernel related features and functionalities are deprecated in Oracle Linux 8.

crash-ptdump-command Package

This package is a `ptdump` extension module for the crash utility. The package is not maintained upstream and is consequently deprecated in this Oracle Linux 8 release.

Using Diskless Boot for installing Oracle Linux for Real Time 8

Diskless boot can risk introducing network latency in real-time workloads. Therefore, this feature for installing Oracle Linux for Real Time 8 is deprecated.

Linux firewire subsystems and associated user space comonents

The `firewire` subsystem provides interfaces to use and maintain any resources on the IEEE 1394 bus. This subsystem is deprecated in the `kernel` package and likewise, associated user space components that are provided by the `libavc1394`, `libdc1394`, and `libram1394` packages.

rdma-rxe Driver

Software Remote Direct Memory Access over Converged Ethernet (Soft-RoCE), or RXE, emulates RDMA. Because of instability issues, this driver is now deprecated.

File Systems and Storage

The following features and functionalities related to file systems and storage are deprecated in Oracle Linux 8.

VDO Write Modes

- `sync`
- `async-unsafe`
- `auto`

In place of these modes, `async` is the recommended write mode to use.

cramfs Kernel Module

In place of the deprecated `cramfs` kernel module, use `squashfs`, which is the recommended replacement.

VDO Manager

The VDO Manager is deprecated and is replaced by the LVM-VDO integration. To create VDO volumes, preferably use the `lvcreate` command instead.

You can use the `/usr/sbin/lvm_import_vdo` script in the `lvm2` package to convert existing volumes that were created with the VDO Manager. In this manner, these volumes can be managed through the LVM-VDO integration.

elevator Kernel Command

The `elevator` kernel command line parameter sets the disk scheduler for all devices. If you require a different scheduler than what the kernel automatically selects, use `udev` rule or the TuneD service to configure your preferred scheduler.

LVM Mirror

Instead of the deprecated LVM `mirror` segment type, use LVM RAID 1 devices with the `raid1` segment type for similar functionality.

peripety Package

The `peripety` package is deprecated. The Peripety storage event notification daemon parses system storage logs into structured storage events to enable you investigate storage issues.

High Availability and Clusters

The following features and functionalities that related to high availability and clusters are deprecated in Oracle Linux 8.

pcs Commands Support for clufter Tool

The `clufter` tool is used for analyzing cluster configuration formats. The `pcs` commands that support the `clufter` tool are deprecated. Using these commands generate a warning about their deprecations. Sections that are related to these commands are removed from the `pcs` help display as well as the `pcs(8)` manual page.

Specifically, the following commands are deprecated:

- `pcs config import-cman`
- `pcs config export`

Compilers and Development Tools

The following compilers and development tools are deprecated in Oracle Linux 8.

libdwarf Library

In place of the deprecated `libdwarf` library, use the `elfutils` and `libdw` libraries for applications that need to process ELF/DWARF files.

As an alternative to the `libdwarf-tools dwarfdump` program, you can use the `binutils readelf` program or the `elfutils eu-readelf` program. Both programs can be used by passing the `--debug-dump` flag.

gdb.i686 Packages

These packages were distributed in earlier Oracle Linux releases to support 32-bit versions of the GNU Debugger (GDB). With the removal of support for 32-bit hardware, these packages are no longer supported or available. The 64-bit version of GDB in `gdb.x86_64` packages can debug 32-bit applications.

Desktop

The following desktop related features and functionalities are deprecated in Oracle Linux 8.

libgnome-keyring Library

The `libgnome-keyring` library is deprecated in favor of the `libsecret` library, which is more compliant with security standards.

Motif Toolkit

The Motif widget tool is deprecated, including the following packages:

- `motif`
- `openmotif`
- `openmotif21`
- `openmotif22`

Likewise, the `motif-static` package has been removed. In place of Motif, use the GTK toolkit.

Virtualization

The following virtualization related features and functionalities are deprecated in Oracle Linux 8.

Web Console Translation Support

The web console no longer performs translations for languages whose available translations are less than 50% of the console's translatable strings. For these languages, the user interface will be in English.

virsh iface-* Commands

`virsh iface-*` commands such as `virsh iface-start`, `virsh iface-destroy`, and so on are deprecated. To configure and manage host network connections, use instead the NetworkManager tool and its related management applications, for example `nmcli`.

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.

Cirrus VGA Virtual GPU Type

The Cirrus VGA GPU device is deprecated and support for it might be removed in KVM virtual machines. In its place, use `stdvga`, `virtio-vga`, or `qxi` devices.

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.

SPICE Remote Display Protocol

With the deprecation of the SPICE remote display protocol, the functionality of attaching smart card readers to virtual machines (VMs) will be provided by third party remote virtualization solutions.

Additionally, the deprecation of this protocol has the following consequences:

- For remote console access, use the VNC protocol.
- For advanced remote display functions, use third party tools such as RDP, HP RGS, or Mechdyne TGX.

Containers

The following features and functionalities that are related to containers are deprecated in Oracle Linux 8.

container-tools Modules

The `container-tools:1.0` and `container-tools:2.0` modules are deprecated and no longer support security updates.

Use newer supported stable module streams, such as `container-tools:3.0` instead.

5
Known Issues

This chapter lists known issues in the current Oracle Linux 8 release. The list covers issues that might affect both x86 and aarch64 platforms. In the list, additional issues that are specific only to aarch64 platforms are labeled `aarch64 only:`.

The following guides provide additional information about known issues that related to specific Oracle Linux components:

- Podman container management tool: Oracle Linux: Podman User's Guide
- System and Oracle Cloud Infrastructure instance upgrade using Leapp: Oracle Linux 8: Performing System Upgrades With Leapp

Installation and Upgrade Issues

The following are known installation and upgrade issues for Oracle Linux 8.6.

UEK R7 ULN Channel Not Enabled After ULN Registration

After Oracle Linux 8.7 is newly installed, UEK R7 is installed as the default kernel. However, if the system is registered on ULN, the UEK R6 ULN channel is enabled by default. To obtain security updates for the default kernel on an Oracle Linux 8.7, the ULN subscriptions must be manually updated to disable the UEK R6 channel and to enable the UEK R7 channel. See Installation and Update Changes for more information on this change.

Log into https://linux.oracle.com with your ULN user name and password and click on the Systems tab to select the system that you have registered to ULN. Go to the **Manage Subscriptions** page and update the channel subscriptions for the system. For example, disable access to the `ol8_x86_64_UEKR6`, and enable access to the `ol8_x86_64_UEKR7` channel. Click on **Save Subscriptions** to save your changes.

(Bug ID 34711928)

Messages referring to tmpfiles.d/ files appear during upgrade

During an upgrade from Oracle Linux 8.5 to Oracle Linux 8.6, and with the appropriate Oracle Linux 8 repositories enabled, the `dnf upgrade` command displays messages similar to the following:

```
Running scriptlet: systemd-239-44.0.1.el8.x86_64
4550/4550
[/usr/lib/tmpfiles.d/dnssec-trigger.conf:1] Line references path below legacy
directory /var/run/, updating /var/run/dnssec-trigger → /run/dnssec-trigger;
please update the tmpfiles.d/ drop-in file accordingly.
[/usr/lib/tmpfiles.d/krb5-krb5kdc.conf:1] Line references path below legacy
directory /var/run/, updating /var/run/krb5kdc → /run/krb5kdc; please update
the tmpfiles.d/ drop-in file accordingly.
[/usr/lib/tmpfiles.d/nss-pam-ldapd.conf:2] Line references path below legacy
directory /var/run/, updating /var/run/nslcd → /run/nslcd; please update the
tmpfiles.d/ drop-in file accordingly.
```

```
[/usr/lib/tmpfiles.d/pesign.conf:1] Line references path below legacy
directory /var/run/, updating /var/run/pesign → /run/pesign; please update
the tmpfiles.d/ drop-in file accordingly.
[/usr/lib/tmpfiles.d/portreserve.conf:1] Line references path below legacy
directory /var/run/, updating /var/run/portreserve → /run/portreserve; please
update the tmpfiles.d/ drop-in file accordingly.
.
.
.
```

These messages can be safely ignored, as the upgrade or package installation completes successfully.

As an alternative workaround, update the configuration by following the instructions in the message. Change the legacy `var/run/<...>` directory path to `/run/<...>`.

(Bug ID 32852433)

Installer automatically enables Ethernet over USB network interface during a PXE installation

During a Preboot Execution Environment (PXE) installation of Oracle Linux 8, the installer automatically enables the Ethernet over USB network interface with the `bootproto=dhcp` and `ONBOOT=yes` parameters. These default settings causes the `NetworkManager` service to fail to start.

To prevent this issue from occurring, or to resolve the issue if you have already encountered it, use one of the following workarounds:

- Prior to installation, disable the `ONBOOT` parameter for the Ethernet over USB network interface in the kickstart file, as follows:

  ```
  network --bootproto=dhcp --device=enp0s20f0u8u3c2 --onboot=off --ipv6=auto
  ```

- During installation, on the Network & Host Name screen, do not select the **Connect automatically with priority** check box to connect automatically on every reboot for the Ethernet over USB network interface.

- If you have already encountered this issue, then after the installation, change the network configuration setting for the Ethernet over USB network interface to `ONBOOT=no`. Then reboot the system.

(Bug ID 31888490)

Interactive text-based installation wizard unable to complete when an alternate language is selected

If you selected an alternate language while using the text-based installer to install the OS, you cannot proceed with the installation. The installation is blocked with [!] flags for **Software Selection** and **Installation Destination** regardless of what you have set for these two options.

However, this issue does not occur if you are performing an installation by using the default English language selection or by using the graphical installation program.

(Bug IDs 30535416, 29648703)

Graphical installation program fails to produce error when an unacceptable Kdump value is entered

A minor upstream usability error affects the graphical installation program during the configuration of Kdump.

If you specify an unacceptable value when manually configuring the Kdump memory reservation, you can click `Done` to return to the Installation Summary screen. The installer does not generate a warning or error message. Instead, the installer automatically resets the value either to the last known acceptable value or the default value of 512 MB, which enables the installation to succeed. However, because this corrected setting is not displayed on the screen, you might not become aware that your specified value was ignored.

This issue does not occur with the text-based installer, which correctly returns an error if you enter an unacceptable value and prevents you from continuing.

(Bug IDs 31133351, 31182708)

Graphical installation program does not display the reserved memory that is manually set for Kdump

A minor usability error affects the graphical installation program during the configuration of Kdump. If you manually change the default memory size that is reserved for Kdump, the new setting is not displayed when the screen is refreshed. Instead, only the values for the total system memory and usable system memory are displayed. Consequently, the limits for the parameter "Memory to be reserved (Mb)" become unknown for future Kdump configuration.

> **✎ Note:**
>
> The default setting `auto` for Kdump memory reservation is adequate as the kernel determines what size to use when it boots

(Bug IDs 31133287 and 31182699)

Scriptlet-related error for microcode_ctl might be displayed during upgrade

A scriplet-related error message might be displayed during an upgrade of an Oracle Linux 8 release to its next version. When you run the `dnf update` command, an output similar to the following might appear:

```
  Running scriptlet: tuned-2.13.0-6.0.2.el8.noarch
            1089/1089
  Running scriptlet: microcode_ctl-4:20191115-4.el8.x86_64
            1089/1089
realpath: weak-updates/kmod-kvdo/vdo/kvdo.ko: No such file or directory
realpath: weak-updates/kmod-kvdo/uds/uds.ko: No such file or directory
dracut: installkernel failed in module kernel-modules-extra
warning: %posttrans(microcode_ctl-4:20191115-4.el8.x86_64) scriptlet failed,
exit status 1

Error in POSTTRANS scriptlet in rpm package microcode_ctl
```

```
Running scriptlet: libgcc-8.3.1-4.5.0.7.el8.x86_64
             1089/1089
Running scriptlet: glibc-common-2.28-101.0.1.el8.x86_64
             1089/1089
Running scriptlet: info-6.5-6.el8.x86_64
             1089/1089
```

This error message is displayed if you use the Server with GUI environment to install Oracle Linux 8 and then you reboot the server by using RHCK. This installation method installs the kernel dependent, `kmod-kvdo` package or module, which is a different version in the previous Oracle Linux 8 release.

However, you can safely ignore the message because the `kmod-kvdo` package is successfully installed during the upgrade process.

> **✎ Note:**
>
> This error does not occur if you install the Minimal Install base environment or if you boot the server with UEK R6 or UEK R7.

(Bug ID 31292199)

rhnreg_ks register command might fail if python3-rhn-virtualization-host package is installed

Beginning with Oracle Linux 8.1, using the `rhnreg_ks` command to register a system with the Unbreakable Linux Network (ULN)might fail if the `python3-rhn-virtualization-hosts` package is installed on the system. This issue has been observed when the `libvirtd` service is not running.

To work around this issue, ensure that the `libvirtd` packages are installed on your system and that the service is enabled and running prior to issuing the `rhnreg_ks` command.

(Bug ID 30366521)

Package conflict between usbguard-1.0.0-2.el8.i686 and usbguard-1.0.0-8.el8.x86_64 on Oracle Linux 8 upgrades

Beginning with Oracle Linux 8.5, when you upgrade Oracle Linux 8 with both the `ol8_baseos_latest` and `ol8_appstream` yum repositories enabled, a conflict between the `usbguard-1.0.0-2.el8.i686` and `usbguard-1.0.0-8.el8.x86_64` packages occurs.

The following error is produced:

```
Problem: package usbguard-1.0.0-8.el8.x86_64 conflicts with usbguard
provided by usbguard-1.0.0-2.el8.i686
  - cannot install the best candidate for the job
  - problem with installed package usbguard-1.0.0-2.el8.i686
(try to add '--allowerasing' to command line to replace conflicting packages
```

```
or '--skip-broken' to skip uninstallable packages or '--nobest' to use not
only best candidate packages)
```

This conflict occurs because in Oracle Linux 8.6 and later releases, the `usbguard-1.0.0-2.el8.i686` and the `usbguard-1.0.0-8.el8.x86_64` packages conflict with each other and could no longer be installed together, unlike in previous Oracle Linux 8 releases.

To work around this issue, remove the `usbguard-1.0.0-2.el8.i686` package from your Oracle Linux 8 system prior to upgrading to the current release.

(Bug ID 34097708)

Presence of beignet package could result in dependency issue during an upgrade

While upgrading a system to the current Oracle Linux 8 release, you might encounter a dependency issue if the `beignet` package exists on the system to be upgraded.

This issue exists specifically in cases where you upgrade systems running Oracle Linux 8.2 or earlier releases to the current Oracle Linux version. In these earlier releases, the `beginet` package requires earlier versions of the `clang-libs` package.

However, the `beignet` package is currently not available for Oracle Linux 8.4 and later Oracle Linux 8 releases. Therefore, the issue does not exist for these cases.

To work around this issue, remove the `beignet` package from the system prior to upgrading to the current Oracle Linux 8 release.

(Bug ID 31213935)

ULN registration wizard not displayed on first boot after an installation

On new installations of Oracle Linux 8, the ULN registration wizard that presents the options to register with ULN and to use Oracle Ksplice is not displayed on first boot.

As an alternative, you can register with ULN after the installation completes. For instructions, see https://linux.oracle.com/.

(Bug ID 29933974)

Graphics controller requirements for an installation on an Oracle VM VirtualBox guest

To successfully install Oracle Linux 8 on an Oracle VM VirtualBox guest, where the graphical installation program is used and the default `Server with GUI` environment is selected, you must set the guest to use the VMSVGA graphics controller and configure the guest with at least 64MB of memory. Otherwise, the graphical display is unable to start correctly.

Beginning with Oracle VM VirtualBox 6.0, the VMSVGA graphics controller is the default controller for guests running Linux operating systems. This issue is more likely to appear if install Oracle Linux 8 on an existing guest that was created on an earlier Oracle VM VirtualBox release. To configure Oracle Linux 8 guests, Oracle recommends that you use Oracle VM VirtualBox 6.0 or later.

ORACLE®

(Bug ID 30004543)

aarch64 only: Installer displays error: 'Failed to set new efi boot target' on systems with a multipath-enabled NVMe controller"

The Oracle Linux 8.7 installer displays the following error on aarch64 systems that have a multipath-enabled NVMe controller:

```
Failed to set new efi boot target . This is most likely a kernel or firmware bug.
```

To work around this issue, disable native multipath support for the installation at boot time by adding the `nvme_core.multipath=N` command-line argument on the target system.

(Bug IDs 34233800, 34215333, 31758304)

Removing container-selinux package might also remove the selinux-policy-targeted package

If you remove the `container-selinux` package from the system after installing the current Oracle Linux 8 release, the `selinux-policy-targeted` package might also be removed.

When this problem occurs, you might also see an error message about being unable to load SELinux policy.

To avoid this issue, use the following syntax with the `dnf remove` command:

```
sudo dnf remove container-selinux --setopt=exclude=selinux-policy-targeted
```

(Bug ID 32860334)

Running dnf update glusterfs-* command fails to upgrade previously installed packages

If `glusterfs-*.i686` packages exist on an Oracle Linux 8 system which you then upgrade to the next update version, running the `dnf update glusterfs*` command later fails to upgrade GlusterFS packages.

As a workaround, first remove the `glusterfs-*.i686` packages from the system, and then run the `dnf update glusterfs*` command.

(Bug ID 30279840)

Updating libss package might fail if libss-devel package is installed

The `libss` package might fail to update if the `libss-devel` package is installed on the system.

This issue persists if UEK R6 is enabled. However, after updating the kernel and enabling UEK R7, the issue is no longer encountered.

However, this issue is fixed in UEK R7. Therefore, to work around this issue, enable the UEK R7 yum repository or ULN channel, and then install UEK R7. Reboot the system after the installation.

(Bug ID 32005190)

ACPI error messages displayed on Dell EMC PowerEdge Server during boot

During a system boot of an Intel-based Dell EMC PowerEdge Server, error messages similar to the following might be displayed if the Dell Active Power Controller (DAPC) setting is enabled in the BIOS:

```
kernel: ACPI Error: No handler for Region [SYSI] (0000000061df8ef3) [IPMI] (20190816/
evregion-132)
kernel: ACPI Error: Region IPMI (ID=7) has no handler (20190816/exfldio-265)
kernel: ACPI Error: Aborting method \_SB.PMI0._GHL due to previous error
(AE_NOT_EXIST) (20190816/psparse-531)
kernel: ACPI Error: Aborting method \_SB.PMI0._PMC due to previous error
(AE_NOT_EXIST) (20190816/psparse-531)
kernel: ACPI Error: AE_NOT_EXIST, Evaluating _PMC (20190816/power_meter-743)
```

To work around this issue, disable the `apci_power_meter` kernel module as follows:

```
echo "blacklist acpi_power_meter" >> /etc/modprobe.d/hwmon.conf
```

After disabling the `apci_power_meter` kernel module, reboot the system for the change to take effect.

For environments that do not require the DAPC feature, as an alternative workaround, you can disable the DAPC BIOS setting.

(Bug ID 32105233)

Oracle Linux 8 does not recognize SAS controllers on older Oracle Sun hardware

The Oracle Linux 8 installer does not recognize some Serial Attached SCSI (SAS) controllers that are found in older Oracle Sun server models. If you attempt to install Oracle Linux 8 on these server models, the installer does not recognize the local disk and the installation fails. Examples of these server models include, but are not limited to, the following: Oracle Sun Fire X4170 M2 Server, Oracle Sun Fire X4170 M3 Server, Oracle Sun OVCA X3-2 Server, and the Oracle Sun X4-2 Server.

The following SAS controllers are removed from the `mpt2sas` driver in RHCK:

- SAS2004, PCI ID 0x1000:0x0070
- SAS2008, PCI ID 0x1000:0x0072
- SAS2108_1, PCI ID 0x1000:0x0074
- SAS2108_2, PCI ID 0x1000:0x0076

- SAS2108_3, PCI ID 0x1000:0x0077

- SAS2116_1, PCI ID 0x1000:0x0064

- SAS2116_2, PCI ID 0x1000:0x0065

- SSS6200, PCI ID 0x1000:0x007E

The following SAS controllers are removed from the `megaraid_sas` driver in RHCK:

- Dell PERC5, PCI ID 0x1028:0x15

- SAS1078R, PCI ID 0x1000:0x60

- SAS1078DE, PCI ID 0x1000:0x7C

- SAS1064R, PCI ID 0x1000:0x411

- VERDE_ZCR, PCI ID 0x1000:0x413

- SAS1078GEN2, PCI ID 0x1000:0x78

- SAS0079GEN2, PCI ID 0x1000:0x79

- SAS0073SKINNY, PCI ID 0x1000:0x73

- SAS0071SKINNY, PCI ID 0x1000:0x71

The workaround for this issue to use the Unbreakable Enterprise Kernel Release 6 (UEK R6) boot ISO, and then run UEK R6 with Oracle Linux 8, as these controllers are supported in the Unbreakable Enterprise Kernel release.

(Bug ID 29120478)

File System Issues

The following are known file systems issues that have been encountered in this release of Oracle Linux 8.

Btrfs file system not supported on RHCK

The Btrfs file system is removed from RHCK in Oracle Linux 8, which means you cannot create or mount this file system when using this kernel. Also, any Btrfs user space packages that are provided are not supported with RHCK.

Support for the Btrfs file system is enabled in UEK R7 and UEK R6. Starting with Oracle Linux 8.3, during an installation, you have the option to create a Btrfs root file system, as well as select Btrfs as the file system type when formatting devices.

For further details about these changes, see the following documentation:

- For information about creating a Btrfs root file system during an installation, see Oracle Linux 8: Installing Oracle Linux.

- For information about managing the Btrfs file system, see Oracle Linux 8: Managing Local File Systems.

- For the latest information about other enhancements that have been made to Btrfs in UEK R6, see Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 6 Update 3 (5.4.17-2136).

  For information about UEK R7, see Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 7 (5.15.0-0.30).

ORACLE

OCFS2 file system not supported on RHCK

The OCFS2 file system is removed from RHCK in Oracle Linux 8, which means you cannot create or mount this file system when using this kernel. Also, OCFS2 user space packages that are provided are not supported with RHCK.

Note that support for OCFS2 file systems is enabled in UEK R7 and UEK R6. For the latest information and other enhancements that have been made to OCFS2 in UEK R6, see Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 6 Update 3 (5.4.17-2136). See also Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 7 (5.15.0-0.30).

ext4: Frequent or repeated system shutdowns can cause file system corruption

If a system that is using the `ext4` file system is repeatedly or frequently shut down, the file system might become corrupted. This issue is difficult to replicate and is therefore considered to be a corner-case issue. The issue exists in the upstream code and proposed patches are currently under review.

(Bug ID 27547113)

Kernel Issues

The following are known kernel issues that have been encountered in this release of Oracle Linux 8.

KVM guests boot with "amd64_edac_mod: Unknown symbol" errors on AMD 64-bit platforms

The following errors might be displayed repeatedly when KVM guests are booting on 64-bit AMD hosts:

```
[   12.474069] amd64_edac_mod: Unknown symbol amd_register_ecc_decoder (err [ 120)
[   12.474083] amd64_edac_mod: Unknown symbol amd_report_gart_errors (err 0)
[   12.852250] amd64_edac_mod: Unknown symbol amd_unregister_ecc_decoder (err 0)
[   12.852297] amd64_edac_mod: Unknown symbol amd_register_ecc_decoder (err 0)
.
.
.
```

These errors occur because the module code for the kernel erroneously returns `-EEXIST` for modules that failed to load and are in the process of being removed from the module list. The `amd64_edac_mod` module will not be loaded in a VM. These errors can be ignored, as they do not impact functionality in any way.

This issue occurs on Oracle Linux 8 hosts that are running RHCK *only* and is not encountered on UEK R6 hosts.

(Bug ID 29853602)

Output of modinfo command does not show Retpoline support

A bug in the Oracle Linux 8 code causes Retropline support to not be displayed in the output of the `modinfo -F retpoline` command, even though the `CONFIG_RETPOLINE` flag is set to `Y`, for example:

```
sudo modinfo -F retpoline
/usr/lib/modules/4.18.0-80.el8.x86_64/kernel/sound/usb/usx2y/snd-usb-us122l.ko
.xz
```

The `CONFIG_RETPOLINE=Y` flag is still required to add and display Retpoline support. If the parameter is enabled, the kernel builds with a retpoline capable compiler.

To confirm that the `CONFIG_RETPOLINE` flag is enabled, search for the parameter in the kernel's `config-kernel` configuration file, for example:

```
cat /boot/config-5.4.17-2011.7.4.el8uek.x86_64 | grep RETPOLINE.
```

```
CONFIG_RETPOLINE=y
```

(Bug ID 29894295)

Kdump might fail on some AMD hardware

Kdump might fail on some AMD hardware that is 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.

(Bug ID 31274238, 34211826, 34312626)

Limitations of the LVM dm-writecache caching method

The new LVM `dm-writecache` caching method has certain limitations that do not exist with the `dm-cache` method, including the following:

- Cannot attach or detach `dm-writecache` when a logical volume is active.

- Cannot take a snapshot of a logical volume when the logical volume is using `dm-writecache`.

- Must use a `dm-writecache` block size that matches the existing file system block size when attaching `dm-writecache` to an inactive logical volume.

- Cannot resize a logical volume when `dm-writecache` is attached to the volume.

- Cannot use `pvmove` commands on devices that are used with `dm-writecache`.

- Cannot use logical volumes with `dm-writecache` when using thin pools or the virtual data optimizer (VDO).

For more information about the `dm-writecache` caching method, see the File Systems and Storage features section of Oracle Linux 8: Release Notes for Oracle Linux 8.2. See also the `lvmcache(7)` manual page.

Error: "mcelog service does not support this processor"

An error indicating that the `mcelog` service does not support the processor can appear in the system log on systems with AMD processors, such as some Oracle Server hardware. The message might be displayed as follows:

```
mcelog: ERROR: AMD Processor family
23: mcelog does not support this processor.  Please use the edac_mce_amd
module instead.
```

The `mcelog` daemon is a service that is used on x86_64 platforms to log and handle hardware error messaging. On AMD systems, the `edac_mce_amd` kernel module handles machine exception logging. Therefore, AMD systems do not require the `mcelog` daemon. This error should be downgraded to a warning.

(Bug ID 29501190)

Power button defaults to ACPI Suspend mode

By default, the Oracle Linux 8 graphical user interface (GUI) console mode treats the hardware power button as the equivalent of the ACPI "Sleep" button, which puts the system into low-power sleep mode. This behavior is specific to the GNOME desktop environment.

In previous Oracle Linux releases, the hardware power button initiated a system shutdown. To ensure that Oracle Linux 8 behaves the same way, do the following:

1. Create a file named `/etc/dconf/db/local.d/01-shutdown-button-action` with following content:

   ```
   [org/gnome/settings-daemon/plugins/power]
   power-button-action='interactive'
   ```

2. Create a file named `/etc/dconf/db/local.d/locks/01-power` with the following content:

   ```
   /org/gnome/settings-daemon/plugins/power/power-button-action
   ```

3. Run the following command:

   ```
   sudo dconf update
   ```

4. Log out of the desktop environment and then log back in for the new settings to take effect.

(Bug ID 25597898)

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 is 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 is needed to flush the pinned memory that is 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 is not encountered.

As a workaround, if a SEV enabled guest with more then 350GB of memory is required, create the guest on a system that is 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)

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
- 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-extra
- kernel-uek-devel
- kernel-uek-doc
- kernel-uek-modules
- kernel-uek-modules-extra
- linux-firmware-core
- NetworkManager-config-connectivity-oracle
- ocfs2-tools
- oracle-backgrounds
- oracle-indexhtml

- `oraclelinux-release`

- `oraclelinux-release-el8`

- `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:

- `dtrace-devel`

- `dtrace-testsuite`

- `libblockdev-btrfs`

- `oracle-database-preinstall-21c`

- `python3-dnf-plugin-ulninfo`

Added Binary Packages for CodeReady Linux Builder by Oracle

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

- `qemu-kvm-tests`

- `shim-unsigned-ia32`

Modified BaseOS Binary Packages

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

- `autofs`

- `binutils`

- `boom-boot`

- `boom-boot-conf`

- `boom-boot-grub2`

- `chkconfig`

- `chrony`

- `cockpit`

- `cockpit-bridge`

- `cockpit-doc`

- `cockpit-system`

- `cockpit-ws`

- `coreutils`

- `coreutils-common`
- `coreutils-single`
- `ctdb`
- `dbus`
- `dbus-common`
- `dbus-daemon`
- `dbus-libs`
- `dbus-tools`
- `dbxtool`
- `dnf`
- `dnf-automatic`
- `dnf-data`
- `dnf-plugins-core`
- `dracut`
- `dracut-caps`
- `dracut-config-generic`
- `dracut-config-rescue`
- `dracut-live`
- `dracut-network`
- `dracut-squash`
- `dracut-tools`
- `efibootmgr`
- `efi-filesystem`
- `expat`
- `expat-devel`
- `firewalld`
- `firewalld-filesystem`
- `fuse`
- `fuse3`
- `fuse3-devel`
- `fuse3-libs`
- `fuse-common`
- `fuse-devel`
- `fuse-libs`
- `fwupd`

- `fwupdate`
- `fwupdate-efi`
- `fwupdate-libs`
- `glib2`
- `glib2-devel`
- `glib2-fam`
- `glib2-tests`
- `glibc`
- `glibc-all-langpacks`
- `glibc-common`
- `glibc-devel`
- `glibc-doc`
- `glibc-gconv-extra`
- `glibc-headers`
- `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-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-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`
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- `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`

ORACLE

- glibc-locale-source
- glibc-minimal-langpack
- grub2-common
- grub2-efi-aa64-modules
- grub2-efi-ia32
- grub2-efi-ia32-cdboot
- grub2-efi-ia32-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
- iptables
- iptables-arptables
- iptables-devel
- iptables-ebtables
- iptables-libs
- iptables-services
- iptables-utils
- 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`
- `kmod-redhat-oracleasm`
- `krb5-devel`
- `krb5-libs`
- `krb5-pkinit`
- `krb5-server`
- `krb5-server-ldap`
- `krb5-workstation`
- `ksc`
- `libasan`
- `libatomic`
- `libatomic-static`
- `libdnf`
- `libertas-sd8686-firmware`
- `libertas-sd8787-firmware`
- `libertas-usb8388-firmware`
- `libertas-usb8388-olpc-firmware`
- `libgcc`
- `libgfortran`
- `libgomp`
- `libgomp-offload-nvptx`
- `libipa_hbac`
- `libitm`
- `libkadm5`

- `libkcapi`

- `libkcapi-hmaccalc`

- `liblsan`

- `libnsl`

- `libquadmath`

- `libreport-filesystem`

- `libsmbclient`

- `libsss_autofs`

- `libsss_certmap`

- `libsss_idmap`

- `libsss_nss_idmap`

- `libsss_simpleifp`

- `libsss_sudo`

- `libstdc++`

- `libtsan`

- `libubsan`

- `libwbclient`

- `libxslt`

- `libzstd`

- `libzstd-devel`

- `linux-firmware`

- `linux-firmware-core`

- `mcelog`

- `microcode_ctl`

- `mozjs52`

- `mozjs60`

- `NetworkManager`

- `NetworkManager-adsl`

- `NetworkManager-bluetooth`

- `NetworkManager-config-connectivity-oracle`

- `NetworkManager-config-server`

- `NetworkManager-dispatcher-routing-rules`

- `NetworkManager-initscripts-updown`

- `NetworkManager-libnm`

- `NetworkManager-ovs`

- `NetworkManager-ppp`
- `NetworkManager-team`
- `NetworkManager-tui`
- `NetworkManager-wifi`
- `NetworkManager-wwan`
- `nscd`
- `nss_db`
- `ntsysv`
- `nvmetcli`
- `opa-address-resolution`
- `opa-basic-tools`
- `opa-fastfabric`
- `opa-fm`
- `opa-libopamgt`
- `OpenIPMI`
- `OpenIPMI-lanserv`
- `OpenIPMI-libs`
- `OpenIPMI-perl`
- `os-prober`
- `parted`
- `platform-python`
- `policycoreutils`
- `policycoreutils-dbus`
- `policycoreutils-devel`
- `policycoreutils-newrole`
- `policycoreutils-python-utils`
- `policycoreutils-restorecond`
- `polkit`
- `polkit-devel`
- `polkit-docs`
- `polkit-libs`
- `procps-ng`
- `procps-ng-i18n`
- `python3-boom`
- `python3-configshell`

- `python3-dnf`

- `python3-dnf-plugin-post-transaction-actions`

- `python3-dnf-plugins-core`

- `python3-dnf-plugin-versionlock`

- `python3-firewall`

- `python3-hawkey`

- `python3-iscsi-initiator-utils`

- `python3-libdnf`

- `python3-libipa_hbac`

- `python3-libs`

- `python3-libsss_nss_idmap`

- `python3-openipmi`

- `python3-policycoreutils`

- `python3-rtslib`

- `python3-samba`

- `python3-samba-test`

- `python3-sss`

- `python3-sssdconfig`

- `python3-sss-murmur`

- `python3-test`

- `python3-urllib3`

- `redhat-release`

- `samba`

- `samba-client`

- `samba-client-libs`

- `samba-common`

- `samba-common-libs`

- `samba-common-tools`

- `samba-krb5-printing`

- `samba-libs`

- `samba-pidl`

- `samba-test`

- `samba-test-libs`

- `samba-winbind`

- `samba-winbind-clients`

ORACLE

- samba-winbind-krb5-locator
- samba-winbind-modules
- samba-winexe
- sanlock-lib
- selinux-policy
- selinux-policy-devel
- selinux-policy-doc
- selinux-policy-minimum
- selinux-policy-mls
- selinux-policy-sandbox
- selinux-policy-targeted
- shim-ia32
- 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-polkit-rules
- sssd-proxy
- sssd-tools
- sssd-winbind-idmap
- systemd
- systemd-container
- systemd-devel
- systemd-journal-remote

- `systemd-libs`
- `systemd-pam`
- `systemd-tests`
- `systemd-udev`
- `target-restore`
- `trace-cmd`
- `tuned`
- `tuned-profiles-atomic`
- `tuned-profiles-compat`
- `tuned-profiles-cpu-partitioning`
- `tuned-profiles-mssql`
- `tuned-profiles-oracle`
- `unzip`
- `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`
- `crash-devel`
- `cups-filters-devel`
- `dconf-devel`
- `dotnet-sdk-3.1-source-built-artifacts`
- `dotnet-sdk-5.0-source-built-artifacts`
- `dotnet-sdk-6.0-source-built-artifacts`
- `dotnet-sdk-7.0-source-built-artifacts`
- `fwupd-devel`
- `galera`
- `gcc-plugin-devel`
- `gcc-toolset-10-gcc-plugin-devel`
- `glib2-doc`
- `glib2-static`
- `glibc-benchtests`
- `glibc-nss-devel`

- `glibc-static`
- `guile-devel`
- `iscsi-initiator-utils-devel`
- `Judy`
- `Judy-devel`
- `kmod-devel`
- `libblockdev-crypto-devel`
- `libblockdev-devel`
- `libblockdev-fs-devel`
- `libblockdev-loop-devel`
- `libblockdev-lvm-devel`
- `libblockdev-mdraid-devel`
- `libblockdev-part-devel`
- `libblockdev-swap-devel`
- `libblockdev-utils-devel`
- `libblockdev-vdo-devel`
- `libcephfs2`
- `libcephfs-devel`
- `libdnf-devel`
- `librados-devel`
- `libradosstriper1`
- `libradosstriper-devel`
- `librbd-devel`
- `libreoffice-sdk`
- `libreoffice-sdk-doc`
- `libsmbclient-devel`
- `libsss_nss_idmap-devel`
- `libstdc++-static`
- `libvirt`
- `libvirt-client`
- `libvirt-daemon`
- `libvirt-daemon-config-network`
- `libvirt-daemon-config-nwfilter`
- `libvirt-daemon-driver-interface`
- `libvirt-daemon-driver-network`

ORACLE

- `libvirt-daemon-driver-nodedev`
- `libvirt-daemon-driver-nwfilter`
- `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-iscsi-direct`
- `libvirt-daemon-driver-storage-logical`
- `libvirt-daemon-driver-storage-mpath`
- `libvirt-daemon-driver-storage-scsi`
- `libvirt-devel`
- `libvirt-docs`
- `libvirt-libs`
- `libvirt-nss`
- `libvirt-wireshark`
- `libwbclient-devel`
- `mariadb`
- `mariadb-backup`
- `mariadb-common`
- `mariadb-devel`
- `mariadb-embedded`
- `mariadb-embedded-devel`
- `mariadb-errmsg`
- `mariadb-gssapi-server`
- `mariadb-oqgraph-engine`
- `mariadb-server`
- `mariadb-server-galera`
- `mariadb-server-utils`
- `mariadb-test`
- `mozjs52-devel`
- `mozjs60-devel`
- `NetworkManager-libnm-devel`
- `nss_hesiod`
- `ocaml-libguestfs`

- `ocaml-libguestfs-devel`

- `OpenIPMI-devel`

- `openscap-engine-sce-devel`

- `PackageKit`

- `PackageKit-glib-devel`

- `parted-devel`

- `python3-mpich`

- `samba-devel`

- `sanlock-devel`

- `sblim-cmpi-devel`

- `sendmail-milter-devel`

- `tog-pegasus-devel`

Modified AppStream Binary Packages

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

- `abrt`

- `abrt-addon-ccpp`

- `abrt-addon-coredump-helper`

- `abrt-addon-kerneloops`

- `abrt-addon-pstoreoops`

- `abrt-addon-vmcore`

- `abrt-addon-xorg`

- `abrt-cli`

- `abrt-cli-ng`

- `abrt-console-notification`

- `abrt-dbus`

- `abrt-desktop`

- `abrt-gui`

- `abrt-gui-libs`

- `abrt-java-connector`

- `abrt-libs`

- `abrt-plugin-machine-id`

- `abrt-plugin-sosreport`

- `abrt-tui`

- `adwaita-gtk2-theme`

- anaconda
- anaconda-core
- anaconda-dracut
- anaconda-gui
- anaconda-install-env-deps
- anaconda-tui
- anaconda-user-help
- anaconda-widgets
- ansible-pcp
- aspnetcore-runtime-3.0
- aspnetcore-runtime-3.1
- aspnetcore-runtime-5.0
- aspnetcore-runtime-6.0
- aspnetcore-runtime-7.0
- aspnetcore-targeting-pack-3.0
- aspnetcore-targeting-pack-3.1
- aspnetcore-targeting-pack-5.0
- aspnetcore-targeting-pack-6.0
- aspnetcore-targeting-pack-7.0
- authd
- autocorr-af
- autocorr-bg
- autocorr-ca
- autocorr-cs
- autocorr-da
- autocorr-de
- autocorr-en
- autocorr-es
- autocorr-fa
- autocorr-fi
- autocorr-fr
- autocorr-ga
- autocorr-hr
- 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-zh
- binutils-devel
- blivet-data
- buildah
- buildah-tests
- clang
- clang-analyzer
- clang-devel
- clang-libs
- clang-resource-filesystem
- clang-tools-extra
- cloud-init
- cockpit-composer
- cockpit-machines
- cockpit-packagekit
- cockpit-pcp
- cockpit-session-recording
- cockpit-storaged

- compat-libgfortran-48
- compat-libpthread-nonshared
- composer-cli
- containernetworking-plugins
- containers-common
- cpp
- crash
- cups-filters
- cups-filters-libs
- dbus-devel
- dbus-x11
- dconf
- delve
- dnf-plugin-spacewalk
- dotnet
- dotnet-apphost-pack-3.0
- dotnet-apphost-pack-3.1
- dotnet-apphost-pack-5.0
- dotnet-apphost-pack-6.0
- dotnet-apphost-pack-7.0
- dotnet-host
- dotnet-hostfxr-3.0
- dotnet-hostfxr-3.1
- dotnet-hostfxr-5.0
- dotnet-hostfxr-6.0
- dotnet-hostfxr-7.0
- dotnet-runtime-3.0
- dotnet-runtime-3.1
- dotnet-runtime-5.0
- dotnet-runtime-6.0
- dotnet-runtime-7.0
- dotnet-sdk-3.0
- dotnet-sdk-3.1
- dotnet-sdk-5.0
- dotnet-sdk-6.0

- `dotnet-sdk-7.0`
- `dotnet-targeting-pack-3.0`
- `dotnet-targeting-pack-3.1`
- `dotnet-targeting-pack-5.0`
- `dotnet-targeting-pack-6.0`
- `dotnet-targeting-pack-7.0`
- `dotnet-templates-3.0`
- `dotnet-templates-3.1`
- `dotnet-templates-5.0`
- `dotnet-templates-6.0`
- `dotnet-templates-7.0`
- `eclipse-ecf-core`
- `eclipse-ecf-runtime`
- `eclipse-emf-core`
- `eclipse-emf-runtime`
- `eclipse-emf-xsd`
- `eclipse-equinox-osgi`
- `eclipse-jdt`
- `eclipse-p2-discovery`
- `eclipse-pde`
- `eclipse-platform`
- `eclipse-swt`
- `efi-srpm-macros`
- `eth-tools-basic`
- `eth-tools-fastfabric`
- `fapolicyd`
- `fapolicyd-selinux`
- `firefox`
- `firewall-applet`
- `firewall-config`
- `gcc`
- `gcc-c++`
- `gcc-gdb-plugin`
- `gcc-gfortran`
- `gcc-offload-nvptx`

- `gcc-plugin-annobin`
- `gcc-toolset-10-gcc`
- `gcc-toolset-10-gcc-c++`
- `gcc-toolset-10-gcc-gdb-plugin`
- `gcc-toolset-10-gcc-gfortran`
- `gcc-toolset-10-libasan-devel`
- `gcc-toolset-10-libatomic-devel`
- `gcc-toolset-10-libitm-devel`
- `gcc-toolset-10-liblsan-devel`
- `gcc-toolset-10-libquadmath-devel`
- `gcc-toolset-10-libstdc++-devel`
- `gcc-toolset-10-libstdc++-docs`
- `gcc-toolset-10-libtsan-devel`
- `gcc-toolset-10-libubsan-devel`
- `gcc-toolset-11-binutils`
- `gcc-toolset-11-binutils-devel`
- `gcc-toolset-11-gcc`
- `gcc-toolset-11-gcc-c++`
- `gcc-toolset-11-gcc-gdb-plugin`
- `gcc-toolset-11-gcc-gfortran`
- `gcc-toolset-11-gcc-plugin-devel`
- `gcc-toolset-11-gdb`
- `gcc-toolset-11-gdb-doc`
- `gcc-toolset-11-gdb-gdbserver`
- `gcc-toolset-11-libasan-devel`
- `gcc-toolset-11-libatomic-devel`
- `gcc-toolset-11-libgccjit`
- `gcc-toolset-11-libgccjit-devel`
- `gcc-toolset-11-libgccjit-docs`
- `gcc-toolset-11-libitm-devel`
- `gcc-toolset-11-liblsan-devel`
- `gcc-toolset-11-libquadmath-devel`
- `gcc-toolset-11-libstdc++-devel`
- `gcc-toolset-11-libstdc++-docs`
- `gcc-toolset-11-libtsan-devel`

- `gcc-toolset-11-libubsan-devel`
- `gcc-toolset-12-gdb`
- `gdb`
- `gdb-doc`
- `gdb-gdbserver`
- `gdb-headless`
- `git-clang-format`
- `glibc-utils`
- `gnome-boxes`
- `gnome-session`
- `gnome-session-kiosk-session`
- `gnome-session-wayland-session`
- `gnome-session-xsession`
- `gnome-themes-standard`
- `guile`
- `httpd`
- `httpd-devel`
- `httpd-filesystem`
- `httpd-manual`
- `httpd-tools`
- `icedtea-web`
- `icedtea-web-javadoc`
- `idm-pki-acme`
- `idm-pki-base`
- `idm-pki-base-java`
- `idm-pki-ca`
- `idm-pki-kra`
- `idm-pki-server`
- `idm-pki-symkey`
- `idm-pki-tools`
- `initial-setup`
- `initial-setup-gui`
- `ipa-client`
- `ipa-client-common`
- `ipa-client-epn`

- `ipa-client-samba`

- `ipa-common`

- `ipa-python-compat`

- `ipa-selinux`

- `ipa-server`

- `ipa-server-common`

- `ipa-server-dns`

- `ipa-server-trust-ad`

- `Judy`

- `kernel-rpm-macros`

- `kernelshark`

- `ksh`

- `leapp-upgrade-el8toel9`

- `leapp-upgrade-el8toel9-dep`

- `libasan6`

- `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-part`

- `libblockdev-plugins-all`

- `libblockdev-swap`

- `libblockdev-utils`

- `libblockdev-vdo`

- `libcmpiCppImpl0`

- `libguestfs`

- `libguestfs-appliance`

- `libguestfs-bash-completion`
- `libguestfs-devel`
- `libguestfs-gfs2`
- `libguestfs-gobject`
- `libguestfs-gobject-devel`
- `libguestfs-inspect-icons`
- `libguestfs-java`
- `libguestfs-java-devel`
- `libguestfs-javadoc`
- `libguestfs-man-pages-ja`
- `libguestfs-man-pages-uk`
- `libguestfs-rescue`
- `libguestfs-rsync`
- `libguestfs-tools`
- `libguestfs-tools-c`
- `libguestfs-xfs`
- `libitm-devel`
- `libquadmath-devel`
- `librados2`
- `librbd1`
- `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-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-es`
- `libreoffice-langpack-et`
- `libreoffice-langpack-eu`
- `libreoffice-langpack-fa`
- `libreoffice-langpack-fi`
- `libreoffice-langpack-fr`
- `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-newt`
- `libreport-plugin-bugzilla`
- `libreport-plugin-kerneloops`
- `libreport-plugin-logger`
- `libreport-plugin-mailx`
- `libreport-plugin-reportuploader`
- `libreport-plugin-ureport`
- `libreport-web`
- `libreswan`
- `libstdc++-devel`
- `libstdc++-docs`
- `libvirt`
- `libvirt-client`
- `libvirt-daemon`
- `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-gluster`
- `libvirt-daemon-driver-storage-iscsi`
- `libvirt-daemon-driver-storage-iscsi-direct`
- `libvirt-daemon-driver-storage-logical`
- `libvirt-daemon-driver-storage-mpath`
- `libvirt-daemon-driver-storage-rbd`
- `libvirt-daemon-driver-storage-scsi`
- `libvirt-daemon-kvm`
- `libvirt-devel`
- `libvirt-docs`
- `libvirt-libs`
- `libvirt-lock-sanlock`
- `libvirt-nss`
- `libvirt-wireshark`
- `libxslt-devel`
- `llvm`
- `llvm-devel`
- `llvm-doc`
- `llvm-googletest`
- `llvm-libs`
- `llvm-static`
- `llvm-test`
- `lorax`
- `lorax-composer`
- `lorax-lmc-novirt`

- `lorax-lmc-virt`
- `lorax-templates-generic`
- `lorax-templates-rhel`
- `lua-guestfs`
- `mecab-ipadic`
- `mecab-ipadic-EUCJP`
- `mod_ldap`
- `mod_proxy_html`
- `mod_session`
- `mod_ssl`
- `mpich`
- `mpich-devel`
- `mpich-doc`
- `netstandard-targeting-pack-2.1`
- `NetworkManager-cloud-setup`
- `nginx`
- `nginx-all-modules`
- `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`
- `openchange`
- `openscap`
- `openscap-devel`
- `openscap-engine-sce`
- `openscap-python3`
- `openscap-scanner`
- `openscap-utils`
- `open-vm-tools`
- `open-vm-tools-desktop`
- `open-vm-tools-salt-minion`

- open-vm-tools-sdmp
- osinfo-db
- pacemaker-cluster-libs
- pacemaker-libs
- pacemaker-schemas
- PackageKit
- PackageKit-command-not-found
- PackageKit-cron
- PackageKit-glib
- PackageKit-gstreamer-plugin
- PackageKit-gtk3-module
- perl-Sys-Guestfs
- perl-XML-Parser
- pesign
- platform-python
- platform-python-debug
- platform-python-devel
- plymouth
- plymouth-core-libs
- plymouth-graphics-libs
- plymouth-plugin-fade-throbber
- plymouth-plugin-label
- plymouth-plugin-script
- plymouth-plugin-space-flares
- plymouth-plugin-throbgress
- 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-remote
- podman-tests
- policycoreutils-gui
- policycoreutils-sandbox
- pykickstart
- python2
- python2-debug
- python2-devel
- python2-libs
- python2-test
- python2-tkinter
- python2-tools
- python3-abrt
- python3-abrt-addon
- python3-abrt-container-addon
- python3-abrt-doc
- python3-blivet
- python3-blockdev
- python3-clang
- python3-dnf-plugin-modulesync
- python3-dnf-plugin-spacewalk
- python3-idle
- python3-idm-pki
- python3-ipaclient
- python3-ipalib
- python3-ipaserver
- python3-ipatests
- python3-kickstart
- python3-libguestfs
- python3-libreport
- python3-rhncfg
- python3-rhncfg-actions
- python3-rhncfg-client
- python3-rhncfg-management

- `python3-rhn-check`
- `python3-rhn-client-tools`
- `python3-rhnlib`
- `python3-rhnpush`
- `python3-rhn-setup`
- `python3-rhn-setup-gnome`
- `python3-sanlock`
- `python3-spacewalk-backend-libs`
- `python3-spacewalk-oscap`
- `python3-spacewalk-usix`
- `python3-test`
- `python3-tkinter`
- `rear`
- `redfish-finder`
- `redhat-lsb`
- `redhat-lsb-core`
- `redhat-lsb-cxx`
- `redhat-lsb-desktop`
- `redhat-lsb-languages`
- `redhat-lsb-printing`
- `redhat-lsb-submod-multimedia`
- `redhat-lsb-submod-security`
- `redhat-rpm-config`
- `rhel-system-roles`
- `rhncfg`
- `rhncfg-actions`
- `rhncfg-client`
- `rhncfg-management`
- `rhn-check`
- `rhn-client-tools`
- `rhn-custom-info`
- `rhnlib`
- `rhnpush`
- `rhnsd`
- `rhn-setup`

- rhn-setup-gnome
- rpmdevtools
- ruby-libguestfs
- samba-vfs-iouring
- sanlk-reset
- sanlock
- scap-security-guide
- scap-security-guide-doc
- scap-workbench
- sendmail
- sendmail-cf
- sendmail-doc
- sendmail-milter
- setroubleshoot
- setroubleshoot-plugins
- setroubleshoot-server
- skopeo
- skopeo-tests
- sos-collector
- spacewalk-oscap
- spacewalk-remote-utils
- spacewalk-usix
- spice-streaming-agent
- sssd-idp
- 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-server`

- `thunderbird`

- `tog-pegasus`

- `tog-pegasus-libs`

- `tuned-gtk`

- `tuned-profiles-postgresql`

- `tuned-utils`

- `tuned-utils-systemtap`

- `vim-common`

- `vim-enhanced`

- `vim-filesystem`

- `vim-X11`

- `virt-dib`

- `virt-install`

- `virt-manager`

- `virt-manager-common`

- `virt-p2v-maker`

- `WALinuxAgent`

- `WALinuxAgent-udev`

- `wget`

- `xdg-desktop-portal`

- `xsane`

- `xsane-common`

- `xsane-gimp`

- `zstd`

Removed BaseOS Binary Packages

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

- `dnf-plugin-subscription-manager`

- `grub2-ppc64le-modules`

- `kpatch`

- `kpatch-dnf`

- `NetworkManager-config-connectivity-redhat`

- `python3-cloud-what`

- `python3-subscription-manager-rhsm`

- `python3-syspurpose`
- `redhat-indexhtml`
- `redhat-logos`
- `redhat-logos-httpd`
- `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`
- `coreos-installer`
- `coreos-installer-bootinfra`
- `coreos-installer-dracut`
- `insights-client`
- `libreport-plugin-rhtsupport`
- `libreport-rhel`
- `libreport-rhel-anaconda-bugzilla`
- `libreport-rhel-bugzilla`
- `redhat-backgrounds`
- `redhat-cloud-client-configuration`
- `redhat-logos-ipa`
- `redhat-support-lib-python`
- `redhat-support-tool`
- `rhc`
- `rhc-worker-playbook`
- `rhsm-gtk`
- `rt-tests`
- `spice-client-win-x64`
- `spice-client-win-x86`
- `spice-qxl-wddm-dod`

- `spice-vdagent-win-x64`
- `spice-vdagent-win-x86`
- `subscription-manager-initial-setup-addon`
- `subscription-manager-migration`
- `subscription-manager-migration-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:

- `asio`
- `Cython`
- `Cython-debugsource`
- `galera-debuginfo`
- `galera-debugsource`
- `hivex-debuginfo`
- `hivex-debugsource`
- `Judy-debuginfo`
- `Judy-debugsource`
- `libiscsi-debuginfo`
- `libiscsi-debugsource`
- `libiscsi-utils-debuginfo`
- `libnbd-debuginfo`
- `libnbd-debugsource`
- `libserf-debuginfo`
- `libserf-debugsource`
- `libvirt-client-debuginfo`
- `libvirt-daemon-debuginfo`
- `libvirt-daemon-driver-interface-debuginfo`
- `libvirt-daemon-driver-network-debuginfo`
- `libvirt-daemon-driver-nodedev-debuginfo`
- `libvirt-daemon-driver-nwfilter-debuginfo`
- `libvirt-daemon-driver-secret-debuginfo`

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- `libvirt-daemon-driver-storage-core-debuginfo`
- `libvirt-daemon-driver-storage-disk-debuginfo`
- `libvirt-daemon-driver-storage-iscsi-debuginfo`
- `libvirt-daemon-driver-storage-iscsi-direct-debuginfo`
- `libvirt-daemon-driver-storage-logical-debuginfo`
- `libvirt-daemon-driver-storage-mpath-debuginfo`
- `libvirt-daemon-driver-storage-scsi-debuginfo`
- `libvirt-dbus-debuginfo`
- `libvirt-dbus-debugsource`
- `libvirt-debuginfo`
- `libvirt-debugsource`
- `libvirt-libs-debuginfo`
- `libvirt-nss-debuginfo`
- `libvirt-python-debugsource`
- `libvirt-wireshark-debuginfo`
- `mariadb-backup-debuginfo`
- `mariadb-debuginfo`
- `mariadb-debugsource`
- `mariadb-embedded-debuginfo`
- `mariadb-gssapi-server-debuginfo`
- `mariadb-oqgraph-engine-debuginfo`
- `mariadb-server-debuginfo`
- `mariadb-server-utils-debuginfo`
- `mariadb-test-debuginfo`
- `mod_dav_svn-debuginfo`
- `nbdfuse-debuginfo`
- `netcf-debuginfo`
- `netcf-debugsource`
- `netcf-libs-debuginfo`
- `ocaml-hivex-debuginfo`
- `ocaml-libguestfs-debuginfo`
- `ocaml-libnbd-debuginfo`
- `perl-hivex-debuginfo`
- `perl-Sys-Virt-debuginfo`
- `perl-Sys-Virt-debugsource`

- `pybind11`

- `pytest`

- `python39-Cython-debuginfo`

- `python3-hivex-debuginfo`

- `python3-libnbd-debuginfo`

- `python3-libvirt-debuginfo`

- `python3x-pyparsing`

- `python-atomicwrites`

- `python-attrs`

- `python-iniconfig`

- `python-more-itertools`

- `python-packaging`

- `python-pluggy`

- `python-py`

- `python-wcwidth`

- `ruby-hivex-debuginfo`

- `SLOF`

- `subversion-debuginfo`

- `subversion-debugsource`

- `subversion-devel-debuginfo`

- `subversion-gnome-debuginfo`

- `subversion-libs-debuginfo`

- `subversion-perl-debuginfo`

- `subversion-ruby-debuginfo`

- `subversion-tools-debuginfo`

- `utf8proc-debuginfo`

- `utf8proc-debugsource`

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-el8`

- `oracle-logos`

Added Source Packages for AppStream by Oracle

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

- `dtrace`

- `oracle-database-preinstall-21c`

- `python3-dnf-plugin-ulninfo`

Modified BaseOS Source Packages

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

- `autofs`

- `binutils`

- `boom-boot`

- `chkconfig`

- `chrony`

- `cockpit`

- `coreutils`

- `dbus`

- `dbxtool`

- `dnf`

- `dnf-plugins-core`

- `dracut`

- `efibootmgr`

- `efi-rpm-macros`

- `expat`

- `firewalld`

- `fuse`

- `fwupd`

- fwupdate

- gcc

- glib2

- glibc

- grub2

- grubby

- iptables

- iscsi-initiator-utils

- kexec-tools

- kmod

- kmod-kvdo

- kmod-redhat-oracleasm

- krb5

- ksc

- libdnf

- libkcapi

- libreport

- libxslt

- linux-firmware

- mcelog

- microcode_ctl

- mozjs52

- mozjs60

- NetworkManager

- nvmetcli

- opa-ff

- opa-fm

- OpenIPMI

- os-prober

- parted

- policycoreutils

- polkit

- procps-ng

- python3

- python-configshell

- `python-rtslib`
- `python-urllib3`
- `redhat-release`
- `samba`
- `sanlock`
- `selinux-policy`
- `shim`
- `sos`
- `sssd`
- `systemd`
- `trace-cmd`
- `tuned`
- `unzip`
- `vim`
- `zstd`

Modified AppStream Source Packages

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

- `abrt`
- `abrt-java-connector`
- `anaconda`
- `anaconda-user-help`
- `ansible-pcp`
- `authd`
- `binutils`
- `buildah`
- `ceph`
- `clang`
- `cloud-init`
- `cockpit-appstream`
- `cockpit-composer`
- `cockpit-session-recording`
- `compat-libgfortran-48`
- `containernetworking-plugins`
- `crash`

- cups-filters
- dbus
- dconf
- delve
- dnf-plugins-core
- dnf-plugin-spacewalk
- dotnet3.0
- dotnet3.1
- dotnet5.0
- dotnet6.0
- dotnet7.0
- eclipse
- eclipse-ecf
- eclipse-emf
- efi-rpm-macros
- eth-tools
- fapolicyd
- firefox
- firewalld
- gcc
- gcc-toolset-10-gcc
- gcc-toolset-11-binutils
- gcc-toolset-11-gcc
- gcc-toolset-11-gdb
- gcc-toolset-12-gdb
- gdb
- glibc
- gnome-boxes
- gnome-session
- gnome-themes-standard
- guile
- httpd
- icedtea-web
- initial-setup
- ipa

- Judy
- ksh
- leapp-repository
- libblockdev
- libguestfs
- libreoffice
- libreport
- libreswan
- libvirt
- libxslt
- llvm
- lorax
- lorax-templates-rhel
- mecab-ipadic
- mpich
- NetworkManager
- nginx
- nodejs
- openchange
- openscap
- open-vm-tools
- osinfo-db
- pacemaker
- PackageKit
- perl-XML-Parser
- pesign
- pki-core
- plymouth
- podman
- policycoreutils
- pykickstart
- python2
- python3
- python-blivet
- rear

- redfish-finder

- redhat-lsb

- redhat-rpm-config

- rhel-system-roles

- rhncfg

- rhn-client-tools

- rhn-custom-info

- rhnlib

- rhnpush

- rhnsd

- rpmdevtools

- samba

- sanlock

- sblim-cmpi-devel

- scap-security-guide

- scap-workbench

- sendmail

- setroubleshoot

- setroubleshoot-plugins

- skopeo

- sos-collector

- spacewalk-backend

- spacewalk-oscap

- spacewalk-remote-utils

- spacewalk-usix

- spice-streaming-agent

- sssd

- systemtap

- thunderbird

- tog-pegasus

- trace-cmd

- tuned

- vim

- virt-manager

- virt-p2v

- WALinuxAgent

- wget

- xdg-desktop-portal

- xsane

- zstd

Modified Source Packages for CodeReady Linux Builder by Oracle

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

- anaconda

- ceph

- crash

- cups-filters

- dconf

- dotnet3.1

- dotnet5.0

- dotnet6.0

- dotnet7.0

- fwupd

- galera

- gcc

- gcc-toolset-10-gcc

- glib2

- glibc

- guile

- iscsi-initiator-utils

- Judy

- kmod

- libblockdev

- libdnf

- libguestfs

- libreoffice

- libvirt

- mariadb

- mozjs52

- mozjs60

- `mpich`

- `NetworkManager`

- `OpenIPMI`

- `openscap`

- `PackageKit`

- `parted`

- `samba`

- `sanlock`

- `sblim-cmpi-devel`

- `sendmail`

- `sssd`

- `tog-pegasus`

Removed BaseOS Source Packages

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

- `kpatch`

- `libica`

- `redhat-indexhtml`

- `redhat-logos`

- `subscription-manager`

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`

- `coreos-installer`

- `insights-client`

- `libica`

- `redhat-cloud-client-configuration`

- `redhat-logos`

- `redhat-support-lib-python`

- `redhat-support-tool`

- `rhc`

- `rhc-worker-playbook`

- `rt-tests`
- `spice-client-win`
- `spice-qxl-wddm-dod`
- `spice-vdagent-win`
- `subscription-manager`
- `subscription-manager-migration-data`
- `toolbox`
- `virtio-win`
- `virt-who`