

# Oracle® Linux 7

## Release Notes for Oracle Linux 7.6

**ORACLE®**

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## Preface

[Oracle® Linux 7: Release Notes for Oracle Linux 7.6](#) provides a summary of the new features and known issues in Oracle Linux 7.6. This document may be updated after it is released.

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## Audience

This document is intended for users and administrators of Oracle Linux 7. It describes potential issues and the corresponding workarounds you may encounter while using Oracle Linux 7. Oracle recommends that you read this document before installing Oracle Linux 7. It is assumed that readers have a general understanding of the Linux operating system.

## Related Documents

The latest version of this document and other documentation for this product are available at:

[Oracle® Linux 7 Documentation](#)

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The following text conventions are used in this document:

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

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insensitive. While doing so, 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 an ongoing, long-term process.

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# Chapter 1 System Requirements and Limits

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1.1 File System, Storage, and Address Space Limitations ..... 1

You can install Oracle Linux 7 on x86-64 systems with up to 2048 logical CPUs and 64 TB of memory. The theoretical upper limit is 5120 logical CPUs and 64 TB of memory, but Oracle has not tested this configuration. A minimum of 2 logical CPUs and 1 GB of memory per logical CPU is recommended. Although the minimum disk space required for installation is 1GB, a minimum of 5 GB is recommended.

## 1.1 File System, Storage, and Address Space Limitations

The following table describes the maximum file size and maximum file system size for the btrfs, ext4, and XFS file systems. File system limitations are affected by kernel versions and features, and by the architecture of the system on which Oracle Linux is installed. The values depicted here are estimates based on the known variables that might affect the maximum theoretical value that can be achieved. The theoretical values might be higher than those depicted here, and the actual achievable values might be lower than the values shown, depending on the hardware and the kernel version that is used.

File System Type	Maximum File Size	Maximum File System Size
btrfs	8 EiB	8 EiB
ext4	16 TiB	1 EiB
XFS	8 EiB	8 EiB

The limits for the ext4 file system that are described here are higher than recommended and might prove unstable. If you plan to work with systems where you are intend to work towards using higher file system sizes or file sizes, it is recommended that you use either the btrfs or XFS file system.

The maximum supported size for a bootable logical unit number (LUN) is 50 TB. GPT and UEFI support are required for LUNs that are larger than 2 TB.

The maximum size of the address space that is available to each process is 128 TB.





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## Chapter 2 Shipped Kernels

Oracle Linux 7.6 ships with the following kernel packages:

`kernel-3.10.0-957.el7` Red Hat Compatible Kernel (RHCK).

`kernel-uek-4.14.35-1818.3.3.el7uek` Unbreakable Enterprise Kernel Release 5 (UEK R5), which is the default kernel.

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

Note that previous releases of UEK, such as UEK R4, are not included on the installation media image but can be installed from the Oracle Linux yum server or from the Unbreakable Linux Network (ULN).

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

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## Chapter 3 New Features and Changes

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This section describes new features and changes in Oracle Linux 7.6. For details of the new features and changes in the initial release of Oracle Linux 7, see [Oracle® Linux 7: Release Notes for Oracle Linux 7](#).

### 3.1 Clustering

The following clustering features, bug fixes, and enhancements are included in this update. See [Oracle® Linux 7: Administrator's Guide](#) for more information on clustering technology and support limitations.

- **Pacemaker now supports path, mount, and timer systemd unit files.** Although previous releases of Pacemaker supported `service` and `socket` systemd unit file, alternative units would fail. Pacemaker can now manage `path`, `mount` and `timer` systemd units, as well.
- **Pacemaker LVM resource agent updates.** New functionality and updates have been applied to the LVM resource agents for better management of shared storage across hosts. Most notably, the new `LVM-activate` resource agent assists with the handling of LVM management throughout the cluster and can be configured to work either with `clvmd` or `lvmlockd`, depending on your implementation.

Options available through the new `LVM-activate` resource agent include:

- `tagging`, equivalent to the `tagging` provided with the existing `lvm` resource agent;
- `clvmd`, equivalent to using `clvmd` with the existing `lvm` resource agent;
- `system ID`, a new option for using the system ID for volume group failover as an alternative to using `tagging`; and
- `lvmlockd`, a new option to use `lvmlockd` and `dlm` for volume group sharing as an alternative to using `clvmd`.

The existing `lvm` resource agent has also been patched to accept the `volume_group_check_only` parameter. This parameter can be set to limit monitoring to only volume groups, to avoid timeouts on tagged volumes. This parameter must only be used with the `lvm` resource agent when you are experiencing timeout issues. Do not use this parameter with the `LVM-activate` resource agent.

### 3.2 File Systems

The following file systems features, bug fixes, and enhancements are included in this update.

- **btrfs: File system deprecated in RHCK.** Starting with Oracle Linux 7.4, btrfs is deprecated in RHCK. Note that btrfs is fully supported with UEK R4 and on UEK R5.
- **pNFS SCSI layout support in RHCK.** Parallel NFS (pNFS) SCSI layouts are supported when using RHCK.

## 3.3 Installation and Upgrade

The following installation and upgrade features, bug fixes, and enhancements are included in this update:

- **In-place upgrade from Oracle Linux 6 to Oracle Linux 7.** The in-place upgrade tools are updated to support upgrading from Oracle Linux 6 to Oracle Linux 7 by replacing the existing operating system. The provided tools can help to check for potential issues during upgrade and ease upgrade processes. See [Section 6.1, “Upgrading from Oracle Linux 6”](#) for more information.
- **Booting from an iSCSI device that is not configured by using iBFT now supported.** The installer now includes a new boot option, `inst.nonibftiscsiboot`. This boot option can be used to install the boot loader onto an iSCSI device that has not been configured in the iSCSI Boot Firmware Table (iBFT).
- **Installing and booting from NVDIMM devices now supported.** The installer is now capable of recognizing Nonvolatile Dual Inline Memory Module (NVDIMM) devices when installing or booting NVDIMM devices in sector mode and can be used to reconfigure NVDIMM devices into sector mode during installation.

This update also includes an extension to the kickstart scripts for the installer, to facilitate new commands for handling NVDIMM devices. Other updates were applied to system components, such as `grub2`, `efibootmgr` and `efivar`, to handle booting from these devices.



### Important

Any system that is installed using any Oracle Linux 7 ISO that is subsequently registered with the Unbreakable Linux Network (ULN), is automatically subscribed to the `ol7_x86_64_latest` and `ol7_x86_64_UEKR5` channels and are configured to download the latest Unbreakable Enterprise Kernel Release 5 (UEK R5) release on the next system update. When you run `yum update` just after registering with ULN, the system is upgraded to the Oracle Linux 7.6 release and the default kernel is automatically changed to UEK R5. If you prefer to continue to use and alternate kernel, such as UEK R4, you must manually change the subscriptions for the system in ULN before you perform the system update.

Systems that are not registered with ULN retain any existing yum channel configuration and continue to use the kernel installed with Oracle Linux 7.5. If you are not registered with ULN and wish to upgrade to also use UEK R5, you must enable the `ol7_UEKR5` repository in your yum configuration.

## 3.4 Kernel

The following changes are specific to RHCK. For more information, refer to latest versions of the release notes for Oracle Linux Unbreakable Enterprise Kernel Release 5 in [Unbreakable Enterprise Kernel Documentation](#).

- **Updated kexec-tools documents for the Kdump FCoE target.** The documentation for `kexec-tools` has been updated to include instructions on using a Fibre Channel over Ethernet (FCoE) target with Kdump.

- **NVMe driver updated to version 4.17-rc1.** The NVMe driver that ships with RHCK has been updated to version 4.17-rc1. This driver includes several bug fixes and enhancements, including a number of improvements for the use of NVMe over Remote Direct Memory Access (RDMA).

## 3.5 MySQL Community Packages

MySQL Community packages are not included on the provided ISO in this release. This change ensures that the ISO size is appropriate for use on typical DVD-ROM media. The MySQL Community 8.0, MySQL Community 5.7, MySQL Community 5.6, and MySQL Community 5.5 packages continue to be available on the Unbreakable Linux Network (ULN) and the Oracle Linux yum server.

You can install MySQL Community packages directly from ULN or from the Oracle Linux yum server by enabling the appropriate channel or repository. For example, you would enable the [ol7\\_MySQL57](#) repository on the Oracle Linux yum server to install the MySQL Community 5.7 packages as follows:

```
# yum-config-manager --enable ol7_MySQL57
```

## 3.6 Networking

The following networking features, bug fixes, and enhancements are included in this update:

- **ECMP fib\_multipath\_hash\_policy support added to the kernel for IPv4 packets.** RHCK is updated to include support for the Equal-cost multi-path routing (ECMP) hash policy by using the `sysctl` command with the `fib_multipath_hash_policy` option. When the value for this option is set to `1`, the kernel performs an L4 hash (multipath hash on IPv4 packets). When the default value of `0` is set, only an L3 hash is used.

Note that if you enable `fib_multipath_hash_policy`, ICMP error packets are not hashed according to the inner packet headers, which is a problem for anycast services, as the ICMP packet could be delivered to the incorrect host.

- **Support for hardware time stamping on VLAN interfaces.** Hardware time stamping can be used on VLAN interfaces, where the hardware and driver module supports this functionality. This feature allows applications, such as `linuxptp`, to enable hardware time stamping.
- **IFDOWN\_ON\_SHUTDOWN option available in /etc/sysconfig/network.** A new option for use when configuring networking in `/etc/sysconfig/network` is available. You can set the `IFDOWN_ON_SHUTDOWN` option to `no` or to `false` to prevent all network interfaces from being taken down when the system is shut down. If this parameter is set to the default value of `true`, network interfaces are taken down during system shut down.

This option can be useful in preventing mount points that use networked-based file systems, such as NFS, from becoming stale if the network is stopped before the file system is cleanly unmounted.

- **More detail in network-scripts error messages for the bonding driver.** Error messages that are related to the failure of bonding driver installation have been made more verbose when using `/etc/sysconfig/network-scripts` to manage an interface.

## 3.7 Security

The following security features, bug fixes, and enhancements are included in this update:

- **Clevis support for TPM 2.0.** The Clevis automated encryption framework that can automatically encrypt or decrypt data or unlock LUKS volumes, is updated to support the encryption of keys in a Trusted Platform Module 2.0 (TPM2) chip. Note that this feature is only available for `x86_64` platform systems.

- **gnutls version updated to 3.3.29.** The GNU Transport Layer Security package, [gnutls](#), has been upgraded to 3.3.29 to include numerous bug fixes and enhancements. Notably, DSA support has been added to [p11tool](#), providing a stricter requirement around DER encoding to reduce BER rule complexity. In addition, the legacy [HMAC-SHA384](#) cipher is disabled by default, and security improvements have been implemented to counter TLS Cipher Block Chaining (CBC) record padding attacks.
- **audit version updated to 2.8.4.** The Linux Audit system is updated to version 2.8.4 to provide bug fixes and enhancements. Notable changes include the addition of a facility to track software updates and installations by using the [rpm](#) or [yum](#) command. The updated version of [audit](#) also includes improvements to remote logging, and an option to dump internal state to [/var/run/auditd.state](#) by using the [SIGCONT](#) signal. Run the [service auditd state](#) command to trigger a dump of the internal state and view the output.
- **Package installation and upgrade with rpm can be tracked by using audit events.** The RPM package manager is updated to provide [audit](#) events so that software package installation and updates can be tracked by the Linux Audit system. This update also means that software installation and upgrades with the [yum](#) command are also tracked.
- **SELinux extended\_socket\_class policy introduced.** The new [extended\\_socket\\_class](#) policy enables SELinux object classes to support all known network socket address families. The policy also supports separate security classes for ICMP and SCTP sockets that were previously covered in the [rawip\\_socket](#) class.
- **SELinux file permission check for mmap() usage.** SELinux can check file permissions on an [mmap\(\)](#) system call to prohibit memory mapping for files that require access validation on each subsequent access. This is a requirement in environments where files are often relabeled at runtime to reflect state changes.

## 3.8 Virtualization

The following virtualization features, bug fixes, and enhancements are included in this update:

- **Paravirtualized clock support.** The paravirtualized [sched\\_clock\(\)](#) function is now integrated into RHCK and enabled by default. The paravirtualized clock is also available in the UEK release. The addition of this support improves the performance of Oracle Linux virtual machines that are running on some hypervisors, such as KVM, which supports this functionality in the [kvm\\_clock](#) driver.
- **QEMU guest agent diagnostics enhanced.** New QEMU guest agent commands have been added to improve diagnostic capabilities that are in line with Virtual Desktop and Server Management daemon requirements. These improvements include the addition of the following commands: [qemu-get-host-name](#), [qemu-get-users](#), [qemu-get-osinfo](#), and [qemu-get-timezone](#).
- **VNC console support for GPU-based mediated devices.** GPU-based devices, including NVIDIA vGPU, can now be used for the real-time rendering of a virtual machine's graphical output through a VNC console.

## 3.9 Technology Preview

Features that are currently under technology preview when using UEK R4U6 are described in [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 4 Update 6](#).

For RHCK, the following features are currently under technology preview:

- **Systemd:** Importd features for container image imports and exports.

- **File Systems:**
  - Block and object storage layouts for parallel NFS (pNFS).
  - DAX (Direct Access) for direct persistent memory mapping from an application. This feature is under technical preview for the ext4 and XFS file systems.
  - `ima-evm-utils` package, which provides utilities for labeling file systems and verifying the integrity of the system at run time.
  - OverlayFS remains in technical preview.
- **Kernel:**
  - Heterogeneous memory management (HMM).
  - No-IOMMU mode virtual I/O feature.
- **Networking:**
  - Cisco VIC InfiniBand kernel driver, which provides similar functionality to RDMA on proprietary Cisco architectures.
  - `nftables` and `libnftnl` network filtering and classification functionality.
  - Single-Root I/O virtualization (SR-IOV) in the `qlcnic` driver.
  - Support for a Cisco proprietary User Space Network Interface Controller in UCM servers provided in the `libusnic_verbs` driver.
  - Trusted Network Connect support.
- **Storage:**
  - Multi-queue I/O scheduling for SCSI (`scsi-mq`). This functionality is disabled by default.
  - Plug-in for the `libStorageMgmt` API used for storage array management. The `libStorageMgmt` API is now fully supported, but the plug-in is under technology preview.

## 3.10 Compatibility

Oracle Linux maintains user-space compatibility with Red Hat Enterprise Linux, which is independent of the kernel version that underlies the operating system. Existing applications in user space will continue to run unmodified on the Unbreakable Enterprise Kernel Release 5 (UEK R5) and no re-certifications are needed for RHEL certified applications.

To minimize impact on interoperability during releases, the Oracle Linux team works closely with third-party vendors whose hardware and software have dependencies on kernel modules. The kernel ABI for UEK R5 will remain unchanged in all subsequent updates to the initial release. UEK R5 contains changes to the kernel ABI relative to UEK R4 that require recompilation of third-party kernel modules on the system. Before installing UEK R5, verify its support status with your application vendor.





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# Chapter 4 Fixed Issues

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This chapter describes issues that are fixed in Oracle Linux 7.6.

Note that additional issues specific to the kernel that you are using might also be resolved. If you are using the default UEK R5, please see [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 5](#). If you are using an alternate UEK release or update, please refer to the appropriate release notes for this kernel version, available at [Unbreakable Enterprise Kernel Documentation](#).

### 4.1 OpenSSL packages updated to fix CVE-2018-0739 and other security issues

Security fixes were applied to the OpenSSL packages that are shipped with Oracle Linux 7 and are included in this update release. These fixes also include a fix for CVE-2018-0739. (Bug ID 28584683)

### 4.2 sosreport fixed to run on UEFI systems

An issue that caused `sosreport` to generate errors within the `grub2-plugin-errors.txt` file when it was run on UEFI systems is resolved. (Bug ID 26586473)

### 4.3 grub2 fix to resolve a SCAP policy failure on /boot/efi permissions

A fix was applied to `grub2` to correct the permissions of files within the `/boot/efi` directory. This fix resolves a conflict with another package, but also resolves a longstanding issue where rpm verification would flag files in this directory as having invalid file modes affecting compliance with the United States Government Defense Information Systems Agency (DISA) Security Technical Implementation Guides (STIGs), as highlighted by the Security Content Automation Protocol (SCAP). (Bug ID 27166026)



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This chapter describes the known issues for Oracle Linux 7.6.

Note that additional issues specific to the kernel that you are using might also be present. If you are using the default UEK R5 please see [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 5](#). If you are using an alternate UEK release or update, please refer to the appropriate release notes for this kernel version, available at [Unbreakable Enterprise Kernel Documentation](#).

## 5.1 Installation and Upgrade Issues

The following issues might be encountered during an installation.

### 5.1.1 Graphical installer allows users to edit kickstart settings

When performing a graphical installation, where some installation options are already set by using a kickstart configuration file, it is still possible to modify these settings by clicking the various fields during

the installation to edit the predefined content. These types of edits during the installation process requires a user to intentionally attempt to modify the setting, effectively enabling an interactive installation, where options that are set in the kickstart configuration are not secured by any policy.

Note that this type of change is not possible when performing a text installation. During a text installation, the user can only modify fields that have not already been defined in the kickstart configuration file. (Bug ID 28642357)

### 5.1.2 Installation on an iSCSI disk

When installing on an iSCSI disk, you must add either `ip=ibft` or `rd.iscsi.ibft=1` to the boot command line and then specify at least one MBR or GPT-formatted disk as an installation target. Otherwise, the installation fails with the error message `No valid boot loader target device found`. (Bug ID 22076589)

### 5.1.3 Installation on an HPE 3PAR TPVV

If you have not applied a Thin Persistence license to an HPE 3PAR storage array, installation fails to create a file system on a thin provisioned virtual volume (TPVV). This license is required to support the low-level SCSI UNMAP command for storage reclamation. If you do not have a suitable license, the workaround is to use a fully provisioned virtual volume (FPVV) instead of a TPVV. (Bug ID 22140852)

### 5.1.4 Installation fails on Aura7 NVMe device

Installation fails if the target device is an Aura7 NVMe add-in card with two block devices. Although the card has two independent NVMe controllers and devices, they are assigned identical WWIDs. The multipath device mapper maps the two block devices to the same WWID, resulting in a bogus multipath configuration that prevents installation.

To work around the issue, disable multipath at boot for the installation by using the installer boot argument `nompath`. After the installation, blacklist the NVMe block devices for multipath configuration on the system by editing `/etc/multipath.conf`, or you can disable device mapper multipath altogether. See [Oracle® Linux 7: Administrator's Guide](#) for more information about configuring multipath. (Bug ID 27638939)

### 5.1.5 Upgrade failure if open files limit is too low and rpm-plugin-systemd-inhibit is installed

Upgrade from Oracle Linux 7.5 can fail if the login session open files limit is set too low and the system that is being upgraded includes many packages from many channels or repositories. The issue can be triggered if the `rpm-plugin-systemd-inhibit` package is installed and the session is configured for a maximum open file limit below 4096. This issue typically results in yum failing to update and error messages similar to:

```
Verifying : glib2-static-2.56.1-1.e17.i686
glib2-static-2.56.1-1.e17.i686 was supposed to be installed but is not!
```

To resolve this issue, set the open file limit to 4096 before running `yum update`:

```
# ulimit -n 4096
# yum update -y
```

(Bug ID 28720235)

## 5.2 Package Conflicts

The following are known package conflicts for packages that are distributed by Oracle for Oracle Linux 7 through ULN or the Oracle Linux yum server.

## 5.2.1 dovecot-devel.i686 and dovecot-devel.x86\_64

The `dovecot-devel.i686` and `dovecot-devel.x86_64` packages in the `ol7_x86_64_optional_latest` ULN channel conflict. Attempting to install both packages results in a transaction check error:

```
Transaction check error:
  file /usr/include/dovecot/config.h conflicts between attempted installs of
  dovecot-devel-1:2.2.10-7.el7.i686 and dovecot-devel-1:2.2.10-7.el7.x86_64
```

There are bitsize differences between the identified file. You may only install one of these packages on the same system at once. (Bug ID 25057633)

## 5.2.2 PackageKit.i686 and PackageKit.x86\_64

The `PackageKit.i686` package from the `ol7_x86_64_optional_latest` ULN channel conflicts with the `PackageKit.x86_64` package in the `ol7_x86_64_u6_base` channel. Attempting to install both packages results in a transaction check error:

```
Transaction check error:
  file /usr/lib/python2.7/site-packages/packagekit/__init__.pyc from install
  of PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/__init__.pyo from install
  of PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/backend.pyc from install
  of PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/backend.pyo from install
  of PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/enums.pyc from install of
  PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/enums.pyo from install of
  PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/filter.pyc from install of
  PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/filter.pyo from install of
  PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/misc.pyc from install of
  PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/misc.pyo from install of
  PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/package.pyc from install
  of PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/package.pyo from install
  of PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/progress.pyc from install
  of PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
  file /usr/lib/python2.7/site-packages/packagekit/progress.pyo from install
  of PackageKit-version.el7.i686 conflicts with file from package
  PackageKit-version.el7.x86_64
```

You may only install one of these packages on the same system at once. To avoid the conflict, exclude the `PackageKit.i686` package in your `yum` configuration. For more information about how to exclude packages, see [Oracle® Linux: Unbreakable Linux Network User's Guide for Oracle Linux 6 and Oracle Linux 7](#).

(Bug ID 24963661)

## 5.3 Upgrading kmod-oracleasm produces depmod errors indicating missing file or directory

The installation or upgrade of the `kmod-oracleasm` package may result in an error similar to:

```
depmod: ERROR: fstatat(6, kvdo.ko): No such file or directory
depmod: ERROR: fstatat(6, uds.ko): No such file or directory
```

This error appears on systems that are running a previous version of the `kmod-oracleasm` package due to a downgrade. When upgrading or reinstalling, the `kmod-kvdo` package installs the module into the weak-updates directory. This practice differs from the previous installation approach expected by `kmod-oracleasm`, which can result in a NULL symbolic link that is declared as a missing file. A standard installation or upgrade is unaffected by this issue. The issue only appears if the packages are downgraded and then upgraded again. (Bug ID 28864195)

## 5.4 Automatic Bug Reporting Tool

The automated reporting daemons and features provided by the Red Hat Automatic Bug Reporting Tool (ABRT) are not supported with Oracle Linux

ABRT packages and associated files, such as `libreport`, are included in the distribution to satisfy package dependencies and can be used to generate local bug reports but the features to automatically upload these reports are not supported. For technical assistance, contact Oracle Support by using the My Oracle Support portal or by telephone.

## 5.5 libvirtd process displays a warning on start-up after an upgrade

After upgrading from Oracle Linux 7.4, the `libvirtd` process displays a warning message similar to following during start-up:

```
libvirtd ... warning : virQEMUCapsInit:1211 : Failed to get host CPU cache info
libvirtd ... warning : virLXCDriverCapsInit:85 : Failed to get host CPU cache info
```

You can safely ignore this warning. Note that this warning does not occur with a fresh installation. (Bug ID 27700583)

## 5.6 Snapshots of KVM guests using UEFI fail and are unsupported

You cannot do snapshots of KVM guests if they use UEFI. In older versions of QEMU and `libvirt`, the tools might allow you to create the snapshot without an error or warning, but the snapshot could be corrupted. More recent versions of these tools prevent snapshot creation with an error similar to the following:

```
virsh # snapshot-create-as OL7-seboot
error: Operation not supported: internal snapshots of a VM with pflash based
firmware are not supported
```

(Bug ID 26826800)

## 5.7 KVM guests with LSI MegaRAID SAS iSCSI controller limited to 7 virtual disks

An Oracle Linux 7 KVM guest using the LSI MegaRAID SAS iSCSI controller is limited to 7 virtual disks. Although KVM guests can have up to 8 iSCSI virtual disks, the LSI MegaRAID SAS controller uses the first slot for the iSCSI Initiator, leaving just the 7 remaining slots for virtual disks.

The workaround for this issue is to use the `megasas` controller instead of the `lsi` controller when creating iSCSI virtual disks. For example, change `-device lsi` to `-device megasas`, as shown in highlighted text in the following example:

```
# /usr/bin/qemu-system-x86_64 -machine accel=kvm -m 8192 -smp 8 \
-drive file=/path/OracleLinux-7.6-x86_64.qcow2,format=qcow2,if=none,id=disk \
-device ide-hd,bus=ide.0,unit=0,drive=disk,bootindex=0 -device lsi,id=lsi0 \
-drive file=/path/disk1.img,format=raw,if=none,id=drive_image1 \
-device scsi-hd,id=image1,drive=drive_image1,bus=lsi0.0 \
...

# /usr/bin/qemu-system-x86_64 -machine accel=kvm -m 8192 -smp 8 \
-drive file=/path/OracleLinux-7.6-x86_64.qcow2,format=qcow2,if=none,id=disk \
-device ide-hd,bus=ide.0,unit=0,drive=disk,bootindex=0 -device megasas,id=lsi0 \
-drive file=/path/disk1.img,format=raw,if=none,id=drive_image1 \
-device scsi-hd,id=image1,drive=drive_image1,bus=lsi0.0 \
...
```

(Bug 27681238)

## 5.8 grubby fatal error during kernel upgrade when /boot is on a btrfs subvolume

If `/boot` is hosted on a btrfs subvolume, GRUB 2 is unable to correctly process the `initramfs` and `vmlinuz` pathnames. This problem occurs when you update or install a new kernel and `grubby` attempts to update the GRUB 2 configuration. In the case where you are running a fresh installation of Oracle Linux 7.6 and you upgrade the RHCK or UEK kernel, the following error is displayed:

```
grubby fatal error: unable to find a suitable template
```

When the system is rebooted after the kernel update, the system boots to the old kernel.

Similarly, when upgrading from Oracle Linux 7.4 to Oracle Linux 7.6, if `/boot` is hosted on a btrfs subvolume, the system boots to the old Oracle Linux 7.4 kernel after the upgrade is complete.

The workaround for this problem is to use `grub2-mkconfig` to regenerate the `/etc/grub2/grub.cfg` file, or `/etc/grub2-efi.cfg` file on a UEFI booted system, immediately after the kernel has been installed or upgraded, for example:

```
# grub2-mkconfig -o /boot/grub2/grub.cfg
```

Obtain a listing of the kernel menu entries in the generated configuration as follows:

```
# grep -P "submenu|^menuentry" /boot/grub2/grub.cfg | cut -d '"' -f2
```

From the listing, select the kernel entry that you want to run as the default kernel and set this entry as the default using the following command, substituting `menu entry title` with the title of the kernel entry that you identified in the listing:

```
# grub2-set-default "menu entry title"
```

You can use the `grub2-editenv list` command to check that the `saved_entry` has been updated with the selected kernel menu title.

Reboot and use `uname -a` to check that the correct kernel is now running.

(Bug ID 22750169)

## 5.9 Hebrew LaTeX fonts

Installing the `tex-fonts-hebrew` package fails unless you first install all of the `texlive*` packages. (Bug ID 19059949)

## 5.10 InfiniBand Issues

The following are issues that you might encounter when using InfiniBand devices.

### 5.10.1 Kdump might fail due to an incorrect InfiniBand Adapter M3 Firmware version

Kdump might fail on Oracle Linux 7.6 if the Oracle Dual Port QDR InfiniBand Adapter M3 Firmware version 2.31.5350 is installed.

To prevent this issue from occurring, update the Oracle Dual Port QDR InfiniBand Adapter M3 Firmware version to at least 2.31.5350. (Bug ID 26351183)

### 5.10.2 Disabling an InfiniBand CA port generates warnings

You might see the following warning messages if you use the `ibportstate disable` command to disable an InfiniBand CA or router port:

```
ibwarn: [2696] _do_madrpc: recv failed: Connection timed out
ibwarn: [2696] mad_rpc: _do_madrpc failed; dport (Lid 38)
ibportstate: iberror: failed: smp set portinfo failed
```

You can safely ignore these warnings. (Bug ID 16248314)

## 5.11 Database installation and operation fails if RemoveIPC=yes is configured for systemd

If `RemoveIPC=yes` is configured for `systemd`, interprocess communication (IPC) is terminated for a non-system user's processes when that user logs out. This setting, which is intended for use on laptop systems, can cause software problems on server systems. For example, if the user is a database software owner such as `oracle` for Oracle Database, this configuration can cause a database installation to fail or database services to crash.

By default, Oracle Linux 7.6 configures `RemoveIPC=no` in `/etc/systemd/logind.conf` to prevent `systemd` from terminating IPC. However, if you have touched this file before updating your system to Oracle Linux 7.6, the update installs the new version of the file as `/etc/systemd/logind.conf.rpmnew` and does not set `RemoveIPC=no` in `/etc/systemd/logind.conf`. To avoid database crashes, set `RemoveIPC=no` in `/etc/systemd/logind.conf` and run the `systemctl reboot` command to reboot the system. (Bug ID 22224874)



## 5.12 Unable to create Oracle Linux 7 LXC containers on NFS

The creation of Oracle Linux 7 containers fails when the `root` file system (`/container`) is hosted on an NFS share. This problem occurs because the `iputils` package in Oracle Linux 7 releases, (Updates 4 and 5) is built to use the Linux file extended attributes `[xattr(7)] security capabilities(7)`. Because the NFS protocol does not support these file capabilities, the `iputils` package might not be installed into an NFS files system. For example, when attempting to create an Oracle Linux 7.4 container, the installation fails while installing the `iputils` package, producing the following error:

```
Error unpacking rpm package iputils-20121221-7.el7.x86_64
error: unpacking of archive failed on file /usr/bin/ping: cpio: cap_set_file
error: iputils-20121221-7.el7.x86_64: install failed
```

Similar issues are seen when attempting to install the `initscripts` and `systemd` packages while creating an Oracle Linux 7.3 container.

This issue occurs on both NFSv3 and NFSv4.

Note that Oracle Linux 6 containers are not affected. (Bug ID 25024258)

## 5.13 Support for Oracle Linux 7 guests on Oracle VM and Xen

Oracle Linux 7 guests are supported for both hardware virtualization (HVM) and hardware virtualization with paravirtual drivers (PVHVM) on Oracle VM Release 3. Oracle Linux 7 guests in a paravirtualized domain (PVM) on Oracle VM or other Xen-based hypervisors are not supported.

Oracle Linux 7 guests of any type are not supported on Oracle VM Release 2. (Bug IDs 18712168, 18667813, 18266964)

## 5.14 Hyper-V related services fail to start on Oracle Linux 7 guest with UEK R4 kernel under Windows Hyper-V Server

If you are running UEK R4 or an earlier release on Oracle Linux 7, the `hypervkvpd` and `hypervvssd` services fail to start if the Hyper-V packages are at version `0-0.29.20160216git.el7` or later.

To avoid this issue, upgrade to UEK R4U5 or later.

(Bug ID 24745861)

## 5.15 Geneve network driver support not available in UEK releases prior to UEK R5

The `ip` and `iproute` commands included with Oracle Linux 7.6 include support for Geneve-capable devices. The module for this driver is included with the RHCK but is not included in UEK R4. The commands to set, add or view Geneve devices are only functional when used with the RHCK or with UEK R5. (Bug ID 24652835) .

## 5.16 NetworkManager fails to respond to IPv6 addresses on low priority networks with DHCP on UEK R4

When running UEK R4 on Oracle Linux 7.6, NetworkManager fails to send a response to low priority networks with DHCP on UEK R4. Networks with higher priority (link-local, IPv6 `fe80::/64` routes) take

priority over the lower priority networks. This behavior might result in the DHCPv6 server failing to send a response to a DHCP client on a lower priority network, even if the network has another output device. (Bug ID 27714775)

## 5.17 Network connection icon reports incorrect state for interfaces

The network connection icon might report an active network interface as being disconnected. This behavior is seen for the `root` user but not for other users. Command-line utilities such as `ip link` and `ifconfig` report the correct state. (Bug ID 19060089)

## 5.18 Power button defaults to ACPI Suspend

By default, Oracle Linux 7 in graphical (GUI) console mode treats the hardware power button as equivalent to the ACPI "Sleep" button, which puts the system into low-power sleep mode. This behavior is specific to GNOME desktop environment.

In previous Oracle Linux versions, the hardware power button initiated a system shutdown. To make Oracle Linux 7 do the same, create a file named `/etc/dconf/db/local.d/01-shutdown-button` with the following content:

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

Then run the following command:

```
# dconf update
```

You must log out of the desktop environment and log back in for the new setting to take effect. (Bug ID 25597898)

## 5.19 Uninstalling libpcap can result in the removal of a large number of libvirt packages

The `libpcap` package is updated to enable functionality for future technologies. If you install this package and then attempt to uninstall it, a large number of `libvirt` packages might also be uninstalled due to dependency relationships. The `libvirt` package has a dependency on the `libvirt-daemon-driver-nwfilter` package and this package has a dependency on `libpcap`. Removing `libpcap` removes the entire `libvirt` family of packages. (Bug ID 28582266)

## 5.20 32-bit RDMA packages are installed when upgrading a system that has rdma-core installed

When upgrading from a system prior to Oracle Linux 7.4, where the `rdma-core.noarch` package is installed, 32-bit versions of the packages and many dependencies are also installed, unnecessarily. This problem occurs because the original version of the package is obsoleted, and during upgrade, the package is replaced with both the `rdma-core.i686` and `rdma-core.x86_64` versions of the package, along with those packages' dependencies.

To work around the issue, run the `yum update` command with the `--exclude=*.i686` option:

```
# yum update --exclude=*.i686
```

(Bug ID 28217831)

## 5.21 dmstats report output does not return any data

The `dmstats report` command does not recognize any of the device mapper targets that are present on a system and returns no output when it is run. The issue is a regression in the upstream package and can be resolved by downgrading the `device-mapper` packages, if required. (Bug ID 28642757)

## 5.22 microcode\_ctl failed early load check for "intel-06-4f-01"

During installation and while booting, an error may appear in the system log:

```
dracut: microcode_ctl: kernel version "4.14.35-1818.3.3.el7uek.x86_64"
failed early load check for "intel-06-4f-01", skipping
```

The intel ucode 06-4f-01 file is incorrectly excluded from `initramfs` for boot-time microcode updates on some kernel versions. This affects certain Intel Xeon E5 v4 CPUs, one of the models formerly known as Broadwell. Oracle Server X6-2 uses this CPU model. The message is harmless provided the BIOS is current for any system using this processor model, as the BIOS will perform the required update. This issue is planned to be addressed in an errata update for `microcode_ctl`. (Bug ID 28879995)



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# Chapter 6 Installation and Availability

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You can download a full Oracle Linux 7.6 installation media image from the Oracle Software Delivery Cloud at <https://edelivery.oracle.com/linux>. You can also obtain the latest Oracle Linux 7 packages from the Unbreakable Linux Network (ULN) and the Oracle Linux yum server.

You can install additional software for Oracle Linux 7 by subscribing to the different channels on ULN or by enabling the required repositories within your yum configuration. To explore the channels that are available to you on ULN, log in to <https://uln.oracle.com/> and view the Channels option. To view the Oracle Linux yum repositories that are available for Oracle Linux 7, visit <https://yum.oracle.com/oracle-linux-7.html>.



### Note

The Oracle Linux yum server does not provide equivalent repositories for some channels that are available on ULN. These channels provide non-open source packages.

If you are installing an update on a system for which you have previously installed the Oracle-supported OFED packages, see [Upgrading a system with an existing UEK R4 installation to continue to use UEK R4](#) for instructions on how to update these packages during an upgrade.

UEK R5 is the default boot kernel for fresh installations of Oracle Linux 7.6. For more information, see [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 5](#).

For systems that are running UEK R3 or UEK R4 and are subscribed to the `o17_x86_64_UEKR3` or `o17_x86_64_UEKR4` channel on ULN, or the `o17_x86_64_UEKR3` or `o17_x86_64_UEKR4` repository on the Oracle Linux yum server, upgrade to the latest UEK release as follows:

1. Upgrade all of the packages on the system, including kernel packages.

```
# yum update
```

By default, the boot manager automatically enables the most recent kernel version so you do not need to change your GRUB configuration.

2. Reboot the system.

```
# systemctl reboot
```



### Important

Oracle Linux 7.6 updates many major subsystems. To ensure that your updated systems function correctly, reboot them after updating.

## 6.1 Upgrading from Oracle Linux 6

It is possible to upgrade an Oracle Linux 6 system to Oracle Linux 7.6 under the following conditions:

- The system meets the minimum installation requirements for Oracle Linux 7 as described in [Chapter 1, System Requirements and Limits](#).

- The Oracle Linux 6 system has been completely updated from the `ol6_x86_64_latest` channel or `ol6_latest` repository.
- UEK R3 or UEK R4 has been installed on the system to be upgraded and is the default boot kernel. Upgrading from UEK R2 is not supported. Note that the system is upgraded to use the UEK R5 release provided with Oracle Linux 7.6.
- No Oracle product stack is present on the system.

Upgrading is supported only for systems that are installed with the Minimal Install base environment. If additional packages are installed from an alternative repository or channel, upgrade might fail or the resulting upgrade might not function as expected.

General instructions on how to perform an upgrade are covered in [Oracle® Linux 7: Installation Guide](#).

The following is a summary of the steps that are specific to the update for this release:

1. Make sure that your system is completely up to date by using the `yum update` command to update to the latest Oracle Linux 6 release. The system must be subscribed to the `ol6_x86_64_latest` and `ol6_x86_64_addons` channels or `ol6_latest` and `ol6_addons` repositories to be updated.
2. Install the latest versions of the required upgrade packages:

```
# yum install openscap redhat-upgrade-tool preupgrade-assistant \
preupgrade-assistant-el6toel7 preupgrade-assistant-el6toel7-data-0 \
preupgrade-assistant-tools preupgrade-assistant-ui
```

Obtain the latest versions of these packages from ULN (in the `ol6_x86_64_addons` channel), or from the Oracle Linux yum server (in the `ol6_addons` repository).

3. If the system is registered with ULN, delete the system from ULN and disable yum plugins.
4. Run the `preupg` command to perform an upgrade assessment:

```
# preupg
```

Examine the results in `/root/preupgrade/result.html` to make sure there are no items that have failed or need attention.

5. Run the `redhat-upgrade-tool-cli` command to perform the upgrade:

```
# redhat-upgrade-tool-cli --network=7.5 --instrepo=OL7_repo_url \
--debuglog=/tmp/upgrade.log --cleanup-post
```

Replace `OL7_repo_url` with the URL of the repository where the Oracle Linux 7.6 ISO is hosted.

6. Reboot the system to start the upgrade process.



#### Note

When upgrading from Oracle Linux 6 to Oracle Linux 7.6, the previous version of UEK R4 is removed from the system during the upgrade and the system is updated to use the UEK R5 release that is provided on the installation media image as the default boot kernel.

## 6.2 Oracle-Supported RDMA Packages

Oracle Linux 7.6 introduces UEK R5 as the default kernel. The Oracle-supported RDMA packages shipped with UEK R5 replace previous OFED packages and use an updated package and channel naming

scheme. Oracle recommends using UEK R5 with Oracle Linux 7.6. If you intend to install RDMA packages, please refer to [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 5](#).

## Upgrading a system with an existing UEK R5 installation

If you are upgrading your system from a release prior to Oracle Linux 7.6, and you are already using UEK R5 along with the Oracle-supported RDMA packages, these packages are updated automatically as part of the upgrade process.

If your system is registered with ULN, ensure that it is subscribed to the `o17_x86_64_UEKR5_RDMA`, `o17_x86_64_UEKR5`, and `o17_x86_64_latest` channels, before upgrade.

If your system uses the Oracle Linux yum server, ensure that the `o17_UEKR5_RDMA`, `o17_UEKR5`, and `o17_latest` repositories are enabled before upgrade.

## Upgrading a system with an existing UEK R4 installation to use UEK R5

If you are upgrading your system from a release prior to Oracle Linux 7.6 and you are using UEK R4 with the Oracle-supported OFED packages, it is recommended that you upgrade to UEK R5 and change to use the corresponding Oracle-supported UEK R5 RDMA packages before you upgrade your system to Oracle Linux 7.6.

Note that if the system is newly registered on ULN, the `o17_x86_64_UEKR5`, and `o17_x86_64_latest` channels are subscribed by default. You may need to subscribe to the `o17_x86_64_UEKR5_RDMA` manually.

If your system uses the Oracle Linux yum server, note that the `o17_UEKR4`, and `o17_latest` repositories are enabled by default. You should ensure that the `o17_UEKR5_RDMA`, `o17_UEKR5`, and `o17_latest` repositories are enabled before upgrade.

Upgrade requires that you remove existing OFED packages prior to installing the compatible packages for UEK R5. Use the instructions in [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 5](#) for guidance on how to do this.

## Upgrading a system with an existing UEK R4 installation to continue to use UEK R4

If you are upgrading your system from a release prior to Oracle Linux 7.6 and you are using UEK R4 with the Oracle-supported OFED packages and you intend to continue to use UEK R4, you must ensure that your system is subscribed to the correct channels or that the correct yum repositories are enabled before you upgrade.

If you are using ULN, check that your system is registered before you upgrade and subscribe the system to the `o17_x86_64_UEKR4_OFED`, `o17_x86_64_UEKR4`, and `o17_x86_64_latest` channels on ULN.



### Warning

By default, the `o17_x86_64_UEKR5` and `o17_x86_64_latest` channels are enabled when you register Oracle Linux 7.6 system with ULN. If the `o17_x86_64_UEKR5` channel is enabled, you must disable it to continue to use UEK R4 with the Oracle-supported OFED packages.

If you are using the Oracle Linux yum server, check that the `o17_latest`, `o17_UEKR4` and `o17_UEKR4_OFED` repositories are enabled. Make sure that the `o17_UEKR5` and `o17_UEKR5_RDMA` repositories are disabled.

Use the `yum update` command to upgrade to Oracle Linux 7.6 with the UEK R4 compatible OFED packages.

If you do not have any of the OFED packages installed, you can proceed to install the packages as described in the installation instructions provided in [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 4 Update 7](#).



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# Appendix A Package Changes from the Upstream Release

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

## A.1 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 [Section A.2, “Changes to Source Packages”](#).

### A.1.1 Added Binary Packages by Oracle

The following binary packages have been added by Oracle:

- `dtrace-utils`
- `dtrace-utils-devel`
- `dtrace-utils-testsuite`
- `kernel-uek`
- `kernel-uek-debug`
- `kernel-uek-debug-devel`
- `kernel-uek-devel`
- `kernel-uek-doc`
- `libdtrace-ctf`
- `libdtrace-ctf-devel`
- `lxc`
- `lxc-devel`
- `lxc-libs`
- `ocfs2-tools`

- `ocfs2-tools-devel`
- `oracleasm-support`
- `oracle-database-preinstall`
- `oraclelinux-release`
- `oracle-logos`
- `reflink`
- `yum-plugin-ulninfo`

### A.1.2 Modified Binary Packages

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

- `abrt`
- `abrt-addon-ccpp`
- `abrt-addon-kerneloops`
- `abrt-addon-pstoreoops`
- `abrt-addon-python`
- `abrt-addon-vmcore`
- `abrt-addon-xorg`
- `abrt-cli`
- `abrt-console-notification`
- `abrt-dbus`
- `abrt-desktop`
- `abrt-gui`
- `abrt-gui-libs`
- `abrt-java-connector`
- `abrt-libs`
- `abrt-python`
- `abrt-tui`
- `akonadi`
- `akonadi-mysql`
- `anaconda`
- `anaconda-core`

- `anaconda-gui`
- `anaconda-tui`
- `anaconda-widgets`
- `apr-util`
- `apr-util-devel`
- `autofs`
- `awscli`
- `basesystem`
- `binutils`
- `binutils-devel`
- `btrfs-progs`
- `cloud-init`
- `clufteer-bin`
- `clufteer-cli`
- `clufteer-common`
- `clufteer-lib-ccs`
- `clufteer-lib-general`
- `clufteer-lib-pcs`
- `cockpit`
- `cockpit-bridge`
- `cockpit-system`
- `cockpit-ws`
- `coreutils`
- `cpp`
- `cups-filters`
- `cups-filters-libs`
- `dbus`
- `dbus-devel`
- `dbus-libs`
- `dbus-x11`

- `dhclient`
- `dhcp`
- `dhcp-common`
- `dhcp-lib`
- `dracut`
- `dracut-config-generic`
- `dracut-config-rescue`
- `dracut-fips`
- `dracut-fips-aesni`
- `dracut-network`
- `firefox`
- `fuse`
- `fuse-devel`
- `fuse-lib`
- `fwupdate`
- `fwupdate-efi`
- `fwupdate-lib`
- `gcc`
- `gcc-c++`
- `gcc-gfortran`
- `gcc-gnat`
- `gcc-objc`
- `gcc-objc++`
- `glibc`
- `glibc-common`
- `glibc-devel`
- `glibc-headers`
- `glibc-utils`
- `gnome-system-log`
- `gnutls`

- `gnutls-c++`
- `gnutls-dane`
- `gnutls-devel`
- `gnutls-utils`
- `gperftools-libs`
- `grub2`
- `grub2-common`
- `grub2-efi-ia32`
- `grub2-efi-ia32-modules`
- `grub2-efi-x64`
- `grub2-efi-x64-modules`
- `grub2-pc`
- `grub2-pc-modules`
- `grub2-tools`
- `grub2-tools-extra`
- `grub2-tools-minimal`
- `grubby`
- `gststreamer`
- `gststreamer-tools`
- `httpd`
- `httpd-devel`
- `httpd-manual`
- `httpd-tools`
- `initial-setup`
- `initial-setup-gui`
- `initscripts`
- `ipa-client`
- `ipa-client-common`
- `ipa-common`
- `ipa-python-compat`

- ipa-server
- ipa-server-common
- ipa-server-dns
- ipa-server-trust-ad
- irqbalance
- iscsi-initiator-utils
- iscsi-initiator-utils-iscsiuio
- java-11-openjdk
- java-11-openjdk-devel
- java-11-openjdk-headless
- kabi-yum-plugins
- kdepimlibs
- kdepimlibs-akonadi
- kdepimlibs-devel
- kdepimlibs-kxmlrpcclient
- kde-settings
- kde-settings-ksplash
- kde-settings-plasma
- kde-settings-pulseaudio
- kexec-tools
- kmod
- kmod-kvdo
- kmod-libs
- kmod-oracleasm
- ksc
- ksh
- libatomic
- libatomic-static
- libdbi-dbd-mysql
- libdbi-dbd-pgsql

- `libdbi-drivers`
- `libgcc`
- `libgfortran`
- `libgnat`
- `libgnat-devel`
- `libgomp`
- `libgudev1`
- `libgudev1-devel`
- `libguestfs`
- `libguestfs-inspect-icons`
- `libguestfs-java`
- `libguestfs-tools`
- `libguestfs-tools-c`
- `libguestfs-xfstools`
- `libitm`
- `libitm-devel`
- `libobjc`
- `libpmem`
- `libpmemblk`
- `libpmemcto`
- `libpmemlog`
- `libpmemobj`
- `libpmempool`
- `libquadmath`
- `libquadmath-devel`
- `libreport`
- `libreport-anaconda`
- `libreport-cli`
- `libreport-filesystem`
- `libreport-gtk`

- `libreport-plugin-bugzilla`
- `libreport-plugin-mailx`
- `libreport-plugin-reportuploader`
- `libreport-plugin-ureport`
- `libreport-python`
- `libreport-rhel-anaconda-bugzilla`
- `libreport-web`
- `libreswan`
- `librpmem`
- `libstdc++`
- `libstdc++-devel`
- `libstdc++-docs`
- `libvmem`
- `libvmmalloc`
- `libxml2`
- `libxml2-devel`
- `libxml2-python`
- `libxslt`
- `libxslt-devel`
- `lorax`
- `lxc`
- `lxc-devel`
- `lxc-libs`
- `lz4`
- `mkbootdisk`
- `mod_session`
- `mod_ssl`
- `mokutil`
- `mozjs52`
- `nfs-utils`



- `nscd`
- `nss-softokn`
- `nss-softokn-devel`
- `nss-softokn-freebl`
- `nss-softokn-freebl-devel`
- `ntp`
- `ntpdate`
- `opa-address-resolution`
- `opa-basic-tools`
- `opa-fastfabric`
- `opa-fm`
- `opa-libopamgt`
- `OpenIPMI`
- `OpenIPMI-libs`
- `OpenIPMI-modalias`
- `OpenIPMI-perl`
- `openssl`
- `openssl-devel`
- `openssl-libs`
- `open-vm-tools`
- `open-vm-tools-desktop`
- `oraclelinux-release`
- `oracle-logos`
- `oscap-anaconda-addon`
- `osinfo-db`
- `os-prober`
- `PackageKit`
- `PackageKit-command-not-found`
- `PackageKit-glib`
- `PackageKit-gstreamer-plugin`

- `PackageKit-gtk3-module`
- `PackageKit-yum`
- `parted`
- `pcs`
- `pcs-snmp`
- `perl-DBD-MySQL`
- `perl-Sys-Guestfs`
- `perl-XML-Parser`
- `plymouth`
- `plymouth-core-libs`
- `plymouth-graphics-libs`
- `plymouth-plugin-label`
- `plymouth-plugin-two-step`
- `plymouth-scripts`
- `plymouth-system-theme`
- `plymouth-theme-charge`
- `pmempool`
- `policycoreutils`
- `policycoreutils-devel`
- `policycoreutils-gui`
- `policycoreutils-newrole`
- `policycoreutils-python`
- `policycoreutils-sandbox`
- `polkit`
- `polkit-devel`
- `polkit-docs`
- `pykickstart`
- `python`
- `python2-ipaclient`
- `python2-ipalib`

- `python2-ipaserver`
- `python-blivet`
- `python-clufter`
- `python-configshell`
- `python-devel`
- `python-jwt`
- `python-libguestfs`
- `python-libs`
- `python-msrestazure`
- `python-rtslib`
- `python-s3transfer`
- `qt3`
- `qt3-devel`
- `qt3-MySQL`
- `qt3-ODBC`
- `qt3-PostgreSQL`
- `qt-settings`
- `rear`
- `redhat-bookmarks`
- `redhat-indexhtml`
- `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-release-server`
- `redhat-rpm-config`

- `redhat-upgrade-dracut`
- `redhat-upgrade-dracut-plymouth`
- `redhat-upgrade-tool`
- `redland`
- `redland-virtuoso`
- `rhn-check`
- `rhn-client-tools`
- `rhnlib`
- `rhnsd`
- `rhn-setup`
- `rhn-setup-gnome`
- `rpmdevtools`
- `rpmemd`
- `scap-security-guide`
- `scap-security-guide-doc`
- `scap-workbench`
- `selinux-policy`
- `selinux-policy-devel`
- `selinux-policy-minimum`
- `selinux-policy-mls`
- `selinux-policy-targeted`
- `setroubleshoot`
- `setroubleshoot-plugins`
- `setroubleshoot-server`
- `shim-ia32`
- `shim-unsigned-ia32`
- `shim-unsigned-x64`
- `shim-x64`
- `sos`
- `sos-collector`

- `spice-streaming-agent`
- `system-config-date`
- `system-config-kickstart`
- `systemd`
- `systemd-devel`
- `systemd-libs`
- `systemd-python`
- `systemd-sysv`
- `tog-pegasus`
- `tog-pegasus-libs`
- `uom-lib`
- `virt-install`
- `virt-manager`
- `virt-manager-common`
- `virt-p2v-maker`
- `virt-v2v`
- `wireshark`
- `wireshark-gnome`
- `xfspgrog`
- `xsane-common`
- `xsane-gimp`
- `xulrunner`
- `yum`
- `yum-plugin-aliases`
- `yum-plugin-changelog`
- `yum-plugin-ovl`
- `yum-plugin-tmprepo`
- `yum-plugin-verify`
- `yum-plugin-versionlock`
- `yum-rhn-plugin`

- `yum-utils`

### A.1.3 Modified Optional Binary Packages

The following optional binary packages have been modified:

- `cups-filters-devel`
- `java-11-openjdk-debug`
- `java-11-openjdk-demo`
- `java-11-openjdk-demo-debug`
- `java-11-openjdk-devel-debug`
- `java-11-openjdk-headless-debug`
- `java-11-openjdk-javadoc`
- `java-11-openjdk-javadoc-debug`
- `java-11-openjdk-javadoc-zip`
- `java-11-openjdk-javadoc-zip-debug`
- `java-11-openjdk-jmods`
- `java-11-openjdk-jmods-debug`
- `java-11-openjdk-src`
- `java-11-openjdk-src-debug`
- `parted-devel`
- `thunderbird`

### A.1.4 New Binary Packages

The following binary packages are new for Update 6, relative to Update 5 of Oracle Linux 7:

- `bcc`
- `bolt`
- `compat-exiv2-023`
- `fribidi`
- `google-noto-emoji-fonts`
- `java-11-openjdk`
- `java-11-openjdk-devel`
- `java-11-openjdk-headless`
- `libglvnd`

- `librdkafka`
- `mozjs52`
- `nbdkit`
- `oracle-database-preinstall`
- `pmempool`
- `python-futures`
- `python-paramiko`
- `python-subprocess32`
- `sos-collector`
- `spice-streaming-agent`

### A.1.5 Removed Binary Packages

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

- `anaconda-user-help`
- `insights-client`
- `kpatch`
- `python-rhsm`
- `redhat-access-gui`
- `redhat-access-plugin-ipa`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-as-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-bn-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-de-DE`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-en-US`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-es-ES`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-fr-FR`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-gu-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-hi-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-it-IT`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ja-JP`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-kn-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ko-KR`

- `Red_Hat_Enterprise_Linux-Release_Notes-7-ml-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-mr-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-or-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-pa-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-pt-BR`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ru-RU`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ta-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-te-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-zh-CN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-zh-TW`
- `redhat-logos`
- `redhat-support-lib-python`
- `redhat-support-tool`
- `subscription-manager`
- `subscription-manager-migration-data`
- `virt-who`

## A.2 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 [Section A.1, “Changes to Binary Packages”](#).

### A.2.1 Added Source Packages by Oracle

The following source packages have been added by Oracle:

- `compat-gcc-32`
- `dtrace-utils`
- `inotify-tools`
- `kernel-uek`
- `libdtrace-ctf`
- `lxc`
- `ocfs2-tools`
- `oracleasm-support`
- `oracle-database-preinstall`



- `oraclelinux-release`
- `oracle-logos`
- `reflink`
- `uname26`
- `yum-plugin-ulninfo`

### A.2.2 Modified Source Packages

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

- `abrt`
- `abrt-java-connector`
- `akonadi`
- `anaconda`
- `apr-util`
- `autofs`
- `awscli`
- `basesystem`
- `binutils`
- `btrfs-progs`
- `cloud-init`
- `cluftr`
- `cockpit`
- `coreutils`
- `cups-filters`
- `dbus`
- `dhcp`
- `dracut`
- `firefox`
- `fuse`
- `fwupdate`
- `gcc`
- `glibc`

- `gnome-system-log`
- `gnutls`
- `gperftools`
- `grubby`
- `gststreamer`
- `httpd`
- `initial-setup`
- `initscripts`
- `ipa`
- `iproute`
- `irqbalance`
- `iscsi-initiator-utils`
- `java-11-openjdk`
- `kabi-yum-plugins`
- `kdepimlibs`
- `kexec-tools`
- `kmod`
- `kmod-kvdo`
- `ksc`
- `ksh`
- `libdbi-drivers`
- `libguestfs`
- `libreport`
- `libreswan`
- `libxml2`
- `libxslt`
- `lorax`
- `lxc`
- `lz4`
- `mkbootdisk`

- `mozjs52`
- `nss-softokn`
- `ntp`
- `nvml`
- `opa-ff`
- `opa-fm`
- `OpenIPMI`
- `openssl`
- `open-vm-tools`
- `oracleasm`
- `oraclelinux-release`
- `oracle-logos`
- `oscap-anaconda-addon`
- `osinfo-db`
- `os-prober`
- `PackageKit`
- `parted`
- `pcs`
- `perl-DBD-MySQL`
- `perl-XML-Parser`
- `policycoreutils`
- `polkit`
- `pykickstart`
- `python`
- `python-blivet`
- `python-configshell`
- `python-jwt`
- `python-msrestazure`
- `python-rtslib`
- `python-s3transfer`

- qt3
- rear
- redhat-bookmarks
- redhat-indexhtml
- redhat-lsb
- redhat-release-server
- redhat-rpm-config
- redhat-upgrade-dracut
- redhat-upgrade-tool
- redland
- rhn-client-tools
- rhnlib
- rhnsd
- rpmdevtools
- scap-security-guide
- scap-workbench
- selinux-policy
- setroubleshoot
- setroubleshoot-plugins
- shim
- shim-signed
- sos
- sos-collector
- spice-streaming-agent
- system-config-date
- system-config-kickstart
- systemd
- tog-pegasus
- uom-lib
- virt-manager

- `wireshark`
- `xfspgrog`
- `xsane`
- `xulrunner`
- `yum`
- `yum-rhn-plugin`
- `yum-utils`

### A.2.3 Modified Optional Source Packages

The following optional source packages have been modified:

- `gnu-efi`
- `jetty-artifact-remote-resources`
- `jetty-parent`
- `jetty-toolchain`
- `kmod-redhat-ixgbe`
- `libreoffice`
- `pesign`
- `publican`
- `sanlock`
- `thunderbird`

### A.2.4 New Source Packages

The following source packages are new for Update 6, relative to Update 5 of Oracle Linux 7:

- `bcc`
- `bolt`
- `compat-exiv2-023`
- `fribidi`
- `google-noto-emoji-fonts`
- `java-11-openjdk`
- `libglvnd`
- `librdkafka`
- `mozjs52`

- `nbdkit`
- `oracle-database-preinstall`
- `python-futures`
- `python-paramiko`
- `python-subprocess32`
- `sos-collector`
- `spice-streaming-agent`

## A.2.5 Removed Source Packages

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

- `anaconda-user-help`
- `dtc`
- `insights-client`
- `kpatch`
- `libcxl`
- `libehca`
- `libica`
- `libocxl`
- `librtas`
- `libservicelog`
- `libvpd`
- `libzfcphbaapi`
- `lsvpd`
- `opal-prd`
- `openssl-ibmca`
- `paflib`
- `powerpc-utils`
- `powerpc-utils-python`
- `ppc64-diag`
- `ppc64-utils`
- `python-rhsm`

- `qclib`
- `qemu-kvm-ma`
- `redhat-access-gui`
- `redhat-access-plugin-ipa`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-as-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-bn-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-de-DE`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-en-US`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-es-ES`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-fr-FR`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-gu-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-hi-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-it-IT`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ja-JP`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-kn-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ko-KR`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ml-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-mr-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-or-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-pa-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-pt-BR`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ru-RU`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-ta-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-te-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-zh-CN`
- `Red_Hat_Enterprise_Linux-Release_Notes-7-zh-TW`
- `redhat-logos`
- `redhat-support-lib-python`
- `redhat-support-tool`
- `s390utils`

- `servicelog`
- `SLOF`
- `subscription-manager`
- `subscription-manager-migration-data`
- `virt-who`
- `yaboot`



---

## Appendix B Removed Modules

The default kernel for Oracle Linux 7.6 is the Unbreakable Enterprise Kernel Release 5 (UEK R5). Prior releases of UEK are not included on the installation media, but can be installed from the Oracle Linux yum server or from the Unbreakable Linux Network (ULN). If you choose to run UEK R4 with Oracle Linux 7.6, please note the following modules have been removed from UEK R4 for Oracle Linux 7 compared with UEK R4 for Oracle Linux 6:

- `3w-xxxx`
- `8390`
- `adp5588-keys`
- `aes-x86_64`
- `af_alg`
- `algif_hash`
- `algif_skcipher`
- `ath5k`
- `autofs4`
- `axnet_cs`
- `can-gw`
- `cbc`
- `cciss`
- `configfs`
- `cpufreq_conservative`
- `cpufreq_powersave`
- `ctr`
- `dmi-sysfs`
- `ems_pci`
- `encrypted-keys`
- `fealnx`
- `gpio-sch`
- `hid-magicmouse`
- `ipv6`
- `kvaser_pci`
- `max7359_keypad`

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- mcs5000\_ts
  - natsemi
  - ne2k-pci
  - ns83820
  - opencores-kbd
  - orinoco\_pci
  - pcnet\_cs
  - pkcs7\_test\_key
  - rotary\_encoder
  - rsxx
  - scsi\_dh\_alua
  - scsi\_dh\_emc
  - scsi\_dh\_hp\_sw
  - scsi\_dh\_rdac
  - seqiv
  - sja1000\_platform
  - usbip-core
  - usbserial
  - via-rhine
  - via-velocity
  - wll2xx
  - wlcore
  - xhci-hcd
  - xhci-pci