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# **Oracle® Linux 6**

## **Release Notes for Oracle Linux 6.5**



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March 2021

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## Abstract

This document contains information about Oracle Linux 6.5. This document might be updated after it is released. To check for updates to this document, see [Oracle® Linux Documentation](#).

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The software described in this documentation is either in Extended Support or Sustaining Support. See <https://www.oracle.com/us/support/library/enterprise-linux-support-policies-069172.pdf> for more information. Oracle recommends that you upgrade the software described by this documentation as soon as possible.

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This document is intended for users and administrators of Oracle Linux. It describes potential issues and the corresponding workarounds you may encounter while using Oracle Linux. Oracle recommends that you read this document before installing or upgrading Oracle Linux.

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## Preface

The *Oracle Linux Release Notes* provides a summary of the new features, changes, and fixed and known issues in Oracle Linux Release 6 Update 5.

## Audience

This document is written for system administrators who want to install or update Oracle Linux. It is assumed that readers have a general understanding of the Linux operating system.

## Document Organization

The document is organized as follows:

- [Chapter 1, \*New Features and Changes\*](#) contains a summary of the new features and changes in this release.
- [Chapter 2, \*Fixed and Known Issues\*](#) contains details of the fixed and known issues with the software.
- [Chapter 3, \*Upgrading to Oracle Linux 6 Update 5\*](#) contains information about how to install updates on your system.

## Related Documents

The documentation for this product is available at:

[Oracle® Linux Documentation](#)

## Conventions

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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# Chapter 1 New Features and Changes

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This chapter describes the new features that are introduced by Oracle Linux 6 Update 5.

## 1.1 Supported Kernels

Oracle Linux 6 Update 5 ships with three sets of kernel packages:

- Unbreakable Enterprise Kernel Release 2 ([kernel-uek-2.6.39-400.211.1.el6uek](#)) for i386
- Unbreakable Enterprise Kernel Release 3 ([kernel-uek-3.8.13-16.2.1.el6uek](#)) for x86-64
- Red Hat Compatible Kernel ([kernel-2.6.32-431.el6](#)) for i386 and x86-64

By default, both the Unbreakable Enterprise Kernel and the Red Hat Compatible Kernel for the specific architecture (i386 or x86-64) are installed and the system boots the Unbreakable Enterprise Kernel.

The ISO image for Oracle Linux 6 Update 5 for i386 includes the Red Hat Compatible Kernel and the Unbreakable Enterprise Kernel Release 2 but not the Unbreakable Enterprise Kernel Release 3, which does not support i386.

The ISO image for Oracle Linux 6 Update 5 for x86-64 includes the Red Hat Compatible Kernel and the Unbreakable Enterprise Kernel Release 3 but not the Unbreakable Enterprise Kernel Release 2.

To make your system boot the Red Hat Compatible Kernel by default:

1. Edit `/etc/grub.conf` and change the value of the `default` parameter to indicate the Red Hat Compatible Kernel. (Each entry for a bootable kernel in the file starts with a `title` definition. The entries are effectively numbered from 0 upwards, where 0 corresponds to the first entry in the file, 1 to the second entry, and so on. To view the GRUB manual, use the `info grub` command.)
2. Edit `/etc/sysconfig/kernel` and change the setting for the default kernel package type from `DEFAULTKERNEL=kernel-uek` to `DEFAULTKERNEL=kernel`.

## 1.2 Unbreakable Enterprise Kernel Release 2

The Unbreakable Enterprise Kernel Release 2 (UEK R2) is based on the upstream kernel 3.0.36 stable source tree.

The Unbreakable Enterprise Kernel supports a wide range of hardware and devices. In close cooperation with hardware and storage vendors, a number of device drivers have been updated by Oracle in the 2.6.39-400 kernel. For details, see the following release notes:

- [Oracle Linux Unbreakable Enterprise Kernel Release 2 Quarterly Update 5 Release Notes](#)
- [Oracle Linux Unbreakable Enterprise Kernel Release 2 Quarterly Update 4 Release Notes](#)
- [Oracle Linux Unbreakable Enterprise Kernel Release 2 Quarterly Update 3 Release Notes](#)

## 1.3 Unbreakable Enterprise Kernel Release 3

The Unbreakable Enterprise Kernel Release 3 (UEK R3) is based on the upstream kernel 3.8.13 stable source tree. For more information about UEK R3, see [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 3](#).

A very large number of changes have taken place in mainline Linux between 3.0.x, on which UEK R2 is based, and 3.8.13, on which UEK R3 is based. For details of all these changes, see the kernel change logs that the Linux Kernel Newbies maintain at <https://kernelnewbies.org/LinuxVersions>.

### 1.3.1 Notable New Features of UEK R3

UEK R3 includes the following major improvements over UEK R2:

- Integrated DTrace support in the UEK R3 kernel and user-space tracing of DTrace-enabled applications.
- Device mapper support for an external, read-only device as the origin for a thinly-provisioned volume.
- The `loop` driver provides the same I/O functionality as `dm-nfs` by extending the AIO interface to perform direct I/O. To create the loopback device, use the `losetup` command instead of `dmsetup`. The `dm-nfs` module is not provided with UEK R3.
- Btrfs `send` and `receive` subcommands allow you to record the differences between two subvolumes, which can either be snapshots of the same subvolume or parent and child subvolumes.
- Btrfs quota groups (`qgroups`) allow you to set different size limits for a volume and its subvolumes.
- Btrfs supports replacing devices without unmounting or otherwise disrupting access to the file system.
- Ext4 quotas are enabled as soon as the file system is mounted.
- TCP controlled delay management (*CoDel*) is a new active queue management algorithm that is designed to handle excessive buffering across a network connection (*bufferbloat*). The algorithm is based on for how long packets are buffered in the queue rather than the size of the queue. If the minimum queuing time rises above a threshold value, the algorithm discards packets and reduces the transmission rate of TCP.
- TCP connection repair implements process checkpointing and restart, which allows a TCP connection to be stopped on one host and restarted on another host. Container virtualization can use this feature to move a network connection between hosts.
- TCP and STCP early retransmit allows fast retransmission (under certain conditions) to reduce the number of duplicate acknowledgements.
- TCP fast open (TFO) can speed up the opening of successive TCP connections between two endpoints by eliminating one round time trip (RTT) from some TCP transactions.

- The TCP small queue algorithm is another mechanism intended to help deal with bufferbloat. The algorithm limits the amount of data that can be queued for transmission by a socket.
- The secure computing mode feature (*seccomp*) is a simple sandbox mechanism that, in strict mode, allows a thread to transition to a state where it cannot make any system calls except from a very restricted set (`_exit()`, `read()`, `sigreturn()`, and `write()`) and it can only use file descriptors that were already open. In filter mode, a thread can specify an arbitrary filter of permitted systems calls that would be forbidden in strict mode. Access to this feature is by using the `prctl()` system call. For more information, see the `prctl(2)` manual page.
- The OpenFabrics Enterprise Distribution (OFED) 2.0 stack supports the following protocols:
  - SCSI RDMA Protocol (SRP) enables access to remote SCSI devices via remote direct memory access (RDMA)
  - iSCSI Extensions for remote direct memory access (iSER) provide access to iSCSI storage devices
  - Reliable Datagram Sockets (RDS) is a high-performance, low-latency, reliable connectionless protocol for datagram delivery
  - Sockets Direct Protocol (SDP) supports stream sockets for RDMA network fabrics
  - Ethernet over InfiniBand (EoIB)
  - IP encapsulation over InfiniBand (IPoIB)
  - Ethernet tunneling over InfiniBand (eIPoIB)

The OFED 2.0 stack also supports the following RDS features:

- Async Send (AS)
  - Quality of Service (QoS)
  - Automatic Path Migration (APM)
  - Active Bonding (AB)
  - Shared Request Queue (SRQ)
  - Netfilter (NF)
- Paravirtualization support has been enabled for Oracle Linux guests on Windows Server 2008 Hyper-V or Windows Server 2008 R2 Hyper-V.
  - The Virtual Extensible LAN (VXLAN) tunneling protocol overlays a virtual network on an existing Layer 3 infrastructure to allow the transfer of Layer 2 Ethernet packets over UDP. This feature is intended for use by a virtual network infrastructure in a virtualized environment. Use cases include virtual machine migration and software-defined networking (SDN).



#### Note

The kernel version in UEK R3 is based on the mainline Linux kernel version 3.8.13. Low-level system utilities that expect the kernel version to start with 2.6 can run without change if they use the `UNAME26` personality (for example, by using the `uname26` wrapper utility, which is available in the `uname26` package).

For more information about the new functionality that UEK R3 provides, see [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 3](#).

## 1.4 FUSE Mount Option

The FUSE module in both UEK R2 and UEK R3 has been enhanced to improve scalability of application throughput on NUMA systems as the number of threads or processes that are accessing FUSE-based file systems increases. To select the new code paths, specify the `numa` mount option when mounting FUSE-based file systems on NUMA systems. This feature is available in UEK R2 from 2.6.39-400.107.0 onwards and in all versions of UEK R3.

## 1.5 Notable New Security Features

The following notable security features are included in this update:

- Applications such as Java and OpenSSL are now able to share a cryptographic data store that crypto toolkits can use for processing trusted certificates.
- Smartcard authentication support in a larger number of application subsystems for single sign on (SSO).
- Updated version of OpenSCAP to comply with the certification requirements of NIST SCAP 1.2.
- Updated Transport Layer Security (TLS 1.2) support.

## 1.6 Technology Preview Features

Technology Preview features are still under development but are made available for testing and evaluation purposes and to give the features wider exposure. These features are not supported under Oracle Linux support subscriptions and are not suitable for production use.

The following Technology Preview features are currently not supported under Oracle Linux 6 and might not be functionally complete:

- FS-Cache
- `fsfreeze`
- IPv6 support in IPVS
- LVM API
- LVM RAID support
- Matahari
- Open multicast ping (`omping`)
- System Information Gatherer and Reporter (SIGAR)
- Trusted Platform Module (TPM)
- Trusted Boot
- `vios-proxy`

### 1.6.1 Technology Preview Features in UEK R2

The following technology preview features are provided with UEK R2:

- **DTrace** (Oracle Linux 6 and x86-64 only)

DTrace is a comprehensive dynamic tracing framework that was initially developed for the Oracle Solaris operating system and which is being ported to Linux by Oracle. DTrace provides a powerful infrastructure to permit administrators, developers, and service personnel to concisely answer arbitrary questions about the behavior of the operating system and user programs in real time. DTrace feature previews are published as a separate set of kernel packages in UEK R2.

DTrace support is integrated with the kernel in the UEK R3 distribution, where it is available as a supported feature for subscribers to ULN.

- **Distributed Replicated Block Device** (Oracle Linux 6 only)

Distributed Replicated Block Device (DRBD) shared-nothing, synchronously replicated block device (*RAID1 over network*), designed to serve as a building block for high availability (HA) clusters. It requires a cluster manager (for example, pacemaker) to implement automatic failover.

- **Kernel module signing facility**

Applies cryptographic signature checking to modules on module load, checking the signature against a ring of public keys compiled into the kernel. GPG is used to do the cryptographic work and determines the format of the signature and key data.

The kernel module signing facility is a supported feature in the UEK R3 distribution.

- **Linux Containers** (Oracle Linux 6 and x86-64 only)

Based on the Linux cgroups and name spaces functionality, Linux Containers (LXC) allow you to safely and securely run multiple applications or instances of an operating system on a single host without risking them interfering with each other. Containers are lightweight and resource-friendly, which saves both rack space and power. In order to get started with containers, you need to install the [lxc](#) package, which is included in the package repository of the Unbreakable Enterprise Kernel.

LXC is a supported feature in the UEK R3 distribution.

- **Transcendent memory**

Transcendent Memory (tmem) provides a new approach for improving the utilization of physical memory in a virtualized environment by claiming underutilized memory in a system and making it available where it is most needed. From the perspective of an operating system, tmem is fast pseudo-RAM of indeterminate and varying size that is useful primarily when real RAM is in short supply. To learn more about this technology and its use cases, see the Transcendent Memory project page on [oss.oracle.com](https://oss.oracle.com/projects/tmem/): <https://oss.oracle.com/projects/tmem/>

## 1.6.2 Technology Preview Features in UEK R3

The following technology preview features are provided with UEK R3:

- **Distributed Replicated Block Device**

Distributed Replicated Block Device (DRBD) shared-nothing, synchronously replicated block device (*RAID1 over network*), designed to serve as a building block for high availability (HA) clusters. It requires a cluster manager (for example, pacemaker) to implement automatic failover.

- **Transcendent memory**

Transcendent Memory (tmem) provides a new approach for improving the utilization of physical memory in a virtualized environment by claiming underutilized memory in a system and making it available where it is most needed. From the perspective of an operating system, tmem is fast pseudo-RAM of indeterminate and varying size that is useful primarily when real RAM is in short supply. To learn more about this technology and its use cases, see the Transcendent Memory project page on [oss.oracle.com](https://oss.oracle.com/projects/tmem/): <https://oss.oracle.com/projects/tmem/>

### 1.6.3 Technology Preview Features in RHCK

The following Technology Preview features are available when running the Red Hat Compatible Kernel (RHCK):

- Btrfs file system
- Closed Process Group (CPG) API for inter-node locking
- Corosync redundant ring with autorecovery
- `corosync-cpgtool` dual-ring configuration
- Cross Realm Kerberos Trust Functionality (relies on samba4 client library)
- DIF/DIX support for SCSI
- `fence_ipmilan` agent diagnostic pulse
- `fence_sanlock` agent for `luci`
- FUSE (Filesystem in Userspace)
- `keepalived` daemon for network load balancing and high availability
- Kerberos v1.10 DIR cache storage type to handle TGTs for multiple KDCs
- Kernel Media support
- `libqb` library for high performance logging, tracing, inter-process communication, and polling by Pacemaker
- Linux Containers (LXC)
- LVM metadata dynamic aggregation (using `lvmetad` daemon)
- LVM support for thinly-provisioned snapshots (single system only)
- LVM support for thinly-provisioned logical volumes (single system only)
- Pacemaker high-availability cluster manager
- `pcs` utility for cluster configuration and management
- Precision Time Protocol (PTP) `linuxptp` implementation
- PTP kernel driver support
- QFQ queuing discipline

- `rgmanager` support for disabling via `/etc/cluster.conf`
- Thin-provisioning and scalable snapshots
- `trousers` and `tpm-tools` packages that support Trusted Platform Module (TPM) hardware



**Note**

Btrfs and FUSE are supported features in the UEK R2 and UEK R3 distributions.

LXC is a supported feature in the UEK R3 distribution.





## Chapter 2 Fixed and Known Issues

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This chapter describes the fixed and known issues for Oracle Linux 6 Update 5.



#### Important

Run the `yum update` command regularly to ensure that the latest bug fixes and security errata are installed on your system.

For details of the fixed and known issues with the Unbreakable Enterprise Kernel Release 3, see [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 3](#).

For details of the fixed and known issues with the Unbreakable Enterprise Kernel Release 2 Quarterly Update 5, see the [Oracle Linux Unbreakable Enterprise Kernel Release 2 Quarterly Update 5 Release Notes](#).

### 2.1 Fixed Issues

The following major issues are fixed in this update:

#### Kernel Panic with Emulex LPe16XXX and Sun Storage FCoE Adapters

A kernel panic could occur at boot time if an Emulex LPe16XXX FCoE adapter or a Sun Storage version of such an adapter was installed and the `lpfc` driver was not updated to version 0:8.3.7.10.4p or later. The version of the `lpfc` driver provided in this update corrects the issue.

#### X Window System Does Not Run in a PVHVM Guest

If you installed an Oracle Linux 6 Update 5 (x86-64) PVHVM guest with either the Desktop or the Software Development Workstation installation options, the X Window System was not accessible after installation when you booted the guest into run level 5. This problem was seen in OVM 3.0 and later. The workaround was to boot the guest into run level 3 and uninstall the `xorg-x11-drv-cirrus` package before switching to run level 5.

The issue is fixed in `xorg-x11-drv-cirrus-1.5.2-1.el6_4.x86_64.rpm` or later versions of this package. (Bug ID 16280196)

### 2.2 Known Issues

This section describes known issues in this update.

#### Updating Oracle Linux Fails if the kernel-uek Package Cannot Be Updated

By default, the installation of Oracle Linux includes the `dtrace-modules` package for UEK R3. This package requires a specific `kernel-uek` version. However, a `yum update` fails if it cannot update the `kernel-uek` package when the `installonly_limit` of three updates is reached as the `dtrace-`

## Known Issues

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`modules` package does not allow the existing `kernel-uek` packages to be removed. `yum` displays an error message similar to the following example:

```
--> Finished Dependency Resolution
Error: Package: kernel-uek-debug-3.8.13-55.1.1.el6uek.x86_64 (public_ol6_UEKR3_latest)
       Requires: kernel-firmware = 3.8.13-55.1.1.el6uek
```

The workaround is to remove any existing `dtrace-modules` packages before updating the `kernel-uek` package, for example:

```
# for package in `rpm -qa | grep dtrace-modules`; do yum remove -y $package; done
```

When you have removed all `dtrace-modules` packages, you can update Oracle Linux, including the UEK R3 kernel. If you want to use DTrace with UEK R3, reinstall the `dtrace-modules` package for the current kernel:

```
# yum install dtrace-modules-`uname -r`
```

(Bug ID 21669543)

## Booting UEK R2 as a 32-bit PVHVM Guest

When booting UEK R2 as a 32-bit PVHVM guest, you can safely ignore the kernel message `register_vcpu_info failed: err=-38`, which might be displayed. (Bug ID 13713774)

## Broadcom NetXtreme II 10Gbps Network Adapter Driver

When using the `bnx2x` driver in a bridge, disable Transparent Packet Aggregation (TPA) by including `options bnx2x disable_tpa=1` in `/etc/modprobe.conf`. (Bug ID 14626070)

## Btrfs File System Issues

For a description of the known issues for btrfs with Unbreakable Enterprise Kernel Release 3, see [Unbreakable Enterprise Kernel: Release Notes for Unbreakable Enterprise Kernel Release 3](#).

For a description of the known issues for btrfs with Unbreakable Enterprise Kernel Release 2 Quarterly Update 5, see the [Oracle Linux Unbreakable Enterprise Kernel Release 2 Quarterly Update 5 Release Notes](#).

## Console Appears to Hang when Booting

On some hardware, the console may appear to hang during the boot process after starting `udev`. However, the system does boot properly and is accessible. A workaround to this problem is to add `nomodeset` as a kernel boot parameter in `/etc/grub.conf`. (Bug ID 10094052, 13485328)

## Default I/O Scheduler

For the Unbreakable Enterprise Kernel, `deadline` is the default I/O scheduler.

For the Red Hat Compatible Kernel, `cfq` is the default I/O scheduler.

## Default NFS Mount Options

The default NFS mount option has changed to NFS v4. To mount an NFS v3 volume (the default in Oracle Linux 5), use the following mount options:

```
-o vers=3,mountproto=tcp
```

## Default Reverse Path Filtering Mode Affects Certain Oracle Products

Oracle Linux 6 defaults to reverse path filtering in strict mode. Some Oracle products and network storage devices work more reliably with reverse path filtering in loose mode. To enable loose mode, issue the following command (where *iface* is the network interface, for example, *eth1*).

```
# sysctl net.ipv4.conf.iface.rp_filter=2
```

The default setting is 1 for strict mode. (Bug ID 10649976)

## DTrace Issues

- If you want to use the DTrace-enabled version of the UEK R2 kernel, subscribe your system to the Dtrace for Oracle Linux 6 (x86\_64) - Latest channel ([ol6\\_x86\\_64\\_Dtrace\\_latest](#)) but not to the Oracle Linux 6 Dtrace Userspace Tools (x86\_64) - Latest channel ([ol6\\_x86\\_64\\_Dtrace\\_userspace\\_latest](#)). The [ol6\\_x86\\_64\\_Dtrace\\_userspace\\_latest](#) channel is provided for use with UEK R3 and installs that kernel as a dependency.
- Using `kill -9` to terminate `dtrace` can leave breakpoints outstanding in processes being traced, which might sooner or later kill them.
- Argument declarations for probe definitions cannot be declared with derived types such as `enum`, `struct`, or `union`.
- The following compiler warning can be ignored for probe definition arguments of type `string` (which is a D type but not a C type):

```
provider_def.h:line#: warning: parameter names (without types) in function declaration
```

- The `vtimestamp()` function does not return a correct value. (Bug ID 17741477)

## Enabling FIPS Mode

To make an Oracle Linux Release 6 Update 5 system compliant with Federal Information Processing Standard (FIPS) Publication 140-2, perform the following steps:

1. Install the `dracut-fips` package:

```
# yum install dracut-fips
```

2. Recreate the `initramfs` file system:

```
# dracut -f
```

3. Identify either the device file path (*device*) under `/dev` of your system's boot device or its UUID (*uuid*) by using `ls -l` to examine the entries under `/dev/disk/by-uuid`.
4. Add either a `boot=device` entry or a `boot=UUID=uuid` entry for the boot device to the `kernel` command line in `/etc/grub.conf`.
5. Add a `fips=1` entry to the `kernel` command line in `/etc/grub.conf` to specify strict FIPS compliance.
6. Disable prelinking by setting `PRELINKING=no` in `/etc/sysconfig/prelink`.

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7. Remove all existing prelinking from binaries and libraries:

```
# prelink -ua
```

8. Install the `openssh-server-fips` and `openssh-client-fips` packages and their dependent packages:

```
# yum install openssh-server-fips openssh-client-fips
```

9. Shut down and reboot the system.



### Note

If you specify `fips=1` on the kernel command line but omit a valid `boot=` entry, the system crashes because it cannot locate the kernel's `.hmac` file.

If you do not disable and remove all prelinking, users cannot log in and `/usr/sbin/sshd` does not start.

(Bug ID 17759117, 17776875)

## Error message Following First Reboot on an HP ProLiant Server

You might see a message similar to the following during the first reboot of an HP ProLiant server:

```
[Firmware Bug]: the BIOS has corrupted hw-PMU resources (MSR 186 is 43003c)
```

You can safely ignore this message. The functionality and performance of the operating system and the server are not affected.

## Incorrect Package Count

Selecting all packages in certain groups during installation might not show the correct package count. (Bug ID 11684244)

## iTCO\_wdt Errors

If you see the following boot-time `dmesg` error with the UEK R2:

```
iTCO_wdt: failed to reset NO_REBOOT flag, device disabled by hardware/BIOS
```

add the line `blacklist iTCO_wdt` to `/etc/modprobe.d/blacklist-watchdog`.

## Journal Corruption in Virtualized Systems

On virtualized systems that are built on Xen version 3, including all releases of Oracle VM 2 including 2.2.2 and 2.2.3, disk synchronization requests for ext3 and ext4 file systems result in journal corruption with kernel messages similar to the following being logged:

```
blkfront: barrier: empty write xvda op failed  
blkfront: xvda: barrier or flush: disabled
```

In addition, journal failures such as the following might be reported:

```
Aborting journal on device xvda1
```

The workaround is to add the mount option `barrier=0` to all ext3 and ext4 file systems in the guest VM before upgrading to UEK R3. For example, you would change a mount entry such as:

## Known Issues

---

```
UUID=4e4287b1-87dc-47a8-b69a-075c7579eaf1 / ext3 defaults 1 1
```

so that it reads:

```
UUID=4e4287b1-87dc-47a8-b69a-075c7579eaf1 / ext3 defaults,barrier=0 1 1
```

This issue does not apply to Xen 4 based systems, such as Oracle VM 3. (Bug ID 17310816, 17313428)

## Kdump Service Configuration

By default, the Kernel Dump service (Kdump) is enabled but not configured. The following boot-time message indicates that Kdump needs to be configured.

```
kdump: No crashkernel parameter specified for running kernel
```

To prevent this message from being displayed, use the Kernel Dump Configuration GUI ([system-config-kdump](#)) to configure or disable Kdump. (Bug ID 16242031)

When configuring a [crashkernel](#) setting for the UEK, only standard settings such as [crashkernel=128M@32M](#) are supported. Settings such as [crashkernel=auto](#), which can be used with the Red Hat Compatible Kernel, are not supported by the UEK and cause Kdump to fail to start. (Bug ID 13495212)

## Linux Containers 32-bit Support

The Linux Containers package ([lxc](#)) is not available for the i386 architecture.

## Linux Containers Interoperability with SELinux

The correct operation of containers might require that you completely disable SELinux on the host system. For example, SELinux can interfere with container operation under the following conditions:

- Running the [halt](#) or [shutdown](#) command from inside the container hangs the container or results in a [permission denied](#) error. (An alternate workaround is to use the [init 0](#) command from inside the container to shut it down.)
- Setting a password inside the container results in a [permission denied](#) error, even when run as [root](#).
- You want to allow [ssh](#) logins to the container. [ssh](#) logins are possible with SELinux enabled if you install the [lxc-0.9.0-2.0.5](#) package (or later version of this package).

To disable SELinux on the host:

1. Edit the configuration file for SELinux, [/etc/selinux/config](#) and set the value of the [SELINUX](#) directive to [disabled](#).
2. Shut down and reboot the host system.

(Bug ID 15967411)

## Linux Containers Default Configuration Location

The default location for a container's configuration has changed from [/etc/lxc/name](#) to [/container/name](#) in [lxc 0.8.0](#) onward.

## Known Issues

To start a container that you created with a previous update of Oracle Linux, specify the `-f` option to `lxc-start`, for example:

```
# lxc-start -n ol6u3 -f /etc/lxc/ol6u3/config
```

To convert an existing container to use the new location:

1. Move the container's configuration directory to `/container/name`:

```
# mv /etc/lxc/name /container
```

2. Edit the `/container/name/config` file and change the values of any `lxc.rootfs` and `lxc.mount` parameters to refer to `/container` instead of `/etc/lxc`.

For example, if the `config` file contained the following entries:

```
lxc.rootfs = /etc/lxc/example/rootfs
lxc.mount.entry=/lib /etc/lxc/example/rootfs/lib none ro,bind 0 0
lxc.mount.entry=/usr/lib /etc/lxc/example/rootfs/usr/lib none ro,bind 0 0
lxc.mount.entry=/lib64 /etc/lxc/example/rootfs/lib64 none ro,bind 0 0
lxc.mount.entry=/usr/lib64 /etc/lxc/example/rootfs/usr/lib64 none ro,bind 0 0
```

you would change these entries to read:

```
lxc.rootfs = /container/example/rootfs
lxc.mount.entry=/lib /container/example/rootfs/lib none ro,bind 0 0
lxc.mount.entry=/usr/lib /container/example/rootfs/usr/lib none ro,bind 0 0
lxc.mount.entry=/lib64 /container/example/rootfs/lib64 none ro,bind 0 0
lxc.mount.entry=/usr/lib64 /container/example/rootfs/usr/lib64 none ro,bind 0 0
```

After converting the container, you do not need to specify the `-f` option to `lxc-start`. (Bug ID 15967411)

## Mellanox ConnectX Drivers

The Mellanox ConnectX core, Ethernet, and InfiniBand drivers are supported only for the x86-64 architecture. (Bug ID 16228063)

## mlx4\_core Conflicts Between the mlnx\_en and ofa Packages

Both the `mlnx_en` and `ofa` packages contain `mlx4_core`. Only one of these packages should be installed. Attempting to install both packages on a single server results in a package conflict error. If you have a Mellanox Ethernet Controller, install `mlnx_en`. If you have a Mellanox InfiniBand Controller, install `ofa`. If your system has both controllers, use `ofa` as it supports both the Ethernet and InfiniBand controllers.

## Oracle Clusterware Fails to Start on ASM Storage with SELinux Enabled

If the SELinux policy packages have not been updated recently, Cluster Ready Services (CRS) might fail to start with messages such as the following in `/var/log/messages`:

```
SELinux is preventing /usr/lib/oracleasm/oracleasm-instantiate-disk from
associate access on the filesystem DATA1.
```

The solution is to upgrade the `selinux-policy` and `selinux-policy-targeted` packages to ensure that you are running a version no earlier than 3.7.195.0.1.el6\_4.5:

```
# yum update 'selinux-policy*'
```

After upgrading the packages, reboot the system. (Bug ID 13925445)

## Oracle RDBMS Server 11gR2 Preinstall Settings Not Visible After Installation

On an x86-64 system, if you install the `pam.i386` package either manually or via a package dependency, and the `oracle-rdbms-server-11gR2-preinstall` package is also selected, this overwrites the settings for Oracle Database in `/etc/security/limits.conf`. This is most likely to occur during a Kickstart-automated installation that includes non-standard packages. To restore the settings, run the `oracle-rdbms-server-11gR2-preinstall-verify` script. (Bug ID 14212822)

## Oracle VM 3.0 Guests Crash During Oracle Database Installation

PVHVM guests on Oracle VM 3.0 crash during Oracle Database installation if the value of the maximum memory (`maxmem`) parameter set for the guest is greater than the amount specified at boot time (`memory`). To avoid this issue, ensure that the values of the `maxmem` and `memory` parameters are the same. This issue has been resolved in Oracle VM 3.1.1. (Bug ID 13396734)

## Paravirtualized Drivers in a Hardware Virtualized Guest

The Unbreakable Enterprise Kernel adds support for PV drivers in a HVM guest (PVHVM) on Oracle VM. The default is to present only PV drivers when running in an HVM guest. To run `kernel-uek` fully hardware virtualized, including the drivers, add the parameter `xen_emul_unplug=never` to the boot parameters in `/etc/grub.conf`, for example:

```
kernel /vmlinuz-2.6.32-300.2.1.el6uek ro root=/dev/VolGroup00/LogVol00 xen_emul_unplug=never
```

Adding this parameter makes the kernel also present the emulated drivers as previously (for example, the `8139cp` network driver).

## Post-Installation Anaconda Errors

In certain cases, after successfully completing installation and rebooting the system, it is possible for errors such as the following to occur:

```
Error in sys.excepthook:
Traceback (most recent call last):
  File "/usr/lib/python2.6/site-packages/meh/handler.py", line 161, in
(lambda)
  File "/usr/lib/anaconda/exception.py", line 44, in handleException
  File "/usr/lib/python2.6/site-packages/meh/handler.py", line 106, in
handleException
  File "/usr/lib/anaconda/gui.py", line 1169, in mainExceptionWindow
ImportError: No module named ui.gui
```

```
14:05:55 CRITICAL: anaconda 11.5.0.47 exception report
Traceback (most recent call first):
  File "/usr/lib64/python2.6/site-packages/gtk-2.0/gtk/_lazyutils.py", line 32,
in __
getattr__
  File "/usr/lib/anaconda/gui.py", line 1453, in keyRelease
    if ((event.keyval == gtk.keysyms.KP_Delete
ImportError: No module named keysyms
```

These errors can safely be ignored.

## RDMA Does Not Load the `mlx4_ib` Module

If you enable the OFED stack and the RDMA service but the version of the RDMA package is lower than `rdma-3.10-3.0.2.el6`, the RDMA service does not load the `mlx4_ib` module automatically.



To configure the RDMA service to load the `mlx4_ib` module at boot time:

1. Edit `/etc/rdma/rdma.conf` and set the entry `MLX4_LOAD=yes` in this file.
2. To make the change take effect, restart the RDMA service or reboot the system.

## Receive Packet Steering Errors

Certain network operations that utilize receive packet steering could cause errors on the system. (Bug ID 11071685)

## `sched_yield()` Settings for the Completely Fair Scheduler

For the Unbreakable Enterprise Kernel, the default setting is `kernel.sched_compat_yield=1`.

For the Red Hat Compatible Kernel, the default setting is `kernel.sched_compat_yield=0`.

## Setting the Serial Console in a Hardware Virtualized Guest

To set the serial console in a hardware virtualized guest, use following settings in the guest:

- Add the following parameters to the kernel boot line in `/etc/grub.conf`:

```
console=tty0 console=ttyS0,57600n8
```

- Add the following line to `/etc/securetty`:

```
ttyS0
```

## Spurious Udev Messages During Failed Path Restoration

If failed paths are restored in a multipath configuration, you might see `udevdm-work` error messages in `/var/log/messages`. The failed paths are restored despite these messages, which you can ignore. (Bug ID 11682171)

## Support for Large Memory 32-bit Systems

Releases of Oracle Linux prior to Oracle Linux 5 supplied a *hugemem* kernel to allow a system to address up to 64 GB of memory in 32-bit mode. The *hugemem* kernel is no longer available in Oracle Linux 5 and later releases.

The Unbreakable Enterprise Kernel (UEK) supports a maximum of 16 GB of memory for 32-bit kernels on bare metal and hardware virtualized machine (HVM) systems, and 8 GB for fully paravirtualized machine (PVM) systems. 32-bit PVM guest operating systems must be located in the first 128 GB of physical memory on the host.

The Red Hat Compatible Kernel (RHCK) has the same limitations, except that PVM systems can have up to 16 GB of memory. The limitation of 8 GB for PVM on UEK was chosen for reasons of reliability.

A 32-bit system uses the PAE (physical address extension) memory feature to map physical memory beyond 4 GB into the 32-bit address space that is available to each process. A 64-bit system can address memory beyond 4 GB without requiring an extra layer of memory abstraction.

Oracle Linux on x86-64 includes 32-bit libraries, which allow applications built for both 64-bit and 32-bit Linux to run on the same system. This capability provides scalability to virtually unlimited memory sizes,



while retaining the ability to run 32-bit applications. Oracle recommends this configuration for any system with more than 4 GB of memory. (Bug ID 16974301)

## udev Message

A message similar to the following might be recorded in `dmesg` or `/var/log/messages` at boot time:

```
udev (pid): /proc/pid/oom_adj is deprecated, please use /proc/pid/oom_score_adj instead.
```

The `udev` process uses the deprecated `oom_adj` kernel interface to prevent it from being killed if the system runs short of memory. You can safely ignore the message as the action still succeeds. To prevent the message from occurring, install the package `udev-147-2.42.el6.arch.rpm` or higher. (Bug ID 13655071, 13712009)

## Unable to Register Oracle Linux Guest with ULN

Registering an Oracle Linux guest running under Virtual Box with the Unbreakable Linux Network (ULN) might fail with a server communication error. The workaround is to run the following command as `root` on the guest:

```
# echo "uuid=`uuidgen -t`" >> /etc/sysconfig/rhn/up2date
```

You can then run `uln_register` again. (Bug ID 14696776)

## Unable to Register with ULN After First Reboot

Following the first reboot after installing Oracle Linux 6, you are prompted to register your system with ULN. If you did not configure your network during the installation, the registration process to ULN cannot succeed. To register your system, log in as `root`, configure the system's network manually, and run `uln_register`.

## xguest Package Not Installable with SELinux Disabled

If the `xguest` package fails to install with a `PREIN` script error, enable SELinux by setting `SELINUX=enforcing` in `/etc/selinux/config`, reboot the system, and reinstall the `xguest` package. (Bug ID 13495388)



## Chapter 3 Upgrading to Oracle Linux 6 Update 5

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This chapter describes how to upgrade your system to Oracle Linux 6 Update 5.

### 3.1 Supported Upgrade Paths

On i386 systems, upgrading from Oracle Linux 6 GA, Update 1, Update 2, Update 3, or Update 4 is supported for the Unbreakable Enterprise Kernel Release 2 and the Red Hat Compatible Kernel. The Unbreakable Enterprise Kernel Release 3 is not supported on the i386 architecture.

On x86-64 systems, upgrading from Oracle Linux 6 GA, Update 1, Update 2, Update 3, or Update 4 is supported for the Unbreakable Enterprise Kernel Release 2, the Unbreakable Enterprise Kernel Release 3, and the Red Hat Compatible Kernel.

Upgrading from a beta release is not supported.

In-place upgrading from a major version of Oracle Linux 5 or earlier is not supported. Although Anaconda provides an option to perform an upgrade, fresh installation is strongly recommended.

If you have an Oracle Linux 5.8 system, you can use new features in the Unbreakable Enterprise Kernel Release 2 without upgrading to Oracle Linux 6 as Oracle Linux 5.8 includes the Unbreakable Enterprise Kernel Release 2. You cannot use features from the Unbreakable Enterprise Kernel Release 3 as this kernel is not available for Oracle Linux 5.8.

### 3.2 Obtaining Oracle Linux 6 Update 5 Packages

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

#### 3.2.1 About the Unbreakable Linux Network

You have the option of registering a system with ULN when you install Oracle Linux 6 on a system. To register with ULN after installation, use the `uln_register` command.

To obtain Oracle Linux updates from ULN, you must have an Oracle Linux support subscription. For more information about ULN, see <https://linux.oracle.com>.

During ULN registration, your server is automatically registered with the latest channels for the base repository, the Unbreakable Enterprise Kernel Release 2, and Unbreakable Enterprise Kernel Release 3 (x86-64 only).

If you upgrade an x86-64 system and want to install the Unbreakable Enterprise Kernel Release 3, you must manually subscribe the system to the Unbreakable Enterprise Kernel Release 3 latest channel and unsubscribe the server from the Unbreakable Enterprise Kernel Release 2 latest channel before running `yum update`.

ULN also provides channels for Oracle-specific software packages such as Oracle's `ASMLib` user-space package and the Oracle Instant Client. To enable access to these packages, log in to ULN and subscribe your system to the Oracle Software channel.

### 3.2.2 About Oracle Yum Server

Oracle also provides all errata and updates for Oracle Linux via the Oracle Yum Server service, which includes updates to the base distribution, but does not include Oracle-specific software. You do not require an Oracle Linux support subscription to use this service. For more information on how to obtain updates from Oracle Yum Server, see <https://yum.oracle.com>.

By default, all new installations of Oracle Linux 6 Update 5 are automatically configured to use the Oracle Yum Server update service. If you subsequently register the system with ULN, the Oracle Yum Server service is automatically disabled.

The following entries in the `/etc/yum.repos.d/public-yum-ol6.repo` file enable you to download the latest available packages for Oracle Linux 6 and the Unbreakable Enterprise Kernel Release 2:

```
[ol6_latest]
name=Oracle Linux $releasever Latest ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/latest/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1

[ol6_UEK_latest]
name=Latest Unbreakable Enterprise Kernel for Oracle Linux $releasever ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/UEK/latest/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1
```

The following entries in the `/etc/yum.repos.d/public-yum-ol6.repo` file enable you to download the latest available packages for Oracle Linux 6 and the Unbreakable Enterprise Kernel Release 3:

```
[ol6_latest]
name=Oracle Linux $releasever Latest ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/latest/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1

[ol6_UEKR3_latest]
name=Latest Unbreakable Enterprise Kernel Release 3 for Oracle Linux $releasever ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/UEKR3/latest/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1
```



#### Note

The `ol6_UEKR3_latest` repository is not available for i386 systems.

If you want to install packages from the playground or OFED repositories, add the following entries and enable them by setting the value of `enabled` to 1:

```
[ol6_playground_latest]
name=Latest mainline stable kernel for Oracle Linux 6 ($basearch) - Unsupported
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/playground/latest/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=0

[ol6_ofed_U EK]
name=OFED supporting tool packages for Unbreakable Enterprise Kernel on Oracle Linux 6 ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/ofed_U EK/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=0
```



#### Note

On a freshly installed Oracle Linux 6 Update 5 system, the `public-yum-ol6.repo` file uses the variables `uek` and `uekr3` to enable or disable `ol6_U EK_latest` and `ol6_U EK3_latest`. For an i386 system, the value of `uek` is set to 1 in `/etc/yum/vars/uek` to enable `ol6_U EK_latest` and the value of `uekr3` is set to 0 in `/etc/yum/vars/uekr3` to disable `ol6_U EK3_latest`. For an x86-64 system, the value of `uekr3` is set to 1 in `/etc/yum/vars/uekr3` to enable `ol6_U EK3_latest` and the value of `uek` is set to 0 in `/etc/yum/vars/uek` to disable `ol6_U EK_latest`.

If you subsequently register the system with ULN, the repository entries in `public-yum-ol6.repo` are disabled and the values of both `uek` and `uekr3` are set to 0.

## 3.2.3 About Oracle Linux Installation Media

Oracle Linux 6 Update 5 contains three distinct repository sources on the installation media for the Unbreakable Enterprise Kernel Release 2, the Unbreakable Enterprise Kernel Release 3, and the Red Hat Compatible Kernel.

To configure `yum` to use both an Unbreakable Enterprise Kernel Release 2 and the Red Hat Compatible Kernel repositories from an ISO image of the installation media, create the file `/etc/yum.repos.d/Media.repo` containing entries similar to the following:

```
[ol6_base_media]
name=Oracle Linux 6 Update 5 Base Media
baseurl=file:///media/ISOimage/Server
gpgkey=file:///media/ISOimage/RPM-GPG-KEY
gpgcheck=1
enabled=1

[ol6_uek_media]
name=Oracle Linux 6 Update 5 UEK Media
baseurl=file:///media/ISOimage/UEK2
gpgkey=file:///media/ISOimage/RPM-GPG-KEY
gpgcheck=1
enabled=1
```

To configure `yum` to use both an Unbreakable Enterprise Kernel Release 3 and the Red Hat Compatible Kernel repositories from an ISO image of the installation media, create the file `/etc/yum.repos.d/Media.repo` containing entries similar to the following:

```
[ol6_base_media]
name=Oracle Linux 6 Update 5 Base Media
baseurl=file:///media/ISOimage/Server
```

```
gpgkey=file:///media/ISOimage/RPM-GPG-KEY
gpgcheck=1
enabled=1

[ol6_uekr3_media]
name=Oracle Linux 6 Update 5 UEK Media
baseurl=file:///media/ISOimage/UEKR3
gpgkey=file:///media/ISOimage/RPM-GPG-KEY
gpgcheck=1
enabled=1
```



#### Note

The `ol6_uekr3_media` repository is not available for i386 systems.

Adjust the value of the `baseurl` and `gpgkey` parameters to match the mount point of the ISO image on your system. If you do not require one of the repositories, set the value of the corresponding `enabled` parameter to 0.

## 3.3 Upgrading the Unbreakable Enterprise Kernel

Oracle Linux 6 Update 5 ships with the latest Unbreakable Enterprise Kernel Release 2 for i386 and Unbreakable Enterprise Kernel Release 3 for x86-64. If you upgrade your system from the installation media, there are four upgrade scenarios:

- If the UEK Release 2 or Release 3 is not currently installed on the system, only the latest Red Hat Compatible Kernel is installed. The UEK R2 or UEK R3 kernel is not installed.
- If UEK R2 is currently installed on an i386 system, the latest version of the UEK R2 kernel is installed.
- If UEK R2 is currently installed on an x86-64 system, the latest version of the UEK R2 kernel is installed unless you enable the UEK R3 repository.
- If UEK R3 is currently installed on an x86-64 system, the latest version of the UEK R3 kernel is installed.

`yum` uses whatever repositories you have configured on your system to upgrade it. You can find the latest UEK R2 packages in the `ol6_i386_UEK_latest` and `ol6_x86_64_UEK_latest` repositories and the latest UEK R3 packages in the `ol6_UEKR3_latest` repository.

If you want to install the latest UEK R2 kernel on an i386 or x86-64 system, subscribe your system to the `ol6_i386_UEK_latest` or `ol6_x86_64_UEK_latest` channel on ULN, or configure the repository in the `/etc/yum.repos.d/public-yum-ol6.repo` file as shown here:

```
[ol6_UEK_latest]
name=Latest Unbreakable Enterprise Kernel for Oracle Linux $releasever ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/UEK/latest/$basearch/
gpgkey=https://yum.oracle.com/RPM-GPG-KEY-oracle-ol6
gpgcheck=1
enabled=1
```

If you want to update an x86-64 system to use the latest UEK R3 kernel, subscribe your system to the `ol6_x86_64_UEKR3_latest` channel on ULN, or configure the repositories in the `/etc/yum.repos.d/public-yum-ol6.repo` file as shown here:

```
[ol6_UEKR3_latest]
name=Latest Unbreakable Enterprise Kernel Release 3 for Oracle Linux $releasever ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/UEKR3/latest/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
```

```
gpgcheck=1
enabled=1
```

## 3.4 Applying the Update

Once you have set up the ULN channels, Oracle Yum Server repositories, or installation media repositories that `yum` should use, you can update all installed packages by running the following command:

```
# yum update
```

This command upgrades your system to Update 5.

You can use the following command to update a specific package:

```
# yum update package
```

For example, to update the Z-shell package (`zsh`), you would enter:

```
# yum update zsh
```

For more information, see the `yum(8)` manual page.





## Appendix A Packages

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The following sections list the packages that have been added to, modified from, or removed from the upstream release, or which have been added to the base release by Oracle.

### A.1 Packages Added to the Upstream Release

The following packages have been added to the upstream release:

- `freerdp`
- `gcc-libraries`
- `glusterfs`
- `mesa-private-llvm`
- `openhpi32`
- `p11-kit`
- `ps_mem`
- `redhat-support-lib-python`
- `redhat-support-tool`
- `snappy`
- `xorg-x11-glamor`

### A.2 Packages Modified from the Upstream Release

The following packages have been modified from the upstream release:

- `abrt`
- `anaconda`
- `autofs`
- `basesystem`
- `bfa-firmware`
- `bind`

- `boost`
- `brlTTY`
- `btrfs-progs`
- `compat-glibc`
- `coreutils`
- `cpuspeed`
- `crash`
- `createrepo`
- `dbus`
- `device-mapper-multipath`
- `dhcp`
- `dracut`
- `e2fsprogs`
- `efax`
- `firefox`
- `firstaidkit`
- `firstboot`
- `fuse`
- `gdm`
- `git`
- `glusterfs`
- `gnome-desktop`
- `grub`
- `grubby`
- `gstalker`
- `httpd`
- `hypervkvpd`
- `initcripts`
- `iptables`
- `irqbalance`

- `iscsi-initiator-utils`
- `java-1.6.0-openjdk`
- `java-1.7.0-openjdk`
- `kabi-whitelists`
- `kabi-yum-plugins`
- `kdeadmin`
- `kdebase`
- `kdebase-workspace`
- `kdelibs`
- `kde-settings`
- `kexec-tools`
- `libitm`
- `libreoffice`
- `libreport`
- `libvirt`
- `libxml2`
- `libxslt`
- `luci`
- `mkbootdisk`
- `module-init-tools`
- `net-snmp`
- `netxen-firmware`
- `nmap`
- `nss`
- `openmpi`
- `openoffice.org`
- `openssl098e`
- `oprofile`
- `PackageKit`
- `pango`

- `pcs`
- `pilot-link`
- `piranha`
- `plymouth`
- `policycoreutils`
- `publican`
- `python-virtinst`
- `ql2400-firmware`
- `ql2500-firmware`
- `qperf`
- `qpidd-cpp`
- `qpidd-qmf`
- `rdma`
- `redhat-bookmarks`
- `redhat-indexhtml`
- `redhat-lsb`
- `redhat-release-server`
- `redhat-rpm-config`
- `rhn-client-tools`
- `rhnlib`
- `rhnsd`
- `rpmdevtools`
- `rsyslog`
- `sanlock`
- `selinux-policy`
- `setroubleshoot`
- `setroubleshoot-plugins`
- `sos`
- `system-config-date`
- `system-config-date-docs`

#### Packages Removed from the Upstream Release

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- `system-config-kickstart`
- `system-config-network`
- `system-config-services`
- `system-config-services-docs`
- `system-config-users-docs`
- `system-icon-theme`
- `systemtap`
- `thunderbird`
- `tog-pegasus`
- `udev`
- `wireshark`
- `xfsdump` (x86-64 only)
- `xfsplogs` (x86-64 only)
- `xkeyboard-config`
- `xsane`
- `xulrunner`
- `yum`
- `yum-rhn-plugin`
- `yum-utils`

Unless otherwise noted, changes relate to branding, trademark usage, or user-interface modifications.

## A.3 Packages Removed from the Upstream Release

The following packages from the upstream release are not included:

- `iprutils`
- `libehca`
- `libica`
- `libreport-plugin-rhtsupport`
- `librtas`
- `libserviceelog`
- `libvpd`

#### Packages Removed from the Upstream Release

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- `lsvpd`
- `openssl-ibmca`
- `powerpc-utils`
- `ppc64-diag`
- `ppc64-utils`
- `publican-redhat`
- `python-rhsm`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-as-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-bn-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-de-DE`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-en-US`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-es-ES`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-fr-FR`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-gu-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-hi-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-it-IT`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-ja-JP`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-kn-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-ko-KR`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-ml-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-mr-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-or-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-pa-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-pt-BR`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-ru-RU`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-si-LK`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-ta-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-te-IN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-zh-CN`
- `Red_Hat_Enterprise_Linux-Release_Notes-6-zh-TW`

- `redhat-logos`
- `redhat-release-notes-6Server`
- `redhat-support-lib-python`
- `redhat-support-tool`
- `s390utils`
- `servicelog`
- `subscription-manager`
- `subscription-manager-migration-data`
- `virt-who`
- `yaboot`

## A.4 Packages Added by Oracle

The following packages have been added to the base release by Oracle:

- `dtrace-modules-3.8.13-16.el6uek` (x86-64 only)
- `kernel-uek` (2.6.39 for i386 and 3.8.13 for x86-64)
- `libdtrace-ctf` (x86-64 only)
- `lxc` (x86-64 only)
- `ocfs2-tools`
- `oracleasm-support`
- `oracle-logos`
- `oraclelinux-release`
- `oraclelinux-release-notes`
- `oracle-rdbms-server-11gR2-preinstall`
- `reflink`
- `uname26` (x86-64 only)

