



Red Hat Enterprise Linux 6

6.6 Release Notes

Release Notes for Red Hat Enterprise Linux 6.6

Edition 6

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Red Hat Customer Content Services

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Abstract

The Release Notes provide high-level coverage of the improvements and additions that have been implemented in Red Hat Enterprise Linux 6.6. For detailed documentation on all changes to Red Hat Enterprise Linux for the 6.6 update, refer to the Technical Notes.

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PREFACE

Red Hat Enterprise Linux minor releases are an aggregation of individual enhancement, security and bug fix errata. The *Red Hat Enterprise Linux 6.6 Release Notes* documents the major changes made to the Red Hat Enterprise Linux 6 operating system and its accompanying applications for this minor release. Detailed notes on changes (that is, bugs fixed, enhancements added, and known issues found) in this minor release are available in the [Technical Notes](#). The Technical Notes document also contains a complete list of all currently available Technology Previews along with packages that provide them.



IMPORTANT

The online *Red Hat Enterprise Linux 6.6 Release Notes* which are located online [here](#), are to be considered the definitive, up-to-date version. Customers with questions about the release are advised to consult the online *Release* and *Technical Notes* for their version of Red Hat Enterprise Linux.

Capabilities and limits of Red Hat Enterprise Linux 6 as compared to other versions of the system are available in the Knowledge Base article available at <https://access.redhat.com/site/articles/rhel-limits>.

Should you require information regarding the Red Hat Enterprise Linux life cycle, refer to <https://access.redhat.com/support/policy/updates/errata/>.

CHAPTER 1. KERNEL

Enhanced SCSI Unit Attention Handling

The kernel in Red Hat Enterprise Linux 6.6 has been enhanced to enable user space to respond to certain SCSI Unit Attention conditions received from SCSI devices via the `udev` event mechanism. The supported Unit Attention conditions are:

- **3F 03 INQUIRY DATA HAS CHANGED**
- **2A 09 CAPACITY DATA HAS CHANGED**
- **38 07 THIN PROVISIONING SOFT THRESHOLD REACHED**
- **2A 01 MODE PARAMETERS CHANGED**
- **3F 0E REPORTED LUNS DATA HAS CHANGED**

Because SCSI Unit Attention conditions are only reported in response to a SCSI command, no conditions are reported if no commands are actively being sent to the SCSI device.

Red Hat Enterprise Linux 6.6 does not provide any default `udev` rules for these events, but user-supplied `udev` rules can be written to handle them. For example, the following rule causes a SCSI device to be rescanned if the inquiry data changes:

```
ACTION=="change", SUBSYSTEM=="scsi",  
ENV{SDEV_UA}=="INQUIRY_DATA_HAS_CHANGED", TEST=="rescan", ATTR{rescan}="x"
```

The rules for the supported events should match on the following `SDEV_UA` environment strings:

```
ENV{SDEV_UA}=="INQUIRY_DATA_HAS_CHANGED"  
ENV{SDEV_UA}=="CAPACITY_DATA_HAS_CHANGED"  
ENV{SDEV_UA}=="THIN_PROVISIONING_SOFT_THRESHOLD_REACHED"  
ENV{SDEV_UA}=="MODE_PARAMETERS_CHANGED"  
ENV{SDEV_UA}=="REPORTED_LUNS_DATA_HAS_CHANGED"
```

Note that in all cases the `DEVPATH` environment variable in the `udev` rule is the path of the device that reported the Unit Attention. Also, multipath I/O currently verifies that multiple paths to a device have some of the same attributes, such as the capacity. As a consequence, automatically rescanning a device in response to a capacity change can cause that some paths to a device have the old capacity and some paths have the new capacity. In such cases, multipath I/O stops using paths with the capacity change.

Open vSwitch Kernel Module

Red Hat Enterprise Linux 6.6 includes the Open vSwitch kernel module as an enabler for Red Hat's layered products. Open vSwitch is supported only in conjunction with products that contain the accompanying user-space utilities. Please note that without these required user-space utilities, Open vSwitch will not function and cannot be enabled for use. For more information, please refer to the following Knowledge Base article: <https://access.redhat.com/knowledge/articles/270223>.

CHAPTER 2. NETWORKING

Changes to HPN Add-On

Starting with Red Hat Enterprise Linux 6.6, the High Performance Networking (HPN) Add-On is no longer be available as a separate product. Instead, the functionality found in the HPN Add-On has been integrated into the base product and delivered as part of the Red Hat Enterprise Linux base channel.

In addition to including the HPN functionality into the base Red Hat Enterprise Linux 6 product, the RDMA over Converged Ethernet (RoCE) implementation has also been updated. RoCE uses Global Identifier or GID-based addressing for node-to-node communication. Previously, GIDs were encoded based on the Ethernet interface's MAC address along with the VLAN ID (if used). Under certain circumstances, the compute entity that runs the RoCE protocol is not aware that its traffic is VLAN-tagged. The compute entity can then sometimes create or assume a wrong GID, which can result in connectivity problems. The updated RoCE implementation resolves this problem by changing the way the RoCE GIDs are encoded, and instead bases them off the IP addresses of the Ethernet interface. All systems that use the RoCE protocol need to be upgraded to Red Hat Enterprise Linux 6.6 to ensure connection reliability due to this change in the wire protocol format.

Please refer to this Red Hat Knowledge Base article for additional information:

<https://access.redhat.com/site/articles/971333>.

CHAPTER 3. SECURITY

SCAP Security Guide

The `scap-security-guide` package has been included in Red Hat Enterprise Linux 6.6 to provide security guidance, baselines, and associated validation mechanisms that use Security Content Automation Protocol (SCAP). **SCAP Security Guide** contains the necessary data to perform system security compliance scans regarding prescribed security policy requirements; both a written description and an automated test (probe) are included. By automating the testing, **SCAP Security Guide** provides a convenient and reliable way to verify system compliance on a regular basis.

CHAPTER 4. VIRTUALIZATION

New Packages: hyperv-daemons

New hyperv-daemons packages have been added to Red Hat Enterprise Linux 6.6. The new packages include the **Hyper -V KVP** daemon, previously provided by the `hypervkvpd` package, the **Hyper -V VSS** daemon, previously provided by the `hypervvssd` package, and the `hv_fcopyp` daemon, previously provided by the `hypervfcopypd` package. The suite of daemons provided by `hyperv-daemons` are needed when a Linux guest is running on a Microsoft Windows host with **Hyper-V**.

CHAPTER 5. STORAGE

Enhancements to device-mapper

Several significant enhancements to `device-mapper` have been introduced in Red Hat Enterprise Linux 6.6:

- The `dm-cache` device-mapper target, which allows fast storage devices to act as a cache for slower storage devices, has been added as a Technology Preview.
- The `device-mapper-multipath` ALUA priority checker no longer places the preferred path device in its own path group if there are other paths that could be used for load balancing.
- The `fast_io_fail_tmo` parameter in the `multipath.conf` file now works on iSCSI devices in addition to Fibre Channel devices.
- Better performance can now be achieved in setups with a large number of multipath devices due to an improved way in which the device-mapper multipath handles sysfs files.
- A new `force_sync` parameter in `multipath.conf` has been introduced. The parameter disables asynchronous path checks, which can help limit the number of CPU contention issues on setups with a large number of multipath devices.

dm-era Technology Preview

The `device-mapper-persistent-data` package now provides tools to help use the new `dm-era` device mapper functionality released as a Technology Preview. The `dm-era` functionality keeps track of which blocks on a device were written within user-defined periods of time called an `era`. This functionality allows backup software to track changed blocks or restore the coherency of a cache after reverting changes.

CHAPTER 6. CLUSTERING

Support for Keepalived and HAProxy Load Balancer technology

Red Hat Enterprise Linux 6.6 provides support for Load Balancer technology with **Keepalived** and **HAProxy**.

Keepalived provides simple and robust facilities for load balancing and high availability. The load-balancing framework relies on the well-known and widely used Linux Virtual Server kernel module providing Layer-4 (transport layer) load balancing. **Keepalived** implements a set of checkers to dynamically and adaptively maintain and manage a load balanced server pool according to their health. **Keepalived** also implements the Virtual Router Redundancy Protocol (VRRPv2) to achieve high availability with director failover.

HAProxy is a TCP/HTTP reverse proxy which is particularly suited for high availability environments. **HAProxy** can:

- Route HTTP requests depending on statically assigned cookies;
- Spread the load among several servers while assuring server persistence through the use of HTTP cookies;
- Switch to backup servers in the event a main server fails;
- Accept connections to special ports dedicated to service monitoring;
- Stop accepting connections without breaking existing ones;
- Add, modify, and delete HTTP headers in both directions;
- Block requests matching particular patterns;
- Persist client connections to the correct application server depending on application cookies;
- Report detailed status as HTML pages to authenticated users from a URI intercepted from the application.

CHAPTER 7. HARDWARE ENABLEMENT

Support for Intel Wildcat Point-LP PCH

Broadwell-U PCH SATA, HD Audio, TCO Watchdog, and I2C (SMBus) device IDs have been added for the drivers, which enables support for the next generation mobile platform in Red Hat Enterprise Linux 6.6.

Intel Ethernet Server Adapter X710/XL710 Support

Red Hat Enterprise Linux 6.6 adds the `i40e` and `i40evf` kernel drivers, which enable support for Intel X710 and XL710 family Ethernet adapters. These drivers are provided as Technology Preview only.

CHAPTER 8. AUTHENTICATION AND INTEROPERABILITY

Better Interoperability with Active Directory

Added functionality of **System Security Services Daemon (SSSD)** enables better interoperability of Red Hat Enterprise Linux clients with Active Directory, which makes identity management easier in Linux and Windows environments. The most notable enhancements include resolving users and groups and authenticating users from trusted domains in a single forest, DNS updates, site discovery, and using NetBIOS name for user and group lookups.

Apache Modules for IPA

A set of Apache modules has been added to Red Hat Enterprise Linux 6.6 as a Technology Preview. The Apache modules can be used by external applications to achieve tighter interaction with Identity Management beyond simple authentication.

CHAPTER 9. DESKTOP AND GRAPHICS

New Package: gdk-pixbuf2

The `gdk-pixbuf2` package, previously a part of the `gtk2` package, has been added to Red Hat Enterprise Linux 6.6. The `gdk-pixbuf2` package contains an image-loading library that can be extended by loadable modules for new image formats. The library is used by toolkits such as GTK+ or Clutter. Note that downgrading the libraries included in the `gdk-pixbuf2` and `gtk2` packages can fail.

CHAPTER 10. PERFORMANCE AND SCALABILITY

Performance Co-Pilot (PCP)

Performance Co-Pilot (PCP) provides a framework and services to support system-level performance monitoring and management. Its light-weight, distributed architecture makes it particularly well-suited to centralized analysis of complex systems.

Performance metrics can be added using the Python, Perl, C++ and C interfaces. Analysis tools can use the client APIs (Python, C++, C) directly, and rich web applications can explore all available performance data using a JSON interface.

For further information, consult the extensive man pages in the `pcp` and `pcp-libs-devel` packages. The `pcp-doc` package installs documentation in the `/usr/share/doc/pcp-doc/*` directory, which also includes these two free and open books from the upstream project:

<http://www.performancecopilot.org/doc/pcp-users-and-administrators-guide.pdf>

<http://www.performancecopilot.org/doc//pcp-programmers-guide.pdf>

CHAPTER 11. COMPILER AND TOOLS

OpenJDK8

Red Hat Enterprise Linux 6.6 features the `java-1.8.0-openjdk` packages, which contain the latest version of the Open Java Development Kit, OpenJDK8, that is now fully supported. These packages provide a fully compliant implementation of Java SE 8 and may be used in parallel with the existing `java-1.7.0-openjdk` packages, which remain available in Red Hat Enterprise Linux 6.6.

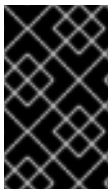
Java 8 brings numerous new improvements, such as Lambda expressions, default methods, a new Stream API for collections, JDBC 4.2, hardware AES support, and much more. In addition to these, OpenJDK8 contains numerous other performance updates and bug fixes.

CHAPTER 12. RED HAT SOFTWARE COLLECTIONS

Red Hat Software Collections is a Red Hat content set that provides a set of dynamic programming languages, database servers, and related packages that you can install and use on all supported releases of Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7 on AMD64 and Intel 64 architectures.

Dynamic languages, database servers, and other tools distributed with Red Hat Software Collections do not replace the default system tools provided with Red Hat Enterprise Linux, nor are they used in preference to these tools. Red Hat Software Collections uses an alternative packaging mechanism based on the `sc1` utility to provide a parallel set of packages. This set allows for optional use of alternative package versions on Red Hat Enterprise Linux. By using the `sc1` utility, users can pick and choose which package version they want to run at any time.

Red Hat Developer Toolset is now a part of Red Hat Software Collections. It is included as a separate Software Collection. Red Hat Developer Toolset is designed for developers working on the Red Hat Enterprise Linux platform. It provides current versions of the GNU Compiler Collection, GNU Debugger, Eclipse development platform, and other development, debugging, and performance monitoring tools.



IMPORTANT

Red Hat Software Collections has a shorter life cycle and support term than Red Hat Enterprise Linux. For more information, see the [Red Hat Software Collections Product Life Cycle](#).

See the [Red Hat Software Collections documentation](#) for the components included in the set, system requirements, known problems, usage, and specifics of individual Software Collections.

See the [Red Hat Developer Toolset documentation](#) for more information about the components included in this Software Collection, installation, usage, known problems, and more.

APPENDIX A. COMPONENT VERSIONS

This appendix is a list of components and their versions in the Red Hat Enterprise Linux 6.6 release.

Table A.1. Component Versions

Component	Version
Kernel	2.6.32-494
QLogic qla2xxx driver	8.07.00.08.06.6-k
QLogic ql2xxx firmware	ql23xx-firmware-3.03.27-3.1 ql2100-firmware-1.19.38-3.1 ql2200-firmware-2.02.08-3.1 ql2400-firmware-7.03.00-1 ql2500-firmware-7.03.00-1
Emulex lpfc driver	10.2.8020.1
iSCSI initiator utils	iscsi-initiator-utils-6.2.0.873-11
DM-Multipath	device-mapper-multipath-libs-0.4.9-80
LVM	lvm2-2.02.108-1

APPENDIX B. REVISION HISTORY

Revision 0.0-0.12 Fixed the description of Enhanced SCSI Unit Attention Handling	Fri Apr 6 2018	Marek Suchánek
Revision 0.0-0.11 Added Keepalived and HAProxy (Clustering).	Tue Mar 29 2016	Lenka Špačková
Revision 0.0-0.10 Removed Industry Standards and Certification.	Wed Oct 14 2015	Lenka Špačková
Revision 0.0-0.9 Update of the Red Hat Enterprise Linux 6.6 Release Notes - OpenJDK8 fully supported.	Thu Mar 26 2015	Milan Navrátil
Revision 0.0-0.7 Release of the Red Hat Enterprise Linux 6.6 Release Notes.	Tue Aug 26 2014	Milan Navrátil