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Introduction to Oracle Linux

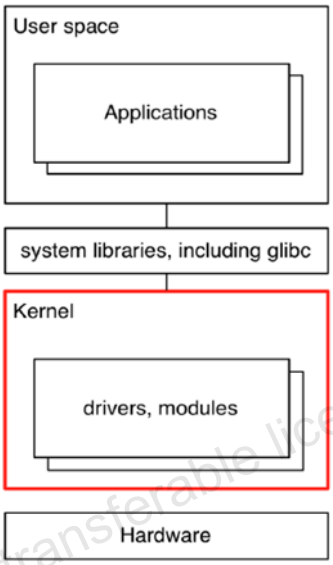
Lesson Objectives

After completing this lesson, you should be able to describe:

- The history of the Linux operating system
- The Linux kernel development model
- Linux distributions
- Oracle's comprehensive Linux solution
- Oracle's contributions to the Linux community
- Oracle Linux's compatibility with Red Hat Enterprise Linux (RHEL)
- Unbreakable Enterprise Kernel

Linux Kernel

- Linux is modular in design:
  - User space
  - Kernel
- Modular design allows for a large development community, better fault isolation, and security.
- Linus Torvalds developed the original Linux kernel.
- Linux version 0.01 was released in September 1991.
- The name Linux is a combination of Linus and UNIX.



The Linux operating system is a modular system. At the lowest level, the kernel interacts with the hardware and controls and schedules access to resources (CPU, memory, storage, network, and so on) on behalf of applications. Applications run in what is called the user space and call only a stable set of system libraries to ask for kernel services. The `glibc` library is the GNU C library that defines the system calls and other basic facilities, such as `open`, `malloc`, and `printf`. Nearly all applications, including Oracle Database, use this library.

This modular design allows components of Linux to originate from different developers, each of which has their own specific design goals in mind. A modular design also means that the Linux kernel is independent of applications and interfaces. The result is that application crashes and security vulnerabilities in applications tend to remain isolated, rather than affecting the system as a whole.

The Windows operating system, alternatively, has a high degree of integration with applications and interfaces. This can have significant security and stability consequences. For example, the Windows kernel is heavily integrated with the graphical user interface.

In Linux, each component is configured separately, typically by using text-based configuration files. Configurations are not in a cryptic database (the Windows Registry). Reading and writing configuration information can be done by scripts or applications by using simple text parsing engines. No special application programming interface (API) is required to interface with the system configuration data.

Linux Kernel Development Model

- Thousands of developers contribute to frequent releases of the kernel.
- Features are pushed upstream through mail lists and IRC.
- New releases deliver stable updates, new features, and performance improvements.
- The Linus Torvalds–led team makes the new releases.
- Mainline kernels are released approximately every three months.
- Kernel branches are available at http://www.kernel.org.
- Linux kernel development uses Git as the source-code control system.

Thousands of developers representing hundreds of corporations contribute to frequent releases of the Linux kernel. The development effort has been called one of the largest cooperative software projects ever attempted. Stable updates are created regularly, which include new features, support for new devices, and performance improvements.

The Linux community collaborates through various mailing lists that are set up to handle kernel development. Features are pushed upstream, through these mail lists and Internet Relay Chat (IRC). Upstream is the term used for a community-owned version of a specific project. This is where the development happens and always has the most recent changes. You can subscribe to some of these development mailing lists at http://vger.kernel.org/vger-lists.html.

Linus Torvalds leads a team that releases new versions, called “vanilla” or “mainline” kernels. A new version of this mainline kernel is officially released approximately every three months. The mainline branch of development incorporates new features, security fixes, and bug fixes. It is not considered a “stable” branch until it undergoes thorough testing. Separate stable branches for each released version exist. The stable branches do not include the latest features, but do include bug fixes.

A number of kernel versions are currently being maintained as stable kernels. These kernels have patches that are backported to them. These patches are primarily driver updates and security fixes. Kernel branches are available at http://www.kernel.org.

Linux Distributions

- Linux distributions:
  - Are built on top of the Linux kernel
  - Are complete operating systems and more
  - Include compiled binaries and source code
- There are hundreds of Linux distributions.
  - Commercially backed distributions
  - Linux community–driven distributions
- Example:
  - Oracle Linux, Debian, Fedora, Red Hat Enterprise Linux (RHEL), Ubuntu, and many others

A Linux distribution (distro for short) is a collection of software built on top of the Linux kernel and offered as a complete package. Distributions are full operating systems plus some additional applications, such as graphics packages, OpenOffice, and others. The kernel is just one component of a Linux distribution.

A typical Linux distribution comprises a Linux kernel, GNU tools and libraries, additional software, documentation and a window system, proprietary applications, free applications, distribution-specific applications for configuration and installation, user manuals, and support information. Most of the software is distributed both as compiled binaries and source code. This allows users to modify and compile the original source code.

There are hundreds of Linux distributions, both commercially backed distributions from companies, such as Red Hat and Novell, as well as Linux community–driven distributions. Some of the more well-known distributions include:

- Oracle Linux
- Debian
- Fedora (a Red Hat–sponsored and community-supported distribution)
- Red Hat Enterprise Linux (RHEL): RHEL is the commercial version of Fedora.
- Ubuntu: Canonical is the vendor behind Ubuntu.

Oracle Linux

- Brings the latest Linux innovations to customers
- Is the best-performing, most modern and reliable Linux OS
- Tracks mainline closely
- Influences Linux roadmap upstream via direct code contributions
- Provides highest-value, enterprise-class support
- Deployment best practices: Full stack tested with real-world workloads
- Provides comprehensive legal indemnification
- Lowers cost
- Ksplice: Apply kernel updates on a running system

Oracle offers a comprehensive Linux solution including:

- Dedicated development team
- Dedicated QA team
- Dedicated support team
- Dedicated ISV and IHV team
- Oracle Linux training and certification
- Oracle Linux consulting services

Ksplice allows you to do kernel updates without having to reboot the system. A kernel update comes from either Oracle or from the kernel community. The Ksplice team takes the update and works it into a binary patch that is inserted into a running kernel. You apply it by using the Ksplice tools and the patch is up and running.

Security updates are announced to the world, and there is typically a time period between when a security problem is globally known and when system administrators have an opportunity to patch their systems. Ksplice allows you to apply security updates without having to wait for your users to tell you it is okay to take down the system. This problem is even more significant when running a large number of systems. Ksplice allows you to maintain highly available systems that are also very secure.

Oracle's Technical Contributions to Linux

- Oracle has a dedicated Linux kernel development team.
- Oracle's technical contributions to Linux include:
  - ASMLib
  - Asynchronous IO (AIO) Kernel Subsystem
  - Btrfs file system
  - Oracle Cluster Filesystem (OCFS2)
  - Linux data integrity based on the T10-PI standard
  - Xen Hypervisor
- All Oracle Linux code is available to the Linux community.
- The Git source tree with change logs and commit messages is available at: http://oss.oracle.com/git/

Oracle's long-term vision is focused on continuing to enhance and extend the enterprise-class capabilities of Linux, and this vision is manifest through the many projects and code contributions that Oracle shares with the Linux community. Oracle continues to strengthen its involvement in the Linux community by providing enhancements that facilitate the development and deployment of enterprise Linux solutions. With Oracle Linux, regarding the code developed, 100% of that code becomes available to the open source community for Linux.

Oracle Linux: Compatible with Red Hat Enterprise Linux (RHEL)

- Source and binaries are fully compatible with RHEL.
- Applications that run on RHEL run on Oracle Linux.
- Trademarks and logos have been removed, but there are no compatibility issues.
- `/etc/oracle-release` was added to identify code obtained from Oracle.
- Oracle continues to track RHEL releases with Oracle Linux ISO releases and errata stream.

Oracle Linux is fully compatible—both source and binary—with Red Hat Enterprise Linux. Applications that run on RHEL run on Oracle Linux.

Strict Binary Compatibility

Tremendous effort has gone into assuring that there is no divergence from the original Red Hat source code, given that the main goal of Oracle Linux and the Oracle Linux Support program is to not fragment the Linux code base, but to improve Linux quality and support.

Oracle Linux is built from the very same source code as Red Hat Enterprise Linux (RHEL). A byte-by-byte comparison of the source code against RHEL reveals no differences, the only changes being the removal of trademarks and copyrights.

Trademarks and logos have been removed from a small number of the packages. These are non-functional text or graphic changes that in no way affect any program code, and they do not generate any compatibility issues. Oracle has added its own text file, `/etc/oracle-release`, so support teams can easily identify that they obtained the code from Oracle.

RHEL provides a text file called `/etc/redhat-release`, which contains a one-line string identifying the specific distribution release. This file is part of the `redhat-release` package. Oracle Linux also contains a text file called `/etc/redhat-release`, which is installed by a package called `oraclelinux-release`.

Unbreakable Enterprise Kernel

- Oracle announced the Unbreakable Enterprise Kernel in September 2010.
- It is used by Exadata and Exalogic for extreme performance.
- The Unbreakable Enterprise Kernel is available since Oracle Linux version 5.5.
- Since Oracle Linux 5.5, you have a choice:
  - Red Hat Compatible Kernel
  - Unbreakable Enterprise Kernel
- Oracle is committed to offering compatibility with Red Hat.
- Full support is offered for customers running either kernel.
- Existing applications run unchanged.

In September 2010, Oracle announced the new Unbreakable Enterprise Kernel for Oracle Linux as a recommended kernel to deploy with Oracle Linux 5 or Red Hat Enterprise Linux (RHEL) 5. Beginning with Oracle Linux 5.5 (default in 5.6), you have a choice when it comes to the kernel, either the Red Hat Compatible Kernel or the Unbreakable Enterprise Kernel. In Oracle Linux 5.6, the Unbreakable Enterprise Kernel became the default kernel.

The initial motivation for creating the Unbreakable Enterprise Kernel was to have a modern and best-performing Linux kernel for the Exadata and Exalogic engineered systems. The kernel needed to scale with the larger number of CPUs, memory, and InfiniBand connects.

Unbreakable Enterprise Kernel is heavily tested with Oracle workloads and therefore recommended for Oracle deployments and all other enterprise deployments. Oracle is committed to offering compatibility with Red Hat, and continues to release and support the Red Hat Compatible Kernel as part of Oracle Linux, for customers that require strict RHEL compatibility. Under the Oracle Linux Support Program, customers can receive full support for Oracle Linux running with either kernel.

Using the Unbreakable Enterprise Kernel instead of the Red Hat compatible kernel changes only the kernel. Nothing changes in the user space. Existing applications run unchanged regardless of which kernel is used. Using a different kernel does not change system libraries such as `glibc`. The `glibc` version in Oracle Linux 6 is 2.12, regardless of the kernel version.

How Do I Learn More?

To learn more about Oracle Linux System Administration, sign up for an Oracle Linux course here: Oracle University

Quiz

Oracle Linux offers a Red Hat–compatible kernel as well as a kernel that is optimized for Oracle applications.

a. True
b. False

Summary

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