Oracle Unbreakable Linux: An Overview

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INTRODUCTION

Oracle Unbreakable Linux is a support program that provides enterprises with industry-leading global support for the Linux operating system at significantly lower costs.

The support program, which is available for any customer whether or not they're running Oracle Unbreakable Linux currently includes support for three architectures: x86; x86-64 (e.g. the latest Intel Xeon and AMD Opteron chips, as used by most Linux customers); and Linux Itanium (ia64).

The program offers support for any existing Red Hat Enterprise Linux installations and for new installations of Oracle Linux, an open source Linux operating system that is fully compatible—both source and binary—with Red Hat Enterprise Linux.

Complete Support for the Complete Software Stack

Oracle's industry-leading support organization offers expertise that looks at the entire application stack running on top of Linux; only Oracle delivers complete support for the complete software stack—database, middleware, applications, management tools, and the operating system itself.

By delivering enterprise-class quality support for Linux, Oracle addresses a key enterprise requirement from customers. When problems occur in a large, complex enterprise environment, it's often impossible to reproduce such occurrences with very simple test cases. Customers need a support vendor who understands their full environment, and has the expertise to diagnose and resolve the problem by drawing from their knowledge of and familiarity with their framework, as opposed to requesting a simple reproducible test case.

Another customer demand is for bug fixes to happen in a timely manner, as customers cannot always afford to wait for months to get a fix delivered to them. Moreover, it's common for customers to be very reluctant to apply a whole set of many unrelated bug fixes in order to solve one particular problem, because doing so heavily disrupts their carefully tuned and tested environments.

Often systems exhibiting the symptoms are in mission-critical production environments with high demand, and consequently cannot afford any downtime, so the risk of applying a patch needs to be as low as possible. The Oracle Unbreakable Linux backport policy addresses this concern.

In addition to the need for true enterprise-class support and timely bugfixes, another key concern facing customers is the high cost of support for the Linux operating system. Addressing this issue, Oracle Unbreakable Linux support costs are much lower than alternatives, offering a variety of levels, with low costs more closely aligned with customer expectation.

Oracle Linux is not a fork of Linux, as it is fully compatible—both source and binary—with Red Hat Enterprise Linux. Compatibility and uniformity is of the utmost importance to Oracle, as the same version of Oracle products must run on many different Linux distributions; Oracle has no reason to fork Linux.

New feature development for Linux is done by Oracle kernel team while working with the upstream maintainers and the Linux community directly, and integrated in the upstream repositories from the start. The intent is that Novell, Red Hat and other distributors will absorb those features in their releases. Oracle will always make sure that all the features are in the mainline and benefit all of the distributions, as the intent is not to cause more fragmentation of the market, but instead to make the market stronger and better.

Oracle Unbreakable Linux Support

Oracle provides three levels of Unbreakable Linux support:

- **Network Support** - access to patches and updates via ULN
- **Basic Support** - access to patches and updates via ULN, 24x7 support, complete Linux server lifecycle management, cluster software
- **Premier Support** - access to patches and updates via ULN, 24x7 support, Linux server lifecycle management, cluster software, premier backports, lifetime support
- For Premier support customers, Oracle issues backports of individual bugfixes to any version of any package currently deployed by the customer as long as such version is not older than six months. For more comprehensive and up to date information on support offerings and pricing read the Oracle Unbreakable Linux data sheet.

Oracle Unbreakable Linux is For Anyone

Oracle Unbreakable Linux support is available for anyone, even if they're not running any Oracle products. Oracle is fully committed to supporting the Linux operating system regardless of which products are running on top of it.

Full Indemnification

Indemnification against intellectual property infringement claims has become an important issue for the Linux community. With the Oracle Unbreakable Linux support program, customers have full indemnification from the world's largest enterprise software vendor. Indemnification applies to all levels of support (Network, Basic and Premier) and the amount of indemnification is not limited in any way by the amount of money a customer has paid to Oracle. Read the Top 5 Facts About Oracle's Indemnification for Linux.

Oracle Linux is Free to Download

Before committing to a purchase, customers should be able to download software for installation, testing and evaluation. With Linux, it's always been possible to download free, consumer-oriented desktop distributions (i.e. Fedora, Ubuntu, OpenSUSE). But enterprise customers had to pay for a support contract to actually get an enterprise Linux distribution, even if they just wanted to evaluate it. With Oracle Unbreakable Linux, customers can always download the binaries and the source code for free, no support subscription required. Free Download: Oracle Linux.

Oracle Unbreakable Linux Network (ULN)

The Unbreakable Linux Network (ULN) is equivalent from a user interface point of view to what Red Hat Network (RHN) offers. ULN is a comprehensive resource for Oracle Unbreakable Linux support subscribers, offering access to Linux software patches, updates and fixes, along with information on the up2date program and support policies. Built on open standards, ULN is an easy to use website accessed via linux.oracle.com.

Oracle Management Pack for Linux

For no additional charge, Oracle Unbreakable Linux Basic and Premier support customers get the Oracle Management Pack for Linux, which delivers comprehensive provisioning, patching, monitoring and administration capabilities via a single, web-based interface, further reducing the complexity and cost of managing Linux environments. Learn more about the Oracle Management Pack for Linux.

Oracle Clusterware for Unbreakable Linux

Oracle Unbreakable Linux support customers at the Basic and Premier support levels can download and deploy Oracle Clusterware at no additional license fee or support cost. Oracle Clusterware is portable cluster software that groups together individual servers so they can cooperate as a single system. A fundamental component of Oracle Real Application Clusters,

Oracle Clusterware can operate independently and helps ensure the protection of an application, Oracle or third-party.

Oracle Clusterware enables high availability, an essential component of business continuity, for applications and databases managed in the cluster environment--including Oracle Single Instance Databases, Oracle Application Servers, Oracle Enterprise Manager components, third party databases, and other applications. Oracle Clusterware for Unbreakable Linux is available for Linux x86 and Linux x86-64. For more information, read the Oracle Clusterware for Unbreakable Linux FAQ.

WHAT IS ORACLE LINUX?

Oracle Linux is based on Red Hat Enterprise Linux and is fully compatible—both source and binary—with Red Hat Enterprise Linux as it includes the exact same set of packages at the same version levels with the same source code as the Red Hat distributions. There are approximately 1,000 packages in the distributions. A byte-by-byte comparison of the source code of the two will reveal no difference, the only changes being the removal of trademarks and copyrights.

After such minor changes, the Oracle Linux source code has been recompiled by Oracle into binaries and made available for download and produced into CD images. Oracle also applied a number of bugfixes on top of the original code. These are very limited in scope, and they are critical for customers to have as soon as possible in their production deployment. For a complete listing, read the following data sheets:

- Certification with Oracle Linux 4
- Certification with Oracle Linux 5

In order to get Linux support from Oracle, a user does not have to install Oracle Linux, if they already have Red Hat Enterprise Linux installed on their systems.

Oracle Cluster File System 2 (OCFS2)

Oracle Linux includes full support for the Oracle Cluster File System (OCFS2), an open source cluster file system included in the mainline Linux Kernel. Other Oracle specific packages are available as additional downloads from a separate Unbreakable Linux Network channel, such as Oracle Instant Client, Oracle ASMlib, Oracle Database Express Edition, Oracle SQL Developer. These packages are also freely downloadable from the Oracle Technology Network.

Extensive Testing

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 Unbreakable Linux program is to not fragment the Linux code base, but to improve Linux quality and support. In addition, Oracle heavily invests in testing and releases critical bugfixes faster, making Linux overall a better option for enterprise deployments.

Packages released by Oracle as part of Oracle Linux undergo a long testing cycle which includes the routine testing of the full software stack with the help of the Oracle Validated Configurations toolkit to ensure that the underlying operating system behavior is correct in all circumstances. Oracle's industry-leading QA team has worked with strategic customers for many years now, and this depth of experience has helped build an extensive test matrix.

Since the focus of the Oracle Unbreakable Linux support program is to ensure the further success and growth of Linux among all customers large and small, the program is available for current Red Hat Enterprise Linux (3, 4 and 5) subscribers as well. Such customers can submit problem reports to Oracle and will receive bugfixes that apply to their RHEL version.

In a similar fashion, for those who may still want to run Oracle products—database, middleware, applications— on Red Hat Enterprise Linux, Novell SLES or Asianux, Oracle continues to fully

support the same set of Oracle products on Linux, Oracle will continue direct cooperation with our partners in the Linux community and will certify Oracle products on those distributions.

Fully Compatible with Red Hat Enterprise Linux

Oracle synchronizes bug fixes at regular intervals with Red Hat Enterprise Linux to maintain full compatibility. Whenever a new version of an individual package (an errata) gets released by Red Hat, not just as part of an update release, the corresponding package for Oracle Linux is made available very quickly, in a matter of hours. If a package has no trademarks and no Oracle specific patches, it will simply be recompiled and reissued for Oracle Linux immediately after going through testing.

If a package has trademarks or Oracle Linux specific changes, Oracle will examine the source code and compare it against the bug fixes that have been already applied and released as part of Oracle Linux. If the Oracle patches are still relevant, then they are reapplied, but if the problems have been fixed in the Red Hat version, whether in the same or in a different way, the Oracle specific patches are dropped and the package recompiled (always checking for trademarks and copyrights issues) and released as part of Oracle Linux via the Unbreakable Linux Network (ULN).

For official updates of existing major releases, for example Red Hat Enterprise Linux 5 Update 5, Oracle re-bundles the Red Hat patches in the update and reissues them as Oracle Linux 5 Update 5, including free ISOs, almost immediately.

As a new major RHEL release is issued, there is usually the need to do some additional testing before Oracle can consider it an official Oracle Linux version. For instance, when Red Hat Enterprise Linux 5 was released, Oracle ensured that the corresponding Oracle Linux product had been well tested before issuing its own version of it, since in the past, it's taken many months for anew major release to stabilize.

For more information on compatibility, download an independent third-party white paper from the Edison Group, Oracle Unbreakable Linux: True Enterprise-Quality Linux Support. (pdf)

Patches and Bugfixes

Another aspect of compatibility with Red Hat Enterprise Linux is around patches and bugfixes written by Oracle and not appearing in the Red Hat distribution. Oracle has independently been providing bug fixes to customers for problems occurring in Red Hat Enterprise Linux for the last four years, and has maintained full compatibility by ensuring that the resolution of the problems does not break application compatibility.

As an example, the kernel ABI is a very important interface to keep stable, and Oracle has been requiring that none of the patches provided to customers or partners breaks that stability, by testing the variables and checksums so that the resulting code is fully compliant with that restriction. There are very few modifications to the existing Oracle Linux code base, only critical bugfixes and no new features. Patches for any of the bugs that are fixed in Oracle Linux will also be contributed back to Red Hat, Novell, and other distributions as applicable. Moreover, if the fixes are also relevant to the upstream source trees maintained by the community, then Oracle assures that they get applied there as well.

There is just one edition (and just one media set) for Oracle Linux, and it's available for all three levels of support. This corresponds to the Red Hat Enterprise Linux Advanced Server edition for version 4, and to the Red Hat Enterprise Linux Server edition for version 5. Both contain all the packages in Red Hat's high-end offering without limiting the set of packages that are available to customers under support contracts or for free downloads.

A new set of ISOs will be made available for free download for every new update of Oracle Linux. Therefore, users of Oracle Linux will be at most one update behind even if they do not purchase any support contract. This is in contrast with the Red Hat Enterprise Linux offering, where just the original initial release is available as a set of ISOs while updates are delivered via RHN only to paying subscribers.

Discover detailed comparisons of Oracle Linux and Red Hat Enterprise Linux and certification information for partners.

Oracle Linux with the Unbreakable Enterprise Kernel

Traditional enterprise Linux distributions are based on outdated, three-to-four-year-old kernels. By introducing Oracle Linux with the Unbreakable Enterprise Kernel, Oracle is bringing the latest innovations from upstream development to customers who run Red Hat Enterprise Linux 5 or Oracle Linux 5 in the data center.

The Unbreakable Enterprise Kernel is based on the 2.6.32 stable kernel and available only on the x86-64 architecture. The Unbreakable Enterprise Kernel is delivered via ULN, so that installation on top of Oracle Linux 5 is quick and easy. Existing customers may subscribe to the Oracle Linux with the Unbreakable Enterprise Kernel channel and install Oracle Linux with the Unbreakable Enterprise Kernel via the up2date agent. Others may install the Unbreakable Enterprise Kernel via our public yum server, public-yum.oracle.com

Because the Unbreakable Enterprise Kernel doesn't require you to reinstall the operating system, existing applications run unchanged. No changes to glibc are required, which means the Application Binary Interface used by userspace applications is unchanged.

Oracle Linux also includes a kernel compiled directly from Red Hat Enterprise Linux source. This means you have a choice at boot time: strict RHEL compatibility or a system optimized for running Oracle software.

WHAT IS BACKPORTING?

In general, there are two types of backporting. The first is more traditional, and is what distribution vendors are offering right now. It's the default engineering development practice with Oracle Linux and Oracle Linux with the Unbreakable Enterprise Kernel, independent from the type of support agreement. In this model, important bug and security fixes applied to the latest major release of a software package also get applied (when relevant) to a previous major release, resulting in an updated software package for both releases.

For example, let's assume that the latest kernel RPM for Oracle Linux 4 is kernel-2.6.9-42.0.3.0.2 while the latest kernel RPM for Oracle Linux 5 is kernel- 2.6.18-8.0.0.4.1.el5. If a critical security or bug fix is produced for the Oracle Linux 5 kernel, it will be also released for the Oracle Linux 4 kernel, if the latter suffers from the same vulnerability. There will be a new RPM for Oracle Linux 5 (kernel- 2.6.18-8.0.0.4.2.el5), and a new RPM for Oracle Linux 4 (kernel-2.6.9-42.0.3.0.3). In order to get the fixes, customers who are running either release should upgrade to the latest version of that software package for the applicable release.

However, this model does have drawbacks. For example, customers who are running an older version of the package on Oracle Linux 4 (say kernel-2.6.9-42.0.3.0.1) would be required to upgrade to the latest (kernel-2.6.9-42.0.3.0.3) in order to get the critical fix. Unfortunately if they did so, more than that single critical bugfix would be applied to their running kernel.

Introducing Premier Backporting

To eliminate this drawback, Oracle Unbreakable Linux Premier support includes Premier Backporting where individual bugfixes are backported on request to any version of any package released within the previous six months. Customers can get a customized version of a package that just contains a specific critical bugfix. This type of backporting benefits customers who deploy systems requiring high availability and reliability and want just one particular issue resolved; with

Oracle, they can now achieve that without the need to undertake a new complete test cycle to account for the many other changes introduced by upgrading the package to its latest version.

As an example of this backport policy consider the kernel: At a given point in time kernel 2.6.9-42.0.3.0.2 is released on ULN. A few weeks later a security and bugfix kernel release is out on ULN: kernel- 2.6.9-42.0.4.0.1 (reissued from Red Hat kernel-2.6.9-42.0.4). Another ULN security release follows in a few more weeks: kernel- 2.6.9-42.0.5.0.1 (reissued from Red Hat kernel-2.6.9-42.0.5). Following that there is a bugfix release: kernel- 2.6.9-46.0.1.0.1.

Let's assume that a customer is running kernel version 2.6.9-42.0.3.0.2 in production environments, and encounters a critical problem, and that the problem is fixed in the latest Oracle Linux 4 kernel version 2.6.9-46.0.1.0.1. Without this type of backporting, the customer would be required to upgrade to the latest (kernel-2.6.9-46.0.1.0.1) in order to get the critical fix.

Unfortunately if they did so, more than that single critical bugfix would be applied to their running kernel. Such bug fixes could destabilize the production environment, however, that specific fix is necessary. If the customer is at the Premier support level, and if the kernel version deployed is dated not earlier than six months before the latest ULN issued kernel, then the customer is entitled to receiving a customized kernel which will be the same he was running plus the fix for his problem applied.

The Unbreakable Linux Network

The Unbreakable Linux Network (ULN) is equivalent from a user interface point of view to what Red Hat Network (RHN) offers. Customers need to register their systems first, then they can access the ULN website using their User ID and Password. On the website, customers can see all of the registered systems, what channels are available and which packages they contain, which versions have been applied, when was the last time one checked in their servers, and so forth. It's also possible to download individual packages online, instead of getting them from CD, including the source code. Visit the Unbreakable Linux Network for more information.

Unlike RHN, the Unbreakable Linux Network channels for older update versions of Oracle Linux are kept up to date and available. For instance, issuing update 5 of Oracle Linux 5 does not obsolete update 4 of Oracle Linux 5, as the Update 4 ULN channels are kept alive. Therefore the customer who decides not to jump patch sets or update releases can always rely on the old channel and keep getting bugfixes from there. For instance, as of this writing, the ULN channels look like this:

Oracle Linux Channels

i386 Architecture	x86-64 Architecture	ia64 Architecture
el4_i386_oracle	el4_x86_64_oracle	el4_ia64_latest
el4_i386_addons	el4_x86_64_addons	el4_u6_ia64_base
el5_i386_latest	el5_x86_64_latest	el4_u6_ia64_patch
el5_ga_i386_base	el5_ga_x86_64_base	el4_u7_ia64_base

(table continued on following page)

i386 Architecture	x86-64 Architecture	ia64 Architecture
el5_ga_i386_patch	el5_ga_x86_64_patch	el4_u7_ia64_patch
el5_u1_i386_base	el5_u1_x86_64_base	el4_u8_ia64_base
el5_u1_i386_patch	el5_u1_x86_64_patch	el4_u8_ia64_patch
el5_u2_i386_base	el5_u2_x86_64_base	el5_u4_ia64_base
el5_u2_i386_patch	el5_u2_x86_64_patch	el5_u4_ia64_patch
el5_u3_i386_base	el5_u3_x86_64_base	el5_u5_ia64_base
el5_u3_i386_patch	el5_u3_x86_64_patch	el5_u5_ia64_patch
el5_u4_i386_base	el5_u4_x86_64_base	
el5_u4_i386_patch	el5_u4_x86_64_patch	
el5_u5_i386_base	el5_u5_x86_64_base	
el5_u5_i386_patch	el5_u5_x86_64_patch	
el5_i386_ocfs2	el5_x86_64_ocfs2	
el5_i386_lsb4	el5_ix86_64 lsb4	
el5_rds_i386_latest	el5_rds_x86_64_latest	
el5_exadata_i386_latest	el5_exadata_x86_64_latest	
el5_unsupported_i386_latest	el5 _unsupported_x86_64_latest	
el5_i386_addons	el5_x86_64_addons	
el5_i386_oracle	el5_x86_64_oracle	
el5_i386_oracle_addons	el5_x86_64_oracle_addons	
el4_i386_latest	el4_x86_64_latest	
el4_u4_i386_base	el4_u4_x86_64_base	

i386 Architecture	x86-64 Architecture	ia64 Architecture
el4_u4_i386_patch	el4_u4_x86_64_patch	
el4_u5_i386_base	el4_u5_x86_64_base	
el4_u5_i386_patch	el4_u5_x86_64_patch	
el4_u6_i386_base	el4_u6_x86_64_base	
el4_u6_i386_patch	el4_u6_x86_64_patch	
el4_u7_i386_base	el4_u7_x86_64_base	
el4_u7_i386_patch	el4_u7_x86_64_patch	
el4_u8_i386_base	el4_u8_x86_64_base	
el4_u8_i386_patch	el4_u8_x86_64_patch	
el3_i386_latest	el3_x86_64_latest	
el3_u8_i386_patch	el3_u8_x86_64_patch	
el3_u9_i386_patch	el3_u9_x86_64_patch	
el3_u9_i386_base	el3_u9_x86_64_base	

Oracle VM Channels

i386 and x86_64 Architecture	I386 and x86-64 Architecture
ovm2_i386_latest	ovm22_i386_latest
ovm2_2.1.0_i386_base	ovm22_2.2.0_i386_base
ovm2_2.1.1_i386_base	ovm22_2.2.0_i386_patch
ovm2_2.1.2_i386_base	ovm22_2.2.1_i386_base
ovm2_2.1.5_i386_base	ovm22_2.2.1._i386_patch
ovm2_2.1.0_i386_patch	
ovm2_2.1.1_i386_patch	
ovm2_2.1.2_i386_patch	
ovm2_2.1.5_i386_patch	

Oracle Linux with the Unbreakable Enterprise Kernel

x86_64 Architecture
ol5_x86_64_latest

Another important ULN component is the Satellite server. The concept behind Satellite server is to install Oracle Linux on one system that is registered with ULN and kept updated using up2date. The system is in turn configured as a Yum server, and then all the systems in the same site or company can use Yum to pull the packages in.

Yum is an Open Source program that can be used to retrieve packages from a repository and resolve their interdependencies. While customers who have the satellite server from Red Hat need to get a RHN entitlement for each system, ULN doesn't do entitlement checking; therefore there are no authentication keys. This is consistent with the same policy in place for all Oracle products.

In addition, the Oracle Management Pack for Linux provides complete Linux server lifecycle management, is available at no additional charge for Basic and Premier support customers. In the future Oracle also plans to release a satellite server based on the same open source software that runs the central ULN repository. All the components of ULN will provide a completely non-proprietary functional equivalent to RHN.

SWITCHING FROM RED HAT TO ORACLE UNBREAKABLE LINUX SUPPORT

Existing Red Hat Enterprise Linux users can easily switch to Oracle Unbreakable Linux support by simply changing the location to download patches and updates to point to the Unbreakable Linux Network (ULN) instead of Red Hat Network (RHN). There is no need to reinstall the operating

system. The software customers have installed on top of the OS doesn't need to be reinstalled either, and they don't have to start from scratch or perform any special migration to Oracle Linux.

All that is required is to register with the Unbreakable Linux Network and download the up2date RPM provided by Oracle. From that point on nothing else needs to be done, as the patches and erratas from Oracle will be received directly via ULN.

Customers who do not have Red Hat Enterprise Linux, and have either another Linux distribution or a different operating system installed can instead just download the full ISOs for Oracle Linux and install it from scratch.

FOCUS ON QUALITY ASSURANCE AND TESTING

Oracle Validated Configurations are pre-tested, validated architectures with software, hardware, storage and networking components together with documented best practices for deployment. Oracle and its strategic partners offer and recommend these configurations to enable end-users to deploy fully tested solutions to achieve standardization with high performance, scalability and reliability while lowering infrastructure costs.

Oracle Validated Configurations offer guidance to customers deciding what should be run as a full system with an Oracle product running on top of a Linux operating system, in turn running on top of hardware, and at the same time listing the most effective set of tuning parameters for their setups (for both kernel and Oracle applications), and workarounds for known problems. Oracle Validated Configurations include a full range of products, with the entire hardware-software stack tested, not just a small portion of it. Testing includes also working with real workloads, both internal and provided by customers. Read the Oracle Validated Configurations overview page for more details on how customers can deploy Linux faster.

Oracle has been working with vendors such as AMD, Brocade, Cisco, Dell, EMC, Emulex, Fujitsu, HP, IBM, Intel, NetApp, QLogic, and many others, representing a wide range of the server hardware vendors, to make sure that the fully integrated stacks were completely tested. In general, many OS vendors test their product in-house, focusing on testing the operating system specifically on a number of hardware pieces, and doing so provides enough confidence in their product. However, in the case of Linux there are a large number of choices, forcing the distribution vendors to heavily rely on companies like HP, IBM and Oracle to do the testing.

Such testing has been happening for many years and Oracle has been building out a very large test suite for this purpose, which runs everywhere. The full test suite for Oracle products on Linux (the Oracle Linux Test) runs 24/7 on thousands of machines. Such tests are designed to verify stability and correct behavior of both the operating system and the Oracle applications running on top of it. It includes installation, functional, stress and destructive tests, which are executed under varying workloads types (I/O intensive, CPU intensive, for instance) with various database sizes. Several parameters are varied during the full run of the test suites, which also include crashes scenarios in Oracle Real Application Cluster configurations.

THIRD PARTY SOLUTIONS

Partners including OEMs, ISVs and other third party vendors are strongly endorsing and supporting Oracle Unbreakable Linux Program, and Oracle Linux is listed as a certified platform by infrastructure vendors and third party applications providers. Oracle has a long history of working with industry-leading companies such as Dell, HP, IBM, Intel, AMD, EMC, Brocade, Fujitsu, NetApp, Emulex, Qlogic and many others. In addition, infrastructure vendors are making sure that their customers can get Linux support from Oracle too. See the Partner Endorsements page for more details.

The partner community realizes there is no re-certification necessary, because the Oracle Linux code is identical to Red Hat Enterprise Linux, therefore anything that was certified on that is also

certified on Oracle Linux. This is also true of the Oracle product suite itself, as it is fully certified on Oracle Linux, since there are no modifications to the source code except removal of trademarks/logos, and no portions of any of the software packages have been rewritten.

If customers have an application deployed on Red Hat Enterprise Linux, it will continue to run "as-is" on Oracle Linux. From a software vendor and a hardware vendor point of view, Oracle certifies and supports all the applications that are certified on Red Hat Enterprise Linux. For a detailed comparison of Oracle Linux and Red Hat Enterprise Linux, read the following data sheets:

- Certification with Oracle Linux 4
- Certification with Oracle Linux 5

ORACLE AND LINUX: A STRONG COMMITMENT

Oracle's involvement with Linux began in 1998, when Oracle Database Release 8 became the first commercial database to be ported to that operating system. Even though there was a still relatively small amount of interest in Linux at the time, it was already used for development and testing environments and Oracle recognized its potential as a viable operating system. At the same time, Oracle started making some investments into some of the Linux startup companies.

In 2002, the initial Oracle Unbreakable Linux program was launched, underscoring Oracle's commitment to Linux as a viable enterprise operating system. At that time, Oracle's Linux team had been working with Linux distributors to make sure that certain features were included in the operating system, and Oracle provided considerable QA on the distributions before their official release. Also in 2002, when Oracle 9*i* Release 2 with Oracle Real Application Clusters was launched, it became the basis for Oracle's Grid Computing technology by making it possible to build a big system based on smaller, cheap components, and run it as one big computer.

Commodity hardware needed a commodity operating system, and Linux was the perfect choice because the alternative would have been an expensive, propriety operating system. At the same time Oracle started providing direct support for the Linux operating system for customers running Oracle products. Any fixes in the OS produced by Oracle for priority one bugs were contributed back to the vendors on whose distribution they manifested and incorporated in their official Linux releases.

Oracle also created a fully open source Linux Cluster File System—Oracle Cluster File System (OCFS)—which was geared towards helping Oracle Real Application Clusters adoption with Oracle 9i. The second version of this, OCFS2, was the first cluster file system to become part of the Linux mainline kernel (in version 2.6.16). At the time Oracle also started sponsoring the Linux security evaluations, because they are important for government contracts and some customers require such level of certification.

Oracle has a dedicated Linux operating system development team in house, and a good number of the engineers are community members and have experience with other Linux distribution vendors. The team has been growing since 2000 and it is fully focused on the operating system, rather than the Oracle products.

Today, the Oracle Linux engineering team focuses on contributing future functionality to the operating system with the Linux community. All the development done by the team takes place in the mainline and upstream communities.

Oracle can provide support for the full software stack within one single team. Such a team is very familiar with the Linux operating system, because Oracle has already been moving to Linux for many years and there is already a large Linux customer base.

Many of Oracle's database support analysts and applications developers are used to working with Linux, and the talent and experience of Oracle's support organization is reflected in numerous

awards, including Service and Support Professionals Association (SSPA) Awards. If a customer has a product concern that affects both the OS and the Oracle product stack, Oracle's support organization has the critical knowledge and experience required to resolve the customer's issue.

Oracle and Linux: Support, Commitment, Leadership

Today, Oracle Database is #1 on Linux with more than 82% market share. Oracle Applications and Oracle Fusion Middleware continue to build significant momentum on Linux as well, with more than 30 percent of Oracle 11i applications and about 50 percent of Oracle Fusion Middleware shipping on Linux last year. Linux is also very strategic to Oracle as a business because it's an open source, open standards alternative to other operating systems, and Oracle participates heavily in open standards, making the combination very good for the company and its customers.

Within the company, there are scores of Linux production deployments as well, making Oracle itself a significant Linux customer. Oracle Linux is Oracle's development environment and Oracle's production environment, with several thousand production systems running Oracle Linux and more than 9,000 developers using it as their development platform.

For more than 30 years, Oracle has provided enterprise-quality support to serve the needs of our customers. Oracle provides a very large-scale support organization, with more than 7,000 professionals in 145 countries providing 24x7 support. Issues can get easily translated in many different languages and they can be followed 24/7 by support professionals around the globe. Oracle Unbreakable Linux leverages Oracle's entire support infrastructure, providing a unique level of scope, experience, and quality.

Complete support for the complete software stack has other advantages in addition to the technical expertise of Oracle's support professionals. When a customer logs into Oracle's bug tracking system they can see all their issues, whether related to the Linux OS or any Oracle products, and the same diagnostic tools that are used to pull information from systems running Oracle products are also used for Linux OS itself.

Oracle is the only vendor in the industry that offers full support for a complete Linux stack – applications, middleware, database, management tools and the operating system.

Learn more about Oracle's support, commitment, and leadership with Linux.

ADDITIONAL RESOURCES

For more information about Oracle Unbreakable Linux, access the following resources:

- **Oracle Unbreakable Linux**
  oracle.com/linux
- **General FAQ on Oracle Unbreakable Linux**
  oracle.com/us/technologies/027617.pdf
- **Download Oracle Linux**
  edelivery.oracle.com/linux
- **Oracle Linux Technical Information**
  http://www.oracle.com/us/technologies/linux/025994.htm
- **Oracle Technical Contributions to Linux**

  http://www.oracle.com/us/products/consulting/026042.htm
- **Oracle Validated Configurations**
  http://www.oracle.com/technetwork/topics/linux/validated-configurations-085828.html

- **Purchase Oracle Unbreakable Linux support**
  oracle.com/store
- **Unbreakable Linux Network**
  linux.oracle.com
- **Oracle Linux with the Unbreakable Enterprise Kernel Data Sheet**
  oracle.com/us/technologies/linux/unbreakable-enterprise-kernel-ds-173416.pdf

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