The Winner for the Best CentOS Linux Replacement is…
Oracle Linux

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Research Premises

DSC has taken a deep look at what Red Hat's decision to kill off CentOS Linux means to users and their best choice at replacing it. This DSC research is based on the following premises:

- IBM-Red Hat announced late fall 2020 that it was discontinuing CentOS Linux.

- CentOS Stream is not a CentOS Linux replacement for the vast majority of users per Red Hat CTO Chris Wright.

- Some CentOS Linux users will be able to use CentOS Stream as a replacement because Red Hat Enterprise Linux (RHEL) is designed to track very closely to it. It's essentially a preview of what's coming with RHEL. The downside comes from the fact CentOS Stream is a rolling release moving from one minor version to another. It is an ongoing beta environment. Many of the releases are not yet hardened, with limited to no quality assurance, nor incorporated into the current released RHEL version, or production ready. Users that depend on CentOS Stream are by definition, beta testers. There will be bugs. They'll lose control when these minor version upgrades or betas, are implemented on their system because it happens automatically. In addition, third party software vendors will not be able to grant certification and support running their software on CentOS Stream. This is because they can't certify or support their software on an OS they still have to test. CentOS Stream will always be in a state of flux for all users making ongoing certifications near impossible. Even software developed by those running on CentOS Stream will have a very difficult time keeping it up to date with all of the patches, fixes, and versions that will be coming unannounced all the time. If and only if these issues aren't a problem for them, can CentOS Stream be a viable replacement. Candidly, there are few users that are able to utilize CentOS Stream as a replacement for CentOS Linux.

- It has become clearly apparent after interviewing several dozen CentOS Linux users, that viable useful CentOS Linux replacements minimally require the Linux distribution to:

    o Be 100% application binary compatibility with RHEL.
    o Minimize time delay for kernel releases tracking with RHEL.
    o Provide all updates, patches, bug fixes, and versions promptly.
    o Deliver rock solid and stable quality assured code.

- o Be available completely free with no mandatory support subscription.
  - o Patch bugs and vulnerabilities promptly.
  - o Provide all source code, binaries, updates, patches, errata, etc., freely available to the community.
  - o Have a proven history/record of stability, community support, and financial stability.
  - o Be committed to delivering their CentOS Linux replacement for years to come.
  - o A rich application ecosystem.

- As noted, these are just the minimum requirements. They are by no means the only CentOS Linux replacement requirements. Varying by CentOS Linux user, many are strongly desiring and in several cases demanding other significant capabilities not found in CentOS Linux. Since they are being forced to find alternatives to CentOS Linux, they want a replacement that provides more and solves several of the CentOS Linux shortcomings. These include:
  - o Having available paid support.
  - o Enhanced security better than CentOS Linux.
  - o Faster loading of upgrades, hot fixes, and patches.
  - o Eliminate annoying CentOS networking randomly shutting down.
  - o Live patching without server slowdown, no reboot required, as an optional service.
  - o Simpler more intuitive management of both the Linux distribution and virtualization on-premises and in the cloud.
  - o Portability between on-premises and public cloud.
  - o Supports both x86 and Arm based servers.
  - o Supports multiple Linux releases.
  - o Federal Information Processing Standards (FIPS), Common Criteria (CC) or Center for Internet Security (CIS) certifications.
  - o A migration utility.

Executive Summary

This research is purposed to help CIOs and system administrators select the CentOS Linux replacement that best fits their current and future requirements. It provides a candid evaluation of the market options. No CIO wants to make the wrong choice and then have to go through yet another migration.

An in-depth examination of the most viable candidates makes it clearly evident that Oracle Linux is the top choice to replace CentOS Linux. Unlike several of the other replacement options, it uniquely meets all of both the minimum and desired CentOS Linux user requirements.

Some CentOS Linux users will be skeptical at best because it's Oracle and likely incredulous about such a conclusion. Oracle is one of the largest Enterprise software technology companies in the world. Others will reject this conclusion out-of-hand because the distributor is Oracle and Oracle's open-source history is mixed. And yet regardless of the level of cynicism, any objective review will reach the same conclusion that Oracle Linux is the best choice for replacing CentOS Linux while providing much more. Read on for the proof.

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The Fundamental CentOS Linux Replacement Problem

IBM Red Hat has given users no choice about using CentOS Linux going forward. They have officially brought an "end-of-life" (EOL), to this very popular free Linux distribution. Many CentOS Linux users were blind-sided and shaken by the late 2020 announcement[1]. CentOS Linux had been binary compatible with Red Hat Enterprise Linux RHEL through release 8. Future RHEL releases will not have a CentOS Linux counterpart.

This is highly troubling for the thousands of IT organizations running on CentOS Linux. IBM Red Hat gave no indication they were going to kill off CentOS Linux before they went and did it.

The official IBM Red Hat alternative to CentOS Linux is they now allow RHEL free – via their developer program - on 16 instances (virtual or physical machines) …period. If 16 instances are all the CentOS Linux user will ever need for development and production combined, it's viable. Self-supported RHEL running on more than 16 instances costs $349/year/machine.

Alternately, some technical analysts believe CentOS Stream is a viable CentOS Linux replacement. Besides the IBM Red Hat official position being no it's not, there are issues in attempting to run IT operations on CentOS Stream.

As previously stated, CentOS Stream is a preview of what's coming with RHEL[2]. It contains future features, patches, and upgrades. They have not gone through rigorous testing and QA. All the bugs have not been worked out. It should be considered a rolling beta release with the exception of major releases. A rolling beta is chaotic. The users are working with non-production code. New releases, hot fixes, and patches are implemented automatically without the users having any control as to when they are implemented. That is likely to cause unplanned disruptions. In fact, at the Red Hat Virtual Summit in May 2021, Mike McGrath, VP of Linux Engineering called CentOS Stream "a public nightly build." Think about that for a moment. This means no third-party software can be certified on CentOS Stream because it is always being updated. They will always be testing and never certifying. No certification means no support. That's no way to run a development or production shop.

Some Linux users can tolerate an ongoing beta environment. Most cannot. Red Hat CTO, Chris Wright, is correct. For most users CentOS Stream is not a CentOS Linux replacement.

If CentOS Linux users are looking at Red Hat for a free Linux distribution beyond 16 instances, they will have to look elsewhere. The next step is to look at the "elsewhere" candidates.

The More Likely Candidates for CentOS Linux Replacement

The primary CentOS Linux replacement suspects include in alphabetical order:

- AlmaLinux
- CloudLinux
- Oracle Linux
- Rocky Linux
- Ubuntu Linux by Canonical

Each candidate's ability to meet both the minimum requirements and major desirable capabilities varies considerably. A deeper look at each one shows how.

Alma Linux

Alma Linux is a a 501(c)(6) foundation, community owned and governed Linux distribution specifically as a CentOS replacement. CloudLinux is an investor in Alma and kicked off the project. CloudLinux utilizes Alma Linux as their version of CentOS Linux. Examining its ability to meeting the minimum CentOS Linux replacement criteria reveals a mixed bag.

AlmaLinux pluses:

- 100% application binary compatibility with RHEL.
- It is essentially a CentOS clone that even defaults to GNOME desktop.
- Provides all source code, binaries, updates, patches, errata, **free** to the community.

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[1] https://www.redhat.com/en/blog/centos-stream-building-innovative-future-enterprise-linux
[2] RHEL is based on Fedora.

- o Supports "secure boot" with v8.4.
- o Customers generally perceive AlmaLinux as quality assured code.
- o Migration from CentOS is relatively easy and non-disruptive via Alma supplied script.
- o Cloud portable and supported on AWS, Azure, and GCP.
- o Runs on both x86 and Arm machines.
- o Has a paid supported distribution via CloudLinux parent TuxCare service.
- o Patches are targeted for release within 1 business day vs. 2 for CentOS.
- o Provides an optional paid live patching[3] option via CloudLinux parent "KernelCare" service.

AlmaLinux minuses:

- o Doesn't have FIPS, CC or CIS certifications, essential for many Linux users.
- o Immature distro with limited history of stability and support – only on second release (8.4). NOTE: AlmaLinux emphasizes prior distro experience to mitigate this.
- o Doesn't support previous RHEL iterations before release 8.3.
- o Does not do anything special to manage instances both on-premises or in the cloud.
- o Cloud support is new.
- o Poor application ecosystem – AlmaLinux claims any application that runs on RHEL runs on them; although, that does not mean those applications are certified to run on AlmaLinux.
- o Limited financial support with grants/yr from CloudLinux, plus percentage of support, and several other high-profile organizations.

AlmaLinux security shortfalls are a major problem for any IT organization upping their security game in the current hyper-malicious attacks with ransomware. KernelCare's ability to implement patches within 1 day, specifically vulnerability patches help, but do nothing for the other major security short falls.

In addition to this dearth of security, other deficiencies such as previous Linux releases, limited certified ecosystem, limited stability, and support history, limited finances, and system management shortcomings, make AlmaLinux a somewhat risky CentOS Linux replacement.

CloudLinux

CloudLinux is a relatively new distribution. Based on RHEL, it is modified to support the requirements and needs of the shared hosting service providers. It does that quite well via extensive partnerships with cPanel, LiquidWeb, as well as 1&1. This is crucial since Red Hat pulled cPanel support for CentOS Streaming.

Although, it's generally hard to view CloudLinux as a drop and play CentOS Linux replacement. It's not and not free either. But, CloudLinux has positioned itself as a CentOS Linux replacement. Examining its ability to meeting the minimum CentOS Linux replacement criteria exposes major issues, even with its other strengths specifically for shared hosting service providers.

CloudLinux pluses:

- o Designed specifically with features and functions aimed at shared hosted service providers.
  - • It isolates each customer into a separate "Lightweight Virtualized Environment" (LVE).
  - • Deep partnerships with cPanel, LiquidWeb, and 1&1.
  - • Shared hosting services like CloudLinux.
- o Cloud portable.
- o Supports "secure boot".
- o Solid quality assured code.
- o Resells 3rd party KernelCare and KernelCare+ service for Live Patching.

CloudLinux minuses:

- o **Not** guaranteed to be 100% RHEL application binary compatible even though RHEL based.
- o i.e., **Not** guaranteed to be 100% CentOS application binary compatible.
- o Not really a self-managed free distribution
  - • No open download – just a 30-day free trial.

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[3] Kernel Live Patching is the process in which patches, hot fixes, and updates are implemented to the Linux kernel without requiring a reboot. Not all Kernel Live Patching is equal. Some are more complete, faster, and easier to use. Pricing for the service varies by vendor. It is essential that the CentOS Linux replacement have a Live Patching option.

- Priced at $14/mo/CloudLinux instance or $18/mo/CloudLinux+ instance that comes with higher priority support and more features.
  - o Relatively new distribution with limited history of stable releases.
  - o Errata is published, but not freely distributed.
  - o Unlike its AlmaLinux, it does not have a migration script or utility at this time.
  - o Doesn't have FIPS, CC or CIS certifications, essential for many Linux users.
  - o Trails RHEL appreciably in releases – as long as 4 weeks.
  - o Limited application ecosystem.
  - o Workaround for security shortfalls is 3rd-party Immunify360 Security Suite software for Linux Servers.
  - o Weak multi-site/multi-cloud management.

The fact that CloudLinux is not guaranteed to be 100% CentOS application binary compatible should automatically disqualify it as a viable CentOS Linux replacement. Since CloudLinux is based on RHEL, it might not necessarily be a major problem. Key word there is "might". As Murphy's Law states: "Whatever can go wrong, will." However, the lack of a free distribution disqualifies it as a viable CentOS Linux replacement for anyone but shared hosted service providers.

Oracle Linux

Oracle has been distributing Oracle Linux both completely free and with optional support since 2006. Oracle is clearly committed to this model. Oracle Linux is specifically architected to be 100% application binary compatible with RHEL and CentOS Linux. Since Oracle launched its distribution in 2006 there has not been one recorded bug relating to that compatibility.

Oracle positions Oracle Linux as the best Linux for Oracle Database and applications for good reason. Oracle Database and Oracle Linux development teams collaborate on performance enhancements, tuning system calls, and C library interfaces to appreciably accelerate applications and query processing times. That collaboration is specifically optimized for Oracle Linux with the Unbreakable Enterprise Kernel (UEK).

Oracle engineers extensively test Oracle Linux with UEK across Oracle's database, middleware, and application tiers as well as on Oracle servers and engineered systems. UEK is also subject to incremental and widespread testing across IT development systems running the family of Oracle Database products, middleware, and applications.

Oracle believes so strongly in Oracle Linux that all of their multi-billion USD businesses depend on it. They are the only public cloud service provider – Oracle Cloud Infrastructure or OCI – to base their infrastructure on the same Linux they distribute. They also base all of their Engineered Systems such as their Exadata and Private Cloud Appliance on Oracle Linux. Oracle is a founding member of the Linux Foundation. Oracle's future is tied to Oracle Linux.

Oracle Linux pluses:
  - o Provides all source code, binaries, updates, patches, errata, **free** to the community.
  - o Oracle contributes significant amounts of code into the Linux open-source project.
    - That code then gets released back by the open-source project.
    - Which in turn, is used in RHEL, CentOS, and other Linux distributions.
    - Oracle Linux also adds optimizations, enhanced capabilities, and performance enhancements beyond what is typically included in RHEL or CentOS distributions.
  - o Choice of two kernels: RHCK (Red Hat Compatible Kernel) or UEK (Unbreakable Enterprise Kernel)
    - Both 100% application binary compatible with RHEL and CentOS Linux.
    - Both always free with optional Enterprise class support.
  - o UEK is specifically performance optimized for Oracle Database and Oracle applications.
    - Runs Oracle Database, middleware, and applications better than any other Linux distro.
  - o Easily the highest performing Linux distribution currently available.
    - Updating Oracle Linux is faster than all other RHEL based distributions.
    - Much faster than CentOS Linux.
    - Even kernel updates are incredibly fast.
    - Fast in both bare metal and VMs.

- o Rock solid stable and even more stable than CentOS Linux.
  - Strong history of distro stability, support, and rapid patches, hot fixes, and version control.
- o Oracle Linux is the OS used throughout Oracle Cloud Infrastructure (OCI).
  - No other Linux distribution, available to customers on-premises and in the cloud, is the exact same release utilized to run the infrastructure of a major public cloud.
- o Security is also rock solid with UEFI secure boot, FIPS 140-2, CC, and CIS certifications.
- o The optional Ksplice service is the most complete, mature, fastest, easy-to-use Kernel Live Patching service available.
  - Because Ksplice is so easy, fast, and non-disruptive, it enables vulnerability patches to be implemented faster, reducing risk of malicious exploitation, and enhancing security.
  - In addition to Kernel live patching, Ksplice also does live patching for hypervisors (KVM and Xen) and critical userspace libraries (glibc and openssl). Ksplice provides an additional benefit: the ability to alert administrators when an alarm is detected via Ksplice Known Exploit Detection.
  - Besides Oracle Linux, Ksplice offers live patching service to RHEL, CentOS, and other Linux distros.
- o Extensive intuitive management options both on-premises and in the cloud with:
  - Oracle Linux Manager.
  - Oracle Linux Virtualization Manager.
  - Unique, incredibly intuitive Oracle Linux Automation Manager.
  - Oracle Cloud Native Environment, a fully integrated open-source suite for development and management of cloud-native applications.
- o Fixes CentOS Linux problem of networking randomly failing.
- o Supports x86 and Arm servers.
- o Supports current and previous RHEL and CentOS Linux releases.
- o Intuitive migration application.
- o A very rich application ecosystem.
- o Two levels of optional paid support – Basic and Premier.
  - Oracle Linux Premier support is free for OCI subscribers and Oracle Engineered Systems.
  - Round-the-clock, cost-effective Linux support, available in 145 countries, for traditional, cloud based, or virtual environments.

Oracle Linux minuses:

- o The cPanel hosting platform currently does not yet support Oracle Linux.
- o Oracle's non-Linux open-source support history has been spotty.
  - However, the Linux support history is very strong and the heart of OCI.
  - Oracle's Public Cloud and on-premises businesses are dependent on Oracle Linux meaning their support is steadfast.

Oracle Linux is currently without question, the fastest, most stable, most secure, most easily managed, most supported and most complete CentOS Linux alternative. It checks off all of the boxes for being a robust, easy to use, CentOS Linux replacement making it the best choice for replacing CentOS. The one exception is for shared hosted service providers that use the cPanel hosting platform.

Rocky Linux

Rocky Linux is the latest CentOS Linux clone from the Gregory Kurtzer, the person who created CentOS Linux. Kurtzer is focusing on making sure Rocky Linux is a pure community effort. For the community driven by the community. The Rocky Linux is a non-commercial distribution promising to be exactly what CentOS Linux was supposed to be before RHEL changed its mind. Kurtzer is determined to keep Rocky Linux community based open source with no corporate influence and no paid support.

Rocky Linux pluses:

- o 100% application binary compatible with RHEL and CentOS Linux.
- o A pure CentOS Linux clone.
- o First 2 releases (8.3 and 8.4) as stable as CentOS Linux.

- o   Supports x86 and Arm servers.
- o   Community driven for the community.

Rocky Linux minuses:

- o   Being a pure CentOS Linux clone also means bug-for-bug compatible.
- o   No increased functionality over CentOS Linux.
- o   No improvement in management.
- o   No UEFI Secure boot, FIPS-140, CC or CIS certifications.
- o   No direct support.
- o   No application ecosystem to speak of.
- o   Delayed patching.
- o   Delayed releases.
- o   Updates, patches, and hot fixes are just as glacially slow to load as CentOS Linux.
- o   No current support from Live Patching services.
- o   No historical RHEL release support.
- o   Brand new distribution with limited history of stable releases.
- o   No published errata.
- o   No migration utility.
- o   No cloud implementations.

Rocky Linux was built specifically to be the CentOS Linux heir and be a pure community effort. Unfortunately, it does nothing to improve on CentOS problems and issues such as load performance, networking randomly failing, or patching delays. It's a brand-new Linux distribution that was first released 30 April 2021. Enhanced security will take considerable time to get certified.

The appeal of Rocky Linux as a CentOS Linux replacement will be mostly for those that only want an unsupported open-source distribution. For the vast majority of CentOS Linux users, Rocky Linux lack of history, performance, enriched functionality, enhanced security, intuitive management, application certifications and support, and cloud portability make it a non-starter for this point-in-time.

Ubuntu Linux by Canonical

Ubuntu Linux has been around for a while. It has a huge application ecosystem, although they do not support Oracle applications. Ubuntu Linux has a user-friendly distribution. Canonical Ubuntu Linux is not application binary compatible with RHEL nor do they claim to be. Canonical's focus and strategy is to position Ubuntu Linux as the Linux distribution for multiple clouds, OpenStack, Kubernetes, and IoT embedded Linux. It is not positioned well as a CentOS replacement. Examining its ability to meeting the minimum CentOS Linux replacement criteria reveals stumbling blocks at best, even with its other strengths.

Ubuntu Linux pluses:

- o   Provides all source code, binaries, updates, patches, errata, etc., **free** to the community.
- o   User friendly distribution.
- o   History of stable solid quality assured code.
- o   Updates load faster than in CentOS.
- o   Cloud portable – with implementations in all public clouds.
- o   Strong Kubernetes support on bare metal, VMware, and public clouds.
- o   Very strong in Telco customers because of OpenStack.
- o   Large community.
- o   Large application ecosystem.
- o   Strong optional security with UEFI secure boot, FIPS 140-2, CC and CIS certifications.
- o   Optional Enterprise support.
- o   Supports x86, Arm, and Power servers.
- o   Optional paid live patching option via Canonical "Livepatch" service.

Ubuntu Linux minuses:

- o   **Not** RHEL application binary compatible
- o   i.e., **Not** CentOS application binary compatible.
- o   Based on Debian, not RHEL.

- o   Does not support past RHEL releases either.
- o   There are no automated migration utilities from CentOS to Ubuntu.
- o   No public cloud vendor has opted to use Ubuntu Linux in their infrastructure.
- o   Doesn't support Oracle applications.
- o   Architected more for beginning and general-purpose users versus commercial business users.
- o   Many supported applications are not fully compatible requiring an emulator to work.
- o   Frequently need to get several dependencies to install on a single program.
- o   Not as well integrated with Kubernetes or Docker containers as RHEL or CentOS Linux.
- o   Weak multi-site/multi-cloud management.

The fact that Ubuntu Linux is not CentOS application binary compatible should automatically disqualify it as a viable CentOS Linux replacement. However, some IT pros will not mind the additional manual labor required to make their applications work on Ubuntu.

Ubuntu may be a quality Linux distribution, but it is a poor CentOS Linux replacement.

Summary and Conclusion

IBM Red Hat's decision to kill off CentOS Linux left many users scrambling for an alternative. A deep examination of the most popular Linux distributions reveals options. The question becomes which of these options make the most sense. Changing from CentOS Linux to another Linux distribution takes effort and time. Most CentOS Linux users would most likely have not taken the time if CentOS were not EOL. Regrettably, it is, and they now have to make a change. If all the CentOS Linux user wants is a CentOS Linux clone, there are several choices. But that's not all many CentOS Linux users are looking for.

Since they will be going through a non-trivial effort to replace CentOS Linux, there are several other aspects they are considering besides RHEL and CentOS Linux binary compatibility. Considerations such as, additional functionality, timing of major and minor releases to match RHEL, live patching option, load performance, management, application performance, enhanced security, application ecosystem, community, published errata, whether there's optional support if they should want it later, x86 and Arm server support.

A quick review of the following table clearly shows one Linux distribution alternative to CentOS Linux jumping out from all the rest. That option being Oracle Linux. Some will be shocked by this, but facts are facts. With the exception of shared hosted services running on the cPanel platform, Oracle Linux is the optimum choice for replacing the EOL CentOS Linux.

Table 1: CentOS Linux Replacement Comparison

	Alma Linux	Cloud Linux	Oracle Linux	Rocky Linux	Ubuntu Linux
100% application binary compatibility with RHEL	√	X	√	√	X
Min time delay for kernel releases tracking with RHEL	√	√	√	X	√
Provide updates, patches, bug fixes, & versions promptly	√	√	√	X	√
Deliver rock solid and stable quality assured code	TBD	TBD	√	√	√
Available completely free w/no mandatory paid support	√	X	√	√	X
Available paid support	√	√	√	X	√
Patch bugs & vulnerabilities promptly	√	√	√	√	√
Provide all source code, binaries, updates, patches, errata, free to community	√	X	√	√	X
Have a proven history/record of stability, community support, & financial stability	X	X	√	X	√
Enhanced security > CentOS Linux w/FIPS & CIS cert.	X	X	√	X	√
Faster loading of upgrades, hot fixes, and patches	X	X	√	X	√
Eliminate annoying CentOS networking randomly shutting down	X	X	√	X	√
Optional live patching w/o server slowdown, or reboot	√	√	√	X	√
Simpler more intuitive mgmt of Linux distro, virtualization on-premises & in the cloud	X	X	√	X	√
Portability between on-premises and public cloud	X	X	√	X	√
Supports both x86 and Arm based servers	√	√	√	√	√
Rich certified app ecosystem	X	X	√	X	√
Supports Oracle Databases & applications	√	√	√	√	X
Supports multiple Linux versions	X	X	√	X	√
A migration utility	√	X	√	X	√
Supported by cPanel hosting platform	√	√	X - requested	√	√

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