VFX LINUX
TASK FORCE

VFX LINUX DISTRIBUTION RECOMMENDATION REPORT

2022

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EXECUTIVE SUMMARY

Linux is the primary operating system used on artist workstations and backend services at most VFX and animation studios, but there is uncertainty about the future with the impending end of life of CentOS Linux 7, the Linux distribution most commonly used by studios.

Studios urgently need to choose where to turn next, and there is a real risk of fragmentation if many different choices are made which would be harmful to both studios and software vendors. There is consensus that coordinated urgent action across the community is needed to enable Linux to continue being the operating system of choice for most studios.

Earlier this year, the VFX Linux Task Force was launched with the single goal of recommending a Linux distribution for VFX and animation studios to align on for use on workstations. This report is the output of that task force after several months of research, outreach, and discussion with Linux distribution vendors, software vendors, and other members of the community. Although the report is focused on workstations, the recommendations presented here are likely to inform choices made regarding render nodes and backend servers too.

While many studios have good reasons for using Linux, Windows and macOS are both seeing wider adoption as an OS for general VFX use and have specific use cases prompting most studios to use a mix of operating systems. This report is aimed at all studios, as the whole community benefits from having Linux as a healthy sustainable choice even if they choose not to use much, or any, of it.

The urgency and scale of work needed across the community imposed some constraints on the choice of distributions to consider, which is elaborated on later in this report. While all options were considered, ultimately, the distributions that were more specifically assessed were AlmaLinux, Red Hat Enterprise Linux, Rocky Linux, and Ubuntu.

After much deliberation, the **primary recommendation** of the VFX Linux Task Force is:

- For **artist workstations running Linux**, it is strongly recommended that all VFX and Animation studios deploy **Red Hat Enterprise Linux (RHEL) 9.x** or one of its binary compatible rebuild distributions such as **AlmaLinux 9.x** or **Rocky Linux 9.x in 2023**, and **no later than June 2024** for those still running CentOS Linux 7.

- **Digital content creation (DCC) software vendors** are encouraged to build their products on **at least RHEL 8.x (or downstream equivalent)** and **qualify all minor releases of RHEL 9** as being officially supported for their customers **in 2023**.

While there were many factors that led to this recommendation, one of the strongest was that there is already a great deal of infrastructure, tooling, and expertise around RHEL / CentOS Linux in the community. While there are benefits to other distributions, they were collectively not compelling enough to build the critical mass needed for so many studios and vendors to agree to retrain and retool in such a short time.

Ubuntu is an excellent Linux distribution with many compelling benefits, so a secondary recommendation is that in the longer term all software vendors should consider providing equal support for both RHEL and Ubuntu. This should only be considered once the primary recommendation above has been addressed.

In the longer term, the community should pool know-how and effort to elevate the professional artist workstation experience on Linux to be at least on a par with, and hopefully exceed, Windows and macOS. New virtualization and containerization technologies should enable more flexibility, and increased interoperability, so that studio workstations with different operating systems can more easily co-exist with each other. Software vendors and studios should work together to ease the adoption of Linux for studios that want to increase its use on workstations. Finally, better community coordination can help increase the ease and frequency of software updates. This would help the whole community to adopt new capabilities more quickly, and use more recent releases that offer better security, performance, and functionality.

Aligning on compatible Linux distributions will make it easier for the community to pool their efforts and benefit from building on a common foundation. For too long, the knowledge of how to build powerful Linux-based studios has been locked up in the silos of individual studios. It is time for the community to come together to pool that knowledge and make it available to all, creating a shared repository of configuration guides, best practices, and tutorials, that are continually updated and improved for the good of all.

Ultimately, these recommendations and the next steps outlined in this report are an important step on the journey of securing the future of Linux as a sustainable, healthy platform for studio workstations, providing a more easily adoptable solution that will eventually deliver the best artist experience on professional graphics workstations.

INTRODUCTION

The professional visual effects (VFX) and animation community is at a crossroads when it comes to the future platform for artist workstations due to the industry's most widely used OS distribution, CentOS Linux 7, soon reaching its end of life.

The early years of the industry were dominated by Silicon Graphics before Linux became the natural successor to SGI's IRIX. Two decades later, Linux is still the primary OS used on artist workstations at most studios, but there is uncertainty about the future after the decision by Red Hat and the CentOS Board to replace CentOS Linux with CentOS Stream, a continuously updated distribution that may not fit the requirements of our industry. At the same time, macOS and Windows are more powerful and capable than ever.

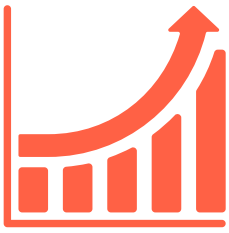
In October 2021, the Visual Effects Society's (VES) Technology Committee conducted the first Studio Platform Survey, the results of which were published in a report in January 2022. Among other insights, the report confirmed that:

- Linux is the preferred option on the majority of professional artist workstations
- CentOS Linux had the majority market share of Linux workstations
- Most studios using CentOS Linux were undecided about what to do next but planned to make a decision before the end of 2022
- Overall, studios were anticipating the use of Linux on workstations to grow more than other operating systems.

As a result of these findings, it was clear that coordinated urgent action across the community is needed to enable Linux to continue as the workstation operating system of choice for most studios. Given its impending end of life, including the end of critical security updates, it is imperative that studios move quickly away from CentOS Linux. The community also must avoid the fragmentation from each studio choosing to move to different distributions, as that would increase costs and be difficult for software vendors supporting their products on Linux. Distribution fragmentation would also create additional burdens for industry-specific open source projects, as well as for in-house teams consuming these projects or developing their own projects with an eye towards collaboration with other studios.

With broad agreement across the community that coordination of distribution selection was more beneficial than studios each making individual selections, the VES Technology Committee launched a VFX Linux Task Force with the single goal of recommending a Linux distribution for VFX and animation studios to align on.

This report is the output of that task force. It explains the process, research, assessment, and finally the recommendation for which distribution to use. It also lays out a longer-term vision and proposed next steps toward the goals of:



- increasing and improving support for Linux from more Digital Content Creation (DCC) tools,
- facilitating Linux adoption by software providers and studios that predominantly use Windows or macOS,
- Linux providing the best artist experience for professional graphics workstations,
- securing the future of Linux as a sustainable, healthy platform for studio workstations.

This report and its recommendations are very much focused just on Linux distribution selection for artist workstations at multi-user VFX and animation studios as this is where most urgent action is required. These recommendations are not aimed at individual artists, who may value being on the latest software over stability or interoperability, or at other uses of Linux.

WHY LINUX?

These days, Linux, Windows, and macOS are all good options for a professional workstation operating system although each has different trade-offs. Those that are less familiar with Linux may have been surprised by the results of the 2021 Studio Platform Survey showing that Linux has the majority market share of workstations at VFX and Animation studios and is seeing more anticipated growth compared to other options.

It is valuable to understand why Linux is preferred for this use by most studios, and why it is worth coordinated effort across the community to sustain it. The primary reasons tend to be:

- **Flexibility** - Open source, standards support, and a large community means Linux is flexible and there is a huge library of code available, plus the opportunity to customize the OS to meet specific needs.
- **Vendor independence** - Linux supports a wide array of products which provides the ability to tailor systems towards specific problems, and not be locked into product life cycles with software-enforced obsolescence.
- **Performance** - Full access to the kernel allows for tuning to optimize for high-performance computing applications like simulation and rendering. With large-scale deployments of render farms and expensive workstation hardware, even small performance gains can provide high value.
- **Network transparency** - Linux allows users to access resources without the user needing to know, or even be aware of, whether the resource is local or elsewhere on the network. Most studios make heavy use of this feature for storage using NFS.
- **Supportability** - The fully open nature of Linux means it is possible to investigate and potentially solve any problem without the necessity of relying on a vendor that may not understand the problem. A studio with access to technical expertise can potentially fix blocking issues affecting its production schedule without having to wait for a solution from an external vendor.
- **Licensing** - The option of no-cost installs, avoiding license management complexity and constraints to scaling up infrastructure. This is especially important when deploying to public clouds, where operating system licensing costs can fundamentally change the economics of what is feasible and what is not. NB: Some Linux distributions do require a paid subscription for access to support and services.

- **Talent** - The use of Linux attracts talented engineers and developers who tend towards deep technical knowledge and bring very beneficial innovation and advocacy to our community.

Again, Windows and macOS are both great options too and most studios use them in addition to Linux, with a good proportion of studios being primarily Windows-based. This report is aimed at all studios, as the whole community benefits from having Linux as a healthy sustainable choice even if they choose not to use it.

THE PROCESS

The VFX Linux Task Force was assembled and launched by the VES Technology Committee in March 2022 with the goal of conducting comprehensive market research before publishing a recommendation in August 2022 for which Linux distribution studios should align on, in the wake of the CentOS Linux project changes.

CentOS Linux 7 is approaching its end of life on June 30th, 2024 but studios will need to have been working on a replacement long before that in order to complete the transition in time, hence the need for some urgency.

The Task Force consisted of 10 people, all of which are lead systems engineers or technology leaders from a mix of small, mid, and large VFX and animation studios, with representation from studios that are predominantly Windows as well as primarily Linux-based.

The group met weekly throughout the process, often inviting industry partners to hear their perspectives and discuss the various options. Among others, the group met with:

Red Hat / RHEL
CIQ / Rocky Linux
CloudLinux / AlmaLinux
Canonical / Ubuntu
VFX Reference Platform Working Group
and DCC vendors including Autodesk, Epic Games, Foundry, and SideFX.

This was a volunteer effort, aiming to independently make an objective recommendation for the long-term benefit of the whole professional VFX and Animation community. However, the authors acknowledge that this process did require some subjective assessment by a group of experienced industry people, although we always tried to keep the needs of the whole community in mind.

The publication of this report signals the end of the VFX Linux Task Force. The next steps outlined below will hopefully germinate new groups to build on this report's recommendations.

LINUX DISTRIBUTIONS

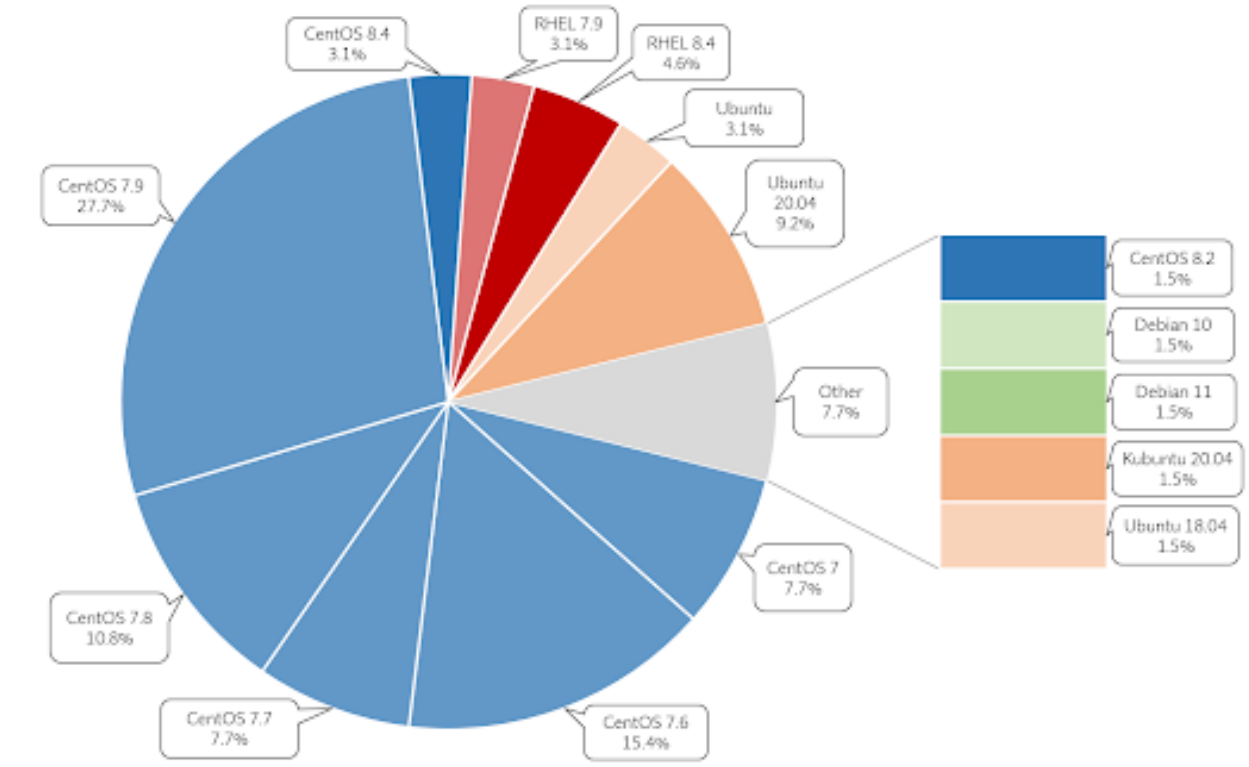
It is imperative that the studio community and their software partners quickly move on from CentOS Linux 7 to a different distribution since it will no longer receive security updates for critical security vulnerabilities, or support new hardware, after June 2024.

In this section, we consider which alternative Linux distributions to assess, and provide more detail about each option.

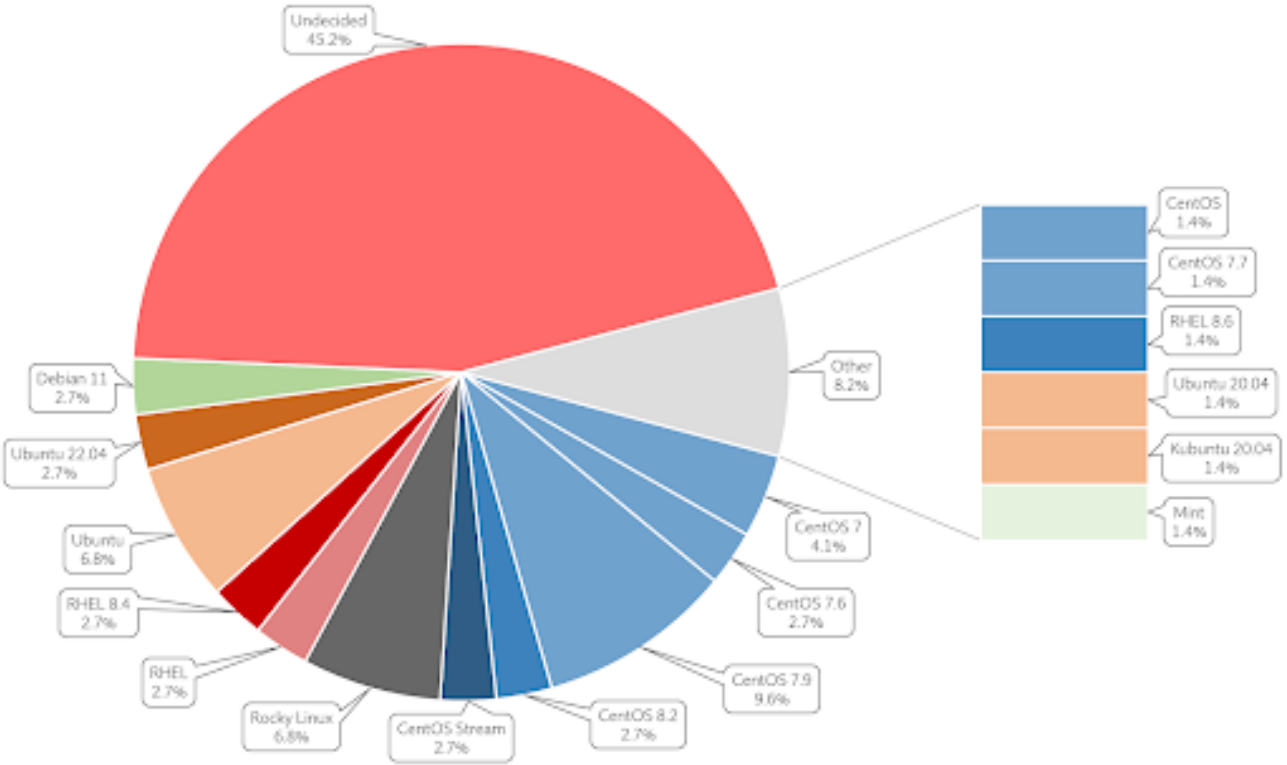
Which Linux Distributions to Consider?

In order to make a recommendation for a Linux distribution, the VFX Linux Task Force had to identify suitable options to research and assess. Given the urgency, the decision was made to only assess Linux distributions or distribution vendors that were represented in the 2021 Studio Platform Survey Report. The challenge of moving a critical mass of studios to a different distribution, unfamiliar and unproven to the industry, is too great a risk. Likewise, expecting the industry DCC software vendors to pivot to supporting a new distribution in the timeframe available was deemed a high-risk factor. This also means that the recommended distribution would naturally be one that the community already has some expertise and experience in using, hopefully easing the transition.

Furthermore, some studios and software vendors require an option that gives them the ability to pay for support, and/or provides a means to financially support open source work in order to help with sustainability, and perhaps have some additional influence in competing over priorities with other industries.



Proportion of studios deploying each Linux distribution version to workstations installed in 2021.[From Studio Platform Survey Report 2021]



Proportion of studios planning on deploying each Linux distribution version to new workstations installed in 2022. [From Studio Platform Survey Report 2021]

From the Studio Platform Survey Report 2021, the distributions that qualified for consideration by the Task Force, both for their inclusion in the report and for the availability of an option to pay for additional support or service, were Red Hat Enterprise Linux, Rocky Linux, and Ubuntu.

Neither Debian nor Mint have options to pay for additional support or services, so they did not qualify for consideration. Kubuntu was rolled into the overall assessment of Ubuntu.

Although AlmaLinux did not appear in the Studio Platform Survey Report, as another RHEL-based rebuild with a strong community focus, it objectively meets all of the selection criteria along with Rocky Linux. Since both AlmaLinux and Rocky Linux are still relatively new, having more than one option here helps minimize the risk of either choice so the decision was made by the Task Force to include it in the assessment.

So, the final distributions that were assessed were AlmaLinux, Red Hat Enterprise Linux, Rocky Linux, and Ubuntu.

Why Not Consider Other Distributions?

There are several great Linux distributions and no doubt many people believe that there are other distributions that would be an excellent choice for a professional graphics workstation. Here are some requirements that explain why other distributions may not be appropriate for the specific use-case of artist workstations at VFX and animation studios:

- Adequate experience and expertise with the distribution in the VFX and animation studio community
- Availability of optional paid-for support and/or services
- Enough stability, and a long enough support lifecycle, to meet the needs of studios and their software partners that often work on multi-year projects
- Conversely, the distribution needs to move fast enough, and consistently enough, to enable studios to adopt new technologies without unpredictable delays
- Licensing needs to support studios using a mix of open source, 3rd party commercial, and proprietary in-house software
- Prompt, robust response to security vulnerabilities
- First-tier driver and library support from commercial GPU vendors.

What About a Custom Distribution?

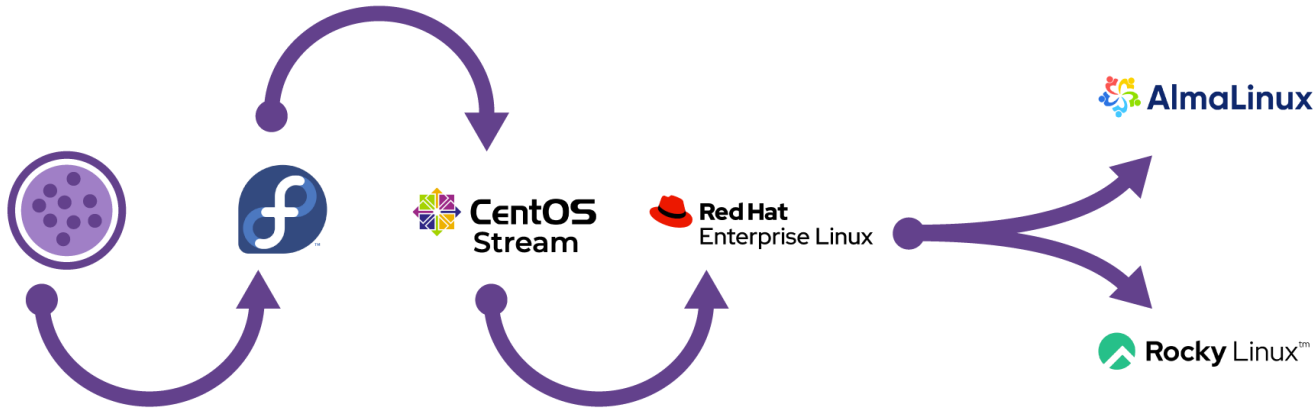
The sustained effort to create and support an original distribution with significant value add for the community is beyond the scope of what the community is currently able to accomplish. The Academy Software Foundation would be the closest thing to an existing industry organization that could tackle such a project, yet it has decided against committing to such a goal whenever the topic has been raised.

The reasons for this are not only that it is so much work to set up and sustain such a distribution, but also that software vendors are much more likely to support their products on a widely used Linux distribution that reaches a broad market than a specialist "VFX Linux" distribution that targets a smaller proportion of their customer base.

Whenever this topic has come up in the community, the conclusion has always been that leveraging an existing, widely used distribution is much more likely to be successful, and that is still the case today. Instead of a custom distribution, it is expected that community efforts may well result in a bundle of additional packages and configuration settings that layer on top of an existing distribution to provide a more consistent artist experience that is better tuned and easier to set up.

About the Red Hat Enterprise Linux Ecosystem

Before getting into the details of individual distributions, it is important to understand the ecosystem around Red Hat Enterprise Linux (RHEL), as described in this diagram.



Open Source Community Projects

Individual projects, each working toward their own goals

Fedora Linux

Collection of the latest and best open source projects

CentOS Stream

More stable collection building towards next minor release of RHEL

Red Hat Enterprise Linux

Production quality, stable, supported operating system

Rebuild Distributions

Freely available "bug-for-bug" compatible rebuilds of RHEL

For many years, CentOS Linux has provided the community with a binary compatible, rebranded alternative to RHEL but its time is coming to an end with the introduction of CentOS Stream. Both Alma Linux and Rocky Linux can be considered "drop-in replacements" for CentOS Linux. Both aim to match, and in practice significantly improve on, the goals of the original CentOS project. Although both are newcomers to the market having been created in response to the CentOS project changes, it is important to understand what goes into these projects, what they have in common with the CentOS Linux distribution they replace and why, despite both being quite new, they are worthy contenders.

Although it is not available free of charge, RHEL is still a true open source distribution. While the myriad available of open source licenses differ in their legal requirements for publishing source code, Red Hat just uploads the source code on release for every software package that makes up RHEL to https://git.centos.org/ where it is publicly available.

While the source code is free for others to use, Red Hat's branding and trademarks are not. So what the CentOS project did (and what other downstream distributions like AlmaLinux and Rocky Linux do today) is take the source code that Red Hat publishes and re-compile it with a minimal set of changes to remove anything trademarked by Red Hat (and replace it with their own branding). They then make the result available free of charge.

This process does not only apply to the initial release. Every time Red Hat updates a software package (either for security, bug fix, or enhancement) the cycle repeats. This is why both AlmaLinux and Rocky Linux can claim to be "1:1" or "bug-for-bug" compatible with RHEL.

The "bug-for-bug" statement is important to take note of: if a bug or security vulnerability exists in RHEL, it exists in any of the rebuild distributions until it is fixed by Red Hat and the rebuild cycle repeats.

Thankfully, modern CI/CD and automation have greatly improved this process and both AlmaLinux and Rocky Linux are setting new records for reducing the gap, with many updates generally being available within a day of release by Red Hat. This release gap can never quite be zero and that may be a major consideration for some when choosing between RHEL or a downstream rebuild.

Please note that not all downstream distributions are created equal, and some are intentionally not 100% compatible. For example, Oracle Linux is another well-established RHEL rebuild although it did not qualify for inclusion in this assessment. Although Oracle claims 100% application binary compatibility with RHEL, Oracle Linux is not quite a 1:1 rebuild. Because there are changes in some core packages such as glibc, it may not be “bug-for-bug” compatible with RHEL, or offer identical performance characteristics.

Red Hat Enterprise Linux

Red Hat Enterprise Linux (RHEL) is a commercial open source Linux distribution developed by Red Hat. It is a well-established distribution and is generally more favored by businesses and organizations than individuals and enthusiasts.

As a commercial distribution, it is only available with a paid-for subscription. This has created a robust, successful business for Red Hat and allows them to employ or sponsor many of the software developers and organizations in the open source software community.

Red Hat was acquired by IBM in 2019, and early concerns have been allayed by RHEL's continued development and success, and Red Hat's strategic importance to IBM. This makes RHEL a relatively safe and secure bet in terms of its longevity and sustainability. In terms of the sustainability of the RHEL Workstation product specifically, it is used widely across multiple industries including automotive, aerospace, semiconductor design, geological research, and scientific visualization among others so its future seems secure.

With the launch of RHEL 8, Red Hat defined new life cycle rules to make consumption of the platform simpler and more predictable. They are as follows:

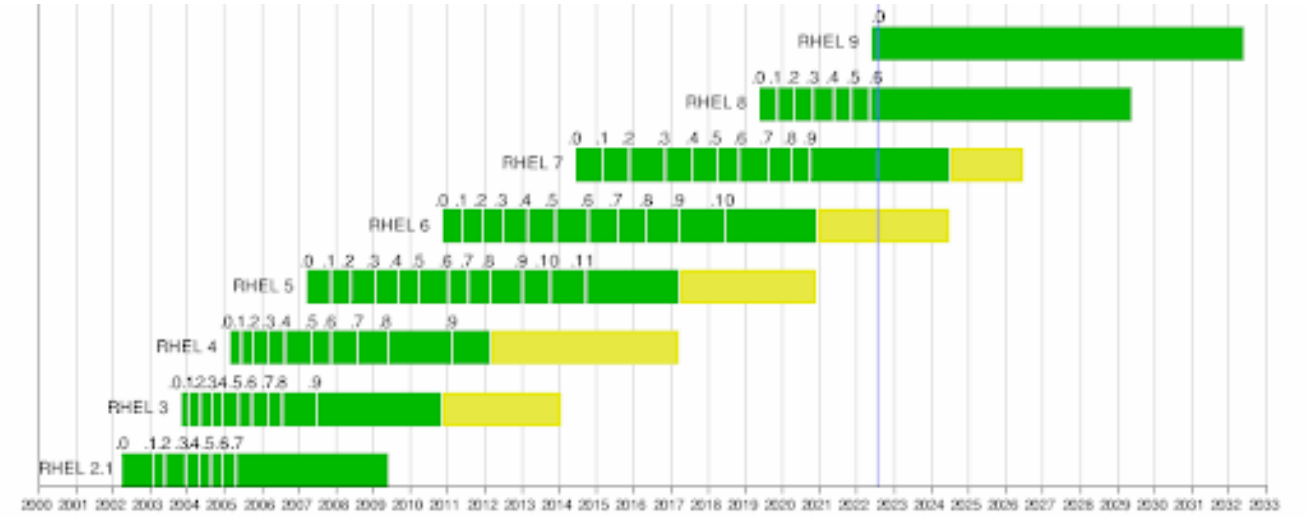
- New major releases every 3 years:

Version	Released	Latest release	Based on...
RHEL 8	May 2019	8.6 (May 2022)	Fedora 28
RHEL 9	May 2022	9.0 (May 2022)	Fedora 34
RHEL 10 (est)	May 2025 (est)	N/A	Fedora 40 (est)

- New minor releases every 6 months for the first 5 years with X.10 being the final minor release.

Major releases of RHEL will still be supported for 10 years. There are two phases of support, Full Support, and Maintenance Support. During Full Support (first five years) there will be new feature enhancements, hardware enablement, etc, whereas Maintenance Support (the remaining five years) will be for just Red Hat rated Critical and Important security and bug fixes.

Version	Full Support Ends	Maintenance Support Ends
RHEL 8	May 31, 2024	May 31, 2029
RHEL 9	May 31, 2027	May 31, 2032



From: https://en.wikipedia.org/wiki/Red_Hat_Enterprise_Linux

For more information on the RHEL life cycle, please review the RHEL Life Cycle knowledge base article.

A majority of studios choose to use a distribution that is available at no cost, but some do pay for RHEL subscriptions for their workstations, servers, and render farm. Although annual investment is required for these subscriptions, in return the studios benefit from expert Linux support and the ability to influence the RHEL roadmap to better meet the studio's needs.

AlmaLinux

AlmaLinux is a 100% binary and "bug-for-bug" compatible rebuild of RHEL, so it has the same technical capabilities and product lifecycle.

It was created by community members using resources from CloudLinux in response to the change of direction of CentOS. The distribution is governed by The AlmaLinux OS Foundation, a 501(c)(6) non-profit organization independently owned and governed by the community. It owns all assets related to AlmaLinux OS.

Although still early in its life, AlmaLinux has shown a lot of promise with a strong governance structure and a good track record for quickly rebuilding and releasing AlmaLinux in response to RHEL releases and updates. Their release of AlmaLinux 8.6 trailed Red Hat by only 2 days. Commercial support services are available from CloudLinux TuxCare.

AlmaLinux appears to have strong community goals in the space, regularly participating in ecosystem events and recently presenting their open build system that they use to build AlmaLinux at the CentOS Summer Dojo. They have also worked with engineers from other projects in creating an open source tool called ELevate (presented at the CentOS FOSDEM Dojo) which not only supports migrating from CentOS 7 to AlmaLinux 8, but also to CentOS Stream 8, Rocky Linux 8, and Oracle Linux 8.

Rocky Linux

Rocky Linux is another 100% binary and "bug-for-bug" compatible rebuild of RHEL, with the same technical capabilities and product lifecycle.

Its founders include Greg Kurtzer, one of the original co-founders of the CentOS Linux distribution, and its goal is to learn lessons from the CentOS Linux experience to create a more sustainable production-ready downstream version of RHEL.

Rocky Linux is owned by The Rocky Enterprise Software Foundation (RESF), a Public Benefit Corporation (PBC) formed in Delaware. The RESF is backed by an advisory board of trusted individuals and team leads from the Rocky Linux community. Ctrl IQ Inc (CIQ) is the founding support and services partner of Rocky Linux.

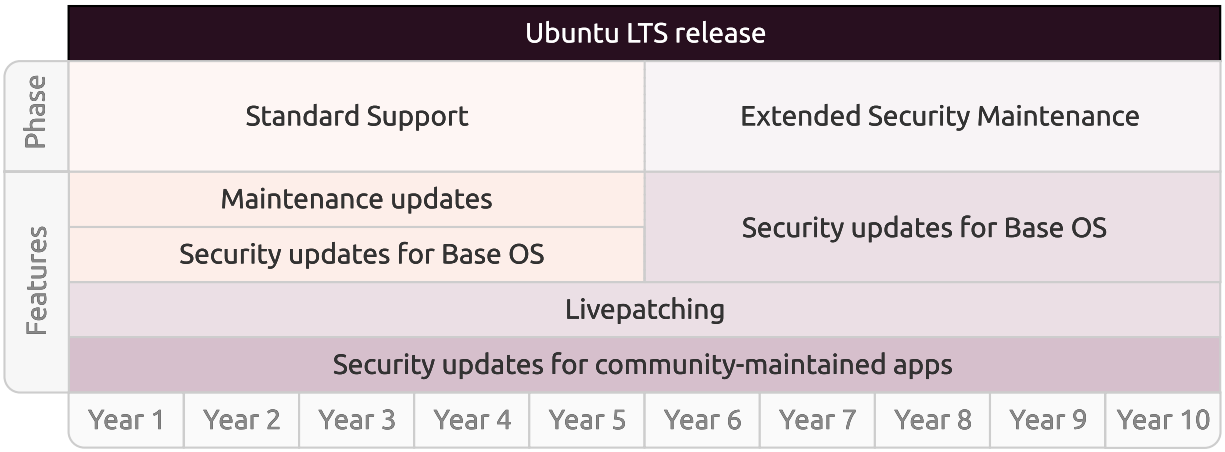
Rocky Linux is also early in its life but has already been making a big impact. It has built an impressive list of sponsors, and CIQ recently received a $26M round of funding, so this seems to be good progress towards long-term financial security.

Releases of Rocky Linux have reliably followed RHEL releases and updates, although the recent Rocky Linux 9 release came 8 weeks after the RHEL 9 release. This was due to Rocky Linux 9 being the first release to be built with a new community-developed and open-source cloud-native build system. As per their press release, "a primary goal in developing the new build system was assuring that new versions of Rocky can be released within one week after each Red Hat Enterprise Linux new version release", which bodes well for future Rocky Linux releases and updates.

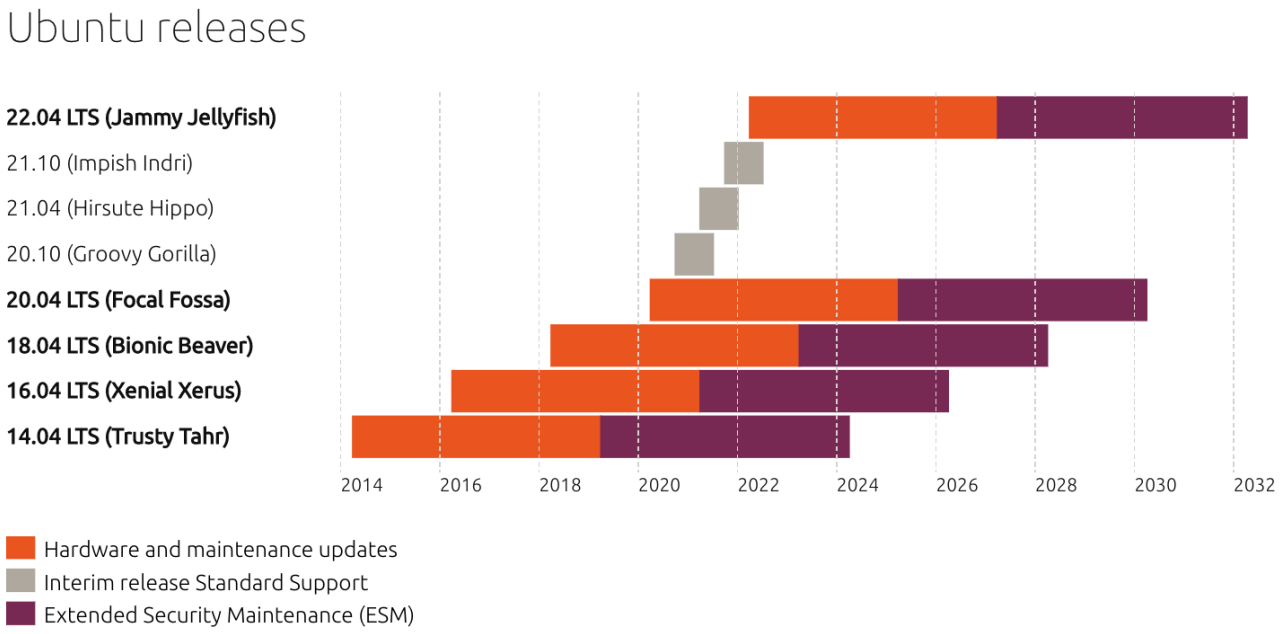
Ubuntu

Ubuntu is a Desktop, Server and IoT focused open source Linux distribution developed by Canonical. Another well-established distribution, Ubuntu is released every 6 months (with long-term support releases every 2 years) and Canonical has impressively maintained this release cadence since its first release in 2004.

Canonical offers optional commercial support services for Ubuntu and all editions of the distribution are freely available, with support for 5 years for the LTS releases. Extended 10-year support is available for LTS releases if purchased.



Similar to Red Hat, the latter 5 years of extended support are limited to security fixes.



Images from: https://ubuntu.com/about/release-cycle

In comparing RHEL vs Ubuntu one of the biggest advantages to Ubuntu has always been its desktop focus and its more frequent release cycle. While both distributions freeze major parts of the distribution (such as the desktop environment) for major / LTS releases, Ubuntu's much shorter LTS release cycle means an opportunity to move forward more frequently (although with Red Hat's new 3-year release cycle for RHEL does bring the two closer).

Another particular strength of Ubuntu over RHEL is the strong support for various desktop environments via the Ubuntu flavors. While they are owned and developed by the community and not Canonical, they benefit by being fully backed by the Ubuntu archive for packages and updates making them well supported. The official flavors that are based on desktop environments currently include Kubuntu (KDE), Lubuntu (LXQt), Ubuntu Budgie, Ubuntu MATE, and Xubuntu (XFCE).

EVALUATION CRITERIA

When considering the various Linux distributions available, the following evaluation criteria were used to make the final recommendation:

Technical

- **Velocity/Reliability** - Each distribution strikes a different balance between reliability & stability, and leaning into the latest releases offering new features and capabilities. While individual artists and developers may prefer high-velocity progress over stability, studios and software vendors tend to lean more towards stability to ensure enough interoperability and reliability to support their businesses.
- **Adoptability** - The ability for studios and vendors to adopt the distribution quickly given the urgent need to replace CentOS Linux.
- **Lifecycle** - How long each release is supported for, how often releases are made, and how quickly downstream releases follow the upstream releases.
- **Future features** - Confidence in the distribution provider addressing VFX-specific needs such as Wayland support for complex DCC tools, and support for specialized hardware such as professional HDR, wide gamut and XR displays.

Commercial

- **Engagement and influence** - The level of engagement the distribution provider has with VFX and animation community, and their level of partnership and influence with key technology partners such as HP/Teradici, Autodesk, Epic Games, Foundry, Nvidia, SideFX, Quantum, Wacom etc.
- **Support service** - The availability of optional additional support services, potentially for an additional cost, for studios that need or want it.
- **Governance model** - Whether the governance model of the distribution or distribution provider is healthy, and aligns with the interests of the community.
- **Financials** - Financial security of the distribution provider.
- **Engineering resources** - The provider's level of engineering resources to sustain an appropriate level of service and innovation.
- **Sustainability** - Confidence in the long-term sustainability of the provider or distribution.
- **Industry knowledge and experience** - Existing know-how and experience with the distribution within the VFX and animation community had to be a consideration.

RECOMMENDATIONS

After extensive research, outreach, and discussion, the primary recommendation is:

For artist workstations running Linux, it is strongly recommended that all VFX and Animation studios deploy Red Hat Enterprise Linux 9.x or one of its binary compatible rebuild distributions such as AlmaLinux 9.x or Rocky Linux 9.x in 2023, and no later than June 2024 for those still running CentOS Linux 7.

DCC software vendors are encouraged to build their products on at least RHEL 8.x (or downstream equivalent) and qualify all minor releases of RHEL 9 as being officially supported for their customers in 2023.

While freedom of choice is one of the strengths of the Linux ecosystem, in the case of the VFX and animation industry it is more important at this time that the community aligns on a common distribution to lower the barrier to Linux adoption by more software vendors and VFX studios. It also allows the community to have more focus on a path forward as we manage the transition from X to Wayland for a community with such graphically complex tools.

The main reasons why RHEL and its downstream distributions were selected are:

- Strong compatibility guarantees making it possible to collectively recommend RHEL and all its “bug-for-bug” compatible downstream distributions rather than just one of them.
- There is already a great deal of infrastructure, tooling, and expertise around RHEL / CentOS Linux in the community and, while there are benefits to other distributions, they were collectively not compelling enough to build the critical mass needed for so many studios and vendors to agree to retrain and retool.
- With the release of RHEL 8, Red Hat committed to regular major releases every 3 years instead of their previous 4 to 5 year cycle which strikes a more forward-leaning balance between stability and progress.

- Very strong engagement and support from the organizations behind RHEL, Rocky Linux, and AlmaLinux through this process which promises many options for partnering to address some of the opportunities and challenges ahead.
- An ecosystem of multiple "bug-for-bug" binary compatible distributions with independent governance structures mitigates the risk of being overly dependent on a single organization.
- Studios have the choice of paying for a support service with RHEL, or using a functionally equivalent downstream distribution without additional cost.

The reason for specifically recommending RHEL 9 for studios is that RHEL 8 is already approaching the end of its 5 years of Full Support in 2024, and will then enter its 5 years of Maintenance Support. Studios adopting RHEL 9 will give them the ability to benefit from new functionality as it is released, as well as more leeway before the next major upgrade is needed.

Giving software vendors the option of building on RHEL 8 allows them to be more inclusive of supporting older distribution releases still used by some of their customers. Software can be built on RHEL 8 in a way that enables seamless support on RHEL 9, as well as including support for some other distributions that do not include a version of glibc as recent as the one included in RHEL 9. A relatively simple way of building on RHEL 8 while gaining access to newer compilers and toolchains is by using the Red Hat Developer Toolset product.

Despite making a recommendation for RHEL and its rebuilds, the Task Force would like to take this opportunity to acknowledge that Ubuntu is a very strong contender and the Canonical team has been an excellent and supportive partner through the research and assessment process. We encourage the community to continue to work with Canonical with an eye to making Ubuntu an even stronger contender for professional graphics workstations in the future. In the meantime, although it is not our recommendation, we do expect some studios may still choose to use Ubuntu on some workstations for specific use-cases. In the longer term, it would be very beneficial to see equal support from all DCC vendors for both RHEL and Ubuntu and so this is a secondary recommendation once the primary recommendations above have been addressed.

In addition to the recommendations laid out above, the Further Guidance and Next Steps sections below should be considered a secondary set of recommendations from the VFX Linux Task Force.

FURTHER GUIDANCE

For VFX and Animation Studios

Adopting RHEL 9 or one of its downstream equivalent distributions on workstations is important to help us collectively achieve the goal of lowering the barrier and cost of adopting and running Linux. Only by taking coordinated action can we make it easier for software vendors to support Linux, and for all technology providers to align on a common platform for meeting the demanding needs of VFX and animation.

By jumping ahead to a newer distribution release, studios will be able to take advantage of many of the performance and feature enhancements added since RHEL / CentOS Linux 7. All studios should encourage their software vendors to follow the recommendation and guidelines outlined in this document to help smooth the upgrade path for everyone.

While the use of RHEL 9, or an equivalent downstream distribution, is just a recommendation, please be aware that not following this recommendation means you will be on a different path to the majority, and it will be a path requiring increased effort and support.

It is a prudent moment to reflect on whether to continue with a downstream distribution, or whether to pay for RHEL. This is often thought of as a choice between "free" and "paid support", but it is more nuanced than that. A "free" OS with no support available means more engineering expertise and support are needed internally and that comes at a cost. The cost of RHEL is not only for support but also for an array of additional services and products that create enough benefit that some studios do elect to pay for RHEL and are happy to continue doing so.

One example of why some studios elect to pay for RHEL is that it secures agreement terms that provide accountability for the governance of the supply chain. A Linux distribution is the end result of a complex set of inputs that are difficult to manage securely, and vulnerable to supply chain attacks. A RHEL subscription provides legal commitments, patent protection, and accountability from the distribution provider that are not currently readily available from more community-driven downstream distributions.

Overall, it would be to the community's benefit for more studios to financially support the Linux ecosystem since it would help ensure that development efforts go towards the features that will be most impactful for VFX and animation, and help to create a healthier and more sustainable ecosystem.

Red Hat is committed to supporting the needs of the VFX and animation studio community. Through the engagement with the VFX Linux Task Force, they are working to develop solutions specifically catering to the needs of studios of all sizes that are easier to acquire, more aggressively priced, and allow for a smoother transition from CentOS. Red Hat is in the process of updating business policies to allow for steep discounts on RHEL subscriptions for VFX and Animation studios and is also updating existing programs to create a more gradual financial transition for studios that choose to move from CentOS to RHEL. These new programs are intended to work well together with their existing programs that are catered to software developers and include RHEL at no additional cost. Please contact Red Hat at rhel-vfx-info@redhat.com for more information on this new initiative.

For DCC Software Vendors

It is a strong recommendation that providers of DCC software should officially support their products on a range of minor releases of RHEL 9.x, and ideally all its downstream distributions. RHEL and its downstream distributions are all binary compatible, and functionally identical with the single exception of the name of the product. Red Hat also offers strong guarantees about binary compatibility across minor releases.

An individual minor release only receives about six months of updates, and this support ends once the next minor release is available. "Pinning" support to a specific minor release therefore puts studios that stick to that release at risk. While extended minor release support is available (for an additional cost and only with RHEL), the vast majority of DCC users do not have access to it. Given the security compliance requirements that the studios have to commit to, supporting future minor releases is essential to enable studios to apply critical security patches without falling out of support. Studios following the required security practices will be installing updates on an ongoing basis and by the time a new minor release comes out, they will already have installed a significant number of the updated package versions rolled up in the new minor release.

When specifying system requirements, vendors should use minimum versions and not static versions. For example, "RHEL 9.2+", "RHEL 9.2 and later", or simply "RHEL 9". Also, vendors should specify something along the lines of “RHEL includes Red Hat Enterprise Linux and compatible downstream or rebuild distributions including Rocky Linux or AlmaLinux".

Specifying the supported Linux distribution releases more broadly in this way should not increase the support burden for vendors, but it will make a much more straightforward on-ramp for the many studios that need it and it is expected that this would translate into increased adoption.

While this is just a recommendation, it is expected that many studio customers will make this a requirement of their software vendors.

LONGER TERM VISION

While this report is focused on a recommendation for the community to consolidate around a specific family of Linux distributions, this is simply the next step on a journey towards creating a workstation experience that is tailor-made for professional VFX and animation artists.

In the longer term, the community should pool know-how and effort to elevate the professional artist workstation experience on Linux to be at least on a par with, and hopefully exceed, Windows and macOS. New virtualization technologies should enable more flexibility, and increased interoperability so that studio workstations with different operating systems can more easily co-exist with each other. Software vendors and studios should work together to ease the adoption of Linux for studios that want to use more Linux on workstations. Finally, increased community coordination can help increase the ease and frequency of software updates which helps the whole community to adopt new capabilities more quickly, and use more recent releases that offer better security, performance, and functionality.

Much of the effort in developing end-user experiences these days is based on simplification or portability to mobile devices and web browsers. While these trends enable wider use and accessibility of computing systems, they limit the potential of what can be achieved in environments where hardware does not need to be so constrained, and the user experience can be tailored for power rather than simplicity. VFX and Animation studios invest heavily in high-end hardware to enable their artists to realize more of their creative potential, and they deserve a workstation experience that is designed for that purpose.

Aligning on compatible Linux distributions will make it easier for the community to pool their efforts and benefit from building on a common foundation. For too long, the knowledge of how to build powerful Linux-based studios has been locked up in the silos of individual studios. It is time for the community to come together to pool that knowledge and make it available to all, creating a shared repository of configuration guides, best practices, and tutorials, that are continually updated and improved for the good of all.

Such a knowledge base would enable more studios to adopt Linux, which in turn would encourage more software vendors to support Linux as a first-class platform for their products. A more standardized, and better understood, Linux platform for studio workstations would also encourage hardware providers such as Intel, AMD, and Nvidia to continue to provide first-rate open-source contributions, such as drivers

and hardware-optimized libraries that are tested and validated against studio environments.

One of the common studio construction patterns is to compose multiple applications into a singular integrated pipeline to enable a more seamless handoff of work between artists, often running an entirely separate piece of software as a sub-component of a different vendor's software. In recent years, container efforts such as Docker have shown great promise, but often struggle to scale when there are many packages in play, and the high degree of isolation they provide can often obstruct the building of integrated pipelines. More recent containerization products such as Apptainer, formerly known as Singularity, better address these challenges by providing secure process isolation but with a more integrated system style approach.

Future use of modern containerization approaches for artist tools will simplify the support burden, and enable more flexibility when it comes to customization of the underlying platform to meet different studio needs. It is likely that eventually these components will also be integrated with package management tools to make it easier for people to install, manage, and run them. All this progress will require research, expertise, and resources. Progress will be much more rapid if this is done in the open as a collaborative effort between studios and their technology partners.

With the increasing pace of technical progress, and the need to keep up to date with security patches, it is anticipated that studios will need to invest in upgrading their systems on a more regular basis, with major OS upgrades happening on a 3-year cycle. More frequent upgrades could make application compatibility more of a challenge, which is another reason why collaboration across the community is essential. By similarly promoting an overlapping pattern of support within the VFX Reference Platform for software updates, the critical libraries for the community can provide either ABI compatibility for that maintenance envelope to enable backward compatibility, or software configuration options and support for having multiple versions of the software installed side-by-side. Combined with that, the community should also consider whether there should be a maintained repository of packaging recipes for the package deployment systems (rpm, deb, etc.) as well as environment management tools such as Rez, and perhaps a repository of pre-built packages.

In summary, we see a path forward for studios to work together to create a robust, sustainable workstation platform that offers the best choice for a premier artist experience, and the preferred deployment platform for high-end digital content creation tool providers. This can be achieved by sharing knowledge and providing some consistent software deployment recipes and practices. This will assist in building and deploying systems that leverage the power of open source software to deliver the open standards and foundation which enables everyone to deliver the next generation of creativity and innovation.

NEXT STEPS

In conclusion, the VFX Linux Task Force has completed their work and proposes the following next steps for the community:

Share Survey Report

Socialize and share this report and its recommendations.

Studios Upgrading to RHEL/Rocky/Alma 9

All studios deploying Linux workstations to start planning the deployment of Red Hat Enterprise Linux 9.x or one of its compatible downstream distributions such as AlmaLinux 9.x or Rocky Linux 9.x in 2023, and no later than June 2024 for those still running CentOS Linux 7.

Software Vendors to Support RHEL/Rocky/Alma 9

All DCC software vendors to plan to build their products on at least RHEL 8.x (or downstream equivalent) and qualify all minor releases of RHEL 9 as being officially supported for their customers in 2023.

Workstation Experience Working Group

ASWF and VES Technology Committee to collaborate on the creation of a "Workstation Experience Working Group" tasked with creating a layer of configuration and packages that enables a best-in-class artist experience on Linux workstations.

Community Hub to Increase Linux Adoption

In addition, the ASWF and VES Technology Committee to collaborate on the creation of a community forum and knowledge base to curate and share know-how for how to adopt and maintain Linux in a studio environment, and for how to port software to Linux

Communities Working Together

These communities to work together to integrate software maintenance and deployment practices with a regular operating system upgrade cadence, providing a stable platform that stays up to date.

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