Canonical

Ubuntu or macOS: a guide for enterprise developers and IT administrators

June 2023

Executive summary

In this guide we compare macOS and Ubuntu in terms of both the developer and IT administrator experience. For developers, both operating systems provide robust tools and environments. Ubuntu offers consistency across cloud, server, and IoT platforms, extensive libraries and packages, and strong community support. macOS provides seamless integration with Apple devices and tools, making it attractive for developers in the Apple ecosystem. However, Ubuntu exhibits greater efficiency in both server-side and cloud-native development, as well as in AI and machine learning tasks. From the perspective of IT administrators, Ubuntu offers wide hardware compatibility, long-term support, full Active Directory integration, and robust security measures, including FIPS-certified components and simplified CIS benchmarks. macOS, while offering a high degree of hardware integration and performance alongside robust security and compliance features, limits flexibility due to its exclusive hardware and often incurs higher management costs.

Introduction

In an increasingly digital and fast-paced business environment, making informed technology decisions is crucial. The selection of an operating system, once a matter of personal preference or basic compatibility, has evolved into a strategic choice that directly impacts team collaboration, resource allocation, and business scalability.

macOS has long been a favourite among developers for its robust functionality, high performance unix-like development environment and sleek design. However, as the businesses focus on cost optimisation, centralised management, and a growing preference for open source development tools, organisations are prompted to reassess their dependence on macOS.

Enter Ubuntu, a powerful, flexible, and cost-effective alternative that is steadily gaining traction among businesses of all sizes. Ubuntu provides an open source ecosystem that is compatible with a diverse range of hardware and software. Its inherent security and scalability makes it a reliable support system for growing organisations. Complementing these benefits is Ubuntu's extensive, active community and professional support services, providing businesses with the reassurance they need when transitioning to a new operating system.

This guide aims to empower businesses with the insights needed to make a well-informed choice between macOS and Ubuntu for their developers. It will delve into the advantages of the Ubuntu ecosystem, the options available to Ubuntu developers, and other factors critical to this important business decision.

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Ubuntu and macOS: developer experience compared

A robust development environment is key to creating efficient, high-quality software. Ubuntu Desktop has become a preferred choice for many developers worldwide, and for good reason. It offers a seamless, powerful platform that mirrors the production environments on cloud, server, and IoT deployments. Ubuntu is also a top choice for developers working in AI and machine learning.

Ubuntu Desktop, designed for developers

With Ubuntu Desktop, developers can work in an environment that closely reflects their deployment targets, be it on cloud, server, or IoT platforms. This consistency across environments not only boosts productivity but also increases confidence in the final product. Ubuntu's strong community support, extensive libraries and packages, and dedication to security further enhance its appeal, making it an empowering choice for developers. By choosing Ubuntu Desktop, developers can take full advantage of the extensive capabilities that Ubuntu offers across various domains.

macOS for developers provides a user-friendly and intuitive interface with seamless integration across other Apple devices. Its well-documented resources and developer tools like Xcode make it an attractive choice, particularly for those developers already immersed in the Apple ecosystem.

Streamlined cloud development

Many businesses are moving their workloads to the cloud for increased scalability and efficiency. Ubuntu Desktop aligns with Ubuntu Server, the most popular operating system on public clouds. This similarity between development and deployment environments eliminates the "it works on my machine" problem and simplifies cloud-native development.

Ubuntu Desktop supports cloud-based developer tools like Docker, LXD, MicroK8s, and Kubernetes. This allows for easy application containerisation and microservices architecture management. Additionally, Ubuntu ensures portability and cost optimisation for workloads since it can be run securely across any private or public cloud platform. These features make Ubuntu a key player in developing and scaling modern cloud applications.

Cloud development on macOS also relies on the use of Docker and other virtualisation technologies to containerise applications as microservices and minimise migration issues when deploying to production. macOS's seamless integration with iCloud services and its native support for cloud-based application development can be advantageous for Apple-centric developers when compared to Windows.

Seamless server operations

Google Cloud   ORACLE®   IBM **Cloud**   amazon web services   Microsoft Azure

Ubuntu's wide range of supported applications and services makes it an excellent choice for server-side development. By using the same operating system on their personal machines and servers, developers can ensure consistent behaviour and compatibility. The wide support for server-based software, automation and debugging tools, as well as scripting languages, combined with robust security features, makes Ubuntu a powerful platform for server operations.

macOS provides robust support for server-side development, but the extent of application and service support might not be as wide-ranging as that offered by Ubuntu. However, macOS does offer strong security features and a user-friendly approach to server-side development.

Innovating with IoT

As IoT devices continue to permeate all areas of our lives, developers need tools that allow them to create reliable, secure, and efficient IoT solutions. Ubuntu Core, with its minimal, containerised approach, has been designed specifically for IoT and embedded devices.

Developing for Ubuntu Core on an Ubuntu Desktop ensures a smooth development process, as developers can use the same libraries and packages in both environments. Developers can take advantage of the Snap packaging system to create highly confined, self-contained applications that work across IoT, cloud, and desktop, simplifying development and deployment.

In comparison, while macOS provides robust support for server-side development, it does not offer a comparable IoT-focused operating system.

Pioneering AI and machine learning

AI and machine learning require a stable, scalable, and high-performance environment. With native support for Python, R, and other popular programming languages used in AI/ML, Ubuntu developers can set up their preferred development environment with ease.

Ubuntu is also the reference platform for NVIDIA's CUDA, making it an optimal choice for developers working with GPU-accelerated machine learning tasks. TensorFlow, PyTorch, scikit-learn and other popular ML libraries run efficiently on Ubuntu, enabling developers to leverage the latest techniques in deep learning and neural networks.

While macOS provides native support for popular AI/ML languages such as Python and R, it does not have the same level of integration with GPU-accelerated tasks as Ubuntu. Despite this, macOS does have robust support for ML frameworks and tools, making it a reliable platform for AI/ML development.

Features	Ubuntu Desktop	macOS
Overall developer experience	Offers a seamless, powerful platform that mirrors production environments on cloud, server, and IoT deployments. A top choice for AI and machine learning developers.	Provides a user-friendly and intuitive interface with seamless integration across other Apple devices. Its well-documented resources and developer tools make it attractive for developers within the Apple ecosystem.
Cloud development	Aligns with Ubuntu Server, the most popular OS on public clouds, for simplified cloud-native development. Supports cloud-based developer tools like Docker, LXD, MicroK8s, and Kubernetes. Ensures portability and cost optimisation since it can run on any private or public cloud platform.	Relies on Docker and other virtualisation technologies for cloud development. Has seamless integration with iCloud services and native support for cloud-based application development.
Server operations	Offers wide support for server-side development, including a range of supported applications and services, automation and debugging tools, and scripting languages. Offers robust security features.	Provides robust support for server-side development with strong security features and a user-friendly approach, but the range of application and service support may not be as extensive as Ubuntu.
IoT innovation	Ubuntu Core is designed specifically for IoT and embedded devices, offering a smooth development process. The snap packaging system simplifies the creation of highly confined, self-contained applications.	Does not offer a comparable IoT-focused operating system.
AI and machine learning	With native support for Python, R, and other popular AI/ML languages, developers can easily create their preferred environment. Ubuntu is the reference platform for NVIDIA's CUDA, optimal for GPU-accelerated ML tasks. Popular ML libraries run efficiently on Ubuntu.	Provides native support for popular AI/ML languages such as Python and R, but doesn't have the same level of integration with GPU-accelerated tasks. Offers robust support for ML frameworks and tools.

Ubuntu and macOS: the IT admin experience

Both Ubuntu Desktop and macOS offer unique benefits to IT administrators, but the two platforms are fundamentally different in design, operation, and cost. In this section we consider both platforms from the perspective of security, management tooling, hardware availability and professional support.

Certified hardware

Ubuntu is compatible with a wide range of hardware from leading manufacturers like Dell, HP, and Lenovo. This gives IT admins the flexibility to deploy Ubuntu on existing hardware or confidently procure new hardware from existing approved vendors. As part of the Ubuntu Certified Hardware program, Canonical works closely with these manufacturers to ensure seamless compatibility and performance, running over 500 OS compatibility focussed hardware tests to ensure the best Ubuntu experience. Canonical also performs continuous update testing for the entire lifecycle of an Ubuntu release.

macOS is limited to Apple's own hardware. Whilst this ensures high levels of integration and performance, it also limits flexibility and increases costs. For IT admins, this could mean less freedom in choosing the right hardware for their specific needs and budget constraints. It also creates a productivity overhead due to the divergence between the user's development environment from their target production environments.

Security

Security is a core focus of Ubuntu. It provides built-in firewall configuration, mandatory access controls through AppArmor, and automatic updates for the OS and installed applications. Long-Term Support (LTS) releases receive security patches for five years. In addition, users can extend the security support to ten years with Canonical's Extended Security Maintenance (ESM) service as part of Ubuntu Pro.

Ubuntu's security mission extends beyond the operating system and, in response to needs of open source developers, now delivers security commitments for the entire open source supply chain. Ubuntu Pro provides additional security patching for the entirety of the Ubuntu Universe repository of over 23,000 packages including Docker, Node.js, Vagrant, Nagios, Ansible, Go and Python.

macOS also offers strong security features. It includes Gatekeeper, which blocks untrusted applications, XProtect, an anti-malware tool, and FileVault 2 for full disk encryption. System Integrity Protection also restricts the root user account and available actions on protected parts of the Mac operating system so that only processes signed by Apple, such as Apple software updates and Apple installers, can modify them. macOS also uses sandboxing to isolate applications and system processes from each other and the system itself, reducing potential harm from malware.

Apple controls both the hardware and software of macOS devices, leading to an integrated security approach. However, as a closed-source system, it relies on internal Apple teams for the identification and patching of security vulnerabilities without the benefit of scrutiny that the open source ecosystem provides.

Device management

Ubuntu provides a wide range of open-source management tools. For custom image creation administrators can leverage cloud-init to apply specified packages on top of a minimal base install to ensure only the necessary OS components and applications are included. This ensures developers have all of the tools they need out of the box whilst minimising attack surface area.

Landscape, Canonical's own management tool, allows IT admins to manage, monitor, and update Ubuntu deployments across various environments from a single interface. Additionally, Ubuntu's open-source nature gives administrators the ability to customise their environment extensively.

macOS uses Apple's proprietary management solutions, like Apple School Manager and Apple Business Manager, or third-party tools such as Jamf. These tools provide robust management options, including device deployment, app distribution, and security settings enforcement. However, they often come with additional costs and do not provide the same level of customisation that open-source tools do.

Active Directory integration

Ubuntu integrates with Active Directory, allowing centralised user management and authentication alongside Windows devices. This is facilitated using SSSD or Winbind, enabling simplified user and access management. As part of Ubuntu Pro, administrators also have access to additional features via ADsys, Canonical's Active Directory bridging tool suite. ADsys enables administrators to benefit from full Group Policy Object support as well as remote script execution and privilege management, aligning Ubuntu more closely with the Windows management experience.

macOS also offers Active Directory integration. It allows for domain join and respects password policies enforced through AD. However, macOS doesn't natively support Group Policy, a key tool used in AD environments. Third-party tools like Jamf can help manage Macs in a way similar to Group Policies, but this requires additional investment.

As organisations increasingly look to cloud providers such as Microsoft Azure for device and identity management, Ubuntu now supports user authentication with Azure AD via Canonical's aad-auth package as well as device compliance monitoring using Microsoft Intune to gate access to secure Azure AD protected resources.

macOS also supports Azure AD authentication using the Microsoft Enterprise SSO plug-in for applications that support Apple's enterprise single sign-on feature as well as via Jamf Pro for instances hosted in the Jamf Cloud. Intune management of macOS is more fully-featured than Ubuntu with the ability to configure device settings, applications and run remote actions.

Support and updates

Ubuntu offers Long-Term Support (LTS) versions that are supported for five years, ensuring stability and security for enterprise deployments. Support can be extended to ten years as part of an Ubuntu Pro subscription. Additionally, Ubuntu benefits from a large, active community for support, extensive trouble-shooting guides and learning resources. Organisations leveraging Ubuntu can log bugs and feature requests publicly, raising the quality of the operating system in a way that benefits the entire ecosystem.

Apple provides regular updates and professional support for macOS. However, the longevity of support for any given version is typically shorter than Ubuntu LTS releases and closely tied to the device generation. Support from Apple is professional and efficient, but community support is smaller in comparison to Ubuntu.

While macOS offers robust, integrated solutions, Ubuntu provides greater flexibility, control, extended support periods, and cost-effectiveness.

Compliance in highly regulated environments

Compliance with federal standards is critical for many organisations, particularly in highly regulated sectors such as government, healthcare, and finance. A key compliance consideration for these organisations are the Federal Information Processing Standards 140 (FIPS) cryptographic requirements as well as hardening standards such as the Center for Internet Security benchmarks (CIS).

FIPS Certified Modules

Ubuntu Pro provides a FIPS-certified kernel and other key software components for use by organisations that require it. These cryptographic packages are tested and attested by atsec Information Security, a NIST accredited laboratory. Developers can take advantage of these validated packages to develop locally with the confidence that their application will work well in a compliant production environment.

macOS also has FIPS 140-2 validated cryptographic modules. However, Apple has only sought validation for the cryptographic modules used within iOS and macOS, making it challenging for developers to ensure compliance in their production environment.

CIS Benchmarks

The Center for Internet Security (CIS) publishes the CIS benchmarks for Ubuntu LTS releases. As these benchmarks contain a large number of hardening rules, compliance and auditing can be greatly simplified by using the Ubuntu native tooling that is available to subscribers of Ubuntu Pro. This includes the Ubuntu Security Guide (USG) which allows administrators to audit monitor systems with OpenSCAP tooling.

The ability to dive deep into the system settings and configurations, combined with the transparency of the open-source model, makes it possible to reach high levels of security hardening with Ubuntu.

The CIS benchmarks for macOS provide recommendations for system settings, user account settings, file permissions, and more. They are designed to mitigate common threats to the macOS system and to ensure the privacy and integrity of data. However, as macOS is a proprietary system, users are limited in their ability to customise and audit the system compared to open-source alternatives.

Features	Ubuntu Desktop	macOS
Certified hardware	Compatible with a wide range of hardware from leading manufacturers. Offers the Ubuntu Certified Hardware program for seamless compatibility and performance.	Limited to Apple's own hardware, ensuring high levels of integration and performance but limiting flexibility and increasing costs.
Security	Offers built-in firewall, mandatory access controls through AppArmor, automatic updates for the OS and installed applications. Provides extended security support through Ubuntu Pro. Delivers security commitments for the open source supply chain.	Strong security features, including Gatekeeper, XProtect, FileVault 2, and System Integrity Protection. However, as a closed-source system, it relies on internal teams for identifying and patching vulnerabilities.
Device management	Provides a wide range of open-source management tools and custom image creation. Landscape allows IT admins to manage, monitor, and update deployments across various environments from a single interface.	Uses Apple's proprietary management solutions or third-party tools. These tools provide robust management options, but often come with additional costs and don't provide the same level of customisation as open-source tools.
Active Directory integration	Integrates with Active Directory using SSSD or Winbind. Offers additional features via ADsys as part of Ubuntu Pro. Supports user authentication with Azure AD.	Offers Active Directory integration, but doesn't natively support Group Policy. Supports Azure AD authentication using the Microsoft Enterprise SSO plug-in and Jamf Pro.
Support and updates	Long-Term Support (LTS) versions are supported for five years, extendable to ten years with Ubuntu Pro. Benefits from a large, active community for support.	Provides regular updates and professional support. Longevity of support for any given version is typically shorter than Ubuntu LTS releases.
Compliance in regulated environments	Offers FIPS-certified kernel and other key software components through Ubuntu Pro. CIS benchmarks are published for Ubuntu LTS releases and can be simplified using native tooling available to Ubuntu Pro subscribers.	Offers FIPS 140-2 validated cryptographic modules, but only within iOS and macOS. CIS benchmarks for macOS are available, but as a proprietary system, macOS provides limited customization and audit capabilities.
Virtual Desktop Instances	Offers fully managed and optimised Ubuntu Desktop environments on Amazon WorkSpaces. Ubuntu VMs are also available on platforms such as Citrix Virtual Apps and Desktops, Google Cloud and VMWare.	Licensing restrictions mean that macOS virtualisation is typically restricted to running on Apple hardware available via third party providers such as MacStadium.

Alternative solutions to empower Ubuntu developers

While Ubuntu Desktop is a robust platform for development tasks, there are several alternative ways to access a full Ubuntu development environment that can provide unique advantages depending on your specific workflows and the requirements of your organisation. In this section we examine the use of Ubuntu on Windows Subsystem for Linux (WSL) and Virtual Desktop Infrastructure (VDI) solutions such as Ubuntu on Amazon WorkSpaces.

These alternatives provide developers with the versatility and capabilities of Ubuntu, while also offering benefits to IT administrators such as simplified management, enhanced security, and cost savings.

Ubuntu on Windows Subsystem for Linux (WSL)

The Windows Subsystem for Linux is a significant breakthrough in creating an integrated experience between Windows and Linux systems. It comes with a full Linux kernel built by Microsoft, which enables developers to run a broad range of Linux software on Windows with performance that closely mirrors native execution.

Developers can now enjoy the benefits of the full Microsoft productivity and security suite provided by Windows, whilst simultaneously harnessing the power of a robust and performant Ubuntu development environment. Shared file system access between Windows and Ubuntu on WSL simplifies operations across the two systems and full support for Docker makes it a strong platform for running containerised applications.

For IT administrators, WSL offers a comprehensive Linux experience that can reduce the need for full virtual machines, dual-boot setups or secondary devices (either Mac or Linux). This can result in streamlined IT infrastructure and reduced management overheads.

Virtual Desktop Infrastructure (VDI) solutions

VDI solutions provide virtualized desktops hosted on a centralised server. This technology allows remote access to Ubuntu, enabling developers to work from any location and on any device.

Ubuntu on Amazon WorkSpaces offers developers an optimised Ubuntu Desktop environment to rapidly build, test and deploy code — spinning up and tearing down instances as required. Administrators benefit from rapid deployment, configuration and scalability for their managed Ubuntu Desktops, gaining visibility of their entire estate from the same AWS console whilst decoupling their developer environments from personal devices so that their applications and data remain secured in the AWS cloud, even when developers are working remotely.

By using virtual desktops, organisations can reduce hardware costs and device provisioning time whilst optimising resource usage.

As flexible working environments become the norm, VDI solutions allow for more efficient and scalable onboarding of remote employees without compromising on security.

Conclusion

The choice of empowering enterprise developers with either macOS or Ubuntu is a strategic one that involves careful consideration of the unique needs of your developers and IT administrators. By aligning your business with Ubuntu's powerful, flexible, and cost-effective solutions, you open up a wealth of possibilities for robust, efficient, and scalable development.

Ubuntu is not just an operating system - it's an ecosystem that fosters innovation, collaboration, and growth. Whether you choose Ubuntu Desktop, or an alternative environment such as Windows Subsystem for Linux or a VDI solution, you gain access to a community of active users, professional support services, and a suite of tools designed to empower your developers and streamline your IT operations.

Ubuntu offers vast libraries of software, seamless compatibility with a range of hardware, and robust security features. For developers, it provides a consistent environment across cloud, server, and IoT platforms, enhancing productivity and confidence in their work. For IT administrators, it offers extensive management tooling, Active Directory integration, long-term support, and cost savings.

To learn more about the role of Ubuntu in harnessing and securing the power of open source technology visit ubuntu.com/desktop/organisations or get in touch.

Resources

- Ubuntu Pro
- Ubuntu Desktop for developers
- Ubuntu Desktop for organisations
- Ubuntu Certified hardware
- Ubuntu on WSL
- Ubuntu on Amazon WorkSpaces

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