Research Report

Advantages and Disadvantages of using Unix/Linux on the Cloud compared to other operating systems.

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I. Abstract

This report looks at pros and cons of using Unix on the cloud compared to other operating systems. We'll also explore on tools and ways to use Unix on the cloud and talk about Infrastructure as Service (IaaS) and Platform as a Service (PaaS).

II. Introduction

The operating system that you use in cloud computing is very important. This purpose of this report is comparing Unix/Linux with other operating system such Windows. We will look at which operating system is better, explore the tools available on Unix, and we'll also discuss two different ways which you can use the cloud, IaaS and PaaS.

III. Advantages of using Unix/Linux on the Cloud over Windows and Linux

Stability

According to (Saikrishna et al., 2014) in [2], cloud computing has two types of delays, networking and communications delay and Start-up and booting time delays. Networking and communications delay refer to the time it takes for data to travel between components of the cloud-based system. These delays directly affect the responsiveness and performance of the applications the cloud is running. The start-up time and booting delays occur when a virtual machine is first initiated within the cloud. This is crucial because this can affect applications which depend on timely processing times such as financial transactions. Hence cloud computing requires an operating system like Unix, which is far superior in terms of stability when compared to windows [3].

Customizability

Unix-based systems are highly customizable. The Unix operating system has no limitations with as much customizable as you want it to be [1]. This means you have more freedom to change the operating system to your needs and if you're an expert in Unix you can make it as much powerful as you want, fix any bugs in the system, and make it much more reliable to use.

Security

Software Testing help in [4] has experimented and stated a comparison between Linux and Windows in terms of their architecture, performance, and security. While considering the security factor that the author has mentioned, he has proposed several points that lean towards Linux being excelled in terms of security. Such that the first point is that Linux is open-source and has a strong user community. Unlike windows where users

don't have permission to modify the source code Linux users have access to the source code and can modify as they want can. Hence experts using Linux can monitor for vulnerabilities within the system therefore there are higher changes of it being identified earlier than hackers can. Moreover, Linux also uses IP tables to boost the security where it configures rules within the Linux kernel firewall thus helping it keep control of the traffic [4]. Additionally, Linux has very few users with 3% of the market where windows users incorporate 80% of the market hence windows being a favourable target amongst the hackers [4]. Therefore, it is safe to say that Linux or Unix is far more secure to use Unix as a cloud than windows.

Powerful Command Line Interface (CLI)

Unix offers a powerful and versatile command line interface when compared to windows. It offers more functionality with more built-in tools for uses such as system monitoring and file management. Its superiority to windows alternative is the reason developers prefer the CLI of Unix.

Resource Efficiency

It is also resource efficient because they can run on lower-end hardware without sacrificing much of its performance. Hence it can save a lot of money while deploying the cloud.

Performance

In contrast, Linux is known for its performance. The is primarily due to Linux's core being less resource-intensive compared to windows and certain distributions a lot of enhancements overtime, further enhancing their performance [5].

IV. Disadvantages of using Unix/Linux on the Cloud over Windows and Linux

Not User-friendly

This is due to is poorly designed user interface and the learning curve it takes to learn Unix. In recent times Linux is becoming quite popular with the release of distributions such as Arch and Ubuntu. I personally like the minimalist style of Arch Linux rather than Ubuntu, but I feel like Ubuntu is more user-friendly than Arch Linux. Currently the most user-friendly operating system seems to be windows. My opinion on why this is that is entirely due to its user base. Windows has far more higher user base compared to Unix and Linux.

Vendor Support

There are situations where organizations may rely on vendor support. Unix is infamous when it comes to vendor support while operating such as windows may offer more comprehensive support especially for vendors.

Licensing Cost

While Linux itself is open-source and can be used without any licensing, unfortunately Unix is not.

V. Integration of Unix-Based Networking Services on the Cloud

Containerization and Orchestration

Docker enables different applications with different OS requirements to run on a shared OS kernel within containers [6]. Docker presented a chance for streamlining and conserving resources.

After that it can be orchestrated using Kubernetes for scaling.

Configuration Management

Tools like Ansible can be used to configure management. “It can configure systems, deploy software and orchestrate advanced workflows to support application deployment, system updates and more” [7].

Auto-Scaling Groups

Cloud services such as AWS provide auto scaling groups, which enables Unix-based services to adjust their capacity dynamically in response to demand.

Load Balancing

Cloud load balancers ensures even distribution of incoming traffic to multiple instances to ensure even distribution of requests.

Cloud Monitoring Services

This allows to monitor performances such as CPU utilization, memory, usage, and network traffic.

Logging and Auditing

Unix-based services can generate logs and records. This is very important so that it can used later for troubleshooting and security.

Integration of Unix-based network services involves several steps such as deployment, scalability, monitoring and management. A real-world example of this would be Netflix. They use AWS auto scaling for their streaming services, this allows them to dynamically adjust resources for their Unix based services to ensure optimal performance during peak usage [8]. This proves how integration Unix-based services on cloud have benefits in terms of scalability, reliability, and efficiency.

VI. Basic Tools for Unix on the Cloud

Basic Tools	Description	Pros	Cons
SSH (Secure Shell)	Is used to establish a secure connection to a remote server	Security, authentication, port forwarding	Network Dependency
SCP (Secure Copy protocol	Is a secure file transfer protocol that allows to secure transfer files between a local machine to a server	Security, Simple syntax	Only singles file transfer
Text Editor	Allows to edit configuration files and scripts	Lightweight, Scripting and Automation	Limited GUI features
File compression& Archiving Tools	Allows to compress and decompress files for easy transfer and storage	Space efficient, Cross-platform compatible, Preserves file attributes	Loss of real-time access

VII. Unix on the Cloud as Platform/Container as a Service vs. Infrastructure as a Service

IaaS

Infrastructure as a service is when an organisation provides you with an infrastructure such as storage or virtualisation through cloud and the user is responsible for the operating system, application, etc. A good use case for this would be to use a service such as AWS for a startup to host their website and pay subscription for the service instead of spending a lot of money on resources.

Advantages of this would be that you only pay for the resources that you use, manage them according to your requirements, and allows users to easily scale up when needed. Disadvantages of it would be to security concerns but can be avoided by choosing a trustable provider with good reputation.

Examples of this cloud providers would be AWS, Google cloud and Microsoft Azure.

PaaS

It is when a cloud provider manages the entire platform, including hardware, operating system, and application [9]. These are useful for developers and programmers who want to build and deploy applications without the need for software updates and hardware maintenance.

Advantages of this includes simplified development, automatic scaling, and built-in services. Disadvantages would be limited customization, and less control over the infrastructure.

Examples of this would include Heroku and google app engine.

VIII. Conclusion

In the end, using Unix/Linux in the cloud has a lot of benefits such as it more secure and stable. However, nothing is perfect, adoption of this in cloud environments also has some drawbacks. When comparing IaaS and PaaS models, we need to consider the trade-offs between customization and managing simplicity. Ultimately this reports the significance of selecting the right operating system for cloud deployments. And in many cases Unix/Linux seems to be the better choice specially while considering security.

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