Cloudly

VMware to Open-source Private Clouds

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Introduction

Before the advent of virtual machines (VMs), businesses typically dedicated entire physical servers to run individual applications or perform specific tasks. This practice often resulted in significant underutilization of hardware resources, as most applications do not require the full capacity of a server. Virtual machines revolutionized this model by enabling organizations to create multiple isolated virtual environments on a single physical machine. Each VM can operate its own operating system, applications, and configurations, facilitating the consolidation of workloads across fewer physical servers. While virtual machines were transformative at their inception, the emergence of more advanced systems, such as Kubernetes is diminishing the relative advantages that VMs once provided.

In this paper, we elaborate on the migration strategies out of VMware infrastructure to private cloud alternatives and is the second of the three series paper. You can read about the open-source alternatives to VMware here.

Why do VMs no longer work?

Approximately a decade ago, virtual machines (VMs) began to present challenges related to system scaling, resource constraints, burst tolerance, and availability. These issues became increasingly prevalent across enterprise and cloud deployments, highlighting the limitations of traditional VM architectures in meeting the evolving demands of modern IT environments.

Limited resources

Virtual machines (VMs) operate with a fixed allocation of resources, including CPU, RAM, and disk space. This structure does not allow for on-demand resource adjustments; if an application requires additional power, the VM must be recreated with higher specifications. Consequently, organizations may find themselves compelled to overprovision resources to accommodate potential traffic spikes, leading to costs associated with underutilized capacity. Moreover, the limitations of allocated resources can adversely affect performance during periods of high demand. If an application exhausts the VM's capabilities, it may experience slowdowns or even crashes, compromising overall system reliability.

Slow scaling

When additional capacity is required, scaling with virtual machines (VMs) is a manual process that can be time-consuming. Organizations must provision a new, larger VM and migrate or replicate their applications, which is often too slow to effectively respond to sudden demand spikes. By the time scaling is completed, valuable business opportunities may be lost. Additionally, scaling down presents its own challenges, as it requires resizing or consolidating VMs, further complicating resource management in dynamic environments.

Traffic limitations

Even minor traffic spikes can overwhelm virtual machines (VMs) if they lack sufficient resources. Their fixed capacity can be easily maxed out during periods of high load, resulting in errors, slowdowns, or crashes. Furthermore, VMs typically do not incorporate automatic load balancing or failover mechanisms. Consequently, the only viable solution often becomes overprovisioning—allocating significantly more resources than are generally required. This approach is neither efficient nor cost-effective, leading to increased operational expenses without corresponding performance benefits.

Downtime risks

Most changes to virtual machines (VMs) necessitate restarts, redeployments, or even complete recreation, which inherently poses risks of downtime and service disruptions. Activities such as migration data and configuration updates can lead to potential data loss or unavailability. These manual processes are not only risky but also prone to errors; a single missed step can result in an outage. This challenge is particularly pronounced for high-availability services that struggle with VM maintenance.

In light of these limitations, relying on VMs for infrastructure management may seem outdated, especially when considering the advanced capabilities of Kubernetes, a leading platform for container orchestration. The following sections will compare how Kubernetes addresses the disadvantages associated with VMs.

Consider Containers, even if Partially

The evolution of container orchestration began with containers, which laid the foundational technology for managing containers. Subsequently, Docker emerged, providing a more user-friendly interface for containers. While Docker has maintained its popularity and widespread adoption, it often presents a learning curve for new users.

As developers began to recognize the limitations of deploying entire applications within a single container, the need for more sophisticated orchestration led to the introduction of Docker Compose. This tool simplified the process of creating compositions from multiple containers, significantly improving workflows. However, it fell short in addressing the scalability requirements of larger applications, particularly those involving AI-driven service management that necessitate substantial data processing capabilities.

This scalability challenge prompted the question: "How can we further optimize this process?" The answer was found in Kubernetes, a revolutionary technology that automates numerous processes and enhances flexibility in scaling workflows. Kubernetes represents a paradigm shift in container orchestration, effectively addressing the complex issues that its predecessors could not fully resolve. The following sections will explore the key advantages of migrating applications to Kubernetes in comparison to traditional virtual machines.

Flexible resource management

While virtual machines (VMs) operate with fixed allocations of CPU, RAM, and disk space, Kubernetes provides a significantly more flexible approach to resource management.Following migration to Kubernetes, organizations are no longer constrained by predetermined resource limits. The platform facilitates dynamic resource allocation tailored to the specific needs of applications. If an application requires enhanced performance, there is no need to recreate an entire VM with higher specifications. Instead, Kubernetes can automatically adjust resource allocation in real time, optimizing performance without the overhead of manual intervention.

Autoscaling

This flexibility also encompasses scaling capabilities.Rather than over-provisioning a virtual machine to accommodate potential load spikes Kubernetes can automatically scale applications as needed. When demand decreases, scaling can be reversed, ensuring that organizations do not incur costs for unused capacity. This dynamic approach to resource management enhances efficiency and cost-effectiveness in managing application workloads.

Dynamic traffic management

Kubernetes provides a robust approach to managing variable workloads, enabling organizations to dynamically adapt to changing demands following the migration from VM-based deployments. During traffic surges, Kubernetes can scale both horizontally and vertically.

With horizontal autoscaling, the number of running instances (pods) is automatically increased or decreased to accommodate fluctuations in workload. Vertical autoscaling, on the other hand, adjusts the CPU and memory resources allocated to existing pods, allowing them to handle increased work without necessitating additional instances.

Furthermore, Kubernetes can efficiently distribute incoming network traffic across multiple instances of an application, all without requiring manual intervention. This automated resource management significantly enhances application performance and reliability in dynamic environments.

Zero downtime

Kubernetes significantly reduces the failure risks commonly associated with virtual machines. It utilizes rolling updates, allowing organizations to gradually replace older versions of applications with newer ones while maintaining service availability throughout the update process. Additionally, when configuration changes are implemented, Kubernetes can apply these changes without requiring a container restart, further minimizing potential downtime.

The platform's self-healing capabilities enhance uptime by automatically replacing failed containers, often before users are even aware of an issue.

The advantages of Kubernetes extend beyond mere technical management efficiency, offering substantial potential to improve an organization's bottom line. The following section will provide insights to help determine whether migrating to Kubernetes aligns with your current business needs and strategic objectives.

Mixed Private Cloud with Mirantis Container Cloud

Businesses are accelerating digital transformation, with cloud-native technologies leading the way. This shift brings challenges like integrating existing systems, finding skilled talent, and adopting open-source tools. The concept of the data center is evolving to include public cloud, hosted services, and SaaS, as developers increasingly expect "cloud-like" services. Open-source technologies like Kubernetes are becoming essential, and the future data center will rely on cloud-native components. Technology leaders must navigate managing these tools while staying focused on driving business value.

Open-source technologies are foundational to modern cloud-native applications, enabling rapid development and scalability through containers and microservices. However, this complexity presents challenges for developers and operators, as highlighted in the 2021 CNCF Survey. The growing demand for multi-cloud and hybrid cloud solutions stems from the need to leverage public cloud services and on-premise resources, driven by cost, data sovereignty, and security concerns. Independent SaaS providers are addressing the integration of open-source cloud-native infrastructure by offering fully integrated solutions that simplify management for operators and developers while ensuring robust security and controls.

How it Works

Many organizations operate extensive clusters across edge sites and various cloud providers. Mirantis Container Cloud addresses this complexity by offering a unified control plane for managing clusters on OpenStack, VMware, bare metal, and major clouds like AWS and Azure. Its integrated StackLight feature ensures comprehensive visibility for streamlined operations. For more details, you can explore the official Mirantis documentation.

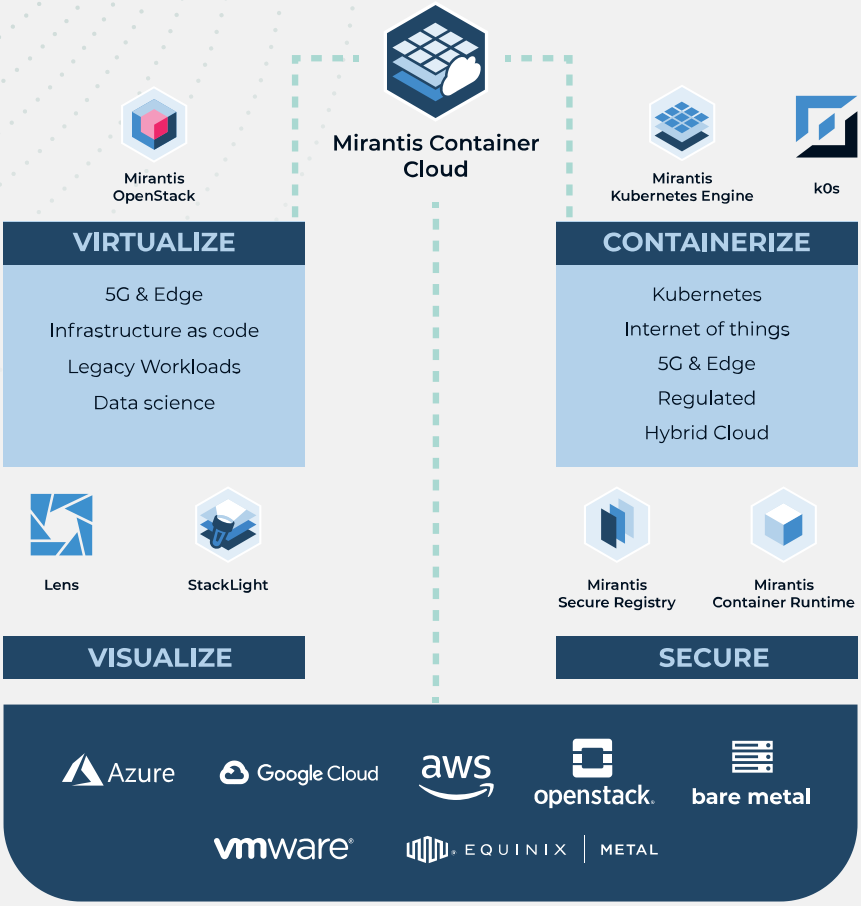

Fig 1. Mirantis Container Cloud Migration Process (See here for details)

Mixed Private Cloud with RedHat OpenShift

For many years, VMware has been a trusted solution for organizations aiming to optimize resource utilization and streamline operational processes. However, the price increases implemented in 2024 have introduced an unexpected financial burden, with some users experiencing cost multiplications several times over.

The combination of rising costs and the limitations of legacy systems has led to a crisis of confidence in VMware for many organizations, prompting them to seek a reliable platform that can address their current challenges and future-proof their infrastructure. However, the complexities of migration, the necessity for minimal downtime, and the importance of ensuring team proficiency present significant hurdles to this transition.

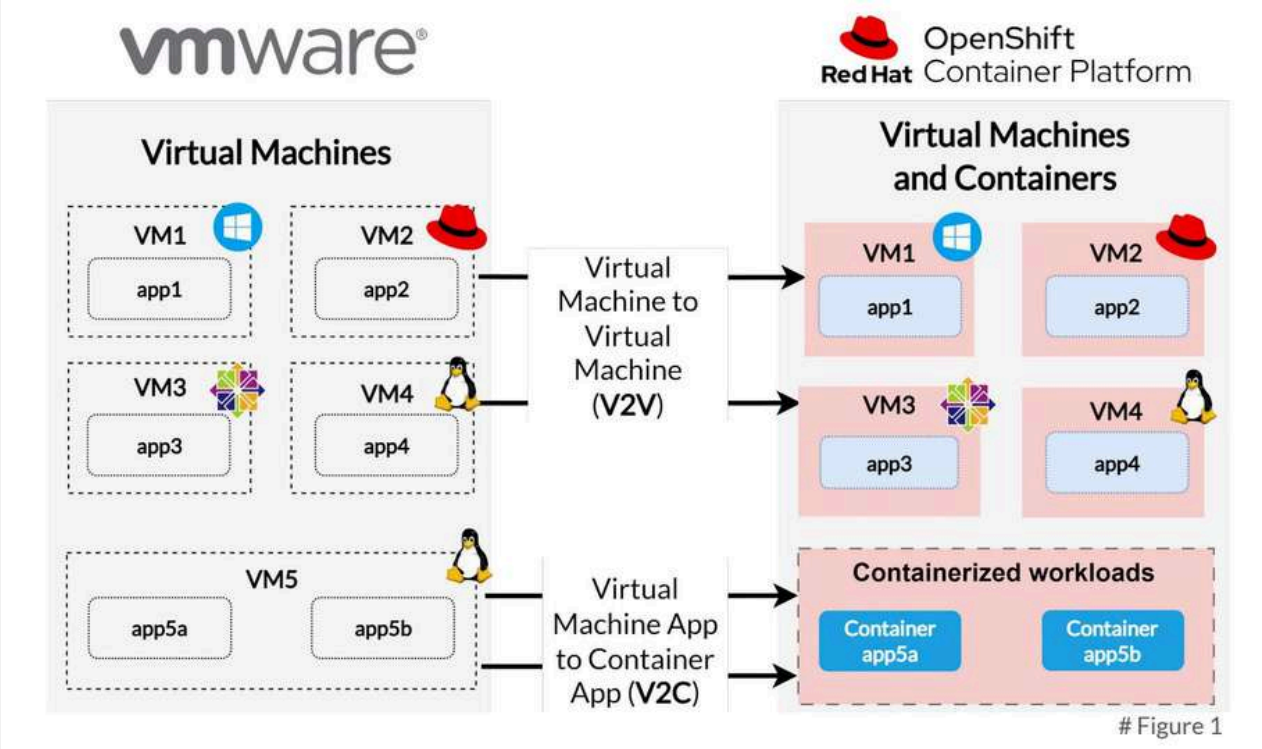

Fig 2. VMware to Openshift Migration (See *here* for details)

Cloudly's VMware to OpenShift Virtualization solution presents a clear and compelling path forward for organizations. By seamlessly integrating the flexibility of containers with the familiarity of virtual machines within a unified, Kubernetes-based environment, OpenShift transforms the management of IT infrastructure for enterprises.

This transition extends beyond mere migration; Cloudly's expert team serves as a true partner, guiding organizations through every stage of the journey—from initial assessment to post-implementation support. Cloudly empowers teams with the knowledge and tools necessary to effectively manage their new OpenShift environment, ensuring sustained success in their operations.

OpenShift offers a comprehensive array of benefits that enhance the effectiveness and efficiency of IT infrastructure. These advantages include:

1. **Cost Reduction and Profit Enhancement:** OpenShift optimizes resource utilization, leading to significant savings on hardware and energy costs, thereby freeing up budget for innovation initiatives.
2. **Enhanced Agility:** The platform enables rapid application deployment and scaling, resulting in quicker time-to-market for new products and services.
3. **Simplified IT Management:** A unified platform reduces complexity, allowing IT staff to focus on more strategic initiatives.
4. **Innovation Enablement:** With a cloud-native foundation, OpenShift fosters an environment conducive to experimentation and the development of cutting-edge solutions.
5. **Effortless Scalability:** The platform adapts seamlessly to fluctuating workloads, ensuring cost-effectiveness while maintaining performance.
6. **Integrated Environment Management:** OpenShift allows for the management of both virtual machines and containers within a single platform, streamlining operations and improving oversight.

Cloudly's expertise facilitated the streamlined delivery of OpenShift clusters, enabling seamless management of a vast environment and effortless integration within the bank's existing ecosystem. By adopting an "Everything-as-Code" philosophy and developing custom operators, Cloudly simplified application onboarding while upholding stringent security standards.The outcome is a highly efficient, agile, and secure OpenShift infrastructure capable of supporting multiple changes per day, ultimately enhancing the bank's technological capabilities and driving substantial business value.

Mixed Private Cloud with OpenNebula

OpenNebula is a powerful yet straightforward open-source solution designed for building and managing enterprise clouds and edge environments. It integrates existing virtualization technologies with advanced features such as multi-tenancy, automated provisioning, and elasticity, enabling on-demand applications and services.

Key benefits of OpenNebula include:

- **Unified Management:** Provides a comprehensive, feature-rich platform that manages IT infrastructure and applications, reducing complexity, resource consumption, and operational costs while avoiding vendor lock-in.
- **Versatile Application Support:** Facilitates the integration of containerized applications from Kubernetes with virtual machine workloads within a shared environment, leveraging the strengths of both mature virtualization technology and container orchestration.
- **Flexible Infrastructure:** Employs an open cloud architecture to orchestrate compute, storage, and networking resources, driven by software.
- **True Hybrid and Multi-Cloud Capabilities:** Empowers organizations to combine their private cloud with infrastructure resources from third-party virtual and bare-metal cloud providers, such as AWS and Equinix Metal, all managed through a single control panel and interoperable layer.
- **Dynamic Scalability:** Allows for the automatic addition and removal of clusters to accommodate peaks in demand, implement fault tolerance strategies, or meet latency requirements.

Migrating a cloud environment from one platform to another can be a complex and challenging process. Compatibility issues often arise due to differences in infrastructure, services, and configurations between the source and target platforms. Adapting existing applications, data, and workflows while ensuring compatibility with dependencies requires meticulous planning and execution.

OpenNebula provides a comprehensive suite of tools and services to facilitate this migration process. One notable tool is OneSwap, which offers a streamlined path for migrating virtual machines (VMs) from vCenter to OpenNebula KVM. With a 96% success rate in automating VM conversions, OneSwap significantly simplifies and accelerates the migration process.

Additionally, OpenNebula has launched its VMware Migration Service, a comprehensive offering designed to help organizations define and execute their migration plans while minimizing disruption to business operations. OpenNebula's skilled cross-functional team brings extensive expertise in cloud architecture and VMware deployments, applying a tailored combination of migration strategies, methodologies, and tools to effectively navigate the complexities of migration and ensure a successful transition. Cloudly partners with the OpenNebula team to confidently migrate your VMware infrastructure to OpenNebula - a high-confidence open-source platform and help manage your infrastructure with enterprise-grade support and manager services.

Hansen, N. (2024, May 7). Smooth VM Migration from VMware to OpenNebula with OneSwap. OpenNebula – Open Source Cloud & Edge Computing Platform. https://opennebula.io/blog/development/smooth-vm-migration-from-vmware-to-opennebula-oneswap/

Conclusion

In an era where cloud infrastructure is vital for organizational success, the ability to seamlessly migrate and manage cloud environments is paramount. Cloudly emerges as a powerful partner that not only facilitates the transition from legacy systems but also empowers organizations to harness the full potential of private and hybrid cloud.

Through deep expertise on tools like OneSwap and the VMware Migration Service, Cloudly provides a robust framework for migrating virtual machines with minimal disruption and a high success rate. Its comprehensive approach combines advanced cloud orchestration with a focus on operational efficiency, ensuring organizations can adapt to changing demands while reducing costs and complexity.

As businesses continue to seek flexibility, scalability, and innovation, Cloudly stands out as a strategic partner capable of transforming cloud infrastructure management. By embracing Cloudly, organizations can navigate the complexities of migration with confidence and don't end there, continue to get our enterprise-grade managed services and support after your migration. We got your cover - end2end.

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