

In today's highly distributed and heterogenous environments that include virtual machines and containers deployed in both private and public clouds, unified cross-cloud control planes will be essential to help IT improve effectiveness and efficiency while gaining control and insight.

From Virtualization to Hybrid Cloud Platform Operations

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Introduction

Server virtualization is a standard technology used on nearly every physical server today and it underpins traditional and modern cloud environments. It is a mature technology, more than two decades old now, but the virtualization market is undergoing rapid changes as enterprise environments experience a renewed wave of modernization and respond to disruptions in the hypervisor vendor landscape. With this wave, they are evaluating virtualization, containers, bare metal, and hyperscale cloud as landing zones for enterprise workloads.

Benefits: An Evolution Over Time

The initial benefit of server virtualization was the increase in server utilization, reducing the physical footprint and more efficiently using datacenter space. IDC data shows an average virtual machine (VM) density of nearly 16 VMs per physical server, which leads to significant savings on physical servers, floor space, and power/cooling. However, as time went on, this level of utilization became expected and new benefits around opex began to appear.

By being able to manipulate servers with software instead of physical operations, VMs improved flexibility and speed. This also led to massive improvements in availability, disaster recovery, maintenance operations, and application deployment. Similar software-defined technologies emerged for storage and networking to form a fully software-defined infrastructure that would become the foundation for modern datacenters.

As cloud deployments began to dominate IT, server virtualization was a foundational technology for public and private clouds. The cloud operating model promised a new, modern approach to consuming resources by focusing on anything-as-a-service delivery models, extensive automation, developer self-service, resource elasticity, and consumption-based cost models, all while maintaining enterprise-level security, governance, and controls in private environments.

AT A GLANCE

WHAT'S IMPORTANT

Enterprises are exploring virtualization alternatives that can integrate with hybrid cloud management platforms. These platforms act as a unified control plane to orchestrate and streamline operations across diverse enterprise runtimes, ultimately accelerating application modernization and the realization of a cloud operating model.

Hybrid cloud management platforms play a key role in enabling this operating model. They focus on orchestrating application services in hybrid and multicloud environments, building on a virtualized foundation but going beyond to manage dozens of dependencies across infrastructure elements. They help provide the APIs, scalability, flexibility, and portability needed to handle dynamic workloads and automated processes.

Today, organizations have a more mature approach to the cloud and are looking for the same level of agility on premises as they are used to experiencing in public cloud environments. Virtualization remains essential in optimizing efficiency, performance, and scale. As the industry adopts more cloud-native applications running in containers, both on premises and in the cloud, environments become more diverse and complex, with customers having to juggle both container and VM environments. While containers and cloud-native architectures represent a more flexible way to modernize apps, they do not necessarily replace VMs, and customers face challenges in integrating the two environments.

Trends

Enterprise digital infrastructure has become increasingly diverse and distributed, introducing new challenges for organizations, especially with the rise of multicloud environments. The explosion of public cloud services expanded VM footprints beyond the traditional datacenter walls, but differing service models and technology stacks between on-premises and public clouds increased complexity, siloing, and portability issues.

Moving forward, enterprises are facing an even more diverse array of environments, including an ecosystem of multiple public clouds, private clouds, and edge computing platforms, all running a mix of VMs, containers, and cloud-managed PaaS. Bare metal has also come back into the picture for certain workloads. This runtime and workload diversity necessitates cohesive management strategies to address interoperability, security, and consistent performance across all runtimes, especially as new breeds of applications emerge in the realms of AI, machine learning, and data science.

VMs as a Cloud Resource

In the evolving landscape of cloud computing, VMs continue to play a crucial role as foundational resources, even as newer technologies emerge. While containers and serverless architectures are gaining traction for their lightweight and scalable natures, VMs remain indispensable for workloads that require strong isolation, compatibility with legacy applications, and specific operating system environments. VMs still play a pivotal role in containers in the cloud, which run in VMs for security reasons.

Kubernetes and Containers

The rise of containers and Kubernetes signifies a major advancement toward lightweight, modern infrastructures tailored for cloud-native applications and modernizing traditional workloads. Application modernization involves transforming legacy applications to align with the latest cloud-native design standards, improving scalability, efficiency, and agility. Today, companies increasingly accomplish modernization through containerization and refactoring into microservices, which the modern Kubernetes control plane manages. Kubernetes provides portability, automation, scalability, and management via APIs. While containers and cloud-native design represent a modern application architecture, VMs remain essential for certain workloads that are not easy to containerize. Enterprises must develop strategies that support application modernization across VMs and containers, effectively managing and integrating both technologies to optimize performance and innovation.

Multi-Hypervisor Deployments

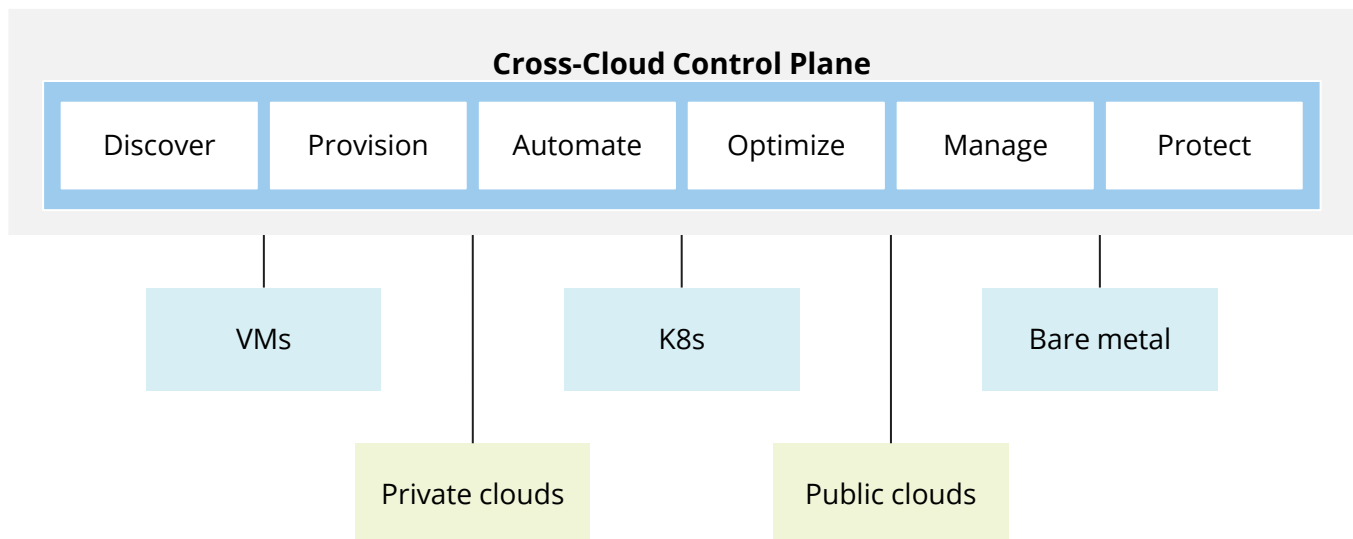
The trend toward multi-hypervisor deployments is growing because of the need for flexibility, cost efficiency, and optimization for an increasing range of use cases with very different requirements. Recently, the market has seen the rise of more specialized, fit-for-purpose hypervisors that are optimized for specific use cases such as cloud deployments, specialized hardware, edge computing, hosting containers/serverless, and security. Organizations often rely on a primary hypervisor for core datacenter operations while selecting others for specific use cases to meet specialized requirements and reduce costs. This tailored approach allows businesses to align their virtualization solutions with operational priorities and budget constraints. While managing multiple hypervisors can be complex, the demand for flexibility drives customers to explore options.

Cloud Ecosystems and Cross-Cloud Control Planes

Cloud ecosystems are becoming increasingly complex as organizations adopt multi-runtime, multivendor, and multicloud strategies to avoid vendor lock-in and meet diverse business needs. The proliferation of cloud services and providers has led to a surge in integrations, as enterprises aim to seamlessly connect disparate systems and applications. While organizations seek agile solutions that can adapt quickly, the intricacies of integrating various cloud services, hardware, and software can hinder rapid deployment, create management complexity, and increase total costs. In addition, the demand for rapid deployments puts pressure on development and operations teams to streamline workflows without compromising security, compliance, governance, and financial accountability.

To address these challenges, enterprises are beginning to prioritize cross-cloud tools, services, and cloud management platforms that can automate and provide visibility across complex cloud ecosystems (see Figure 1). Development teams want the ability to freely adopt new technologies with the least overhead, and IT teams want to match the right infrastructure and service model with different applications. This is the primary goal of platform engineering and platform operations teams — to enable consistent and repeatable developer self-service and abstract away the complexity of underlying tools and technologies.

FIGURE 1: **Cross-Cloud Control Plane**



Source: IDC, 2025

However, the main challenge is that the environment is becoming much more diverse and complex, and managing all the technologies in a common way is critical. The development of universal, cross-cloud control planes will be important as enterprises enter this new wave of modernization.

Considering HPE from Virtualization to Hybrid Cloud Platform Operations

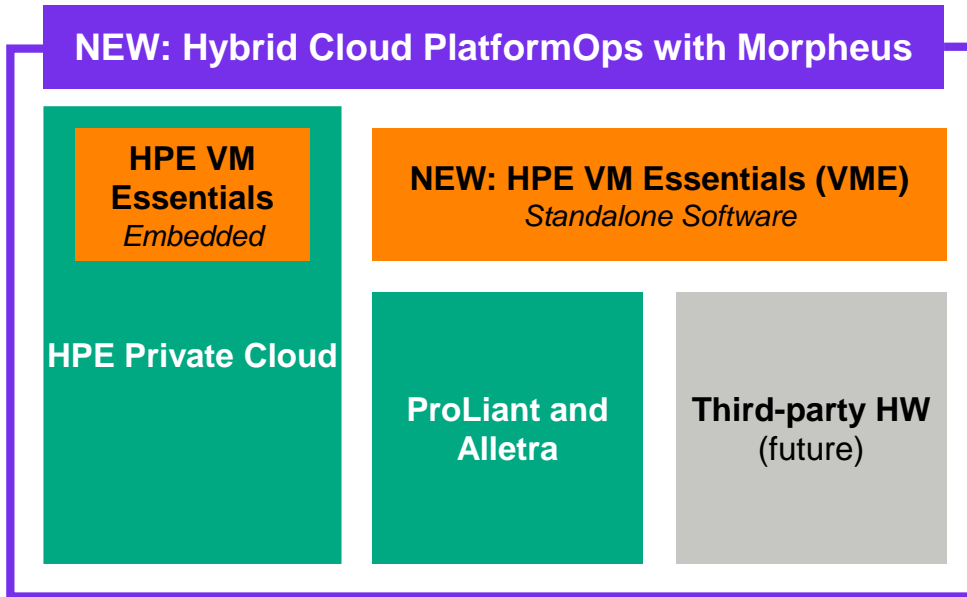
Hewlett Packard Enterprise (HPE) GreenLake offers a unified cloud operating model that delivers a consistent experience across a hybrid environment, which can include the edge, datacenter, and the public cloud. The model enables rapid deployment and scaling of virtualized, containerized, and bare metal resources, aligning with the need for agility and speed in modern IT operations. By supporting traditional VMs and modern containerized workloads, HPE GreenLake facilitates application modernization while allowing customers to continue to run their traditional workloads across private and public clouds.

With technology that Morpheus Data (a recent Hewlett Packard Enterprise acquisition) developed, HPE has announced the availability of HPE VM Essentials (VME) software, a virtualization solution that includes the HPE VME hypervisor based on the open source Kernel-based Virtual Machine (KVM). HPE VME is a cost-effective, full-featured hypervisor and clustering solution with features such as host-to-host live migration, resource placement, high availability, and VM snapshots.

In addition to the built-in VME hypervisor, the HPE VME software will integrate with existing VMware clusters to simplify the management of VMware and new HPE VME environments. This unified virtualization solution enables simple, catalog-driven VM vending into ESXi and HPE VME from one interface. It includes advanced features such as third-party IPAM and DNS integration, automated task execution, third-party backup integration, secrets management, and VMW-to-KVM image conversion. It also allows customers to continue running their existing VMs and optionally convert parts of their existing virtualization estates at their own pace to HPE VM Essentials. HPE VM Essentials is based on open source KVM and licensed on a per-socket basis.

HPE provides customers with options to consume HPE VM Essentials (see Figure 2) as an embedded part of HPE Private Cloud offerings or as standalone software qualified on HPE ProLiant servers and HPE Alletra storage. The company has declared its intent to extend support to third-party hardware platforms.

In addition, by leveraging Morpheus as the foundational software for HPE VM Essentials, HPE has provided an upgrade path for organizations that want to extend beyond management of VMs across VMware and HPE VM Essentials KVM hypervisors. The full Morpheus platform operations suite can integrate with other virtualization technologies from Nutanix to Microsoft to Oracle, and others. It can also integrate with Kubernetes, bare metal providers, and hyperscale public clouds.

FIGURE 2: *HPE VM Essentials*

Source: HPE, 2025

HPE's Unified Approach to Virtualization

HPE's hybrid cloud platform provides the ability to manage VM and container runtimes from multiple vendors. In addition, platform ops features from Morpheus enable customers to orchestrate and operate in a hybrid cloud environment seamlessly, solving customer virtualization challenges in a multivendor, multicloud environment.

HPE takes a holistic approach to solve virtualization challenges by offering an alternative hypervisor with full-stack cloud management platform, enabling organizations to do the following:

- » Reduce costs with HPE VM Essentials, which is built on a proven, supported, and open source KVM, and priced competitively per socket rather than per core
- » Continue operating their existing multivendor virtualization environment without any disruption, and migrate their VM workloads at their own pace and with flexible consumption and upgrade paths
- » Simplify management across the HPE VME hypervisor and other hypervisors, and enable multivendor hybrid IT
- » Run modern cloud on their VM resources and accelerate their application modernization journey
- » Reduce risk with enterprise-grade support and an extensive partner ecosystem

As a result, organizations get a future-proof platform in addition to a virtualization alternative solution. In detail:

- » Many customers want to optimize their existing virtualization environment without having to migrate. HPE CloudPhysics provides advanced analytics and insights into VM resource utilization, helping organizations make informed decisions about optimizing their workloads and infrastructure. HPE CloudPhysics assessments can help

guide enterprises to reduce the costs of existing deployments by right-sizing license usage and matching the workloads' needs to the optimal infrastructure (with shared storage arrays or by moving to the latest generation of processors that can get more work done with fewer cores). It can also help generate impact and cost assessments when migrating VMs to a new platform.

- » The HPE Hybrid Cloud management platform (based on Morpheus Data) allows users to deploy VMs, containers, and application services across any cloud. This capability streamlines day 0–1 operations and mitigates vendor lock-in by enabling organizations to manage workloads across diverse environments. The platform has features such as self-service provisioning, fine-grained role-based access controls, automated orchestration and workflow, cost optimization and control, and policy-based enforcement and governance, while empowering IT teams to respond quickly to changing business demands.
- » Advanced automation tools and capabilities (which HPE OpsRamp powers) simplify day 2 operations, allowing complete visibility into multivendor heterogeneous environments through full-stack observability, intelligent analytics, and AI-driven automation. HPE OpsRamp's advanced observability capabilities provide proactive management capabilities, allowing teams to monitor performance metrics and automate routine tasks effectively.

HPE Services offers virtualization assessment, migration, and advisory capabilities to help customers assess and strategize where to move VM workloads, whether it is to the public cloud or private cloud or containers. HPE Services works with customers on deep-dive architecture and workload assessments and helps build road maps to create successful migration plans.

In summary, HPE VM Essentials and Morpheus cloud management operations capabilities simplify management, optimize resource utilization, and future-proof enterprise IT infrastructures while delivering a user-friendly experience that minimizes the complexities typically associated with managing multivendor, multicloud environments.

Challenges

There are several key challenges with introducing any new computing platform such as HPE VM Essentials and platform-to-platform migration. However efficient and cost-effective a new platform may be, the cost of migration may eclipse any deployment and operational savings. Enterprises need to carefully evaluate, on a workload-by-workload basis, the effort required to untangle the workload from its existing environment and the time it will take to recoup the extra costs. There is also a risk factor to consider, as there is always the chance for unexpected downtime or security incidents during migration and when learning a new platform.

While KVM is a mature and stable hypervisor, enterprises must evaluate well beyond the hypervisor. The orchestration, management, and control planes for KVM are critical for today's cloud environments. Many KVM-based solutions are on the market today, and new ones are emerging, all with very different operating stacks and various maturities.

Skills are a major factor in any migration. Entrenched platforms can be comforting because users have built up years of experience and knowledge about the platform. It can be costly and disruptive to retrain staff on a new platform, and it can introduce operating risks as administrators learn how to operate the platform in a resilient and secure manner.

Conclusion

Server virtualization — a mature technology — remains crucial as enterprises modernize IT environments and is the foundation for modern datacenters and cloud deployments. However, the IT environment has become increasingly complex, and companies have to manage VMs alongside containers and across hybrid, multicloud environments. Cross-cloud control planes will be essential to help IT gain unified control and insight into these highly distributed and heterogeneous environments.

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About the Analyst



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MESSAGE FROM THE SPONSOR

As enterprises explore virtualization alternatives, they seek more than just enterprise-grade virtualization solutions. Their goals extend to modernizing applications, reducing costs, boosting agility, and ensuring seamless compatibility with modern workloads, such as containers and cloud-native applications. To achieve these outcomes, enterprises must move beyond traditional virtualization and embrace hybrid cloud platform operations. A hybrid cloud platform with a unified control plane is essential for simplifying the management and operation of diverse enterprise runtimes, including VMs, containers, and bare metal. More importantly, it serves as a catalyst for application modernization by enabling self-service provisioning, automated workflows, and policy-based governance and control, ensuring operational efficiency and strategic alignment with modern IT demands.

HPE empowers enterprise IT to run a modern cloud on HPE VM Essential or any other hypervisor, enabling enterprises to embark on their application modernization journey with hybrid cloud platform ops.



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