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Solution for migrating and managing applications running on virtual machines to the Kubernetes Container Orchestration platform

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The evolution of cloud computing and container orchestration technologies, spearheaded by Kubernetes, has necessitated innovative solutions for migrating traditional IT infrastructure into these modern environments. Migration as a Service (MaaS for short) stands at the forefront of this technological leap, addressing the intricate process of transitioning virtual machines (VMs) and their applications to Kubernetes-based platforms. This paper delves into the technical architecture and operational mechanisms of MaaS, a solution meticulously designed to bridge the gap between conventional virtualization methodologies and containerized ecosystem efficiencies.

Keywords: Cloud computing, KubeVirt, Migration as a Service, Container oschestration, Cloud native

Introduction: In the process of migrating workloads to a container-native platform, restructuring applications and re-architecting infrastructure will consume a lot of effort. During this process, the occurrence of down-time as well as system conflicts after restructuring will be among the issues that consume effort and time. Developing Migration as a Service tools (abbreviated as MaaS) will help solve the problem in a simpler way and with less effort.

Main content: At its core, MaaS employs KubeVirt, an advanced open-source tool, to facilitate the seamless integration of VMs within Kubernetes clusters, thus enabling the dual management of containers and VMs on a singular platform. The technical blueprint of MaaS revolves around three principal components: the MaaS Controller, CDI (Containerized Data Importer) Controller, and KubeVirt Controller. Together, these elements orchestrate the migration process, converting VMs into Kubernetes-native formats, ensuring compatibility, and maintaining operational integrity.

The process begins with the MaaS Controller, which oversees the entire migration lifecycle, from initial assessment to final deployment. It interacts with the CDI Controller to import VM disk images into persistent volume claims (PVCs) in the Kubernetes environment, a crucial step for preserving data and state continuity. Concurrently, the KubeVirt Controller plays a pivotal role in creating and managing VM instances as first-class citizens within the Kubernetes ecosystem, leveraging custom resource definitions (CRDs) for VM representation.

Our comprehensive evaluation demonstrates the MaaS system's capability to not only co-locate VMs and containers efficiently but also to enhance the scalability, flexibility, and

resilience of cloud infrastructure. This approach significantly reduces migration complexity, downtime, and risk, presenting a robust pathway for enterprises aiming to modernize their IT landscapes.

In summary, the MaaS solution tested by Viettel Cloud exemplifies a groundbreaking advancement in cloud migration strategies, embodying a sophisticated blend of Kubernetes' scalability and the versatility of traditional VMs. This paper aims to contribute to the broader understanding of hybrid cloud environments, offering insights into overcoming migration challenges and unlocking new potentials in cloud infrastructure management.

Conclution: The Migration as a Service streamlines the process of migrating virtual machines to a container-native platform, offering a simplified, efficient path to modernizing applications with minimal downtime. Designed for compatibility with various virtualization sources like Openstack, Hyper-V, and various Cloud provider such as AWS, Google Cloud Platform, it minimizes manual efforts and facilitates a smooth transition to Kubernetes. By leveraging MaaS, organizations can achieve enhanced performance, scalability, and cost savings, ensuring their infrastructure is future-proof and aligned with modern cloud-native technologies.

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