Canonical

From VMware to Ubuntu-based infrastructure

Practical insights to ensure a seamless migration

Executive summary

Migrating away from VMware to open source infrastructure is becoming an increasingly compelling option for many enterprises – especially in light of the pending acquisition of VMware by Broadcom. Organisations that follow this path are positioning themselves to take advantage of new innovations while simultaneously reducing costs and avoiding vendor lock-in.

Compared with VMware, leading open source alternatives can typically deliver greater capabilities at a fraction of the cost. Whereas proprietary infrastructure can severely limit an organisation's flexibility, open source solutions give users the freedom to seamlessly adopt the latest technologies to drive efficiency, performance and competitive advantage.

However, migrating from VMware is not without its challenges, particularly for enterprises that are operating a large, long-standing VMware footprint that touches numerous workloads. To help simplify the process, Canonical has developed a proven migration framework.

This is the second in a series of whitepapers exploring the VMware-to-open source journey. While the first instalment provided a high-level analysis of why businesses are making the shift to open source, this paper will go more in-depth on the migration itself, offering practical guidance alongside two common migration scenarios.

Contents

Introduction

To provide some context before digging into migration details, it is worthwhile to briefly recap on the current situation with VMware and the reasons why so many enterprises are migrating to open source solutions, such as Ubuntu-based infrastructure.

Why enterprises are moving away from VMware

VMware is a leading vendor in the virtualisation space, with approximately 45 percent market share.[1] Many enterprises have been using VMware products for decades, and while the tools are familiar, they are also costly and built on proprietary technology.

With Broadcom's acquisition of VMware, existing concerns related to costs and vendor lock-in are high on the agenda for many users. Following previous acquisitions, such as CA Technologies and Symantec, customers experienced increased prices, reduced investment in innovation, and cut back on support – and customers fear that the same thing will happen with VMware's acquisition. In a survey of more than 300 VMware users following the acquisition announcement, 451 Research found that 40 percent of respondents felt negatively about the deal.[2]

In light of these concerns, existing VMware customers now have several options. The first option is to continue using VMware. By avoiding the need to migrate and reskill users, this path offers stability, but sacrifices flexibility, can eventually come with a high TCO, and provides some business risks due to the unknown evolutions of the offering following the acquisition.

Another option is to move to a public cloud. These platforms give enterprises access to powerful tools and a more modern architecture, but when running workloads at scale and in the long-term, public clouds can be highly expensive.

The next alternative is to use Kubevirt to temporarily run virtual machines on Kubernetes. While this can be a good intermediate solution before workloads are fully transformed and rearchitected, it is not viable long-term. Kubernetes is meant for stateless, ephemeral and scalable workloads, but workloads running on virtual machines are stateful, long-lasting, and difficult to scale, making for a poor fit.

The final and, in many cases, most compelling option is to lift-and-shift and migrate to open source infrastructure virtualization solutions with full enterprise security and support.

Why businesses are choosing open source infrastructure

Modern open source solutions represent reliable, trustworthy and highly cost-effective alternatives to proprietary products. In fact, 89 percent of IT leaders consider enterprise open source solutions to be as secure or more secure than proprietary software.[3]

For most enterprises considering migration away from VMware, the most critical requirement for the new infrastructure is feature parity with the existing environment. In almost all cases, there are open source equivalents for each

component of the VMware portfolio that offer the same and better capabilities. What's more, these open source solutions are available without expensive licences, and while enterprise support services still incur a cost, they tend to be significantly lower than equivalent services from proprietary vendors.
Open source infrastructure also offers major advantages in flexibility and innovation when compared with VMware. Community-driven development ensures that users are not reliant on a single vendor, and leads to a much faster rate of advancement. Additionally, users of open source software can freely adopt new solutions without worrying about contractual obligations, enabling them to stay at the cutting edge.

Choosing and maintaining multiple open source solutions from different sources is its own challenge, but this can be mitigated by using an enterprise-grade, supported stack such as Ubuntu-based infrastructure. Ubuntu serves as an open source aggregation platform that provides streamlined access to tens of thousands of open source software packages, mirroring the convenience of a proprietary ecosystem while delivering the flexibility and cost-effectiveness of open source.

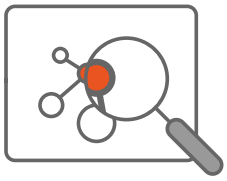
For a deeper dive into migration drivers and the advantages of Ubuntu-based infrastructure, read the previous whitepaper, From VMware to Open Source.

How to approach a successful migration

Moving away from VMware is rarely a straightforward process. This is because enterprises have often been using VMware infrastructure for many years, and the VMware footprint can span many different products and workloads in a way that is unique for each business.

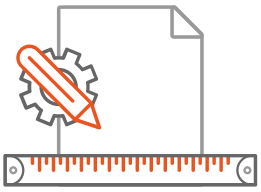
Given this complexity, there is no single recipe for migration, as the journey will always vary based on the circumstances and requirements of each organisation. That being said, Canonical has developed a broad framework that can help guide enterprises to their own optimal migration outcomes.
The migration framework includes five key stages:

Discovery and analysis



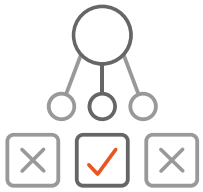
The first step in a successful migration is to build a comprehensive understanding of the VMware estate that needs to be moved. Organisations should analyse which VMware products they are using for which workloads, and whether each of those products is essential, optional or unnecessary. To avoid unexpected operational disruption, it is also critical to thoroughly map all application and network dependencies, catalogue performance and other technical requirements, and identify any hardware limitations.

Planning and design



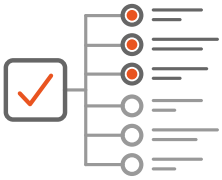
Equipped with the information found during the discovery phase, an enterprise can next move on to migration planning. This stage involves determining which infrastructure components can address the organisation's requirements, and how those components can be combined into a cohesive stack. Instead of going straight into designing the final migration, it is best to start by planning a proof of concept (PoC).

Proof of concept



The PoC is an essential step to ensuring the success of the overall project, since it will help businesses identify any gaps in the initial analysis, allowing adjustments to be made ahead of the full migration. It is common to encounter unexpected complications during the PoC, and it is much easier to address issues at this stage rather than later in the migration process where they could cause major and costly delays.

Test, adjust and optimise



Sometimes a single PoC might not be enough to establish confidence in the migration strategy. If this is the case, further testing, adjustment and optimisation are necessary to refine the plan. The project should not move ahead to the full migration until the organisation is satisfied that it has ticked every box to ensure a smooth transition.

Migrate

Following successful testing and any necessary adjustments, it is time to execute the plan and begin the full migration. Depending on the scale of the project, migration can take place all at once, or incrementally. For highly complex VMware estates, it is also possible to temporarily run the new infrastructure in parallel with the existing environment to minimise the risk of disruption.
To demonstrate how this framework can function in practice, the next sections will explore two common migration scenarios: moving a VMware environment to MicroCloud or OpenStack depending on the organisation's preference and use case. For the purposes of these examples, the migration target will be Ubuntu-based infrastructure.

Migration scenario 1: VMware to OpenStack

What is OpenStack?

OpenStack is an open source cloud platform that enables users to manage distributed compute, network and storage resources. OpenStack aggregates resources into pools, and allows on-demand provisioning of virtual resources.

With 40 million cores in production, OpenStack is the most widely deployed open source cloud software in the world, and one of the four most active open source projects globally.[4] It is supported by thousands of individual contributors, and it has been built in collaboration with numerous partners, including both Canonical and VMware.

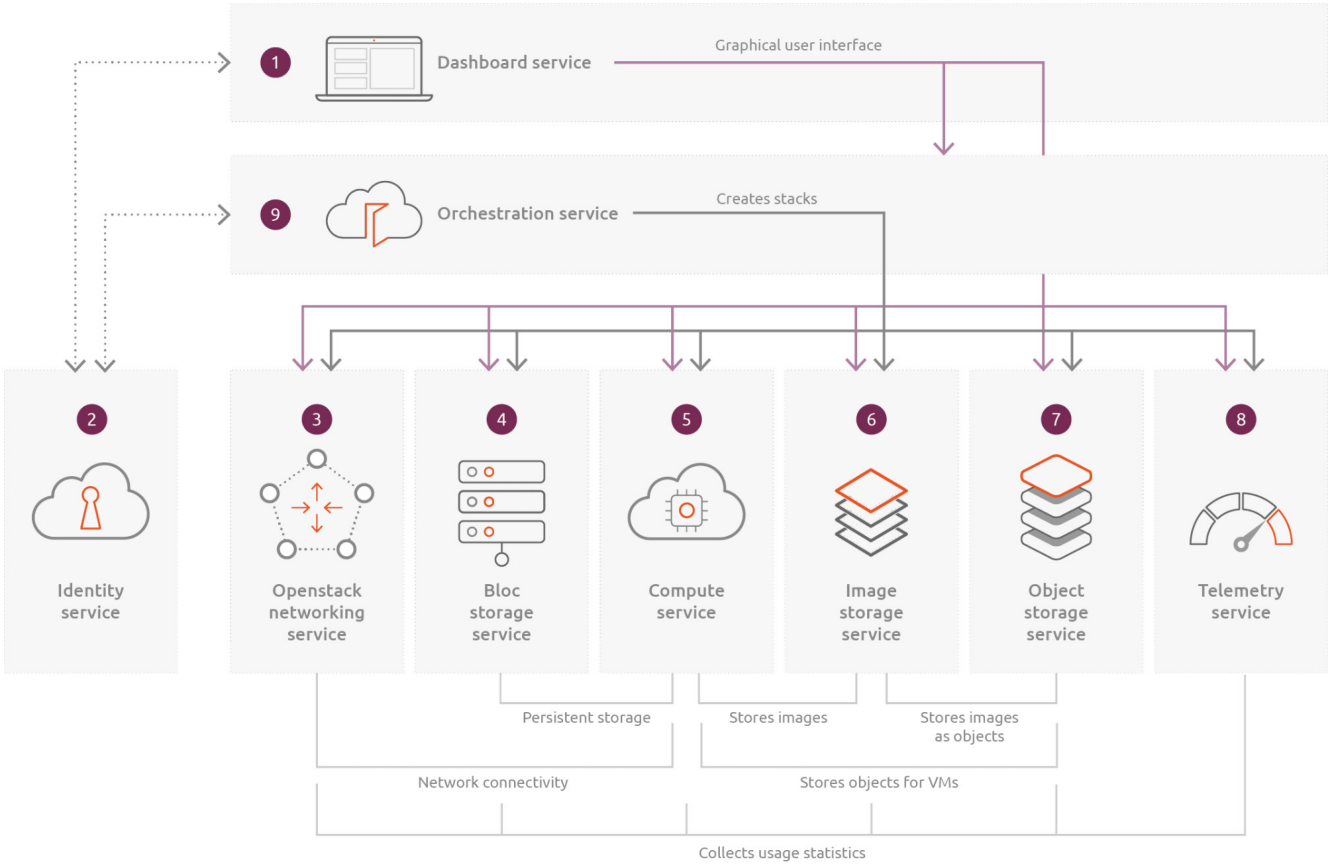
The platform is a cost-effective alternative to proprietary virtualisation solutions, and it gives businesses a way to build their own private clouds with functionality and convenience similar to that of leading hyperscalers.

The platform has a modular architecture consisting of the following components:

- OpenStack services – expose standardised API endpoints and handle basic cloud functions
- OpenStack dashboard – provides a web-based user interface

- OpenStack client – provides a command-line user interface
- SQL databases – store various records created by OpenStack services
- Message queues – facilitate inter-process communication
- Additional components – NoSQL databases, Memcached, etc.

OpenStack's high-level design (HLD) can be visualised as follows:



There are multiple distributions of OpenStack on the market, but not all are suitable for large-scale enterprise use cases. Canonical's Charmed OpenStack is a good choice for these scenarios thanks to its ease-of-use, price-performance, and security.

Canonical supports all new versions of OpenStack within two weeks of the upstream release, and users benefit from extensive automation throughout the initial deployment, post-deployment operations and when upgrading between consecutive OpenStack versions.

Organisations that need to maximise security and stability can opt for enterprise-grade support from Canonical, delivered through a transparent, cost-effective support subscription. This subscription covers not only OpenStack, but also Kubernetes, Ceph for storage, MAAS for server provisioning and LXD. Each release is supported for up to ten years with ongoing maintenance and security updates. Enterprises can also take advantage of Canonical's fully managed OpenStack service, handing over operational responsibility for Charmed OpenStack so that internal teams can focus on the core business rather than infrastructure.

Feature comparison

Charmed OpenStack includes many comparable components that provide the same functionality as those found in a VMware estate. These OpenStack components often work differently from VMware equivalents, but nonetheless enable feature parity between new and legacy environments.

Functionality	VMware components and features	Comparable Charmed OpenStack components and features
Virtualisation layer	vSphere	Nova
Hypervisor	ESXi	KVM/QEMU
Networking	NSX/VDS	OVN
Storage	vSAN	Ceph
Live migration	vMotion	Nova live migration
Block live migration	Storage vMotion	Nova block live migration
Resource scheduling	DRS	Watcher (on the roadmap)
Logging	vRealize Log Insight	LMA
High availability	HA	Masakari
Host affinity rules	Host (anti-)affinity rules	Host aggregates
VM affinity rules	VM (anti-)affinity rules	Server groups
Automation and orchestration	VMware Aria Automation	Heat (OpenStack native project), Terraform, Ansible and Juju

As the table above shows, the only VMware component that lacks an equivalent in Charmed OpenStack is the Distributed Resource Scheduler (DRS). However, Watcher, the relevant component, is on the roadmap and will be available in the near future.

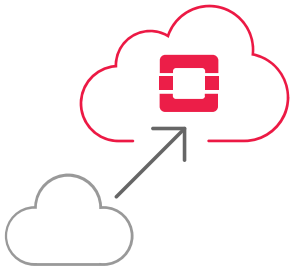
Despite sharing many of the same functionalities, there are several key differences between Charmed OpenStack and VMware. First and foremost, whereas VMware is a mostly proprietary platform, Charmed OpenStack is fully open source. Consequently, the TCO for Charmed Openstack is typically much lower, even when factoring in optional enterprise support and the potential upfront costs of migration. The cost difference is further accentuated when considering that VMware often requires specialised storage hardware, while Charmed OpenStack can use commodity storage.

From a technical perspective, Charmed OpenStack treats resources differently than VMware. Whereas VMware follows the traditional approach of managing

each server individually, Charmed OpenStack treats resources as a collective that can be configured and managed as a group. The Charmed OpenStack approach involves total automation, is highly scalable, and enables users to easily replace faulty servers rather than having to repair them. In Charmed OpenStack, operations code is packaged for reusability and OpenStack complexity gets abstracted in favour of model-driven operations. This makes operations easy to manage even with a small team, coupled with the benefits of using the OpenStack standardised API endpoints.

Last but not least, stack dependency and upgrade limitations are relatively high with VMware due to the complexity of individually upgrading numerous interconnected components. With Charmed OpenStack, it is easy to upgrade all components simultaneously and automatically.

Migration strategies



There are three different ways to approach a migration to Charmed OpenStack. The optimal strategy for each business depends on the nature and complexity of the workloads, as determined during the discovery and analysis phase.

“The easy way” – lift and shift

For simpler VMware estates, it is sometimes possible to execute a straightforward lift and shift. Canonical partners with various independent software vendors (ISVs) that offer migration tools to streamline the process. For instance, the Coriolis migration tool from Cloudbase can enable a fully automated lift and shift from VMware to Charmed OpenStack.

The viability of this approach depends heavily on the workloads being migrated. In some cases it can be as simple as dedicating the endpoint, performing basic configuration and replicas, and letting a migration tool handle the rest. This is not always feasible, however.

“The medium way” – application layer modernisation

When dealing with more complex VMware ecosystems, it is often necessary to make a number of changes to existing workloads before they can be migrated. In these cases, the application layer can be modernised for an easier migration, while the database layer remains as-is.

With this approach, the migration takes place in two stages. The first stage would be addressing the application layer, making the necessary changes and then migrating it to the target environment. The second stage would involve breaking down the database and network dependencies before they can be migrated as well.

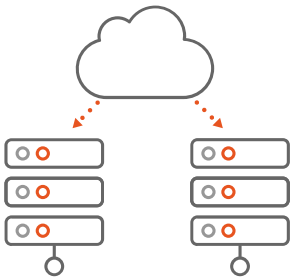
“The hard way” – rearchitect

For the most complex use cases, where an organisation is deeply reliant on various VMware tools, a significant amount of re-architecting might be needed prior to migration. Canonical offers professional services and partners with leading system integrators (SIs) to ensure that enterprises have access to the highest levels of expertise for these challenging scenarios.

Between these three strategies and with support from Canonical and its partners, enterprises will be able to successfully migrate their VMware estate to Charmed OpenStack, unlocking unprecedented flexibility, a lower TCO and access to accelerated innovation. However, for smaller VMware deployments or clusters, an alternative open source infrastructure platform to consider is MicroCloud.

Migration scenario 2: VMware to MicroCloud

What is MicroCloud?

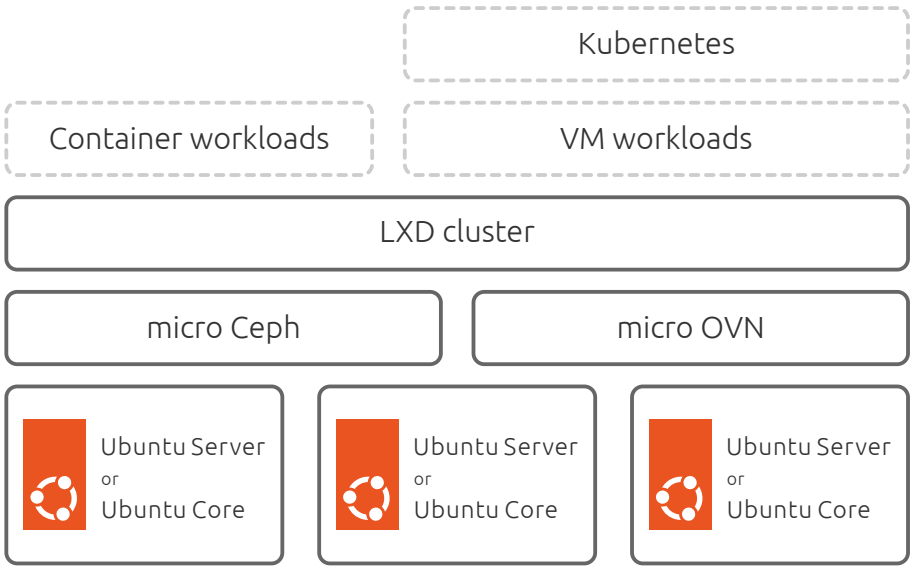


Many VMware users run infrastructure in smaller clusters, with each cluster dedicated to a specific purpose. Canonical's MicroCloud is an ideal fit for these use cases. It is a lightweight but powerful open source cloud platform purpose-built for small clusters and edge deployments. As opposed to the modularity and wide range of components available with OpenStack solutions, MicroCloud was designed to provide a straightforward solution, limiting the integration options and providing a more opinionated approach. This ensures the simplicity of operations, and makes MicroCloud operational even on commodity hardware.

MicroClouds start from just three servers – the minimum number necessary to achieve high availability by default – and scale up to as many as 50 servers. The platform is built with simplicity and automation in mind, and it is inherently secure since components are packaged using containerised snaps, providing an additional layer of isolation while enabling seamless updates.

MicroCloud achieves its enterprise-ready functionality by combining three leading open source solutions into one lightweight cloud. It utilises the system container and VM management tool LXD for compute and virtualisation. Ceph provides block, file system and object storage. And OVN is used for networking. Each of these is a well-supported, production-grade solution that receives frequent updates. Together, they enable Canonical to deliver a simple cloud platform built on best-of-breed open source tools.

The Canonical micro cloud



System containers

A notable feature of MicroCloud is that it uses system containers. System containers differ from the application containers that most people are familiar with from Docker and Kubernetes in that they are capable of running a full guest OS rather than just a single application or process. In this way, MicroCloud offers the density of containers with bare metal performance, while also being able to run workloads in a similar way to virtual machines. Simply put, it provides the best of both worlds.

VMware users can employ system containers for traditional applications that they have previously been running on VMs, and still enjoy the advantages of more performant and resource-efficient infrastructure.

Feature comparison

Just like Charmed OpenStack, MicroCloud includes various components that deliver comparable functionality to VMware products.

Functionality	VMware components and features	Comparable MicroCloud components and features
Virtualisation layer	vSphere	LXD
Hypervisor	ESXi	KVM/QEMU for VMs, LXC for system containers
Networking	NSX/VDS	OVN
Storage	vSAN	Ceph
Live migration	vMotion	lxd-migrate
Block live migration	Storage vMotion	N/A
Resource scheduling	DRS	N/A
Logging	vRealize Log Insight	Canonical Observability Stack, or Metrics API
High availability	HA	HA by default
Host affinity rules	Host (anti-)affinity rules	Projects/cluster groups/scriptlet based placement
VM affinity rules	VM (anti-)affinity rules	Projects/cluster groups/scriptlet based placement
Automation and orchestration	VMware Aria Automation	Not built-in. Ansible, Terraform, Juju and other third-party integrations

MicroCloud does not include built-in automation and orchestration components, but users can freely integrate leading third-party tools, such as Ansible, Terraform or Juju, ensuring maximum flexibility.

When it comes to advanced scheduling and affinity rules, MicroCloud users have several options. They can set up cluster groups with different configurations, and target specific systems or users to those groups. They can restrict specific projects to specific machines with dedicated instances, images and profiles. Or they can employ the new scriptlet-based instance scheduler feature, which helps users decide on a cluster target at the point of instance creation by utilising information about the requested instance and the existing environment.

A key difference between VMware and MicroCloud is how they approach storage. With VMware, administrators work with datastores, which are large, shared file systems on which VMs are created or stored. VMs use files for configuration and for virtual discs, and file locking prevents two hypervisors from accessing the same VM concurrently.

With MicroCloud and LXD, administrators instead work with storage pools. When creating a container or VM, LXD automatically creates file systems for containers and virtual block devices for VMs. These containers and VMs are assigned to a hypervisor host and this host will always be the default machine for running that specific container or VM. However, the host can be swapped with the “lxc move” command. Distributed storage technologies like Ceph make it very easy for multiple hosts to swap containers and VMs.

Migration

LXD has its own migration tool which enables migration of existing LXD instances between servers, and also migration of physical or virtual machines externally to LXD instances. In essence, the tool lets users create a LXD instance based on an existing disk or image.

The tool runs on any Linux machine. It connects to a LXD server and creates a blank instance, and users can either configure the instance immediately or wait until after the migration. The tool then copies the data from the existing image that is being migrated.

Depending on the unique properties of the VMware estate, it is likely that some debugging and changes will be necessary during the process. Based on the complexity of the use case, external tools, such as Coriolis, can also be used.

Key Takeaways

- Migrating from VMware to open source infrastructure can be challenging, but it is worth the effort to achieve flexibility, TCO reduction and long-term competitive advantage.
- Migration complexity can be mitigated by partnering with a leading open source vendor and system integrators.
- Canonical offers various open source infrastructure solutions that can be combined in different ways for a tailored and optimised migration journey.
- The right migration solution should be chosen based on the organisation’s needs and requirements, taking into account scale, modularity,

the need to expose standardised API endpoints, and ability to customise, among other considerations.

- Whatever the target infrastructure chosen, it will not be a like-for-like replacement. Some changes will be necessary in how an organisation interacts with and operates its infrastructure.
- Migration needs to be thoroughly considered, planned and tested in accordance with a proven methodology.

Conclusion

Migrating away from VMware can be a daunting prospect, but with robust planning, the right solutions and expert support, enterprises can make the shift to open source infrastructure with the least possible disruption.

There will always be some degree of change needed in order for long-time VMware users to adapt to a new environment. This is because open source developers are not creating solutions explicitly as alternatives to VMware, but rather they are designing tools fit for modern infrastructure. The virtualisation landscape has changed significantly in the last 30-40 years, and enterprises that have always used VMware stand with much to gain from adopting modern best practices.

In the long-term, this paradigm shift is well worth the effort – both from a cost perspective, and to futureproof infrastructure strategies with the benefit of open source innovation.

The scenarios presented in this whitepaper are just two examples of potential migration paths. Canonical and its partners offer an array of tools that enable organisations to plan and execute a successful migration based on their specific requirements

To discuss how Canonical solutions can support your migration use cases, get in touch.

To learn more about why enterprises are choosing open source solutions and Ubuntu-based infrastructure, read the previous whitepaper or watch our webinar.

Learn More

- https://microcloud.is/
- https://ubuntu.com/openstack
- https://maas.io/
- https://ubuntu.com/ceph
- https://ubuntu.com/kubernetes

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