What is a virtual machine (VM)?

Published May 11, 2022 • 3-minute read

🔗 Copy URL

Overview

A virtual machine (VM) is a virtual environment that functions as a virtual computer system with its own CPU, memory, network interface, and storage, created on a physical hardware system (located off- or on-premises). Software called a hypervisor separates the machine's resources from the hardware and provisions them appropriately so they can be used by the VM.

The physical machines, equipped with a hypervisor such as Kernel-based Virtual Machine (KVM), is called the host machine, host computer, host operating system, or simply *host*. The many VMs that use its resources are guest machines, guest computers, guest operating systems, or simply *guests*. The hypervisor treats compute resources—like CPU, memory, and storage—as a pool of resources that can easily be relocated between existing guests or to new virtual machines.

VMs allow multiple different operating systems to run simultaneously on a single computer—like a Linux® distro on a MacOS laptop. Each operating system runs in the same way an operating system or application normally would on the host hardware, so the end user experience emulated within the VM is nearly identical to a real-time operating system experience running on a physical machine.

How do VMs work?

Virtualization technology allows you to share a system with many virtual environments. The hypervisor manages the hardware and separates the physical resources from the virtual environments. Resources are partitioned as needed from the physical environment to the VMs.

When the VM is running and a user or program issues an instruction that requires additional resources from the physical environment, the hypervisor schedules the request to the physical

system's resources so that the virtual machine's operating system and applications can access the shared pool of physical resources.

Types of hypervisors

There are 2 different types of hypervisors that can be used for virtualization.

Type 1

A type 1 hypervisor is on bare metal. VM resources are scheduled directly to the hardware by the hypervisor. KVM is an example of a type 1 hypervisor. KVM was merged into the Linux® kernel in 2007, so if you're using a modern version of Linux, you already have access to KVM.

Type 2

A type 2 hypervisor is hosted. VM resources are scheduled against a host operating system, which is then executed against the hardware. VMware Workstation and Oracle VirtualBox are examples of type 2 hypervisors.

Why use a VM?

Server consolidation is a top reason to use VMs. Most operating system and application deployments only use a small amount of the physical resources available when deployed to bare metal. By virtualizing your servers, you can place many virtual servers onto each physical server to improve hardware utilization.

This keeps you from needing to purchase additional physical resources, like hard drives or hard disks, as well as reducing the need for power, space, and cooling in the datacenter. VMs provide additional disaster recovery options by enabling failover and redundancy that could previously only be achieved through additional hardware.

A VM provides an environment that is isolated from the rest of a system, so whatever is running inside a VM won't interfere with anything else running on the host hardware.

Because VMs are isolated, they are a good option for testing new applications or setting up a production environment. You can also run a single purpose VM to support a specific process.

Why choose Red Hat?

Red Hat has supported virtualization software development for a long time—improving the KVM hypervisor and contributing to KVM and oVirt since both communities were founded.

The KVM hypervisor is now the core of all major OpenStack® and Linux virtualization distributions, and it has set records for overall performance and for running the largest quantity of well-performing VMs on a single server.

Red Hat® Virtualization is an open, software-defined platform that virtualizes Linux and Microsoft Windows workloads. Built on Red Hat Enterprise Linux and KVM, it features management tools that virtualize resources, processes, and applications—giving you a stable foundation for a cloud-native and containerized future.

Keep reading

ARTICLE

Containers vs VMs

Linux containers and virtual machines (VMs) are packaged computing environments that combine various IT components and isolate them from the rest of the system.

Read more →

ARTICLE

What is a virtual machine (VM)?

A virtual machine (VM) is an isolated computing environment created by abstracting resources from a physical machine.

Read more →

ARTICLE

What is KVM?

Kernel-based virtual machines (KVM) are an open source virtualization technology that turns Linux into a hypervisor.

Read more →

More about virtualization

Products	›
Related articles	›
Resources	›
Training	›

We're the world's leading provider of enterprise open source solutions—including Linux, cloud, container, and Kubernetes. We deliver hardened solutions that make it easier for enterprises to work across platforms and environments, from the core datacenter to the network edge.