Brief on Virtual Machine

A Virtual Machine is an Operating System or application environment that runs on software that replicates special hardware. The end-user experience when utilizing a virtual machine is identical to that of special hardware.

**Virtual Machine** abstracts the hardware of our personal computer such as CPU, disk drives, memory, [NIC (Network Interface Card)](https://www.geeksforgeeks.org/nic-full-form/), etc, into many different execution environments as per our requirements.

**How Does a Virtual Machine Work?**

Virtualization is the method of creating a software-based, or "virtual" version of a computer with good amounts of CPU, memory, and storage that are "borrowed" from a physical host computer (such as your personal computer) and/or a remote server. The working of the virtual machine is very simple just check the published article on the [Working of a Virtual Machine](https://www.geeksforgeeks.org/virtual-machine/).

**Types of Virtual Machine**

There are two types of Virtual Machine

* Process Virtual Machine
* System Virtual Machine

**Process Virtual Machine**

**Purpose:**  
Designed to run a single application or process in an isolated environment.

**How It Works:**  
It provides a platform-independent programming environment that abstracts the underlying OS. It starts when a program begins and terminates when the program ends.

**Example:**

* **Java Virtual Machine (JVM):** Runs Java bytecode on any platform.
* **.NET CLR (Common Language Runtime):** Executes .NET applications.

**Key Features:**

* Application-level isolation
* Platform independence (write once, run anywhere)
* Short-lived (lives only as long as the process runs)

**System Virtual Machine**

**Purpose:**  
Provides a complete system platform that supports the execution of a full operating system.

**How It Works:**  
It emulates an entire physical machine including CPU, memory, storage, and network interface. It allows multiple OSes to run concurrently on a single physical host.

**Example:**

* VMware Workstation
* Oracle VirtualBox
* Microsoft Hyper-V
* KVM (Linux-based)

**Key Features:**

* Full OS virtualization
* Supports multiple VMs on a host
* Used in server consolidation, cloud services, etc.
* Long-lived and persistent

**Advantages of Virtual Machine**

* There are no protection problems because each virtual machine is completely isolated from all other virtual machines.
* Virtual machine can provide an instruction set architecture that differs from real computers.
* Easy maintenance, availability and convenient recovery.
* Energy and cost savings.
* Easy backup and clone.
* Virtual Machine provide Flexibility and Customization.

**Disadvantages of Virtual Machine**

* When multiple virtual machines are simultaneously running on a host computer, one virtual machine can be affected by other running virtual machines, depending on the workload.
* Virtual machines are not as efficient as a real one when accessing the hardware.

**What is Hypervisors in Virtualization?**

Hypervisor as name suggests, it is a software, hardware, or firmware that generally make virtualization possible. It simply creates virtualization layers that separates CPU/processors, RAM and all other physical resources from virtual machines that we create. Its type includes Native hypervisor and Hosted hypervisor. It is used to allocate each VM resources such as CPU, memory, storage, and network to simply run guest OS and applications.