**Virtual Machine (VM)**

Definition  
A virtual machine is a software-based emulation of a physical computer. It allows multiple operating systems to run on a single physical machine using virtualization technology.

Components

1. Hypervisor: A software layer that enables the creation and management of virtual machines.
   * Type 1 hypervisors run directly on physical hardware.
   * Type 2 hypervisors run on a host operating system.
2. Host Machine: The physical computer where the hypervisor runs.
3. Guest Machine: The virtual machine running its own operating system within the hypervisor.
4. Virtual Hardware: Simulated resources like CPU, memory, storage, and network interfaces used by the VM.

Features

* Isolation: Each VM operates independently from others.
* Portability: VMs can be moved between different physical machines.
* Snapshots: The state of a VM can be saved and restored.
* Resource sharing: VMs share CPU, memory, and storage of the host.
* Flexibility: VMs can run different operating systems on the same hardware.

Advantages

* Efficient use of hardware resources
* Easier testing and development environments
* Ability to run multiple operating systems simultaneously
* Simplified backup and disaster recovery
* Better security through isolation

Disadvantages

* Performance overhead due to virtualization
* Higher resource requirements
* Complexity in setup and configuration
* Potential security vulnerabilities in hypervisor layer

Applications

* Software development and testing
* Running outdated or different operating systems
* Cloud computing infrastructure
* Educational and training purposes
* Server consolidation in enterprise environments



