

## Properties of Virtual Machine

### 1. Isolation:

- VMs run in isolated environments, ensuring that processes and applications running in one VM do not affect those in another VM.
- TechCorp runs multiple VMs for different departments (e.g., HR, Finance, Development). Each VM operates independently, so if the Development VM crashes due to a software issue, the HR and Finance VMs continue running unaffected.

### 2. Encapsulation:

- A VM can be represented as a set of files, making it easy to move, copy, and back up.
- Each VM at TechCorp is stored as a set of files on a storage device. When TechCorp needs to move a VM to a new physical server, they simply copy the VM's files to the new server and start it up.

### 3. Hardware Independence:

- VMs can run on any physical machine that has the appropriate virtualization software, regardless of the underlying hardware.
- TechCorp's VMs can run on any server with the appropriate virtualization software (e.g., VMware, Hyper-V). They can move VMs between servers with different hardware configurations without compatibility issues.

### 4. Resource Allocation:

- Resources such as CPU, memory, storage, and network bandwidth can be allocated and managed for each VM independently.
- TechCorp allocates specific amounts of CPU, memory, storage, and network bandwidth to each VM. The Finance VM gets more storage for databases, while the Development VM gets more CPU and memory for compiling code.

### 5. Snapshots and Cloning:

- VMs can be snapshot at a point in time, allowing them to be restored to that state later. Cloning allows the creation of exact copies of VMs.
- Before making significant changes to the HR application, TechCorp's IT team takes a snapshot of the HR VM. If the changes cause problems, they can revert to the snapshot. They also clone the HR VM to create a test environment for new software updates.

## 6. Scalability:

- VMs can be scaled up (adding more resources to a single VM) or scaled out (adding more VMs) to meet varying workload demands.
- During peak times, such as end-of-month financial reporting, TechCorp can allocate additional resources to the Finance VM. If more capacity is needed, they can quickly create new VMs to handle increased workloads.

## 7. Performance Monitoring:

- Virtualization platforms typically include tools for monitoring the performance of VMs and the underlying host system.
- TechCorp uses monitoring tools to track the performance of each VM and the underlying physical servers. They receive alerts if a VM is using too much CPU or if the physical server's memory is nearing capacity.

## 8. Security:

- VMs can be configured with security features such as firewalls, intrusion detection systems, and encryption, ensuring secure operations.
- Each VM at TechCorp is equipped with its own firewall and antivirus software. The IT team also encrypts sensitive data on the HR and Finance VMs to protect against unauthorized access.

## 9. Migration:

- VMs can be migrated from one physical host to another with minimal downtime, a process known as live migration or vMotion (in VMware environments).
- When TechCorp needs to perform maintenance on a physical server, they use live migration to move running VMs to another server without downtime. This ensures continuous operation of critical services.

## 10. Provisioning:

- VMs can be quickly provisioned from templates, reducing the time and effort required to deploy new environments.
- To onboard new employees, TechCorp quickly provisions new VMs from pre-configured templates. This allows new employees to start with a fully set-up environment tailored to their role.

## 11. Compatibility:

- VMs can run different operating systems (Windows, Linux, etc.) on the same physical host, enabling a diverse range of applications.

- TechCorp runs both Windows and Linux VMs on the same physical servers. This allows their diverse range of applications, including a legacy payroll system on Windows and a new web application on Linux, to operate concurrently.

#### **12. Disaster Recovery:**

- VMs can be easily backed up and restored, enhancing disaster recovery capabilities.
- TechCorp performs regular backups of their VMs. In the event of a disaster, they can restore these backups on new hardware, minimizing downtime and data loss.

#### **13. Support for Legacy Systems:**

- VMs can run legacy operating systems and applications, extending their usable life.
- The company still relies on a legacy inventory management system that only runs on an older version of Windows. Instead of maintaining old hardware, they run this system in a VM on modern servers.

#### **14. Centralized Management:**

- Virtualization platforms often provide centralized management interfaces to manage multiple VMs and hosts.
- TechCorp's IT team uses a centralized management console to manage all their VMs and physical servers. This console provides a single interface to monitor performance, apply updates, and manage resources.

#### **15. Cost Efficiency:**

- VMs enable better utilization of physical hardware, potentially reducing costs associated with physical server deployment and maintenance.
- By running multiple VMs on a few powerful physical servers, TechCorp reduces the need for numerous physical machines, saving on hardware costs, power, and cooling.

#### **16. Software Testing and Development:**

- VMs provide isolated environments for testing and development, allowing multiple configurations and setups to be tested concurrently.
- TechCorp's development team uses VMs to create isolated environments for testing new applications. They can quickly spin up multiple VMs with different configurations to test compatibility and performance without affecting production systems.