SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

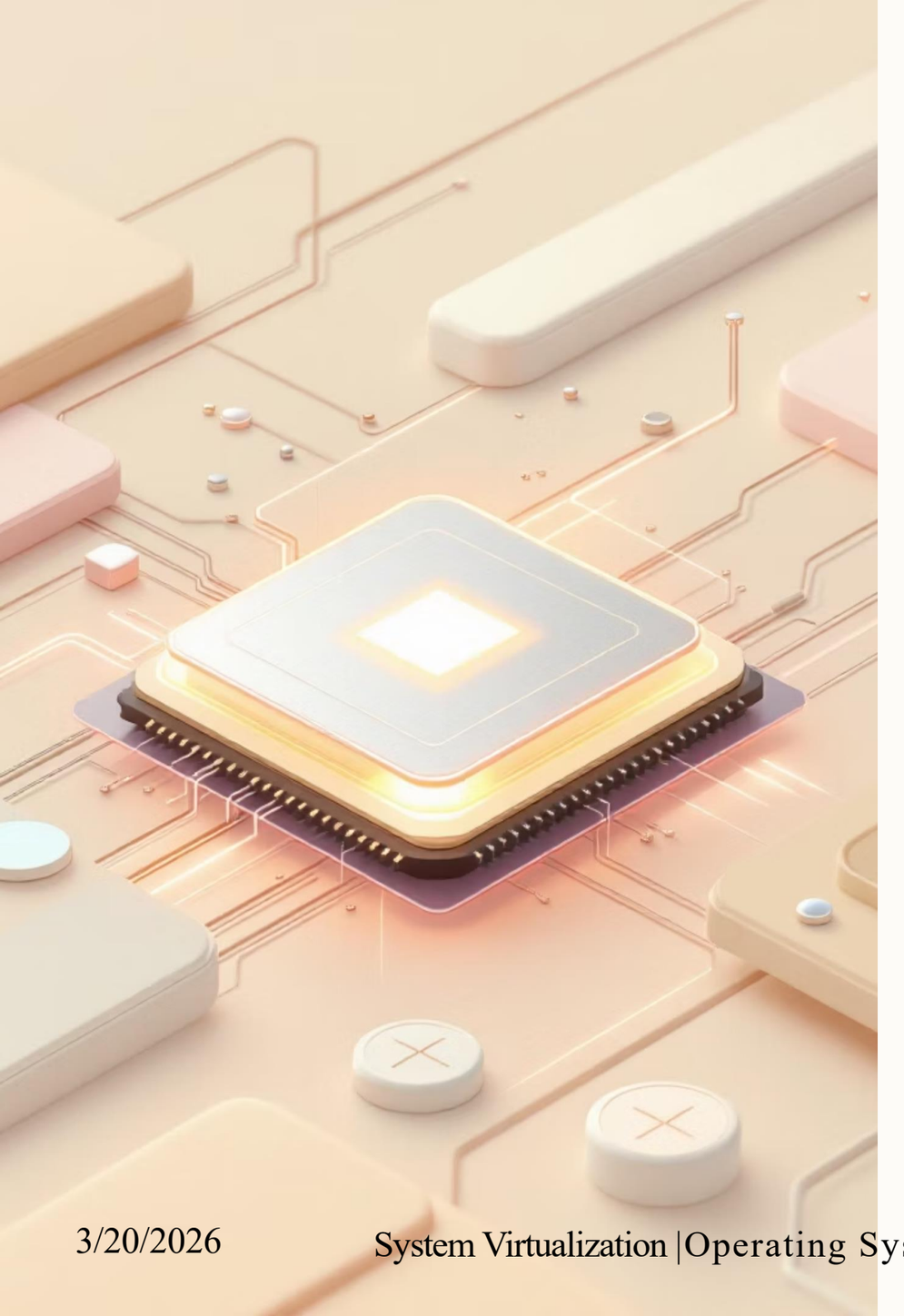
Department of Computer Science and Engineering

23CST206–OPERATING SYSTEMS AND VIRTUALIZATION

B.E- CSE /IV SEMESTER

UNIT – IV VIRTUALIZATION

Topic 5:System Virtualization



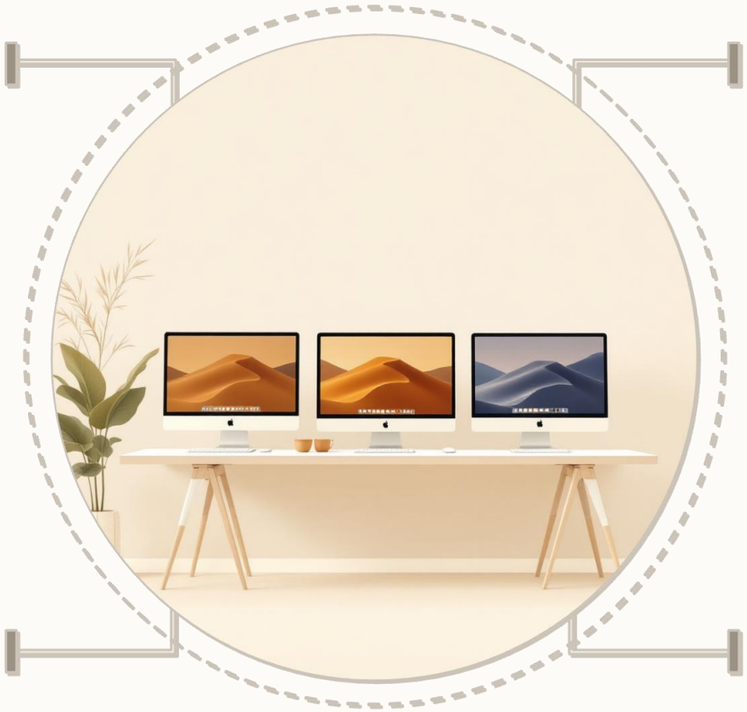
System Virtualization

Virtualizing entire computer systems to run multiple operating systems simultaneously on a single physical machine.

What is System Virtualization?

Host
Physical machine providing resources

Hypervisor
Manages virtual machines and resources



Guest OS
Independent operating systems running

Virtual Hardware
Emulated CPUs, memory, and devices

Key Concept

1

One Physical System

Single computer hardware

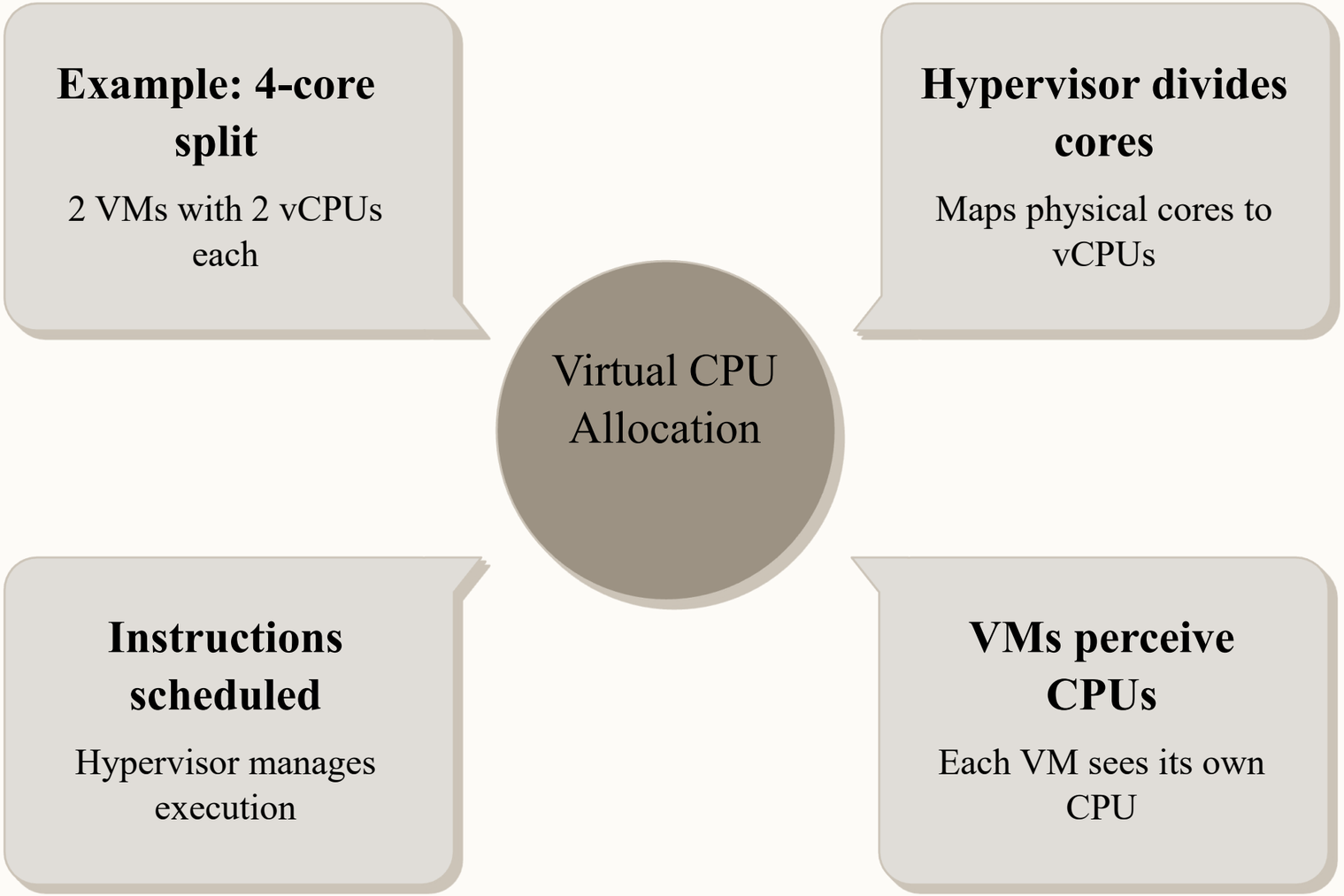
2

Multiple Virtual Systems

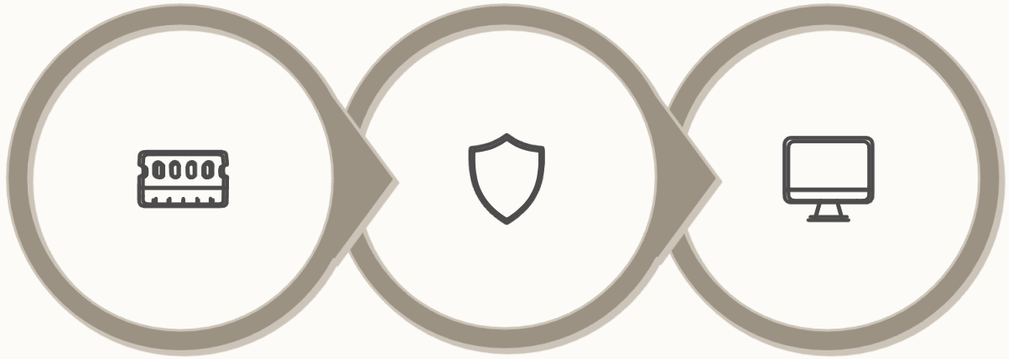
Independent virtual machines

Each virtual system includes virtual CPU, memory, storage, network, and its own guest operating system.

Virtual CPU (vCPU)



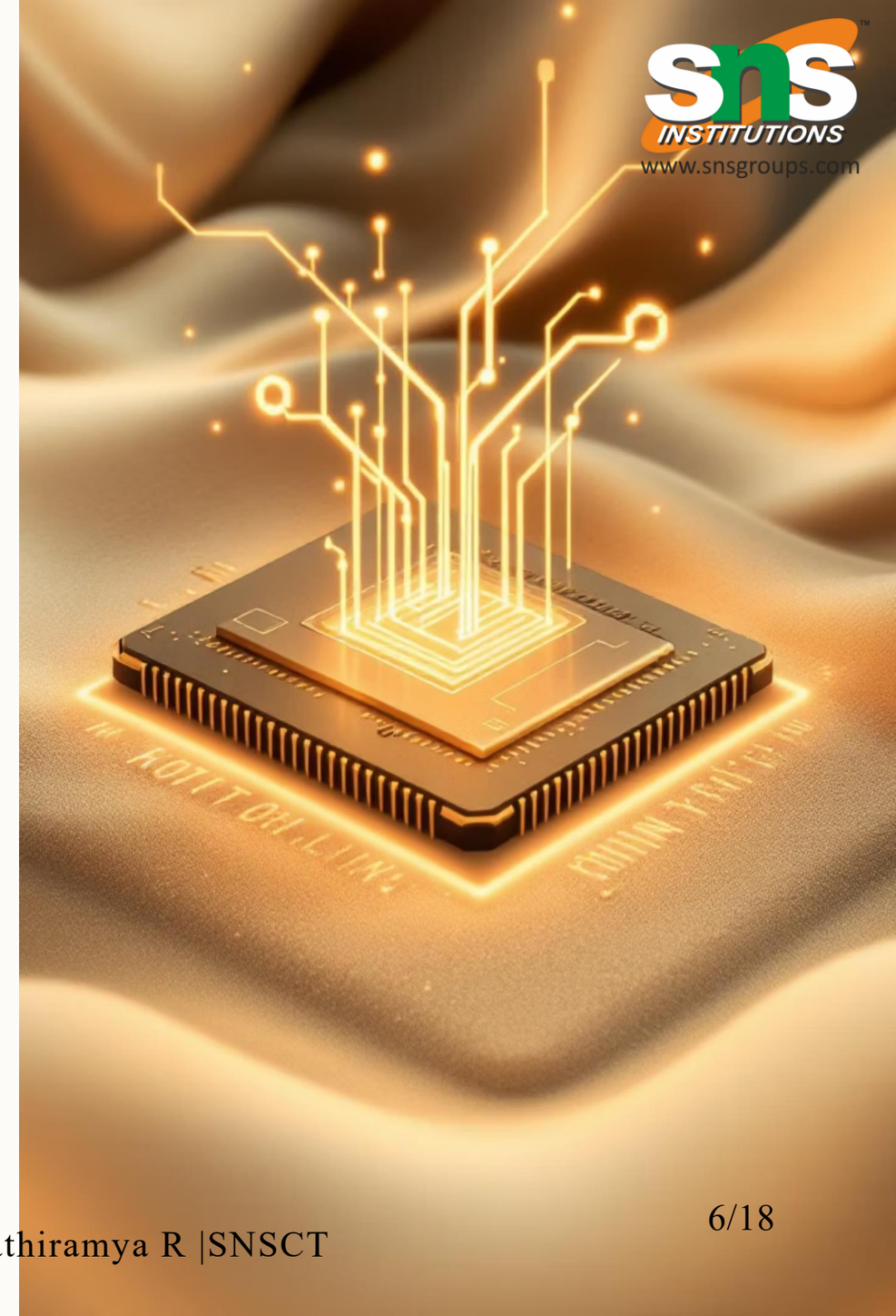
Virtual Memory (vRAM)



Allocation

Isolation

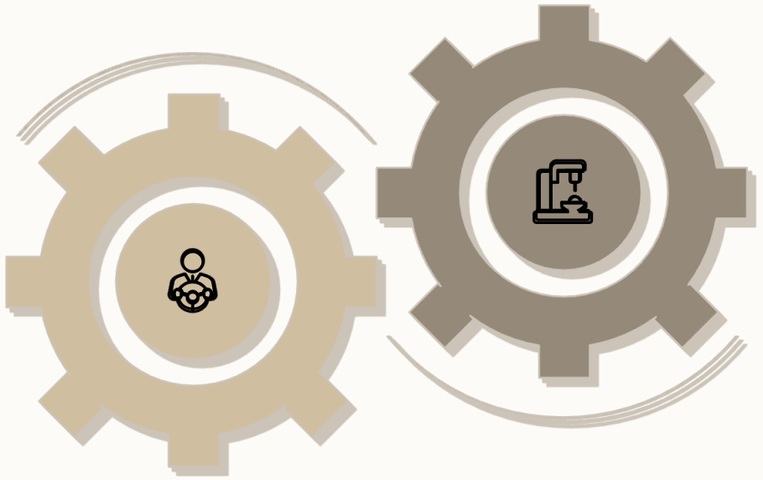
Example:
8GB/8GB



Virtual Storage (vDisk)

Flexible Configuration

Supports different sizes and file systems, such as 50GB or 100GB partitions.



Virtual Disk File

A single file on the host system that appears as a dedicated drive to the guest OS.

Virtual Network

Example: VM1 uses IP 192.168.1.10, VM2 uses 192.168.1.20

Virtual Network Interfaces

Hypervisor creates interfaces for VMs

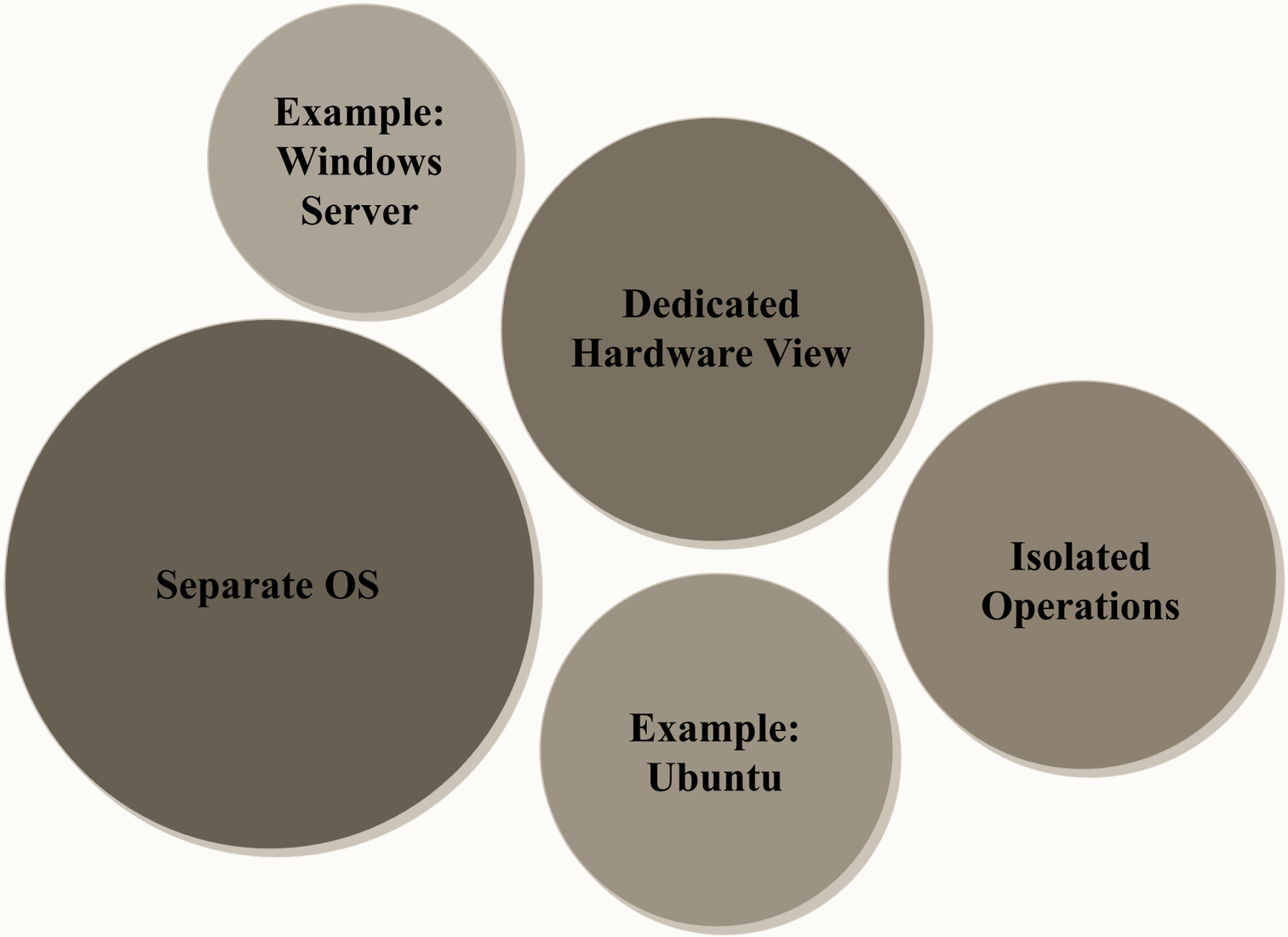
Virtual Switch

Enables VM-to-VM and external traffic

Network Configuration

Different IPs, subnets, and settings

Guest Operating System



Why System Virtualization?

Problems in Traditional Systems

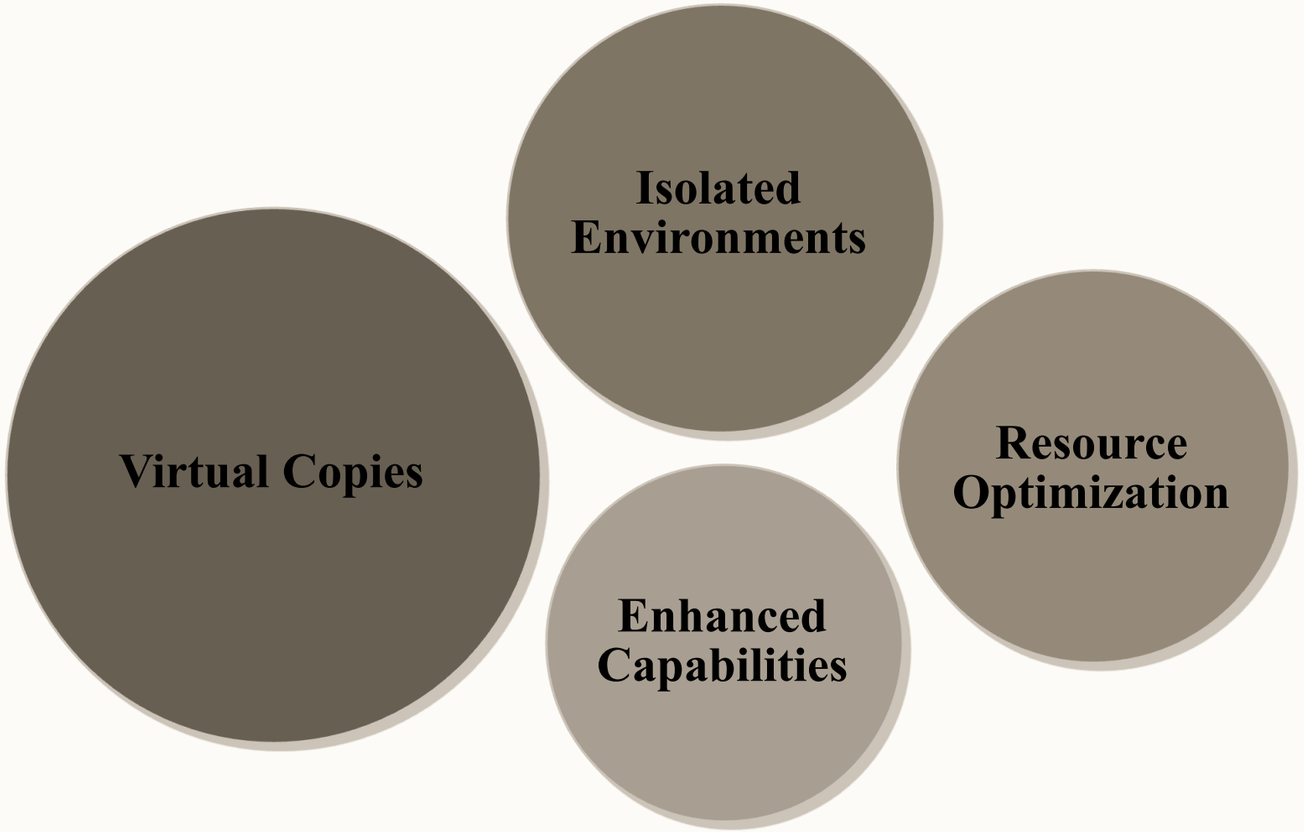
- Underutilized hardware
- High infrastructure cost
- Difficulty testing multiple OS
- Poor scalability

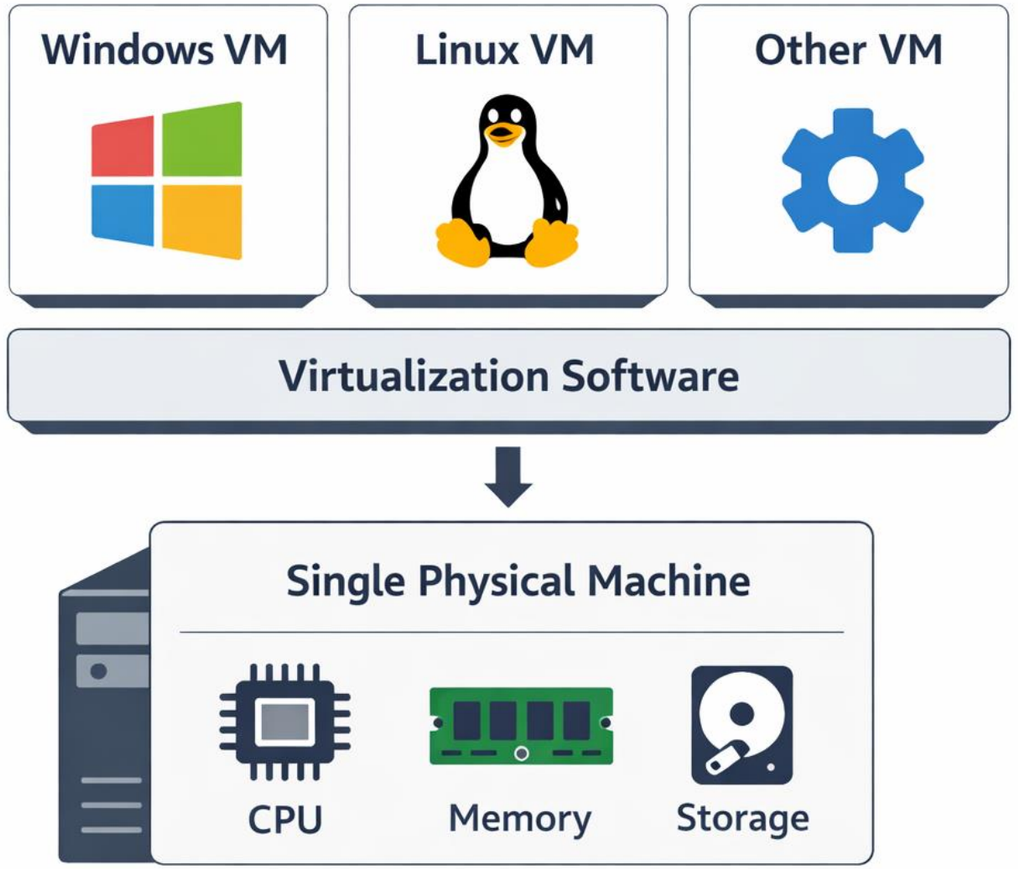
Solution

Run multiple OS instances on same hardware efficiently

Virtualization Architecture

Framework and techniques used to create and manage virtual instances of computer resources, enabling multiple virtualized instances to operate on a single physical machine.



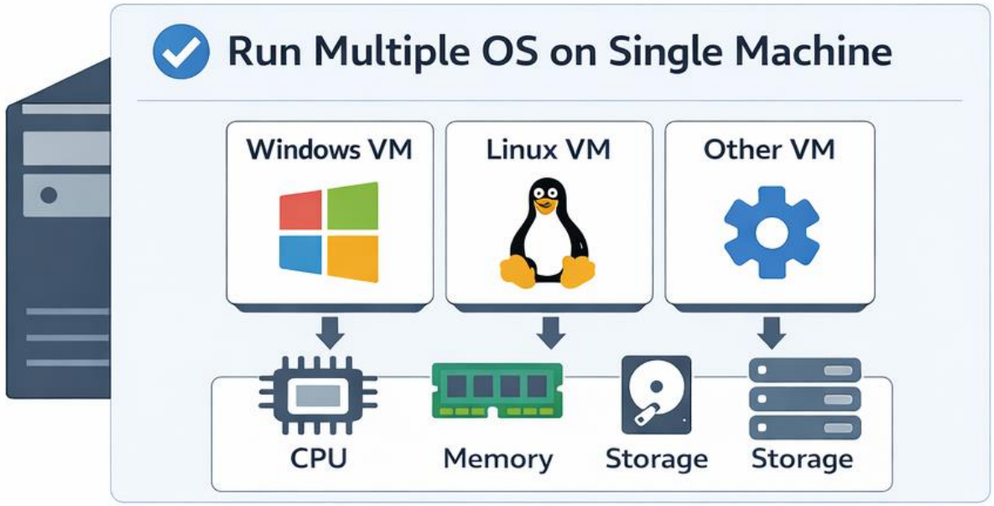


User Needs

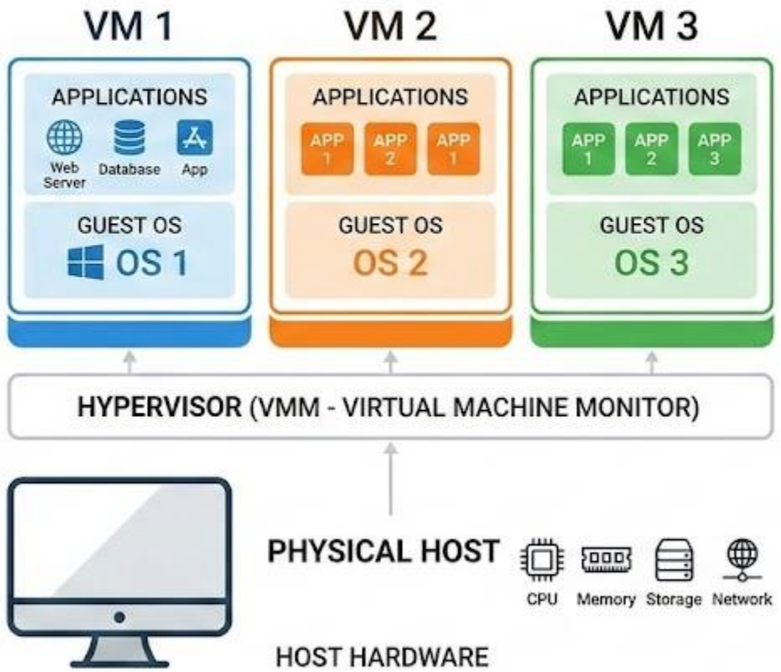
- Run multiple operating systems
- Reduce hardware cost
- Improve system utilization
- Ensure security and isolation between systems

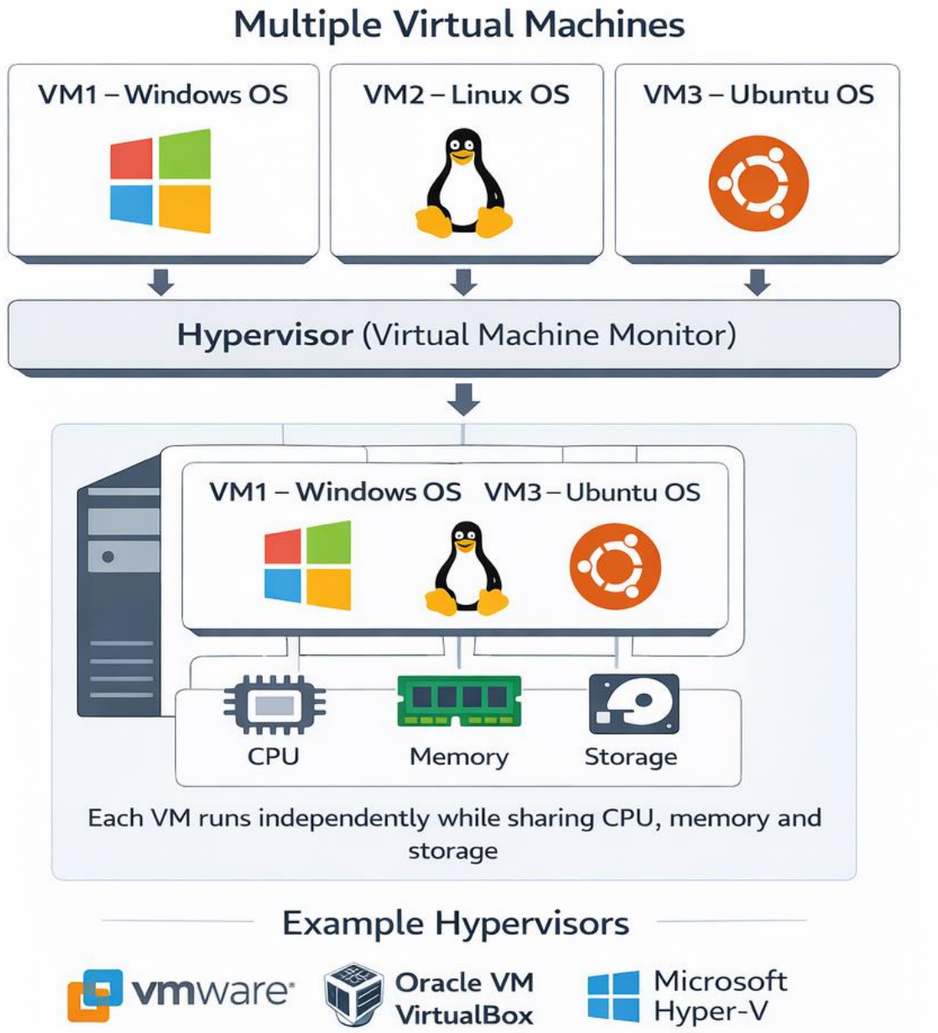
Defined Problem

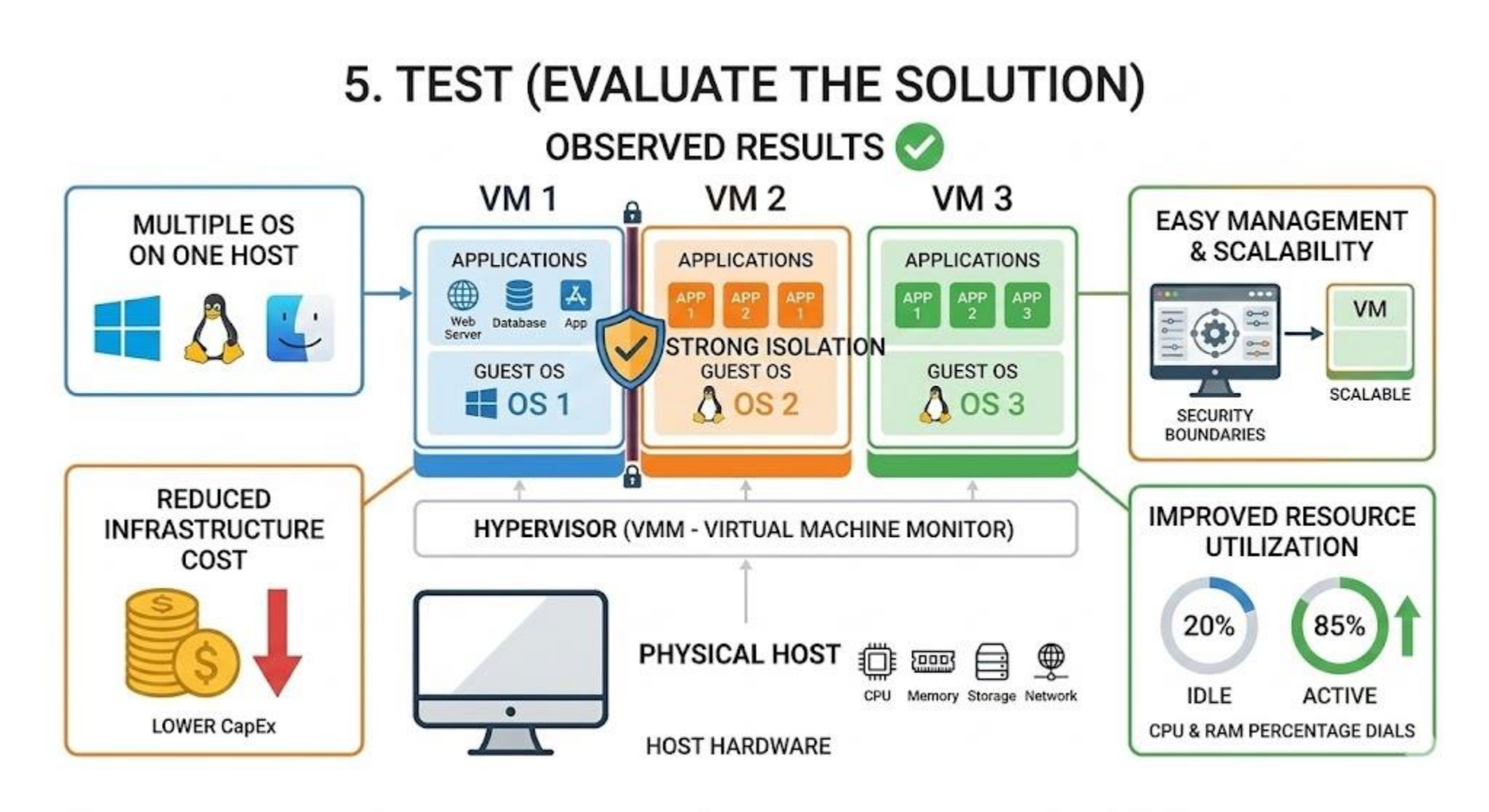
- High infrastructure cost
- Underutilized hardware resources
- Increased maintenance effort



Hypervisor-based System Virtualization







System Virtualization in Operating Systems

Definition

- Run multiple OS on one physical machine

Key Concept

- One physical system
- ➡ Multiple virtual systems

Components

- Virtual CPU
- Virtual Memory
- Virtual Storage
- Virtual Network

Why Needed

Problems

- Underutilized hardware
- High infrastructure cost
- Difficult testing for multiple OS

Solution

👉 Run multiple OS instances on the same hardware efficiently.