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 1:Types of Virtualization

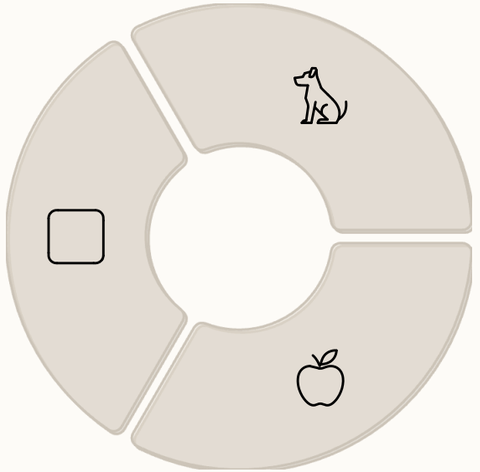
Types of Virtualizations

What is Virtualization?

Virtualization is the process of running multiple virtual machines or environments on a single physical machine by sharing its hardware resources.

Windows OS

Run Windows applications and environments

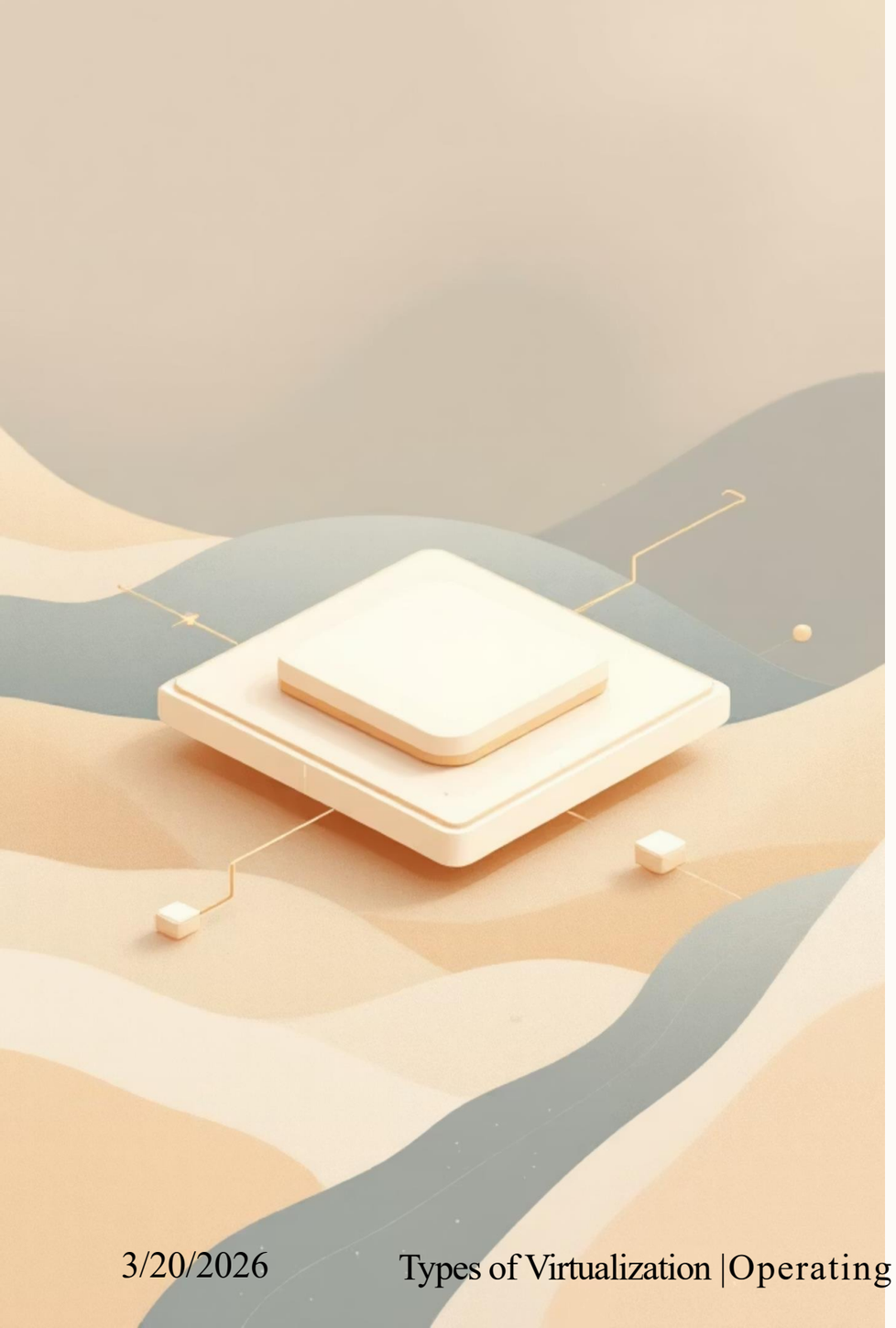


Linux OS

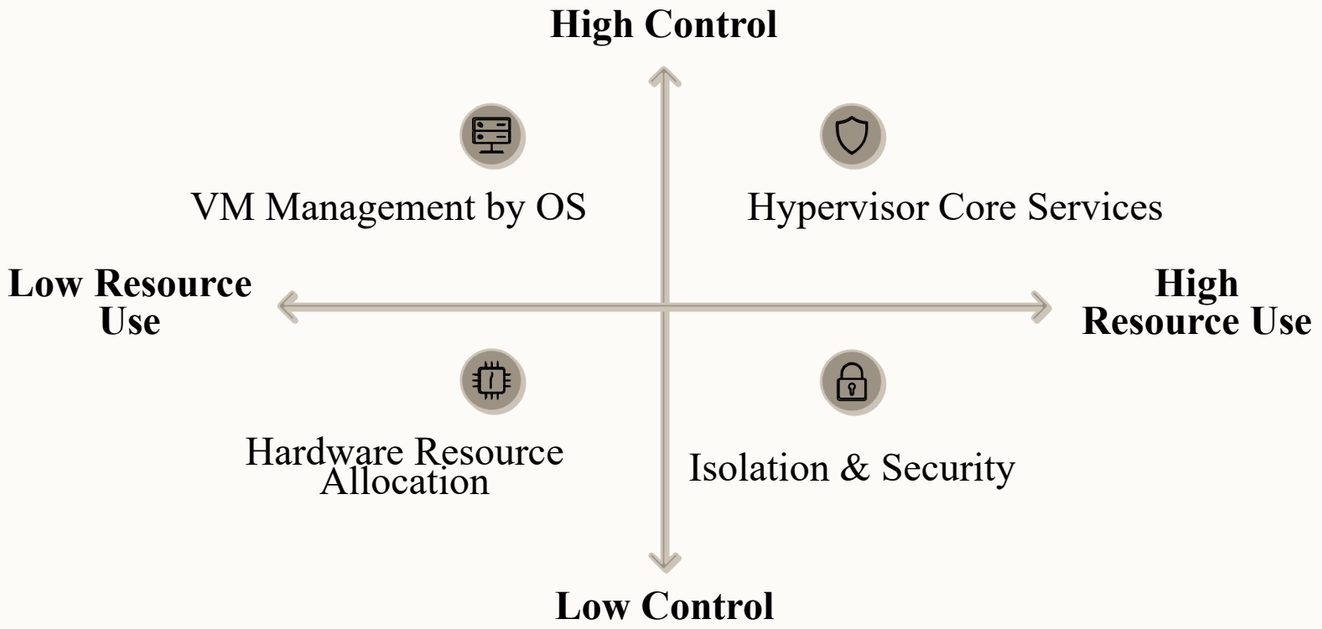
Execute Linux distributions simultaneously

macOS

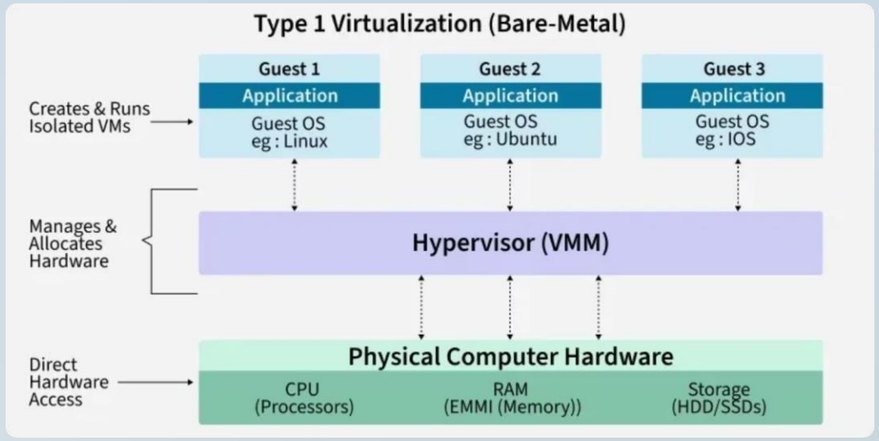
Access macOS features on non-Apple hardware



Virtualization in Operating Systems



The Core Architecture



At the heart of virtualization is a piece of software called the Hypervisor.

Physical Hardware (Host)

The actual server with CPU, RAM, and Disk

Hypervisor

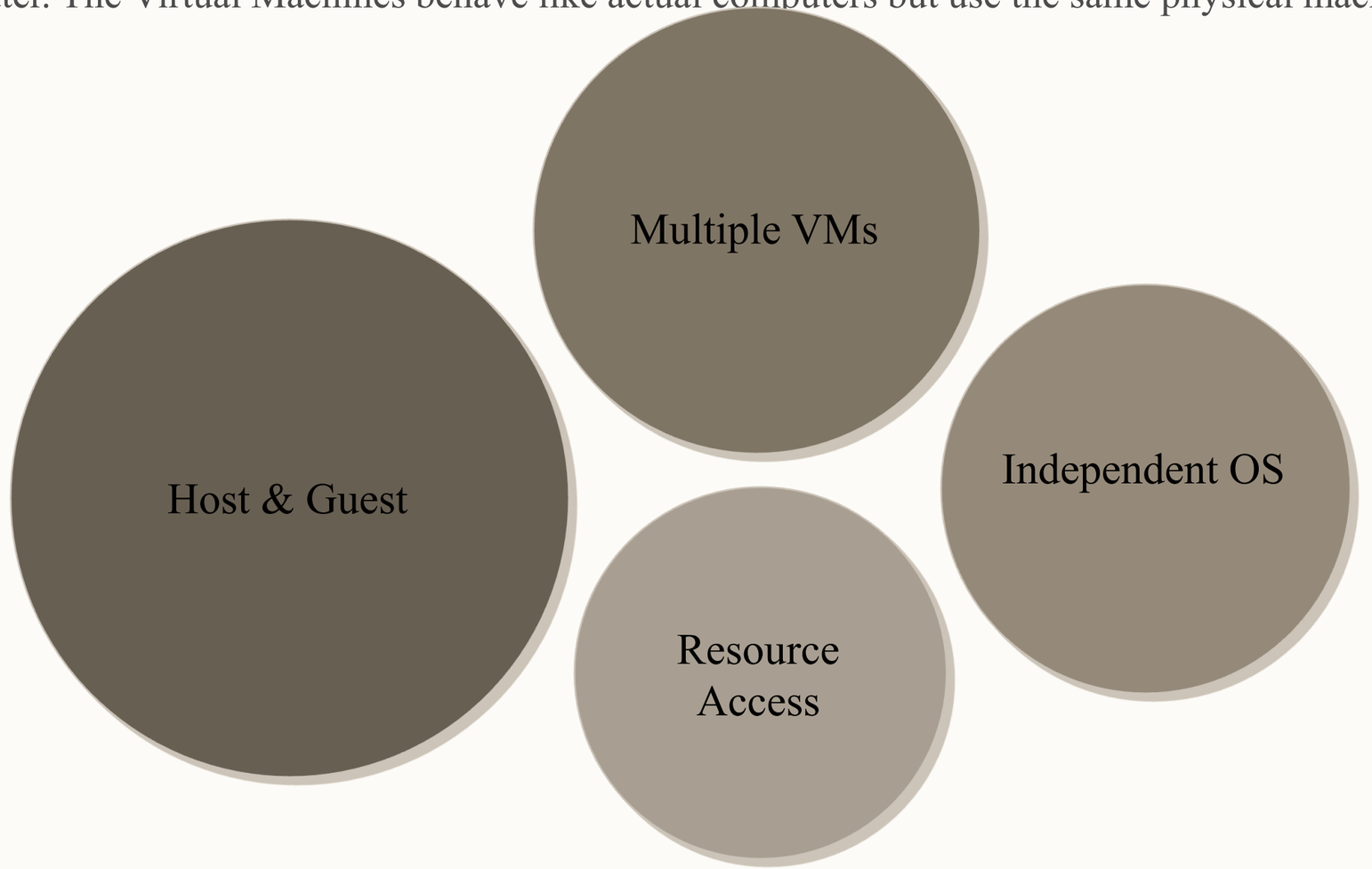
Lightweight software layer that allocates resources and manages VMs

Virtual Machine (Guest)

Software-based computer with its own OS, libraries, and applications

How Virtualization Works

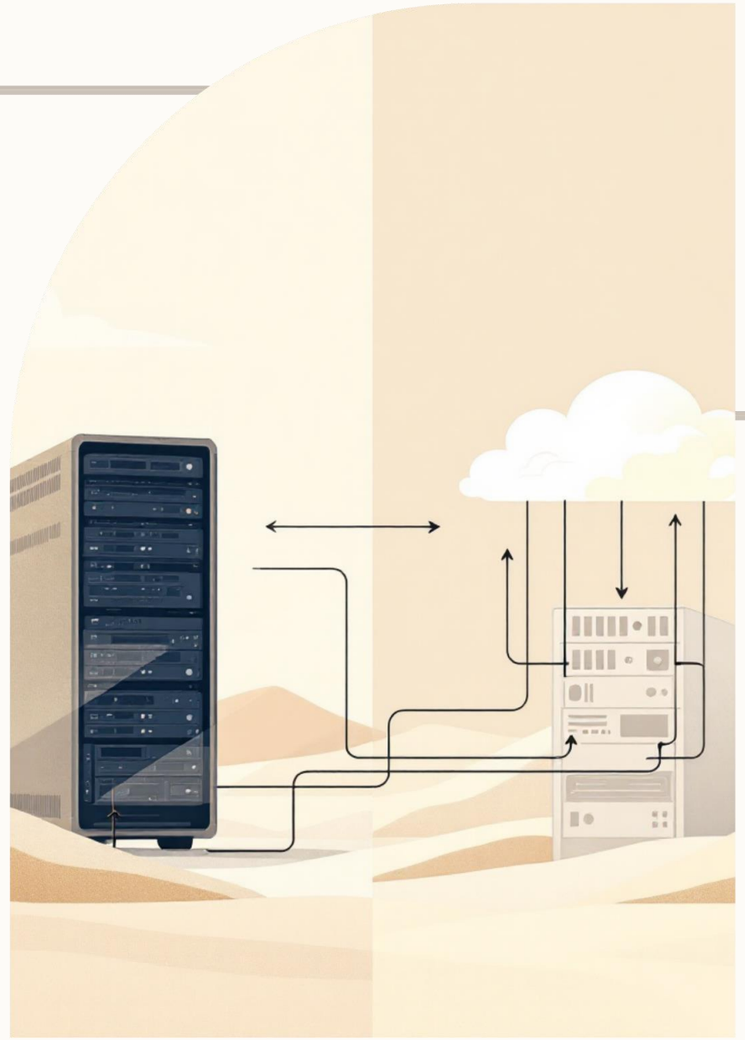
Virtualization uses special software known as hypervisor to create many virtual computers (cloud instances) on one physical computer. The Virtual Machines behave like actual computers but use the same physical machine.



Why Virtualization is Essential

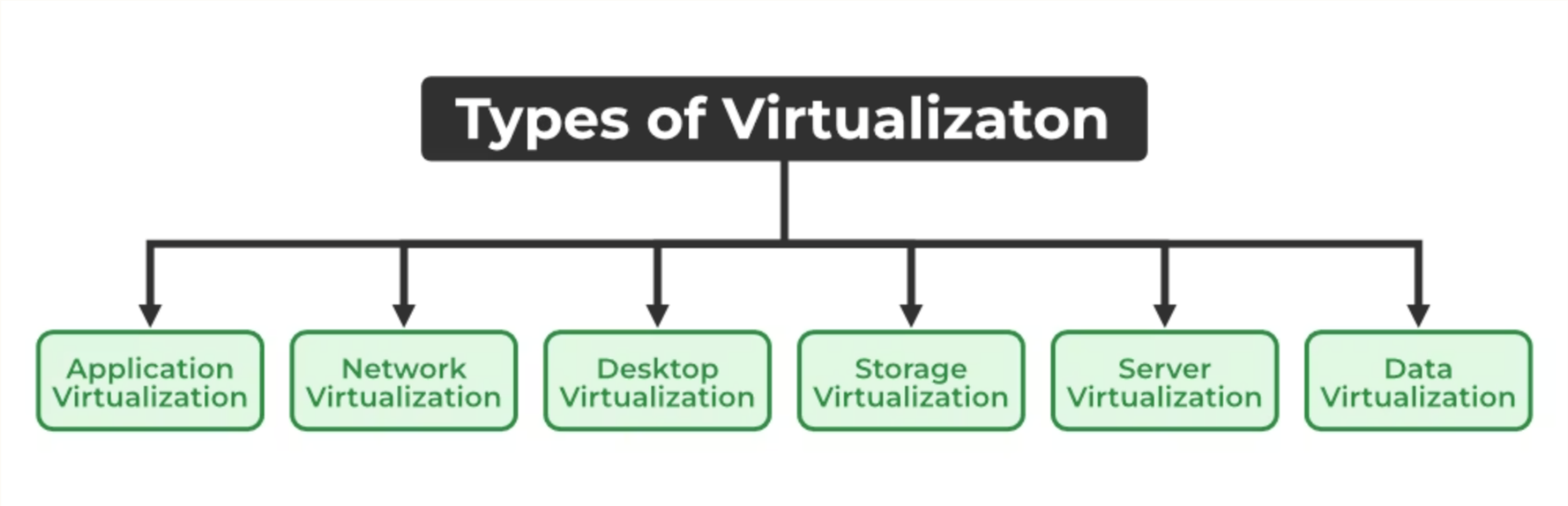
Problems

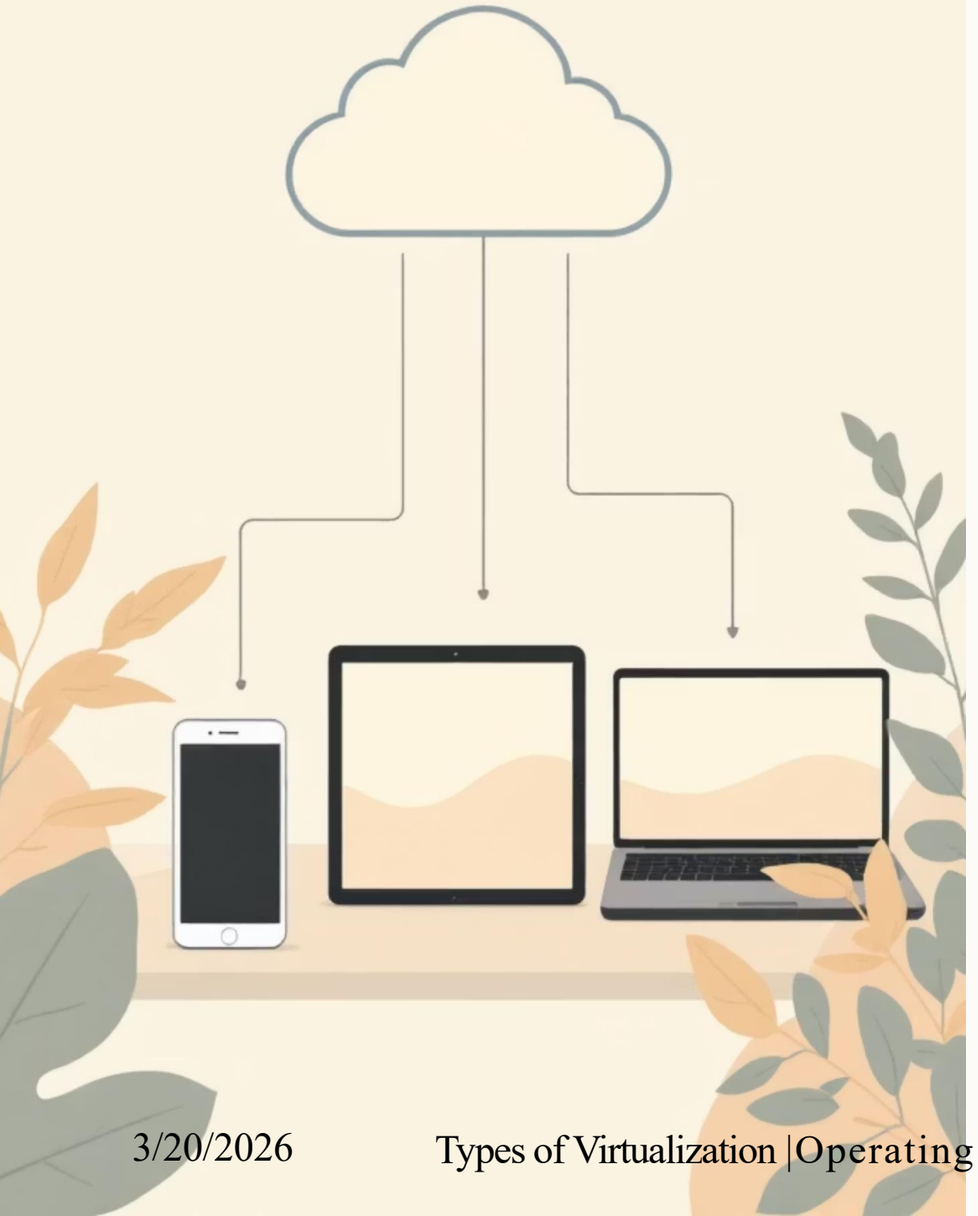
Low utilization, high cost, hard maintenance, poor scalability.



Benefits

Better utilization, lower cost, improved security, easy recovery, cloud support.





Application Virtualization







Application Virtualization

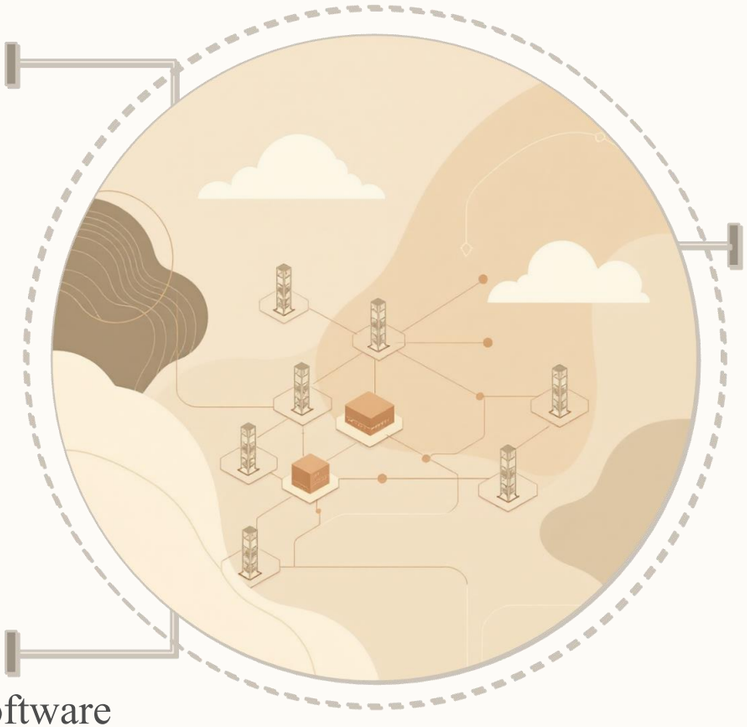
Apps run centrally and stream to users remotely.

Network Virtualization

Physical

Network

Remains unchanged



Virtual

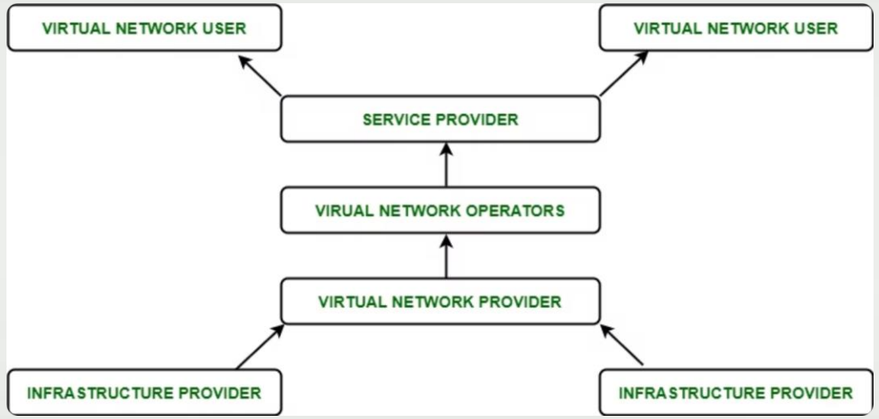
Networks

Created logically

Software

Control

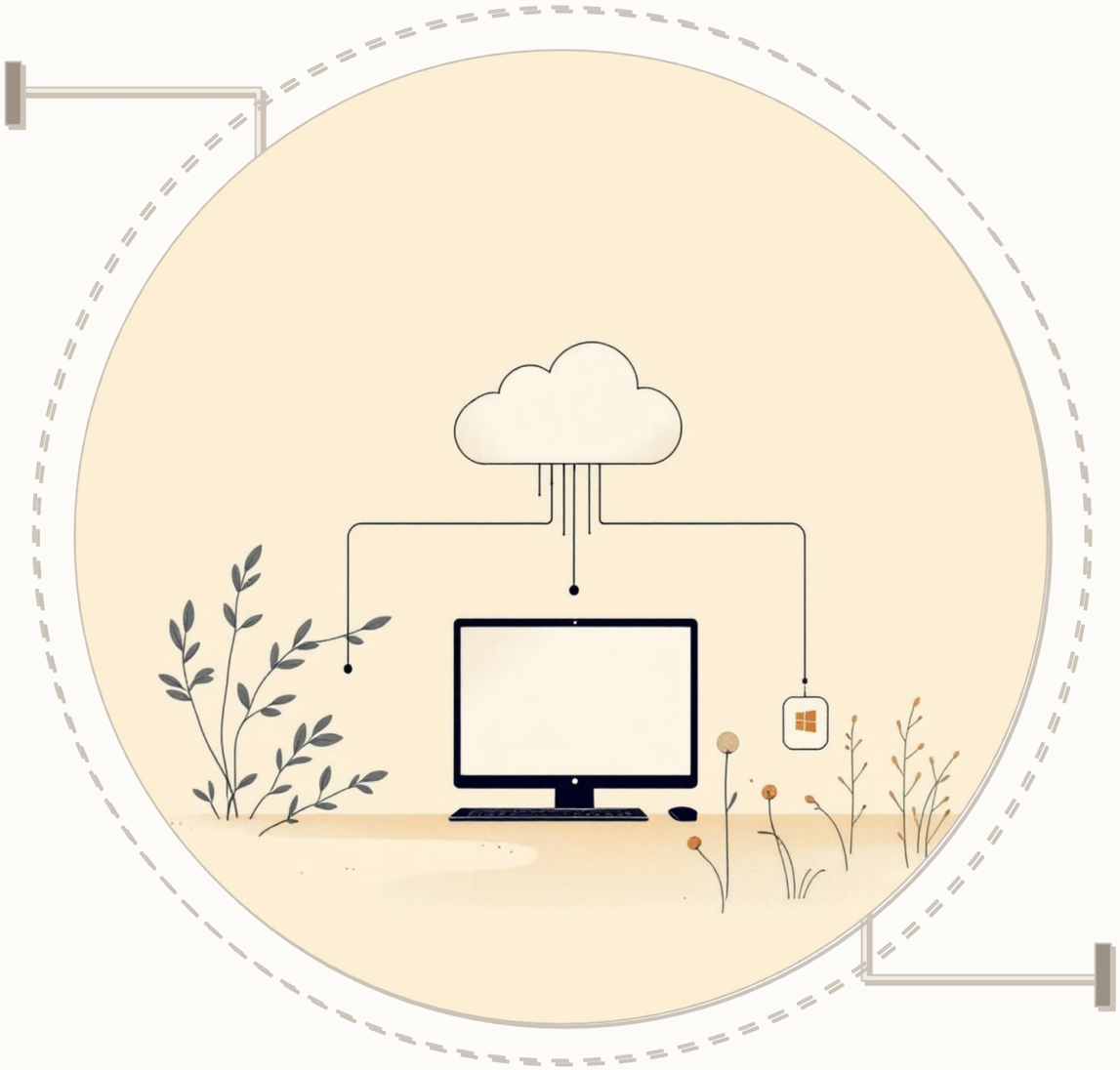
Managed by software



Desktop Virtualization

Local Client

Low-power device (Chromebook or thin client)



Virtual Desktop

Full Windows 11 session hosted on a server

Types of Virtualization in Education

A Design Thinking Approach to Infrastructure Modernization

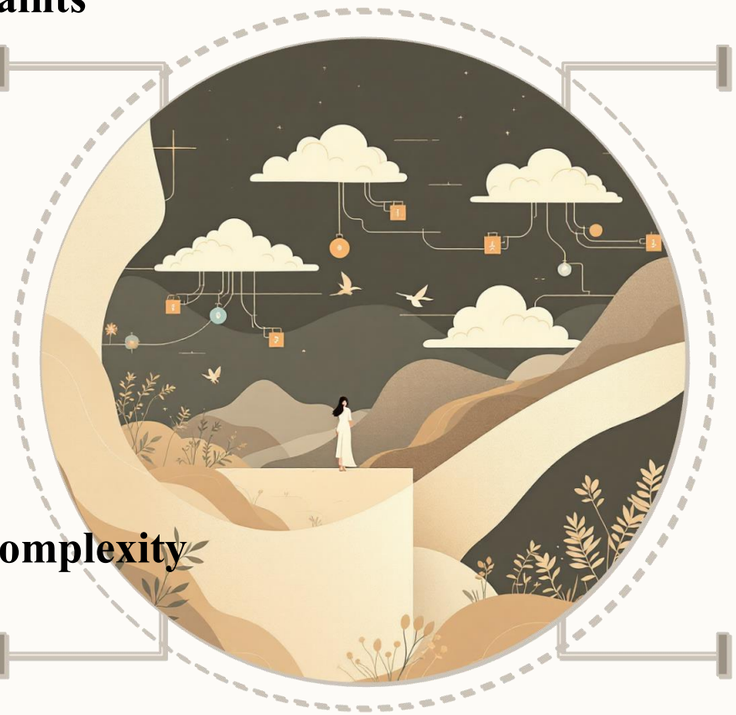
The Challenge Facing Educational Institutions

Infrastructure Constraints

Limited servers and aging hardware

Device Diversity

Varied student and staff devices



Management Complexity

Software and network bottlenecks

Data Fragmentation

Information scattered across systems

Empathize: Understanding Stakeholder Needs

Students

Access apps and desktops from anywhere

Faculty

Reliable, high-performance systems for teaching

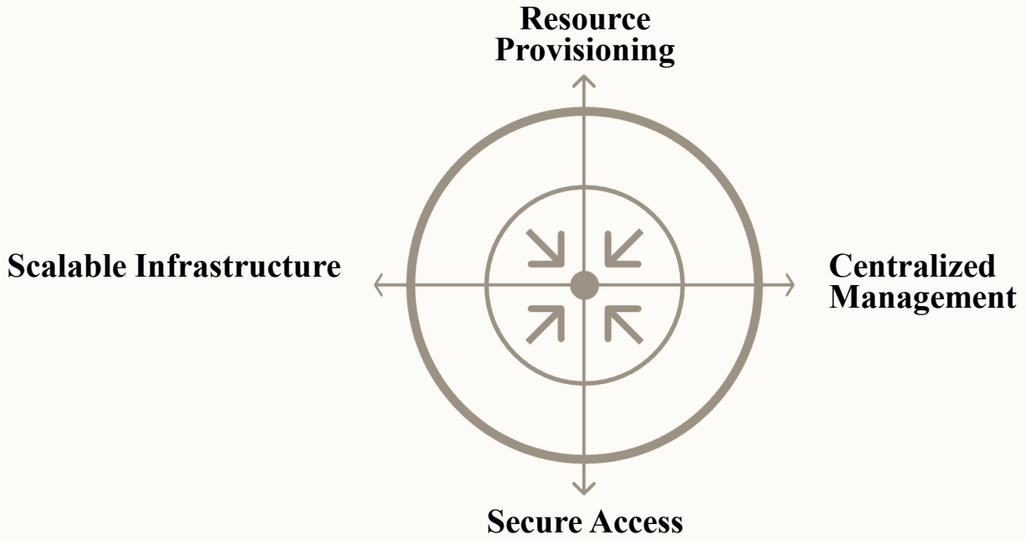
IT Administrators

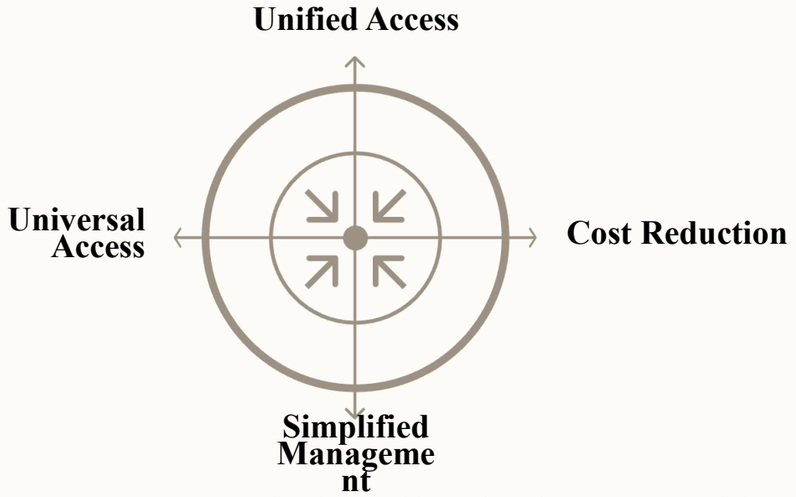
Simplify server, deployment, and access management

Institutional Management

Reduce costs and improve resource ROI

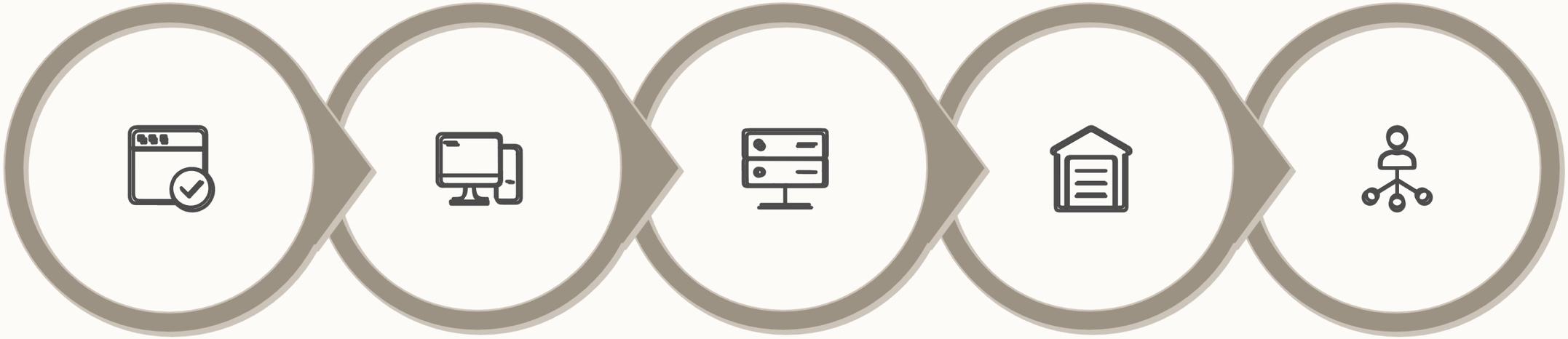
Define: Core Requirements





Ideate: Virtualization Solution Components

Five complementary virtualization technologies work together to create a complete infrastructure solution.



Application Virtualization

Desktop Virtualization

Server Virtualization

Storage Virtualization

Network Virtualization

Prototype: Implementation Strategy

Building the virtualization infrastructure requires strategic deployment of hardware, software layers, and management systems.

Deploy Physical Infrastructure

Install Hypervisor Layer

Host Virtual Resources

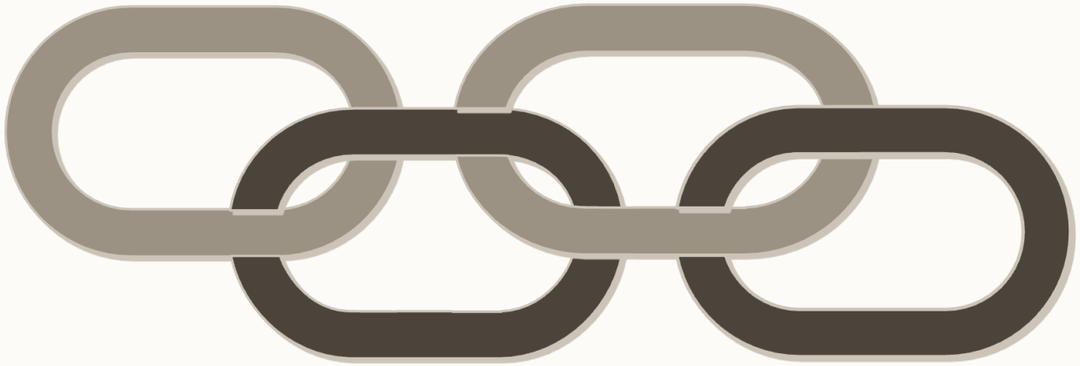
Create Storage System

Implement SDN

Test: Validation and Evaluation

Requirements Validation

Performance Verification



Compatibility Testing

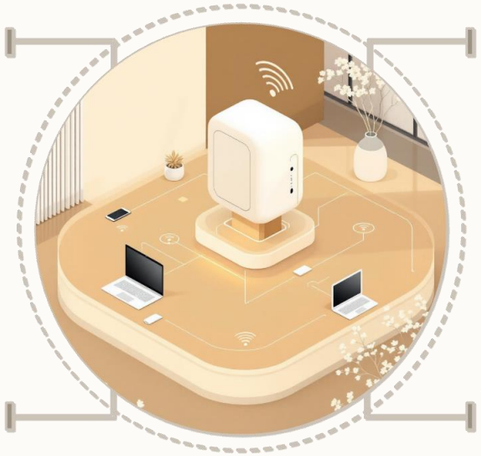
Benefit Validation

Accessibility

Test access from laptops, tablets, thin clients

Performance

Assess speed, resource use, and response times



Cost Analysis

Measure hardware, maintenance, and operations savings

Security

Validate isolation, data protection, and compliance

Practice Puzzle

Classroom / Exam Exercise