VIRTUALIZATION

By

Jitendra Singh Tomar || Jeetu

AGENDA

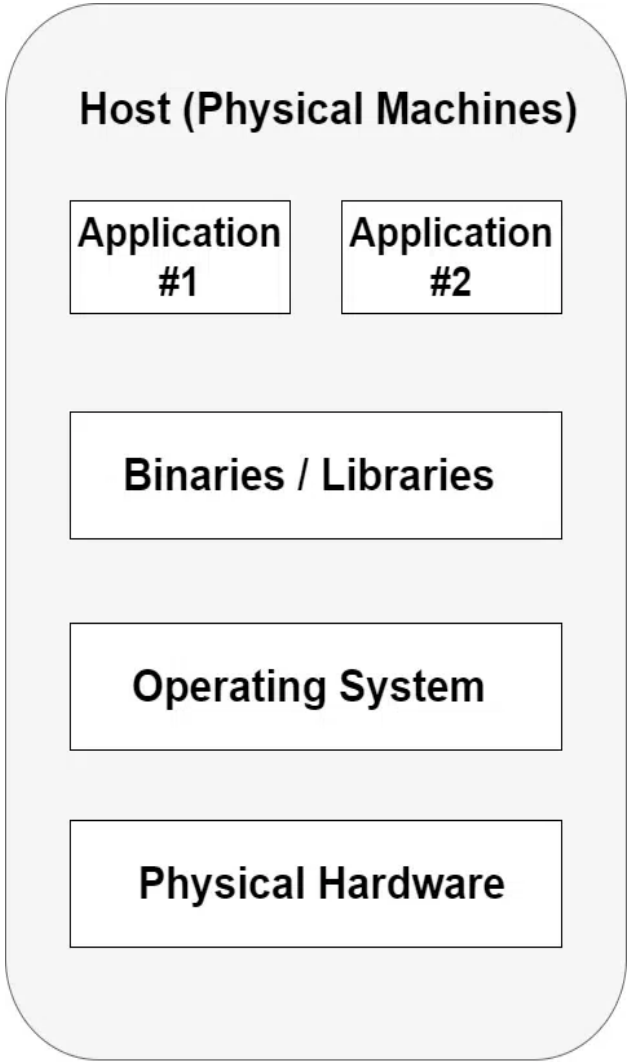
- Overview of Virtualization
- Evolution of Virtualization and VMware history
- Types of Virtualization
- Advantages and Disadvantages of Virtualization
- Hyperthreading and Memory virtualization overview
- VMware products overview

OVERVIEW

- Virtualization is technology that you can use to create virtual representations of servers, storage, networks, and other physical machines.
- Virtualization refers to the process of creating virtual computers on top of a single physical computer.
- These virtual computers are known as virtual machines. Virtual machines use the hardware of the physical computer, but they do have their own operating systems.
- Each virtual machine functions as an independent computer.
- Virtualization allows the organizations to utilize the hardware of a single computer to create multiple virtual computers and therefore increase productivity.

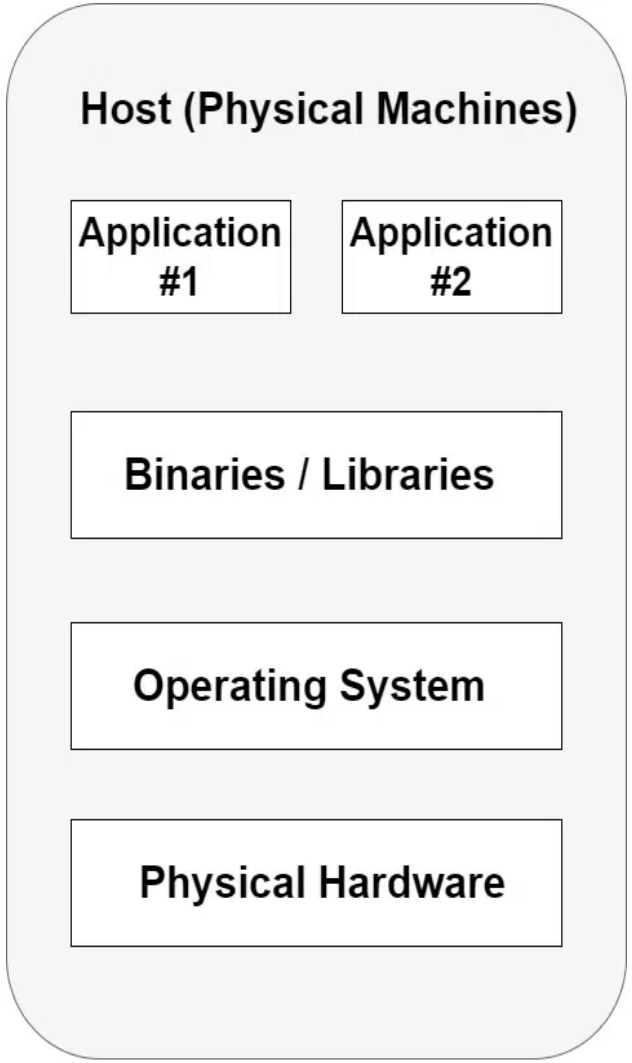
EVOLUTION OF VIRTUALIZATION

Bare metal computing

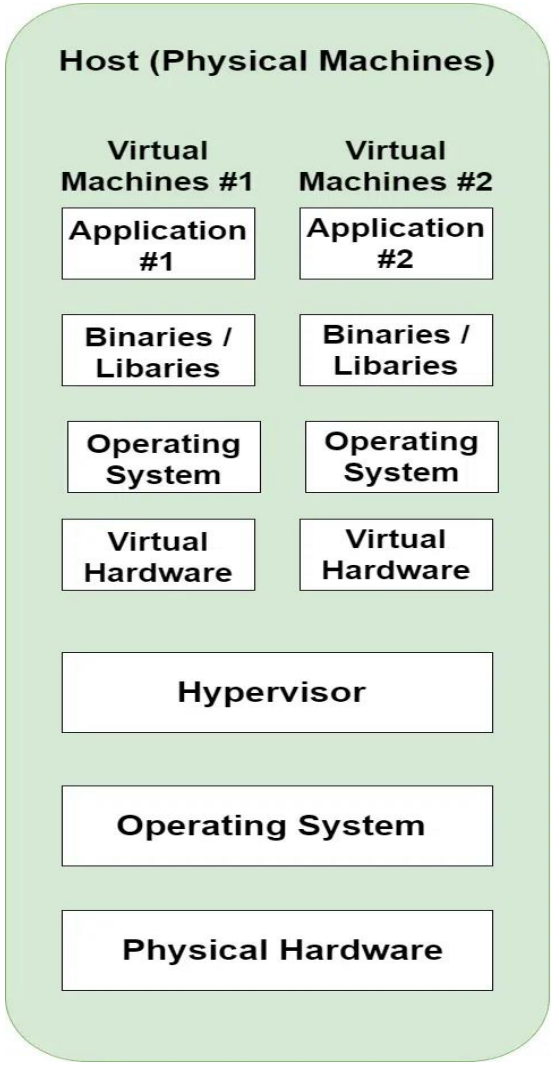


EVOLUTION OF VIRTUALIZATION

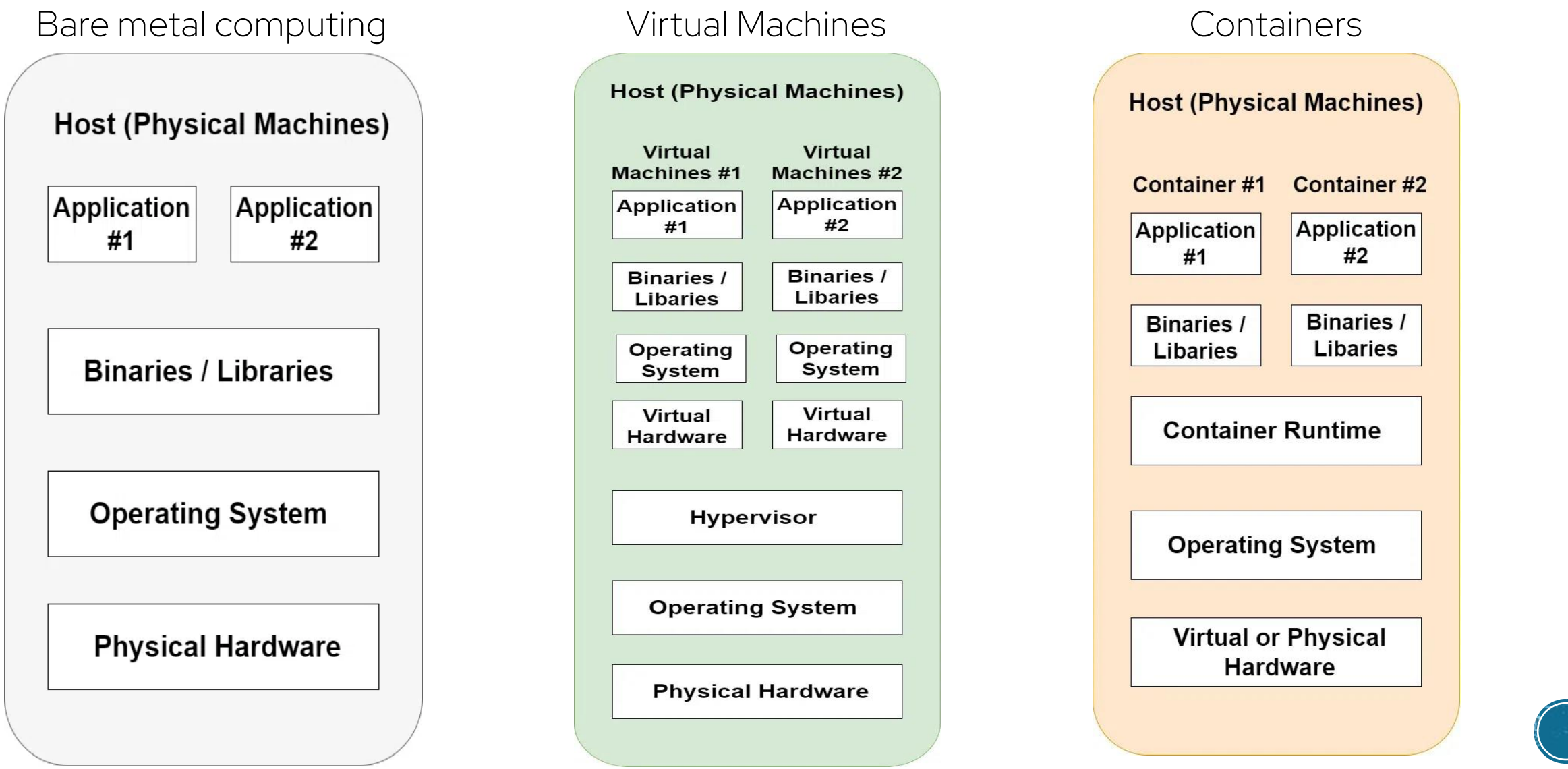
Bare metal computing



Virtual Machines



EVOLUTION OF VIRTUALIZATION



EVOLUTION OF VIRTUALIZATION

	Bare Metal	Virtual Machine	Container
Dependency Management	Poor	Good	Good
Utilization	Poor	Fine	Good
Isolation	Good	Good	Fine
Start up Speed	Poor	Fine	Good
Dev/Prod Parity	Poor	Fine	Good
Control	Good	Fine	Fine
Operational Overhead	Poor	Fine	Good

TYPES OF VIRTUALIZATION

APPLICATION VIRTUALIZATION

- Application virtualization is a technology that allows applications to run in an isolated environment on a host system.
- This isolation provides several benefits, such as compatibility across different platforms, easier deployment, and enhanced security.
- The application is separated from the underlying operating system and other applications.
- The application and its dependencies (like specific versions of libraries) are packaged together into a single executable or container.
- This allows the application to run without needing to install those dependencies on the host system.

TYPES OF APPLICATION VIRTUALIZATION

- Remote Application Virtualization
  - ✓ The application runs on a remote server, and only the user interface is delivered to the client device.
  - ✓ Citrix Virtual Apps, Microsoft RemoteApp.
- Streaming Application Virtualization
  - ✓ The application is streamed to the client device on demand.
  - ✓ Only the parts of the application that are needed are delivered initially, with other components streamed as needed.
- Local Application Virtualization
  - ✓ The application is fully encapsulated and runs locally on the client device but within a virtualized environment.
  - ✓ This method is typically used for *legacy applications* or those requiring specific environments.

NETWORK VIRTUALIZATION

- It is a method of combining hardware and software network resources and functionalities into a single, software-based administrative entity, which allows for the efficient management and deployment of network resources.
- It abstracts physical network components like switches, routers, and firewalls into virtual counterparts, enabling more flexible, scalable, and dynamic network configurations.
- Types of Network Virtualization
  - External Network Virtualization
  - Internal Network Virtualization

KEY COMPONENTS OF NETWORK VIRTUALIZATION

- Key Components:
  - Virtual Switches (vSwitches)
  - Virtual Routers
  - Virtual Firewalls
  - Software-Defined Networking (SDN)
  - Network Functions Virtualization (NFV)
- Popular Network Virtualization Solutions
  - VMware NSX
  - Cisco ACI (Application Centric Infrastructure)
  - OpenStack Neutron
  - Microsoft Hyper-V Network Virtualization

DESKTOP VIRTUALIZATION

- Desktop virtualization is a technology that separates the desktop environment and its applications from the physical client device that is used to access it.
- This allows users to run their desktop from a central server, making it accessible from virtually any device.
- Desktop virtualization provides numerous benefits in terms of flexibility, security, and manageability.
- Desktop virtualization is a powerful technology for organizations seeking to provide secure, flexible, and manageable desktop environments for their users, particularly in remote work, education, and BYOD scenarios.

DESKTOP VIRTUALIZATION

- Types:
  - Virtual Desktop Infrastructure (VDI)
  - Remote Desktop Services (RDS)
  - Desktop as a Service (DaaS)
  - Local Desktop Virtualization
- Popular Desktop Virtualization Solutions:
  - VMWare Horizon
  - Citrix Virtual Desktop
  - Microsoft Azure Virtual Desktop
  - Amazon Workspaces

STORAGE VIRTUALIZATION

- Storage virtualization is a technology that abstracts physical storage resources from multiple storage devices and consolidates them into a single, centralized, and manageable virtual storage pool.
- This virtualization layer allows administrators to manage storage as a unified resource, irrespective of the underlying hardware, improving flexibility, efficiency, and scalability in storage management.
- Storage virtualization allows:
  - Improved utilization
  - Simplified management
  - Scalability & flexibility
  - Cost efficiency

TYPES OF STORAGE VIRTUALIZATION

- Block-Level Storage Virtualization
  - Virtualizes storage at the block level, which means it abstracts the physical storage blocks from multiple storage devices (like SANs) and presents them as a unified storage pool.
  - This type is commonly used in storage area networks (SANs) to improve storage utilization and simplify management.
    - Examples include IBM SAN Volume Controller (SVC) and EMC VPLEX.
- File-Level Storage Virtualization:
  - Virtualizes storage at the file level, allowing files to be abstracted from the physical storage devices.
  - This type is used in network-attached storage (NAS) environments and can provide features like global namespace and transparent file migration across storage systems.
    - Examples include Microsoft DFS (Distributed File System) and NetApp's ONTAP.

TYPES OF STORAGE VIRTUALIZATION

- Object-Level Storage Virtualization:
  - Abstracts storage into objects, which include data and metadata, and stores them in a flat address space.
  - It's commonly used in cloud storage solutions, providing scalability and efficient management of large amounts of unstructured data.
    - Examples include Amazon S3 and OpenStack Swift.
- Popular Storage Virtualization Solutions
  - VMware vSAN
  - IBM SAN Volume Controller (SVC)
  - EMC VPLEX
  - NetApp ONTAP
  - Hitachi Virtual Storage Platform (VSP)

SERVER VIRTUALIZATION

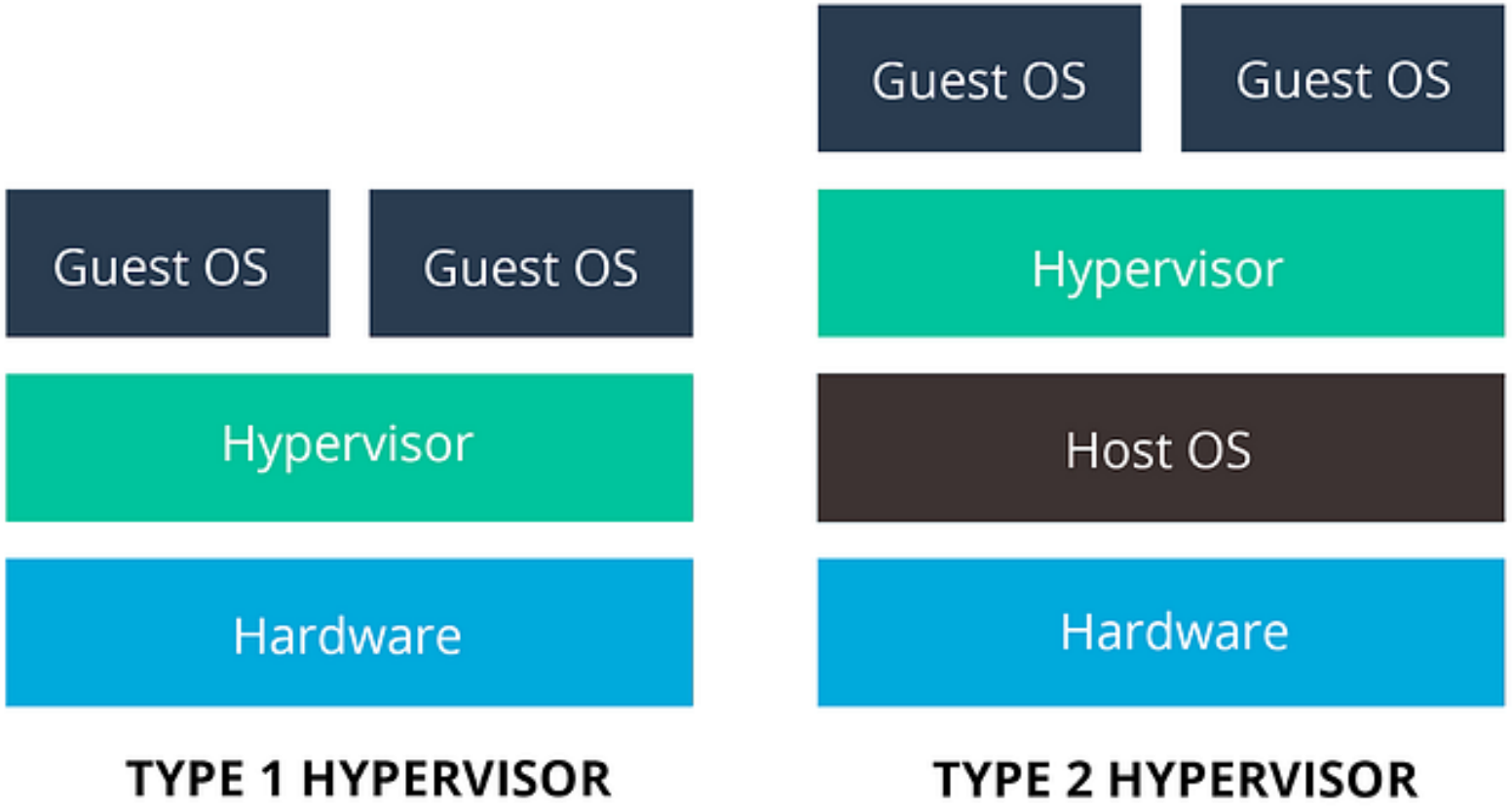
- Server virtualization is a technology that allows multiple virtual servers to run on a single physical server.
- Server virtualization provides significant benefits in terms of resource optimization, cost savings, and flexibility.
- Future Trends
  - Hybrid Cloud Integration
  - Hyper-Converged Infrastructure (HCI)
  - Automation and Orchestration

TYPES OF SERVER VIRTUALIZATION

- Full Virtualization
  - The most common form, where the hypervisor provides a complete virtual environment that emulates the underlying hardware.
- Para-Virtualization
  - The guest OS is aware that it is running in a virtualized environment and communicates directly with the hypervisor for certain operations.
- OS-Level Virtualization (Containerization)
  - Containers share the same OS kernel but are isolated from each other, making them lightweight and highly efficient.

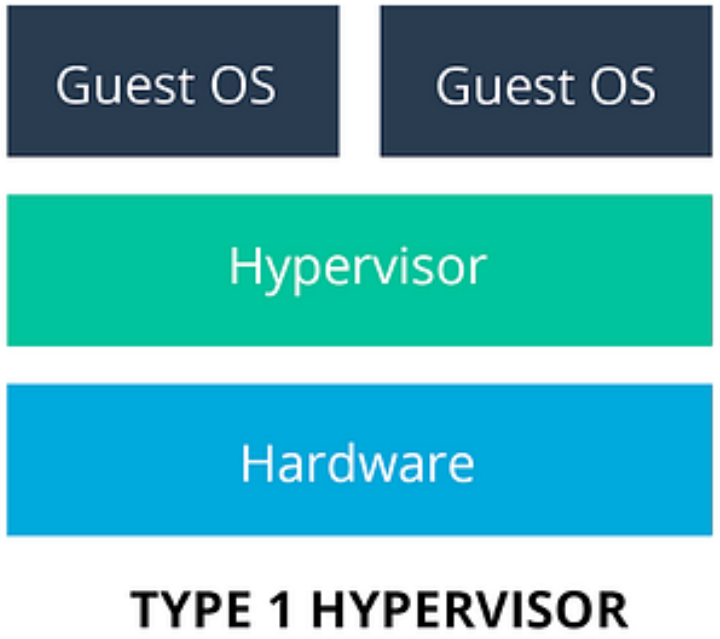
COMPONENTS OF SERVER VIRTUALIZATION

- Hypervisor
  - Type 1 (Bare-Metal Hypervisor)
  - Type 2 (Hosted Hypervisor)
- Virtual Machines (VMs)
- Management Tools



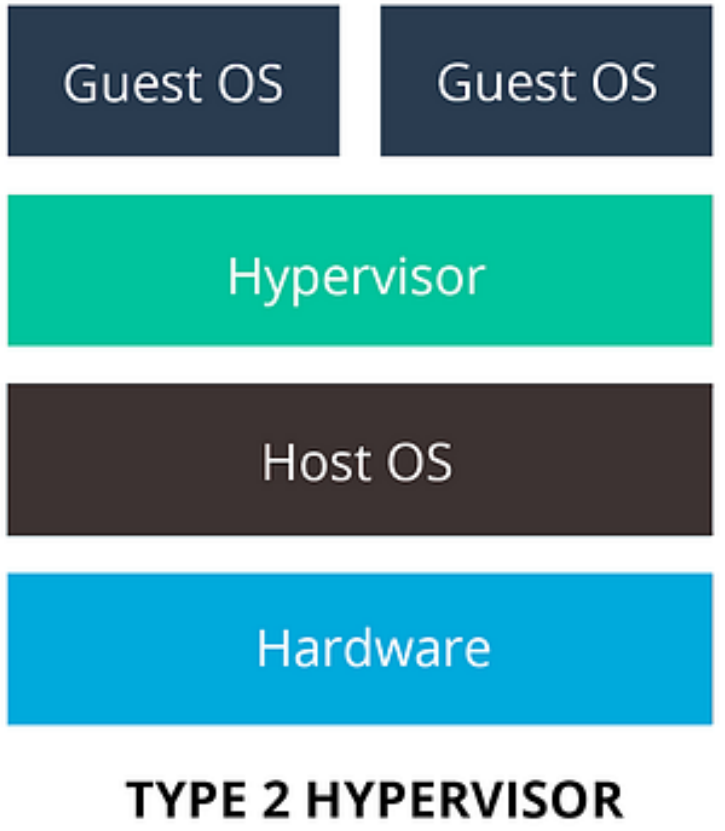
TYPES OF HYPERVISORS

- Type-1
  - Microsoft Hyper-V
  - VMWare ESXi
  - KVM
  - Xen
  - Oracle VM server
  - RedHat Virtualization
  - Citrix Hypervisor
  - OpenVZ
  - LXC (Linux Container)



TYPES OF HYPERVISORS

- Type-2
  - Oracle VirtualBox
  - QEMU (Quick Emulator)
  - KVM
  - Hyper-V Manager
  - Parallel Desktops
  - VMWare Workstation
  - VMWare Fusion
  - Bochs
  - PearPC



TYPE 2 HYPERVISOR

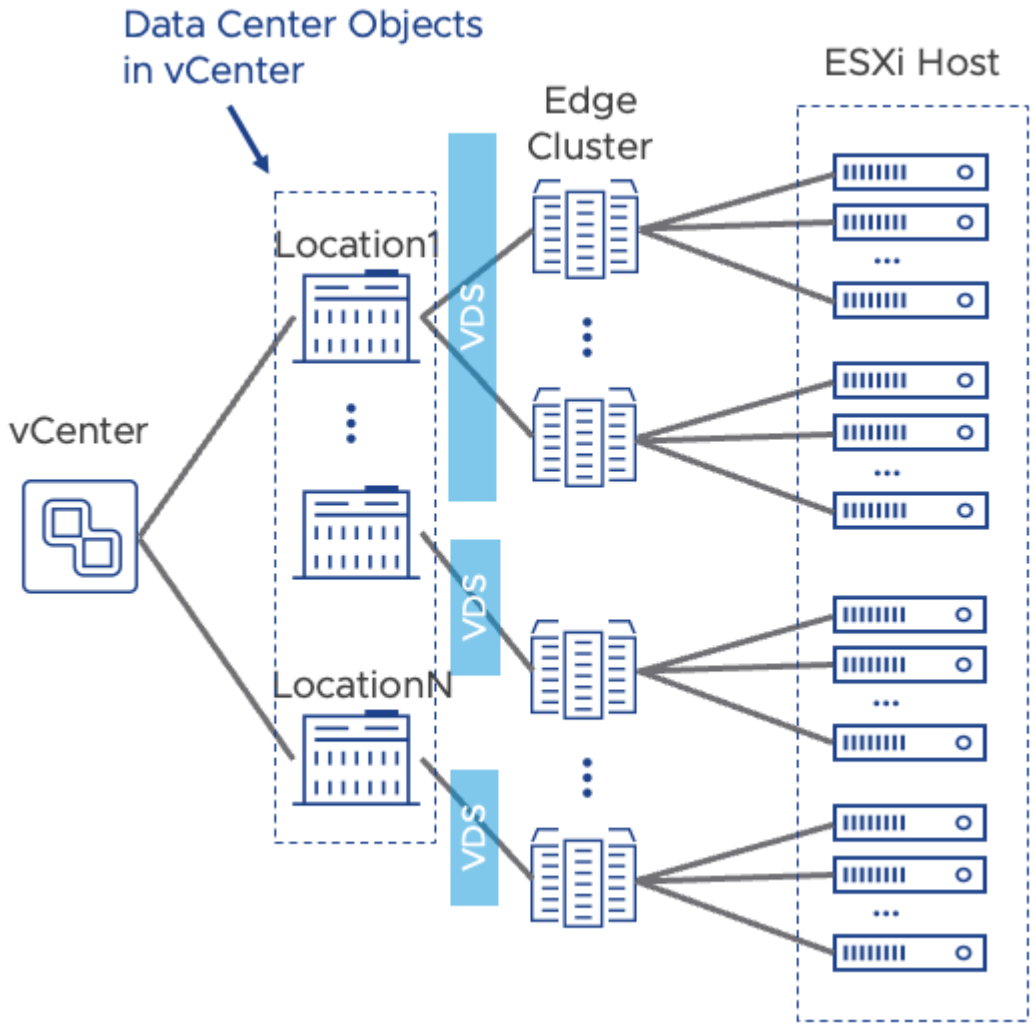
VMWARE PRODUCTS OVERVIEW

- Compute Virtualization
  - *VMware vSphere*: The core hypervisor that enables virtualization of servers.
  - *VMware vCenter*: A centralized management platform for vSphere environments.
  - *VMware vCloud Suite*: A comprehensive suite of products for building and managing private clouds.
- Networking and Security
  - *VMware NSX*: A software-defined networking (SDN) platform for virtualizing network functions.
  - *VMware vRealize Network Insight*: A network visibility and analytics tool.
  - *VMware vShield*: A security platform for protecting virtualized environments.
- Storage
  - *VMware vSAN*: A hyper-converged storage platform.
  - *VMware Virtual Volumes*: A storage abstraction layer that enables independent management of storage.

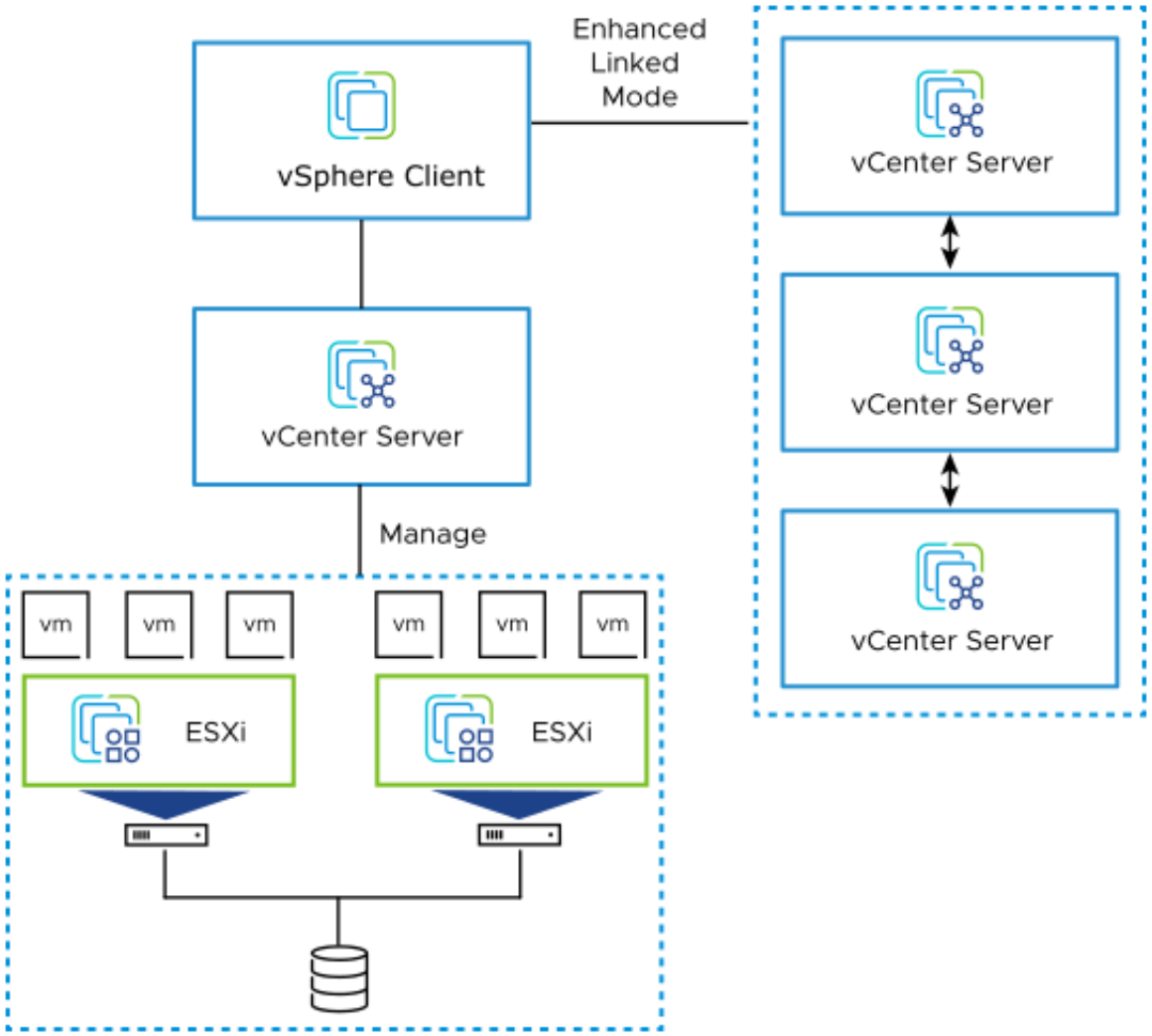
VMWARE PRODUCTS OVERVIEW

- Cloud Management
  - *VMware vRealize Automation*: An automation platform for IT infrastructure.
  - *VMware vRealize Operations*: A cloud management platform for monitoring and optimizing IT resources.
  - *VMware Cloud Foundation*: A pre-integrated platform for building and running hybrid clouds.
- End-User Computing
  - *VMware Horizon*: A desktop virtualization platform.
  - *VMware Workspace ONE*: A unified endpoint management platform.
- Other Products
  - *VMware Tanzu*: A platform for building and running modern applications.
  - *VMware Aria*: A cloud operations platform.
  - *VMware vCloud Director*: A multi-tenant cloud management platform.

VMWARE ARCHITECTURE



VMWARE VSPHERE



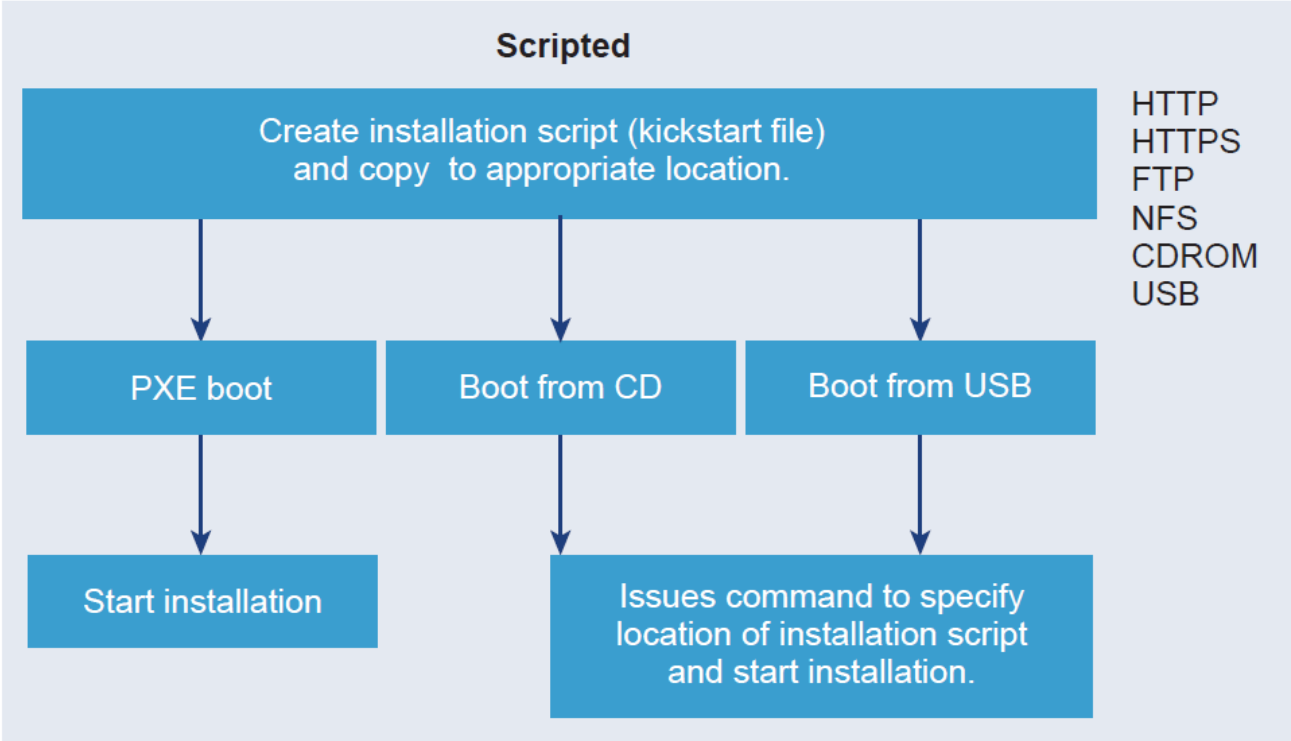
MINIMUM REQUIREMENTS FOR VMWARE ESXI 6.7

- CPU:
  - *Minimum*: 2 cores (4 logical processors)
  - *Recommended*: 4 cores (8 logical processors) or more
- Memory:
  - *Minimum*: 8 GB
  - *Recommended*: 8 GB or more
- Storage:
  - *Minimum*: 20 GB for the ESXi installation
  - *Recommended*: At least 100 GB for the operating system and virtual machines
- Network Interface Card (NIC):
  - *Minimum*: 1 NIC
  - *Recommended*: 2 NICs or more for redundancy and improved performance

MINIMUM REQUIREMENTS FOR VMWARE ESXI 6.7

Additional Considerations:

- Virtual Machines (VMs): The amount of CPU, memory, and storage required will depend on the number and type of VMs you plan to run.
- Workload: The specific workload (e.g., database, web server, virtual desktop) will also affect the hardware requirements.
- High Availability: If you require high availability features like HA and DRS, you may need additional hardware resources.

OPTIONS FOR INSTALLING ESXI

- Interactive ESXi Installation
  - You boot the installer from a CD or DVD, from a bootable USB device, or by PXE booting the installer from a location on the network.
- Scripted ESXi Installation
  - Running a script is an efficient way to deploy multiple ESXi hosts with an unattended installation.