INTRODUCTION TO VIRTUALIZATION

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Virtualization

- **Virtualization** refers to the process of creating a virtual version of physical hardware resources, such as servers, storage devices, networks, or even operating systems. It allows multiple virtual environments or systems to run on a single physical machine, making better use of available resources.
- The core idea of virtualization is abstraction: separating hardware from the software environment so that users can interact with virtualized components independently of the underlying physical hardware.

Types of Virtualization

- Hardware Virtualization
- Operating System Virtualization
- Network Virtualization
- Storage Virtualization
- Desktop Virtualization

Hardware Virtualization

- Involves creating virtual machines (VMs) that simulate physical hardware.
- Commonly used in server environments for resource efficiency.
- Example: VMware, Microsoft Hyper-V, Oracle VirtualBox.

Operating System Virtualization

- Allows multiple operating systems to run on a single physical machine without the need for additional hardware.
- Example: Containers (Docker, LXC).

Network Virtualization

- Abstracts physical networking hardware into logical networks for better management and flexibility.
- Example: Virtual LANs (VLANs), Software-Defined Networking (SDN).

Storage Virtualization

- Pools physical storage from multiple devices into a unified virtual storage environment.
- Example: SAN (Storage Area Network), NAS (Network Attached Storage).

Desktop Virtualization

- Allows users to access a desktop environment remotely from any device.
  - Example: Virtual Desktop Infrastructure (VDI), Citrix.

Benefits of Virtualization

- Resource Optimization
- Cost Savings
- Scalability and Flexibility
- Isolation and Security
- Disaster Recovery

Common Virtualization Tools

- **VMware**: A widely used platform for hardware virtualization.
- **VirtualBox**: An open-source virtual machine software for desktop virtualization.
- **Docker**: A leading containerization platform for OS-level virtualization.
- **Microsoft Hyper-V**: A hypervisor used for running VMs on Windows systems.
- **KVM**: A Linux-based virtualization solution.