Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
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Cloud Computing

Assignment 1: Use case of cloud

What is Virtualization?

Virtualization is technology that you can use to create virtual representations of servers, storage, networks, and other physical machines. Virtual software mimics the functions of physical hardware to run multiple virtual machines simultaneously on a single physical machine. Businesses use virtualization to use their hardware resources efficiently and get greater returns from their investment. It also powers cloud computing services that help organizations manage infrastructure more efficiently.

How does virtualization work?

Virtualization uses specialized software, called a hypervisor, to create several cloud instances or virtual machines on one physical computer.

Cloud instances or virtual machines

After you install virtualization software on your computer, you can create one or more virtual machines. You can access the virtual machines in the same way that you access other applications on your computer. Your computer is called the host, and the virtual machine is called the guest. Several guests can run on the host. Each guest has its own operating system, which can be the same or different from the host operating system.

From the user's perspective, the virtual machine operates like a typical server. It has settings, configurations, and installed applications. Computing resources, such as central processing units (CPUs), Random Access Memory (RAM), and storage appear the same as on a physical server. You can also configure and update the guest operating systems and their applications as necessary without affecting the host operating system.

What are the different types of virtualization?

You can use virtualization technology to get the functions of many different types of physical infrastructure and all the benefits of a virtualized environment. You can go beyond virtual machines to create a collection of virtual resources in your virtual environment.

Server virtualization

Server virtualization is a process that partitions a physical server into multiple virtual servers. It is an efficient and cost-effective way to use server resources and deploy IT services in an organization. Without server virtualization, physical servers use only a small amount of their processing capacities, which leave devices idle.

Storage virtualization

Storage virtualization combines the functions of physical storage devices such as network attached storage (NAS) and storage area network (SAN). You can pool the storage hardware in your data center, even if it is from different vendors or of different types. Storage virtualization uses all your physical data storage and creates a large unit of virtual storage that you can assign and control by using management software. IT administrators can streamline storage activities, such as archiving, backup, and recovery, because they can combine multiple network storage devices virtually into a single storage device.

Network virtualization

Any computer network has hardware elements such as switches, routers, and firewalls. An organization with offices in multiple geographic locations can have several different network technologies working together to create its enterprise network. Network virtualization is a process that combines all of these network resources to centralize administrative tasks. Administrators can adjust and control these elements virtually without touching the physical components, which greatly simplifies network management.

What are the benefits of virtualization?

Virtualization provides several benefits to any organization:

Efficient resource use

Virtualization improves hardware resources used in your data center. For example, instead of running one server on one computer system, you can create a virtual server pool on the same computer system by using and returning servers to the pool as required. Having fewer underlying physical servers frees up space in your data center and saves money on electricity, generators, and cooling appliances.

Automated IT management

Now that physical computers are virtual, you can manage them by using software tools. Administrators create deployment and configuration programs to define virtual machine templates. You can duplicate your infrastructure repeatedly and consistently and avoid error-prone manual configurations.

Faster disaster recovery

When events such as natural disasters or cyberattacks negatively affect business operations, regaining access to IT infrastructure and replacing or fixing a physical server can take hours or even days. By contrast, the process takes minutes with virtualized environments. This prompt response significantly improves resiliency and facilitates business continuity so that operations can continue as scheduled.

Challenges faced by virtualization

- Resource distribution: Virtualization partitions systems in different ways, which can affect the availability and performance of resources for users and applications.
- VM sprawl: Virtualization can lead to creating too many virtual machines per server, which can consume resources and complicate management.
- Backward compatibility: Virtualization can introduce compatibility issues with older hardware and software, which can affect functionality and security.
- Performance monitoring: Virtualization can make it harder to monitor and troubleshoot the performance of virtual machines and applications, as they share resources and dependencies.
- Backup: Virtualization can pose challenges for backup and recovery, as virtual machines can have different formats and locations.
- Security: Virtualization can increase the risk of security breaches, as virtual machines can be more vulnerable to attacks and harder to protect.

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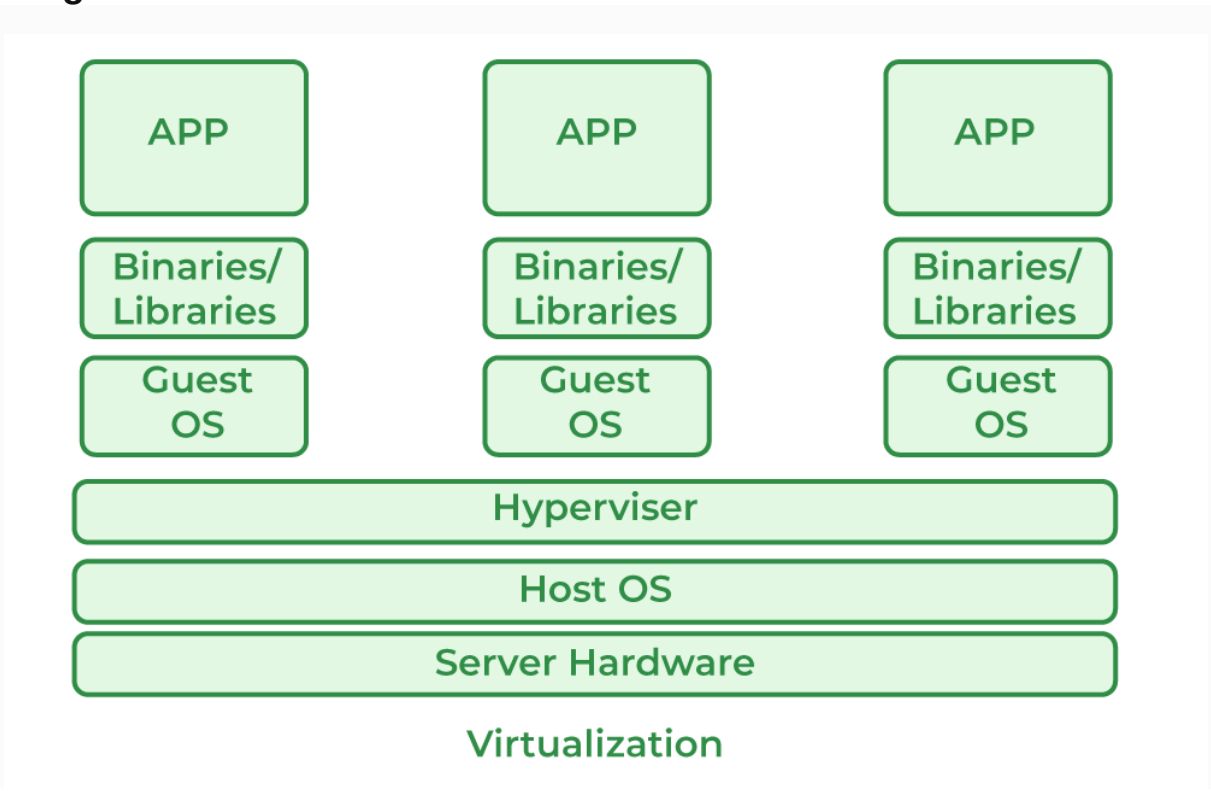
Diagram of Virtualization



Hypervisor

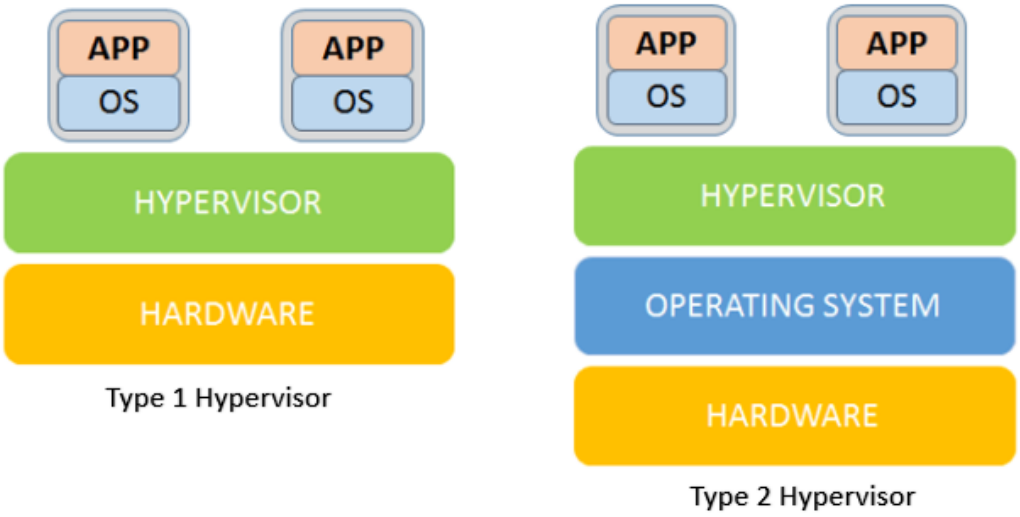
The *hypervisor* is a software component that manages multiple virtual machines in a computer. It ensures that each virtual machine gets the allocated resources and does not interfere with the operation of other virtual machines. There are two types of hypervisors.

Type 1 hypervisor

A type 1 hypervisor, or bare-metal hypervisor, is a hypervisor program installed directly on the computer's hardware instead of the operating system. Therefore, type 1 hypervisors have better performance and are commonly used by enterprise applications. KVM uses the type 1 hypervisor to host multiple virtual machines on the Linux operating system.

Type 2 hypervisor

Also known as a hosted hypervisor, the type 2 hypervisor is installed on an operating system. Type 2 hypervisors are suitable for end-user computing.



What's the difference between Type 1 and Type 2 Hypervisors?

Type 1 and type 2 hypervisors are software you use to run one or more virtual machines (VMs) on a single physical machine. A virtual machine is a digital replica of a physical machine. It's an isolated computing environment that your users experience as completely independent of the underlying hardware. The hypervisor is the technology that makes this possible. It manages and allocates physical resources to VMs and communicates with the underlying hardware in the background.

The type 1 hypervisor sits on top of the bare metal server and has direct access to the hardware resources. Because of this, the type 1 hypervisor is also known as a *bare metal hypervisor*. In contrast, the type 2 hypervisor is an application installed on the host operating system. It's also known as a *hosted* or *embedded hypervisor*.

Summary of differences: type 1 vs. type 2 hypervisors

	Type 1 hypervisor	Type 2 hypervisor
Also known as	Bare metal hypervisor.	Hosted hypervisor.
Runs on	Underlying physical host machine hardware.	Underlying operating system (host OS).
Best suited for	Large, resource-intensive, or fixed-use workloads.	Desktop and development environments.
Can it negotiate dedicated resources?	Yes.	No.
Knowledge required	System administrator-level knowledge.	Basic user knowledge.
Examples	VMware ESXi, Microsoft Hyper-V, KVM.	Oracle VM VirtualBox, VMware Workstation, Microsoft Virtual PC.