Virtualization

Virtualization is a technique, which **allows to share single physical instance of an application or resource among multiple organizations or tenants** (customers).

Virtualization uses software called **hypervisors** to create multiple virtual computers (known as virtual machines or VMs) on a single physical machine. These virtual machines can access all the parts of the physical machine, including the computer's brain or processors, memory and storage.

It does so by assigning a logical name to a physical resource and providing a pointer to that physical resource on demand.

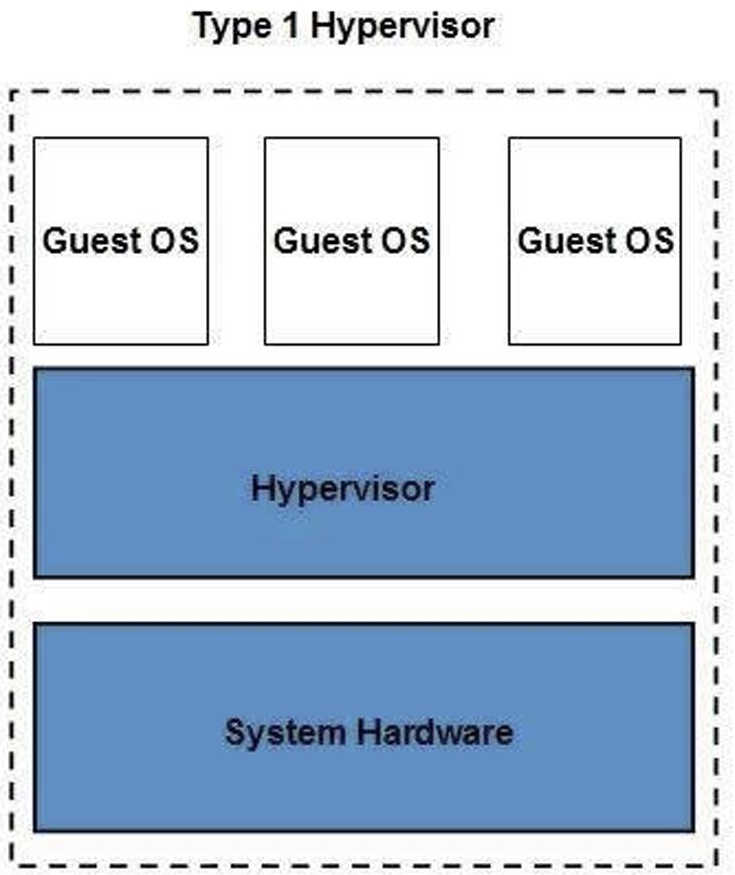
Each virtual machine runs on its own operating system and functions like a completely separate machine—even though it's sharing the resources of one physical computer. This is the key feature of virtualization: **a single physical machine running multiple tasks simultaneously on different virtual machines, instead of several computers each running a single task**.

Creating a virtual machine over existing operating system and hardware is referred as **Hardware Virtualization**. Virtual Machines provide an environment that is logically separated from the underlying hardware. The machine on which the virtual machine is created is known as **host machine** and virtual machine is referred as a **guest machine**. This virtual machine is managed by a software or firmware, which is known as **hypervisor**.

Hypervisor

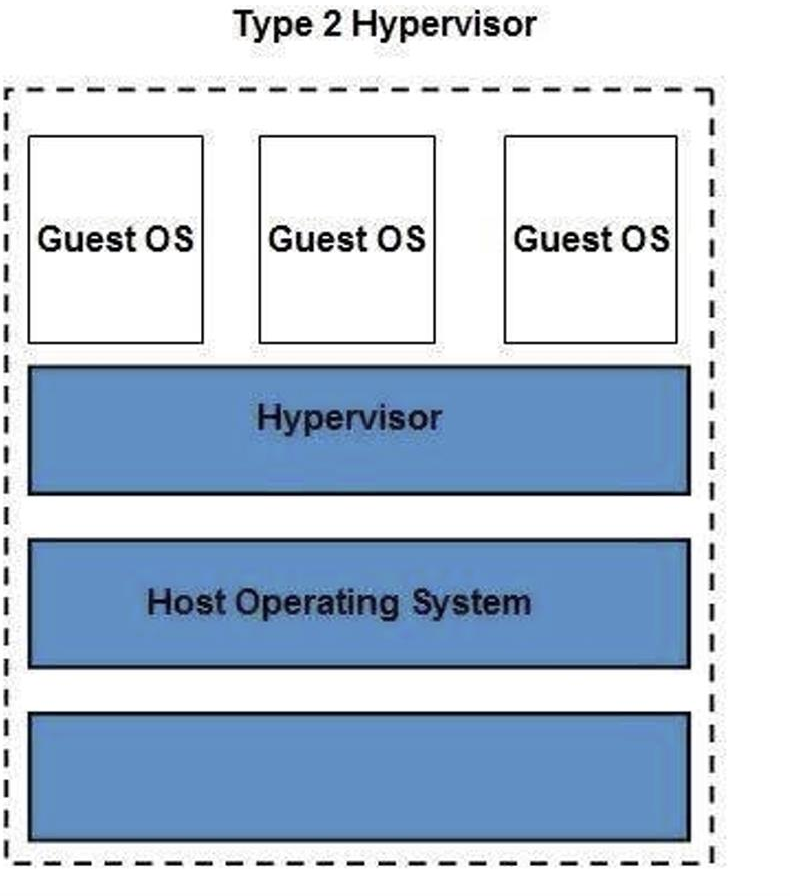
A hypervisor can create any number of virtual machines on a computer or within a server environment. Each virtual machine works like a separate computer, running its own applications on its own operating system while sharing the resources of the physical computer with other virtual machines running on that same computer.

Type 1 hypervisors. A Type 1 hypervisor runs directly on a computer's hardware, functioning as its own operating system.



The type1 hypervisor does not have any host operating system because they are installed on a bare system. Eg: LynxSecure, RTS Hypervisor, Oracle VM.

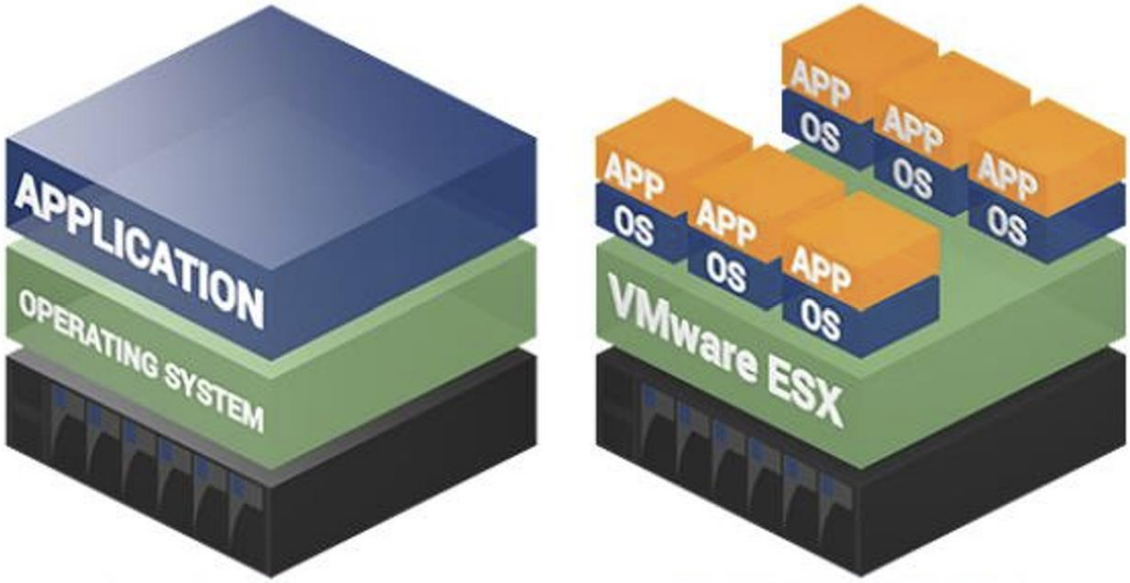
Type 2 hypervisors. A Type 2 hypervisor is installed on a computer's operating system, just like any other software. e.g.: Containers, VMWare workstation.



Types of virtualizations

Server Virtualization: Using server virtualization, you can host several virtual servers on one physical server. Each of these virtual servers is unique and isolated from the others and operates and runs its own applications and operating system independently.

Example/Use Case. Using server virtualization, your business could run your email server, customer relationship management (CRM) system and databases on separate virtual servers housed within one physical server—maximizing the use of your hardware resources.



Clasic Server Installation

Virtualized server Intallation

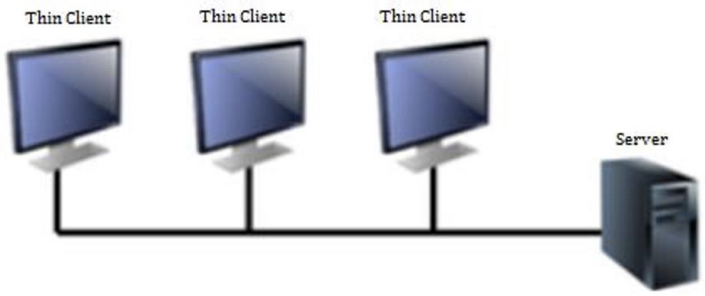
Data Virtualization

Data virtualization allows data to be retrieved from multiple sources using one application or point of access. This means data stored in **different databases, systems and locations** and in different formats can be accessed and managed as if it was stored in one central location.

Example/Use Case. A small retail business might use data virtualization to give it a unified view of sales data from its **physical store**, its online store's **SQL database** and additional **data stored in the cloud**. Doing this would enable the business to more effectively analyze sales data from across a range of locations and platforms and make data-driven decisions for future sales promotions and inventory management.

Desktop Virtualization

With desktop virtualization, you create a separate, virtual desktop on a centralized or remote server, rather than on a physical computer. This type of setup lets your employees access this virtual desktop from any device with an internet connection, enabling them to work remotely or while using their own devices.



You can also use desktop virtualization to run several operating systems on one physical machine. For example, if you need to work with an application that runs on Linux as well as software that requires Windows, you could use desktop virtualization to create two virtual machines each running a different operating system (Linux and Windows) on the same computer.

Example/Use Case. By using desktop virtualization to create a virtual desktop on a centralized server, a design agency could give its designers working remotely access to **high-performance desktop environments**, including specialized design software, regardless of the performance capabilities of the designers' personal computing devices.

Storage virtualization

It lets you manage physical storage from different network storage devices as if all your physical storage is in one place. For example, you might be storing your data in a **hard drive on a server**, on **external hard drives** and on **dedicated network-attached storage (NAS) devices**. Using storage virtualization, all this storage can be pooled together and managed as one storage space.

Example/Use Case. Let's say your business has three separate servers, each with 1TB (terabyte) of storage space. If one server runs out of space, you wouldn't be able to turn to the free space available on the other servers. But with storage virtualization, you'd be managing these servers as one entity with 3TB of storage in total—which means you can easily allocate the storage space without worrying about where the physical server is located.

Application Virtualization

With application virtualization, you're able to run an application on a computer without installing that application on the computer in the traditional sense. Here's how it works: The application is installed either in a **virtual environment on your computer or on a remote**

server. In the server example, you'd be able to use the application as if it was installed locally on your computer, but with the processing happening at the server level.

Example/Use Case. An accounting firm that uses a certain type of accounting software can use application virtualization to install the software on a server for employees to access remotely. This can be a more effective solution than installing the software on each employee's computer, as the firm's IT team will only need to update and troubleshoot the server instance of the software, rather than separate installations on individual computers.

Network Virtualization

In a network, physical devices such as switches and routers set out a fixed path for data to travel through. Network virtualization divides these resources—much like splitting up a highway into separate lanes. Each lane is then directed to a specific computer or device. This means you can direct and manage the path traveled by data through the network as necessary (in real time), rather than as set out by the network's physical layout.

Example/Use Case. A tech startup might use network virtualization to create virtual networks to house separate development, testing and production environments. For example, one virtual network could be designated for development, allowing the startup's developers to work in an environment that's a copy of the production environment—without potentially disrupting the actual production environment.

Advantages of Virtualization

Cost Savings

With virtualization, you can maximize the use of your existing hardware and reduce the need for additional physical machines or servers. You won't just save on your hardware costs, either: Because you'll need **less hardware,** you'll save on costs associated with the **operation, cooling and maintenance** of your hardware.

Efficiency

Instead of using several **separate servers to run different applications**, you can run multiple applications on different virtual machines all housed on the same physical server. This leads to a reduction in IT management tasks, better utilization of existing resources and improved efficiency overall.

Reduced Maintenance

Because your multiple virtual machines can be managed through a single console, IT management and maintenance is no longer as complex freeing up your **IT team's time to focus on more productive, strategic tasks** instead of updates and ongoing maintenance.

Disaster Recovery

Virtualization enhances business continuity and makes disaster recovery easier: Virtual machines are easy to replicate and move to a different server should your hardware fail. You can also quickly create backups of virtual machines—essentially, snapshots in time you can easily go back to if necessary.

Scalability and Flexibility

With virtualization, you can quickly create or remove virtual machines as needed, making it easier to scale your tech resources up (or down) in response to your business's changing needs.

Better Environmental Footprint

Less hardware means less energy consumption—and a win for your business from an environmental perspective.

Risks and Drawbacks of Virtualization

As with any technology, though, virtualization isn't a one-size-fits-all solution. Its potential disadvantages may outweigh the benefits it could bring to your business. Understanding the possible risks and drawbacks is critical to the effectiveness of your virtualization strategy.

Complexity

While virtualization can greatly simplify certain IT management tasks (for example, updates and maintenance), the implementation of the virtualization technology itself can be complex—particularly for businesses with limited IT resources.

Setup Costs

Virtualization will often lead to reduced costs in the long run, but the initial setup and implementation phase can get expensive. For example, in addition to the cost of the **virtualization software,** you may need to upgrade your existing hardware as well as train your IT department in virtualization skills.

Performance

While virtualization gives you the ability to create multiple virtual machines on a single server, it's important not to overload a server with too many virtual machines. The proper allocation of

resources and consistent monitoring of performance is necessary to ward off potential performance issues.

Security Risks

With virtualization, you'll need to implement robust cybersecurity measures, such as firewalls and intrusion detection systems. Regular security audits are a must, too. While it's easy to replicate a virtual machine and move it to another server in case of a data breach or virus attack, when a virtual machine is compromised, other virtual machines on the same server might also be affected—and such attacks can be difficult to detect.

Interdependency

While virtualization enhances disaster recovery, there's a flip side: When you have multiple virtual machines relying on a single physical server, the failure of the server can lead to all the virtual machines running on it to go down as well. It's essential to have a solid disaster recovery plan in place (for example, the creation of frequent backups) to ensure business continuity if disaster strikes.