# What are the most popular hypervisors used for infrastructure virtualization?

***Hypervisor*** is a program that allows simultaneous and parallel execution of several operating systems on the same host machine. The hypervisor also allows you to isolate operating systems from each other to ensure security, separation and resource management.

Hypervisor is also provided with guest operating systems running on the same host machine, means for interacting with each other, as if these OSs were running on different physical computers.

The hypervisor can be called the minimum operating system (microkernel). It provides host operating systems with virtual machine service — by virtualizing or emulating physical hardware. It also allows independent control of each virtual machine.

## Types of Hypervisors

There are several types of hypervisors — a native hypervisor, a hosted hypervisor, and a hybrid hypervisor.

***Native hypervisor -*** runs directly on the host machine hardware to manage guest virtual machines. These include **VMware ESXi** and **Citrix XenServer**.

***Hosted hypervisor*** – run on a regular OS like other applications in the system. It is installed by the “second layer” on top of the installed operating system. These include **Oracle VM VirtualBox**, **QEMU/KVM**, and **Parallels**.

***Hybrid hypervisor*** – the combination of the first and second type of hypervisors. Such hypervisors consist of a specific hypervisor that controls the processor and memory, as well as a special service OS working under its control, through which guest OSs gain access to physical equipment. These include **Sun Logical Domains** and **Microsoft Hyper-V**.

# Types of Virtualization

## Resource virtualization

It allows you to concentrate, to abstract and simplify the management of resource groups, such as network, storage, and namespaces.

## Platform virtualization

Creating a software system based on the existing hardware and software systems. The system provides the hardware resources and software is called the host (host), and it created a system - guest (guest). There are several types of platform virtualization, each of which has its own approach to the concept of *“virtualization”*.

### Types of platform virtualization:

### Full virtualization

With this virtualization used unmodified copies of guest operating systems. To support these operating systems is a common emulation layer on top of the host OS performance in the role of which is the normal operating system. This technology is used in **VMware Workstation**, **VMware Server**, **Parallels Desktop**, **Parallels Server**, **Hyper-V**.

The advantages of this approach could be considered:

* the relative ease of implementation;
* universality;
* reliability of the solution;
* All control functions are assumed by the host OS.

Disadvantages:

* high additional overhead for used hardware resources;
* lack of consideration of guest OS features;
* less flexibility in the use of hardware.

### Paravirtualization

For this approach to virtualization guest OS kernel modification is performed in such a manner that it is included a new set of APIs, through which it can work directly with the hardware, without conflicting with other virtual machines. There is no need to involve a full OS as a host software which functions in this case takes the hypervisor.

Advantages of this technology in the absence of the host OS needs - VM installed on the "bare metal", and hardware resources are used efficiently.

Disadvantages - the complexity of the approach and the need to create a specialized hypervisor OS.

### OS kernel level virtualization

This approach involves the use of a host OS kernel for the creation of independent concurrent operating system environments. For the guest software is only created its own network and hardware environment.

Advantages:

* high efficiency of use of hardware resources;
* low technical overhead;
* excellent handling;
* minimizing the cost of acquiring licenses.

Disadvantages - the implementation of only homogeneous computing environments.

### Application Virtualization

This type of virtualization implies the use of a model of strong isolation of application programs with controlled interaction with the OS, in which each instance of applications, all its main components are virtualized: files (including system ones), registry, fonts, INI files, COM objects, services. Application runs without installation procedures in the traditional sense of the word and can run directly from removable media.

This approach has advantages:

* accelerating desktop deployment and the ability to manage;
* minimizing not only conflicts between applications, but also the need for application compatibility testing.

This technology can be used on a single computer, and more precisely in the same operating system, several disparate applications simultaneously. Application virtualization allows users to run the same pre-configured application or group of applications from the server. In this case, the application will run independently of each other, without making any changes to the operating system.

### Desktop virtualization

Desktop virtualization involves emulator user interface. The user sees the application and works with it on his terminal, although in fact the application runs on a remote server, and the user is transferred only a picture of the remote application. Depending on the operating mode, the user can see the remote desktop and the application running on it, or only the application window itself.

# The main differences of the most popular hypervisor

## Microsoft Hyper-V

**Hyper-V** is a hypervisor microkernel architecture running on. Its peculiarity is that the driver of the device installed inside the host operating system. The host operating system starts just like all virtual machines. The only difference is that only the host operating system has direct access to the equipment. Resource allocation and other tasks involved in the hypervisor. The advantages of this type of hypervisors include support for virtually any equipment, because it does not require the driver was sharpened by the hypervisor. Starting with version 2016, support for nested virtualization has appeared.

### KVM

Linux hardware virtualization system. It is a loadable Linux kernel module (kvm.ko). It consists of the kvm.ko kernel module and processor-specific modules kvm-intel.ko and kvm-amd.ko. Since **KVM** is just a Linux kernel module, it will not work by itself. Here comes to the rescue **QEMU**.

**QEMU** - software to emulate hardware with open source. **QEMU** can work without **KVM** but using **KVM** hardware virtualization speed VM is higher than when operating without. A **QEMU/KVM** bundle is preferred.

### Citrix Hypervisor (earlier XenServer)

A distinctive feature of Xen is a paravirtualization support along with hardware virtualization.

**XenServer** includes several versions: Free, Standard and Enterprise Editions. They are all installed from the same image. Earlier, Standard version differed little from the Free version. The first included additional support. But starting with XenServer 7.3, some features, such as Active Directory integration, dynamic memory management, and much more, were removed from the free version. The maximum pool size is now limited to three hosts. Thus, the gap between Free and Standard has become quite significant. Licensed by CPU Sockets. To manage the hypervisor used by Citrix XenCenter management console, which is installed on a computer running Windows.

### VMware ESXi

Software product hardware virtualization. It is installed directly on the physical server and shares its resources into logical partitions (virtual machines).

**VMware ESXi** is a hypervisor running on a monolithic architecture. It includes all the drivers of hardware devices in your code It is believed that such a hypervisor provides greater performance because the drivers are located inside the hypervisor. But this has a negative side, as only those devices whose drivers are installed in the hypervisor are supported.

### Oracle VM VirtualBox

**VirtualBox** - virtualization software product developed by Oracle. Runs on all popular operating systems as Windows, Linux, MacOS. **VirtualBox** is a pretty good product and great for home use. Easy to use, it has an intuitive interface and many options. There is the possibility of forwarding USB to the guest operating system.