

Victor Danylenko's Homework

1. Які найпопулярніші гіпервізори використовуються для віртуалізації інфраструктури.

Most popular hypervisors for large scale virtualization of infrastructure are type 1 hypervisors: AWS Nitro, Hyper-V, KVM, VMware ESXi, Xen

Amazon Web Services older instances used Xen, newer instances run on Nitro, KVM based hypervisor developed by Amazon.

Google cloud uses KVM hypervisor but with non-QEMU implementation. It runs with virtual machine monitor and hardware emulator developed by Google.

Microsoft Azure Cloud runs on Hyper-V, Windows Server based Hypervisor.

There are also popular Type 2 Hypervisors: VirtualBox, VMware Workstation\Pro, VMware Fusion.

2. Стисло опишіть основні відмінності найпопулярніших гіпервізорів.

Type1:

Main difference between **AWS Nitro** and other type 1 hypervisors is that Nitro is hardware assisted hypervisor that uses special ASICs (app. specific interface cards) in place of usual software Device Models that handle instructions from VM Systems and do not use server hardware recourses on that. Such hardware solutions are described to be significantly faster than software Device Models. There are Storage, Network cards, Card Controller, Security chips. Nitro hypervisor itself based on KVM hypervisor, but stripped down to do minimal amount of work which allows using server hardware fully for guest systems.

Hyper-V is Windows based Microkernel hypervisor, that comes both as part of some editions of Windows Server, and as standalone Hyper-V Windows Server edition without graphical interface. It is free but requires additional licensing for Windows Guest based systems, non-Windows based Guests systems are free to add. Hyper-V has biggest limits of RAM for Host (24TB) and allows for Generation 2 Guest Systems to use 12TB RAM, up to 240 vCPUs, and 64 TB size of Disks in VHDX format. Can both increase and decrease virtual disk size. Unlike some others type 1, Hyper-V doesn't allow overcommitting of RAM for guest systems, and doesn't allow Hot add/remove of vCPUs in a running guest system. Hyper-V also lacks inbuilt VMs backup management, so backups have to be created and managed with other means. Microsoft provides paid Hyper-V management tool SCVMM, for centralized managing of multiple hosts and clusters on Hyper-V. But not having this tool doesn't restrict functionality or scalability of Hyper-V based systems, just provides easier large scale management.

VMware ESXi is a Monolithic hypervisor of VMware. It is a part of vSphere VMware infrastructure. Earlier version – ESX ran on a Linux kernel, which acted as primary VM, but to minimize use of server recourses ESXi is based on specific VMKernel and only takes 70mb of Host system space to run. But in order to manage VMware virtualization platform user has to use other components of vSphere, such as VMware vSphere Client or VMware vCenter Server. For disk storage VMware uses its native clustered file system VMware VMFS, which provides bigger levels of flexibility with shared access from multiple VMs. Also ESXi has more advanced memory management: Guest Ballooning, Memory Compression, VMware Oversubscription/Overcommit. VMware vMotions/vShere Distributed Recourse Scheduler allow zero downtime scheduled migrations of workloads between servers. This hypervisor also supports biggest numbers of logical processors in Host system – 768, and 4096 vCPUs used in host system, while falling back behind Hyper-V in recourses can be used in instance of Guest system. Downside of vSphere is licensing - most parts of vSphere infrastructure require additional license plans.

KVM is hypervisor based on open source hardware virtualization technology built into Linux kernel. It's light and fastest free hypervisor, with same scalability as others for big infrastructures. Only supports hardware virtualization on Intel and Amd processors. KVM won't run on old processors without virtualization hardware support. Also it lacks any

setup, management and backup tools for virtualization, but there are enough apps to pick in Linux repositories. There is also no dedicated support service. But there is commercial option with support - Red Hat Enterprise Virtualization.

Xen is microkernel hypervisor, needs Linux based operating system to work, supports both hardware virtualization, and also para-virtualization. Para-virtualization mode support is only for specifically patched Linux distributives. Can run windows based guest systems only in HVM mode

Type 2:

Differences between type 2 VMware hypervisors are: VMware Fusion runs on MacOS, VMware Workstation runs on Windows, VMware has free version of Workstation Pro with lot of disabled functions such as – snapshots, cloning, sharing VMs, creating virtual networks. Also free Workstation Player can't be connected into VMware vSphere infrastructure.

Oracle VM VirtualBox is free cross platform type 2 hypervisor that supports most of common virtualization functions like network virtualizations, snapshots, screen recording etc. But in comparison with VMware has less detailed hardware settings. Also has VRam size restricted to 256mb and unsupported DirectX for 3D graphics.