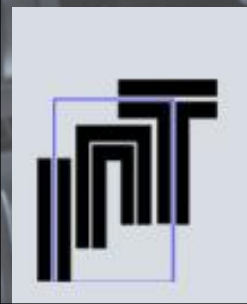


Open Source Virtualization

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Basic concepts

- > Open Source
- > Virtualization
 - # Categories
 - # Virtualization Software
 - \$ VMware
 - \$ Openstack
 - \$ KVM
 - \$ oVirt
 - # Deployment tools – components
 - \$ Ansible
 - \$ GlusterFS
- > Case Studies

Open Source

- > Open Source Software is software that its source code is open and available for all users to see, check, change and optimize.
- > Open Source programs are available for free to the public.
- > There are commercial products with additional functions which are based on Open Source code.

Virtualization

What is it?

- > Virtualization is the ability, via the appropriate software, to create, manage, edit and operate Virtual Machines on a physical machine (PC, Server).
- > Utilizes the resources of the physical machine accordingly, whether they are storage, network or compute resources and allocates them to virtual machines.

What are the reasons that led to the need for the development of Virtualization?

> 1960

- # As a method of dividing system computing resources from mainframes between different applications.

> 1999

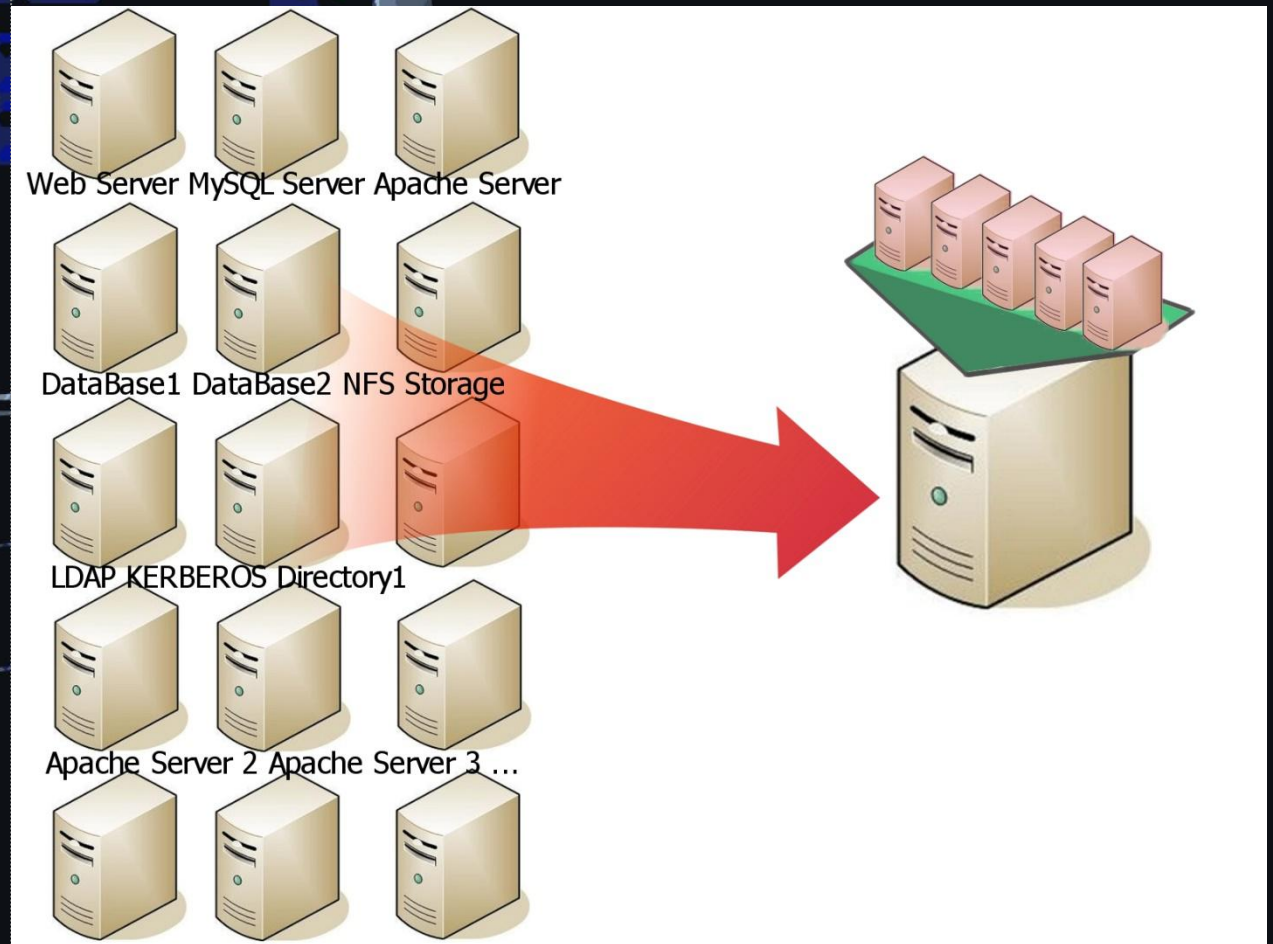
#VMware Workstation on hardware Intel IA-32

> Σήμερα

- # Expanding hardware capabilities involves more parallel tasks achieved through Virtualization as optimizing hardware usage.
- # Cost control and simplification of management through the integration of servers (Server Consolidation).
- # Control of large computer installations and clusters.
- # Ability to run complex applications in different hardware and OS environments. The main features of the new computational phenomenon, the so-called Cloud Computing.

Server Consolidation

> Server Consolidation is done when we move from many **physical** servers to much fewer physical ones and replace the first ones with **virtual** servers..



Virtualization Types

- Some of Virtualization's variants are:
 - > Computing Virtualization
 - > Storage Virtualization
 - > Network Virtualization

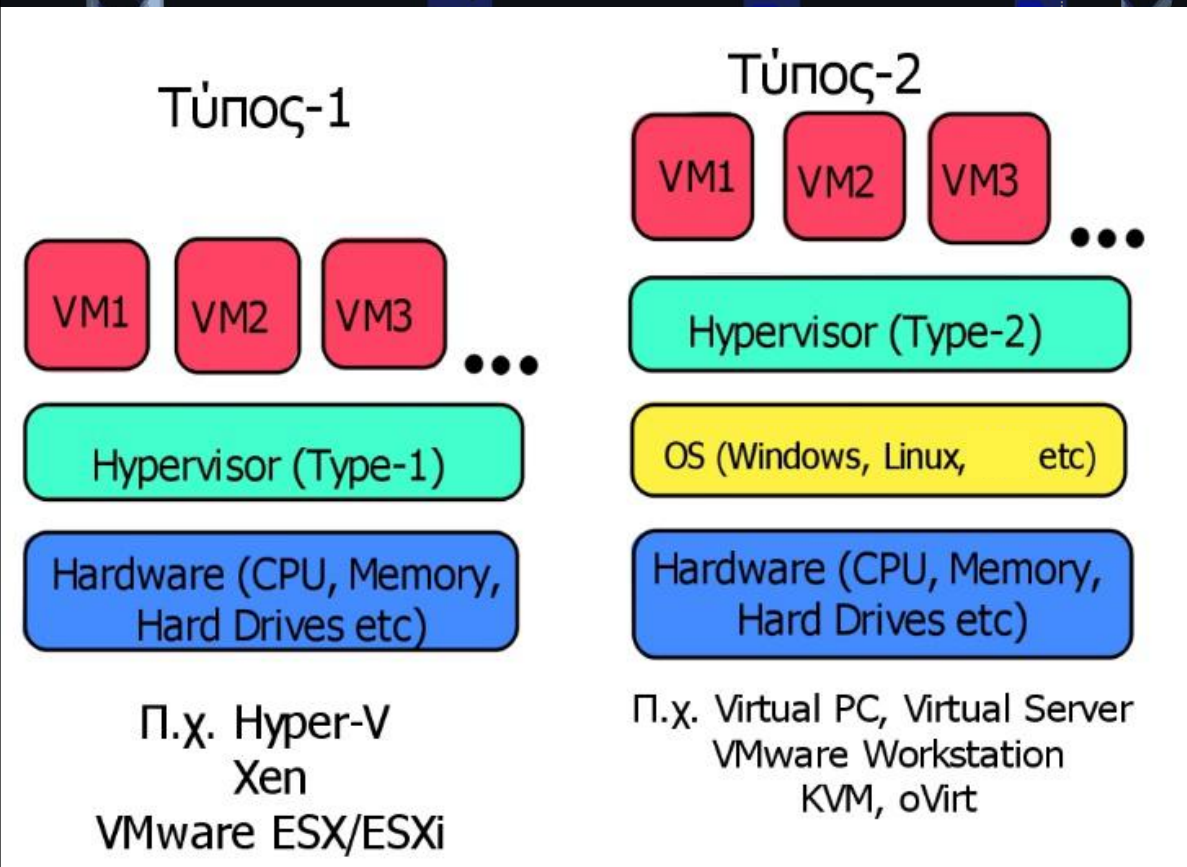
Main Virtualization Parts

Virtualization's main parts are:

> The Hypervisor

- # Type-1, bare-metal Hypervisor
- # Type-2, hosted Hypervisor.

> Virtual Machine - VM



Well Known Virtualization Software

- > VMware / Vsphere / ESXi
- > OpenStack / KVM
- > Amazon / Xen
- > Azure / Hyper-V
- > Google / G Suite
- > Ovirt / KVM

Vmware - Vsphere

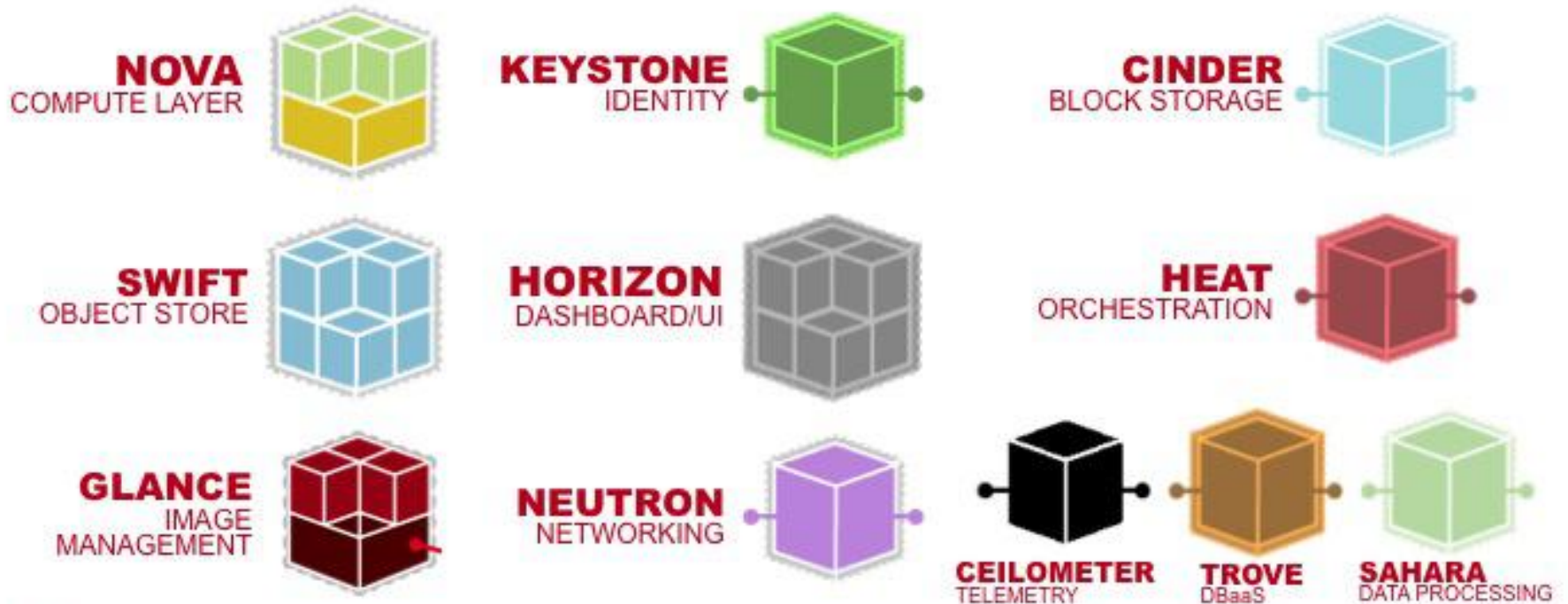
- > The most well-known and most advanced Virtualization software. It is addressed mainly to companies that want their own private cloud.
 - > User-friendly.
 - > Exact solution and purchase of the License every three years to use the system. The cost increase for each node added is almost exponential.
 - > Users are “locked” in the software.
- # Amazon, Google and Azure, which deal with Warehouse Computing and have Hyper-infrastructure, had no interest in locking themselves in VMware software and being forced to renew their contracts with the company every time they expired. Each, individually, chose to make their own Virtualization software. Specifically, Amazon developed Xen, Google the Google Cloud and Microsoft Azure developed Hyper-V.

OpenStack

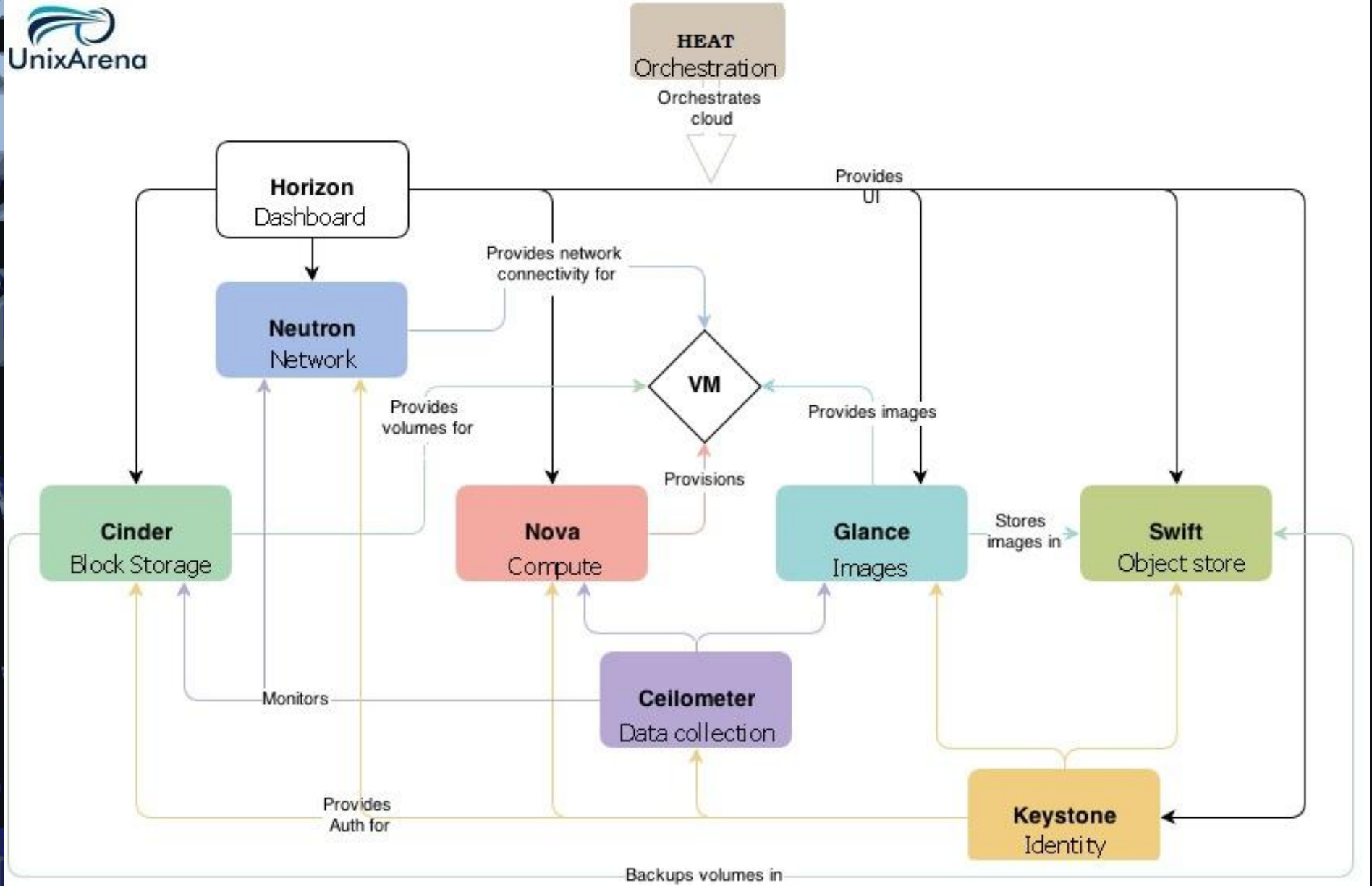
- > Created by NASA and RACKSPACE in their effort to create an Open Source-based Cloud.
- > Big community with many developers.
- > For big organizations and their needs.
- > Manages large-scale compute, storage, networking resources in the Data Center.
- > Creates its own ecosystem providing capabilities for creating and managing Private or Public Cloud, user authentication services, networking, computing power, storage (as object, blocks or filesystems), key management, DataBase as a Service, management and processing of Big Data, capability Backup/Restore and Disaster/Recovery and much more. Additionally, system administrators in OpenStack have access to the system through a Dashboard.
- > Implementing and supporting an integrated Openstack infrastructure requires several engineers, as it is a huge project with many parameters..

OpenStack

OpenStack® Services





OpenStack



Ovirt

- > It is the Open Source version of the commercial Red Hat Virtualization and concerns smaller data Centers than those handled by OpenStack.
- > It is a software for smaller applications compared to OpenStack
- > Aims to cover the so-called Virtual Data Center.
- > Based on KVM.
- > Friendly Graphic User Interface (package Cockpit)
- > Uses the Ansible systems automation tool and its Playbooks through the gdeploy tool.
- > Offers a multitude of services and functions.
- > Makes it easy to create shared GlusterFS storage.

KVM

- > Part of the Linux kernel from kernel version 2.6.20 (February 2007).
- > Works in collaboration with the QEMU package and the libvirt library.
 - # KVM -> kernel module 
 - # QEMU -> systems emulation software 
- > One of the most well-known Virtualization Software to date with ESXi /Vmware/Vsphere and the upcoming Hyper-V/Microsoft/Azure.
- > Simple and unpretentious GUI.
- > Absolute control of the system Virtualization.

qemu_kvm

Ansible & Gdeploy

> Ansible

System automation tool through its Playbooks. Its goal is to automate the processes of creating, upgrading and updating multiple systems through a single central unit..

> Gdeploy

A tool that uses the functions of Ansible and was developed to make it easier to create and install GlusterFS sites.

GlusterFS

- > Software Defined Storage – Software solution for storage problems.
- > Distributed Storage solution.
- > It is Free and Open Source software and can be used with off-the-shelf hardware.
- > It offers great security to production systems by keeping copies of itself.
- > Its purpose is to provide Cloud storage and media streaming to the users of the systems.

Ovirt

- > Consists of:
 - # Engine
 - # Node
- > We can examine oVirt on:
 - # LiveCD
 - # Basic Single hosted environment
 - # Ovirt node with three physical nodes

Self-hosted Engine

> Engine:

- # The oVirt Manager is the one who manages everything that happens in the oVirt system.

- # The most powerful oVirt has to offer.

> Self-hosted engine:

- # It concerns a virtualized environment in which the Engine can be run as a VM on the hosts it manages, while in the past there was a need for separate hardware.

- # It overcomes the "single point of failure" problem that existed in earlier versions and presupposes the existence of Gluster storage as a datastore, instead of NFS or SAMBA storage, so that it can ensure full availability (resiliency)

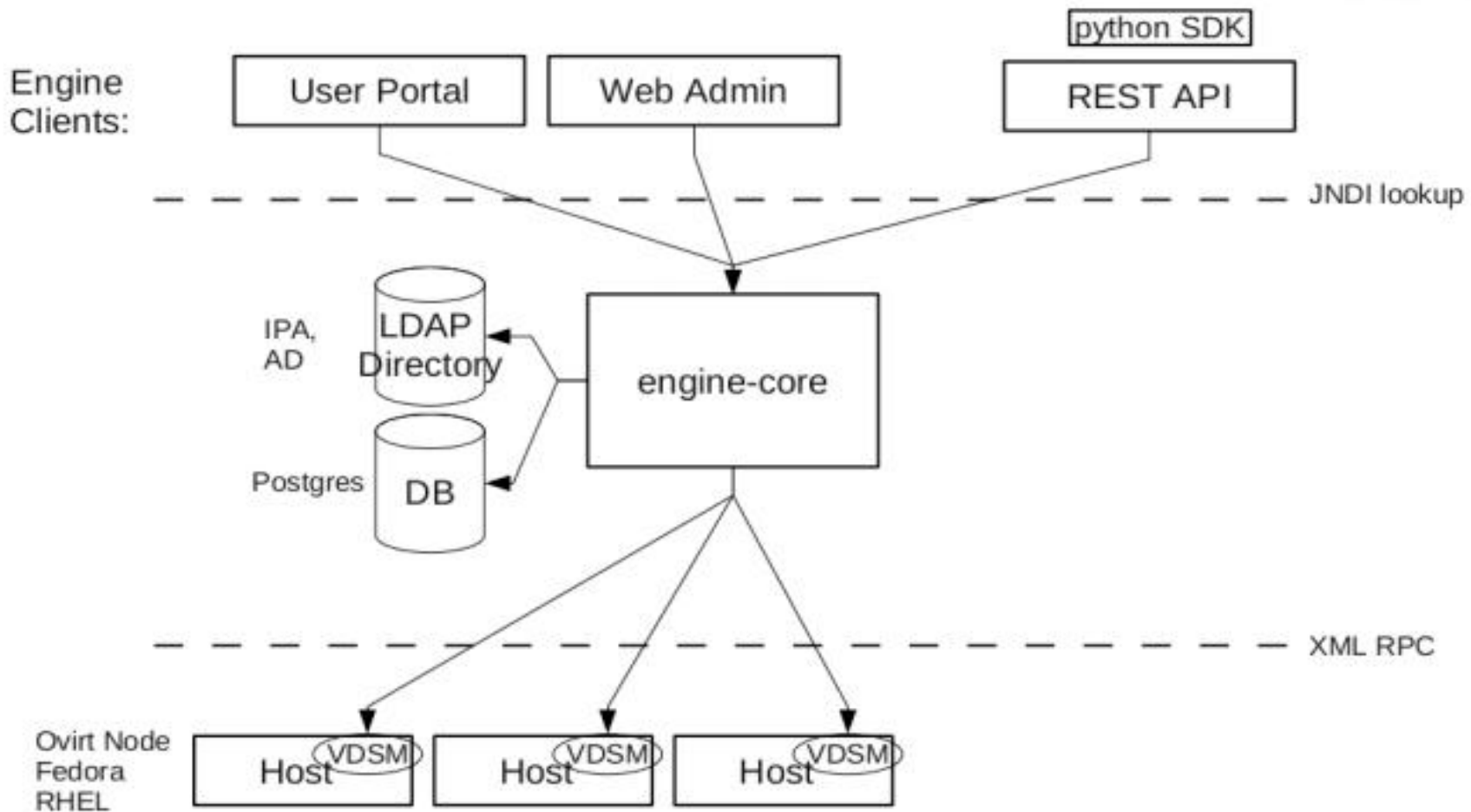
Ovirt Node

- > 3+ nodes (Specifically, there is no limit to how many nodes we want to put in our system, as is the case with the Vmware license we have obtained for three nodes.)
- > Creation of GlusterFS (SDS Cloud type)
- > Redundant system
- > Linear expansion

oVirt Architecture



Overview



Deploying oVirt [1/2]

- > Self-hosted Engine
 - # Operating System installation (CentOS/RHEL, Debian 7.5+).
 - # Installation of package ovirt-release42.rpm, downloaded from oVirt's site.
 - # Installation of ovirt-engine.
 - # Installation of engine-setup.

Deploying oVirt [2/2]

- > Ovirt Nodes

- # Commit IP addresses for nodes and the engine, a total of 4 addresses and set to either the DNS server or in the / etc / hosts file of each node.

- # Installation of the minimal operating system ovirt-node provided by the oVirt site.

- # Set static addresses in each node to correspond to the blocked ones.

- # Installation of oVirt appliance image (ovirt-engine-appliance-4.2-20180617.1.el7.noarch.rpm)

Creation of GlusterFS on oVirt Nodes

- > In each node, we activate the SSH service, so that the nodes can communicate with each other and with the engine via passwordless SSH. => gdeploy
- > Inserting clean disks into the nodes for use as Gluster storage.
- > Deployment through an automated process (gdeploy) on Cockpit.

GlusterFS on oVirt Nodes

The screenshot shows the oVirt Open Virtualization Manager interface. The top navigation bar includes the oVirt logo and the text "OPEN VIRTUALIZATION MANAGER". On the right side of the top bar, there are icons for a bookmark, a tag, a list with a "0" notification, a bell with a "3" notification, a help icon, and a user profile icon.

The left sidebar contains a navigation menu with the following items: Dashboard, Compute, Network, Storage (highlighted in blue), Administration, and Events.

The main content area is titled "Storage > Storage Domains". It features a search bar labeled "Storage:" with a clear (x), favorite (star), dropdown (v), and search (Q) icons. Below the search bar are four buttons: "New Domain", "Import Domain", "Manage Domain", and "Remove", followed by a vertical ellipsis menu icon.

Below the buttons is a table of storage domains. The table has a refresh icon and a dropdown menu on the left, and a "1-4" indicator with left and right arrow icons on the right. The table columns are: Domain Name, Comment, Domain Type, Storage Type, Format, and Cross (partially visible). The table contains four rows of data:

		Domain Name	Comment	Domain Type	Storage Type	Format	Cross
▲		data		Data	GlusterFS	V4	Activ
▲	👑	hosted_storage		Data (Master)	GlusterFS	V4	Activ
■		ovirt-image-repository		Image	OpenStack Glance	V1	Una
▲		vmstore		Data	GlusterFS	V4	Activ

GlusterFS on oVirt Nodes

RT NODE 4.2.3.1 Unlocked Oops! root

ov-node1.islab.l... Reset

```
root@ov-nodel:~  
  
width: 32 bits  
clock: 33MHz  
capabilities: ide bus_master emulated  
configuration: driver=ata_piix latency=0  
resources: irq:17 ioport:1f0(size=8) ioport:3f6 ioport:170(size=8) ioport:376 ioport:500(size=16)  
*-cdrom  
description: DVD-RAM writer  
product: DVD-RAM GSA-T40L  
vendor: HL-DT-ST  
physical id: 0.0.0  
bus info: scsi@0:0.0.0  
logical name: /dev/cdrom  
logical name: /dev/sr0  
version: KS03  
capabilities: removable audio cd-r cd-rw dvd dvd-r dvd-ram  
configuration: ansiversion=5 status=nodisc  
[root@ov-nodel ~]# df -H
```

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/mapper/onn-ovirt--node--ng--4.2.3.1--0.20180613.0+1	196G	2.0G	184G	2%	/
devtmpfs	12G	0	12G	0%	/dev
tmpfs	12G	4.1k	12G	1%	/dev/shm
tmpfs	12G	18M	12G	1%	/run
tmpfs	12G	0	12G	0%	/sys/fs/cgroup
/dev/mapper/onn-var	16G	143M	15G	1%	/var
/dev/mapper/onn-tmp	1.1G	3.0M	950M	1%	/tmp
/dev/mapper/onn-home	1.1G	2.7M	951M	1%	/home
/dev/sdal	1.1G	218M	736M	23%	/boot
/dev/mapper/onn-var_log	8.4G	53M	7.9G	1%	/var/log
/dev/mapper/onn-var_log_audit	2.1G	9.7M	2.0G	1%	/var/log/audit
/dev/mapper/onn-var_crash	11G	38M	9.9G	1%	/var/crash
tmpfs	2.3G	0	2.3G	0%	/run/user/0
/dev/mapper/gluster_vg_sdb-gluster_lv_engine	22G	35M	22G	1%	/gluster_bricks/engine
/dev/mapper/gluster_vg_sdb-gluster_lv_data	22G	35M	22G	1%	/gluster_bricks/data
/dev/mapper/gluster_vg_sdb-gluster_lv_vmstore	22G	35M	22G	1%	/gluster_bricks/vmstore

```
[root@ov-nodel ~]#
```


Problems we encountered while using oVirt

> Node:

The hard drives that will make up the Gluster must be clean. In case we used to use them somewhere else, we have to reset them with the command:

- `dd if=/dev/zero of=/dev/sdb`

Generally, we do not run the `yum update` command for no reason after the Gluster has been created, otherwise we may change the versions of the oVirt Nodes and the node systems will be no longer able to communicate with each other, thus disrupting their operation. Restoring to a previous version may not work.

Conclusions from the use of oVirt

- > In general, the versions of oVirt are updated on a monthly basis, often eliminating problems (eg networking in VMs) and bugs we may encounter while using it..
- > Rapid development.
- > Active community and support.
- > Devel opportunities.

Useful Links

Historic records:

https://en.wikipedia.org/wiki/Timeline_of_virtualization_development

Ovirt : <https://www.ovirt.org/>

Ovirt users forum :

<https://lists.ovirt.org/archives/list/users@ovirt.org/>

KVM : https://www.linux-kvm.org/page/Main_Page

VMware : <https://www.vmware.com/>

OpenStack : <https://www.openstack.org/software/project-navigator/openstack-components#openstack-services>

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A stack of server racks is shown, with the text "Thank you!" overlaid in the center. The server racks are silver and black, with blue handles and green indicator lights. The text is in a white, italicized font.

Thank you!