C3E project

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Agenda

- Present the C3E cloud environment
- Illustrate how openStack environment allows you to provide the remote visualization
- Discuss in some details “virtualization of GPUs”
- Install and test remote visualization tools on virtual machines.

C3 project

Project

HPC on-demand ;-)

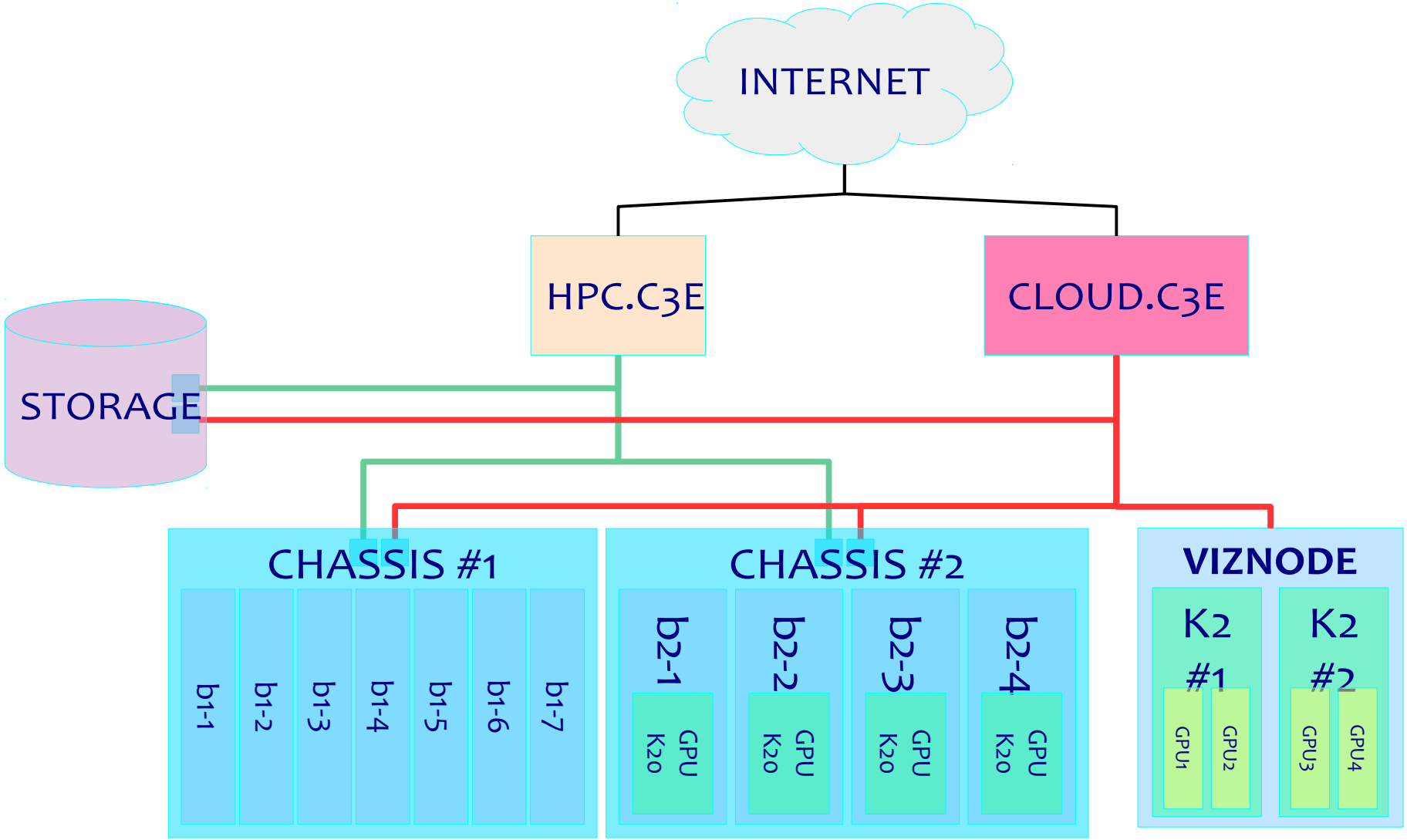
The purpose of the C³ Project is to make available efficient infrastructure for supercomputing to companies and entities through CLOUD COMPUTING.

It is an initiative by eXact lab srl in collaboration with COSILT.

In addition to this, the idea is to allow the development of a center of expertise and knowledge on the issues of business development through the use of High Performance Computing systems, actively involving companies, industrial and academic partners.

www.c3hpc.com

C3 hardware/logical structure



C3E Infrastructure: HW details

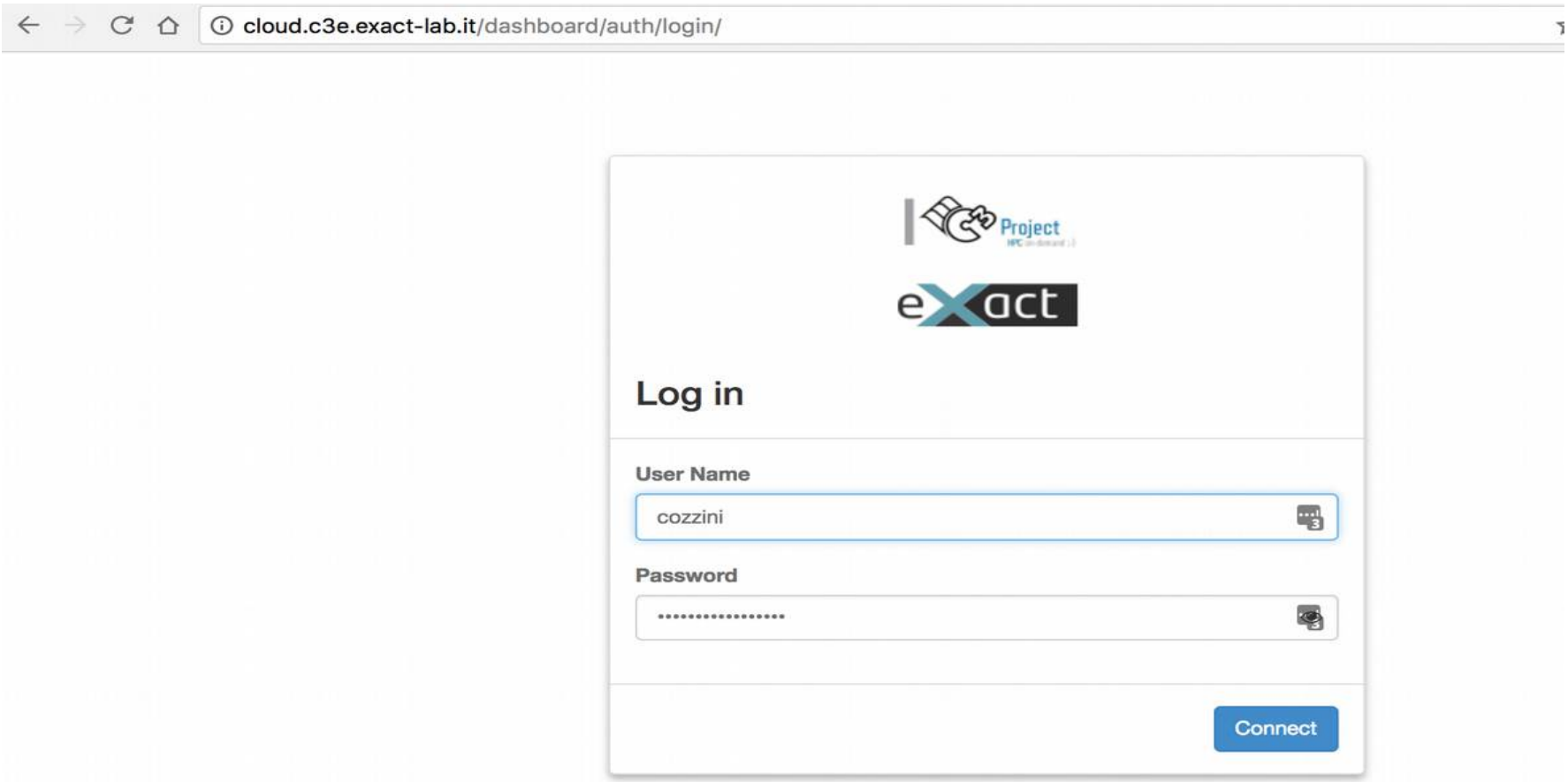
Front-end nodes: Cloud/HPC
- Dual Intel 40 core @2.3GHz
- 32 GB RAM
- 2 Tb storage

Computational nodes: BXX
- Dual Intel Xeon E5 -2697/v2
- 24 core @2.7GHz
- 64 GB RAM
- 1 Tb storage

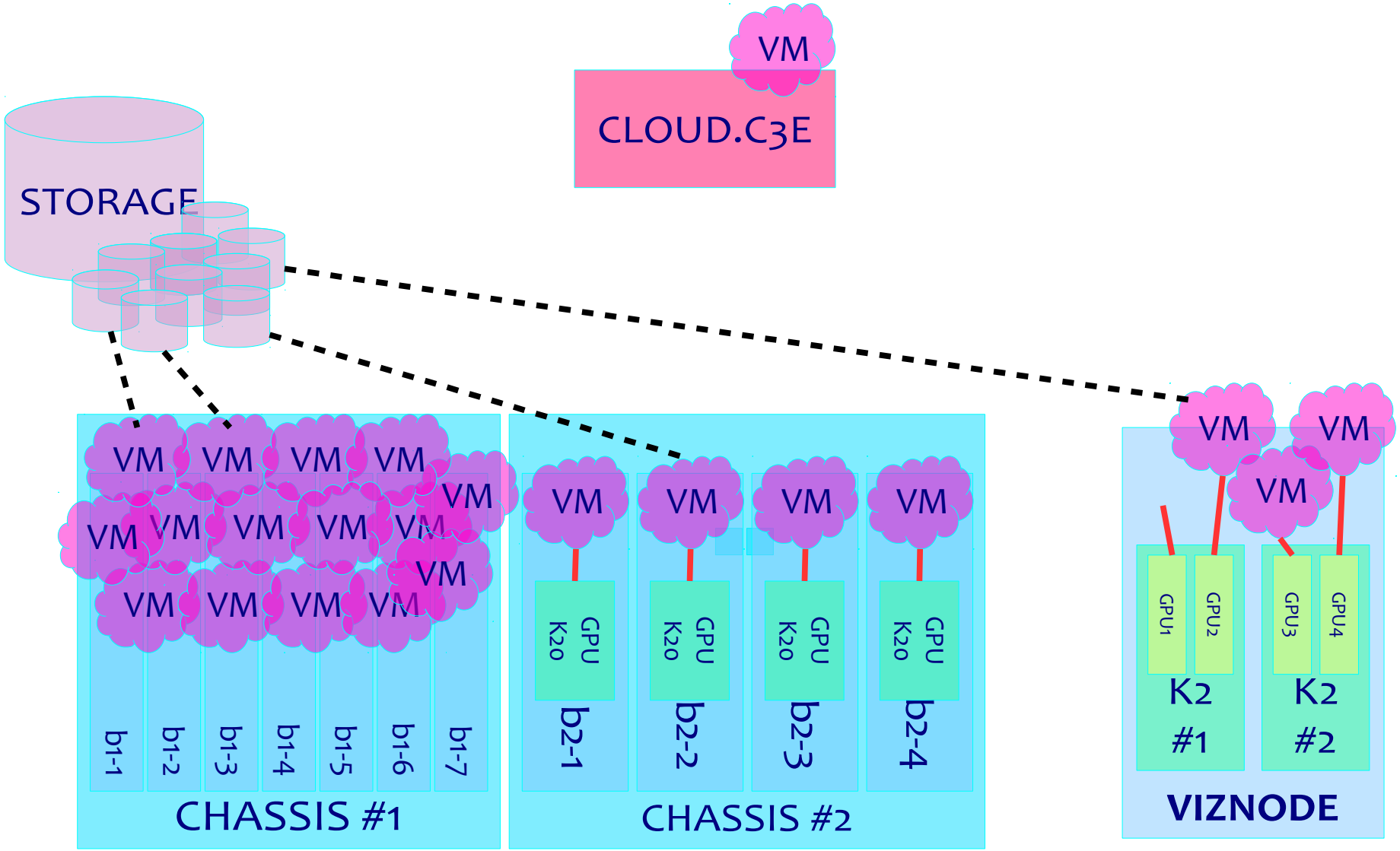
GPU: 2 K20X

Viznode: Dual Intel(R) Xeon(R) CPU E5-2630 v2
- 12 cores @2.60GHz
- 128 GB RAM
- 2 NVIDIA GRID K2 (2 GPUs on a each card_

C3 project login



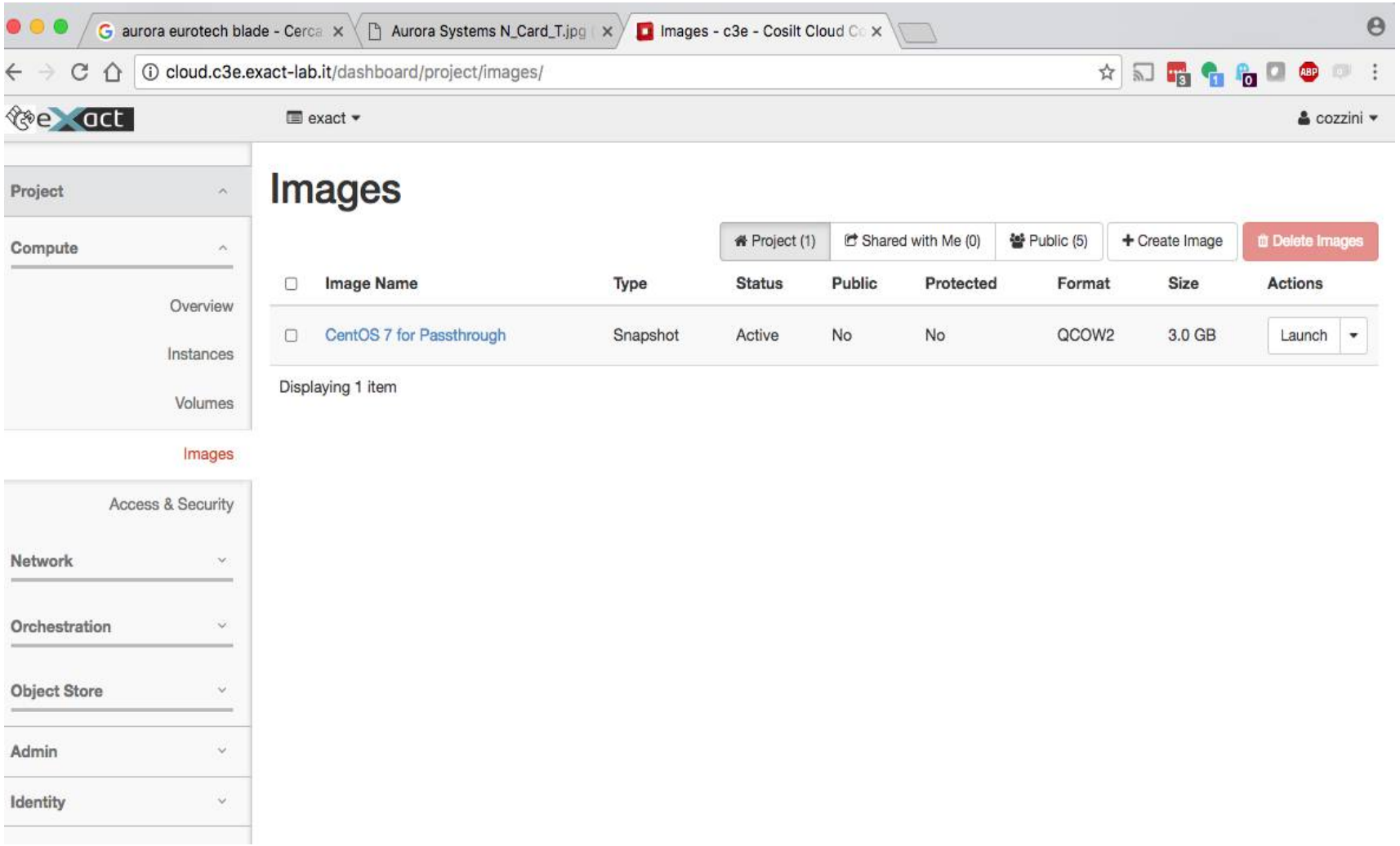
C3 VM provisioning..



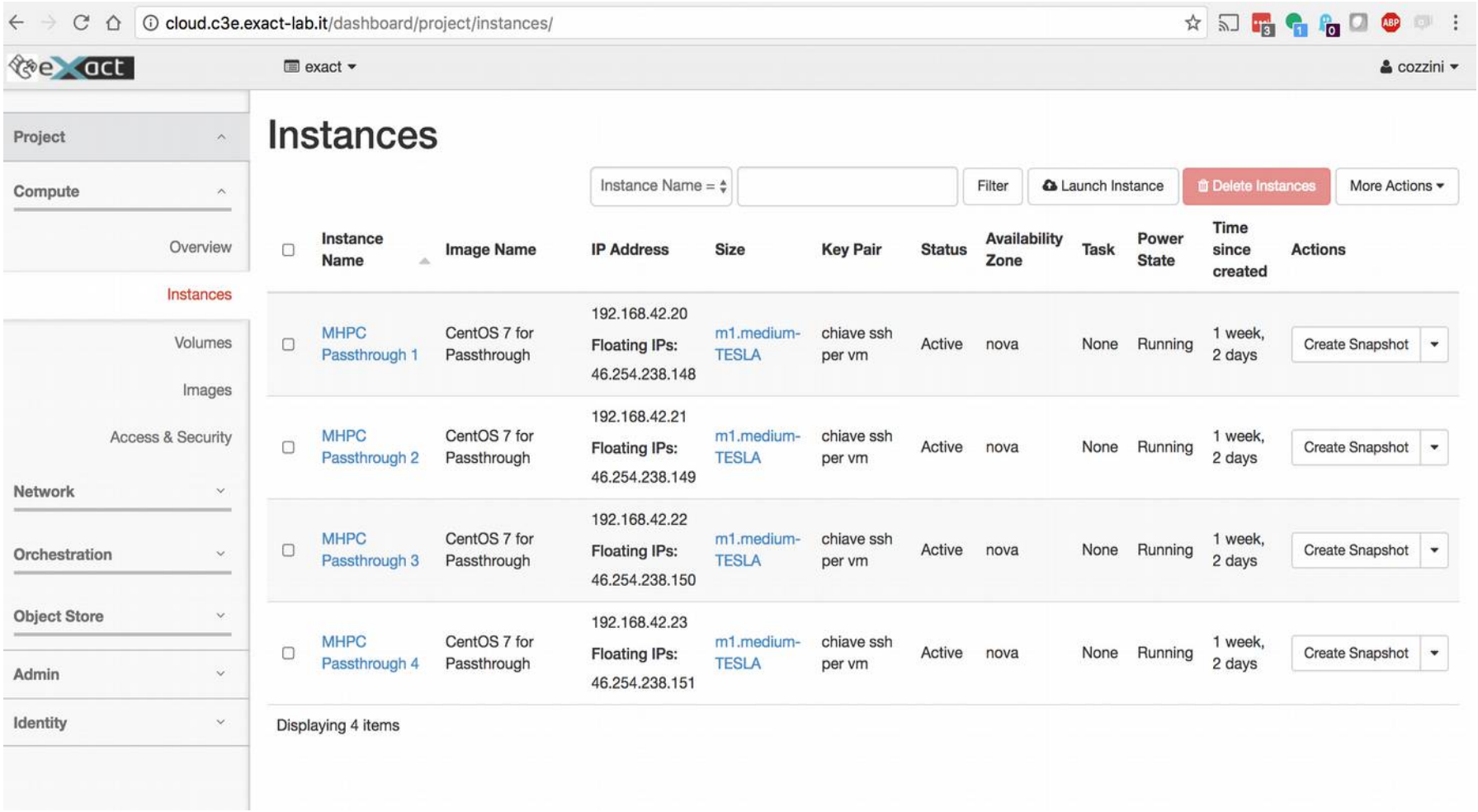
Virtual machine with GPUs..

- Provide VM with GPGPU facilities
  - a VM can have direct access to the GPU on the compute node and so provide hardware acceleration
- Done through enabling at hypervisor level “PCI passthrough” linux kernel mechanism.
- This allows QEMU-KVM (the virtualization hypervisor used in this case by OpenStack) to assign each single GPU esclusively to a single virtual machine

Get the GPU flavor



C3 VMs for today



About OpenStack network

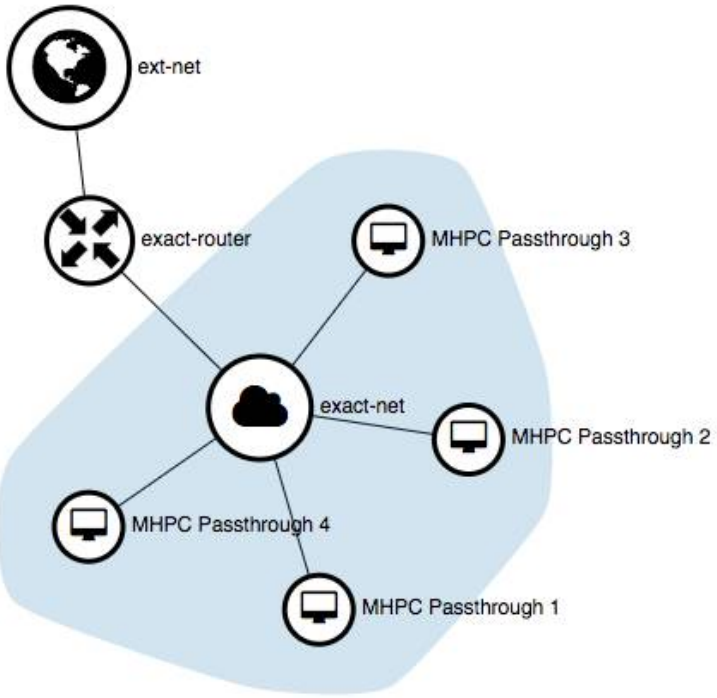
- The internal network is where the virtual network are spawned.
- A virtual network belongs to a tenant and can be shared.
- It is possible to assign a floating IP to a VM spawned on the virtual network
- The security of the VM is managed by the security groups (it is still possible to have a firewall on the VM, but only the connections allowed by the security groups will arrive to the VM)

Network topology

Network Topology

Resize the canvas by scrolling up/down with your mouse/trackpad on the topology. Pan around the canvas by clicking and dragging the space behind the topology.

Toggle labels | Toggle Network Collapse | Launch Instance | + Create Network | + Create Router



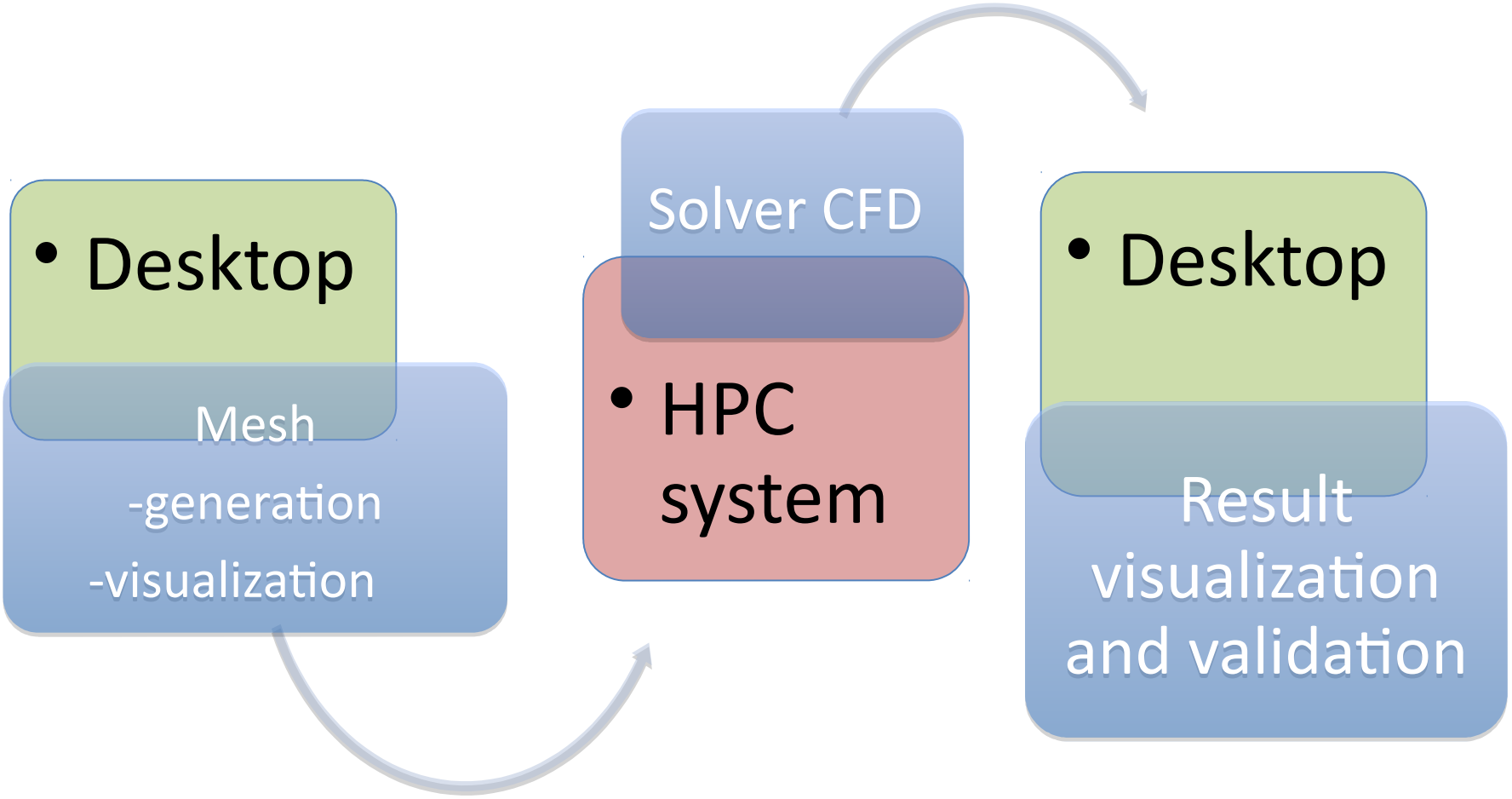
Case study: openViewSHIP

FVG funded joint industrial/academic project - **Leaded/Proposed by eXact lab**

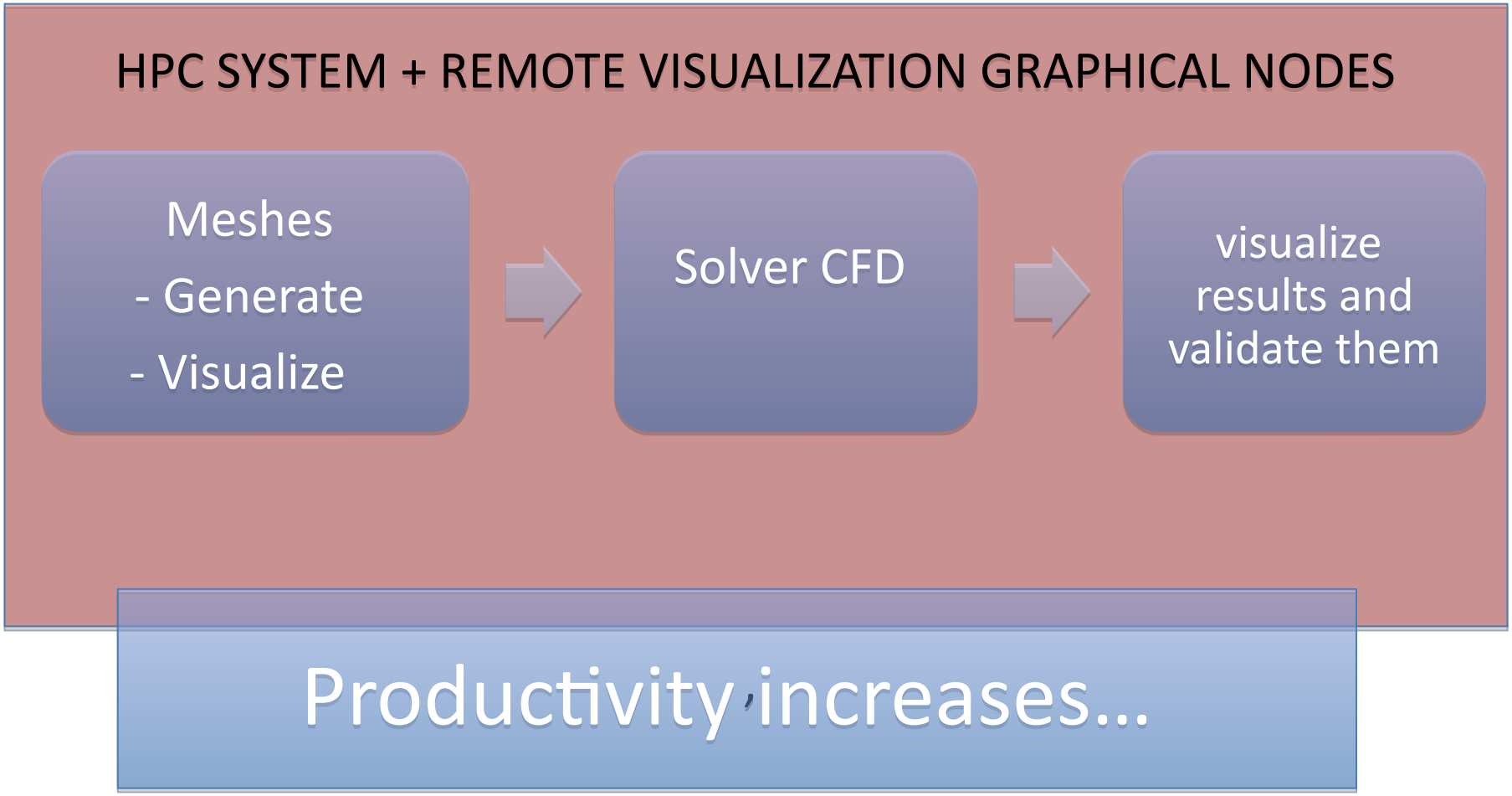
GOAL

Setup an integrated computational ecosystem for hydrodynamics simulations for naval industrial sector in FVG region

The cumbersome workflow..

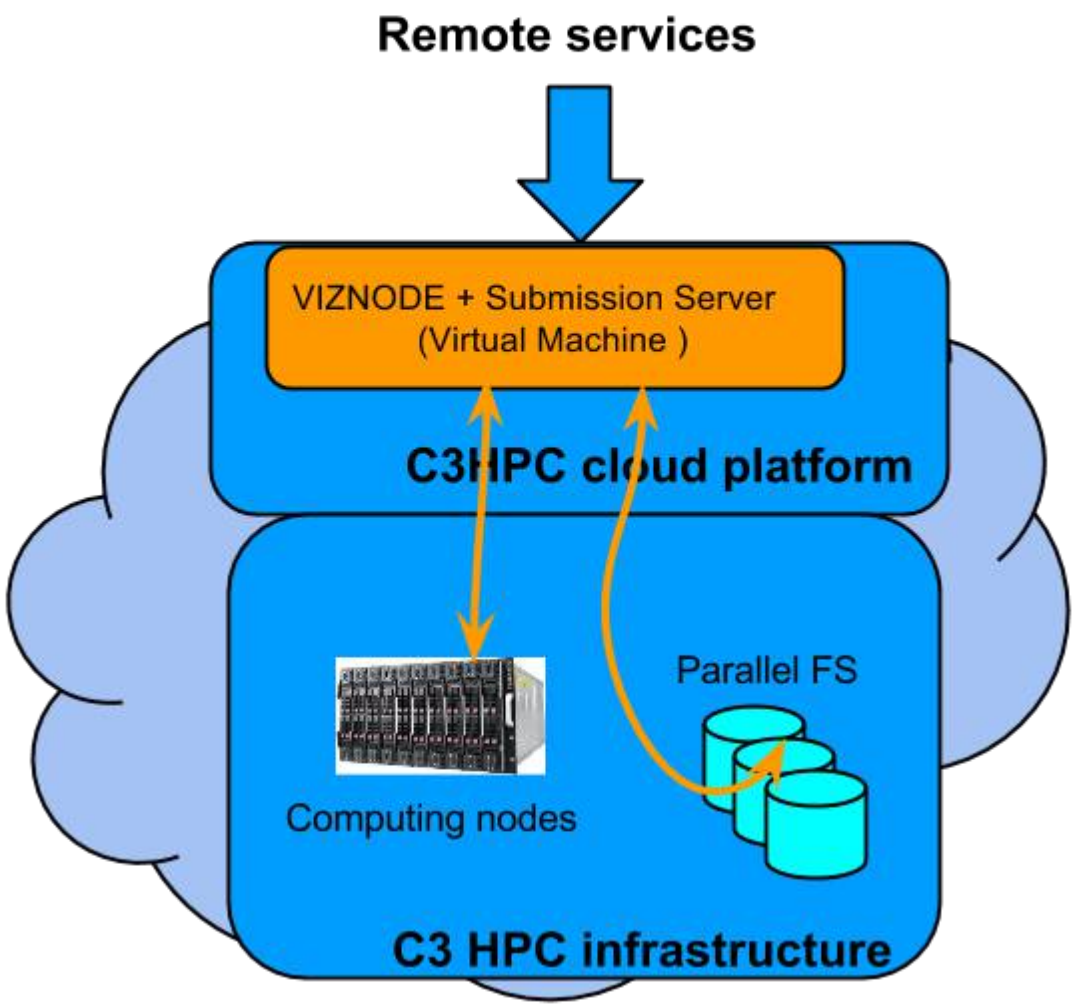


Our proposed solution



The overall picture

- Access can be provided by VM running on cloud.
- Vm could be any OS (windows) and can host any specific/ad hoc software
- Submission done via any kind of portal/mechanism directly to the queue system on HPC platform
- Data are available from VM on the Lustre parallel FS.
- Remote visualization done by means of DCV. Virtual machine able to share GPU resource for graphical intensive tasks



OpenViewSHIP: the Viznode..

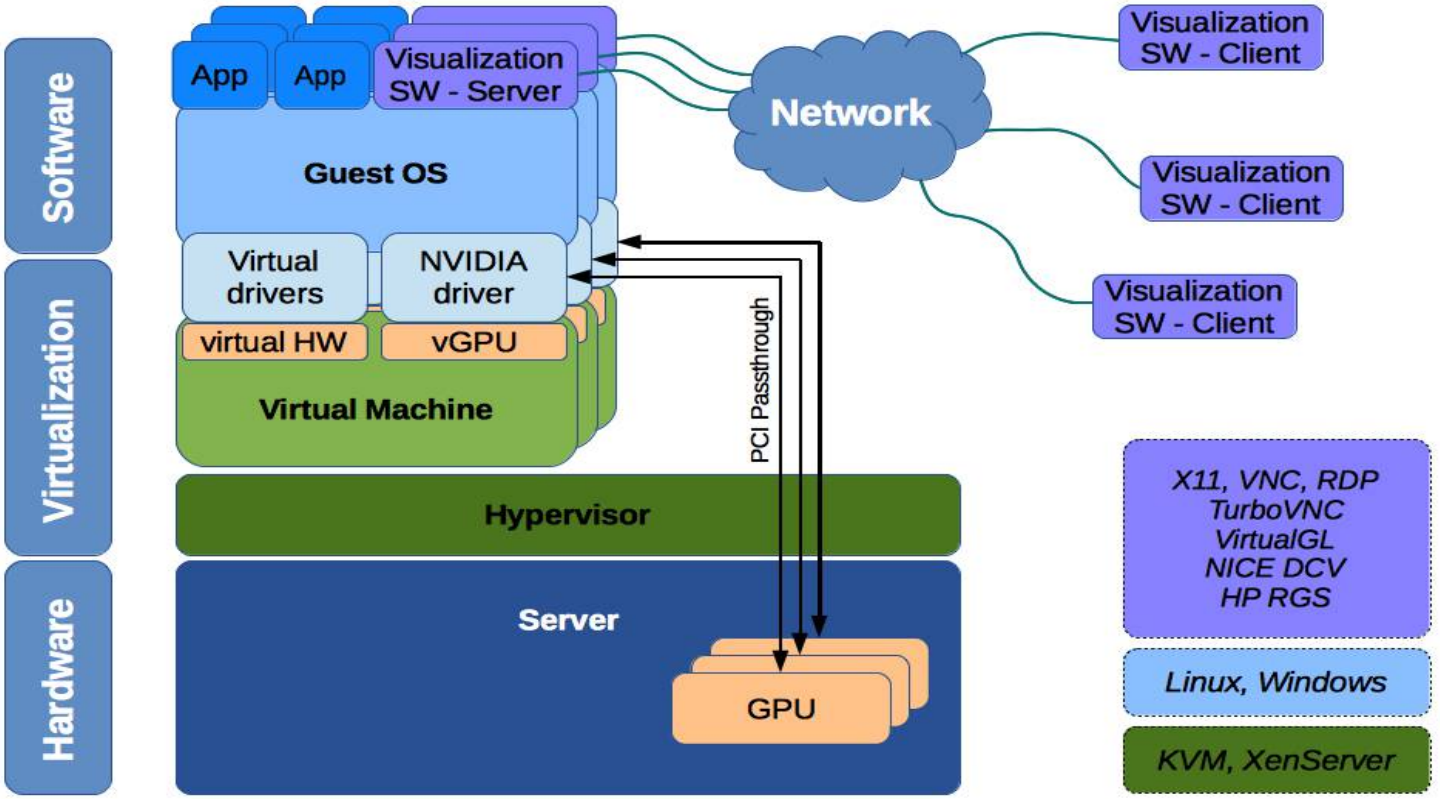
- Developed by eXact in collaboration via Nvidia
- Tested by openViewSHIP partners
  - 1 Viznode integrated in Coca cluster (UNITS)
  - 1 Viznode integrated in c3hpc cluster via openstack cloud
- Driving idea:
  - Open source solution as much as possible
  - Usage transparent to the users

VizNode: HW components

- Nvidia K2 cards

- 1U Multicore node

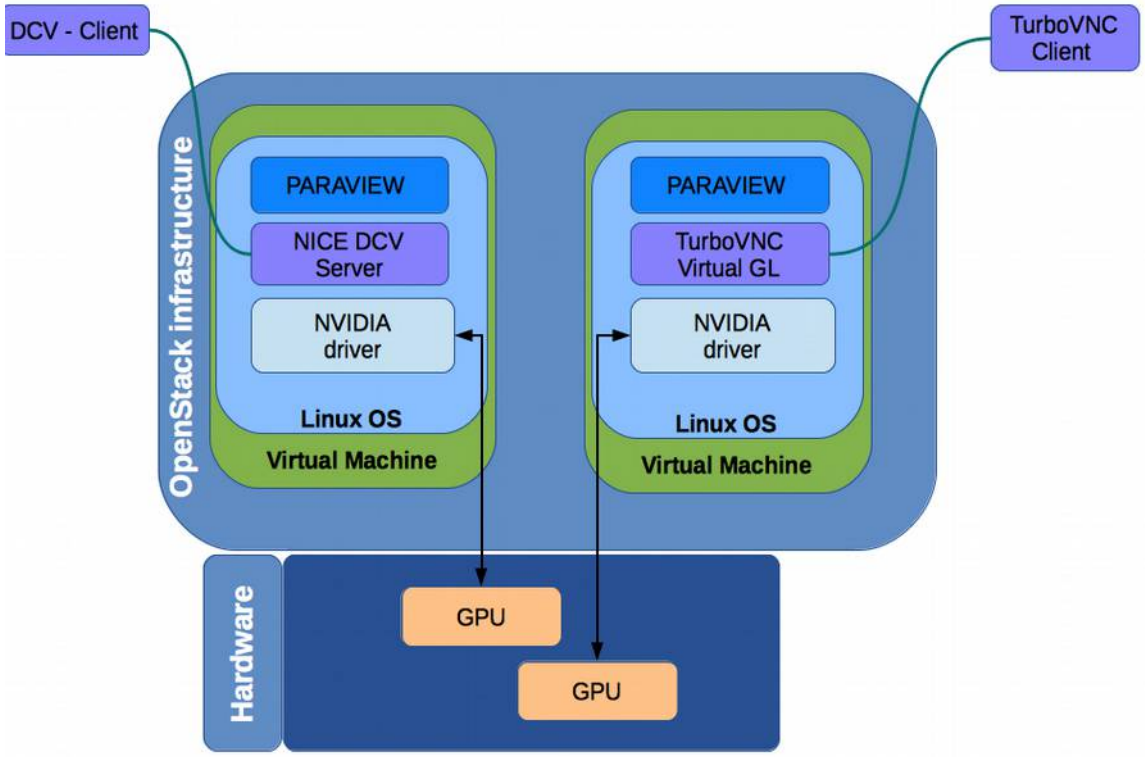
VizNode: the software stack



Remote Visualization software

- Nice DCV
  - proprietary, based on realVNC for remotization, it supports Linux and Windows for the server and Linux, Windows and MacOS for the client.
- HP RGS
  - proprietary, it supports Linux and Windows for the server and Linux, Windows and MacOS for the client.
- VirtualGL with TurboVNC and libjpeg-turbo
  - open-source software collection, it supports Linux, Windows and MacOS for both the server and the client.

VizNode: the c3hpc setup



Today's exercise...

- Log into the VM machine..
- Install the remote visualization software and some testing software
- Compare visualization performance by means of standard X11 forwarding and the remote visualization software.
- See rst file in the github repo (D9 folder)