IT- ecosystem of the HybriLIT platform

[1]Belyakov D., [1]Butenko Yu., [1]Kirakosyan M., [1]Matveev M., [1]Podgainy D., [1]Streltsova O., [1]Torosyan Sh., [2]Vala M., [1]Zuev M.

[1]LIT JINR, Dubna, Russia

[2]Pavol Josef Safarik University, Kosice, Slovakia

In order to efficiently use HPC-resources in solving scientific and applied problems, it is necessary to provide both computing resources and software-information environment that allows users to simplify work with the existing computing resources. Another aspect that influences the development of the software-information environment is integration of HPC-resources with applied program packages that are increasingly being used to solve complex technical problems that are necessary for JINR. All this leads to the formation of an IT ecosystem, which is not only a convenient means for carrying out resource-intensive computations, but also becomes a fruitful educational environment allowing students to learn latest computing architectures, technologies and tools for parallel programming.

Virtual Desktop Interface – Citrix structure

Windows Server 2016 AD
active directory

Active directory
DHCP
DNS

System VMs

Citrix Studio
Citrix StoreFront
LM Citrix
LM Nvidia

Windows Server 2016 DC
Delivery controller

Hypervisor with **2x** CPUs 32 cores, **4x** NVIDIA Tesla M60, **512** Gb RAM and XenServer 7.6 operation system

Change mode from calculate to graphical + NVIDIA GRID drivers install

Using Citrix Center for manage VMs: creating virtual machines and changing hardware settings for master image

Master image

4 Cores, 20 Gb RAM, 2 GDDR, 40 Gb SSD

Citrix environment settings: XenTools, Samda, Nvidia GRID, Citrix VDA

4 Cores, 20 Gb RAM, 2 GDDR, 40 Gb SSD

4 Cores, 20 Gb RAM, 2 GDDR, 40 Gb SSD

HybriLIT environment settings

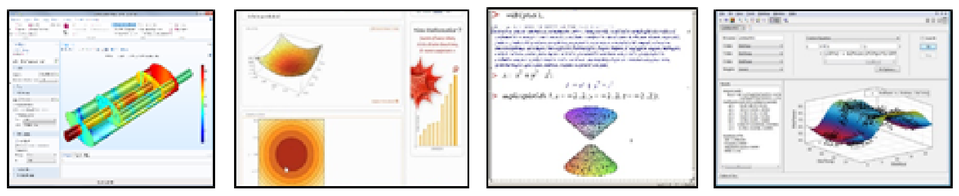
Scientific Linux 7.6, CVMFS with Comsol, Maple, Matlab, Mathematica

4 Cores, 20 Gb RAM, 2 GDDR, 40 Gb SSD

Citrix environment settings: XenTools, Samda, Nvidia GRID, Citrix VDA

Citrix Studio settings: add host, create machine catalog, create delivery group

Connect to Virtual Desktop via browser and Citrix Receiver for running the required packages



Ecosystem for Machine & Deep Learning

Ecosystem for ML/DL

Computation component

Servers with NVIDIA Volta & Intel Xeon Gold

Dell Volta specs:
GPU: 4x Nvidia Volta V100-SXM2 *NVLink* 32Gb HBM2
CPU: 2x Intel(R) Xeon(R) Gold 6148 CPU @ 2.40GHz 20 Cores/40 Threads
RAM: 512 GB DDR4 2666MHz
SSD: 2*240 GB

Development component

VM with JupyterHub
https://jhub.jinr.ru

VM:
CPU: 24 Cores
RAM: 32 GB

NumPy
SciPy
matplotlib
pandas
jupyterhub
TensorFlow
scikit-learn

Tutorials on the basis of the HybriLIT platform

- More than **43** tutorials and lectures on parallel programming technologies were held in 2014-2019 yy.
  - Total number of participants comprises over **500** people from different universities and scientific centers.
    - Participants of the tutorials are students and scientists from Russia, Slovakia, Romania, Armenia, China, Mongolia, Egypt, Bulgaria, India, etc.