INP site: grid and cloud

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General Information

- INP grid site (BY-NCPHEP):

  run by scientists and engineers of Laboratory of Fundamental Interactions, Institute for Nuclear Problems of Belarussian State University (INP BSU);

  we are involved in:

  CMS T3 grid site support

  JINR cloud integration

  NGI_BY regional staff activity

  WLCG computing shifts (ADC)

Milestones

- 2008

  Site was registered in GocDB as BY-NCPHEP

- 2011

  Site was registered in CMS SiteDB as T3 BY-NCPHEP

- 2018

  Integration to JINR cloud

Resources

- servers

  Dell PowerEdge R610/710/620/630 and Supermicro

- physical cores in computing cluster

  200 (most of them X5650 and E5-2620)

- RAM in computing cluster

  680 Gb

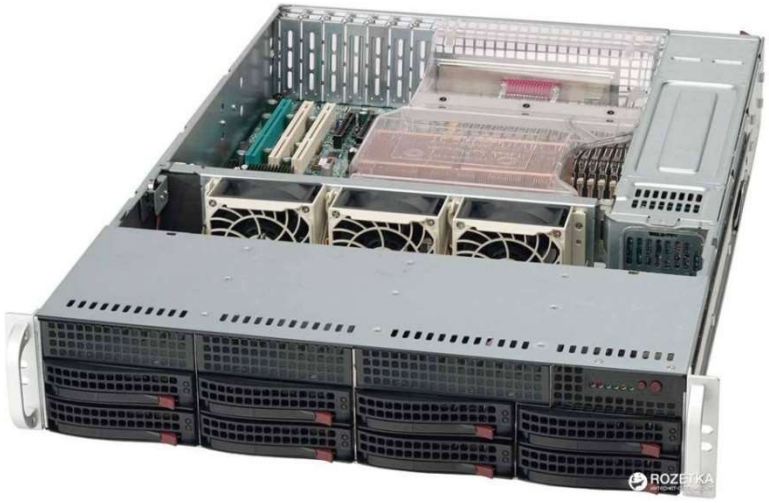
Resources

- Storage 128 Tb:

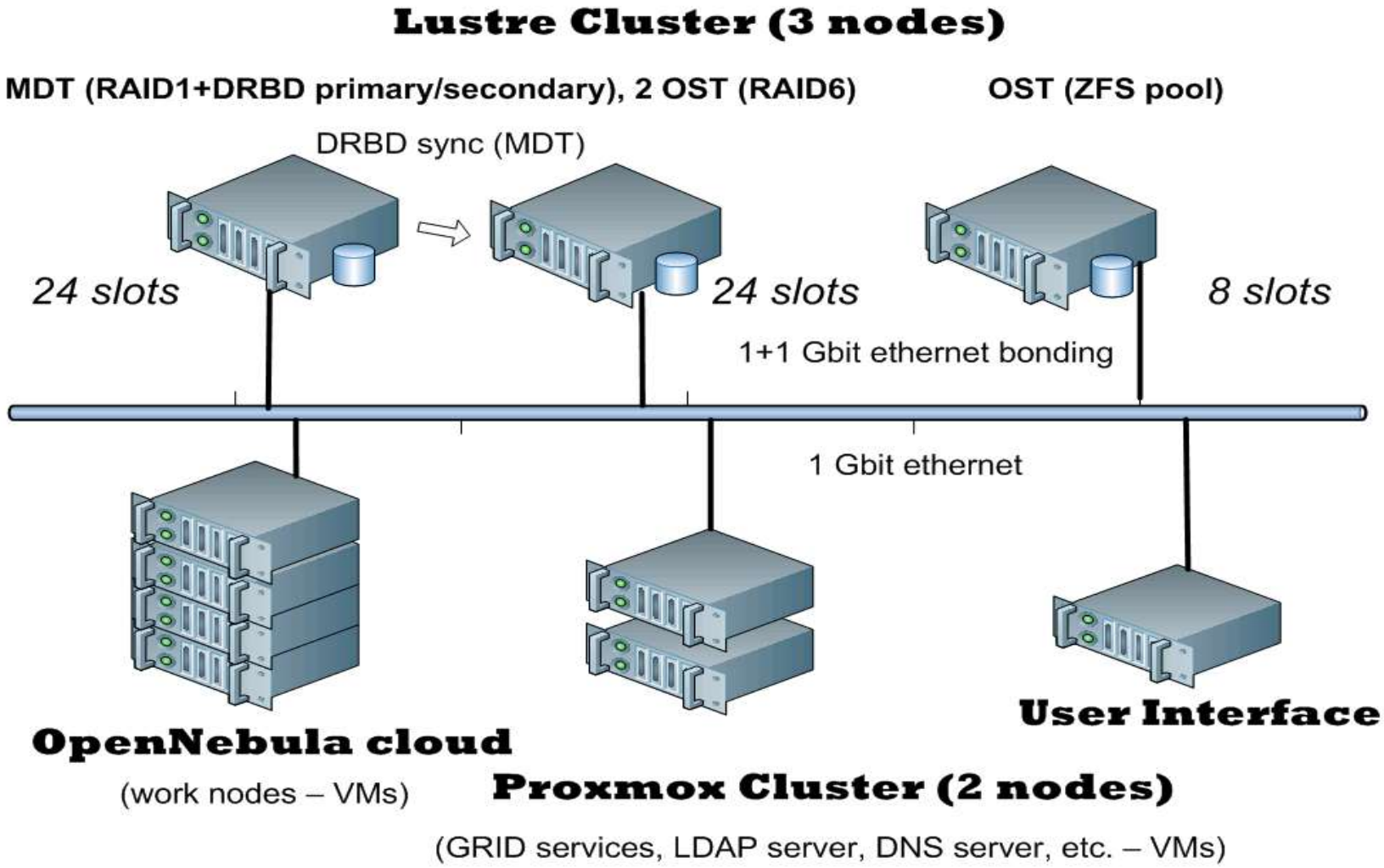
  2 x 24 slots and 1 x 8 slots chassis;

  Lustre (2 MegaRAID RAID6 nodes and 1 ZFS node)

  DRBD

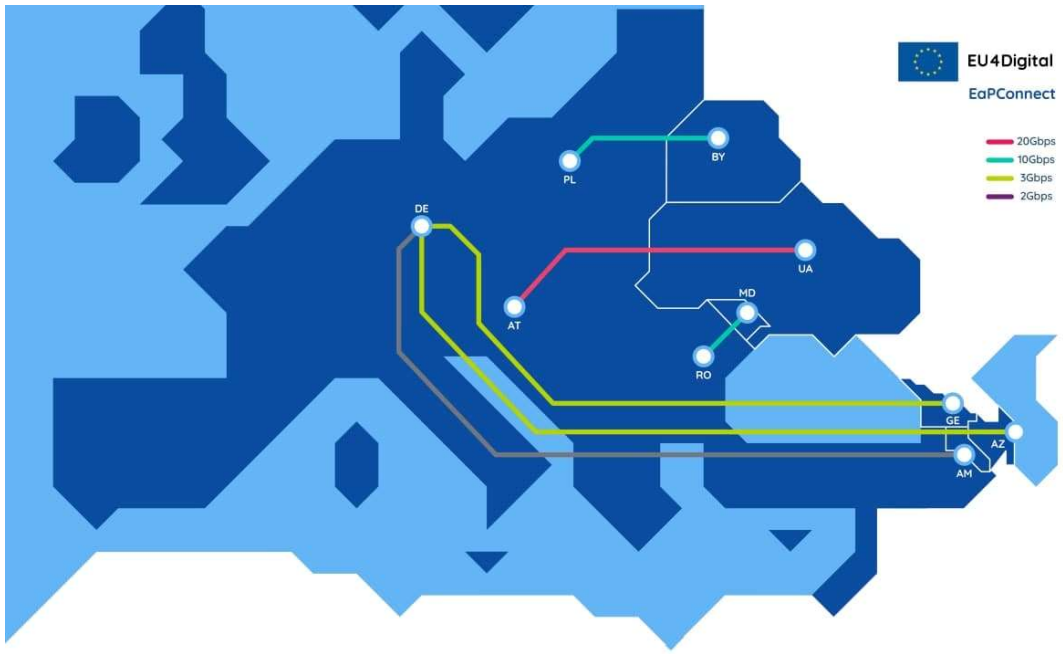


Network


Lustre Cluster (3 nodes)
MDT (RAID1+DRBD primary/secondary), 2 OST (RAID6)
OST (ZFS pool)
DRBD sync (MDT)
24 slots
24 slots
8 slots
1+1 Gbit ethernet bonding
1 Gbit ethernet
OpenNebula cloud
(work nodes – VMs)
User Interface
Proxmox Cluster (2 nodes)
(GRID services, LDAP server, DNS server, etc. – VMs)

Network

- 1Gb LAN with
  - 2Gb bonded interface for storage boxes
  - 2x10 Gb SFP+ Intel X520-DA2 for cluster MPI jobs
- 100Mbit WAN (62 public IPv4 addresses)



GRID services

- The only belarussian certified and production WLCG site at the moment

The Grid WLCG view shows the accounting data from all Grid Sites in the database in Belarus. Accounting information is only gathered from Sites that are certified in GOCDB. The metric shown is Total number of jobs, grouped by Site and Year, all VOs are shown.

Belarus — Total number of jobs by Site and Year (All VOs)

Site	2023	Total	Percent
BY-NCPHEP	5,614	5,614	100%
Total	5,614	5,614	
Percent	100.00%		

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GRID services

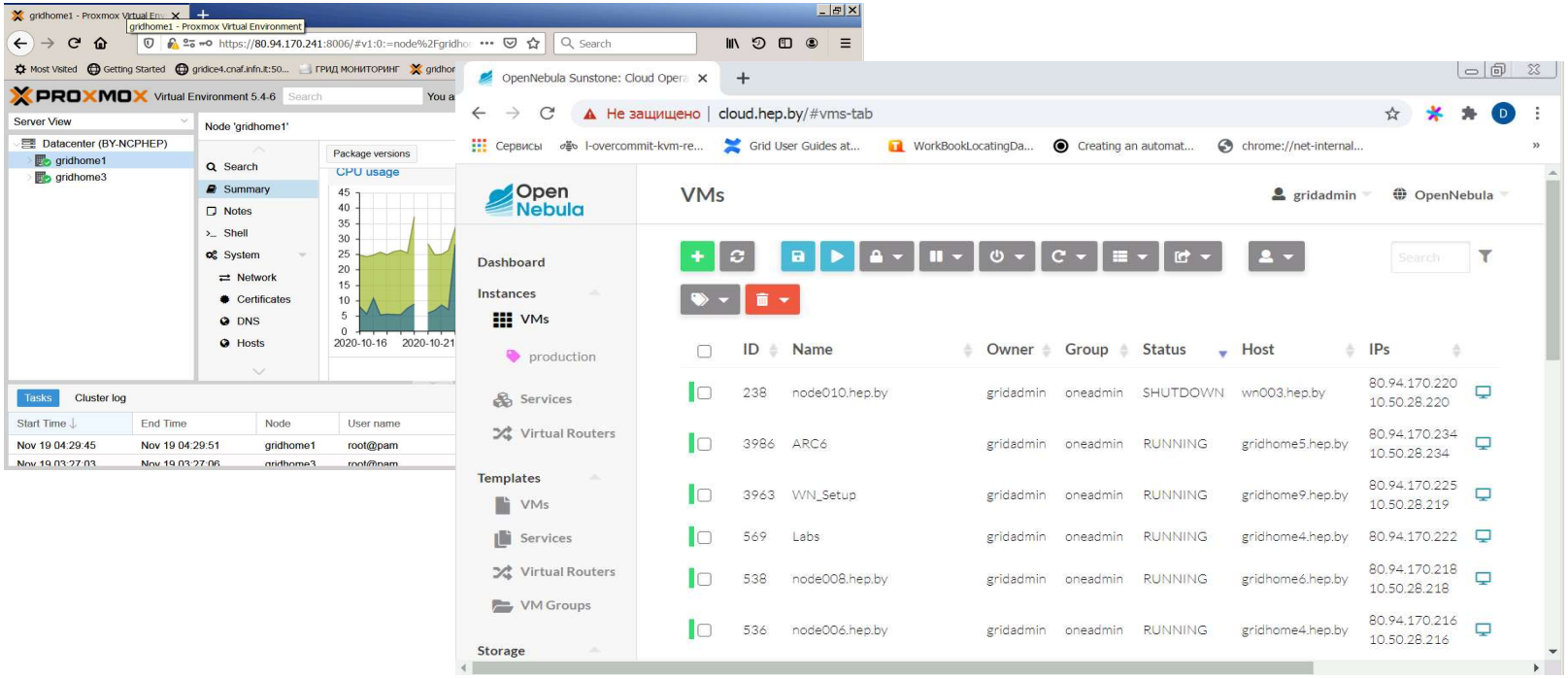
- ARC CE (Torque/Maui)
- Squid Frontier and CVMFS
- StoRM SE
- SBDII
- APEL
- UI

Cloud

- Infrastructure is based on Opennebula and Proxmox VE

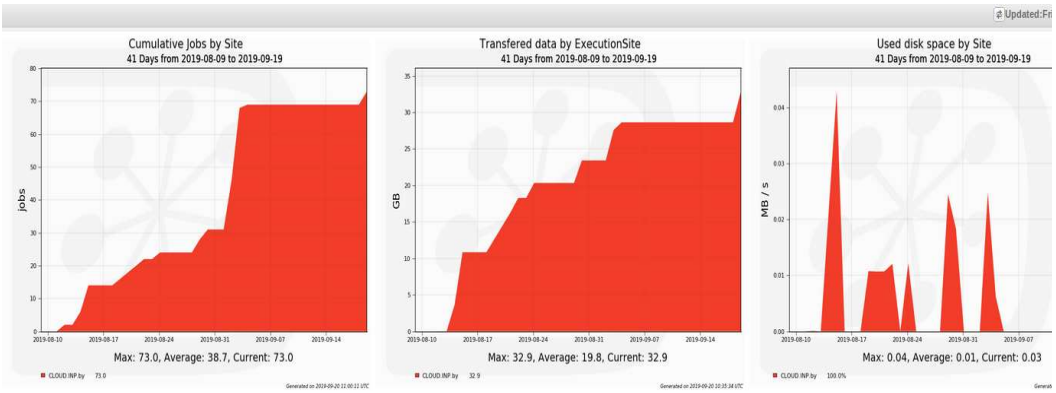
  Proxmox 5.4 (grid services VMs)

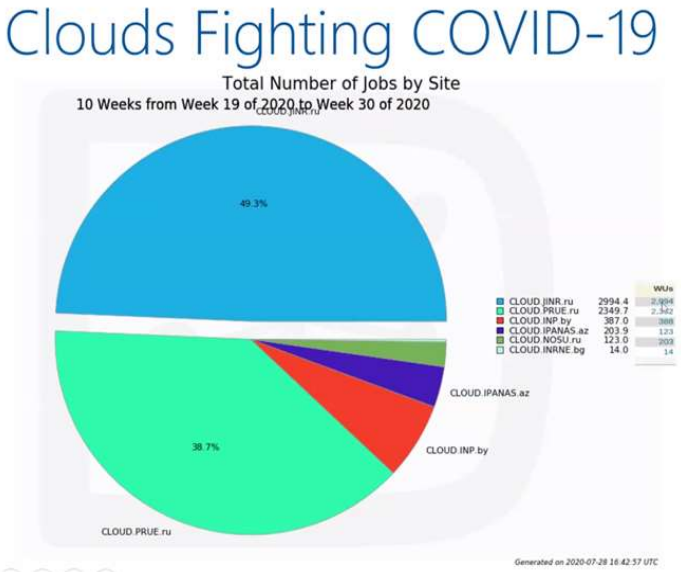
  Opennebula 6.2(work nodes VMs, JINR cloud VMs)



Cloud

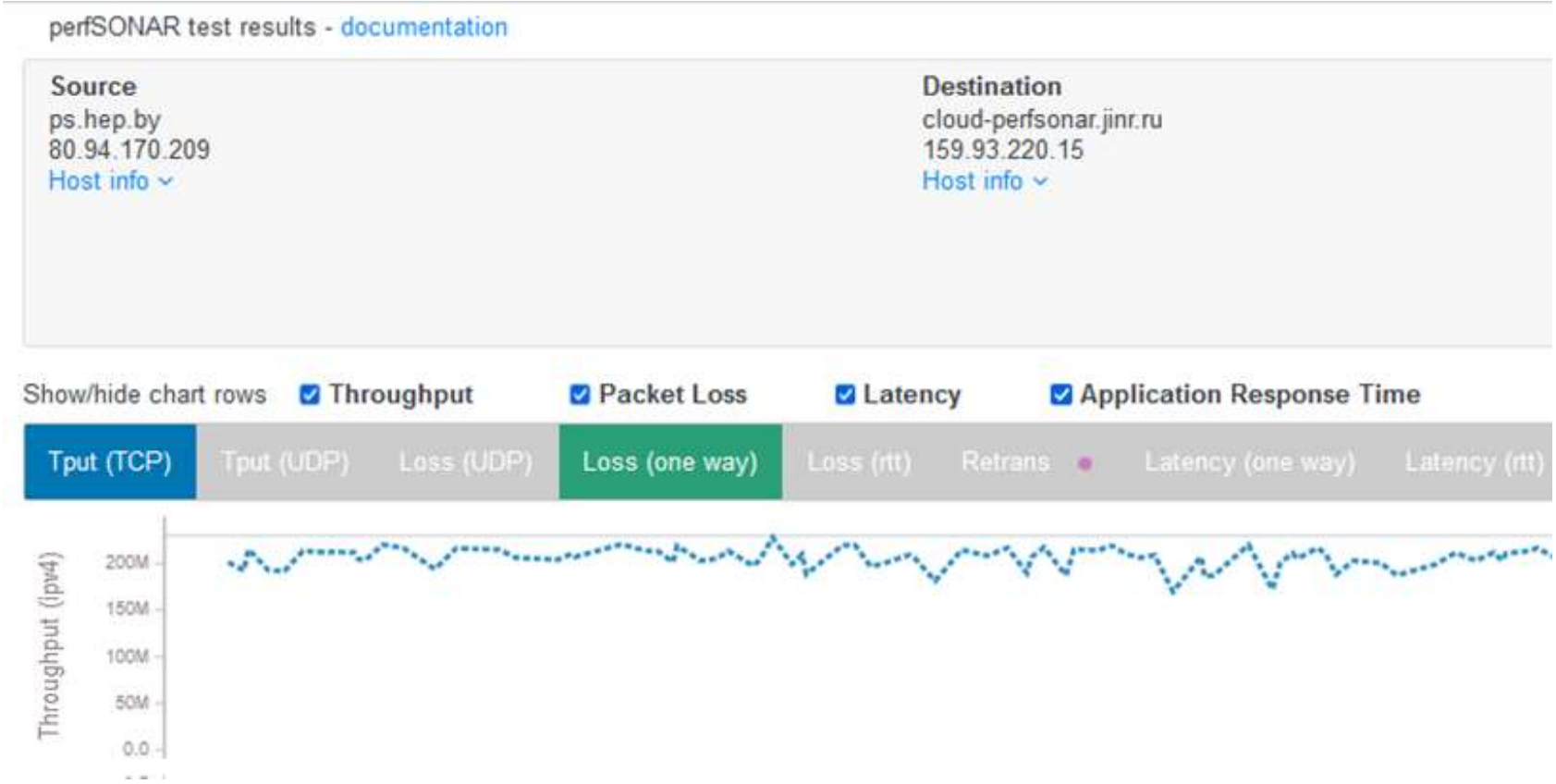
- Cloud is integrated in JINR cloud and participate in joint activity, like COVID-19 folding@home or NICA test data generation





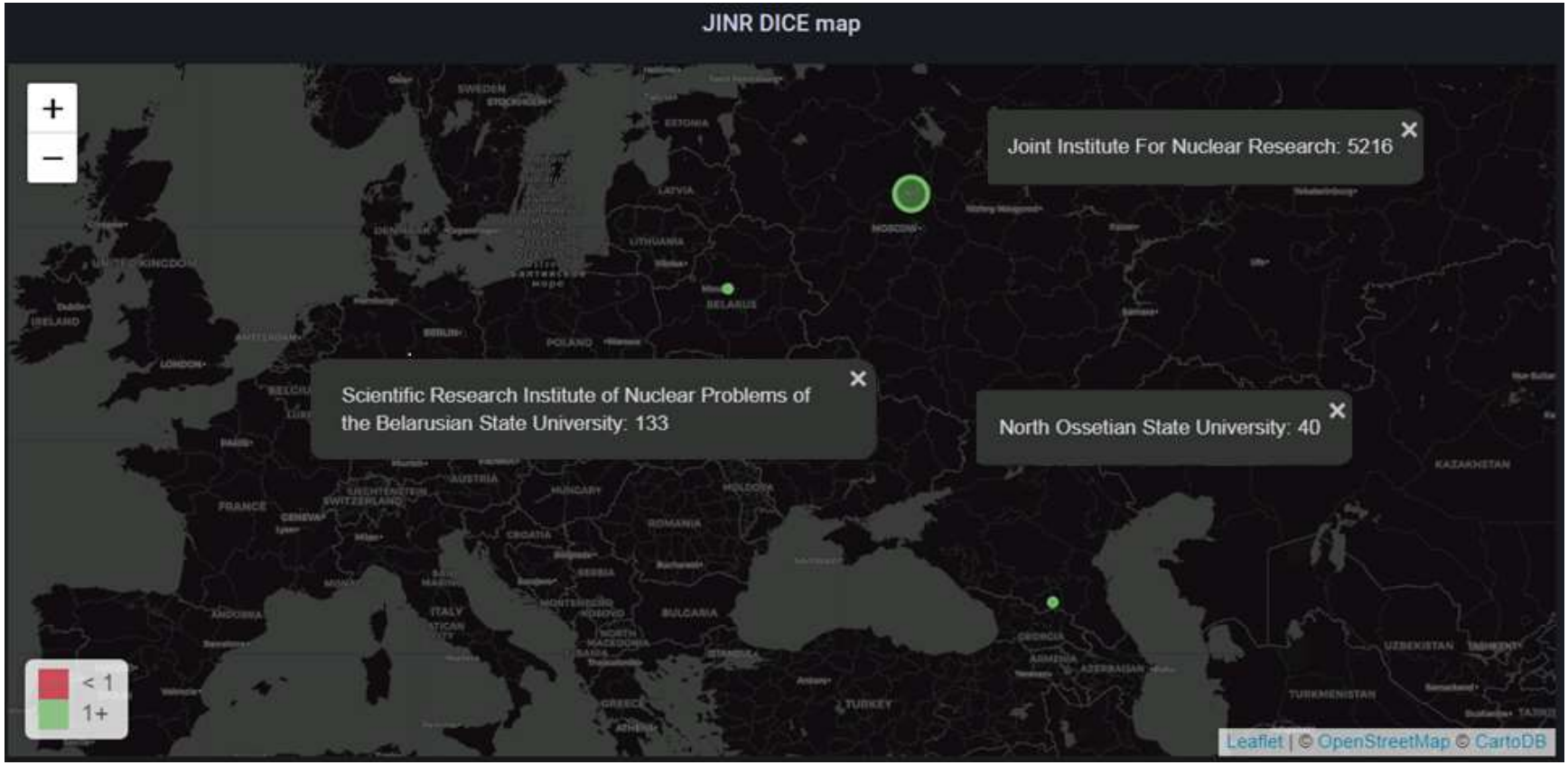
Cloud

- To monitor our network connectivity in JINR cloud, the perfSONAR toolkit is used



Cloud

- JINR cloud monitoring service was deployed recently (prometheus + thanos docker containers)



Software supported

- WLCG and CMS VO software (CVMFS distribution model)
- ORCA, Quantum ESPRESSO (MPICH, OpenMPI, OpenMP)
- Virtual Labs (ROOT and pythia) for Belarussian State University students

Software supported: some details

- - work nodes are VMs in the cloud
- - single basic image has all preinstalled software
  (and both CERN and JINR CVMFS mounts)
- - VMs performance optimized by:
  guest-to-host NUMA mapping
  (qemu-kvm replaced by qemu-kvm-ev)
- - hyperthreading on host:
  disabled for VMs running computational tasks

Software supported: NICA

- MPD/SPD VO are enabled on the CE (grid04.hep.by)

The view shows the accounting data in Site BY-NCPHEP. The metric shown is Total number of jobs, grouped by VO and Month, all VOs are shown.

Resource Centre BY-NCPHEP — Total number of jobs by VO and Month (All VOs)

VO	Jun 2023	Total	Percent
atlas	400	400	7.72%
ops	3,778	3,778	72.96%
spd.nica.jinr	1,000	1,000	19.31%
Total	5,178	5,178	
Percent	100.00%		

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Software supported: NICA

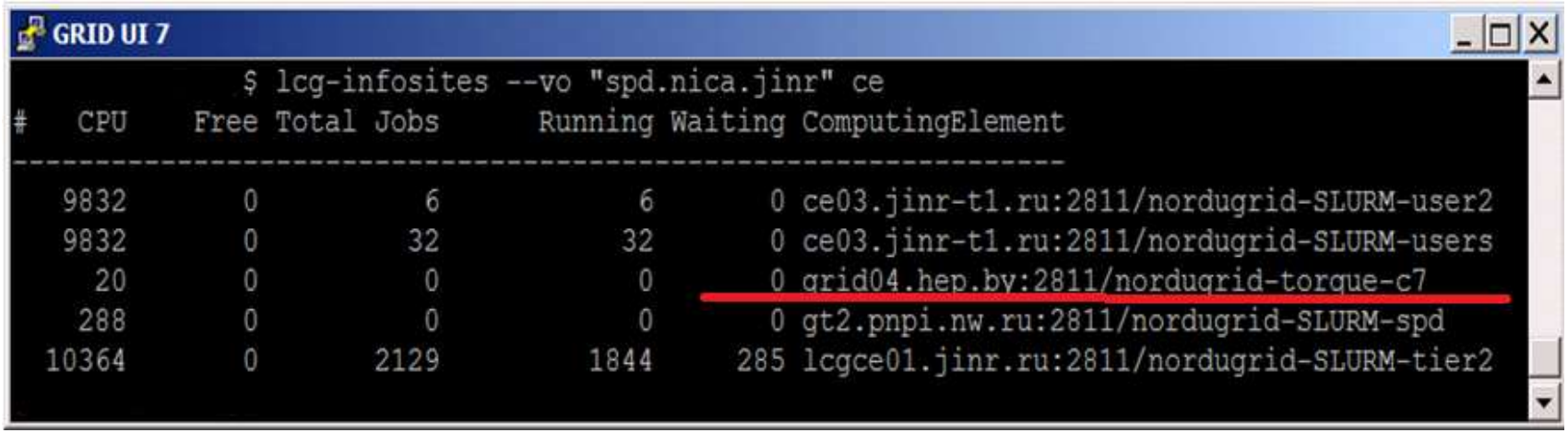
- spdroot 4.1.5.1 is available from CVMFS like:

  source /cvmfs/nica.jinr.ru/spd/centos7/spdroot/4.1.5.1/bin/SetEnv.sh

  spdroot.py spdroot/4.1.5.1/share/examples/SimuQslPy6.C

- test to check declaration for SPD support:

  lcg-infosites --vo "spd.nica.jinr" ce



Software supported: NICA

- Available ways to access data:

  - our StoRM SE is configured to support MPD/SPD

  - data located at eos.jinr.ru are available by
    EOS client for VO members (eosfusebind x509)

Monitoring tools

- Ganglia (cluster health)
- UptimeRobot (servers uptime)
- Cacti (router traffic)
- PerfSonar (channel bandwidth)
- WLCG/EGI monitoring (grid services)
- custom scripts (SMART, temperature, etc.)

Plans

- further JINR Cloud integration
- expand support for MPD/SPD computing
- resources extension (cores, disks, LAN/WAN)
- try
  - ipv6
  - tokens