JINR
MLiT

NICA
MPD

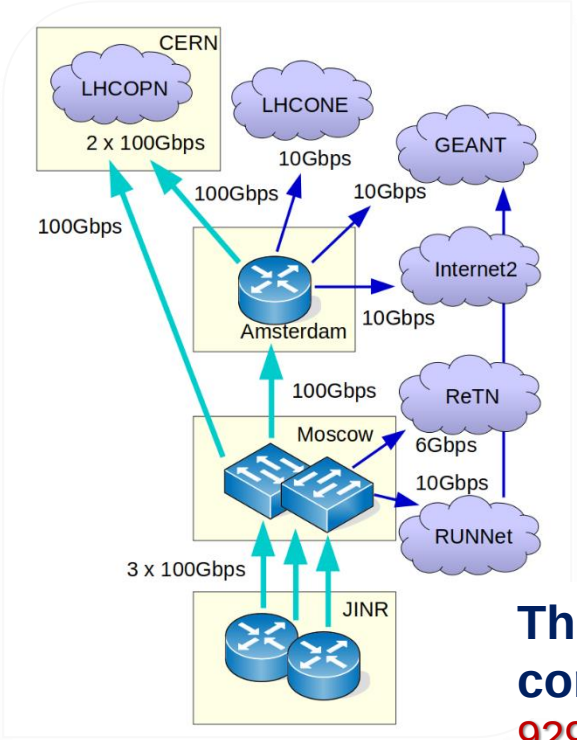
MPD 14th collaboration meeting

MLIT resources and services for the MPD experiment

Igor Pelevanyuk

Mescheryakov Laboratory of Information Technologies

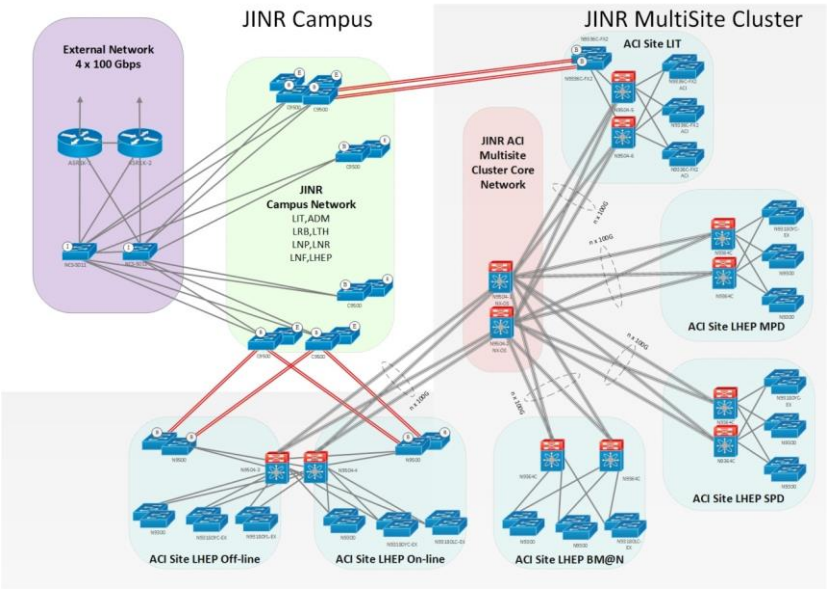
Network in JINR



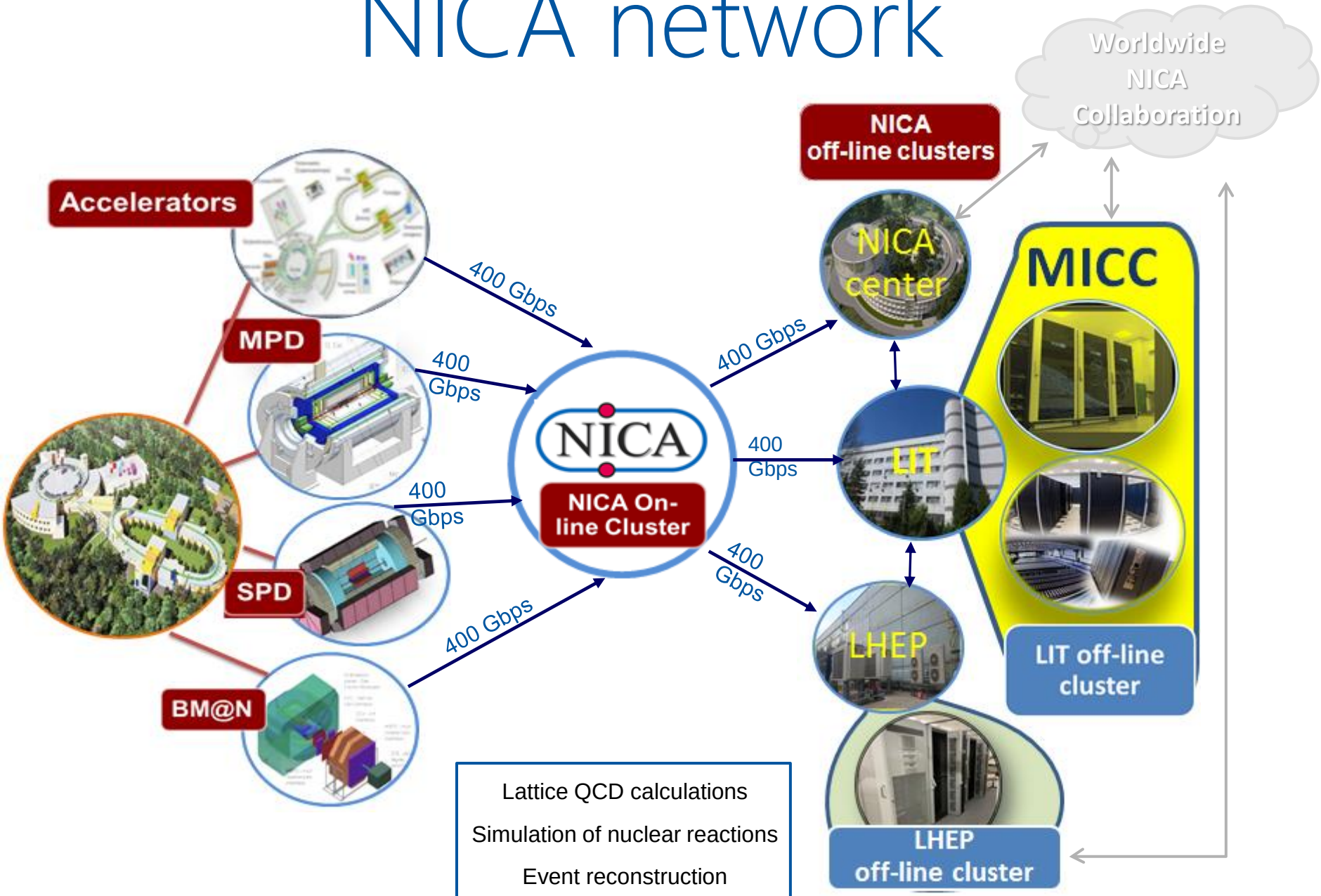
- JINR-Moscow 3x100 Gbit/s
- JINR-CERN - 100 Gbit/s and JINR-Amsterdam 100 Gbit/s for LHCOPN, LHCONE, GEANT networks
- Direct channels up to 100 Gbit/s for communication using RU-VRF technology with the collaboration of RUHEP research centers and with Runnet, ReTN networks
- The multi-site cluster network with a bandwidth 4x100 Gbit/s between VBLHEP and MLIT

The JINR LAN comprises:

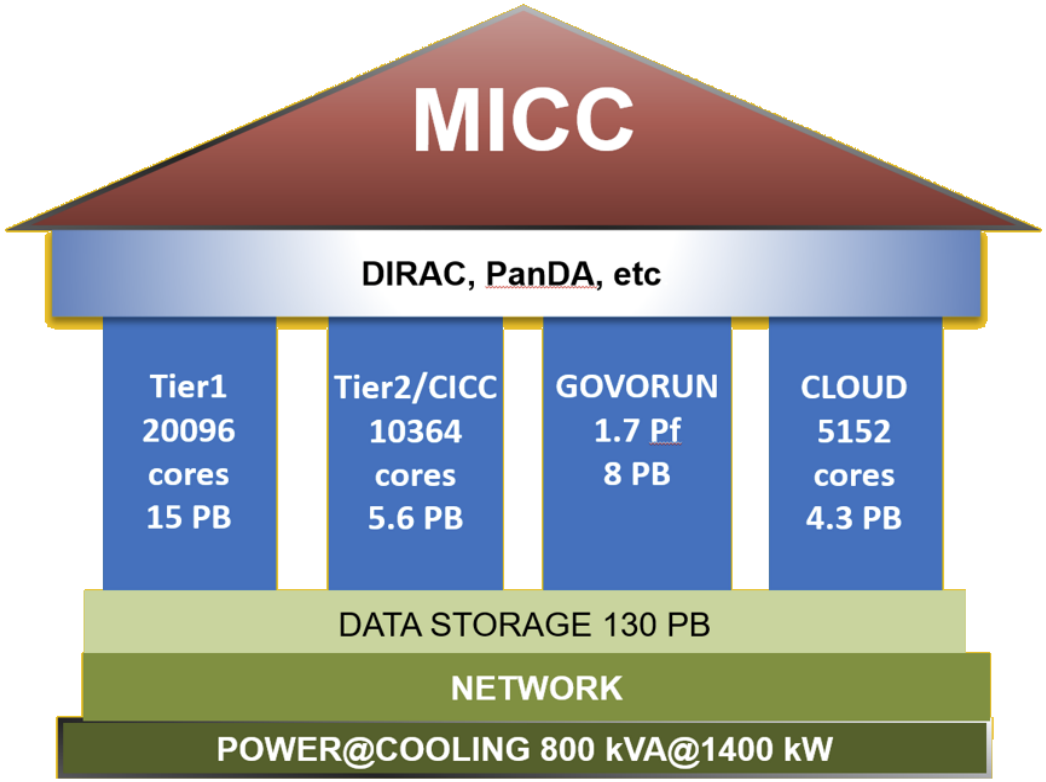
9291 network elements
18044 IP-addresses
6355 users registered within the network
4477 *.jinr.ru service users
1455 digital library users
837 remote VPN
111 EDUROAM users



NICA network



Multifunctional Information and Computing Complex



4 advanced software and hardware components:

- Tier1 grid site
- Tier2 grid site
- Govorun supercomputer
- Cloud infrastructure

Distributed multi-layer data storage system

- Disks
- Robotized tape library

Engineering infrastructure

- Power
- Cooling

Network

- Wide Area Network
- Local Area Network

We ensure **multifunctionality**, **scalability**, **high performance**, **reliability** and **availability** in 24x7x365 mode for different user groups that carry out scientific studies within the JINR Topical Plan

MICC storage systems

Disks
43 PB

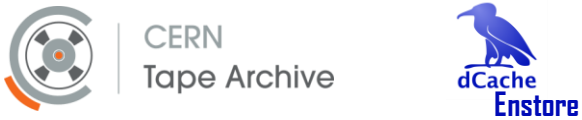
Disks are the main storage that allows processing of experimental and Monte-Carlo data

EOS storage is used by all experiments on NICA collider. dCache is used by CMS experiment.

MPD statistics on MLIT EOS:
Physical space occupied – 2.04 PB
Physical space free – 0.36 PB
MPD space on EOS may be expanded (to some extent) by request.

Tapes
100 PB

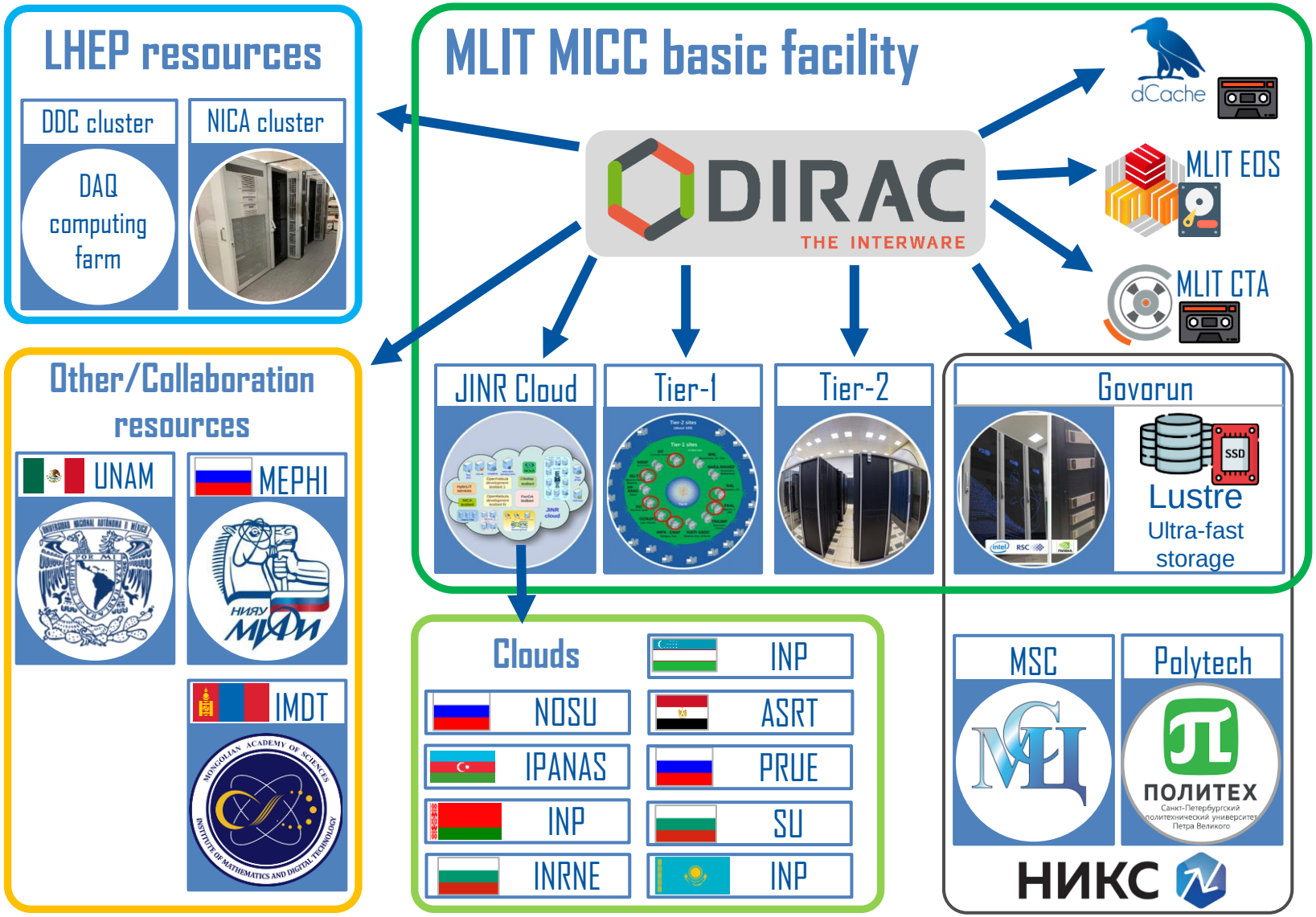
Tapes are primarily used for data backups



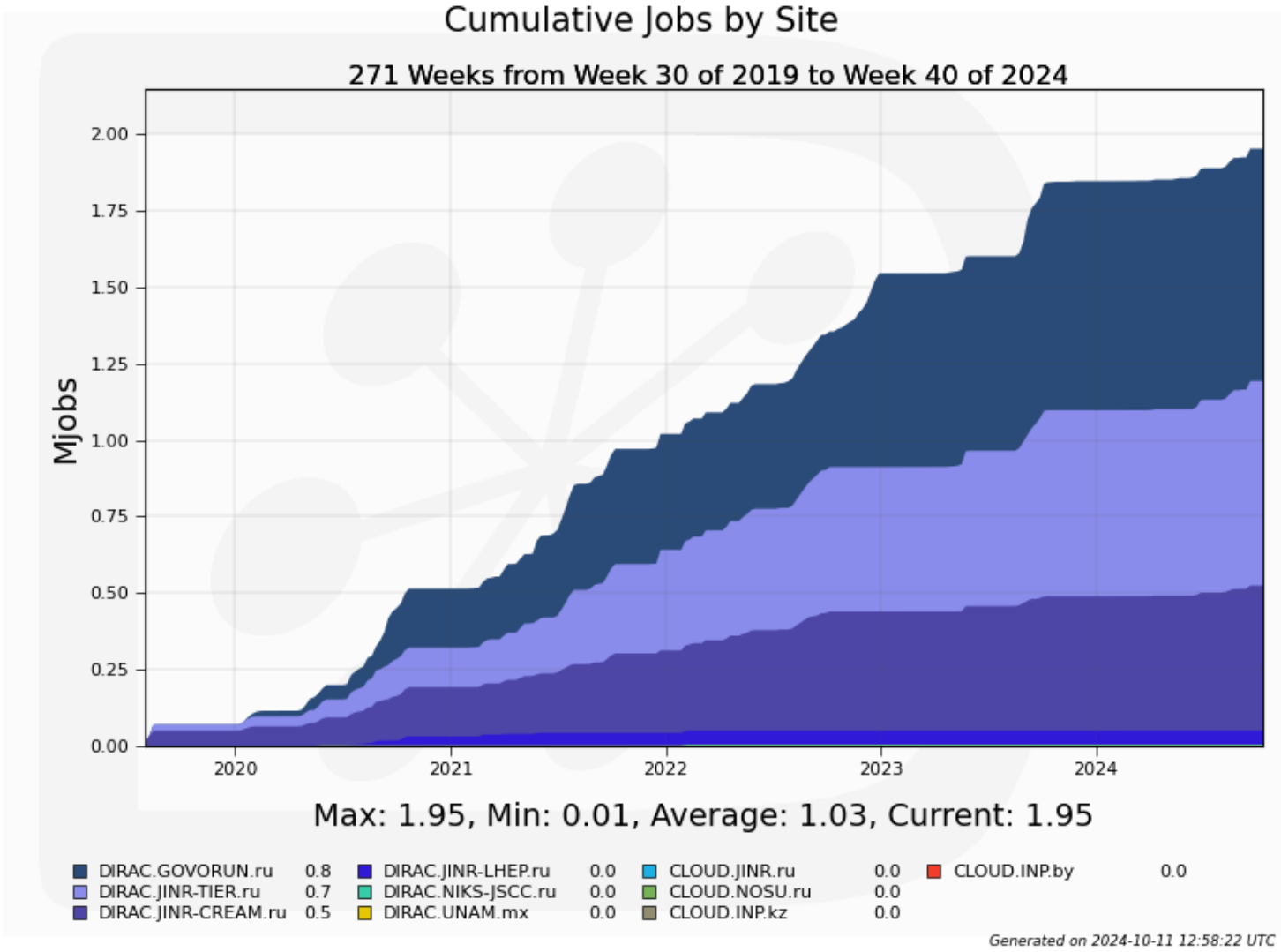
Enstore is the original system that may work with dCache to provide access to tapes. CTA is a CERN archival solution, it is rather new system which was adopted by many experiments.

CTA is proposed to be used as an archival storage for MPD. That is ongoing work by MPD members from MLIT.

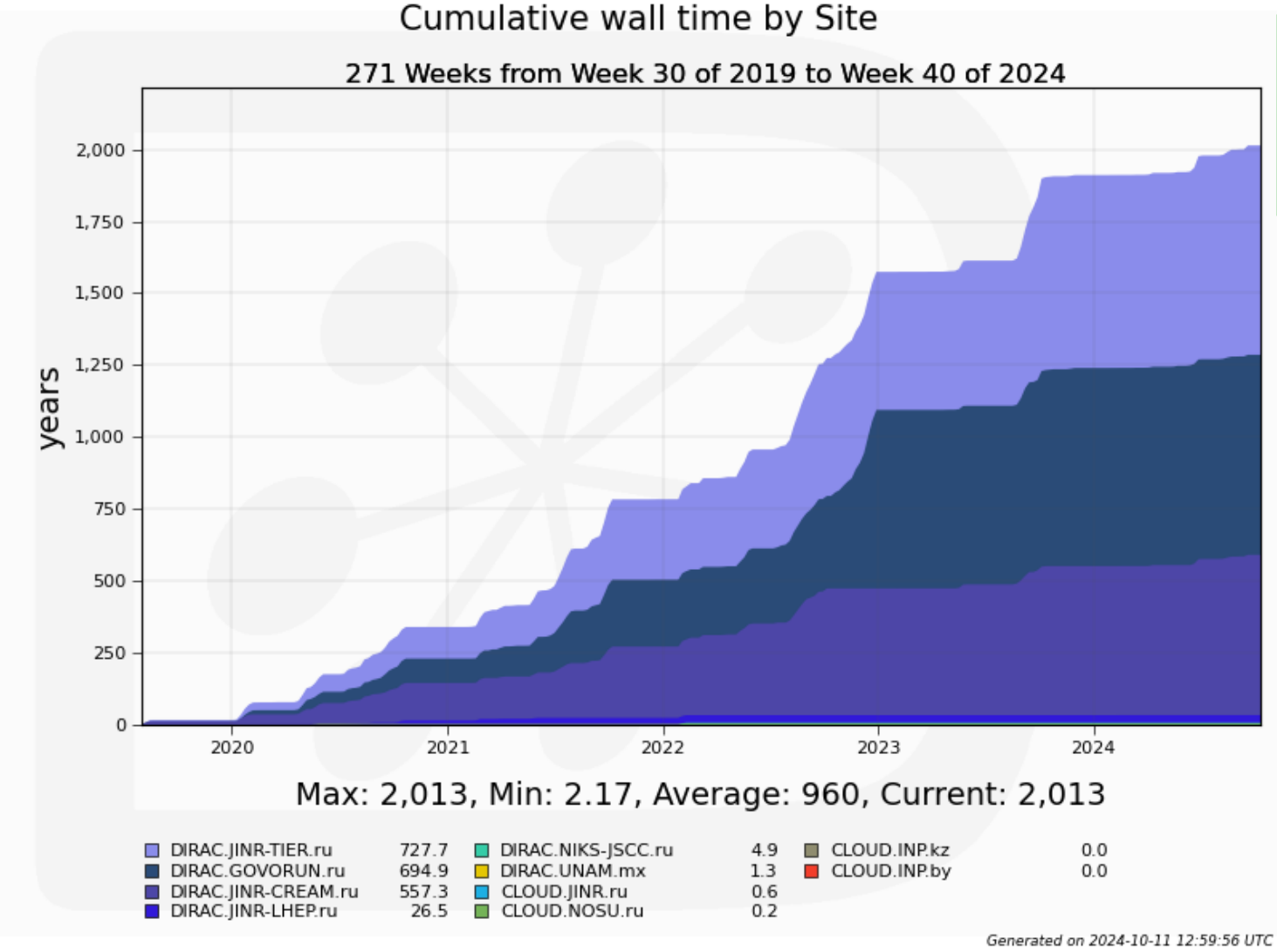
DIRAC in JINR



Successful MPD Jobs executed



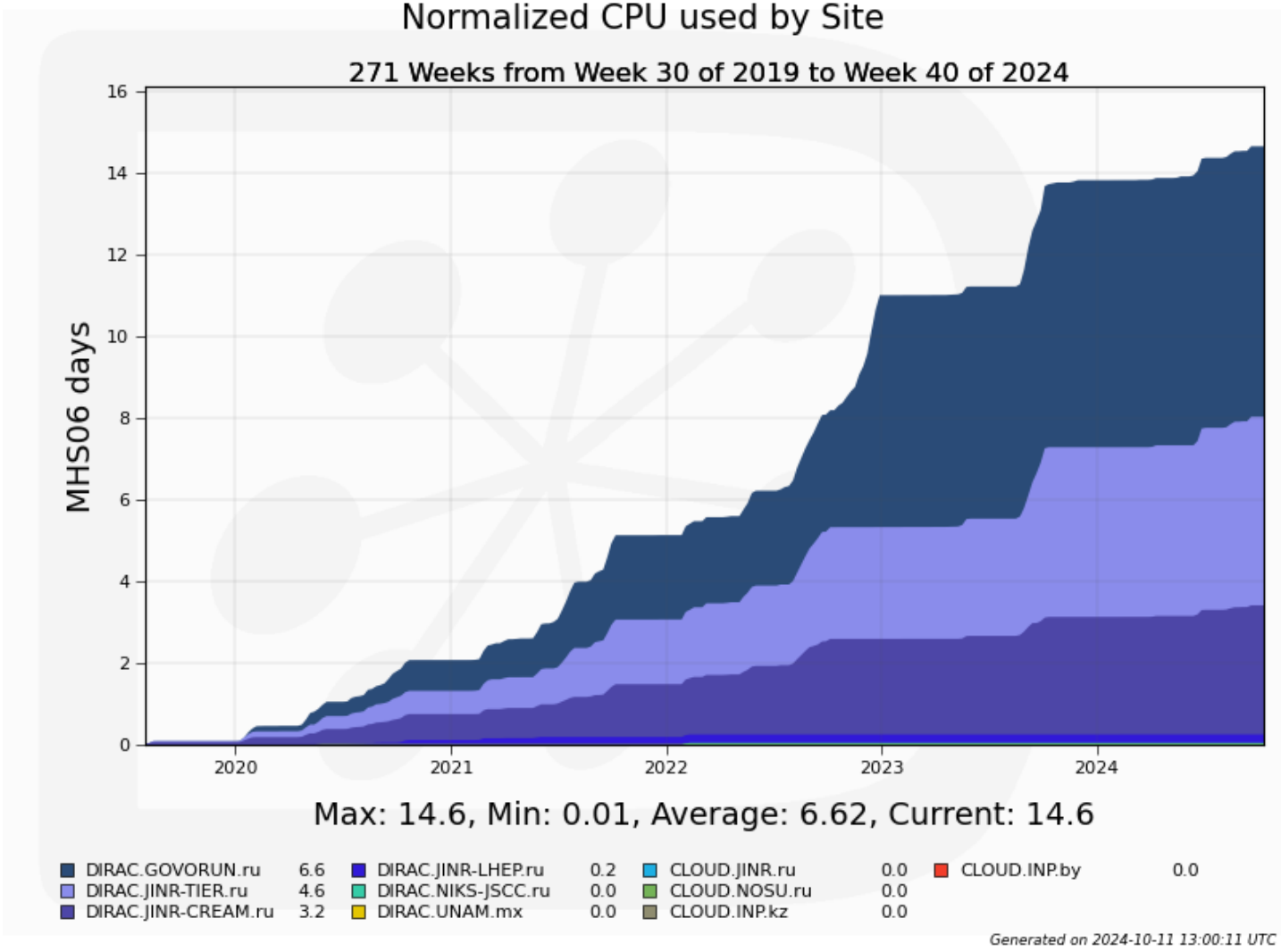
Successful MPD Jobs walltime



2013

total computation time (years)

Successful MPD Jobs normalized time



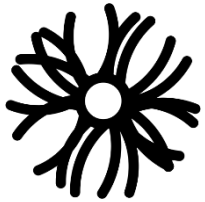
40k

HEPSpec06 Years

MPD in numbers

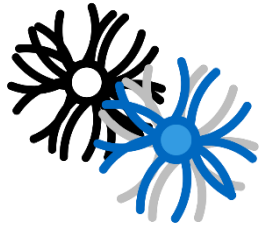
36

data generation campaigns



1.412 B

events generated

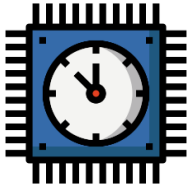


568

events reconstructed

1.95 M

jobs completed



2013

total computation time(years)

1.6 PB

MPD data produced

10

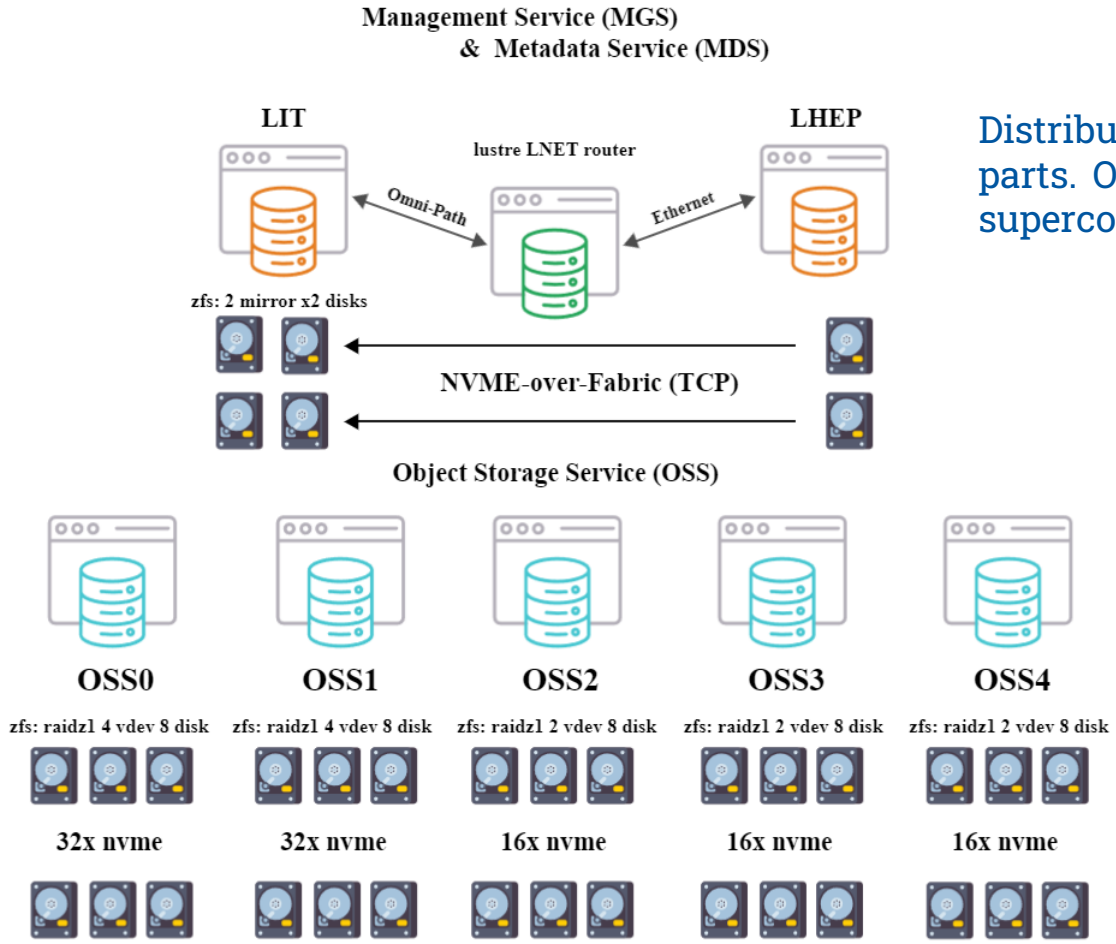
data analysis campaigns

500 M

events analyzed

Distributed Lustre Govorun/NCX

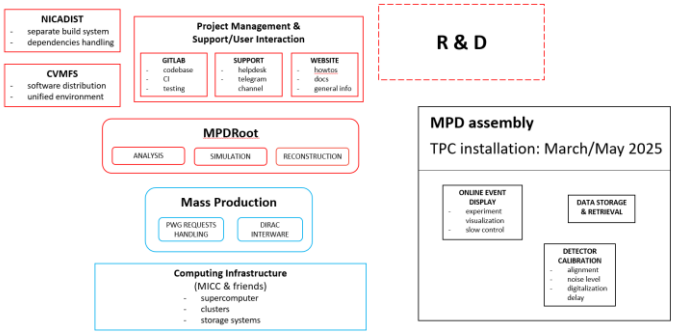
The task is to simplify data transfers between Govorun supercomputer and NCX cluster



Distributed Lustre file system consists from two parts. One on NCX cluster and one on Govorun supercomputer.

Tests done with DIRAC demonstrated good performance of distributed Lustre file system which was similar to local HDD performance.

MPDRoot Developments



MLIT is responsible for applying modern development and integration techniques for mpdroot software. New releases are published regularly.
Automatic tests and deployment is done using GitLab and CVMFS.

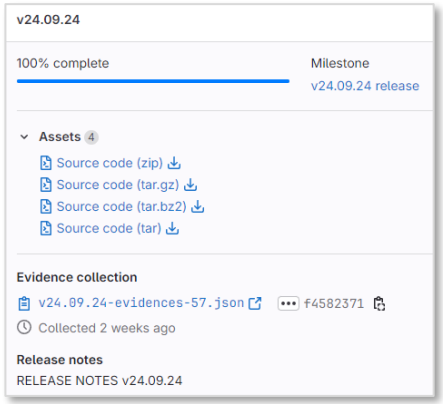
git.jinr.ru/nica/mpdroot/-/releases

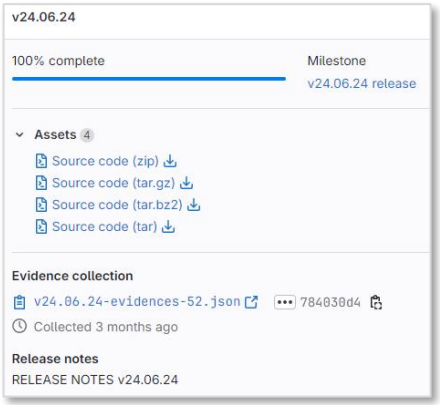
New features

- Analysis updates (physicists)
- LUSI detector
- Global QA histograms
- ACTS vertexing
- ACTS v36 port

Latest dependencies

- ROOT …… 6.32.06
- GCC ……13.2.0
- Boost …….1.83.0
- FairRoot …. 18.6.10
- GEANT4 …. 11.2.1
- Python ……. 3.12.4
- GSL ……2.8
- Fedora 40, Ubuntu 24.04 LTS



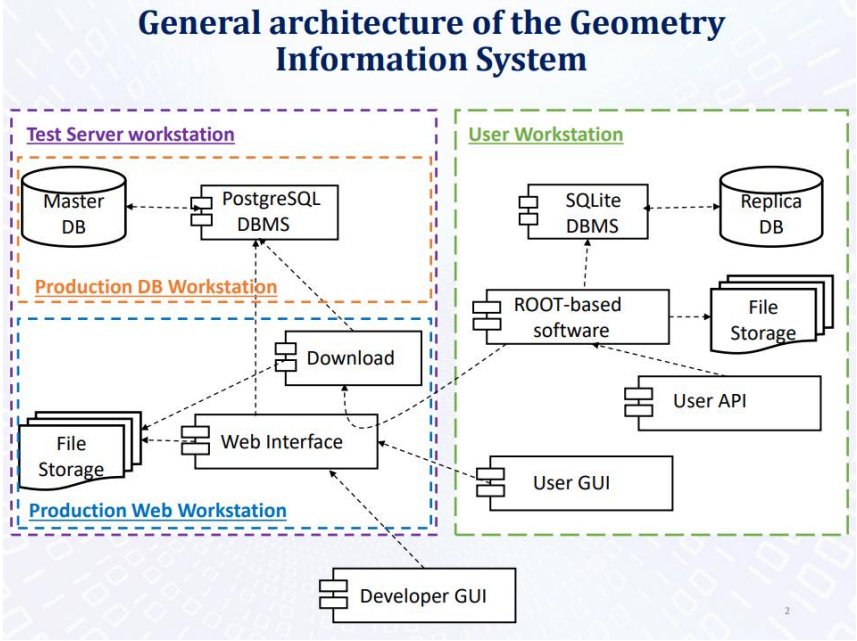


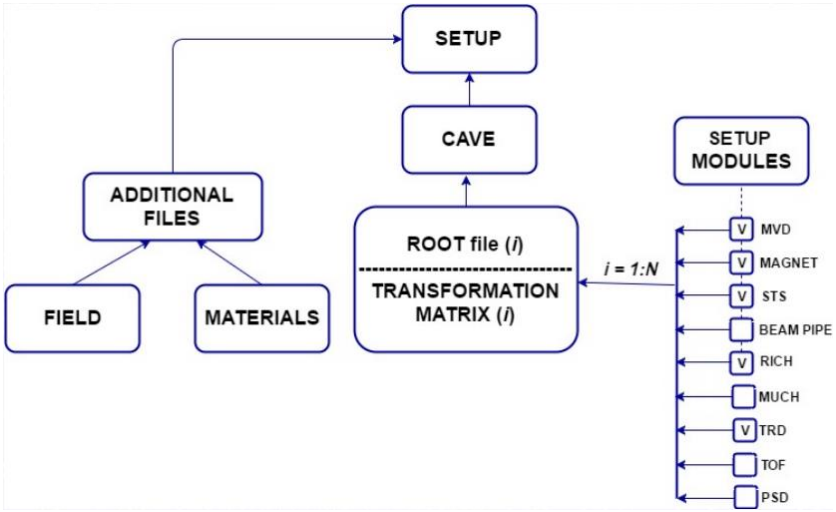
More detailed info will be presented today by Slavomir Hnatic: https://indico.jinr.ru/event/4806/contributions/27982/

MPD databases

There are two databases that are in development now and crucial for successful MPD operations: Geometry DB and Conditions DB.

Team in MLIT develops their structure and study a way to improve performance of these databases.

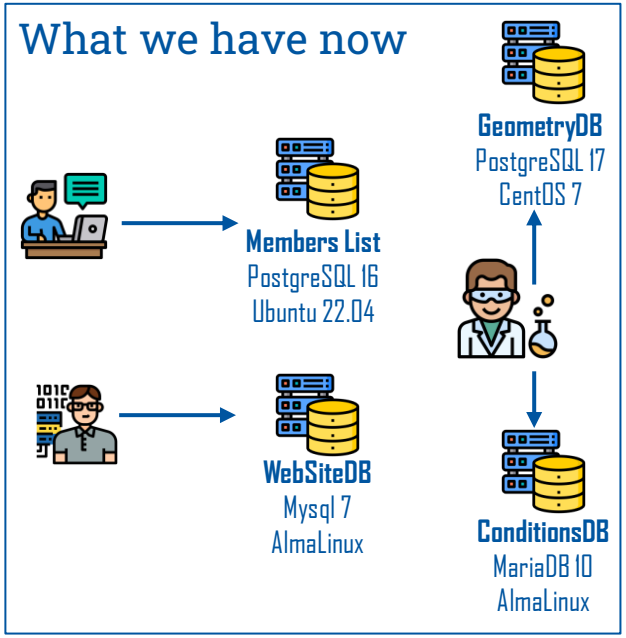


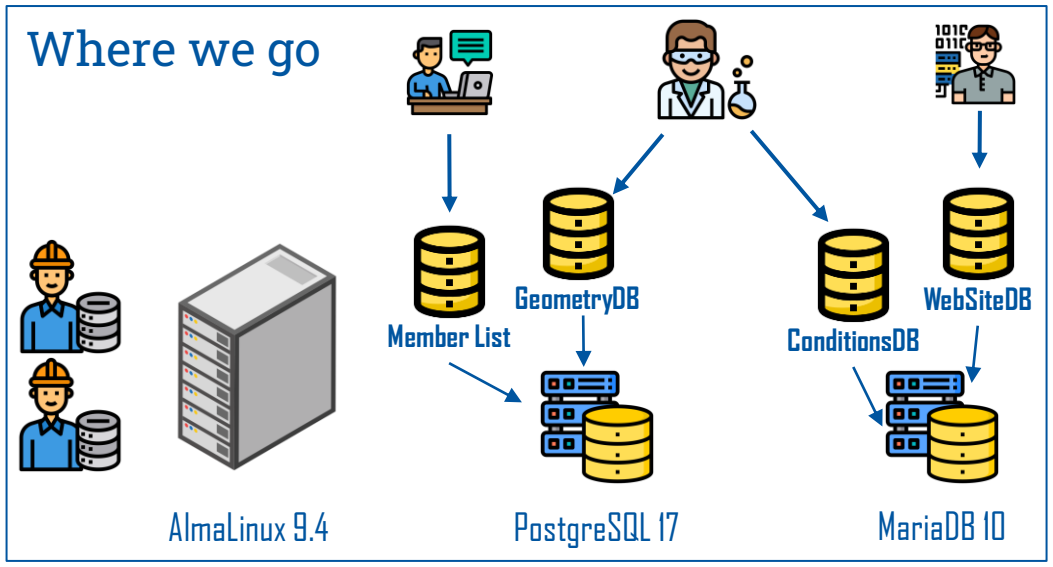


The prototype of the Condition database, at the request of users, was created in 2023. For this purpose, the state database created for BM@N was used. It was adapted for the MPD experiment. At the moment, it is being transferred from the HybriLIT to a special machine.

Central Database Service

The need to host and support a number of databases leads to the need for some sort of Central Database Service.
An establishing meeting was organized with representatives from MPD experiment to discuss requirements and usage models of this service.





This approach should:

- Free developers from administration
- Simplify OS and DB updates
- Automate backup procedures
- Improve security
- Boost DB performance

In development

Storage Service for Scientific Documentation

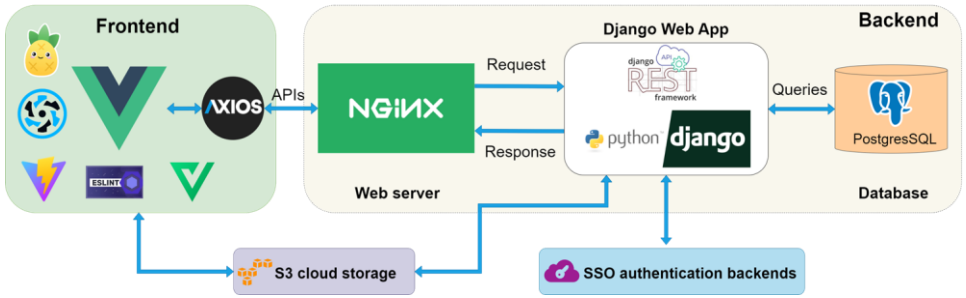
Scientific groups collaborate on various types of documents:

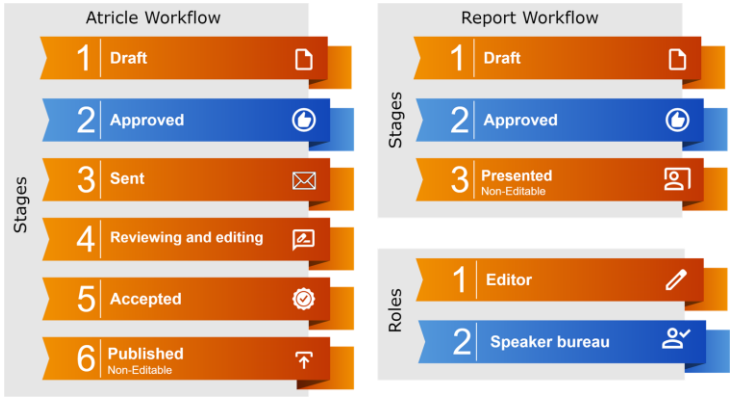
- Articles
- Abstracts
- Presentations
- Reports, etc

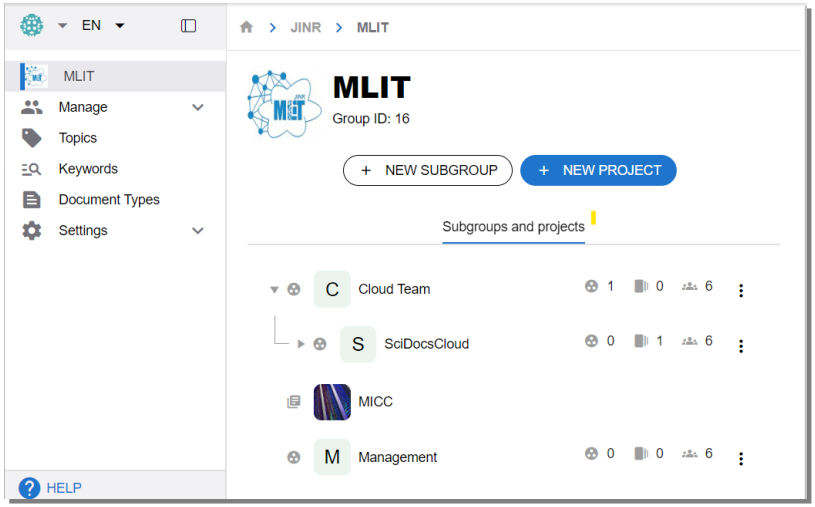
Common challenges of collaborative work:

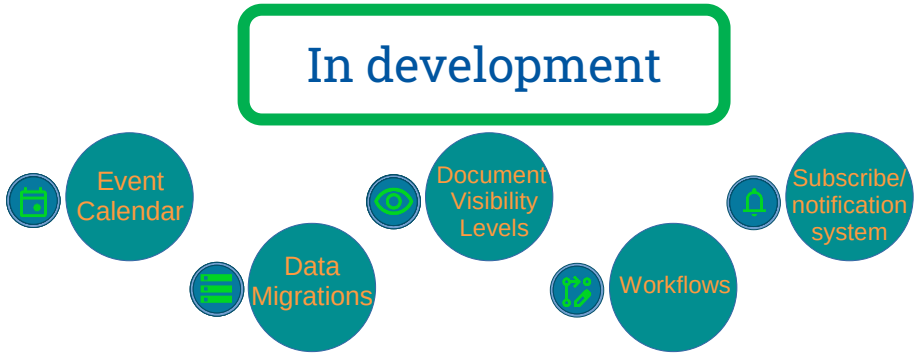
- Organizing safe and structure documents storage
- Tracking changes to documents
- Restricting access to documents
- Sharing of documents

The service is available for use: https://docs.jinr.ru



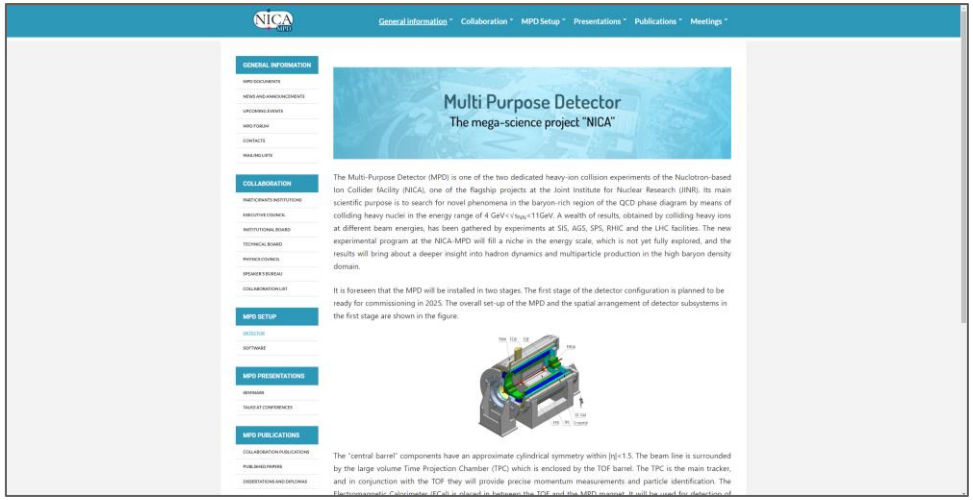






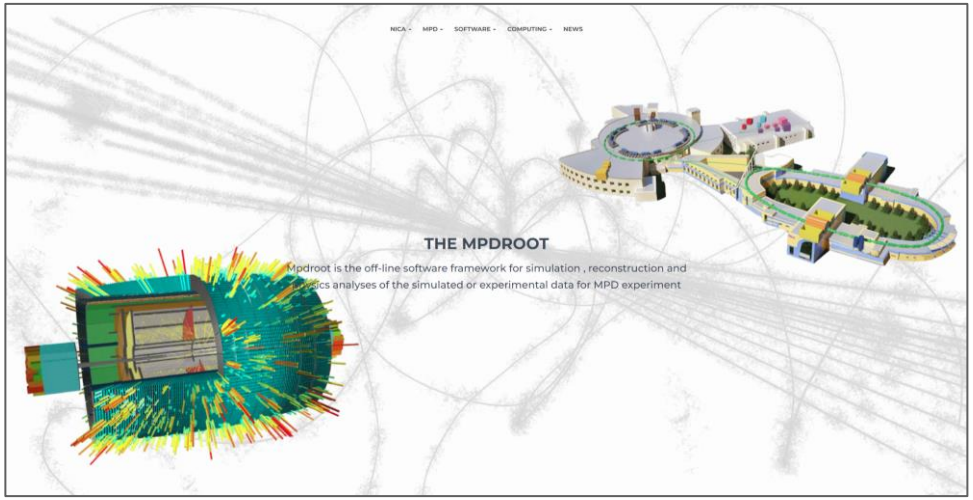
MPD collaboration websites

MLIT is hosting some of the MPD Collaboration websites. Some participants from MLIT were taking participation is websites developments.



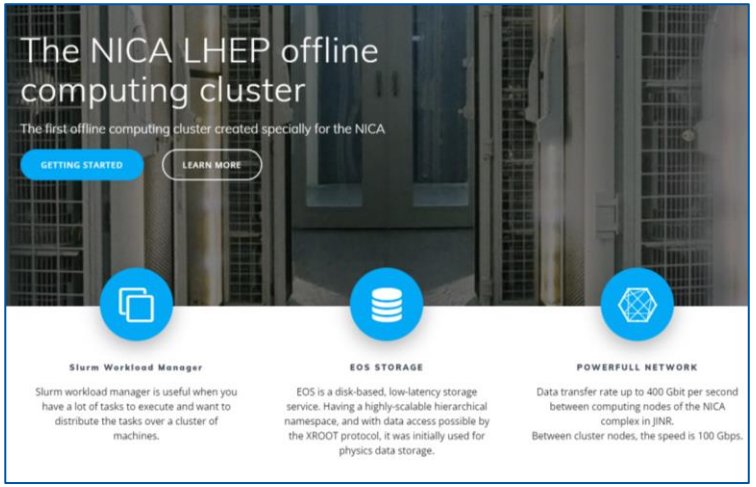
https://mpd.jinr.ru/
MPD collaboration website

https://mpdroot.jinr.ru/
MPD root website



Works related to NCX cluster

MLIT team was working in collaboration with NCX team to perform migration from SGE to Slurm which is a modern cluster workload management system.



Together with Ivan Slepov a monitoring system with public access was developed and presented to users of NCX cluster.
It allows users to be aware of current load on the NCX cluster and reminds them about local storage occupation.

MLIT in MPD IT infrastructure

Participants from MLIT

Aleksandr **Kokorev**	Maria **Lubimova**
Anastasia **Anikina**	Maxim **Zuev**
Andrey **Dolbilov**	Natalia **Gromova**
Balashov **Nikita**	Oksana **Streltsova**
Dmirty **Belyakov**	Sergei **Shmatov**
Dmitry **Podgainy**	Slavomir **Hnatic**
Evgeny **Aleksandrov**	Tatyana **Strizh**
Igor **Aleksandrov**	Valeriy **Mitsin**
Igor **Pelevanyuk**	Vladimir **Korenkov**
Irina **Filozova**	Vladimir **Trofimov**
Jan **Busha Jr.**	Vladimir **Uzhinsky**

Mescheryakov Laboratory of Information Technologies take active participation in MPD collaboration wide range of works related to both **development** and **support** of IT services and providing **computing, storage and network resources**.

Conclusion

MLIT provides a wide range of IT different services and resources:

- GitLab, CVMFS, Slurm, DIRAC
- Govorun, Tier1, Tier2, EOS, CTA
- Network, hosting, security

MLIT also directly participates in MPD collaboration activity:

- Develop new services and setting up new systems.
- Participate in development of applied software.
- Develop new approaches to solve appearing problems.

Thank you for attention

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