Development of a Cloud Service for Scientific Computing on the MICC
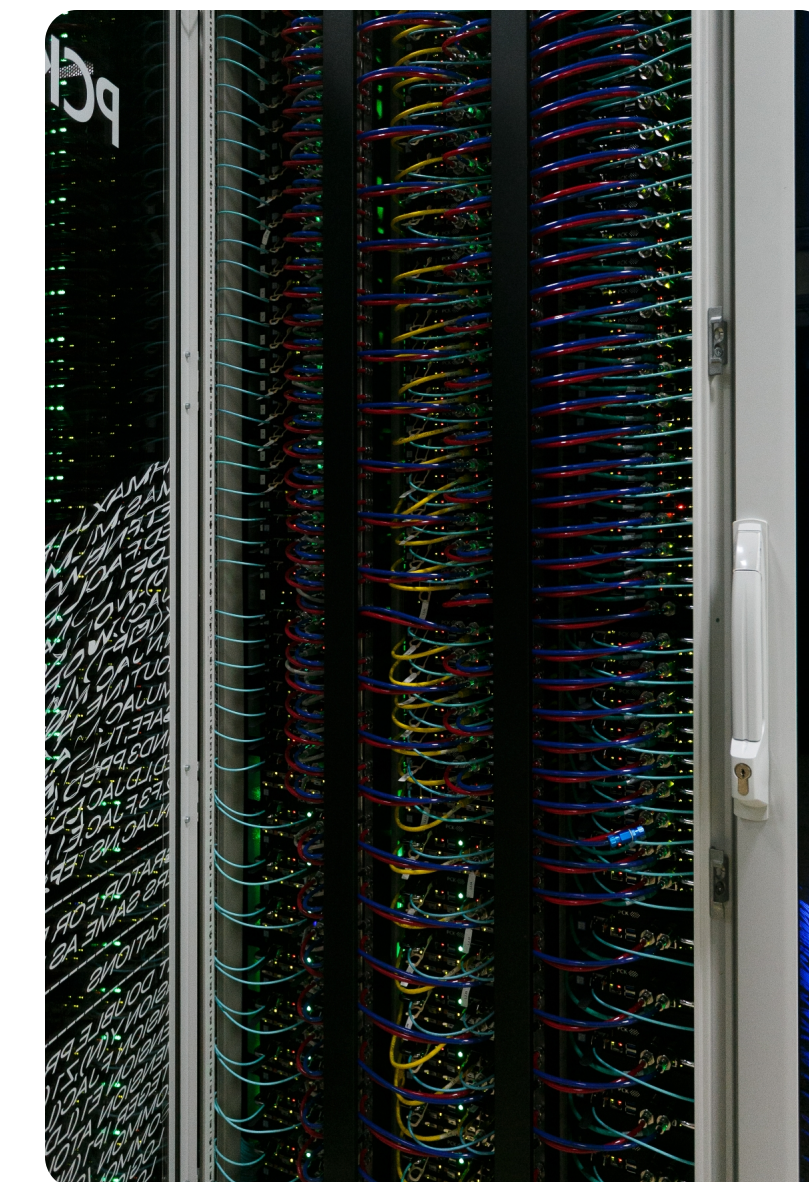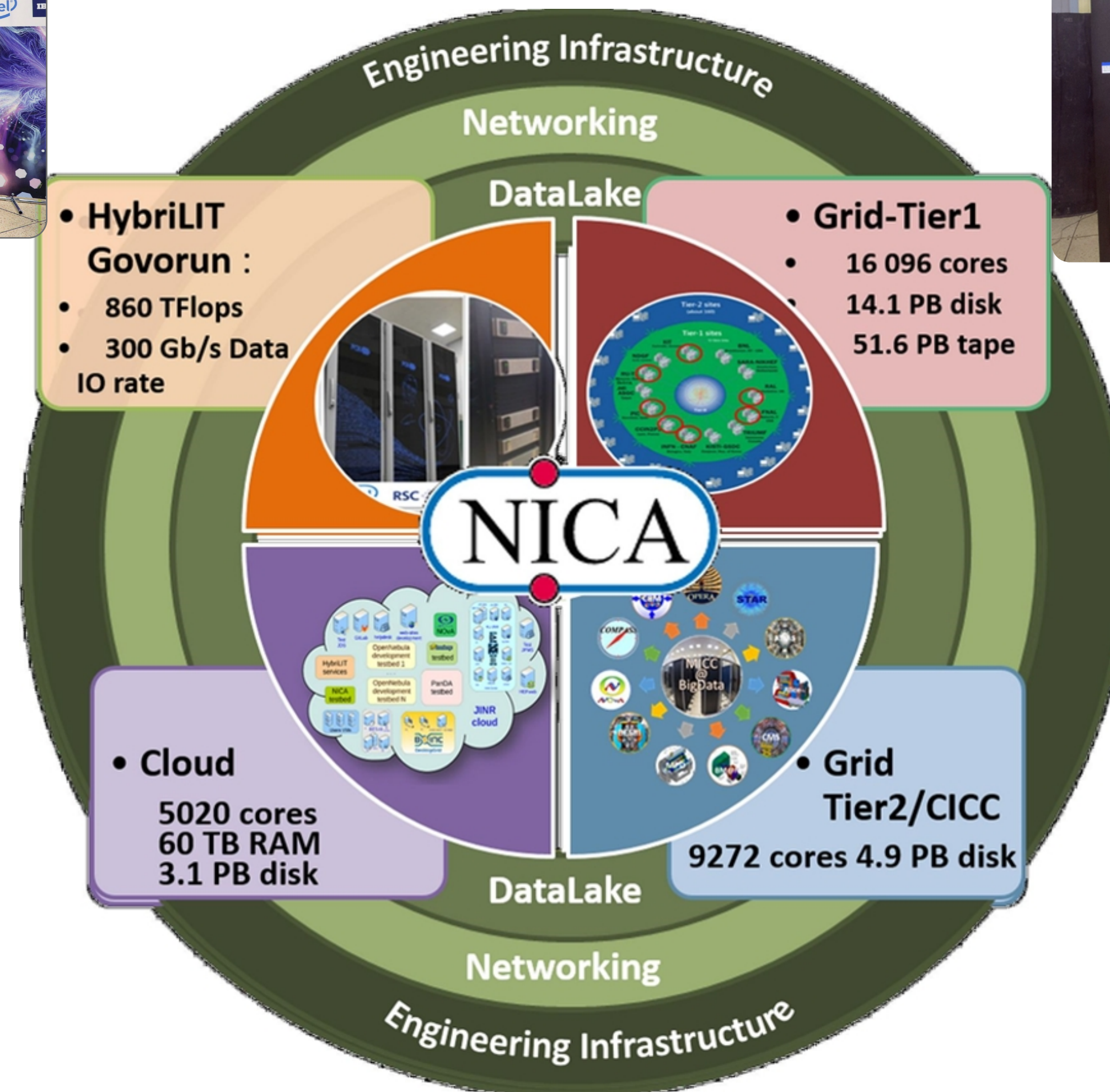
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XI Scientific Conference of Young Scientists and Specialists "Alushta-2022"

The Multifunctional Information and Computing Complex (MICC)

- **HybriLIT Govorun :**
  - 860 TFlops
  - 300 Gb/s Data IO rate

- **Grid-Tier1**
  - 16 096 cores
  - 14.1 PB disk
  - 51.6 PB tape

- **Cloud**
  5020 cores
  60 TB RAM
  3.1 PB disk

- **Grid Tier2/CICC**
  9272 cores 4.9 PB disk

Engineering Infrastructure

Networking

DataLake

NICA

Project Overview

- Major time-eaters when entering a typical research project

  — Learning the MICC usage

  — Setting up the software environment

- Some categories of users have time limits, e.g. summer students

The goal of the project is to give simple access to the MICC resources and software

- Provide a single entry point via web access
- Hide complexity of MICC structure
- Give administration tools for research supervisors

Benefits

- Reduce time spent on technical issues
- Prevent malicious usage of resources
- Free up time to spend on the actual research

Project implementation

Cloud Service for Scientific Computing on the MICC has been developed

- Currently available resources

  — JINR Cloud infrastructure
  — HybriLIT platform
- Currently available applications

  — Long Josephson junctions stack simulation
  — Superconductor-Ferromagnetic-Superconductor JJs
  — Annular Array of JJs average
  — Long Josephson junction coupled with the ferromagnetic
  — Stack of short JJ with LC shunting
  — Stack of short JJ

Main Service Components

1. JINR SSO as the authentication system

2. Web-portal

- Fixed number of applications available
- Common compute resource parameters
- Simple Data Visualization

3. Meta-scheduler

- Handles job submission
- Currently supported resources include

     — JINR Cloud via HTCondor
     — HybriLIT via Slurm

4. Data storage

- CephFS pool of the Cloud storage
- Simple web-access

5. CernVM-FS as application storage

Web portal

Available at saas.jinr.ru

Web portal: «Creating a job»

App

Long Josephson junctions stack simulation

Superconductor-Ferromagnetic-Superconductor Josephson junctio

Annular Array of JJs average

Long Josephson junction coupled with the ferromagnetic thin film

Resources

JINR cloud
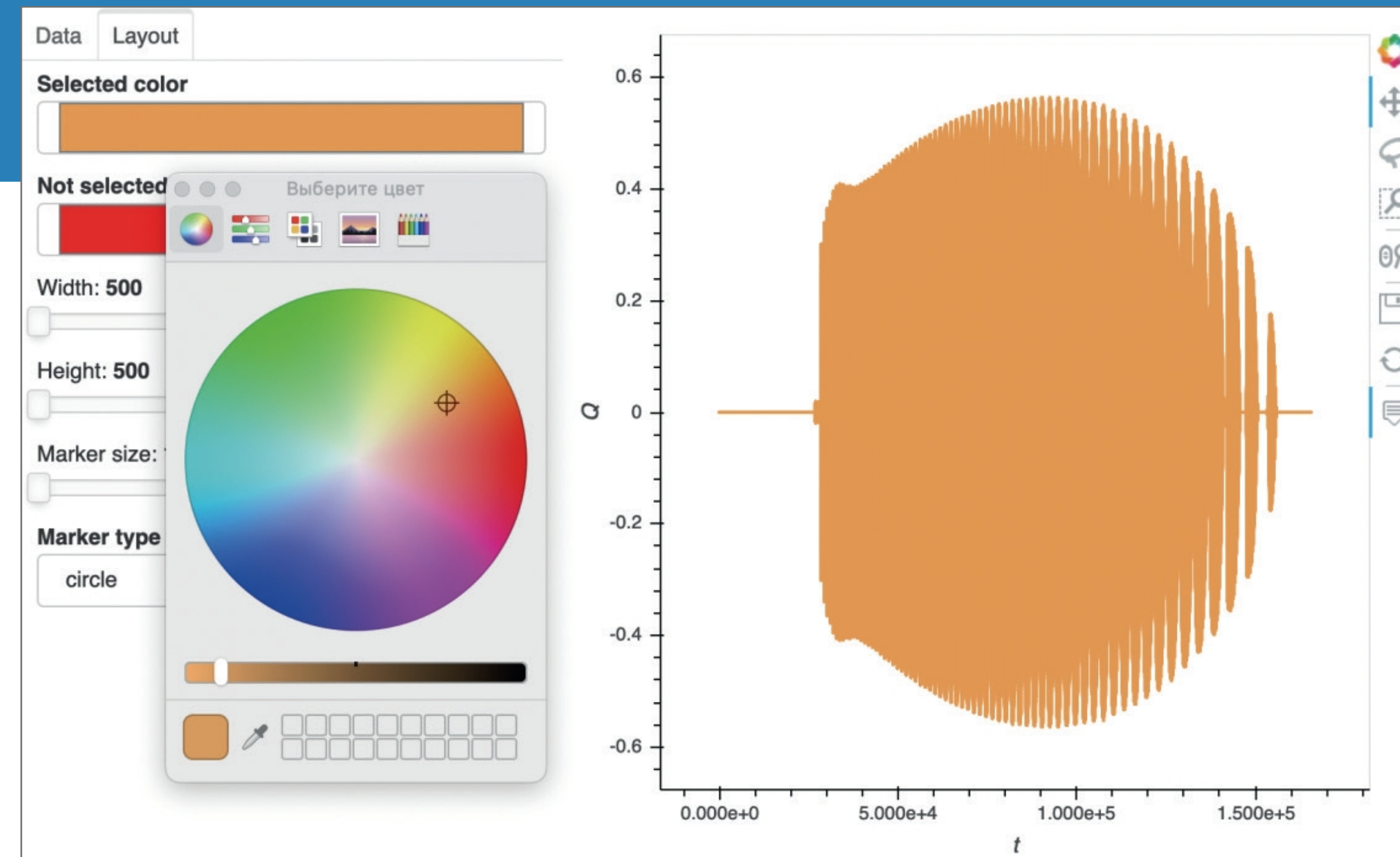
HybriLIT cluster

Number of VMs: 9 / 20   CPU per VM: 14 / 22

1   1

Job parameters

Physical parameters

N: M: a:
10   0   1

α: Amp: ω:
0.1   0   0

Web portal: «Jobs results»

- Monitor the status of running jobs
- Download the results of completed jobs
- View the details of jobs
- Control jobs (cancel or resubmit)
- Visualize the results of the completed jobs

List of jobs

ow [10 ▾] entries   Search: [ ]

Job ID	URL with job results	Storage time of result	Details	Status		
508	http://vm221-63.jinr.ru:8081/afdda7d714b044378a9580d1863b18c4	-	ℹ	cancelled	✖	🔁
507	http://vm221-63.jinr.ru:8081/2ff7664328ae43cbb42a632a5e514fc1	Removed	ℹ	done	✔	🔁
499	http://vm221-63.jinr.ru:8081/8465a4ab503c4e1bb4eb9bc975569f50	Removed	ℹ	done	✔	🔁

New Features: Admin panel access control system

- Introduce roles and groups in the service
- Restrict access to specific interface components base on user roles
- Define a limited set of apps for users based on groups access control

New Features: Interface for managing applications

- Control panel
- Add a new application
- Edit the existing applications parameter sets
- Determine computing resources for applications

Applications management

Add New

List of apps

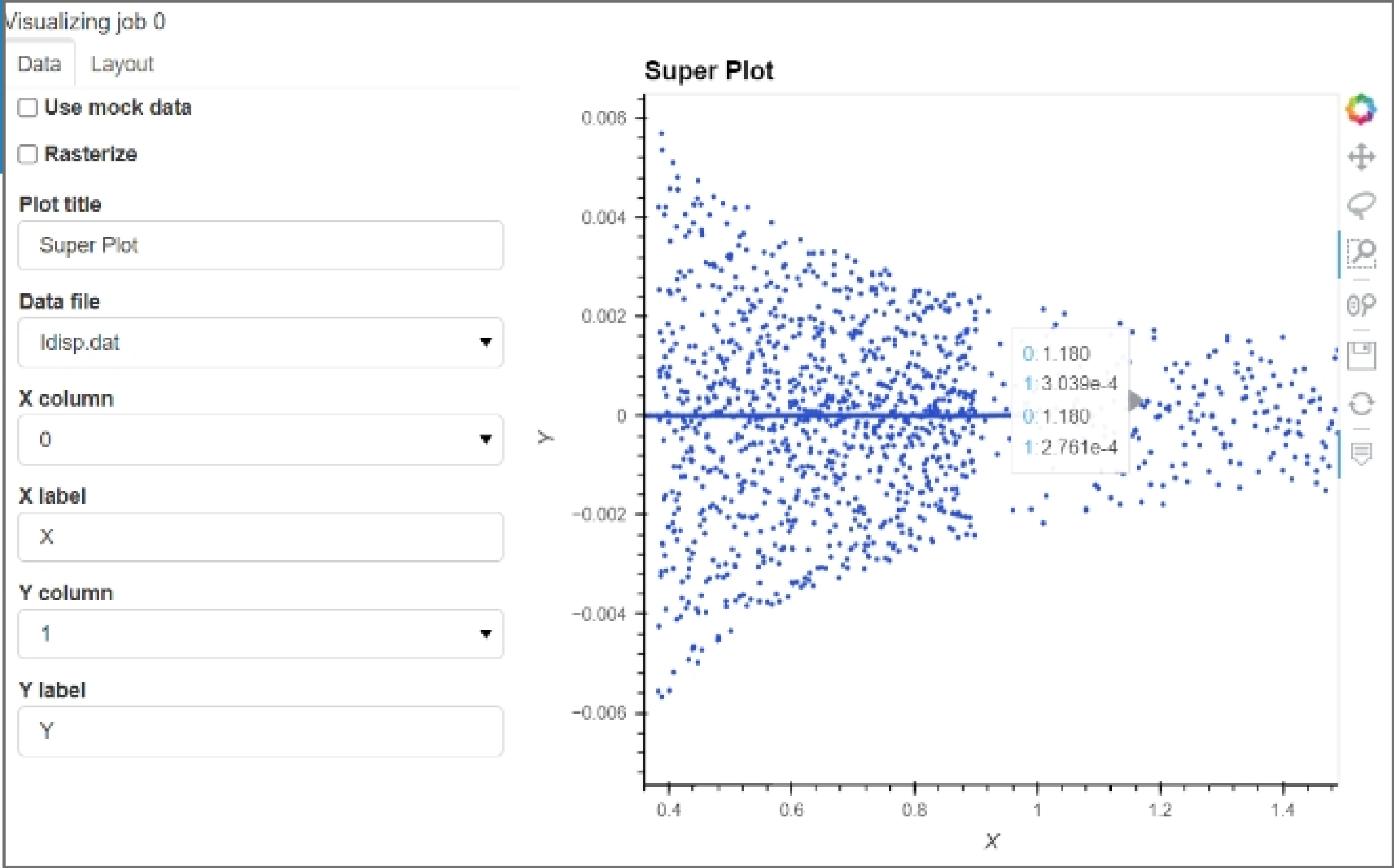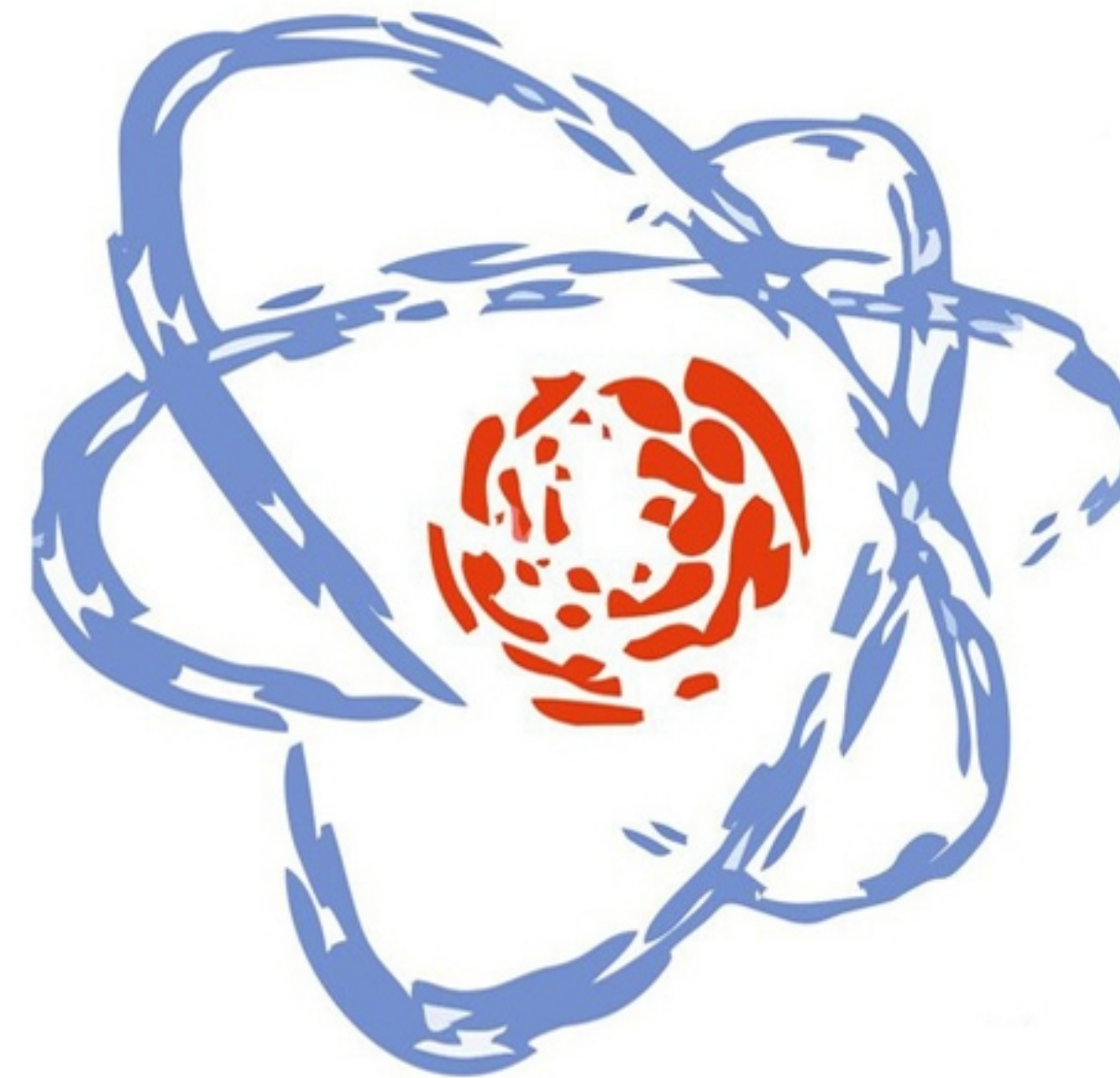| ID	Name	Description	Actions
2	Long Josephson junctions stack simulation	Long Josephson junctions stack simulation	✏️ 🗑️
4	Superconductor-Ferromagnetic-Superconductor Josephson junction simulation	Superconductor-Ferromagnetic-Superconductor Josephson junction simulation	✏️ 🗑️

Demo mode

Available at saas.jinr.ru/demo

Future Development

- Add new applications

- Improve the Admin panel and the user interface

- Consider creating a common OS environment via containerization technology

- Add support for the DIRAC interware

Thank you for your attention!