



Joint Institute for Nuclear Research

Problem-oriented Interface for MICC

Nikita Balashov, Nikolay Kutovski, Ivan Sokolov

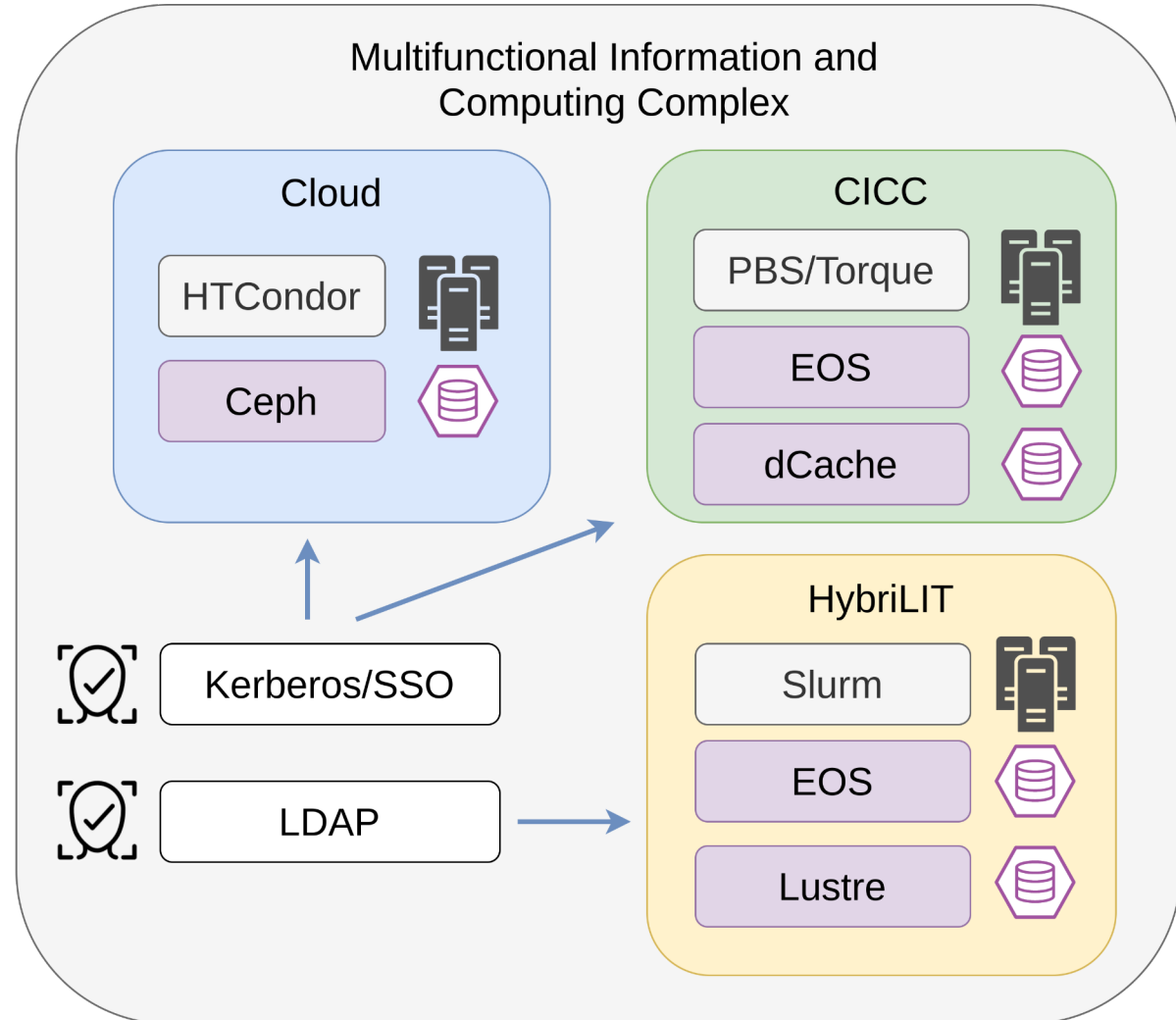
The XXIV International Scientific Conference of Young Scientists and Specialists
(AYSS-2020)

9 November 2020

This work is supported by the Russian Science Foundation under grant #18-71-10095

MICC Resources

- Multifunctional Information and Computing Complex (MICC)
 - Complex of Information and Computing Resources (CICC)
 - JINR Cloud infrastructure
 - HybriLIT heterogeneous platform
- Variety of job schedulers:
 - PBS/TORQUE
 - HTCondor
 - Slurm
- A number of storage systems to choose from:
 - Ceph
 - Two independent EOS instances (CICC and HybriLIT)
 - dCache
- HybriLIT has its own AuthN/AuthZ system, which prevents it from being fully-integrated to MICC

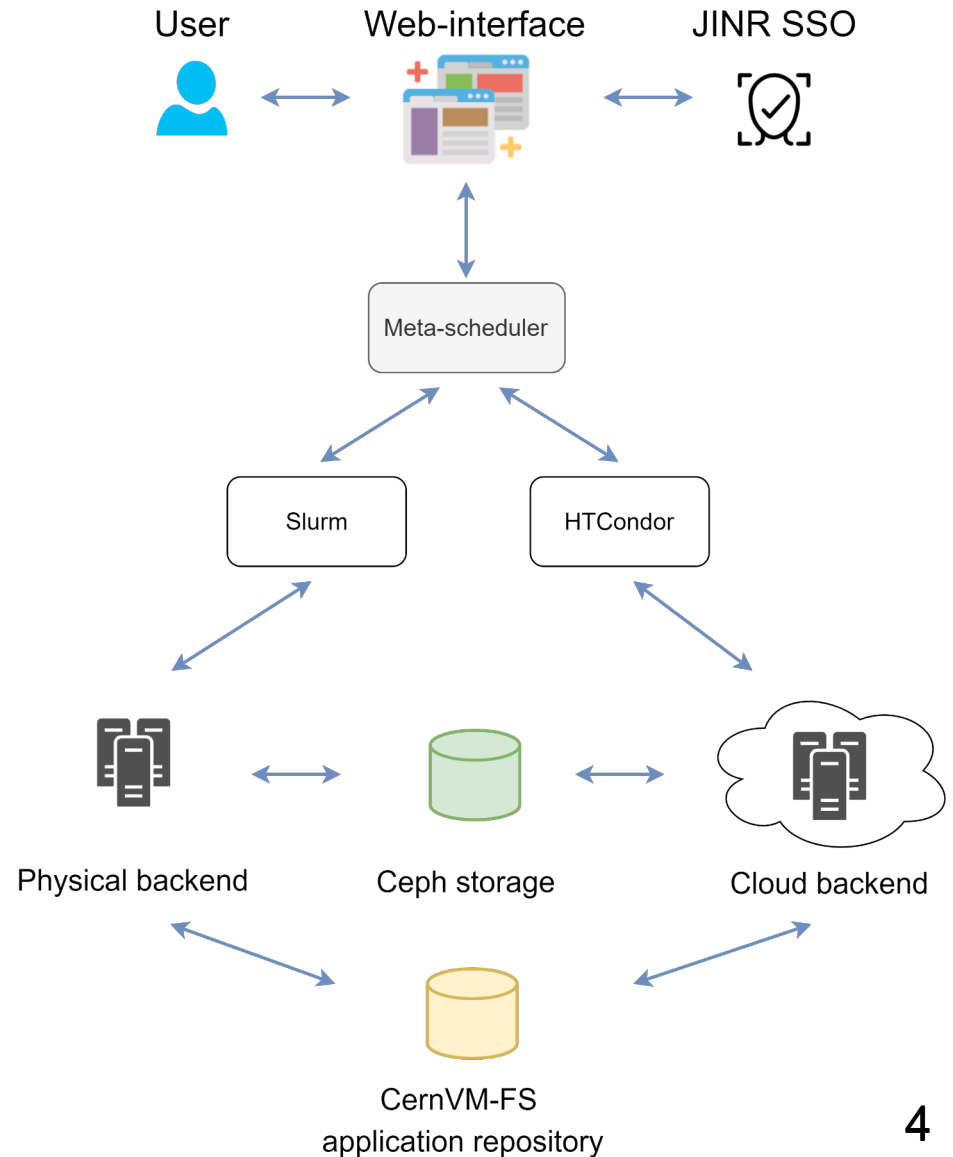


Project Overview

- Some categories of users have **tight time limits**, e.g. summer students
- **Major time-eaters** when entering a typical research project:
 - Learning the MICC usage
 - Setting up the software environment
- The **goal** of the project is to give **simple access** to the MICC resources and software:
 - Provide a single entry point via web-access for students
 - Hide complexity of MICC structure
 - Tools for research supervisors to define applications and their compatibility with different types of MICC resources
- **Benefits:**
 - Reduce time spent on technical issues, free up time to spend on the actual research
 - Prevent **malicious usage** of resources, since students are bound to supervisor-defined applications

Main System Components

- JINR SSO as the authentication system
- Web-portal
 - Fixed number of applications available
 - Individual application parameter sets
 - Common compute resource parameters
- Meta-scheduler:
 - Handles job submission
 - Currently supported resources include:
 - JINR Cloud via HTCondor
 - HybriLIT via Slurm
 - Provides automatic horizontal scaling of HTCondor nodes in the Cloud
- Data storage
 - CephFS pool of the Cloud storage
 - Simple web-access
- CernVM-FS as application storage



Web-portal

- Available at saas.jinr.ru
- No app developer interface yet, user only
- Currently available apps
 - Long Josephson junctions stack simulation
 - Short Josephson junctions stack simulation
 - Superconductor-Ferromagnetic-Superconductor Josephson junction simulation


App

Hello test

Long Josephson junctions stack simulation

Short Josephson junctions stack simulation

Superconductor-Ferromagnetic-Superconductor Josephson junction simulation

$$\begin{cases} \frac{\partial \varphi}{\partial t} = V, \\ \frac{\partial V}{\partial t} = \frac{\partial^2 \varphi}{\partial x^2} - \sin \varphi - \beta V + I. \end{cases}$$


граничные условия

$$\begin{aligned} \varphi(x, t)|_{x=0} &= 0, & \frac{\partial \varphi(x, t)}{\partial t} \Big|_{x=0} &= 0, \\ \frac{\partial \varphi(x, t)}{\partial x} \Big|_{x=0} &= H_{\text{ext}}, & \frac{\partial \varphi(x, t)}{\partial x} \Big|_{x=L} &= H_{\text{ext}} \end{aligned}$$

Job parameters

Physical parameters

N: β : α : Noise_{max} (Amp):

Nonperiodic boundary conditions

External electromagnetic radiation

ω (Hz): A (Amp):

Resources

JINR cloud

HybriLIT cluster

Number of VMs: 1/5 CPU per VM: 1/5 RAM per VM (GB): 1/10

Parameters

Δt :

I_0 : I_{max} :

Dependencies

Future Development

- Web-portal reengineering is in process
- Introduce user groups and roles
- Implement application developer interface and publishing technology
- Built-in data visualization in the web-interface (needs research)
- Reconsider data access technology
- Consider creating a common OS environment via container technology

Thanks!