Grid and Cloud technologies. Practical usage of EMI, DIRAC, OpenNebula middleware.

Laboratory of Information Technologies (LIT)

Introduction

Nowadays it is impossible to imagine a scientific research without computer assistance. In many fields' scientists have a need to simulate complex processes as well as to store, manage, process and analyze huge amount of data. Grid and Cloud technologies let solve such tasks.

JINR actively participates in different international projects, which are relied on advanced computing technologies. JINR has Tier-1 and Tier-2 grid sites what are parts of Worldwide LHC computing grid (http://wlcg.web.cern.ch) infrastructure. Along with these production grid sites there is a training grid infrastructure aimed for learning, development and research activities. It is deployed on facilities of JINR cloud service (http://cloud.jinr.ru) which is also used for a wide range of tasks including trainings in cloud technologies.

Project aims

1. Basic grid and cloud concepts use cases and benefits of both technologies for science.
2. Theoretical knowledge on grid and cloud infrastructures, middleware's architectures and services (mostly focusing on EMI and OpenNebula).
3. Practical skills to start unassisted work with EMI, DIRAC and OpenNebula, ones of the most widespread grid and cloud middleware in the world:

- Security infrastructure (requesting a digital certificate, making a temporary proxy certificate, different manipulations with digital certificates);
- Job management (job preparation, requirements description, running it in the Grid, controlling, obtaining results);
- Data management (copying data to and from grid, other common operations);
- Operations with metadata catalogs (making file's replicas (exact copies), registration data in special file catalogs, assigning additional access rights and metadata descriptions);
- Basic skills on clouds (creating virtual machine image, making VM templates, VM creation and deployment, accessing VM, cloud testbed deployment, Docker containers and their use in life).

Practical trainings are held on Multifunctional Information and Computing Complex JINR (https://micc.jinr.ru/).

Entry requirements

Good knowledge in Linux user-level skills (including command line operations) as well as administration and programming (including text editors and shell scripting) are expected from applicants.

Materials

- Ross J. Anderson - Security Engineering: A Guide to Building Dependable Distributed Systems
- Thomas A. Limoncelli - The Practice of System and Network Administration
- DIRAC Manual - https://dirac.readthedocs.io/en/latest/
- EMI - https://en.wikipedia.org/wiki/European_Middleware_Initiative
- OpenNebula Manual - http://docs.opennebula.org/5.10/

Number of project participants

2 students are recommended

Leader of project from JINR

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