Towards Cloud resources federalization in NGI_RO

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Cloud and Big Data Center for participation in the European Cloud for Open Science
- CeCBiD-EOSC -

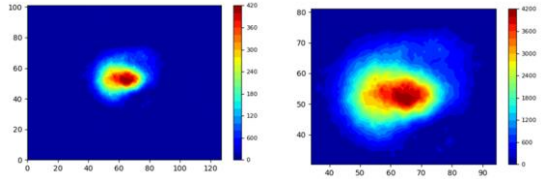
Project co-funded by European Regional Development Fund through
Competitiveness Operational Programme 2014-2020

CeCBiD-EOSC

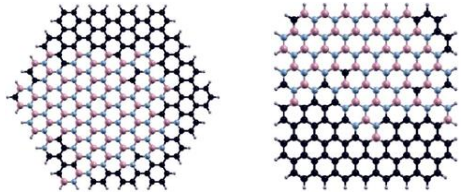
❑ PROJECT OBJECTIVES

1. Equipment purchase for implementation of the Cloud and Big Data resource centre (CLOUDIFIN upgrade)
2. Applications development and services provisioning for:

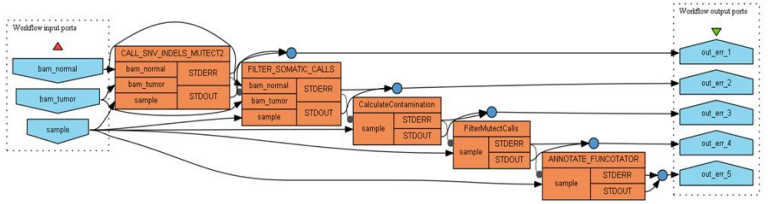
- AAI, management and monitoring of the resource center
- computational support of infrastructure & research @ ELI-NP



- modeling/simulation of nanostructures/devices using DFT + ML methods



- analysis of New Generation Sequencing data (NGS)



- **pilot platform: federalization of resources offered by national Cloud centers**

NATIONAL FEDERATED CLOUD

- **OBJECTIVE: creating a pilot platform capable of interconnecting at national level, within a federalized computing cloud, independent cloud centers developed in institutions belonging to the RDI system. The platform must provide an unique AAI and the coordinated sharing of national cloud resources.**

  Partners:

  - 'Ovidius' University from Constanta
  - NIRD for Molecular and Isotopic Technology from Cluj

- **MOTIVATION:**
  - obvious user benefits (larger resource pool, better availability of hw/sw, etc.)
  - control over data according to the national legislation (sometimes necessary)
  - there will be RO resource centers that would like to share but will find it difficult to enrol in a foreign federation

- **ANALYSIS of:**
  - user requirements
  - legal and organizational constraints
  - criteria for user acceptance
  - system requirements / specifications

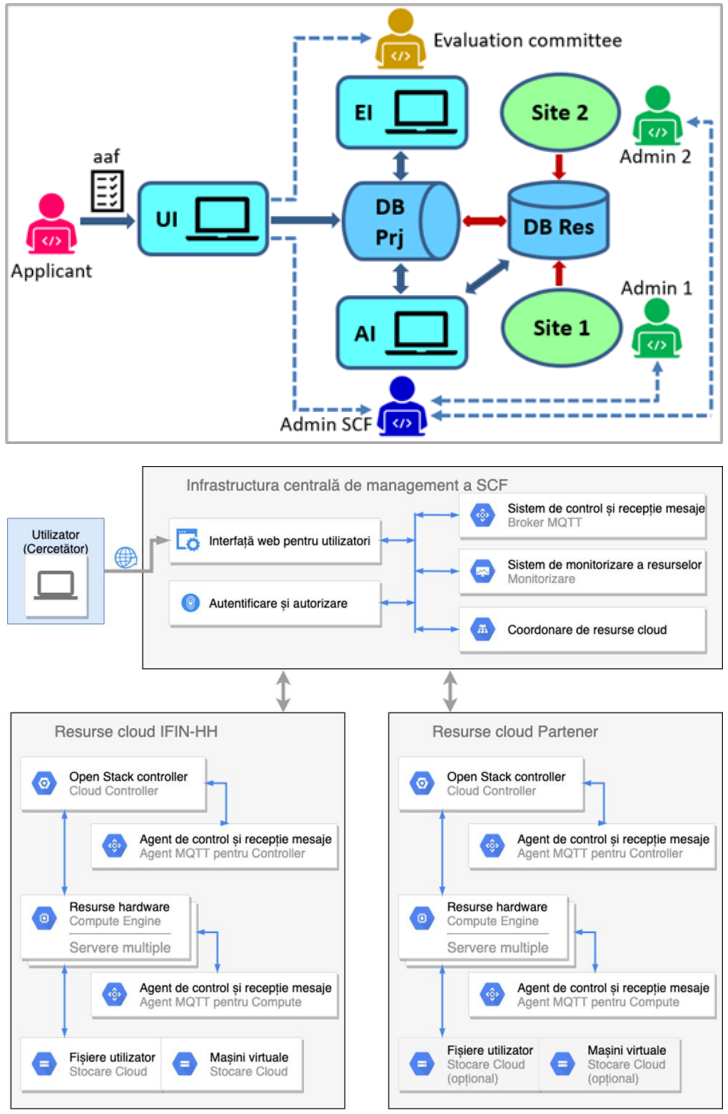
ARCHITECTURE AND IMPLEMENTATION

❑ General technical premises for the creation of the pilot platform:

- Exclusive use of *open source* software for infrastructure implementation (cost, software compatibility).
- Exclusive use of OpenStack for IaaS provision by the resource centres. Ensures the interoperability of the cloud centres that will be connected to the pilot platform.

❑ Conditions for integration in the pilot platform:

- Data communication infrastructure will be provided by RoEduNet, with a guaranteed minimum bandwidth of 1 Gb/sec.
- The minimum guaranteed level of dedicated resources offered by a cloud center will be negotiated and specified through Memorandums of Understanding.
- Local data security will be ensured by each center that provides storage services.
- The minimum level of service availability will be 90% and will be stipulated both in the Agreement regarding the operational level, concluded between the manager of the platform and the managers of the resource centers, as well as in the Agreement regarding the level of services, concluded between the supplier and users.
- The supported operating system is Linux, CentOS or Ubuntu distributions. New distributions can be accepted after testing.



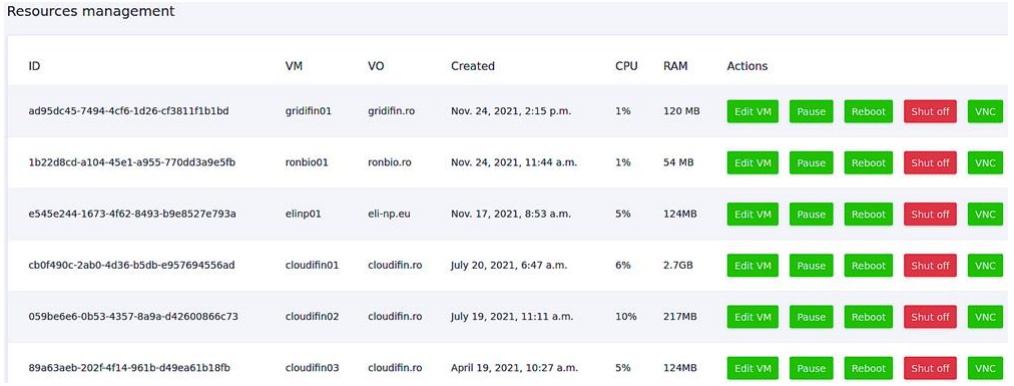
IMPLEMENTATION

❑ Communication

- The transport of messages between the system's components is performed through the (encrypted) MQTT protocol (used in IoT). This ensures bidirectional communication for the information system and resource management.
- A Message Control and Reception System was developed, based on the MQTT protocol, which communicates with the specialized Message Control and Reception Agent, located on the OpenStack controller, as well as with the Agents located on the Cloud Compute servers. Local firewalls will accept connections only with IPs of centres where agents are running.

❑ Graphical interfaces and backend applications

- new user and compute project requests
- AAI (user/pass, oauth2 will be added soon)
- User virtual office (Fig 1) + backend software.
- Own resources management interface (Fig. 2).
- Admin. management interface for creating users, OpenStack projects,...
- a



IMPLEMENTATION

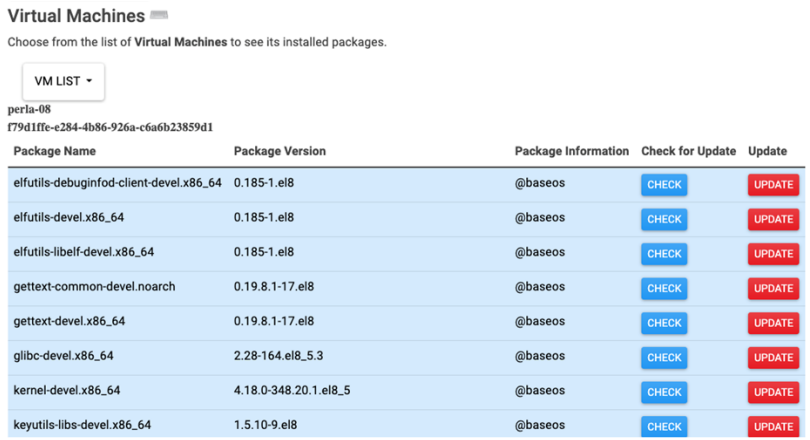
❑ Repository of custom VM images

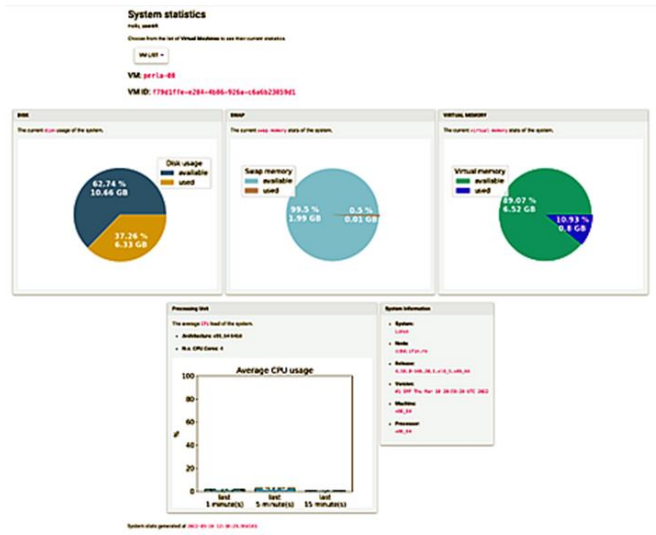
- system software stack + scientific applications for various computing projects

❑ Management and monitoring of resources (VMs) at central / user levels

- Web application for viewing the OpenStack infrastructure in topological form, in real time.
- Databases for users + computing projects, resources.
- Service for inventory and management of software packages that are installed on VMs (Fig.1).
- Information regarding the remote site resources are transmitted to the CMI broker through MQTT by agents that run on the local sites.
- Agents were programmed with nodes discovery functionality.
- Service for monitoring the usage statistics of a virtualized computing system (Fig.2)

❑ Successful testing of MQTT messages communication was performed between CMI and the UOC cloud site





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THANK YOU FOR YOUR ATTENTION !

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