



## About Czech National Grid Infrastructure (NGI)

**MetaCentrum**, an activity of the CESNET association, operates and manages distributed computing infrastructure consisting of computing and storage resources owned by CESNET as well as co-operative academic centers in the Czech Republic. MetaCentrum is responsible for building the Czech National Grid Infrastructure (NGI) as a part of the European Grid Infrastructure (EGI) and its integration to related international activities.

### NGI in Numbers (September 2012)

- computing and storage capacities of **9** academic institutions in **10** locations,
- **5000** CPU cores (national grid) + **4000** CPU cores (connected to EGI),
- **600** TB (national grid) + **1.8** PB (connected to EGI) disk capacity
- more than 550 researchers from 29 universities and research institutions,
- wide range of disciplines: computing chemistry, bioinformatics, climate modeling, material sciences, physics, astrophysics, economics, and more.

## Clouds and Scheduling Development

### HPC Cloud

Prototype based on OpenNebula, oriented on high performance computing usage, available for all users of NGI\_CZ, integrated into *FedCloud* testbed in EGI. System is intended for use-cases where classical grid approach with pre-installed nodes doesn't work.



### Torque Batch System

Fork of the original *Torque* batch system enhanced for stability covering all features provided by the CZ\_NGI. The system is coupled with a custom high-performance queue based scheduler.

### Virtualization - Magrathea

Software suite developed to grid and clouds integration. MetaCentrum operates user virtual machines and standard grid jobs together in a unified resource pool managed by a single resource broker. Semi-permanent virtual clusters with private networking can be created with standard *Torque* commands. This functionality is achieved by *Magrathea* and other components.



### Alea Simulator

Open source, platform independent job scheduling *simulator*, designed for study, testing and evaluation of various job scheduling techniques. It provides both textual and graphical simulation outputs and includes implementations of several common scheduling algorithms.



## Identity Management, Operation and Tools Development

### Beyond Identity Federations

CESNET operates a set of clinical and histological medical images that is integrated with a large number of identity federations world-wide. Based on experience with its operations, we have developed a concept of user-centric identity federations.



### Moonshot

CESNET participates in project *Moonshot* that develops a brand-new technology introducing federated identity to a broad range of non-Web services. CESNET integrated the technology with several Grid tools and with distributed file systems.



### Perun

CESNET has designed and developed *Perun* service to manage users and resources in distributed environments. The system provides several unique features that make it suitable for operations in large infrastructures.



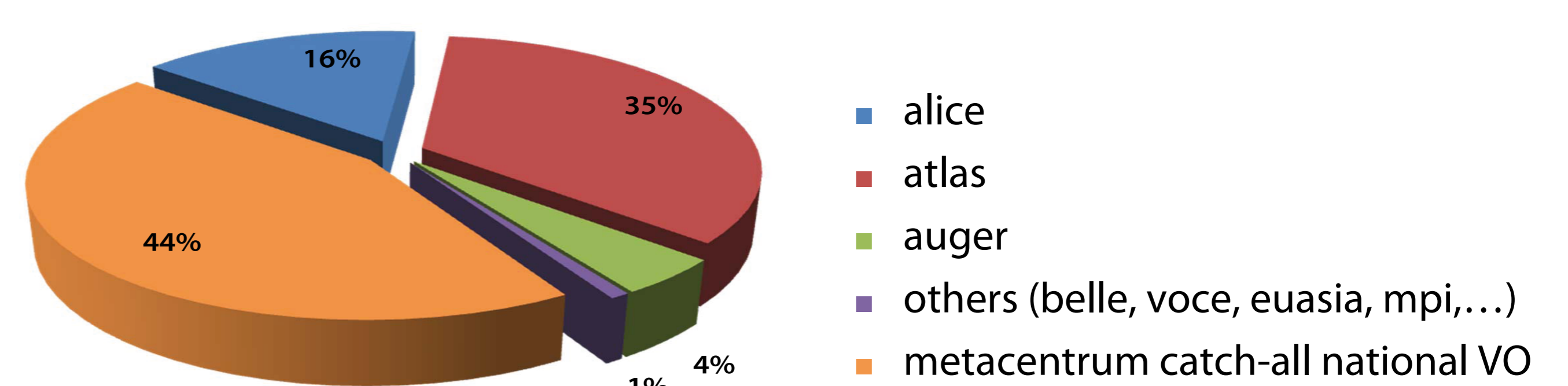
### RT/GGUS Interface

CESNET developed and maintain the integration between GGUS (central EGI ticketing system) and RT (used by several NGIs). Numerous extensions are provided to RT used to support various workflows of EGI.eu and the EGI-InSPIRE project, including the entire software release process.



### NGI\_CZ Total elapsed time per VO

6 mil. CPU hours in total per month (8/2012)



## Middleware Development

### EMI Services Development

*ProxyRenewal* – controlled periodical renewal of proxy certificates.

*GridSite* – gridified web solution (for EMI components).

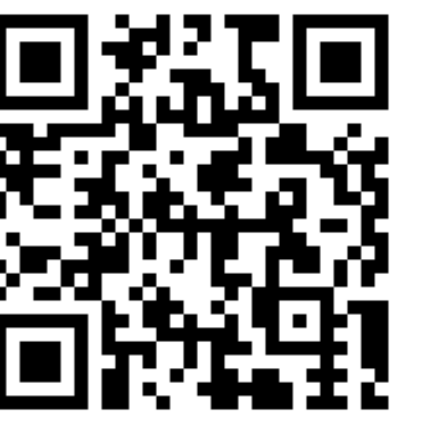
*EMI Common Authentication Library (caNI)* – uniform authentication features across multiple middlewares and programming languages. CESNET is responsible for the C part of the product.



## Complex Monitoring and Accounting Development

### EMI gLite Logging and Bookkeeping (L&B)

Service for monitoring the status of various processes such as compute jobs, data transfers or virtual machines. It comes with reliable asynchronous message delivery solution, complex querying interface and additional advanced features such as notifications.



### PBSmon

Web application for observing the current state of both hardware and virtual computing resources of the virtual organization MetaCentrum VO.



### Pakiti

Service *Pakiti* is developed to detect machines that are not properly updated with security patches. Utilizing the *Pakiti* service site administrators can detect unpatched machines, which otherwise pose a significant risk for the whole infrastructure.



## Projects

MetaCentrum is actively involved in many international Grid projects, such as EMI, EGI InSPIRE, CHAIN, EPIKH, Moonshot. In EGI InSPIRE we participate in:

**DMSU:** coordination (and contribution at the technical level) the 2nd line support of deployed software (middleware, batch systems, and operational tools) on the EGI infrastructure.

**FedCloud:** participation (resource provider) in task-force and task.

**Backoffice:** providing central EGI support services (website, document server, mailing lists, Jabber) running on CESNET resources.

**EGI CSIRT:** developing&deployment of security monitoring tools.

## Cross Discipline Cooperation

Leveraging the grid resources efficiently requires non-trivial effort by both the application area and IT experts. We seek for such collaborations actively, involving also both under- and postgraduate students of computer science. The outcomes of this work are scientific results in the application areas, which would not be possible without the wide usage of computational resources, as well as more generally applicable results in the computer science itself.

The scientific areas we work with include, but are not limited to, chemistry, structural biology, neurology, earth observation, and astronomy.

Supported projects: ELIXIR, CEITEC, CzechGlobe, SuperNemo, Belle, Auger, etc.