



## **A European Federated Cloud: Innovative distributed computing solutions by EGI**

Gergely Sipos (1), Matteo Turilli (2), Steven Newhouse (1), and Peter Kacsuk (3)

(1) EGI.eu, Amsterdam, The Netherlands, (2) Oxford University e-Research Centre, Oxford, UK, (3) MTA SZTAKI, NGI-HU, Budapest, Hungary

The European Grid Infrastructure (EGI) is the result of pioneering work that has, over the last decade, built a collaborative production infrastructure of uniform services through the federation of national resource providers that supports multi-disciplinary science across Europe and around the world. This presentation will provide an overview of the recently established 'federated cloud computing services' that the National Grid Initiatives (NGIs), operators of EGI, offer to scientific communities. The presentation will explain the technical capabilities of the 'EGI Federated Cloud' and the processes whereby earth and space science researchers can engage with it. EGI's resource centres have been providing services for collaborative, compute- and data-intensive applications for over a decade. Besides the well-established 'grid services', several NGIs already offer privately run cloud services to their national researchers. Many of these researchers recently expressed the need to share these cloud capabilities within their international research collaborations – a model similar to the way the grid emerged through the federation of institutional batch computing and file storage servers. To facilitate the setup of a pan-European cloud service from the NGIs' resources, the EGI-InSPIRE project established a Federated Cloud Task Force in September 2011. The Task Force has a mandate to identify and test technologies for a multinational federated cloud that could be provisioned within EGI by the NGIs. A guiding principle for the EGI Federated Cloud is to remain technology neutral and flexible for both resource providers and users:

- Resource providers are allowed to use any cloud hypervisor and management technology to join virtualised resources into the EGI Federated Cloud as long as the site is subscribed to the user-facing interfaces selected by the EGI community.
- Users can integrate high level services – such as brokers, portals and customised Virtual Research Environments – with the EGI Federated Cloud as long as these services access cloud resources through the user-facing interfaces selected by the EGI community.

The Task Force will be closed in May 2013. It already

- Identified key enabling technologies by which a multinational, federated 'Infrastructure as a Service' (IaaS) type cloud can be built from the NGIs' resources;
- Deployed a test bed to evaluate the integration of virtualised resources within EGI and to engage with early adopter use cases from different scientific domains;
- Integrated cloud resources into the EGI production infrastructure through cloud specific bindings of the EGI information system, monitoring system, authentication system, etc.;
- Collected and catalogued requirements concerning the federated cloud services from the feedback of early adopter use cases;
- Provided feedback and requirements to relevant technology providers on their implementations and worked with these providers to address those requirements;
- Identified issues that need to be addressed by other areas of EGI (such as portal solutions, resource allocation policies, marketing and user support) to reach a production system.

The Task Force will publish a blueprint in April 2013. The blueprint will drive the establishment of a production level EGI Federated Cloud service after May 2013.