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Contribution ID: **55**                                                                      Type: **Demonstration**

# NeuroLOG: a federated environment for neurosciences supporting multi-centric studies

*Monday 12 April 2010 17:20 (10 minutes)*

The NeuroLOG project develops a distributed environment dedicated to the support of collaborative and multi-centric studies in neurosciences. The NeuroLOG environment leverages grid technologies to deploy a highly secure, large scale data federation and to deliver high throughput neuroimages analysis. It is interfaced to the gLite middleware and takes advantage of the EGEE grid. It integrates in existing site-specific neuro-informatics environments. NeuroLOG clients, deployed on user desktops, provide neurosciences services through a coordinated federation of site servers and grid services.

## Detailed analysis

The NeuroLOG middleware has reached maturity and is deployed over a federation of 4 collaborating neuroscience centers. Its data management layer integrates neuro-images, associated neuro-pathological test results and other metadata stored in the databases. Advanced data representation technics, a data mediation and a data federation layer are used to represent in a unified view, manipulate and integrate the data source. A specific access control policy was designed to support multi-centric collaborations while ensuring that the local privacy policy of each provider prevails.

In addition, the middleware provides neuro-data analysis tools representation and deployment functionality. The collaborating centers can expose and share their data analysis algorithms for integration in neuro-image analysis pipelines. The MOTEUR workflow designer and enactor is used to describe neurosciences studies, taking advantage of the distributed computing resources provided by EGEE. The workflow engine is seamlessly integrated to the data management layer to facilitate the manipulation of experimental data sets. All facets of the NeuroLOG middleware are integrated in a unique graphical environment.

## Conclusions and Future Work

This demonstration will show the use of the NeuroLOG middleware in concrete neuroscience data analysis use cases: adding users to the federation, granting access to the resources, browsing the distributed data sets, selecting data sets relevant for a given study and executing a neurosciences pipeline. It will emphasise on the use of distributed resources and the exploitation of the EGEE grid for the addressing the computation needs. It will discuss the usability of grid resources for neurosciences and the perspectives to better support that community in the future.

## Impact

Neurosciences are increasingly relying on computerized analysis of large, coherent data sets including images and associated information on the clinical and environmental context. Indeed, epidemiological, therapy and drug impact studies require the analysis of large population of patient images over long periods. Furthermore, large data sets are required to build neuro-atlases characterizing the anatomy and physiology of the normal or pathological brain. Federating domain-specific resources is increasingly important to assemble the data sets required, or to compare data analysis procedures developed in neuroscience centers. Data sets can be assembled for pathologies with low occurrence rates. Specialized atlases can be composed for specific populations.

Variations of pathologies can be studied over large geographical areas. Best practices can be identified and exchanged.

The neuro-scientists are standing half way between clinical neurologists and computer scientists. They are accustomed to the use of computing environments for supporting their experiments and they are a vector to demonstrate the use of computerized models and tools to the clinical world.

## Keywords

Neurosciences, Workflows, Data Representation, Data Federation

## URL for further information

http://neurolog.polytech.unice.fr

## Justification for delivering demo and/or technical requirements (for demos)

The NeuroLOG environment is accessible through a high level, portable and integrated GUI. The client has a strong visual impact. It provides convincing grid-enabled use cases from a sensitive domain.

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**Session Classification:**   Demo Session 1, Welcome Drink

**Track Classification:**   Software services exploiting and/or extending grid middleware (gLite, ARC, UNICORE etc)