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A transitional middleware to support neurosciences on the EGEE grid

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Computational neurosciences are brain image-based experimental sciences requiring the recruitment of large populations data sets and the set up of complex analysis pipelines. The grid provides a computing infrastructure adapted to face many computational neurosciences challenges. However, processing medical data in an open, wide scale environment creates new issues for the neurologists. In addition, existing environments have to be considered in a transitional environment towards HealthGrids.

Impact

To benefit from grid resources, non-expert users such as neuroscientists need an environment adapted to their daily practice integrated in their regular desktop. Neuroscience centers each have their own practices and data schemas. The middleware is accessible through a multi-platforms client deployed on the end user desks. The middleware uses a data mediation and federation product to adapt to the heterogeneous schemas proposed and to federate resources among the sites through a standard relational DB query engine. A federated data schema to which each local database is mapped was designed. An ontology associated to this schema will enable rich representation and queries in the future. Access to grid resources is seamlessly provided by a generic application code wrapper and submission interface. The service providers can decide deployment on local resources or the EGEE grid depending on their services requirements. Application pipelines are supported by the MOTEUR workflow engine.

URL for further information

http://neurolog.polytech.unice.fr

Conclusions and Future Work

The NeuroLOG middleware tackles the needs of neuroscientists and bridges academic grids with their regular computing environment. The access to large scale grid infrastructures enables populations studies and large data sets recruitment to support complex brain anatomo-functional studies. The NeuroLOG middleware and data schema more precisely addresses multiple sclerosis, brain strokes and brain tumours disease studies. One of the MS pipelines was implemented while the others are being designed.

Keywords

Neurosciences, middleware architecture, medical data representation, workflows analysis

Detailed analysis

The NeuroLOG project designs an environment to bridge neurosciences center resources and the EGEE grid infrastructure. The middleware aims at federating the data and computing resources of the various center while preserving centers autonomy. In particular, data access control, which is a key issue for medical sciences, remains the responsibility of the sites hosting data. Data externalized to collaborating sites or grid sites is fully anonymized and secured. The NeuroLOG project therefore provides a federated platform which access

policy is locally determined by the participants, similarly to the model of autonomous computing centers federating their resources in the EGEE infrastructure. In addition, the NeuroLOG middleware takes into account the neurosciences needs: complex and heterogeneous medical data sets representation, medical data browsing and visualization, medical data analysis pipelines construction and experimental results annotation and registration.

Primary authors: Mr GAIGNARD, Alban (I3S / CNRS); Mr GODARD, David (Visioscopie); Dr LINGRAND, Diane (I3S / University of Nice - Sophia Antipolis); Mr MICHEL, Franck (IRISA); Mr ROJAS BALDERRAMA, Javier (I3S / University of Nice - Sophia Antipolis); Dr MONTAGNAT, Johan (I3S / CNRS)

Presenter: Mr GAIGNARD, Alban (I3S / CNRS)

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