

A Grid Software for Virtual Eye Surgery Based on Globus 4 and gLite

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Describe the scientific/technical community and the scientific/technical activity using (planning to use) the EGEE infrastructure. A high-level description is needed (neither a detailed specialist report nor a list of references).

“Grid-Enabled SEE++” is a grid-based simulation software that supports the diagnosis and treatment of certain eye motility disorders (strabismus). The overall goal is to develop an efficient grid-based tool for “Evidence Based Medicine”, which supports the surgeons in choosing optimal surgery techniques for the treatments of different syndromes of strabismus.

Report on the experience (or the proposed activity). It would be very important to mention key services which are essential for the success of your activity on the EGEE infrastructure.

Since we met with some limitations of Globus 4, we also designed a version of “Grid-Enabled SEE++” compatible with gLite.

We use some kind of server jobs (as executers for parallel Hess calculations) started via the WMS service. To return the allocated port numbers, we investigate and exploit the interactive job submission feature of gLite.

We may exchange the access layer developed earlier for the SEE++ medical databases to an AMGA-based solution.

Pathology Fitting is proposed to execute on gLite as parametric jobs. Each job will be started with different initial parameters founded in the SEE++ medical databases.

We plan to apply the R-GMA information system as well, such that our system will be able to discover automatically the available databases and the executer jobs on the grid.

An important security concept is the managing of the Virtual Organizations, because we have to be sure that the published medical data will be hosted only by certain trusted grid nodes.

With a forward look to future evolution, discuss the issues you have encountered (or that you expect) in using the EGEE infrastructure. Wherever possible, point out the experience limitations (both in terms of existing services or missing functionality)

The fact that “Grid-Enabled SEE++” is an interactive application with many fine-grained jobs (the users change the eye parameters by a manual trial and error method and they wait for the result of a simulation before starting a subsequent one) may make the software an interesting testcase for gLite. We expect to report on the differences between gLite and Globus Toolkit based on the observations with the two versions of our software system.

Describe the added value of the Grid for the scientific/technical activity you (plan to) do on the Grid. This should include the scale of the activity and of the potential user community and the relevance for other scientific or business applications

In Globus Toolkit 4, we developed a parallel version of the simulation of the Hess-Lancaster test (typical medical examination). By this, we speeded up this simulation by a factor of 14-17.

Furthermore, we reported the prototype implementation of a medical database component for “Grid-Enabled SEE++”. Our next steps concentrate on developing a distributed grid-enabled database system.

Finally, we designed a so called grid-based Pathology Fitting algorithm, which would be able to determinate (or at least estimate) automatically the pathological reason of a patient’s strabismus. Since the outcome of this algorithm strongly depends on the initial estimation for the pathological case, we propose to exploit the grid in the following way:

- by searching in the grid-based SEE++ medical databases for similar pathological cases and
- by starting concurrent pathology fitting processes with these cases as the starting points of the optimizations (parameter study).

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