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## Gwendia workflows for cardiac image analysis

*Tuesday 13 April 2010 16:00 (20 minutes)*

We will present the description of a cardiac image analysis workflow with the new Gwendia language and its enactment on two different grid platforms, namely EGEE (using the MOTEUR workflow engine) and Grid'5000 (using the DIET workflow engine). Technical achievements enabling the execution of the very same workflow on those two grids will be presented. Finally, early application results (both performance and medical imaging) will be reported.

### Detailed analysis

This presentation will detail achievements of the Gwendia French national project to describe and execute medical imaging grid workflows on various platforms. First, specific features of the Gwendia workflow language will be highlighted on a cardiac segmentation pipeline. In particular, the use of list manipulations and iteration strategies to handle multidimensional medical images will be exemplified. Second, experiments using two workflow engines will be reported. DIET MA-DAG is used to run the cardiac workflow on the Grid'5000 while MOTEUR is used for the deployment on EGEE. Thanks to significant technical effort, the very same workflow can be run on those two grids. Based on that, performance comparisons between those two grids will be presented.

The resulting implementation offers a unique tool for large-scale processing of cardiac images. Results will be shown highlighting how parameter estimation and myocardium segmentation can be improved using the grid. In particular, sweeps on physical and imaging parameters will be detailed.

### Conclusions and Future Work

The implementation of a cardiac image analysis pipeline with the Gwendia workflow language has been discussed. Based on that, performance comparisons between Grid'5000 controlled conditions and EGEE production ones were presented. DIET was used to run the workflow on Grid'5000 while MOTEUR was the EGEE enactor. Medical imaging results illustrating how a particular use-case can benefit from the grid computing power have been shown.

### Impact

Although workflow technology has been acknowledged many times to be a very powerful tool to support grid porting of a variety of applications, it has to be recognized that writing grid workflows is still an art only mastered by a few. Because it is dedicated to the description of applications handling a lot of data, the Gwendia language is expected to reduce such a usability gap faced by domain scientists. Moreover, since DIET and MOTEUR can both interpret this language, the very same workflows can be executed on the Grid'5000 and EGEE grids, which somehow bridges research and production grid communities.

Regarding medical image analysis, the Gwendia project offers a concrete tooling for the large-scale processing of cardiac images. In particular, variability among cardiac sequences (due to pathologies, acquisition conditions, etc.) make robust myocardium segmentation very challenging. Workflows such as the one built in the scope of Gwendia allows to rapidly identify suitable parameter sets, benefiting from the computing power offered by the grid.

## Keywords

Workflows, cardiac imaging, Grid'5000, EGEE, DIET, MOTEUR

## URL for further information

<http://gwendia.polytech.unice.fr>

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