Contribution ID: **152** Type: **Oral**

Overview of the grid fusion applications and the possible workflows among them

Wednesday 14 April 2010 11:00 (20 minutes)

Grid computing developments have increased substantially in fusion research.
A great variety of applications have been ported to the grid in the frame of EGEE, EELA and EUFORIA projects. These applications belong to different plasma physics domains and different strategies have been used to port them, depending on the nature of the applications. These codes are ready to establish workflows among them in order to produce new relevant physics results that could not be achieved running the applications separately

Impact

The grid-ported applications have been chosen to play a role in the different fields of fusion research in order that the grid produces relevant results for different fusion subcommunities. Moreover, different tools have used to port the applications in order to take advantage of the developments that have been performed by the grid scientists.
The onset of these applications on the grid architecture allows the establishment of complex workflows between both grid and HPCs applications, allowing the researchers to join different physical models.
Several new relevant scientific results have been obtained using the grid, which opens the window to new research activities. All these developments have had a demonstration effect that shows that grid computing can be useful in a large variety of research activities. But, finally, the main impact of this work is that an increasing number of fusion scientists is using the grid for their customary research.

Keywords

Fusion, Workflows, EUFORIA, EGEE, EELA

URL for further information

http://www-fusion.ciemat.es

Detailed analysis

Plasma Physics research is composed of a large variety of problems. Many branches of Physics are at work in fusion research and, therefore, a large variety of applications is used by fusion scientist, many of them suitable for running on distributed architectures like the grid.
In this work, a review of the fusion applications running in the grid is presented, taking into account their different structures and their different applications on Plasma Physics. We have ported Monte Carlos codes, parameter scan applications, and parallel MPI-based ones. To accomplish this task, several tools and pieces of middleware have been used, including both standard tools and ad-hoc developments. Some instances of the standard tools are Kepler, gLite, Gridway, MPI, and DRMAA. While examples of developed applications are START, TAPAS4GRID and VASHRA-T.

Several possible complex workflows among these applications are under development, showing that the grid is flexible enough to perform such workflows. Kepler is the standard workflow engine used among the fusion community for establishing workflows among different architectures.

Conclusions and Future Work

A large variety of applications ported to the grid in the frame of different projects has been presented in this work, showing the use of different techniques for the grid-porting. The applications have been chosen to show that the grid can play a role in different research fields, opening the window to new developments and new research activities. Several possible workflows have been also shown, as a preliminary result of one of the main future activities in this direction, since complex workflows among fusion applications will allow the scientist to relate different physics models.

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Session Classification: Fusion

Track Classification: Scientific results obtained using distributed computing technologies