Contribution ID: **47** Type: **Oral**

FUSION RESULTS WITHIN EGEE

Monday, February 11, 2008 4:00 PM (20 minutes)

Ion kinetic transport application allowed the estimation of ion collisional transport both in tokamaks and stellarators, showing properties that could not be found by the customary methods: transport is not diffusive and that there exist important asymmetries, oppositely to what was thought. Further improvements of the applications are ongoing.
MaRaTra calculations have allowed to estimate the heating of plasmas
confined in complex geometries, like that of TJ-II stellarator, by quasi-electrostatic waves. This is especially challenging, since it is necessary to consider a huge number of rays. The optimization of wave launching requires a large number of runs with 10^4 - 10^5 rays. The heating system for TJ-II stellarator has been designed using these results. Gridway metascheduler is used in MaRaTra.
Stellarator Optimization. The application is running and several stellarator configurations are explored. Future activities will involve the optimization of TJ-II stellarator.
Kepler

3. Impact

Ion Kinetic Transport: Grid computing has allowed to remove the doubtful approximations that are used in the customary modelling tools, i.e., we do not assume that transport is diffusive, we do not perform any average on magnetic surfaces and we can perform estimates for arbitrary mean free paths, being therefore a method valid for low collisonality plasmas, as the ones that will be present in a fusion reactor. These achievements could be done by following a huge number of independent particles during all their life in the plasma.
MaRaTra: A huge number of independent calculations are needed for optimizing the launcher and the receiver. This problem structure is perfect for grid computing: a bunch of rays is running in every node of the grid.
Stellarator Optimization. Different stellarator configurations can be studied in separated nodes of the grid. A genetic algorithm chooses the best one regarding a target function. Different target function can be implemented within the algorithm.

URL for further information:

http://www.fusion.ciemat.es

4. Conclusions / Future plans

The Fusion VO was used for MaRaTra and Ion Kinetic Transport. The Stell. Opt. and the Relfletometry applications run in the Russian Grid. The CPU time for a single case is about 2 years. The future plans involve the enhancement of Ion Kinetic Transport and MaRaTra applications with new equations and the exploitation of Stell. Opt.
The experience in using the grid and the middleware will be exploited in Euforia Project. New applications will be ported and Kepler will be used for complex workflows

Provide a set of generic keywords that define your contribution (e.g. Data Management, Workflows, High Energy Physics)

Fusion. Workflow

1. Short overview

Modelling is becoming a key activity in fusion research. Several applications have been chosen as demonstrative examples of the grid capabilities:

Ion Kinetic Transport. Study of ion trajectories in tokamak and stellarator plasmas.
MaRaTra: Massive Ray Tracing. Plasma heating modelling within WKB theory implies the use of large number of rays.
Stellarator optimization. Allows the searching of optimal magnetic configurations.
Plasma reflectometry optimisation. Application in development phase.

If demonstration is requested please explain what visual or interactive aspects of the contribution necessitate a demonstration rather than a presentation or poster?

A projection of the results will be shown during the presentation.

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