

MARATRA: A Production Fusion Physics System

Thursday 10 May 2007 11:40 (20 minutes)

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).

The target of “MAssive RAY TRAcing in Fusion Plasmas” is the Fusion Physics scientific community. In particular, MARATRA aids those community members who are working in the optimization of plasma heating by electron Bernstein waves (EBW).

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.

For porting this application onto the Grid, we relied on the execution services offered by FUSION VO resources and used the GridWay Metascheduler (<http://www.gridway.org/>) as a Resource Broker. In particular, its workload management capabilities have been proved to be very valuable in order to scale the input data. These valuable capabilities comprehend Opportunistic Migration (automatic resubmission of running jobs to better resources), Performance Slowdown Detection (migration when a intolerable performance loss for a job, which happens to be case in the present application) and Fault Detection & Recovery (job cancellation, remote system crash or outage, network disconnection, client fault tolerance). Also, GridWay has been chosen because it implements the Open Grid Forum (<http://www.ogf.org/>) DRMAA Standard (<http://drmaa.org/>), both C and JAVA bindings, providing compatibility of applications with DRM systems that implement the Standard, such as SGE, Condor, ...

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)

Basically, we found the queuing times high and, in many occasions, many computing resources (downtime and even DN not mapped) were not available. Thanks to its fault

tolerance mechanisms, GridWay could handle these situations, making its combination with the EGEE infrastructure a very reliable one.

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

A microwave beam can be modeled as a set of rays, each one with an independent trajectory. The more rays that can be traced, the more accurate the results are. A regular case study in a cluster environment involves tracing a factor of 10^2 rays. The proposed optimization procedure in the case of EBW heating needs to increase two orders of magnitude the number of rays used in conventional ray tracing. The possibilities offered by a large-scale Grid infrastructure, and in particular EGEE, is to increase this factor to 10^3 and 10^4 .

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