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Type: **Demonstration**

Complex Scientific Workflows exploiting Grid and HPC

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Simulating a full fusion Tokamak requires a range of codes and applications which address different aspects of the plasma and at specific ranges of space and time scales. The computational complexity of all these tools is so high that only paradigms like grid computing or HPC allow to carry out all the simulations. The EUFORIA project enables the European fusion modelling community to exploit Grid and HPC.

In this work we show a complex workflow that uses two applications that run in different computer architectures: grid and HPC.

Detailed analysis

As previously shown by the fusion community, the usage of grid infrastructures for fusion research has provided interesting and relevant results that have created a large number of new possibilities to explore in the future. The Fusion community has been traditionally focused on HPC and it still reluctant to use grid computing, but with this work we show the feasibility to join both technologies and take the maximum advantages from these computational technologies. Our experience shows how to create and execute complex workflows to simulate plasma physics is a critical point nowadays and the key point for the future of the simulation in our field.

EUFORIA supports fusion modellers in this simulation work by providing programming expertise for porting and optimising codes on a range of computing platforms, providing grid and HPC resources, and providing the tools required to orchestrate the range of simulation codes necessary to simulate the full fusion reactor.

Conclusions and Future Work

With the modifications introduced to Kepler, we can demonstrate the technical feasibility of launching jobs from this workflow orchestration tool to a mixed DEISA and EGEE environment. We show not only the technical feasibility, but also the scientific relevance of the results that can be obtained and the importance of this development in future researches.

Impact

Kepler, a workflow orchestration tool, has been adapted by EUFORIA to enable fusion modellers to submit simulations to both Grid and HPC resources from their desktops and to visualise the results they obtain.

The project partners collaborate with DEISA and EGEE in order to ensure a wide adoption of the tools developed and deployed by EUFORIA in the infrastructure of DEISA and EGEE, by using the Fusion VO resources.

The possibility to create and run complex workflows, with some components running in HPC and some components running in Grid, with the use of the results obtained from these components by another component that can also run on Grid or HPC becomes a reality with these developments.

Keywords

Fusion, Workflow, Grid, HPC, EGEE, DEISA

URL for further information

<http://scilla.man.poznan.pl:8080/confluence/x/mQAY>

Justification for delivering demo and/or technical requirements (for demos)

The main feature of this work is the ability to execute complex workflows in mixed HPC-Grid environments. This is perfect for a demo where we can show the functionality of the developments.

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