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A Grid execution model for the ANSYS engineering simulation software

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Printable Summary

The increasing availability of computer power on Grid platforms has prompted the implementation of complex computational codes on distributed systems and, at the same time, the development of appropriate visual interfaces and tools able to minimize the skills requested to the final user to carry out massive Grid calculations. The work performed to implement a complex engineering simulation software usecase on distributed systems making use of the IGI web portal is here presented and discussed. The work has been carried out within a collaboration with the User Support Unit of the Italian Grid Initiative (IGI) and the INFN-Legnaro National Laboratories (INFN-LNL).

Wider impact of this work

The porting of legacy applications onto the Grid infrastructure, together with the development of the related workflows and gateway, is being carried out as part of a more general effort to build a solid platform, offered to users as a service, for assembling accurate multi scale realistic simulations. This is the case of the INFN-LNL which activity, in the context of the SPES project R&D [M. Manzolaro, G. Meneghetti, A. Andrighetto, Nucl.Instrum. Methods Phys. Res., Sect. A 623 (2010) 1061-1069], is strongly focused on the electro-thermal design of high temperature devices for the production of Radioactive Ion Beams. The related numerical analyses are strongly non-linear, mainly because of the radiative heat transfer computation, and require a relevant computational power to obtain a solution. The implemented case study demonstrates the validity of this approach and makes available a reusable example for other groups interested in porting their applications to production Grid systems.

Description of the work

The application chosen requested to be ported to the Grid environment, making use of the IGI resources available under the GRIDIT VO, is the commercial suite called ANSYS Inc.
ANSYS is an engineering simulation software (computer-aided engineering, or CAE) that offers a comprehensive range of engineering simulation solution sets providing access to virtually any field of engineering simulation that a design process requires. In the present work the suite ANSYS has been installed and configured in some Worker Nodes that belongs to the IGI domain. A web interface to run the simulation exploiting the production Grid services was provided through a dedicated portlet of the IGI Portal which is a powerful and easy to use gateway to distributed computing and storage resources. The web GUI was built in strong partnership with the user community interested in porting the application to gather their requirements. In a typical usecase the user provides the initial input files and configuration parameters and waits for the results until the calculation is terminated. This process may take several hours, even days using the resources available to run this application. As the granted amount of cpu time is limited on Grid sites, special care was taken in handling the checkpointing of the calculation. Another crucial aspect of such long simulations is the evolution's audit of the calculations at runtime, so a facility that exploits Grid Storage Elements was created to make temporary files and partial output available for inspection at runtime. The present strategy enable the user to check the consistency of the output at runtime, evaluating possible strategies aimed at saving time, computing resources and at avoiding waste of license usage.

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