

G-NEMO: a Grid empowered version of the state-of-the-art European modelling framework for oceanographic research

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Description of the work

The application chosen to be implemented in the Grid environment, making use of the IGI resources available under the GRIDIT VO, is the simulation framework called NEMO, one of the most important simulation frameworks chosen to be ported in the Grid environment to demonstrate the capabilities of the new IGI platform for parallel applications. NEMO is an ocean modelling framework which is composed of “engines” nested in an “environment”. The “engines” provide numerical solutions of ocean, sea-ice, tracers and biochemistry equations and their related physics. The “environment” consists of the pre- and post-processing tools, the interface to the other components of the Earth System, the user interface, the computer dependent functions and the documentation of the system. In the present work, the NEMO configuration used in MFS was ported to the gLite based infrastructure of the IGI domain. As an added value, a web interface to run the simulation was provided through a dedicated portlet integrated in 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. A typical simulation could last hours and even days of concurrent calculation using the parallel resources available in the Italian Grid Infrastructure, so special care was taken in handling the safe interruption and restart of the simulation and a facility to inspect files at runtime was also created.

Wider impact of this work

The implemented case study demonstrates the validity of this approach as part of a more general effort to build, as a service, a solid platform for enabling the access to computing and storage resources for those communities interested in porting their applications to the Grid. 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 for assembling accurate multi scale realistic simulations. This is the case of the Research and Development unit at INGV which is focused in development new physical processes in the ocean general circulation model NEMO, in order to produce more accurate forecast and analysis of the Mediterranean Sea, and aims to increase the chance to have new modelled processes in the operational data production service which runs daily at INGV. Otherwise these developments may remain an academic practice.

Printable Summary

The availability of computer power on Grid platforms has prompted the implementation of complex codes on distributed systems and, consequently, the development of appropriate visual interfaces and tools able to minimize the skills requested to the final user to carry out massive Grid calculations. In this work the Nucleus for European Modelling of the Ocean (NEMO) package has been implemented on the Italian Grid Initiative (IGI) infrastructure making use of the IGI web portal. NEMO is developed by a European Consortium established between CNRS (F), Mercator-Ocean (F), NERC (UK), UKMO (UK) and since 2011 CMCC (I) and INGV (I). The work has been carried out within a collaboration with the User Support Unit of IGI and the National Group for Operational Oceanography (GNOO) at National Institute of Geophysics and Vulcanology (INGV) and benefits of the activities of a more general project developed inside IGI aimed at deploying a scalable, reliable and easy-to-use HPC distributed platform.

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