Geophysical Research Abstracts, Vol. 7, 08716, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08716

GENIE: Exploiting Grid enabled computing and data handling resources for integrated Earth system modelling

A. R. Price (1), G. Xue (1), A. Yool (2), D. J. Lunt (3), P. J. Valdes (3), T. M. Lenton (4), J. L. Wason (1), G. E. Pound (1), S. J. Cox (1) and the GENIE team (5)

(1) School of Engineering Sciences, University of Southampton, Southampton SO17 1BJ, UK, (2) Southampton Oceanography Centre, University of Southampton, Southampton SO14 3ZH, UK, (3) School of Geographical Sciences, University of Bristol, University Road, Bristol BS8 1SS, UK, (4) School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK, (5) http://www.genie.ac.uk/people/ (a.r.price@soton.ac.uk; www.genie.ac.uk)

The GENIE project is developing a grid based framework for the composition, execution and management of new Earth System Models, and the data they produce. Our principle aims are to

- flexibly couple together state-of-the-art components to form unified Earth System Models (ESMs),
- study and tune the resulting ESMs over multi-millennial timescales.

We have achieved this by developing a framework and technologies which allow us to exploit:

- grid-enabled computational resources, and
- grid-enabled data management to allow post-processing, analysis and sharing of the distributed data produced by model runs.

Our framework is based around the widely used Matlab problem solving environment and is also being extended to provide the same functionality for Python. It is built upon

software developed by the UK Geodise project (www.geodise.org). A Matlab client provides a common environment for the project Virtual Organisation and allows the scripting of model execution through an interface to the computational Grid (Globus and Condor resources are supported). An augmented version of the Geodise Database Toolbox provides access to a grid-enabled repository for scripts, binaries and output data from the GENIE framework. In addition, rich metadata associated with these files is stored in a grid-enabled database, which can then be searched to locate files in the repository. We provide both GUI and programmatic access from the scripting environment to archive and retrieve files from the file repository and also to query the metadata store. An interface is also provided to a sophisticated Design Search and Optimisation package OPTIONS which has been exploited in some of our tuning studies.

We will illustrate the use of our grid-enabled environment with a number of exemplars representative of the range of scientific challenges that we have been addressing. These include (1) ensemble studies of the behaviour of the ocean's thermohaline circulation, (2) parameter tuning of coupled atmosphere, ocean and sea-ice models, and (3) multi-millennial timescale simulations. Our studies have used a wide range of local and national grid-enabled computational and data handling resources and have demonstrated how the grid can be exploited for integrated Earth system modelling.