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SymGrid: Symbolic Computations on Grids

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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 EU SCIEnce infrastructure project targets users of symbolic computing systems such as Maple. We aim to provide Grid-enabled symbolic computations through providing: (1) computational steering tools integrating seamlessly with existing tools; (2) the ability for users to identify symbolic components to form part of a Grid-enabled application; (3) adaptive resource brokers supporting the irregular workloads found in symbolic computations; (b4) large-scale heterogeneous demonstrators.

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.

The two current components of SymGrid framework are SymGrid-Services and SymGrid-Par. SymGrid-Services complies with the WSRF standard for Grid services based on Globus Toolkit 4. A middleware package was designed in order to allow the easy-to-use access in a uniform way from any computer algebra system to Grid and Web services. It consists of a set of Java classes and a set of computer algebra system libraries. SymGrid-Par allows symbolic computations to be executed as parallel computations on a computational Grid. The SymGrid-Par middleware is built on the GRID-GUM, Grid-enabled implementation of Glasgow Parallel Haskell that provides various high-level parallelism services providing a flexible, adaptive environment for managing parallelism at various degrees of granularity. GRID-GUM uses MPICH-G2. Moreover, GRID-GUM has been designed with novel dynamic load scheduling mechanisms for shared hierarchical heterogeneous computational Grids based on Globus Toolkit 2 or higher.

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)

The delays in porting the EGEE tools towards new WSRF-compliant Grid architectures have created several discussions and problems in connecting EGEE sites from SCIEnce with new non-EGEE sites build upon Globus Toolkit 4. The SCIEnce team hopes that the new version gLite will solve this issue.

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

Significant uses of symbolic computation systems, such as Maple, are found in

areas of physics, mathematics, biology, chemistry and engineering disciplines. Worldwide, it is estimated that there are at least 1 million users. While symbolic computations may have extremely high computational and data demands, at present, however, only a few symbolic computation systems provide any form of Grid accessibility. Most of these provide little more than wrappers to standard Globus library calls, and none allows simultaneous deployment of Grid services, access to external Grid services, and the coupling of symbolic components into a coherent Grid application. In contrast, SymGrid provides sophisticated interactive computational steering interfaces, with simple and high-level access to Grid services. Common data and task interfaces allow complex computations to be constructed by orchestrating heterogeneous distributed components from various systems into a single system

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Session Classification: Users in the wider Grid community - from science to business

Track Classification: Related Projects