Grid Task Execution

Ames Task Execution Center, Moffett Field, California

IPG Execution Service is a framework that reliably executes complex jobs on a computational grid, and is part of the IPG service architecture designed to support location-independent computing. The new grid service enables users to describe the platform on which they need a job to run, which allows the service to locate the desired platform, configure it for the required application, and execute the job. After a job is submitted, users can monitor it through periodic notifications, or through queries.

Knowledge Base Editor (SharpKBE)

NASA’s Jet Propulsion Laboratory, Pasadena, California

The SharpKBE software provides a graphical user interface environment for domain experts to build and manage knowledge base systems. Knowledge bases can be exported/translated to various target languages automatically, including customizable target languages. The tool enhances current practices by minimizing reliance on toolsmiths for system workflow management, and also improves the quality and maintenance of those systems by reducing the number of errors within the knowledge bases. This tool’s primary capability is in the area of expert systems modeling, specifically where there is a need to capture and efficiently manage large quantities of domain information (see figure). The SharpKBE supports C# and SHINE targets, and in concert with SHINE additionally produces C and
C++ targets. The knowledge base, which is created via graphical expression editors, is saved to a standardized XML document structure that is more flexible than previously existing formats, which were written in LISP-style syntax. This provides the user with intuitive mechanisms for viewing and modifying knowledge bases (see example) as well as the ability to produce customized style sheets. The editor can support the auto-coding paradigm for fault detection systems in flight software applications with reduced cost.

This program was written by Raffi Tikidjian, Mark James, and Ryan Mackey of Caltech for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44476.

Parallel Computing With Satellite Orbit Analysis Program

NASA’s Jet Propulsion Laboratory, Pasadena, California

This software innovation speeds up the computation time of the Satellite Orbit Analysis Program (SOAP) tool by parallelizing the code using the message-passing interface (MPI) library. The speed increases almost linearly with the number of processors, allowing the per-study duration of the visualization and analysis of space missions to take place in hours, rather than overnight. The software can conduct a parametric study involving millions of design vectors in a few hours of computational time by distributing the design scenarios among multiple processors. This allows SOAP to run in a parallel mode on JPL’s new, high-performance computer cluster, which has 1024 Intel Xeon processors.

Parametric Study and Contours in SOAP were the first targets of parallelization. The two functions compute one or more variables over a given time period and become quickly computation-intensive as report duration, time resolution, and variable complexity increase. The spatial and variable domains are sliced and distributed to each processor proportionally to its processing power. The result of the computation over the slice is collected at the end of the computation, and a single processor handles the file-writing task. Each space and variable domain contribution is completely independent so that message