Award No: 0437810
Project Title: Keeping Condor Flight Worthy
Investigators: Miron Livny, Todd Tannenbaum
Institution: University of Wisconsin-Madison
Website: http://www.cs.wisc.edu/condor
Prepared by: Mary Beth Kurz, Sebastien Goasguen, Clemson University

Image Description: Clemson Brackett Hall Lab PCs running Condor

Project Description and Outcome

America's international competitiveness in science depends on the power and ease of use of the computing infrastructure on our campuses. This NSF project, entitled "Keeping Condor Flight Worthy" sustains the support and development of the Condor High Throughput Computing Software ("Condor"), a distributed system that enables scientists to easily perform large-scale computations by harnessing the power of any available computer. Created at the University of Wisconsin-Madison more than two decades ago, Condor is a distributed system that delivers the ideas of grid computing by matching resources to jobs through a flexible matchmaking mechanism that brings together applications and resources. Through this novel mechanism Condor can turn a collection of computers scattered throughout the campus into a powerful campus grid. The successful deployment of the Condor system at Clemson University since the beginning of 2007 amply demonstrates that any campus can bring the power of a campus grid to the finger tips of its researchers and educators. Once such a grid is in place, it can provide the campus community with a gateway to our national cyber infrastructure.

In January 2007, Dr. Arden Bement, director of the National Science Foundation stated that "Leadership in Cyberinfrastructure may well become the major determinant in measuring pre-eminence in higher-education among nations". Condor has proven to be a tenant of Cyberinfrastructure. With support initiated a decade ago by the National Center for Supercomputing Applications, Condor is now being deployed at Purdue University and Clemson University. Jim Bottum, Chief Information Officer and Vice Provost for Computing and Information Technology at Clemson, and former Vice President for Information Technology at Purdue, is pleased with the 20 years Condor initiative. "It is impressive how 20 years later People are still using Condor and discovering its true power." Bottum said. Clemson University (an EPSCOR institution) has now deployed Condor across its campus. Researchers now have access to a campus computing grid consisting of almost 1,000 windows PC in labs, the libraries, coffee shops and other places on campus maintained by the Clemson Computing and Information Technology (CCIT) group.

Dr. Mary Beth Kurz, Assistant Professor of Industrial Engineering at Clemson, has been the first to harness the new Condor grid at Clemson, using the equivalent of 17 years of computer time in just one week. "Before using the campus grid, I was completely without hope of completing the computational studies my research required," Dr. Kurz said. "As soon as I saw hundreds of my jobs running on the campus grid, I started sending love notes to the Condor team at Clemson." Dr. Kurz studies genetic algorithms for large scale optimization in manufacturing and scheduling applications, and the Condor application has enabled her to run hundreds of algorithmic processing jobs to increase the throughput of manufacturers.

Dr. Kurz, seeks methods for increasing the throughput in manufacturing environments, which is a central component of the *American Competitiveness Initiative* investment in research and development (R&D). Per that initiative, this research can be directly transferred into marketable manufacturing processes, which are critical to America's global competitiveness. These genetic algorithms can also be applied to other combinatorial optimization problems.

Initially deployed at Clemson only three months ago, Condor has already greatly impacted Clemson's research capabilities through the power of the newly formed campus grid. Two staff members at CCIT worked part time on the initial deployment with consulting from Dr. Sebastien Goasguen, Assistant Professor of the New School of Computing at Clemson University who has a part time appointment with CCIT as well. Dr. Goasguen, who previously led the deployment of Condor at Purdue University resulting in a total of 11 TFlops, works with CCIT to drive the development of a Cyberinfrastructure Center on campus. The Condor deployment was the first initiative of this center due to its ease of implementation, its robustness and its low cost of entry. Clemson also joined the Open Science Grid (OSG) to share the power of its campus resources with other institutions and gain access to our national cyber infrastructure. Clemson University has made computing a strategic priority, and the investment in this campus wide cyberinfrastructure through the use of Condor, and partnership with the OSG, will boost research and education in many areas including manufacturing research.