

**Abstract for Award 0331645**  
**“ITR: Virtual Grid Application Development Software (VGrADS)”**

The “Computational Grid”, as described in *The Grid: Blueprint for a New Computing Infrastructure* and demonstrated by many proof-of-concept applications, promises to connect computers, databases, and people in a network to solve problems in scientific research and other diverse fields. However, the complexity, unreliability, and overhead of low-level operations in today’s systems obscure the Grid’s potential. The five-year Virtual Grid Application Development Software (VGrADS) project attacks a fundamental part of this problem – how to more effectively program these highly complex and dynamic systems. It will develop software tools that simplify and accelerate the development of Grid applications and services, while delivering high levels of performance and resource efficiency. This improved usability will greatly expand the community of Grid users and developers. In the process, VGrADS will contribute to both the theory and practice of distributed computation.

To address these aims, VGrADS will explore, define, and implement a hierarchy of virtual resources and a set of programming models for Grid computing. It will conduct research in three key areas:

1. Virtual Grid (vgrid) architectures enabling a separation of concerns between high-level services and the Grid’s inherent complexity.
2. Programming models, compilers, component libraries, and tools supporting creation of Grid applications.
3. Core software technologies, including performance-efficient scheduling, fault tolerance, and economic models for resource management, allowing scalable Grid computations.

VGrADS will pursue this agenda by collaborating with leading scientific applications to elicit key challenges, validate results, and disseminate technology. It will distribute software that it creates in open-source form for the research community. It will also build on its PIs’ past successes in human resource development by using existing programs to attract and retain women and minorities in computational science.