Goals and Equipment. As the NSF's TeraGrid facility comes online, the role of Itanium clusters in Grid computing will increase substantially. The purpose of this project is to acquire an Itanium cluster for Grid computing, including storage and software, to be maintained by the OU Supercomputing Center for Education & Research (OSCER). Specifically, through a combination of NSF funds and University of Oklahoma (OU) cost share, OSCER will acquire: an Itanium cluster consisting of 32 or more Itanium CPUs, at least 2 GB of RAM per CPU, a high performance interconnect, and at least half a TB of local hard disk; additional storage to be incorporated into OSCER's existing storage servers (1.5 TB in OSCER's FiberChannel-1 disk server; 20 TB in OSCER's AIT-3 tape library); appropriate software (compilers and debuggers); significant system administration time for installation, deployment and ongoing maintenance.

Research Activities. Several investigations will use these resources: three ongoing, two with proposals already submitted or now being submitted, and one with initial proposals in development. All will use this project's resources for design, development, testing and debugging of Grid-enabled software. The Modeling Environment for Atmospheric Discovery (MEAD) collaboration is developing and adapting cyberinfrastructure to enable simulation, data mining/machine learning, and visualization of hurricanes and storms using the TeraGrid. The Linked Environments for Atmospheric Discovery (LEAD) project will develop Grid-enabled resources for realtime weather forecasting and related research. The High Energy Physics Data Grid Tools project will develop tools for dynamic workspaces for scientific analysis communities that will allow small groups to create dynamic workspaces for their projects and complementary collaboratory tools for realtime interactive sharing of these dynamic workspaces. The George E. Brown, Jr. Network for Earthquake Engineering Simulation's NEESgrid project is linking earthquake researchers across the U.S. with leading-edge computing resources and research equipment, allowing geographically distributed collaborative teams to plan, perform, and publish their experiments. The HiMUST project will develop a Grid-based problem solving environment for multiscale, multiphase, multiphysics flow through porous media, using hydrocarbon reservoir simulation as an initial testbed but broadly applicable to a wide variety of systems including aquifers, separation tower and reactor units with packed beds, filters, catalytic converters, and even biological systems such as bone tissue. The Grid-PRADO project will provide Grid-enabled aircraft design through massively parallel searching of design parameter spaces, providing a Web-based, Grid-enabled tool for design engineers not only in aerospace, but ultimately across a wide spectrum of disciplines.

Impact. First, these resources will enhance OU researchers' ability to engage in cutting edge Grid-based computational research — not only the investigators on this project, but also dozens of OSCER partner research teams. Second, the participating projects will act as testbeds for examining and enhancing the capabilities of Grid-enabled environments. Third, OSCER has established a unique High Performance Computing (HPC) education program, partially funded under an existing NSF CRCD grant, featuring (a) a workshop series titled "Supercomputing in Plain English" targeted at scientists and engineers with modest computing experience but strong mathematics and science backgrounds, combined with (b) HPC "rounds," in which OSCER personnel partner with a variety of research teams by providing weekly consultations, applying HPC principles and practices to the teams' specific investigations. Fourth, this project strengthens an ongoing partnership between OU's High Energy Physics research team and its counterpart at historically African-American Langston University, as well as establishing, through LEAD, a new partnership between OU and Howard University. Fifth, the research results generated by both the participating projects and other OU science and engineering teams will be broadly disseminated through journals and conferences, including an annual regional conference conducted by OSCER and now entering its second year. Finally, OSCER has strong ties to Oklahoma's EPSCoR program and to HPC sites in neighboring EPSCoR states.

Management Plan. Because these resources will be managed by OSCER, the management plan will be an extension of OSCER's existing administrative system: a Board (including 5 of this project's personnel) that provides representation for all participating OU colleges, and a Director (the PI) accountable to the Board and reporting directly to OU's Chief Information Officer. Mechanisms for setting policy and making decisions are well established.