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Linked Environments for Atmospheric Discovery (LEAD): A Cyberinfrastructure for Mesoscale Meteorology Research and Education

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Linked Environments for Atmospheric Discovery (LEAD), a project funded by the US National Science Foundation Large Information Technology Research (ITR) program in fall, 2003, will facilitate the identification, access, preparation, assimilation, prediction, management, analysis, mining, and visualization of a broad array of meteorological data and model output, independent of format and physical location. A transforming element of LEAD is dynamic workflow orchestration and data management, which will allow use of analysis tools, forecast models, and data repositories as dynamically adaptive, on-demand systems that can a) change configuration rapidly and automatically in response to weather; b) continually be steered by new data; c) respond to decision-driven inputs from users; d) initiate other processes automatically; and e) steer remote observing technologies to optimize data collection for the problem at hand.

We describe in this presentation the concepts, architecture, implementation plans, and expected impacts of LEAD, the underpinning of which will be a series of interconnected, heterogeneous virtual IT "Grid environments" designed to provide a complete framework for mesoscale meteorology research and education. Much of the LEAD infrastructure being developed for the WRF model, particularly workflow orchestration, will play a significant role in the nascent WRF Developmental Test Bed Center located at NCAR. Education Testbeds will integrate education and outreach throughout the entire LEAD program, and will help shape LEAD research into applications that are

congruent with pedagogic requirements, national standards, and evaluation metrics. Ultimately, the LEAD environments will enable researchers, educators, and students to run atmospheric models and other tools in much more realistic, real time settings than is now possible, with emphasis on the use of locally or otherwise uniquely available data.