LEAD at Unidata

Status Update, April 2009

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The LEAD project is currently in the no-cost extension period and nearing the end of its period of performance as an NSF Large ITR award. LEAD has pioneered a new approach for integrating complex weather data, assimilation, modeling, mining, and cyberinfrastructure systems in innovative ways to empower researchers and students with capabilities heretofore available at only a few major universities and research or operational centers around the world. Containing virtually all elements of modern cyberinfrastructure – from adaptive sensors and high-performance computing and networking to huge data sets, human decision making and complex virtual organizations – LEAD functionality also has been integrated with the TeraGrid as a successful TeraGrid Science Gateway project and continues to serve as an *avant-garde* research system for the meteorological and computer science communities. LEAD has been a principal application driver for helping TeraGrid identify and solve some of its most important challenges and prepare for the next generation XD environment.

One-Year No-Cost Extension

In July, 2008, all nine LEAD institutions submitted and were granted a one-year no-cost extension (NCE), which will continue LEAD as an NSF cooperative agreement through 30 September 2009.

UPC continues its role in the project and providing data, software and support for the project and valuable assistance in the testing and deployment of and end-user support for LEAD systems in the atmospheric sciences community. The Unidata LEAD test bed continues to be a primary resource of data for LEAD workflows.

LEAD Beyond the ITR Phase

The LEAD PIs continue to strategize about securing funding for a continued LEAD deployment facility. The LEAD PIs visited NSF on 29-30 September 2008 to meet with NSF program officers and to discuss possible scenarios for deployment as well as continued development of various components of the LEAD cyberinfrastructure. Based on conversations with NSF officials, LEAD PIs were invited to submit a modest supplemental funding request to keep the LEAD infrastructure and systems operating through the end of the current fiscal year. A summary of that request is appended below. The LEAD PIs also developed and submitted a longer term vision and sustainability document for the project: http://www.unidata.ucar.edu/staff/mohan/LEAD_Vision_V5%20Public.pdf

LEAD Staff Departures

As noted in the last status report, the uncertainty surrounding the future of LEAD and longer-term funding for the project resulted in the departure of two staff members, Anne Wilson (in May 2008) and Tom Baltzer (September 2008). In light of the fact that LEAD will be in a no-cost extension period starting on 1 October, the UPC then decided that those positions will not be filled. However, Brian Kelly continues his role in managing the data systems and the Unidata LEAD testbed, both of which play a critical role in the LEAD overall infrastructure and workflows.

LEAD Supplemental Funding Request

Towards Broad and Deep Community Deployment of LEAD

PROJECT SUMMARY

From the beginning, the LEAD vision has been to not only enable breakthrough advances in atmospheric and computational science while developing innovative and useful cyberinfrastructure technologies, but to do so in a practicable way that transforms meteorological research and education and provides outstanding value to other disciplines. However, this transformation can occur only when LEAD is transitioned from a research project and made available as a persistent, sustained facility upon which the community can rely. This goal was expressly stated in the original LEAD proposal:

> *"As a virtual extension of the user's desktop, LEAD will enable researchers, users, educators, and students to use atmospheric models and other tools in more realistic, real time settings than is now possible."*

In an effort to enhance its visibility and adoption by the community, the LEAD team presented a 90-minute tutorial as part of the annual WRF Workshop in Boulder, CO on June 27, 2008. It was attended by some 30 participants, most of whom brought a laptop and were able to access the LEAD Portal, construct and submit WRF based workflows and view results from their numerical simulations. An important capability made available by LEAD was namelist editing for the WRF model. Further, this was the first time LEAD had a presence at the WRF Workshop, and it represented an opportunity to explain how LEAD and the WRF Portal differ, and how both groups are working to leverage and couple their capabilities. LEAD has been used in a variety of education initiatives, including the WxChallenge, and the 2007 and 2008 Spring Experiments of the NOAA Hazardous Weather Testbed. Options are being explored for its application by campus weather services at colleges and universities. LEAD is additionally being used in crop modeling research by Western Michigan University Scientists as part of a project funded by USDA.

The outcomes and impacts realized by LEAD provide a strong foundation upon which to build a persistent cyberinfrastructure for atmospheric sciences, with extensibility to other science and engineering domains. ***Consequently, funding is being sought to continue making LEAD available to the community through the no-cost extension period,*** and longer-term plans for deployment also are being developed.

Intellectual Merit. The fundamental IT advances under this request are primarily the engineering tasks of transforming basic research into useful, deployable, and maintainable technologies. In order to enhance the usefulness of LEAD, we propose to bring into LEAD the WRF 3DVAR variational data assimilation package. The LEAD framework already supports ADAS, both of which can be used for creating three-dimensional atmospheric analyses. Indeed, ADAS and the WRF 3DVAR system can be used sequentially (e.g., for single Doppler wind analysis), though such capability is beyond the scope of what can be accomplished during the no-cost extension period. Adding the WRF 3DVAR system will both enhance LEAD and make it much more attractive to the WRF community.

Broader Impact. Through efforts under this supplemental request, we will continue making LEAD available to the community, supporting the vision stated in the original LEAD proposal:

> *"The [LEAD environment] will accelerate the transfer of WRF-based research results into operations, ..."*

This will be accomplished by participating in the WRF Workshop and WRF Tutorial in 2009 and through the organization and hosting of a workshop in late Summer 2009 around the broader goal of the benefits of on-demand, grid enabled systems. The workshop will target field programs that need on-demand, tailored numerical forecasting for guiding crew and instrument deployment, and users of the emerging "warn on forecast" concept, as well as WRF users, and others interested in exploring interoperation of LEAD with similar efforts in other cognate disciplines. A key to the workshop is student involvement funded through travel scholarships.