Integration of the NASA Land Information System as an Application Framework into the MRC Rapid Prototyping Capabilities Infrastructure

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Overview
The Mississippi Research Consortium (MRC) is implementing a computational Rapid Prototyping Capabilities (RPC) infrastructure, in order to identify, evaluate, and integrate research results for applications. The NASA Land Information System (LIS) is a functional Land Data Assimilation System (LDAS) that incorporates a suite of land models in an interoperable computational framework. NASA LIS has been identified to be integrated into the RPC infrastructure as a cross-cutting applications framework (AF).

NASA Land Information System
The land models in LIS incorporate surface and atmospheric parameters of temperature, snow/water, vegetation, albedo, soil conditions, topography, and radiation. Many of these parameters are available from in-situ observations, numerical model analysis, and from NASA, NOAA, and other remote sensing satellite platforms at various spatial and temporal resolutions. The computational resources, available to LIS via the RPC infrastructure, support e-Science experiments involving the global modeling of land-atmosphere studies at 1km spatial resolutions as well as regional studies at finer resolutions. Thus the LIS AF with-in RPC can be used to rapidly prototype experiments in order to evaluate the viability of basic research results toward applications of societal benefits.

LIS Architecture
LIS currently is comprised of a LIS core, a number of community land models, data servers, and visualization systems – integrated in a high-performance computing environment. LIS uses model independent software frameworks, such as the Earth Systems Modeling Framework (ESMF) and Assistance for Land Modeling Activities (ALMA). The LIS user interface (UI) can be used to query, browse, and download LIS derived products. Besides, any clients that support OpenDAP can be used to access the model results.

Preliminary Results of RPC LIS Experiments
The Noah land model in LIS is being used to evaluate the potential for producing high resolution (1 km) soil moisture maps in the Mississippi delta region. Both in-situ measurements from the USDA Soil Climate Analysis Network (SCAN) and remotely sensed data from the AMSR-E instrument onboard the Aqua satellite will be assimilated into the Noah model using the data assimilation capabilities of LIS. Vegetation data from the MODIS sensors are also being evaluated for potential improvements. The Weather Research and Forecasting (WRF) model is being initialized using the soil moisture estimates from LIS to study the impacts of higher resolution soil moisture information on weather forecasts.

Integrating LIS into RPC Infrastructure
Community consensus protocols and standards-based technologies are being adopted to enable the services of LIS accessible to other RPC experiments. The LIS model results will be disseminated using Unidata technologies, such as the THREDDS Data Server (TDS), and further analyzed using tools such as the Integrated Data Viewer (IDV). The experiment results will also be published to NASA Global Change Master Directory (GCMD) and other digital libraries.

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