

## **Virtualizing Lifemapper for PRAGMA: Step 2 - The Computational Tier**

Aimee Stewart<sup>1</sup>, Cindy Zheng<sup>2</sup>, Phil Papadopoulos<sup>2</sup>, C.J. Grady<sup>1</sup>

<sup>1</sup>Biodiversity Institute, University of Kansas Biodiversity Institute

<sup>2</sup>San Diego Supercomputer Center, University of California at San Diego

Lifemapper, from the University of Kansas, is a multi-tier system containing an archive of species occurrence data and potential distribution maps, plus a set of biological research analysis tools. The research tools include two modules, Species Distribution Modeling, or LmSDM, for mapping the ecological niche of individual species and Range and Diversity, or LmRAD, for looking at the landscape level ecology of multiple species. These tools are built using web services and we provide a client for programmatic access or application plug-ins for connecting from QuantumGIS or VisTrails workflow tool. The backend of Lifemapper consists of compute, management, web, and data tiers. These tiers operate in a modular fashion; they may be directed to communicate with one or more instances of Lifemapper.

As part of the PRAGMA Virtual Biodiversity Expedition, Step 1 involved implementation of a script at Indiana University (IU) which analyzed metadata at the Universiti Teknologi Malaysia (UTM) Geoportal instance to initiate Lifemapper SDM experiments using satellite and species data from Mount Kinabalu in Sabah, Malaysia maintained at the University of Florida (UF). After Lifemapper completed the SDM models, the script retrieved and cataloged metadata in a GeoPortal instance running at IU.

For Step 2, we have created a Lifemapper compute tier on a Virtual Cluster (VC) at San Diego Super Computer Center (SDSC). The portability of SDSC's VC increases the scalability of Lifemapper, as well as making it more portable and flexible. The VC requests jobs from and returns them to the KU Lifemapper management tier, where they are cataloged and stored. This VC primarily computes PRAGMA user data, but may calculate archive data if there are no pending PRAGMA jobs.

The next step of the VBE will be to create a Virtual Network Overlay based at UF to isolate PRAGMA or other groups with data access restriction, and to extend Lifemapper with IU provenance generation tools.