Geophysical Research Abstracts,
Vol. 11, EGU2009-3436-1, 2009
EGU General Assembly 2009

A technology framework to analyse the Climate Change impact on biodiversity species distribution

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Several biodiversity application scenarios require modeling the impact of climate change on species distribution. For this purpose, heterogeneous data resources and modeling services are required to interoperate.
An information technology and service framework to study the Climate Change impact on biodiversity species distribution is presented. This framework allows the development of relevant biodiversity application scenarios. These draw on data and information exchange from a series of systems interconnected through SOA (Service Oriented Architecture) applying established international standards as well as Community interoperability arrangements. The overall system architecture consists of six main logical components:
- Biodiversity Data Provider: a component which is able to provide biodiversity data.
- Climatological Data Provider: a component which is able to provide climatological data.
- Catalog: a component which is able to perform queries on the available biodiversity and climatological datasets.
- Model Provider: a component which is able to run ENM (Ecological Niche Models) on the selected biodiversity and climatological datasets.
- Use Scenario Controller: a component which acts as a workflow controller implementing the business process of a typical biodiversity scenario. It is controlled by the user through the GUI.
- Graphical User Interface (GUI): The component for user interaction. It controls the workflow manager to perform the required operations for implementing the biodiversity basic scenario.
These components play the three typical roles of a SOA where Consumers discover Providers through a Registry. In our framework Data and Model providers are the Service Providers; the GUI-Controller pair acts as a Consumer and the Catalog plays the role of the Registry. Where necessary it also acts as a Broker between Consumer and Providers. This fourth component is necessary for heterogeneous and federated systems.
The framework was conceived and successfully experimented in the GEOSS Interoperability Process Pilot Project (IP3) and demonstrated at the IV Ministerial summit in Cape Town –November 2007. Presently, the framework is used for the GEOSS Architecture Implementation Pilot project –phase 2.
The usage case of the impact of climate change on the distribution of Pikas in North America is presented and discussed. This usage case is based on research being done at the University of Colorado. The used presence datasets were collected by the Scientist and from the GBIF (Global Biodiversity Information Facility) Data Portal. Climate datasets were discovered and collected by the WMO publications and distribution system.