Geophysical Research Abstracts
Vol. 15, EGU2013-10804, 2013
EGU General Assembly 2013

BP-Broker use-cases in the UncertWeb framework

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The UncertWeb framework is a distributed, Web-based Information and Communication Technology (ICT) system to support scientific data modeling in presence of uncertainty.

We designed and prototyped a core component of the UncertWeb framework: the Business Process Broker. The BP-Broker implements several functionalities, such as: discovery of available processes/BPs, preprocessing of a BP into its executable form (EBP), publication of EBPs and their execution through a workflow-engine.

According to the Composition-as-a-Service (CaaS) approach, the BP-Broker supports discovery and chaining of modeling resources (and processing resources in general), providing the necessary interoperability services for creating, validating, editing, storing, publishing, and executing scientific workflows.

The UncertWeb project targeted several scenarios, which were used to evaluate and test the BP-Broker. The scenarios cover the following environmental application domains: biodiversity and habitat change, land use and policy modeling, local air quality forecasting, and individual activity in the environment.

This work reports on the study of a number of use-cases, by means of the BP-Broker, namely:

- eHabitat use-case: implements a Monte Carlo simulation performed on a deterministic ecological model; an extended use-case supports inter-comparison of model outputs;
- FERA use-case: is composed of a set of models for predicting land-use and crop yield response to climatic and economic change;
- NILU use-case: is composed of a Probabilistic Air Quality Forecasting model for predicting concentrations of air pollutants;
- Albatross use-case: includes two model services for simulating activity-travel patterns of individuals in time and space;
- Overlay use-case: integrates the NILU scenario with the Albatross scenario to calculate the exposure to air pollutants of individuals.

Our aim was to prove the feasibility of describing composite modeling processes with a high-level, abstract notation (i.e. BPMN 2.0), and delegating the resolution of technical issues (e.g. I/O matching) as much as possible to an external service. The results of the experimented solution indicate that this approach facilitates the integration of environmental model workflows into the standard geospatial Web Services framework (e.g. the GEOSS Common Infrastructure), mitigating its inherent complexity.

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under Grant Agreement n° 248488.