Motivation
The use of a standard Grid platform as a main communication backbone resolves heterogeneities on the level of computing systems, but does not solve the heterogeneity of data used in particular applications and data storages.

Contribution
User-oriented system for composition of scientific workflows and semantic integration of heterogeneous Grid resources
- User-friendly means for composition of decision-making workflows
- Services for discovery and semantic integration of resources as an extension of the standard Grid environment
- Ontology-driven user-oriented integration technique

What is an Ontology?
An ontology is a formal, explicit specification of a shared conceptualization. It resembles faceted taxonomies but use richer semantic relationships among terms and attributes, as well as strict rules about how to specify terms and relationships.

Approach to The System

Workflow Composition
1. The user defines an integration workflow.
   - Available resources are shown as icons in the workbench
   - The "ties" between icons indicates the integration of those connected resources
   (See Fig. 3)
2. Semantic binding two resource data to their Domain Ontologies.
3. Add matching pairs in Matching Ontology. (See Fig. 4)

Semantic Mapping
1. Query related domain ontologies over Functional Ontology
2. Semantic binding two resource data to their Domain Ontologies.
3. Add matching pairs in Matching Ontology.

Application
Our system is evaluated by the use case “Best source of irrigation water”. Here, WaSiM and GAMS simulation systems will be integrated to evaluate the conjunctive use of surface and groundwater in reservoir based irrigation systems. Fig. 3, 4, 5 present how it works in Workflow Composition layer, Semantic Matching and Semantic Mapping layers respectively.

Workflow Composition Layer
- Define a workflow (Function Domain Ontology); (See Fig. 3)
- Define the necessary data required by the workflow (Hydrological Domain Ontology; (See Fig. 3)
- Define the transformation rules (See Fig. 4)

Semantic Mapping Layer
- Checks the rules about how to specify terms and relationships.
- Enable reuse of knowledge
- Make domain assumptions explicit
- Analyze the knowledge
- Resolve semantic heterogeneities

Result of the integration
- Inflows
- Precipitation
- Surface Water
- Ground Water
- Rain

Routing Q1: What are the matching pairs between the hydrological domain ontologies and the Economic domain ontology defined in Rule Engine? Q2: Which transformation rules will be applied? Answered by Semantic Mapping

Workflow Composition Layer
- Define a workflow (Function Domain Ontology);
- Define the necessary data required by the workflow (Hydrological Domain Ontology;
- Define the transformation rules (See Fig. 4)

Semantic Mapping Layer
- Checks the rules about how to specify terms and relationships.
- Enable reuse of knowledge
- Make domain assumptions explicit
- Resolve semantic heterogeneities

User-Oriented Ontology-based Integration of Resources for GLOWA Volta Grid Infrastructure
Yan Leng1, Alexandr Savinov1, Serge Shumilov1.

Three-layered Architecture for ontology-based Integration of Resources in Grid Infrastructure

Three-layered Architecture with three layers:
- Semantic Mapping Layer
- Semantic Matching Layer
- Workflow Composition Layer

Fig. 2: Three-Layered Architecture

Fig. 3: Workflow Composition Layer

Fig. 4: Semantic Matching Layer

Fig. 5: Semantic Mapping Layer

Contact: S. Shumilov, shumilov@gei.unibw.de
1 Department of Computer Science III, University of Bonn, 2 Center for Research Development, University of Bonn, GLOWA Volta Project, www.glowa-volta.de