Argos: An Ontology and Web Service Composition Infrastructure for Goods Movement Analysis

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Argos Research Objectives

- Computer science research:
  - Model scientific problems as computational workflows: data access and processing operations represented as web services
  - Expressive web services description language
  - Automatic web service composition
- Digital government application:
  - Intra-metropolitan freight flow model
  - Test with government partners
- Social sciences research:
  - Goods movement-based accessibility measures from intermediate computations
  - Tests of accessibility impacts on employment concentrations and land values

Approach

- Model data using domain ontology
  - Multi-dimensional datacube
    - dimensions: geo, flow, product, time interval, value, unit, ...
  - Hierarchical values: subclass, part-of
  - Describe sources and operations
    - Uniform data representation: RDF/S
    - Uniform access: Web Services
    - Semantic descriptions: Triple
      - variant of F-Logic for RDF
      - logic rules over ontology
  - Automatically compose computational workflow
    - Exploring mediator techniques using Triple

Current Status

- Initial ontology for goods movement
  - Using Protégé as knowledge acquisition tool output in RDF/RDFS
- Modeled workflow for freight flow estimation in the Los Angeles region (ongoing)
  - Data sources and processing operations implemented as Web Services
    - Operations expressed as Triple programs
    - Extended Triple with aggregation
  - Workflow implemented as a BPEL4WS composition of web services

Next Steps

- Triple-based mediator for automatic composition of web services
- Generalize operations and extend ontology
  - Complete workflow for freight flow estimation of the Los Angeles region
  - Different granularities, scales
  - Use Argos for research on urban structure
  - Test application by government practitioners