Introduction

- **Purpose of research**: to develop a flexible data query and analysis system based on the web services paradigm.
- **Application domain**: metropolitan goods movement, including modeling of goods movement flows and effects of goods movement activities on urban spatial structure.
- **Three objectives**:
  - Advance computer science research in web services, automated workflow
  - Develop and conduct test applications of a freight flow model in cooperation with government partners, and
  - Use the model to conduct social science research.

Three Tasks – Argos Year 2 Overview

1) Developing an ontology for describing various data elements and sources that compose goods movement domain
2) Identifying new data sources to improve previous goods movement workflow and model

Ontology Fragment in Protege

1) **Ontology Development**
   - Ontology describes the data items in different sources and the data produced by operations uniformly as multidimensional objects.
   - Data to be described includes production, consumption and flows of goods by quantity, value, type, location and time period
   - Core dimensions: geography (e.g. Los Angeles CMSA), temporal extent of measurement, commodity type (industry classifications), measurement unit and flow type
   - Description language: uses Resource description framework (RDF) augmented with the logic language Triple

2) **New data Sources**
   - Argos intra-metropolitan freight flow model relies on commonly available, inexpensive secondary data sources (e.g. IMPLAN, Commodity Flow Survey, Waterborne Commerce of United States). Model development steps:
     - Estimate zone level intraregional commodity specific trip attractions and trip productions by using a regional input / output transactions table
     - Estimate commodity and mode specific interregional and international trip attractions and productions for zones with import export nodes
     - Create regional origin – destination matrix
     - Load the O-D matrix on a regional highway network with known passenger flows

3) **Automatic Workflow**
   - Develop an architecture based on expressive web service descriptions that enables services compositions to be automatically derived.
   - Focus on automatically generating workflows that include aggregation operations.
   - Five steps in the composition approach:
     - Model the application domain as an RDF/S ontology
     - Describe the contents of each data source
     - Model the possible computational operations
     - Combine the ontology, sources, and operations into a Triple program
     - Execute the workflow by translating the generated operation graph to the XML workflow language BPEL4WS.

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Automated Workflow Sample


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