A Framework for Integrating Oceanographic Data Repositories

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Abstract

In addition to result widgets, S2S will support parameter description widgets to provide additional context about a user’s parameter restrictions. The bounding box widget was designed to support multiple inputs:
1) free text input, 2) click and drag in a Google Map, 3) auto-complete search over SeaVib salt and fresh water body gazetteer.

Use Case: The Seafloor to Surface Ocean Data Finder

The S2S Application Ontology:

Widget: a user interface element that visualizes results of S2S Queries and facilitates user input (i.e., parameter selection)

OpenSearch:

- http://www.opensearch.org
- Specification for describing search services and results
- Grammar for describing UBL template
- Provides keyword search in address theses of FireFox, IE, et al.
- Many science repositories do not offer keyword search.
- S2S defines vocabulary to specify input formats for search parameters

Future Work and Directions:

- Drupal community website for S2S component registry and search services discovery
- Cross-repository search utilizing community vocabularies
- Data visualization widgets for standard data formats like RDF and NetCDF
- Web browser plug-ins to provide search interfaces at data provider websites

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Use Case Workflow Diagram:

1. Search parameters can be also be specified if not needed during a search session. S2S Services may specify a default configuration and avoid parameters and widgets.
2. Search parameters can also be displayed if not needed during a search session.
3. Reusable search parameters for a customized experience. S2S Services can restrict parameters over efficiency or other purposes.
4. Although not strictly a framework for faceted browse, S2S Services can be constructed to meet the requirements of a facetted browser interface.

Semantic Web Methodology & Technology Development Process

- Establish and improve a well-defined methodology vision for semantic technology based on application development
- Leverage controlled vocabularies, etc.
- Leverage technology infrastructure
- Rapid prototype
- Analysis
- Evaluation
- Leverage technology infrastructure
- Rapid prototype
- Analysis
- Evaluation

Challenges:

- For the oceanographer...
  - Unaware of data repositories in other disciplines
  - Learning curve for each data repository
- For the data provider...
  - Too many standards to keep up with
  - Resources spent on search interface development
- For the informaticist...
  - Non-uniformity of data structures and services
  - Non-standard (and missing) metadata vocabularies

Use Case: Oceanography Domain

- Oceanography
  - Data Administration
  - Physical Oceanography
  - Geophysical Oceanography
  - Chemical Oceanography
  - Biological Oceanography

Use Case: Oceanography Metadata

- Metadata
  - Profile Finder
  - Deployment Data & Metadata Discovery
  - Through Cruise
  - Mephit

Use Case: Oceanography Deployment

- Deployment
  - Through Cruise
  - Mephit
  - OOI
  - Fracture Zone and Hole, MA, United States
  - Woods Hole Oceanographic Institution, Woods Hole, MA, United States

Use Case: Oceanography Collaboration

- Collaboration
  - Marine Metar Data
  - Northwest Atlantic
  - Southwest Atlantic
  - Eastern Tropical Pacific

Use Case: Oceanography Sponsor

- Sponsor
  - TWC
  - RPI
  - Rensselaer Polytechnic Institute
  - WHRI
  - Woods Hole Oceanographic Institution

Use Case: Oceanography Search

- Search
  - Data Source
  - Data Type
  - Data Format
  - Data Repository
  - Search
  - Query
  - Template Application

Use Case: Oceanography Application

- Application
  - Oceanography
  - S2S Application Ontology
  - S2S Application Ontology Diagram

Background:

Oceanographic research covers a broad range of science domains and has had tremendous success in cross-disciplinary endeavors. Advances in cyberinfrastructure are making it easier to share data across disciplines through the use of web services and community vocabularies. Best practices in the design of web services and vocabularies to support interoperability amongst science data repositories are only starting to emerge. Strategic design decisions in these areas are crucial to the creation of end-user data and application integration tools.

We present S2S, a novel framework for deploying customizable user interfaces to support the search and analysis of data from multiple repositories. Our research methods follow the Semantic Web methodology and technology development process developed by Fox et al. This methodology stresses the importance of close science-technology interactions when developing scientific use cases, keeping the project well scoped and ensuring the result meets a real scientific need.

Glossary:

RPI — Rensselaer Polytechnic Institute
TWC — Tetherless World Constellation at RPI
WHOI — Woods Hole Oceanographic Institution
RDF — Resource Description Framework
OWL — Web Ontology Language

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- S2S
- Search
- Application
- Ontology

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