OGC
Open Geospatial Consortium

Ontology and Geospatial Standards

Ontology Summit 2009
NIST Gaithersburg, MD
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April 6, 2009

What is the OGC?

- **Open Geospatial Consortium, Inc. (OGC)**
  - **Not-for-profit, international voluntary consensus standards organization**
  - **Founded in 1994, Incorporated in US, UK, Australia**
  - **360+ (up from 340 last year) industry, government, research and university members**

OGC Mission

To lead in the development, promotion and harmonization of open spatial standards …

OGC's Approach for Advancing Interoperability

- ***Interoperability Program*** **(IP)** - a global, innovative, hands-on rapid prototyping and testing program designed to accelerate interface development and validation, and bring interoperability to the market

- ***Specification Development Program*** **–Consensus standards process similar to other Industry consortia (World Wide Web Consortium, OMA etc.).**

- ***Outreach and Community Adoption Program*** **– education and training, encourage take up of OGC specifications, business development, communications programs**

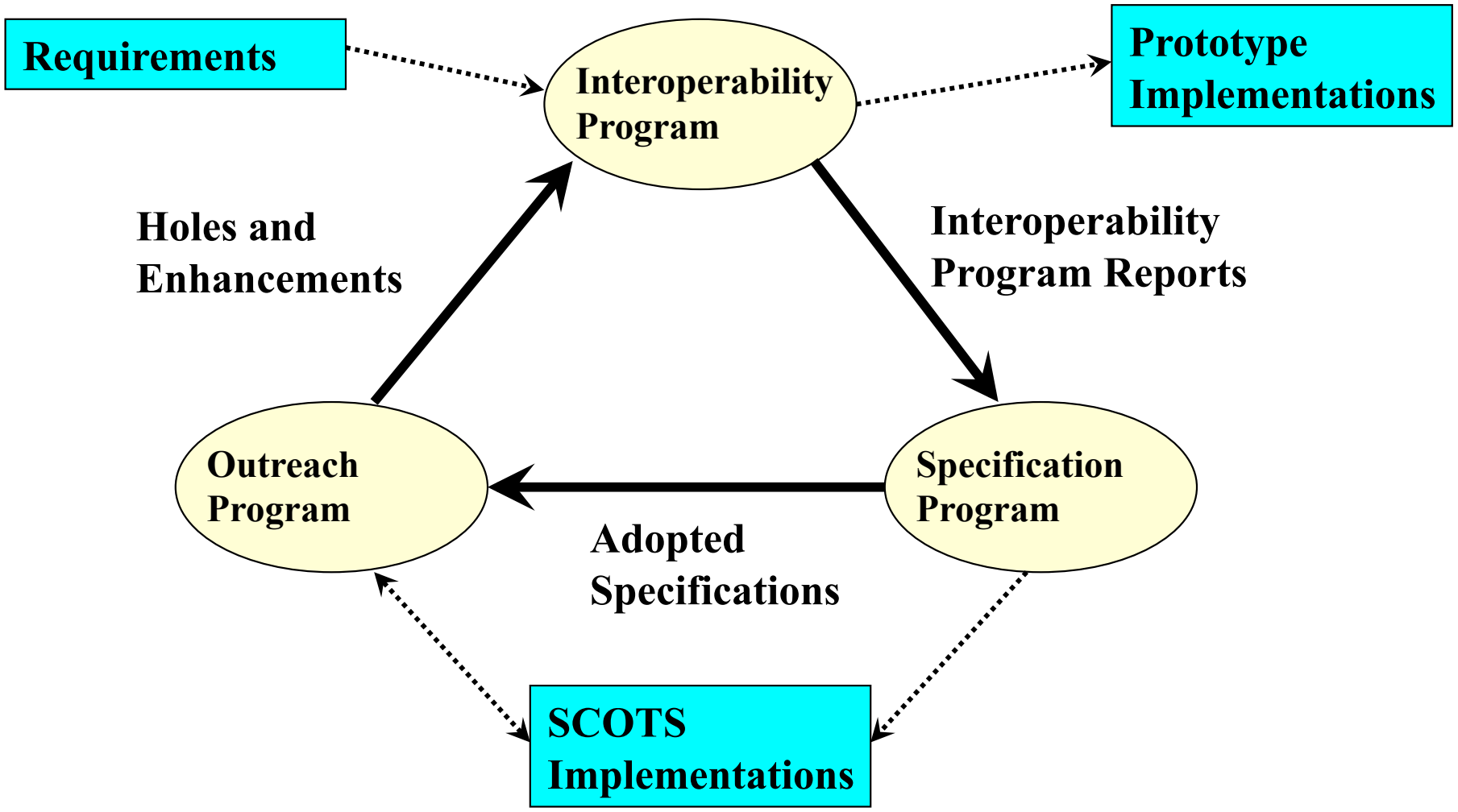
OGC Interoperability Program Policies

- Running Code
  - Implementations from different developers to test draft interoperability specifications
- Intellectual Property Rights
  - In accordance with OGC Intellectual Property Rights Policy
  - All information created in [most] initiatives must remain confidential until released through an OGC process. [Some pilots differ, e.g. GEOSS]
- OGC Baseline Support
  - First consider OGC Adopted Document Baseline; then consider new specification development
  - Engineering Reports (ER's) posted for consideration by the OGC Specification Program
  - Coordination through OGC Reference Model

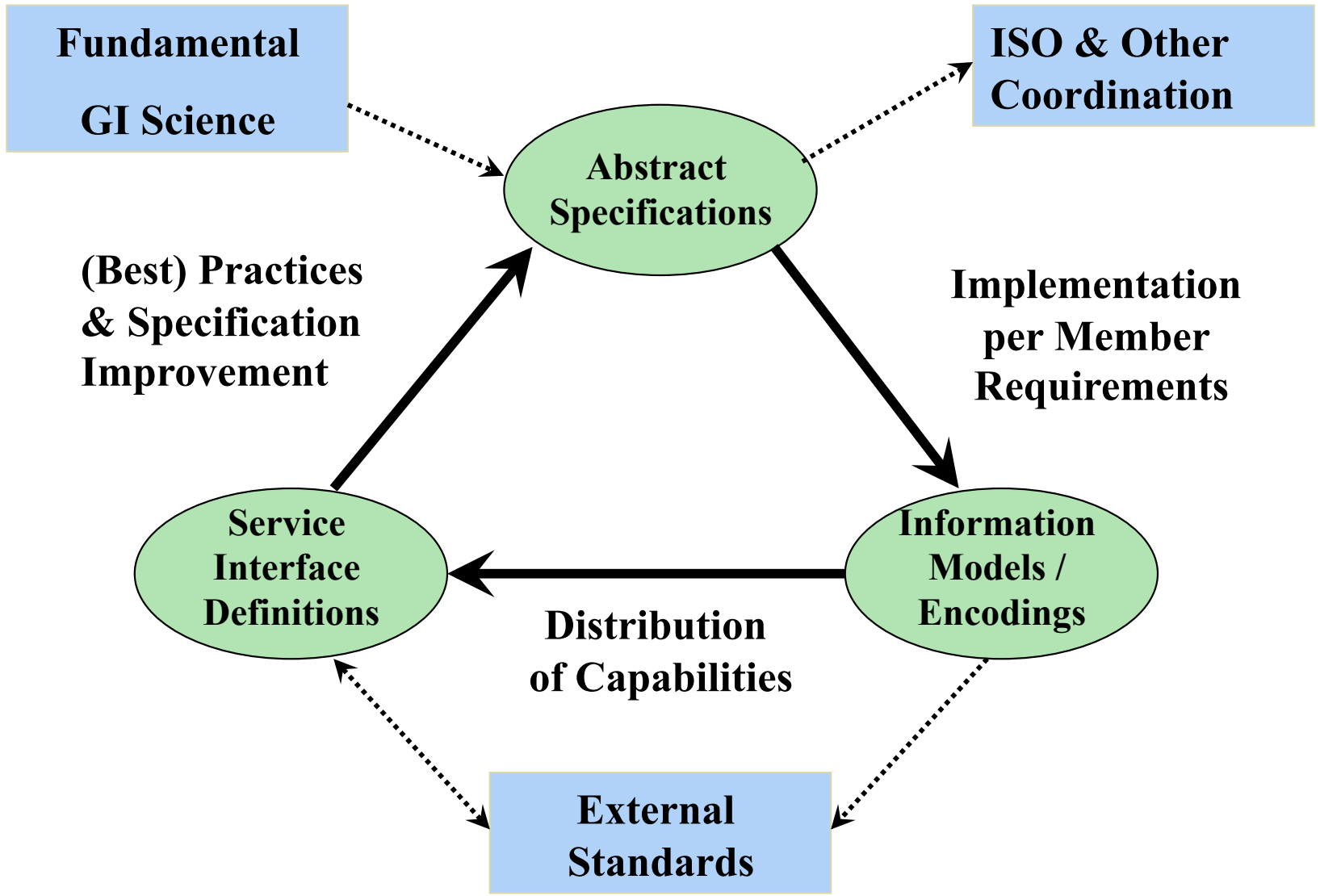
OGC Interoperability Testbed Policies and Procedures (05-129r1)
http://www.opengeospatial.org/about/?page=ippp

Iterative Development

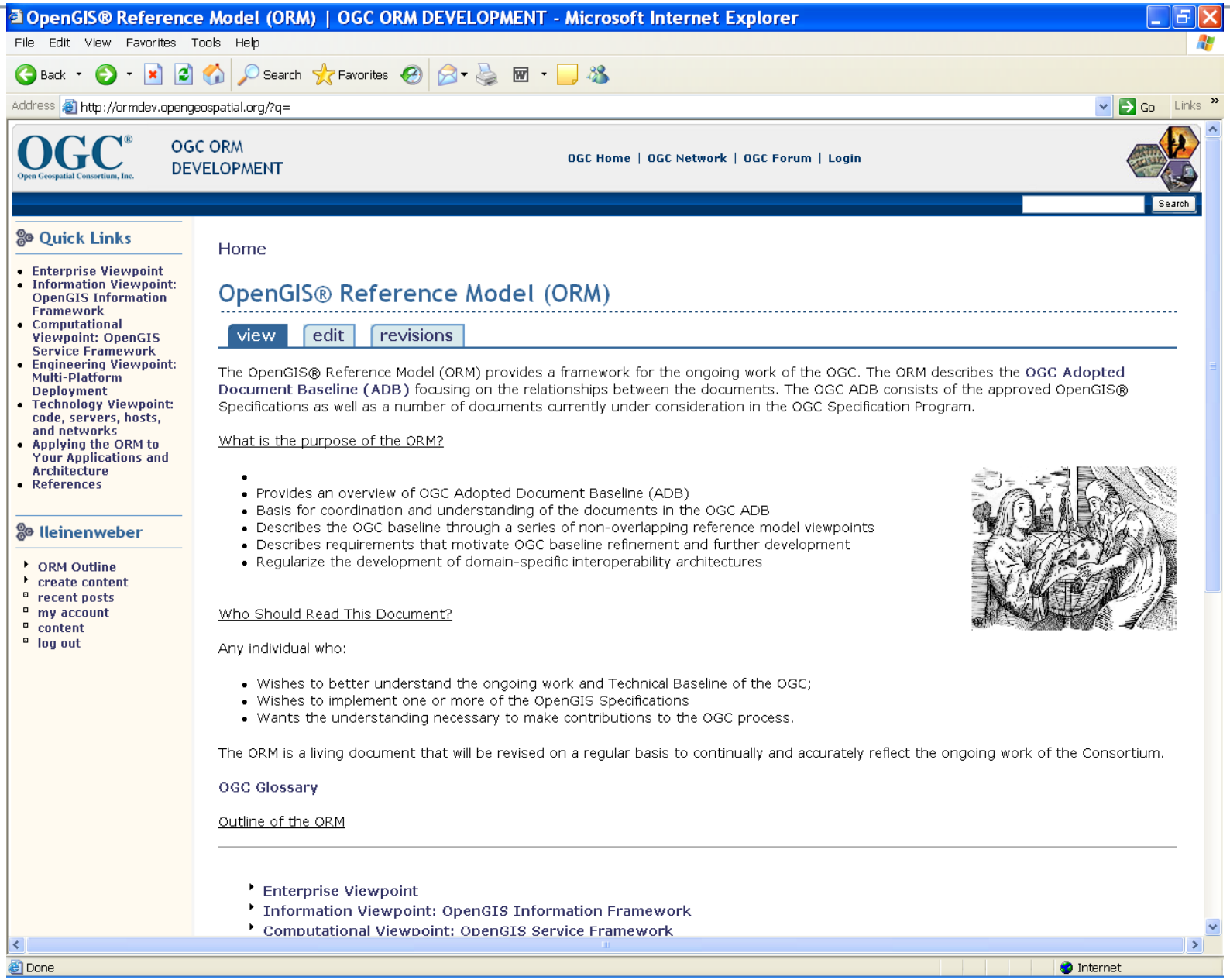
Yielding Tested Specifications



OGC Areas of specification



OGC Reference Model (ORM)



Ideas for Ontology Roles in OGC Standards

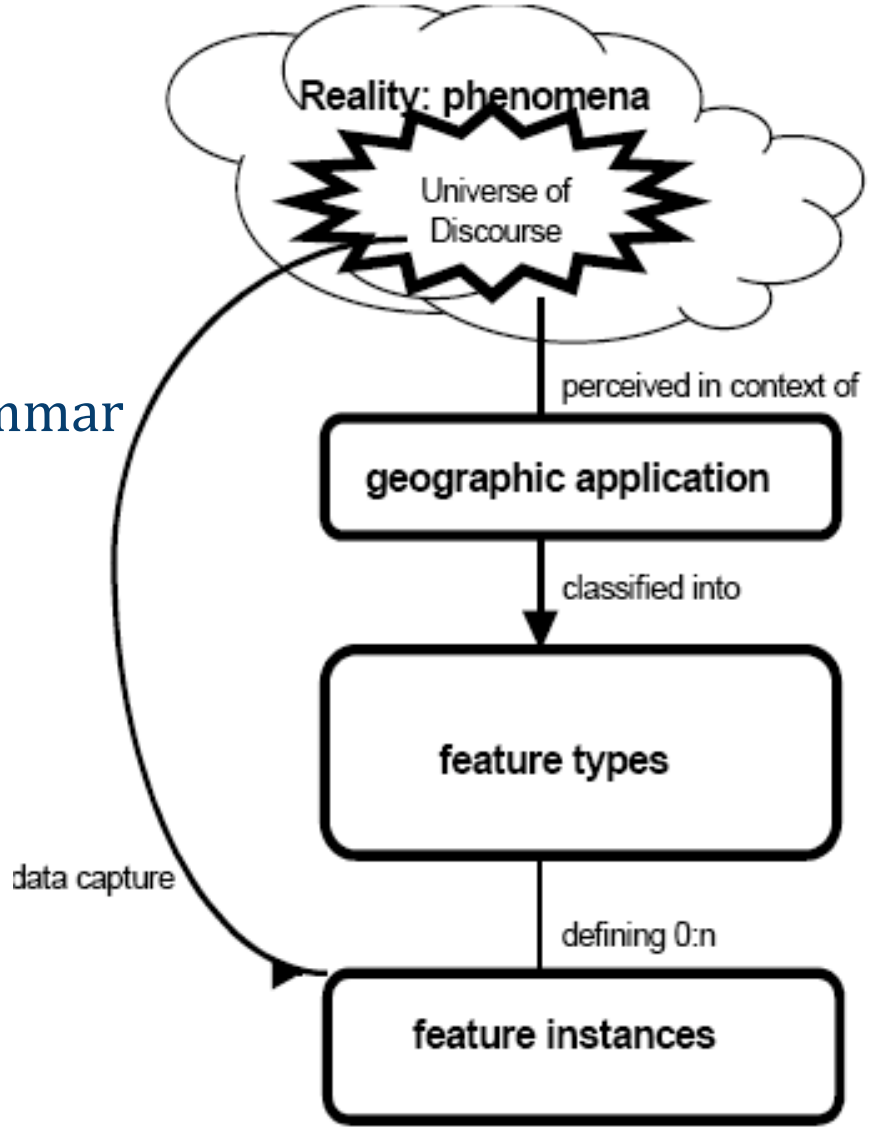
- Domain ontologies used in practice for implementation of OGC standards
- OGC implementation specifications which specify ontologies
- OGC abstract or conceptual standards specified using ontologies
- An ontology for the OGC standards process
- Ontologizing lessons for OGC standards process

OGC Encounters with Ontologies

- Geospatial Semantic Web Interoperability Experiment
- W3C Geo 2007 ontology
- Drexel OWL ontologies for OGC / ISO TC211 schemas
- SWING Project semantic annotation
- SWE - Oceans IE Semantic mediation between coastal atlases

Geospatial Ontology Challenges

- Geographic Representation
  - Feature discernment
  - Geometry attributes
  - Reference systems
  - Symbolization and visual grammar
- Observational processes
  - Natural phenomena
  - Measurable properties
  - Observation event
  - Collection process
  - Feature of interest
  - Classification



GSW IE and Beyond

- The OGC geospatial semantic web interoperability experiment tested initial architectures and technologies for cross-domain, distributed geospatial knowledge query, leading to multiple questions and follow-on activities.

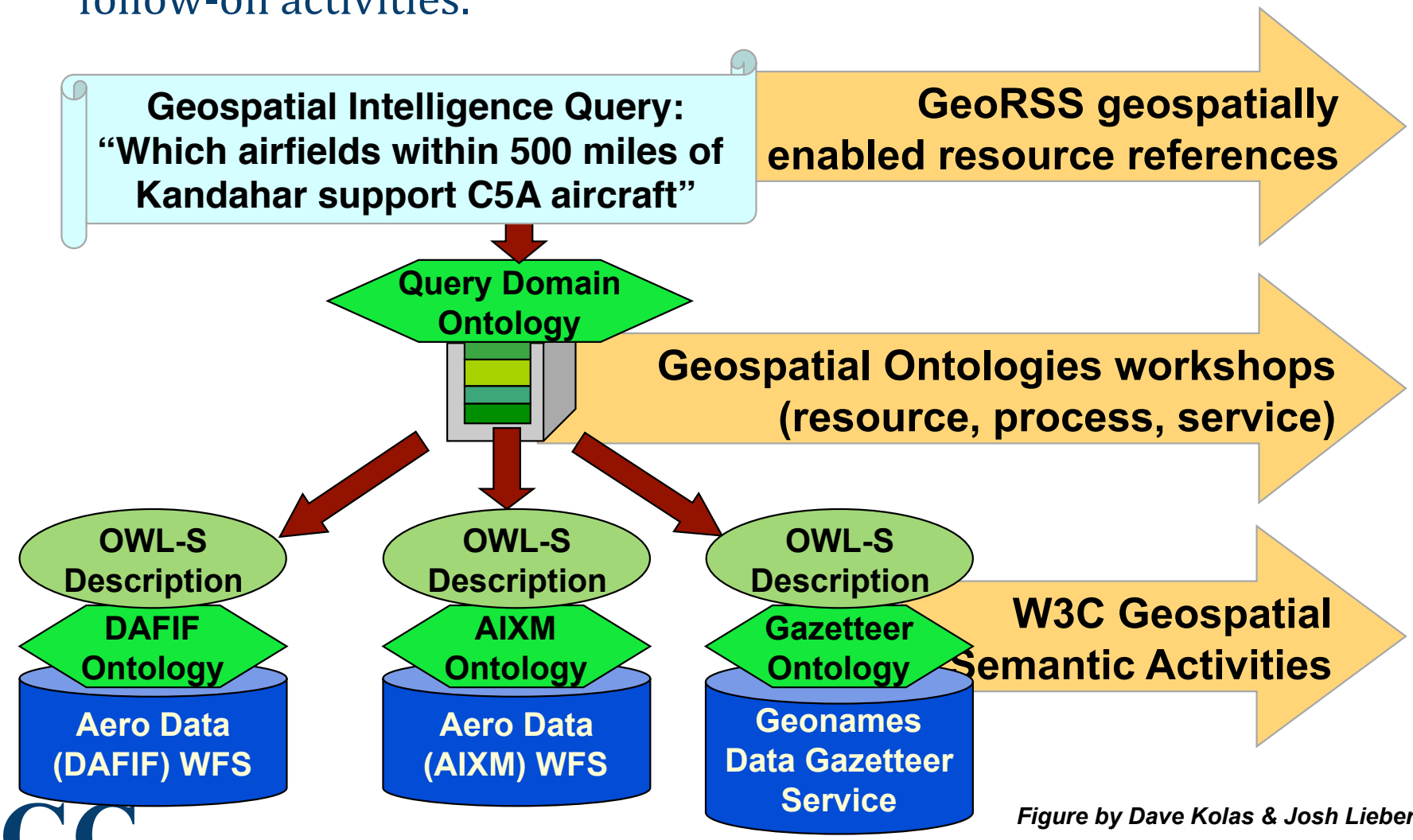
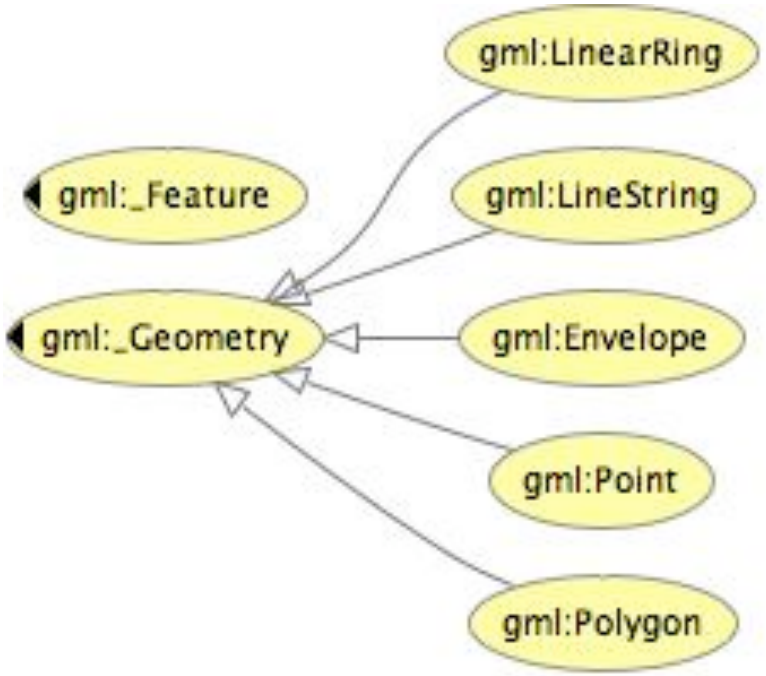
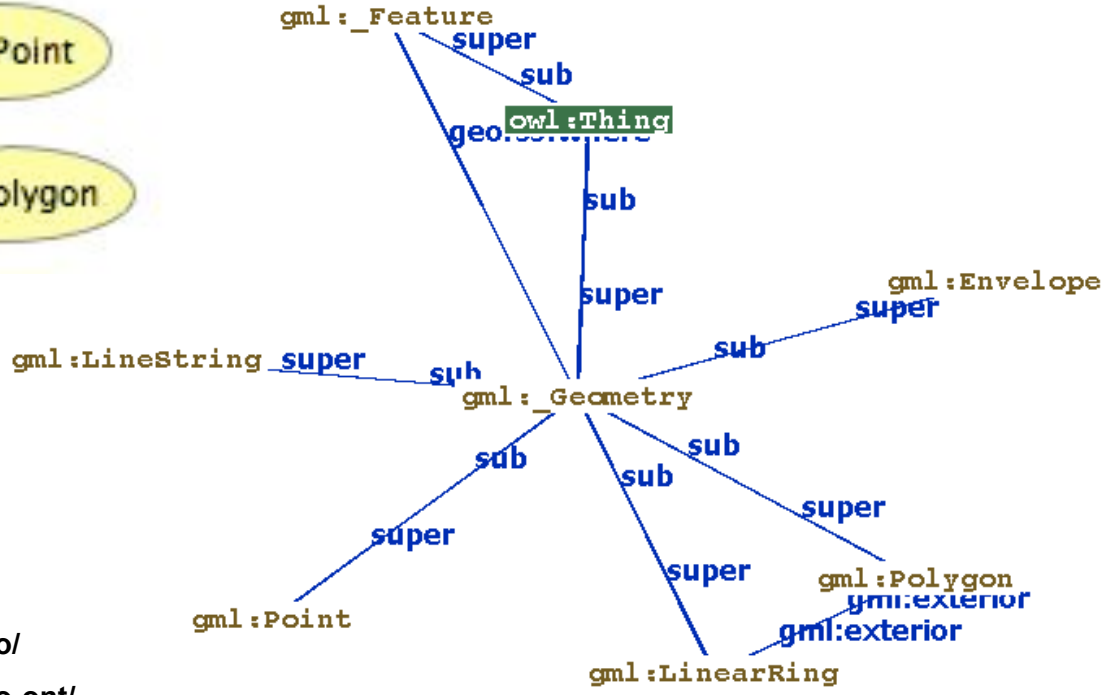


Figure by Dave Kolas & Josh Lieberman

W3C Geo 2007





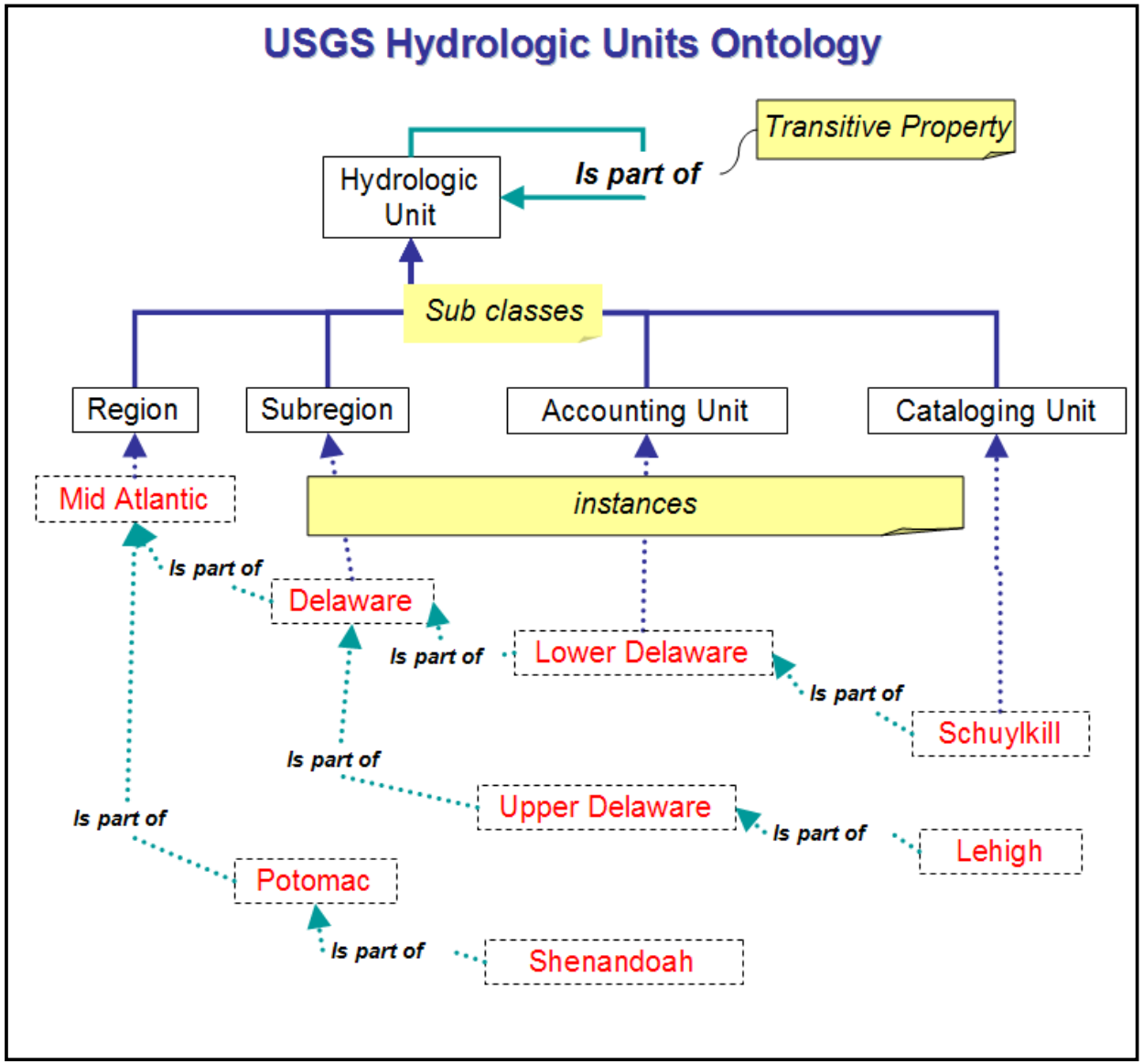
http://www.w3.org/2005/Incubator/geo/XGR-geo/

http://www.w3.org/2005/Incubator/geo/XGR-geo-ont/

What Could a Geospatial Ontology Look Like?

- Spatial Ontology - an explicit, partial description or vocabulary of representations which people use in geospatial/spatial domains

- Example - USGS Hydrologic Units are organized in an ontology

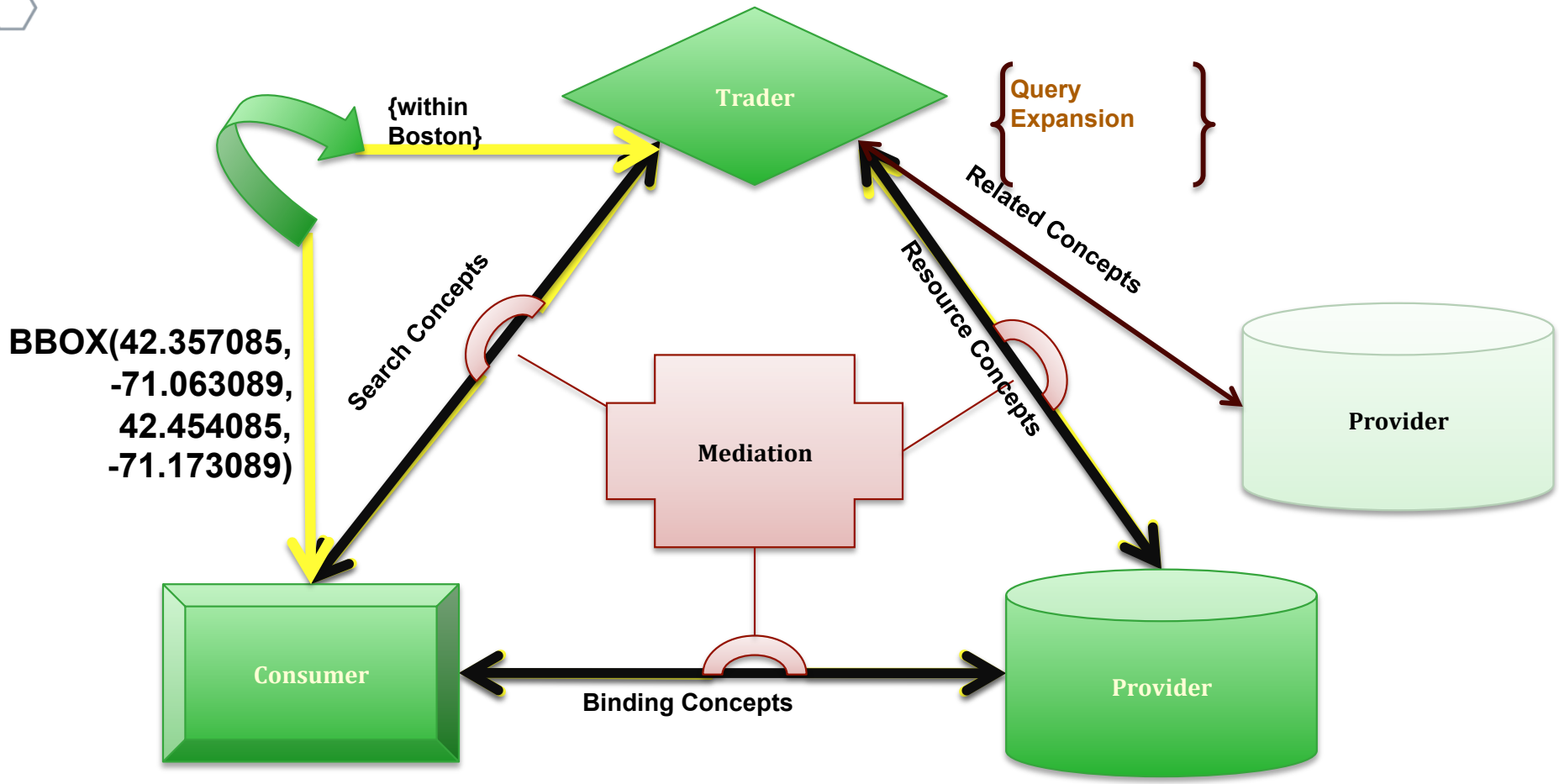


From Hydrologic Ontologies Framework (HOW) by Michael Piasecki, Bora Beran & Luis Bermudez
Presented at 3rd GEON Annual Meeting San Diego, CA, May 5-6, 2005

Semantic Annotations in OGC Standards

- Discussion Paper 08-167 - Patrick Maué, Philippe Duchesne, Sven Schade
- Semantic Web services INteroperability for Geospatial decision making (EU-IST FP6 project (FP6-26514))
- Development of ontology infrastructure to support:
  - Semantic annotation of service capabilities and service contents
  - Support the user in formulating goals
  - Discovery of geographic information and geoprocessing services
  - Specify workflows for service execution
- Annotations at 3 levels
  - Keywords & Thesaurii, e.g. gmd:MD_Keywords
  - Application ontologies, e.g. schema annotation with sa-wsdl
  - Data domain ontologies, e.g. using sa:modelReference
- Implications for a variety of OGC implementation standards

Geosemantic Roles Within GeoWeb



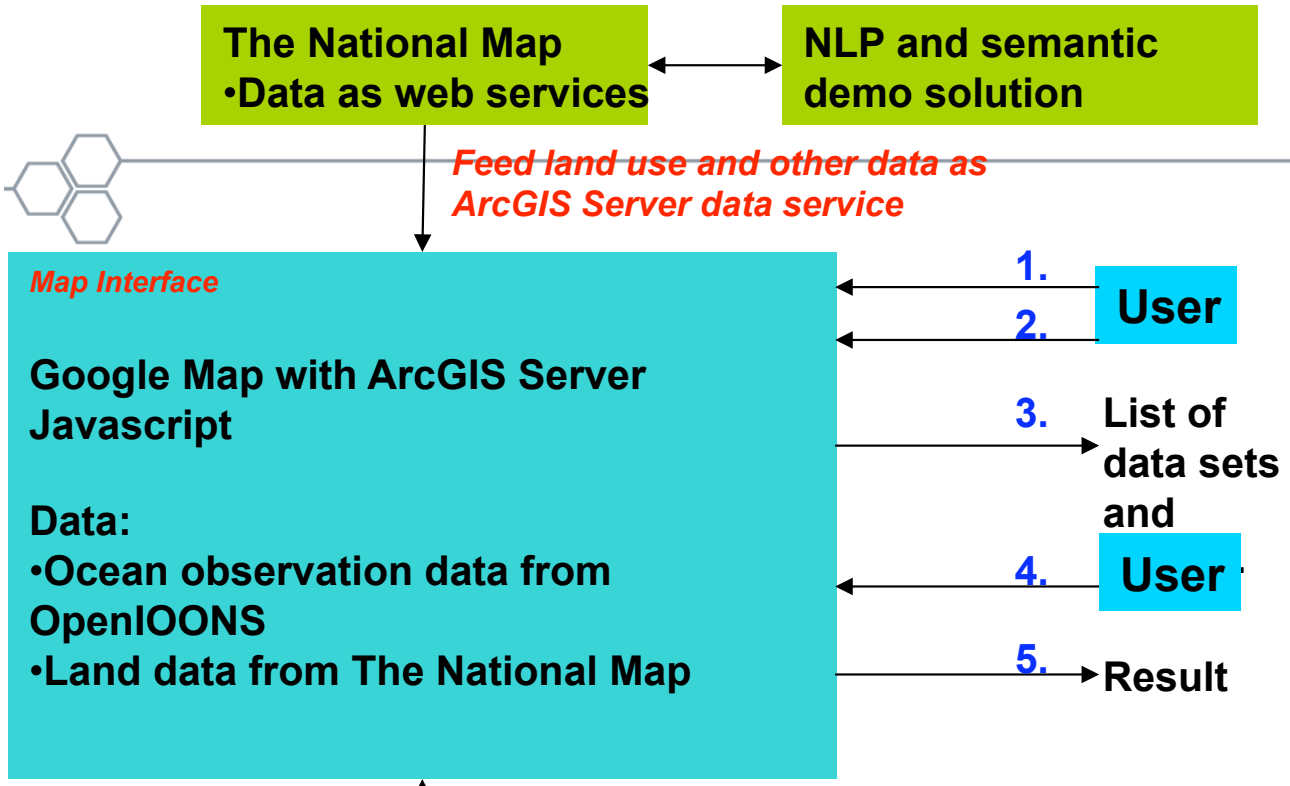
- Mediation (translation) between community concepts
- Query expansion to add additional concepts
- Inference simplification (e.g. coordinate -> topology) to support reasoning

Where Next with Ontologies in OGC Standards

- Formal representation of rules and constraints in specifications
- Opportunities for mediation between knowledge communities inside and outside of OGC
- Proposed incorporation of ontologizing process as an activity thread in next OWS testbed - OWS-7
- Testbed activity realization generally requires
  1. Interest from OGC members
  2. Financial sponsorship of the activity
- (2) typically results from legal mandates, discernment of pain points, urgent bottlenecks, or strong potential for exciting new capabilities.

Geosemantic Web Challenges

- Geosemantic agent architecture is under-developed and un-proven in operational systems (or very well hidden away).
- Ontologies and formal encodings for geospatial knowledge are not yet established (chicken – egg problem)
- Geosemantic knowledge is "hidden" in textual description and syntax specifications (substantial task to extract and make explicit)
- Generalized geospatial inference is hard to design and harder to implement (spatial logic and tedious combinatorics)
- Killer app to drive investment in the Geosemantic Web has not yet been discovered (could it be discovery mediation?)



Scenario step by step:

1. User browse the site and click an event to view an observation.
2. User draw a polygon (or define a distance) that may be affected by the observation.
3. A list of land use data returned. And, a search function is provided to search certain land use.
4. User select one or few land use categories. NLP and semantic demo come here (or right after TNM).
5. The map interface displays the polygons/areas from the search, and may give a tabular report.

Discussions:

1) Each green box is for one or few participating demos.
2) OpenIOONS is a perfect demo of semantic and ontological work. But it may be difficult to integrate the whole project onto our demo site. We could demo this part separately?
3) OpenIOONS can provide KML data in two ways: download and then published as KML service on the demo web site, or retrieved directly from OpenIOONS site as a KML data service (preferred).
4) Depending on the data by TNM, we could have other use cases.
5) Time commitment.

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With Input from Gary Berg-Cross SOCoP