



# Reference Model(s) for Geospatial Semantic Standards

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# Motivation

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- Federation of disparate geospatial services and data across domain and community boundaries:
  - Increasing need to perform semantic mediation between the concepts and vocabularies brought into these federations in order for discovery and exploitation of geodata resources to be successful.
  - Need for a consistent geosemantic framework for successful mediation to occur.
- Publication of linked geodata.
  - “Putting it out there and see what happens” has enormous potential for geospatial enablement and fusion.
  - Also has enormous potential for confusion and duplication as link scheme development and "triplification" are carried out in many different ways.

# History (abbreviated)

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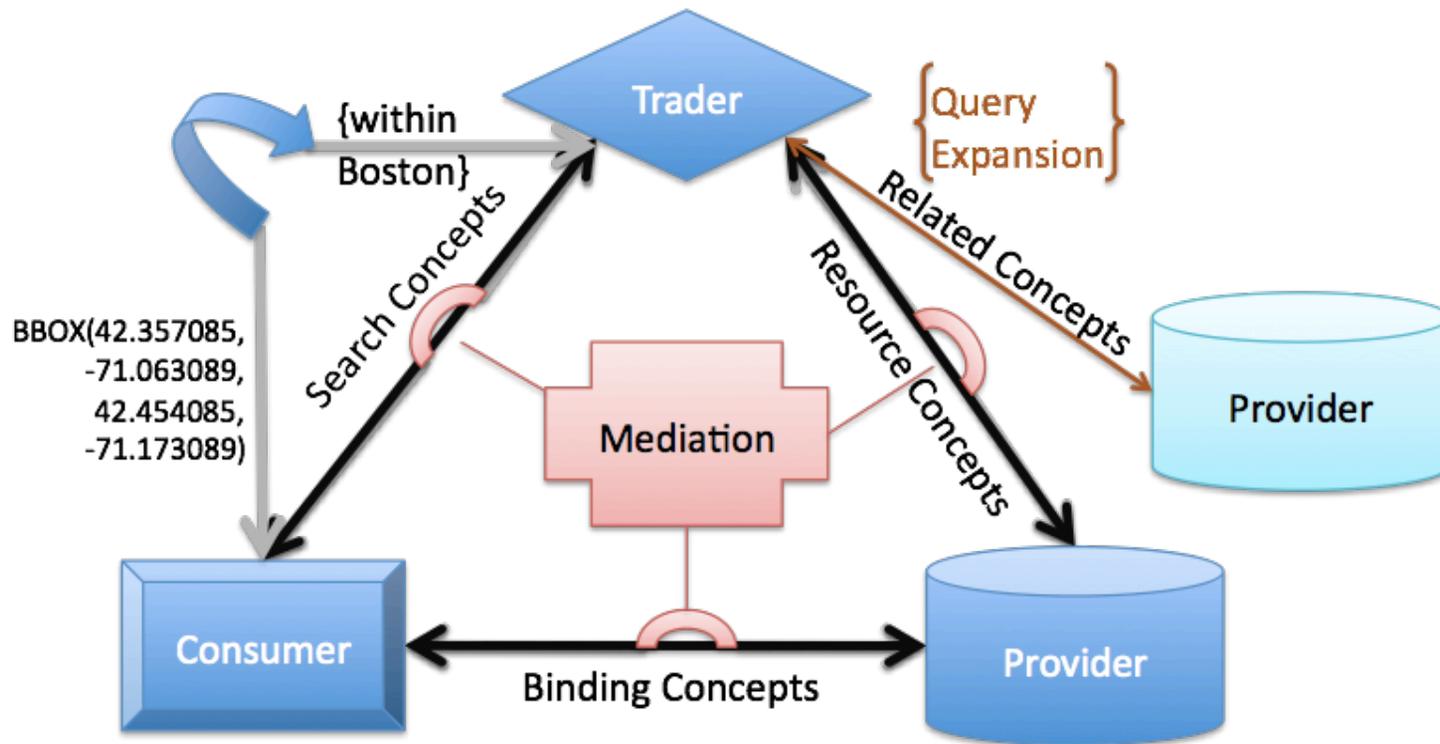


- 1999 Semantics SIG, Ontologies and GIS
- 1999 OGC Abstract Topic 14 – Semantics and Information Communities
- 2003 W3C Geo vocabulary
- 2006 OGC Geospatial Semantic Web Interoperability Experiment
- 2006 W3C Geo vocabulary updated from GeoRSS
- 2006 OGC Geosemantics Domain Working Group
- 2007 Spatial Ontology Community of Interest
- 2008 Marine Metadata Initiative mediation services
- 2009 Linked geodata (UK and elsewhere)
- 2010 Geospatial SPARQL RFC
- 2010 Semantic mediation in GEOSS AIP-3
- 2010 Many other activities

# Service Oriented Architecture and Mediation



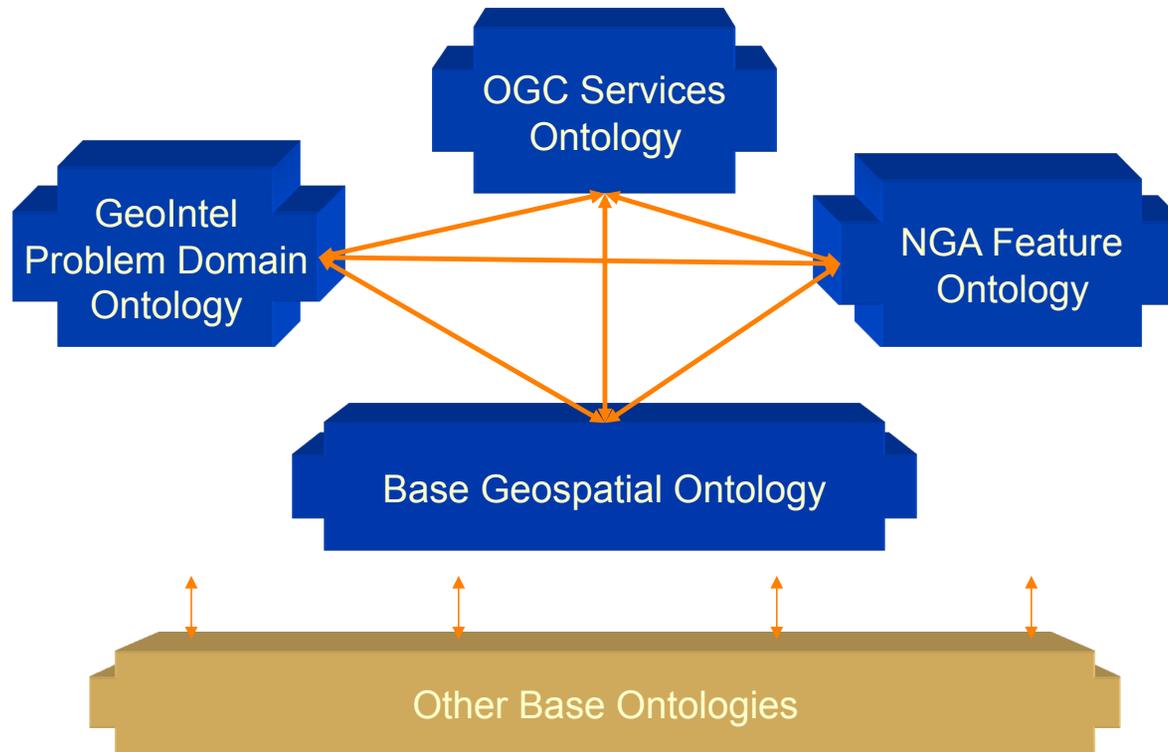
Distinct functionality offered through shared interoperability arrangements



OGC<sup>®</sup>



# Multiple GSW Ontology Components



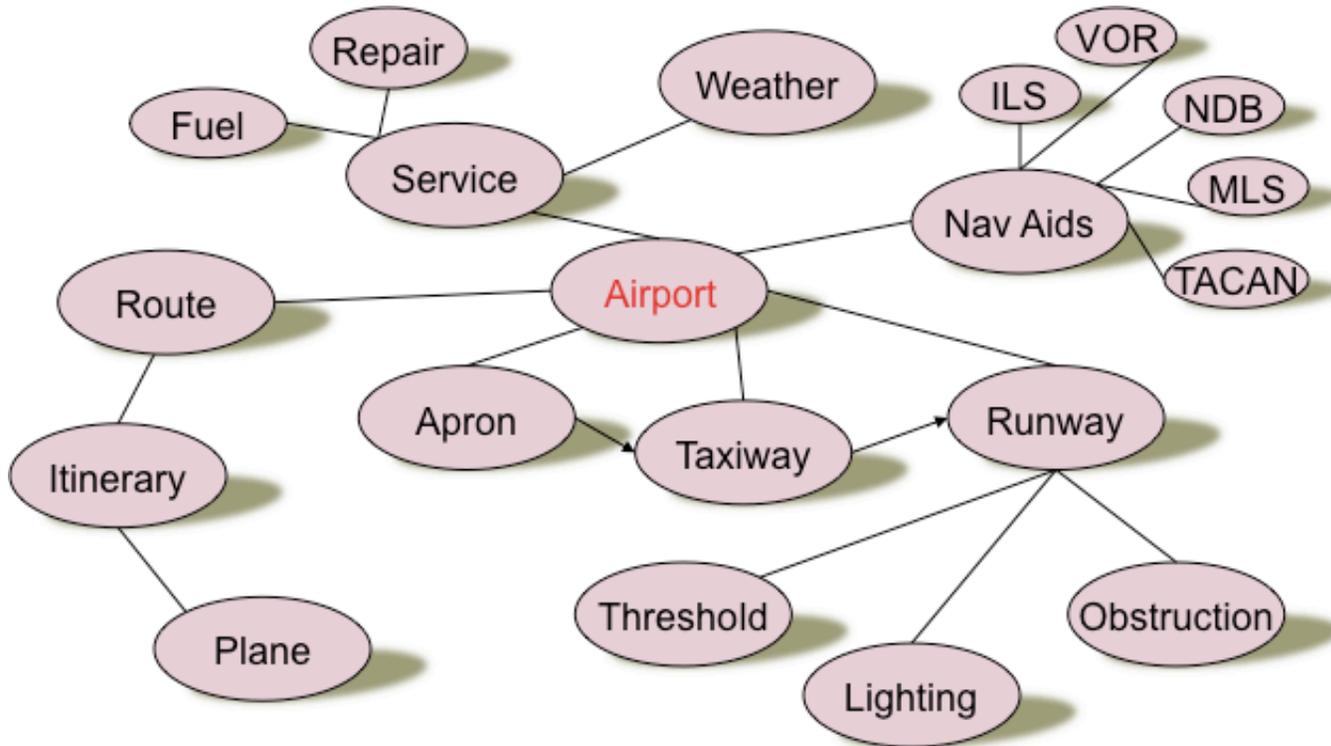
# Geosemantic Mediation Issues

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- Formal concepts
- Mapping between concepts: theory and representation
- Semantic heterogeneity
- Application of concepts
- Utilization of mappings
  - Query expansion
  - Result translation
- GEOSS Issues
  - Vocabulary registration
  - Vocabulary usage in metadata and attributes
  - Creation / maintenance of mappings
  - Query expansion mechanics and UI
  - Result mapping

# Linked Geodata



# Ontologized Geodata Issues

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- “Triplification” -> variety versus excessive “Same-as”
  - Level of detail -> “Same-as” at one level and “Different-from” at another
- General Feature Model -> General Triple Model?
- Web-accessibility of names and links
- The spatial problem (non-orthogonal):
  - Type links “Type-of”
  - Schema links “Property-of”
  - Instance links “Same-as”
  - Spatial links “Same-place-as”
  - Topological links “Is-connected-to”
  - Mereological links “Is-part-of”
  - Cognitive links “represents-same-chunk-of-reality”
- Computability / decidability -> does it matter?
- Services and Behavior – problem of service – data matching

# Reference Model – Views & Definitions

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- Conceptual / abstract description
- Pattern or framework for specifications
- Provides standards for implementation
- Educational – guidelines, practices, motivations
- Basis for discussion and collaboration
- Call to (specification) action
- Differentiation – what needs to be different about a geospatial and / or semantic specification
- Examples:
  - OGC Reference Model (!)
  - RM-ODP
  - FEA Data Reference Model

# Road Ahead to the Next Intersection

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- Reference model for semantic enablement
  - Feature linking
  - Geospatial concept mapping
  - Standard ontologies
  - Procedure for “ontologization”
  - Semantically enabled service
- Specific OGC specifications and/or semantic profiles
  - General Contextual Feature Model
  - Simple Linked Features
  - Geospatial SPARQL
  - Semantic WFS
  - Geosemantic Broker Service
- Cognition and Intention
  - Out of sight, but just around the corner