OGC®
Making location count.

Geospatial Standards and the Semantic Web

Luis Bermudez. Ph.D.
Director of Compliance Program
2013-10-17

© 2013 Open Geospatial Consortium

Agenda

- OGC and need for URIs
- Management of OGC URIs
- OGC Naming Authority
- GeoSPARQL
- Ontology Experiments
- The Future

OGC®

© 2013 Open Geospatial Consortium

Open Geospatial Consortium

470+ volunteer organizations (members)

4000+ Users

60+ Standards

700+ implementing products

150+ current certified implementations

OGC®

© 2013 Open Geospatial Consortium

OGC Standards

Lots of science data are served and are encoded following OGC standards

- netCDF
- KML
- WMS
- SOS
- WPS
- WCS…

OGC®

© 2013 Open Geospatial Consortium

OGC Produces hundreds of artifacts per year

OGC Standards List
Specification Profiles
Abstract Specification
OGC Reference Model
OGC Schema Updates
Public Engineering Reports
TC Policy Directives
GeoDRM Reference Model

Best Practices
Discussion Papers
Deprecated Documents
Retired Documents
Requests (RFP's, RFQ's...)
White Papers
Change Requests
Submit Change Request or Requirement

OGC®

© 2013 Open Geospatial Consortium

64 Change Requests were submitted in 2011

Direction Information for the Transition UML class in the data model	11-151	JeaJun Yoo	2011-10-19
Incorrect reference in ows19115subset.xsd	11-156	David Valentine	2011-10-19
Temporal Constraints for State and Transition UML class in the data model	11-149	JeaJun Yoo	2011-10-19
WMTS 1.0 Change Request - Conform to OGC 08-131r3 ModSpec	11-155	Paul Daisey	2011-10-19
Ambiguity in GetRecords TypeNames parameter for CAT 2.0.2	11-173	Enrico Boldrini	2011-12-14
Ambiguity in GetRecords TypeNames parameter for ISO Metadata AP 1.0	11-174	Enrico Boldrini	2011-12-14
Implemenation of required valueOf() function will reduce query/filter efficiency.	11-177	Panagiotis (Peter) A. Vretanos	2011-12-14

© 2013 Open Geospatial Consortium

OGC needs to identify artifacts and more

- Standards
- Concepts in a standard
- Conformance Classes
- Concepts ciritical to OGC standards (coordinate reference systems, units)
- …

© 2013 Open Geospatial Consortium

Formal identification

Uniform Resource Names (URN) Namespaces

Last Updated
2012-04-23
Note
`This is the Official IANA Registry of URN Namespaces`

This registry is also available in plain text.

epcglobal	35	[RFC5134]
cgi	36	[RFC5138]
ogc	37	[RFC5165]
ebu	38	[RFC5174]
3gpp	39	[RFC5279]
dvb	40	[RFC5328]
nena	41	[RFC6061]

© 2013 Open Geospatial Consortium

IANA RFC 5165

A Uniform Resource Name (URN) Namespace for the Open Geospatial Consortium (OGC)

urn:ogc:{OGCresource}:{ResourceSpecificString}

An operational OGC URN "resolver" is available at http://urn.opengis.net/. The resolver provides a registry of the currently member approved OGC URN's used in currently approved and implemented OGC standards.

The OGC Naming Authority is a permanent OGC resource. The documents and related OGC URN resources, such as the URN resolver, have stable URLs. The ONA reference is http://www.opengeospatial.org/ogcna.

OGC®

© 2013 Open Geospatial Consortium

URLs or URNs ?

http URIs ✔

© 2013 Open Geospatial Consortium

OGC Definition types

http://www.opengis.net/def/def-type/

label	OGC Definition types
created	14/02/2012
creator	OGC Naming Authority
member	**Authorities for definitions endorsed by the OGC**
	Classification schemes
	Coordinate axes
	Coordinate Axis Directions
	Coordinate operation methods
	Coordinate operation parameters
	Coordinate Operations
	Coordinate Reference Systems
	Coordinate Systems
	Data or processing service types
	Datatypes

© 2013 Open Geospatial Consortium

OGC Document element types

http://www.opengis.net/def/doc-element/

label	OGC Document element types
created	14/02/2012
creator	OGC Naming Authority
member	Document clause Document figure Document table Term and definition
see also	ogc-na-policies DOC

© 2013 Open Geospatial Consortium

Coverage Type

http://www.opengis.net/def/coverageType/OGC-EO/

title	CoverageType
label	Coverage Type Coverage Types
modified	11/10/2012
created	2010-11-23
creator	European Space Agency Spot Image S.A.
definition	Specifies if the imagery should be acquired in one or multiple passes
member	Mono-Pass Mono-Pass Multi-Pass Multi-Pass Single Swath Single Swath

OGC®

© 2013 Open Geospatial Consortium

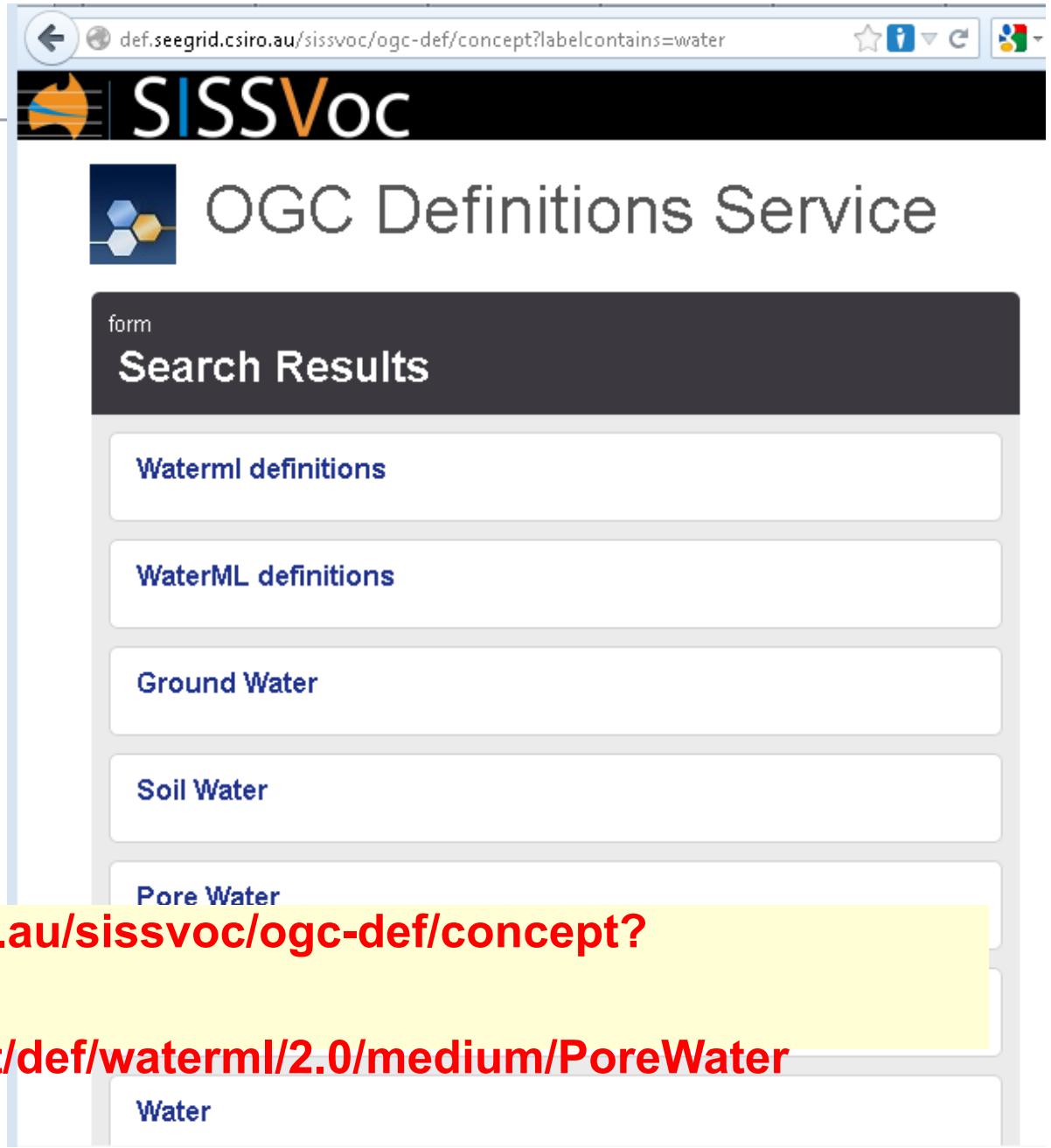
Vocabulary Server

1. Vocabularies are formalized using RDF/SKOS
2. Expert users want to connect to a SPARQL endpoint
3. Normal users need a simple interface with basic queries
   - "find concept by-label"
4. Vocabularies are strongly governed
   - read-only access for most users
5. Service owner ≠ content URI owner
   - same content may be hosted in multiple services

OGC®

© 2013 Open Geospatial Consortium

- OGC Definition URIs are hosted/ redirected to SISSvoc



http://def.seegrid.csiro.au/sissvoc/ogc-def/concept?labelcontains=water

http://www.opengis.net/def/waterml/2.0/medium/PoreWater

OGC®

© 2013 Open Geospatial Consortium

OGC Naming Authority

- Subcommittee of the Technical Committee (TC)
- Manages the register resources
- Coordinates with OGC staff the publication of the registry
- Every standard that is submitted for publication passes through the OGG-NA

© 2013 Open Geospatial Consortium

Conclusions OGC URIs

- Some Science Data is published via OGC Standards
- OGC uses URIs to identify OGC resources, standards and related resources
- URIs are governed and maintained by OGC Naming Authority

OGC®

© 2013 Open Geospatial Consortium

OGC GeoSPARQL - A Geographic Query Language for RDF Data

Approval Date: 2012-04-27

Publication Date: 2012-09-10

Document uri: http://www.opengis.net/doc/IS/geosparql/1.0

Reference number of this OGC® project document: OGC 11-052r4

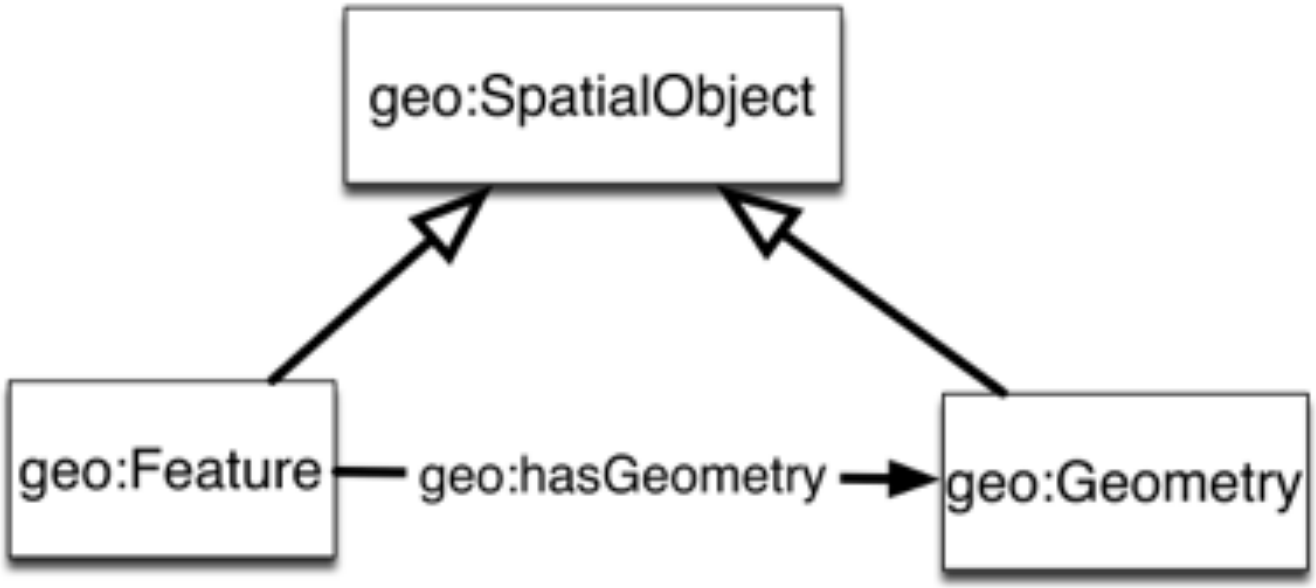
Version: 1.0

Category: OGC® Implementation Standard

Editors: Matthew Perry and John Herring

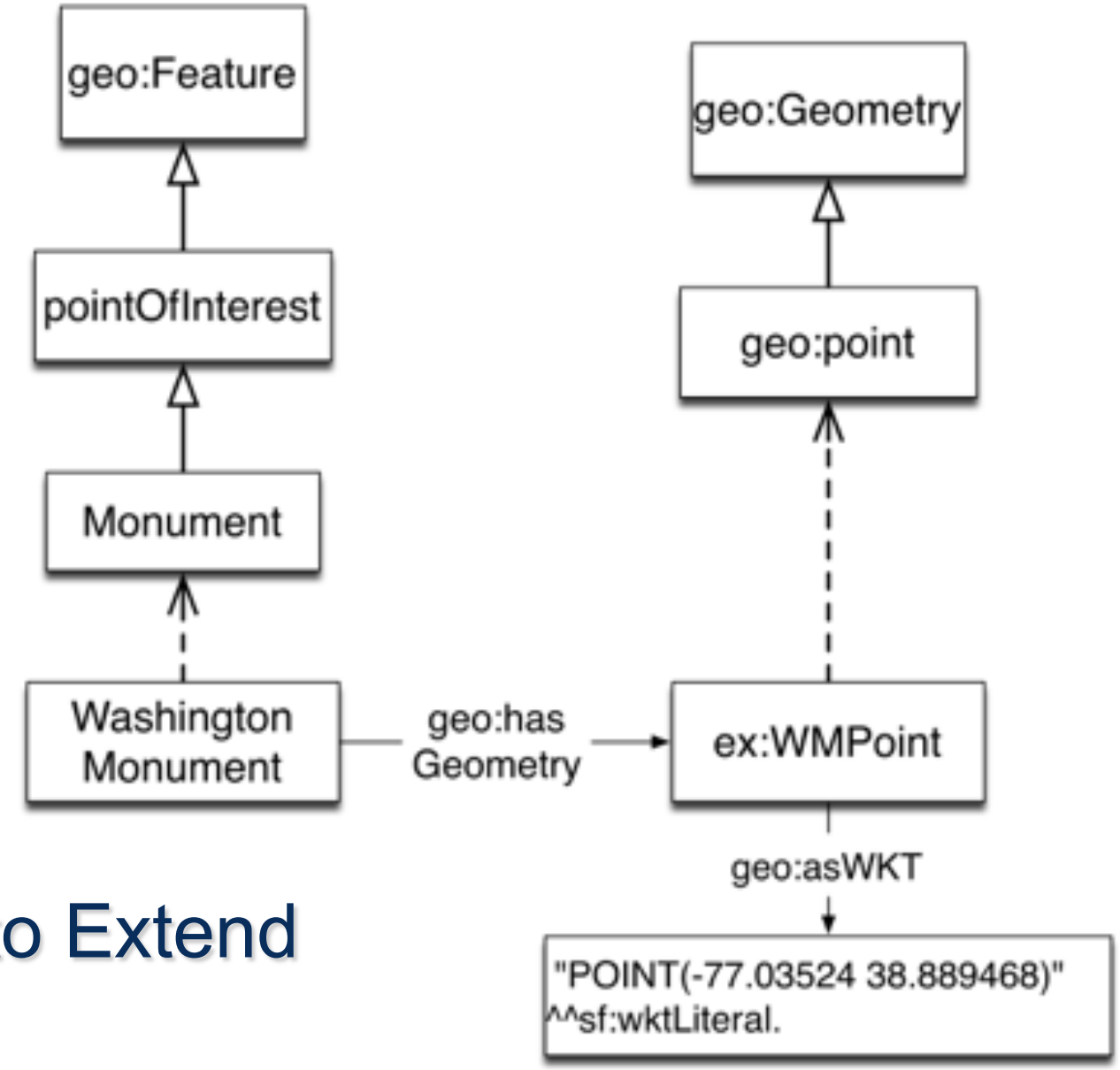
© 2013 Open Geospatial Consortium

Simple Model



http://www.opengis.net/ont/geosparql

© 2013 Open Geospatial Consortium



Easy to Extend

OGC®

© 2013 Open Geospatial Consortium

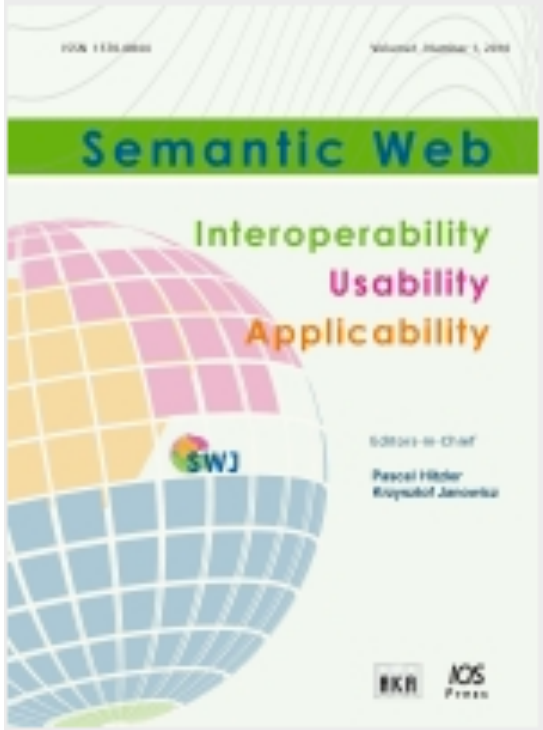
Geospatial Properties in GeoSPARQL

- geo:ehContains
- geo:ehCoveredBy
- geo:ehCovers
- geo:ehDisjoint
- geo:ehEquals
- geo:ehInside
- geo:ehMeet
- geo:ehOverlap
- geo:sfContains
- geo:sfCrosses
- geo:sfDisjoint
- geo:sfEquals
- geo:sfIntersects
- geo:sfOverlaps
- geo:sfTouches
- geo:sfWithin

OGC®

© 2013 Open Geospatial Consortium

Excellent Article

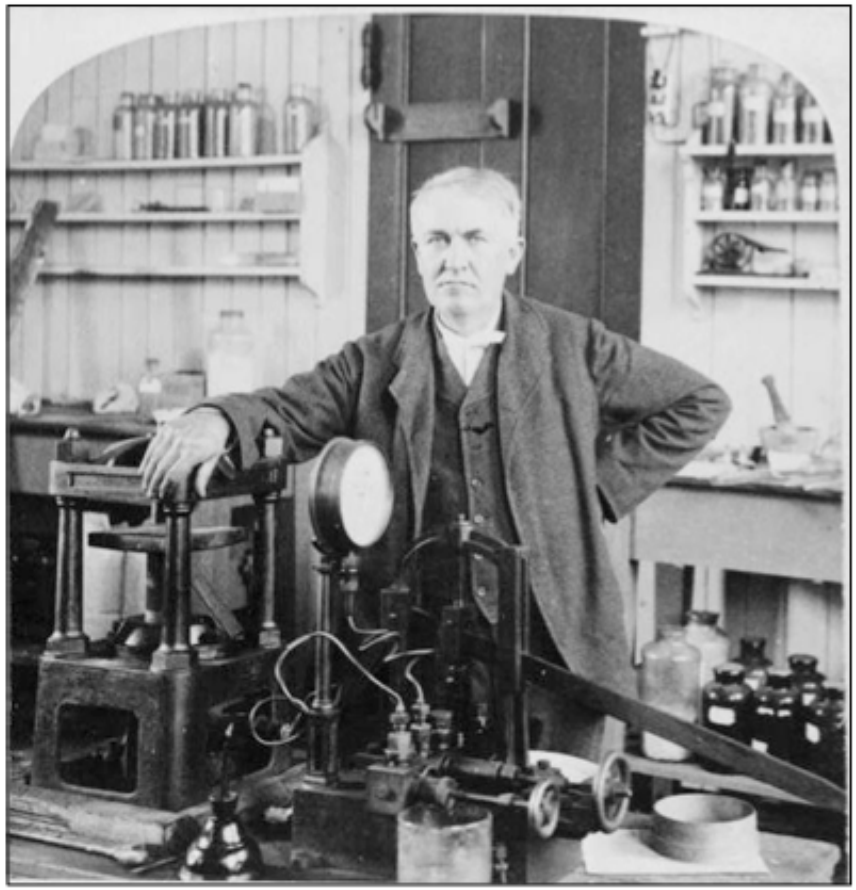


Enabling the geospatial Semantic Web with Parliament and GeoSPARQL

Journal	Semantic Web
Publisher	IOS Press
ISSN	1570-0844 (Print) 2210-4968 (Online)
Subject	Information Technology, Artificial Intelligence and Theory of Computation
Issue	Volume 3, Number 4 / 2012
Pages	355-370
DOI	10.3233/SW-2012-0065
Subject Group	Computer & Communication Sciences

© 2013 Open Geospatial Consortium

Interoperability Program Activities



I have not failed, I've just found 10,000 ways that won't work.

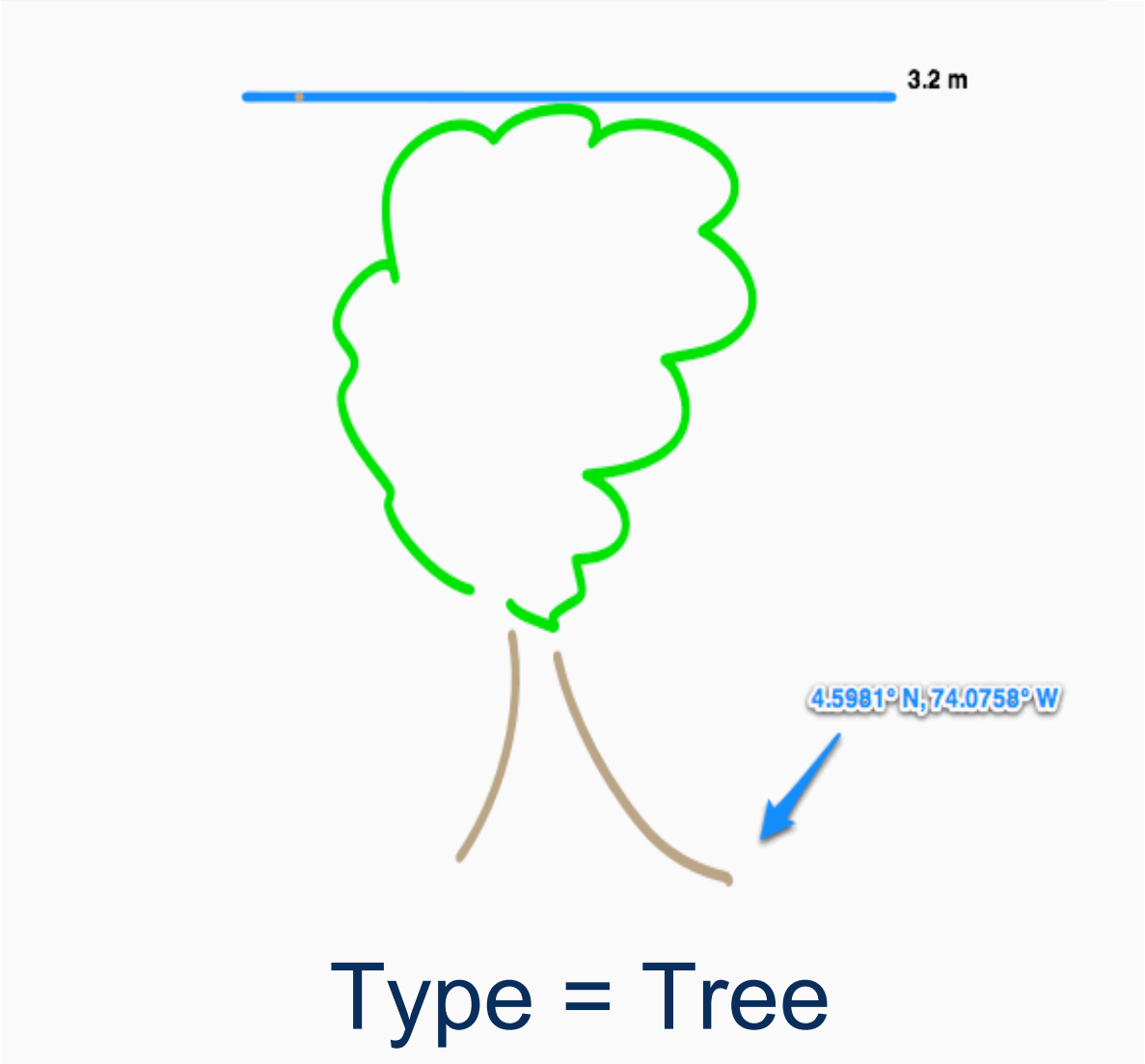
Thomas Edison

OGC®

© 2013 Open Geospatial Consortium

Web Feature Service

Public
Access
Manipulation
of Features



Example Get Feature Request

http://frameworkwfs.usgs.gov/framework/wfs/wfs.cgi?DATASTORE=Framework&service=wfs&version=1.1.0&request=GetFeature&

typeName=

gubs:GovernmentalUnitCE&

maxFeatures=5

OGC®

Communities create their own model (types)

NGA

Feature: **RoadGeocurve**

Property:

RoadGeocurve.medianPresent

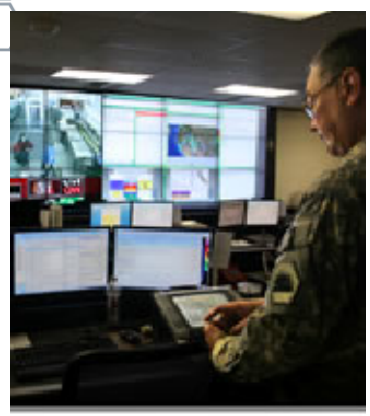
USGS

Feature: **RoadSegmentGeocurve**

Property:

RoadSegmentGeocurve.cfccCode

OWS-8 CCI – Motivation Scenario



California National Guard

Prefers

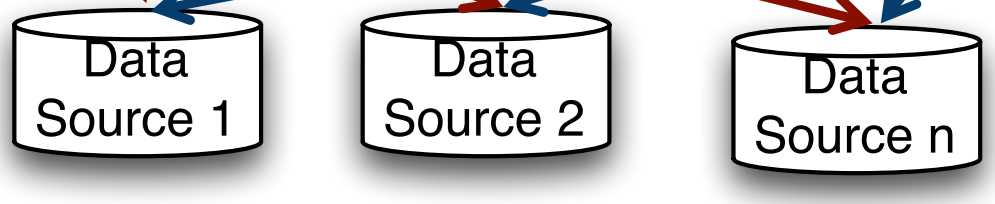
NGA model - Local Topographic Data Store (LTDS)

Monterey Airport Field operator

Prefers

USGS model - The National Map (TNM)

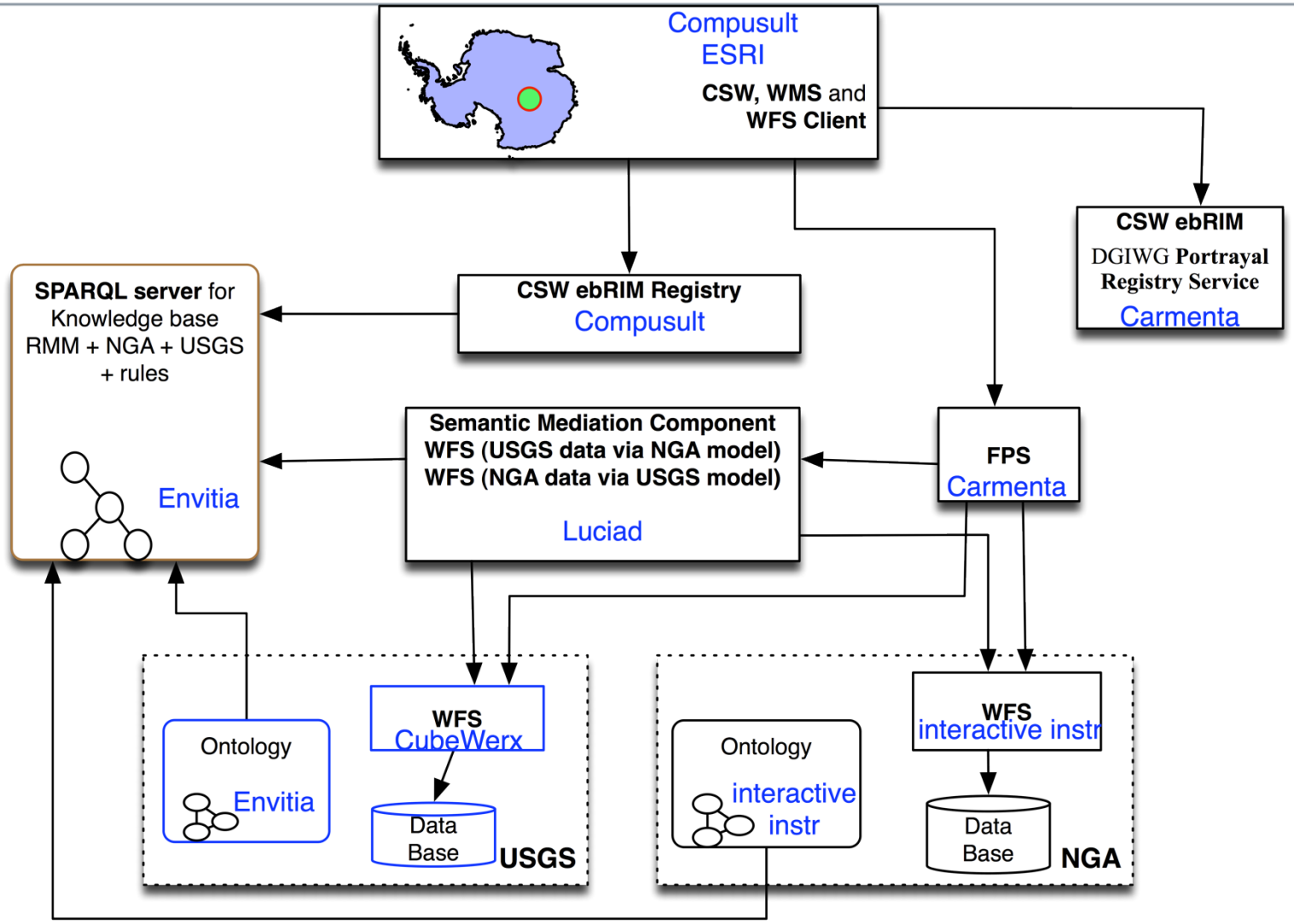
Mediate



OGC®

© 2013 Open Geospatial Consortium

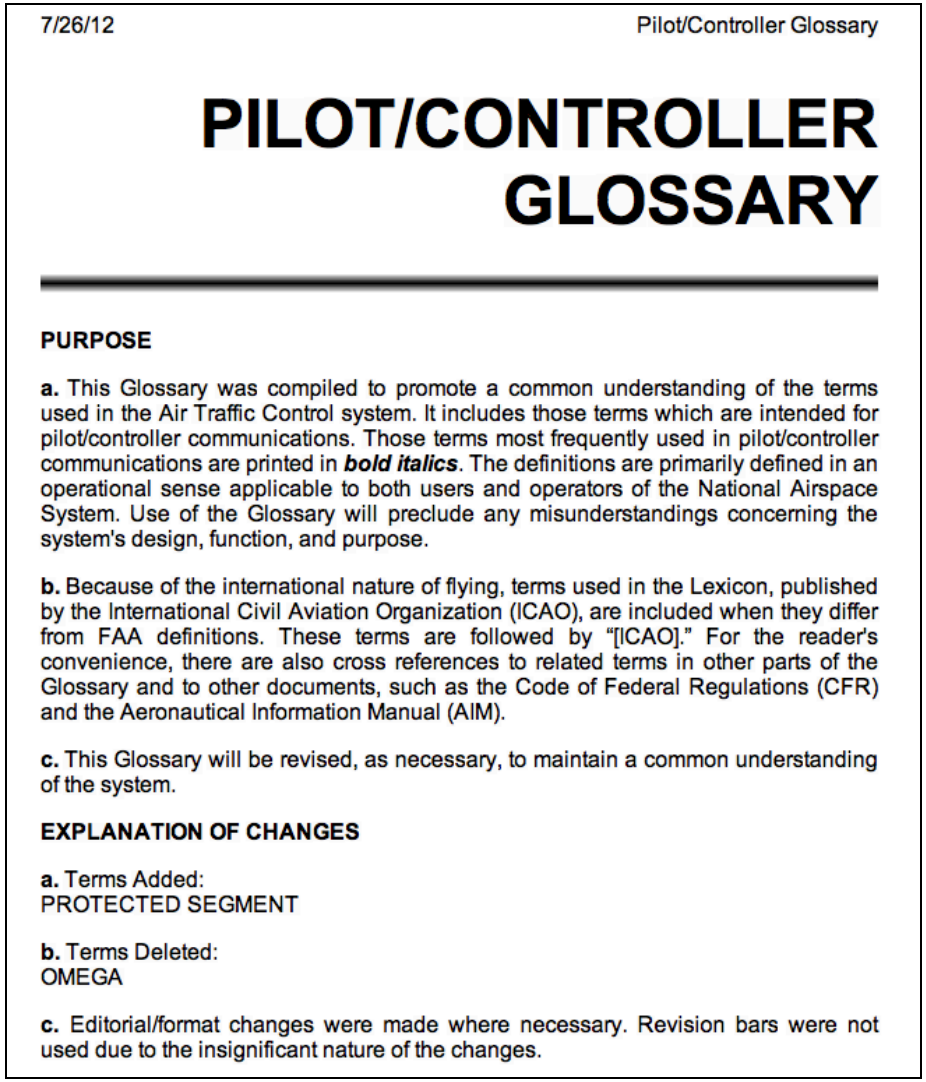
OWS-8 CCI Architecture



© 2013 Open Geospatial Consortium

OWS-9 CCI Aviation Client

- Pilots terminology
  - Using **Air Transportation Information Ontology**
    - **Includes** Pilot Controller Glossary for the JPAMS project (air traffic control procedures)



7/26/12 Pilot/Controller Glossary

PILOT/CONTROLLER GLOSSARY

PURPOSE

a. This Glossary was compiled to promote a common understanding of the terms used in the Air Traffic Control system. It includes those terms which are intended for pilot/controller communications. Those terms most frequently used in pilot/controller communications are printed in ***bold italics***. The definitions are primarily defined in an operational sense applicable to both users and operators of the National Airspace System. Use of the Glossary will preclude any misunderstandings concerning the system's design, function, and purpose.

b. Because of the international nature of flying, terms used in the Lexicon, published by the International Civil Aviation Organization (ICAO), are included when they differ from FAA definitions. These terms are followed by "[ICAO]." For the reader's convenience, there are also cross references to related terms in other parts of the Glossary and to other documents, such as the Code of Federal Regulations (CFR) and the Aeronautical Information Manual (AIM).

c. This Glossary will be revised, as necessary, to maintain a common understanding of the system.

EXPLANATION OF CHANGES

a. Terms Added:
PROTECTED SEGMENT

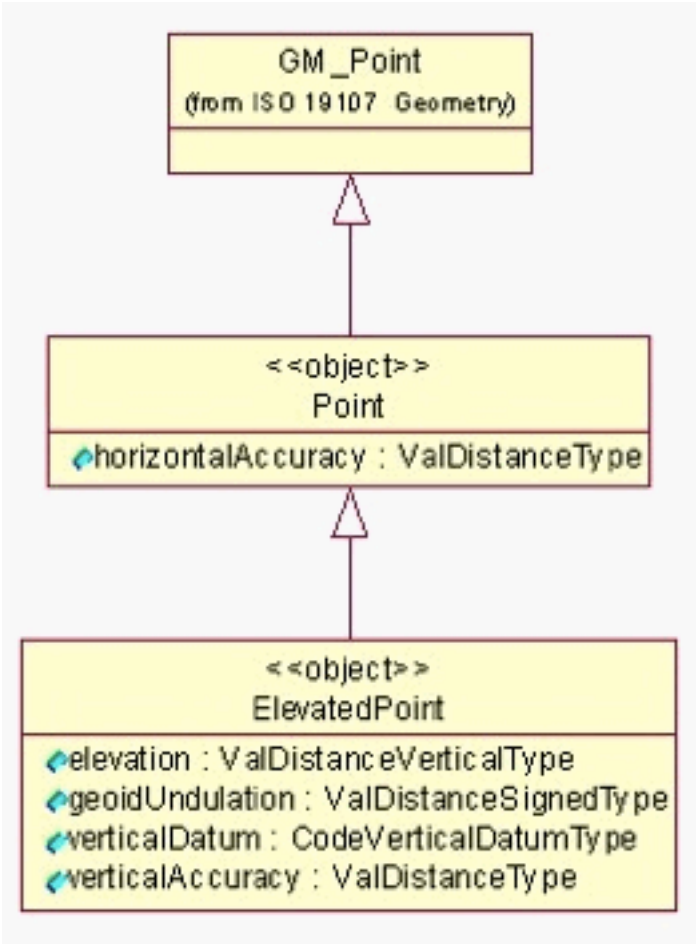
b. Terms Deleted:
OMEGA

c. Editorial/format changes were made where necessary. Revision bars were not used due to the insignificant nature of the changes.

OGC®

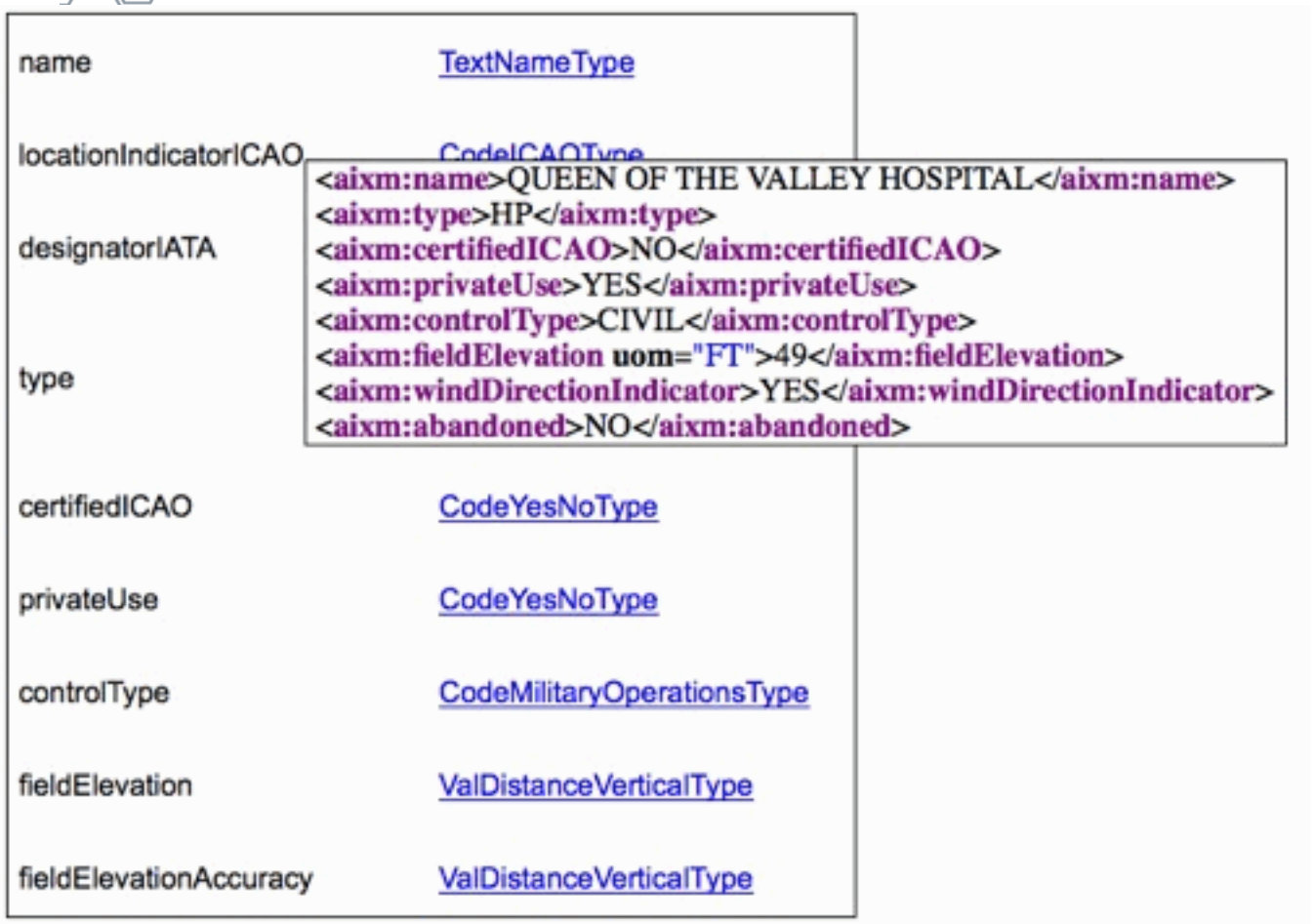
© 2013 Open Geospatial Consortium

AIXM features



© 2013 Open Geospatial Consortium

AIXM features



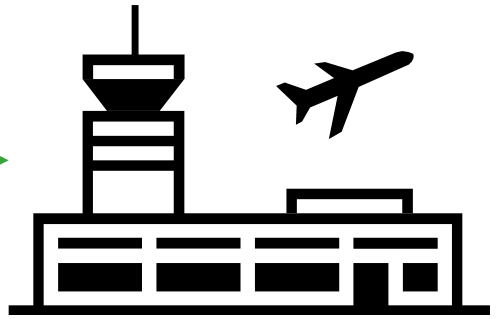
OGC®

© 2013 Open Geospatial Consortium

OWS-9 CCI Aviation Architecture

Pilots

Pilot Controller Glossary



Air Traffic Control

Client

Web Feature Service

AIXM Data (GML)

Web Processing Service

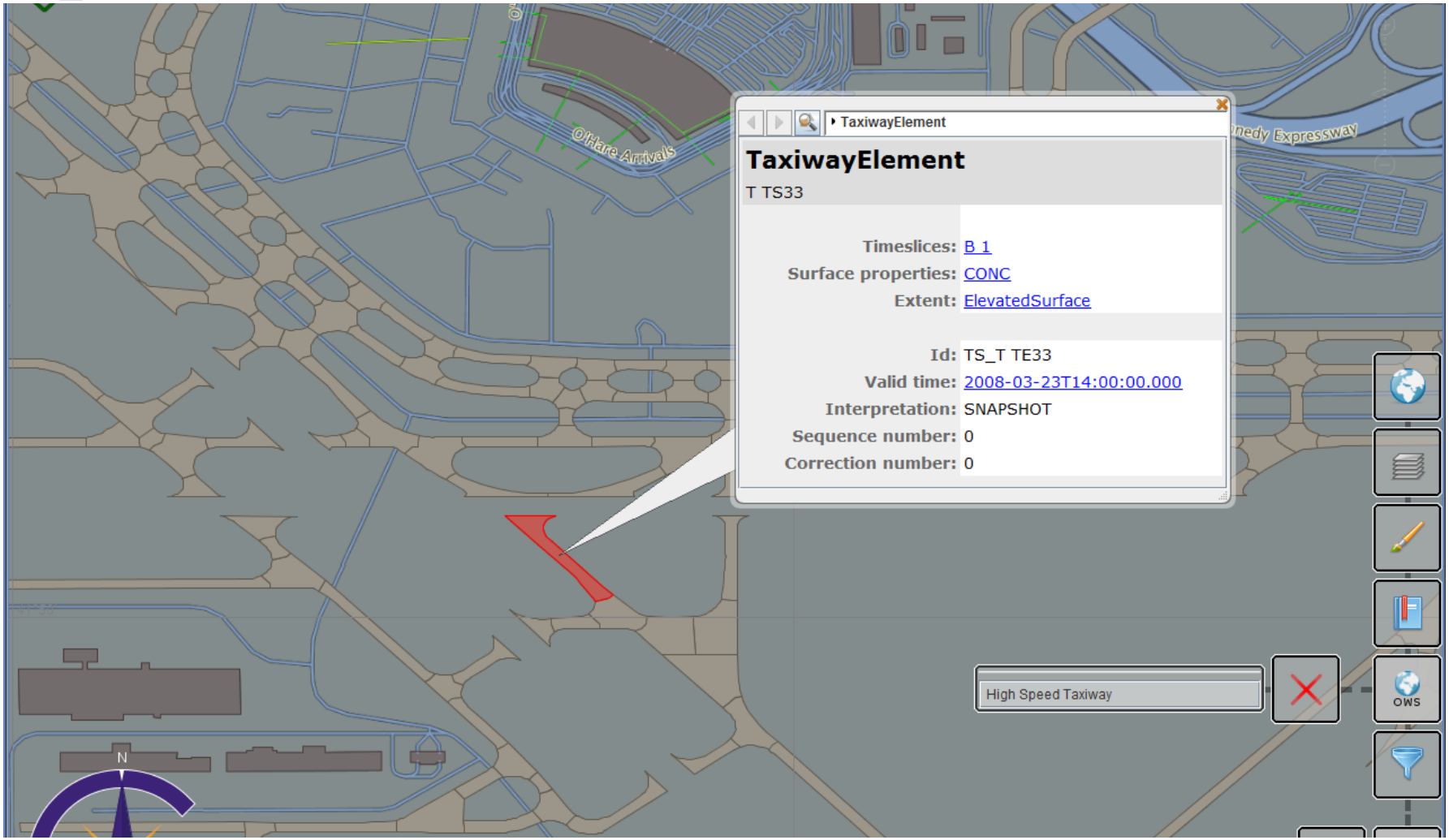
SPARQL Server

FAA Air Transportation Information Ontology mappings Glossary and AIXM

OGC®

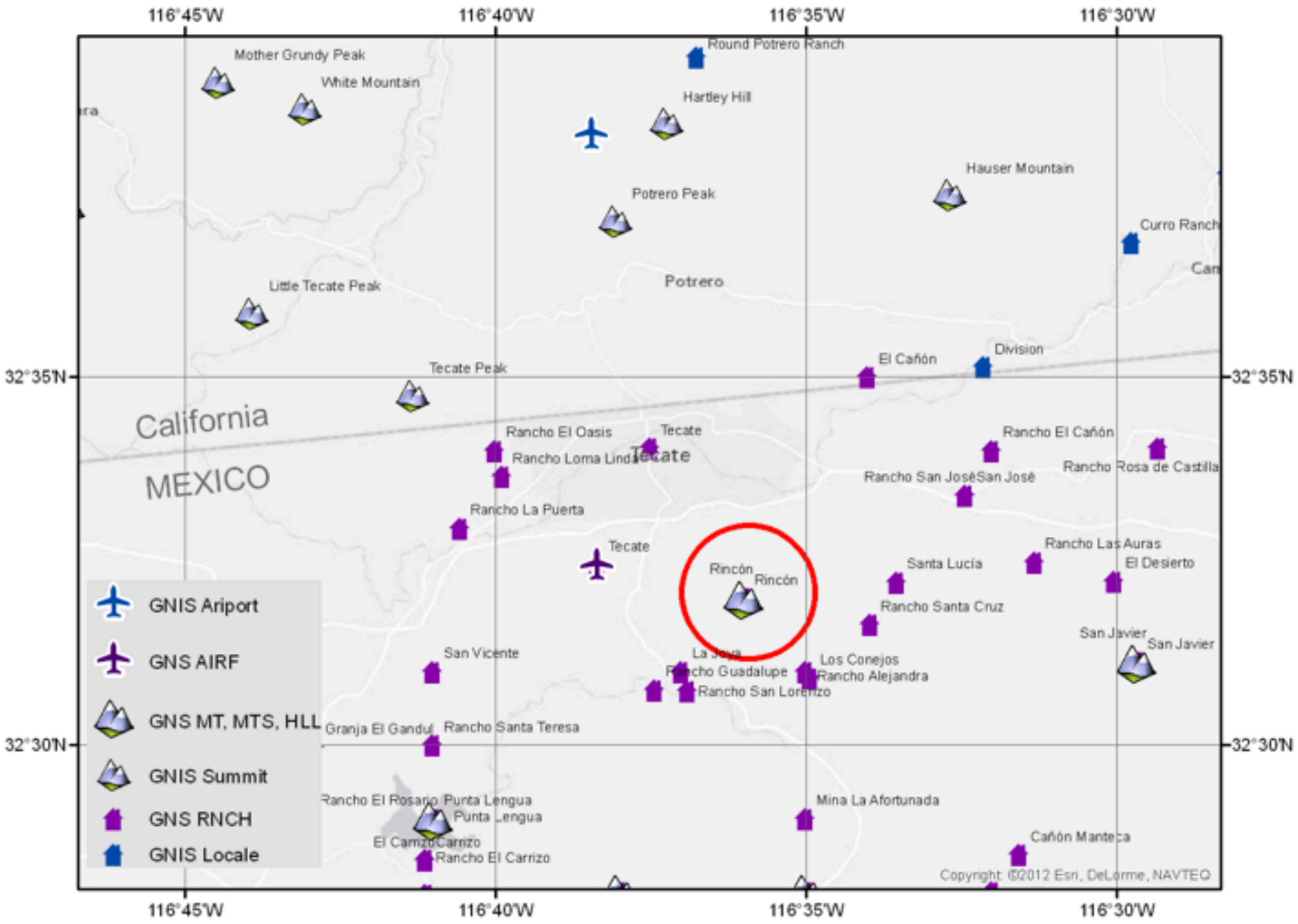
© 2013 Open Geospatial Consortium

Search by topic in the glossary

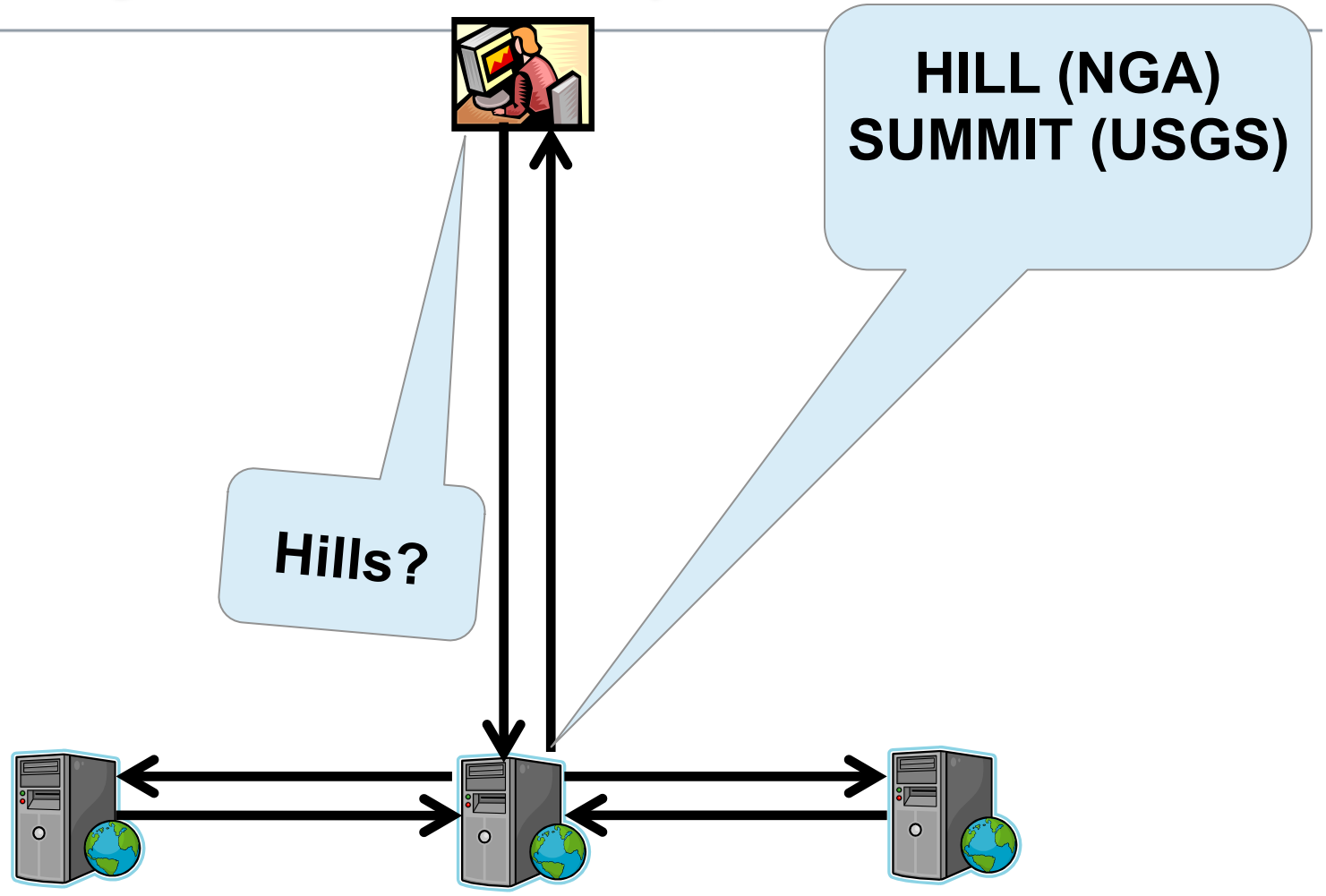


© 2013 Open Geospatial Consortium

CCI Geonames Demo



Single Point of Entry Gazetteer



USGS Gazetteer
(CubeWerx)

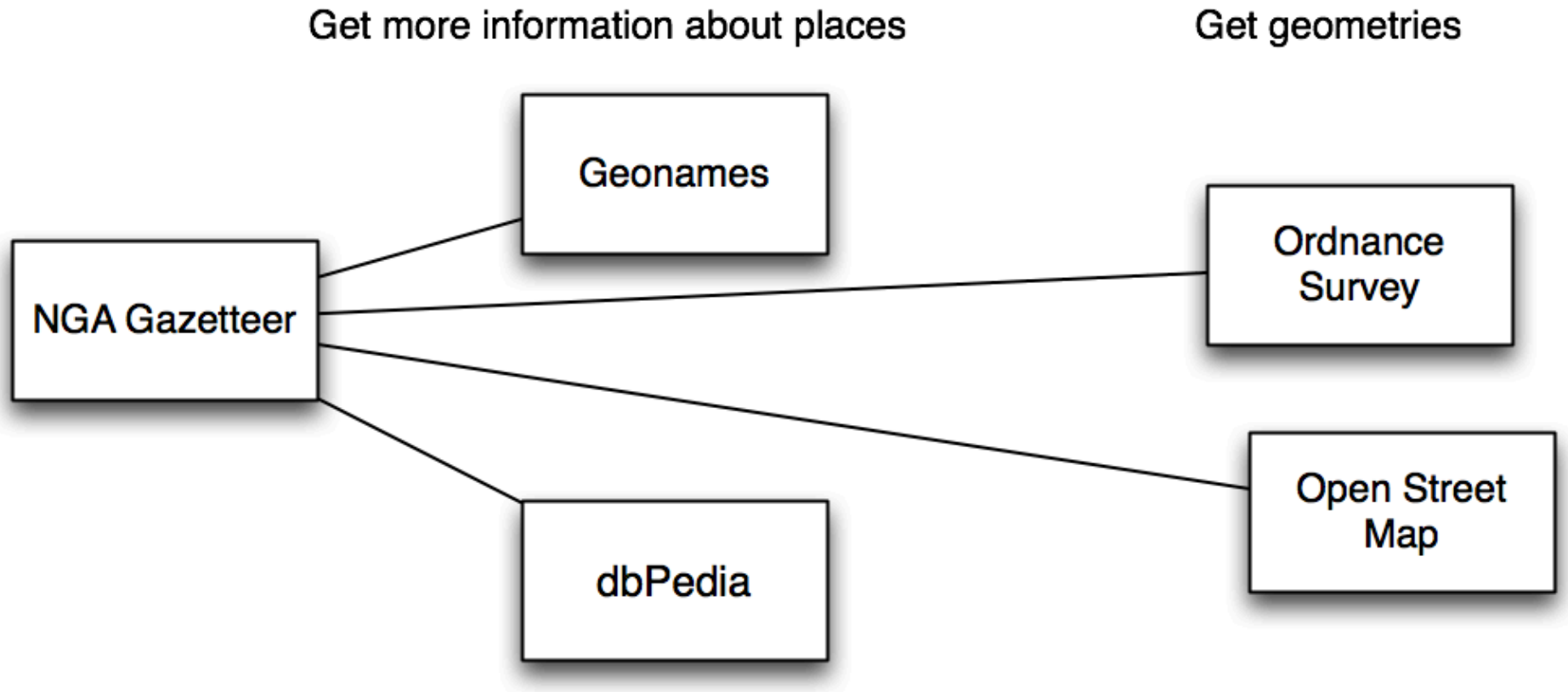
Semantically Rich
Single Point
of Entry Gazetteer
(Envitia)

NGA Gazetteer
(Intergraph)

OGC®

um

OWS 10 (2013-2014) Linked Data



© 2013 Open Geospatial Consortium

The Future: UML to OWL

Patterns and automatic converstion from OGC models to OWL

© 2013 Open Geospatial Consortium

Presented at the last Technical Committee Meeting

© 2013 Open Geospatial Consortium

Importance

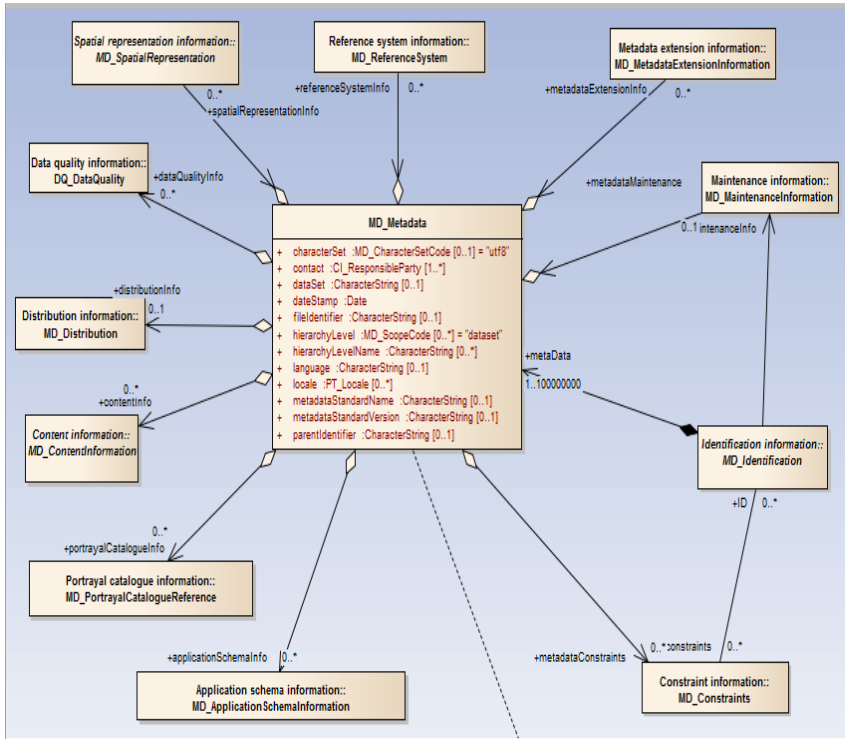
- Developing rules for application ontologies in OWL
- Introducing spatial operators as defined in ISO19107 and ISO19125-1 to the Semantic Web for spatial reasoning and inference, so they can be used as part of Semantic Web languages (RDF, RDF-S, and OWL)
- Translation of the ISO harmonized model from UML to OWL
- Defining Web services ontologies.

© 2013 Open Geospatial Consortium

Generating the ISO/TC 211 harmonized ontology

UML Model

Output in OWL



iso19115MetadataEntitySetInformation.txt - Bloc-notes

Fichier Edition Format Affichage ?

```
<rdf:RDF xmlns="http://def.isotc211.org/iso19115/2006/MetadataEntitySetInformation#"
  xml:base="http://def.isotc211.org/iso19115/2006/MetadataEntitySetInformation"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:iso19115="http://def.isotc211.org/iso19115/2006/MetadataEntitySetInformation#">
  <owl:Ontology rdf:about="http://def.isotc211.org/iso19115/2006/MetadataEntitySetInformation">
    <rdfs:label>ISO 19115:2006 MetadataEntitySetInformation</rdfs:label>
    <dc:source>http://standards.iso.org/iso/19115/ed-2/en/</dc:source>
    <owl:versionInfo>2006-07-01</owl:versionInfo>
  </owl:Ontology>
  <owl:Class rdf:about="&iso19115;MD_Metadata">
    <skos:prefLabel>MD_Metadata</skos:prefLabel>
    <skos:definition>Information about the metadata</skos:definition>
    <dc:source>http://standards.iso.org/iso/19115/ed-2/en/</dc:source>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="&iso19115;MD_Metadata.fileIdentifier"/>
        <owl:maxCardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:maxCardinality>
      </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="&iso19115;MD_Metadata.fileIdentifier"/>
        <owl:allValuesFrom rdf:resource="xsd;string">
      </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="&iso19115;MD_Metadata.language"/>
        <owl:maxCardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:maxCardinality>
      </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="&iso19115;MD_Metadata.language"/>
        <owl:allValuesFrom rdf:resource="xsd;string">
      </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="&iso19115;MD_Metadata.characterSet"/>
        <owl:maxCardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:maxCardinality>
      </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="&iso19115;MD_Metadata.characterSet"/>
```

OGC®

Copyright © 2013 Open Geospatial Consortium

ISO/TC 211 Harmonized ontologies

- One thread of the ISO/TC 211 Group for Ontology Maintenance (GOM)
- Development of an application for the automatic derivation of ontologies from the ISO/TC 211 harmonized model
- Status
  - in development
  - Environment: EA/JScript
  - Alpha version
- Next phases
  - Testing
  - Corrections
  - Beta version

Jean.Brodeur@NRCan-RNCan.gc.ca
Project leader and editor of ISO19150-2
Convenor of the ISO/TC 211 Group for Ontology Maintenance (GOM)

OGC®

Copyright © 2013 Open Geospatial Consortium

The Future Future

A more comprehensive Geospatial Ontology

Maybe a Working Group

OGC®

© 2013 Open Geospatial Consortium

Contact Information

Luis Bermudez, Ph.D.
lbermudez@opengeospatial.org
@berdez on Twitter
http://www.linkedin.com/in/bermudez

http://www.opengeospatial.org

OGC®

© 2013 Open Geospatial Consortium