



Geospatial Standards and the Semantic Web

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2013-10-17

Agenda



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

Open Geospatial Consortium



470+ volunteer organizations
(members)

4000+ Users

60+ Standards

700+ implementing
products

150+ current certified implementations

OGC[®]



OGC Standards



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

- netCDF
- KML
- WMS
- SOS
- WPS
- WCS...

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

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 TypeName parameter for CAT 2.0.2  | 11-173 | Enrico Boldrini | 2011-12-14 |
| Ambiguity in GetRecords TypeName parameter for ISO Metadata AP 1.0  | 11-174 | Enrico Boldrini | 2011-12-14 |
| Implementation of required valueOf() function will reduce query/filter efficiency.  | 11-177 | Panagiotis (Peter) A. Vretanos | 2011-12-14 |

OGC needs to identify artifacts and more



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

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] |
| rena | 41 | [RFC6061] |

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>.

URLs or URNs ?



http URIs ✓

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 | |

















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 | <ul style="list-style-type: none">Document clause Document figure Document table Term and definition  | |
| see also | <ul style="list-style-type: none">ogc-na-policiesDOC | |

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 |  |

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”
1. Vocabularies are strongly governed
 - read-only access for most users
1. **Service owner \neq content URI owner**
 - same content may be hosted in multiple services



- OGC Definition URIs are hosted/redirected to SISSvoc

The screenshot shows a web browser window with the address bar containing the URL: def.seegrid.csiro.au/sissvoc/ogc-def/concept?labelcontains=water. The page header features the SISSvoc logo and the text "OGC Definitions Service". Below the header, a dark grey bar contains the word "form" and the title "Search Results". The main content area displays a list of search results in blue text, each within a white box with a grey border. The results are: "Waterml definitions", "WaterML definitions", "Ground Water", "Soil Water", "Pore Water", and "Water".

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

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

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

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 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>

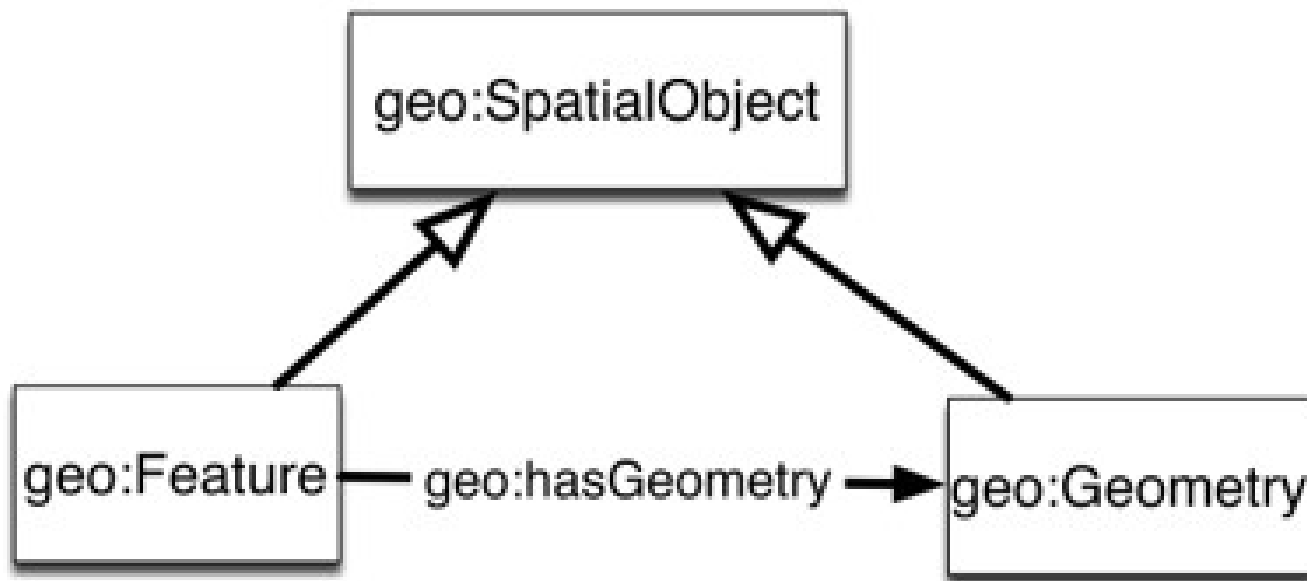
Reference number of this OGC[®] project document: OGC 11-052r4

Version: 1.0

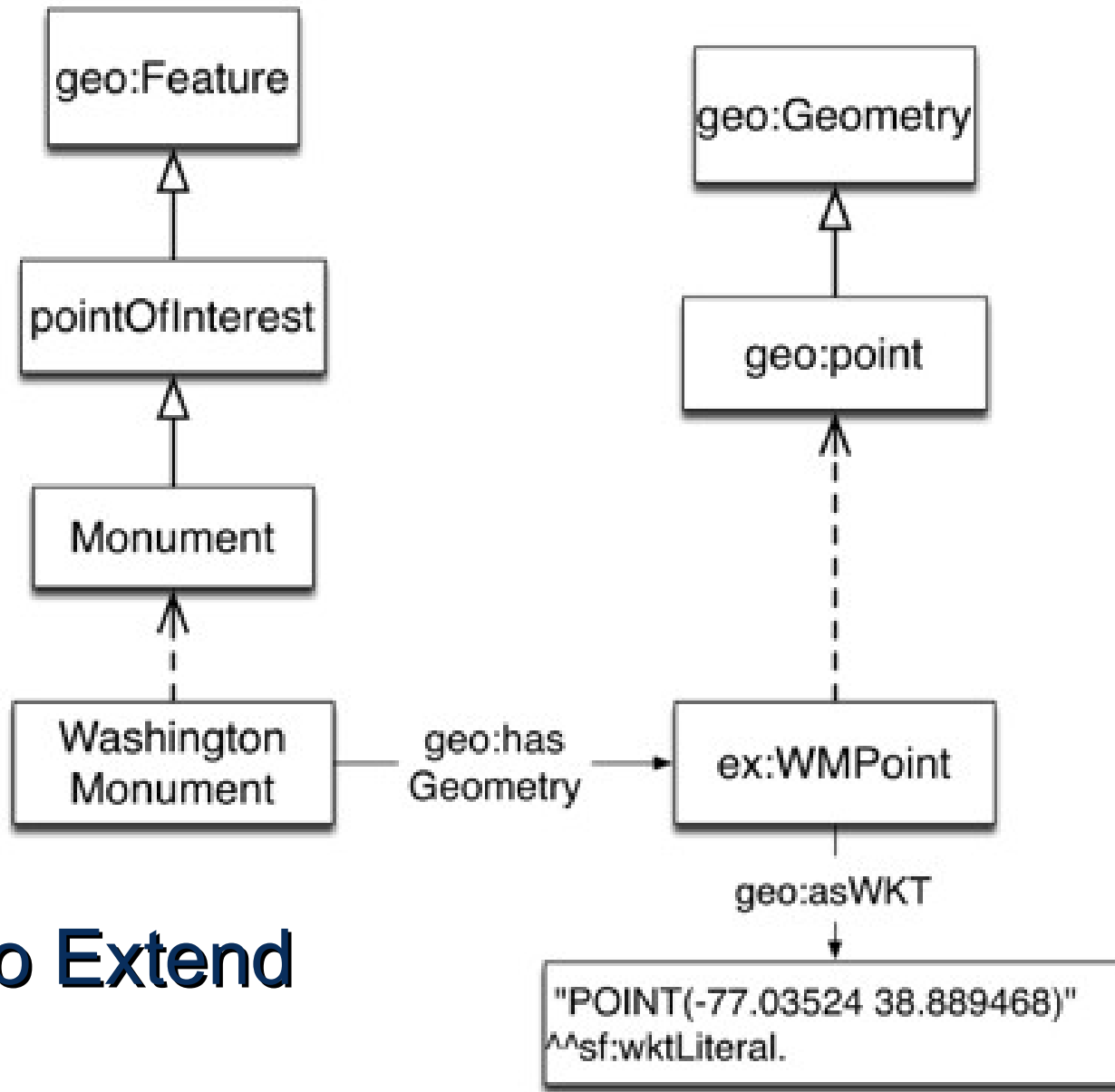
Category: OGC[®] Implementation Standard

Editors: Matthew Perry and John Herring

Simple Model



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



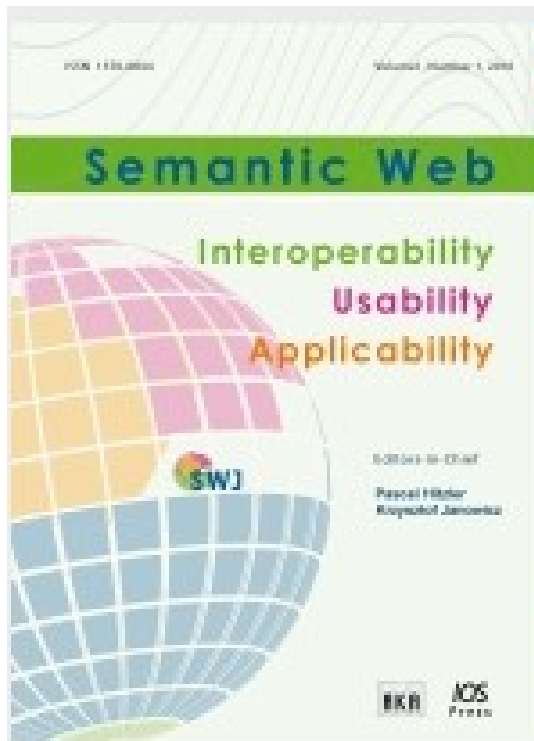
Easy to Extend

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`

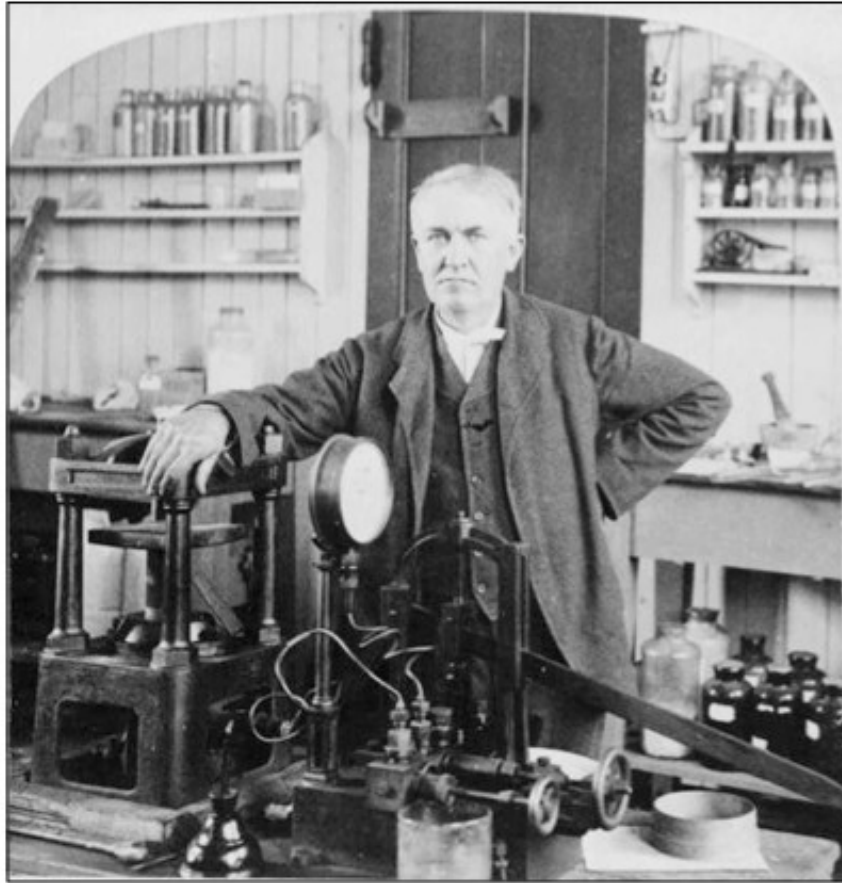
Excellent Article



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 |

Interoperability Program Activities



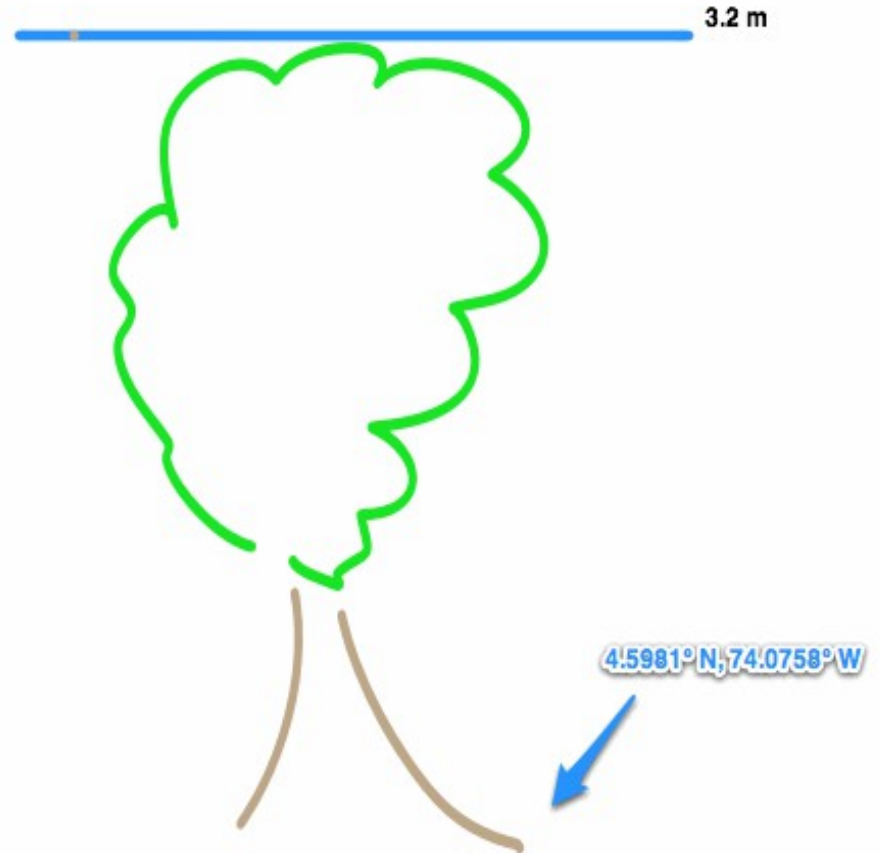
I have not failed, I've just found 10,000 ways that won't work.

Thomas Edison

Web Feature Service



Public
Access
Manipulation
of Features



Type = Tree

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`

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**



**Monterey Airport
Field operator**

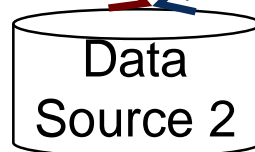
↓
Prefers

↓
Prefers

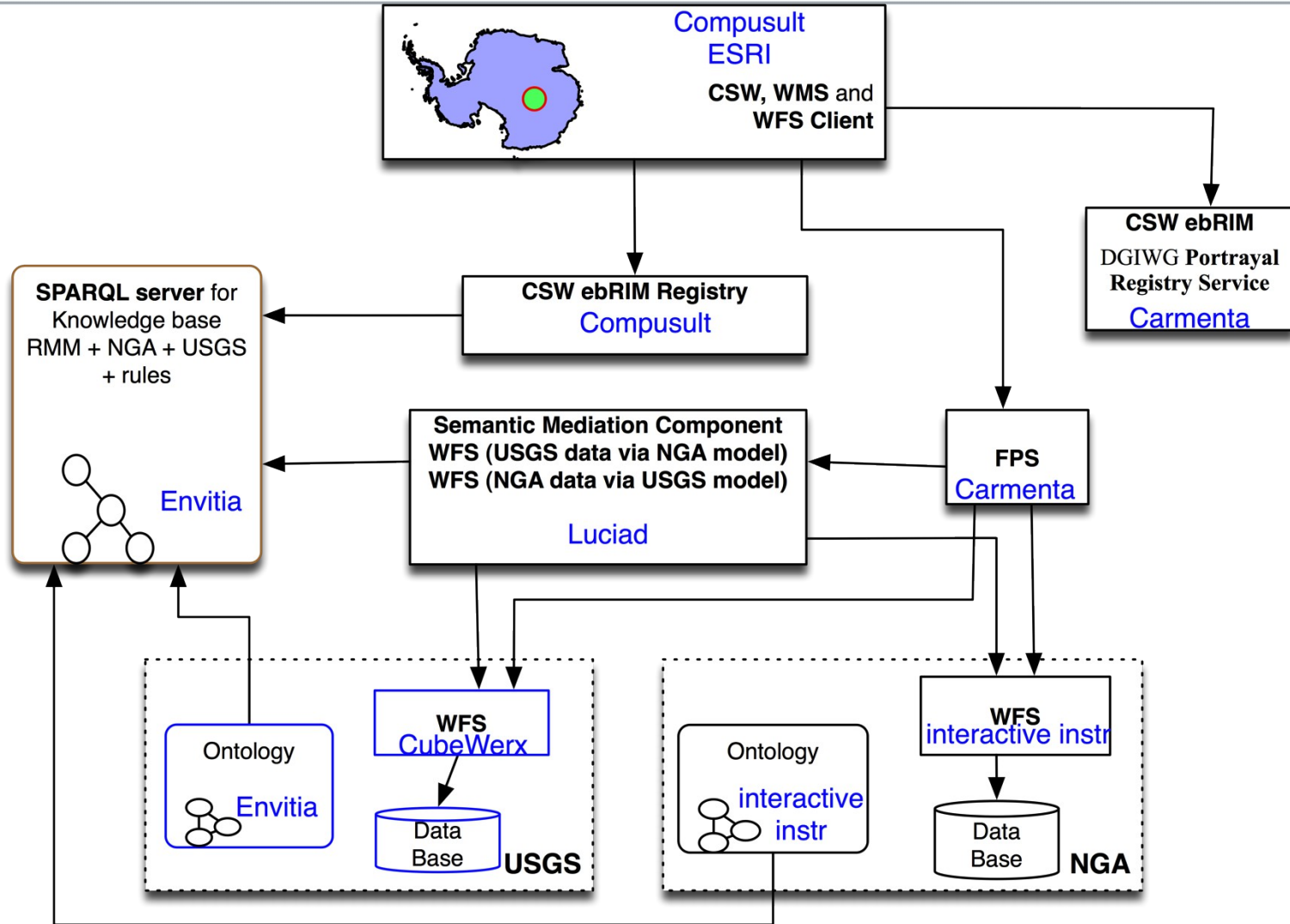
**NGA model - Local
Topographic
Data Store (LTDS)**

**USGS model - The
National Map
(TNM)**

Mediate



OWS-8 CCI Architecture



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.

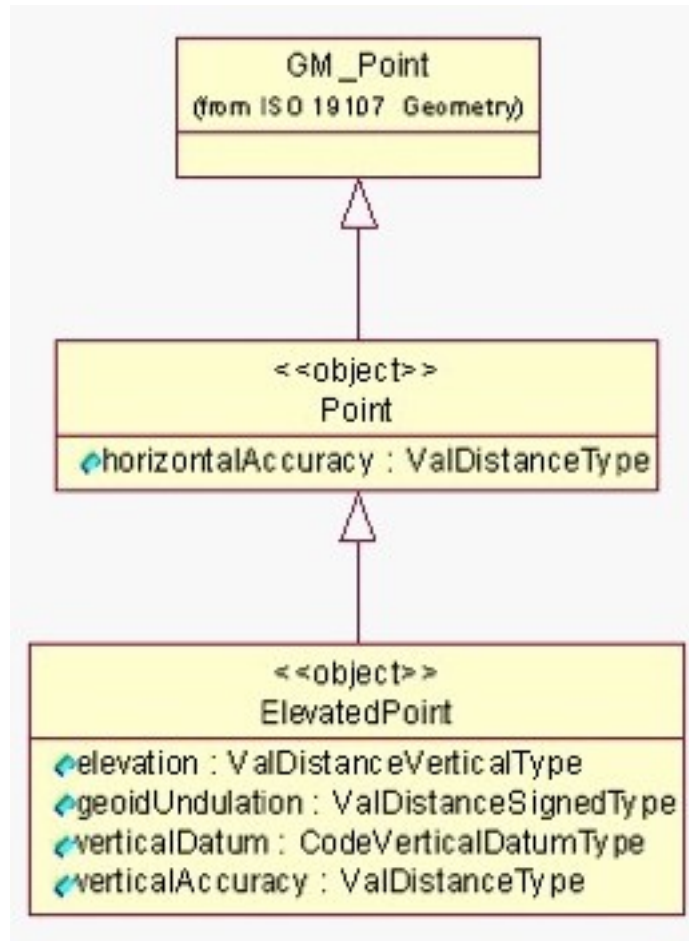
EXPLANATION OF CHANGES

a. Terms Added:
PROTECTED SEGMENT

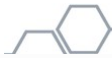
b. Terms Deleted:
OMEGA

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

AIXM features

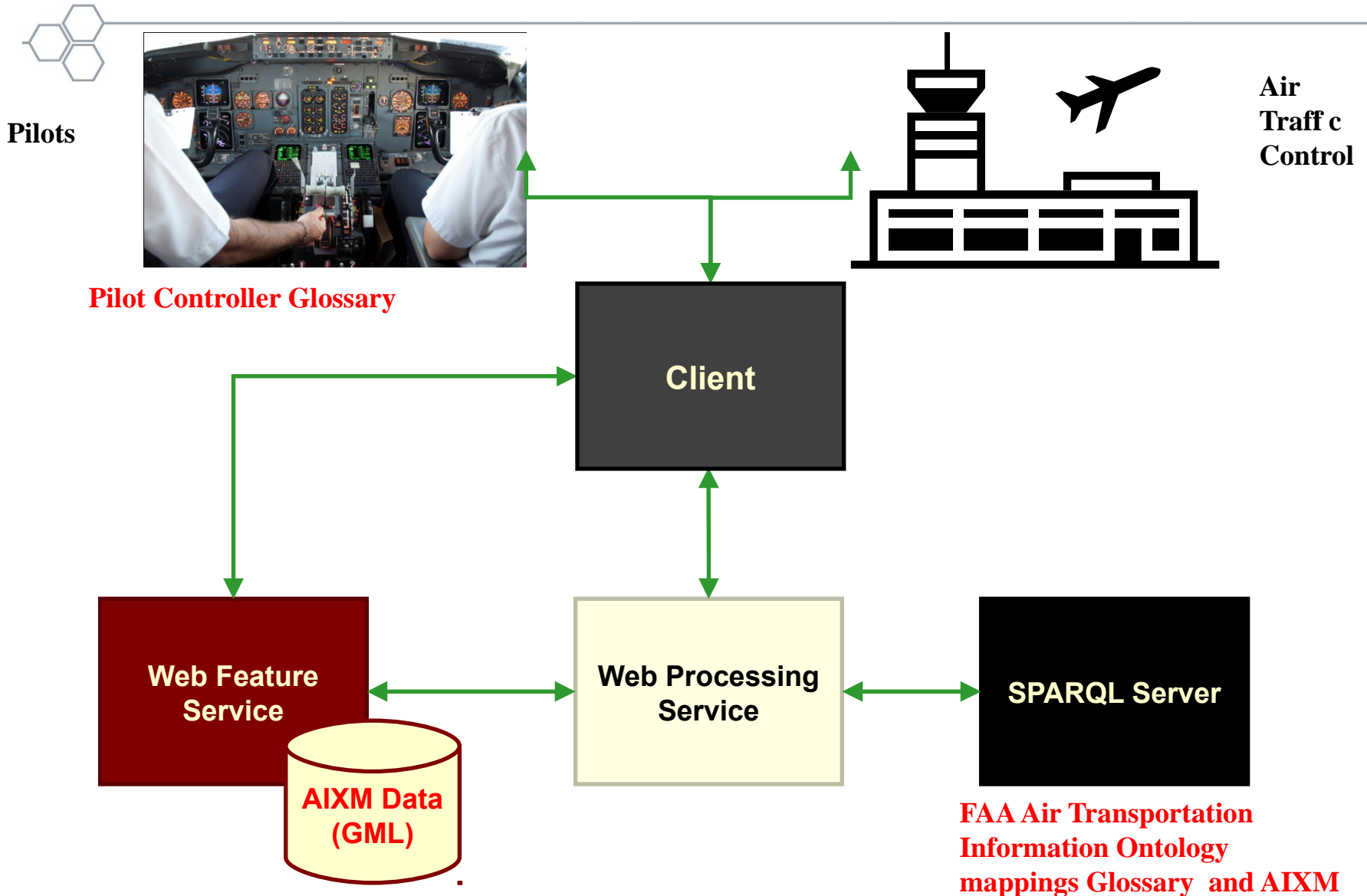


AIXM features



| | |
|------------------------|--|
| name | TextNameType |
| locationIndicatorICAO | CodeICAOType |
| designatorIATA | <pre><aixm:name>QUEEN OF THE VALLEY HOSPITAL</aixm:name> <aixm:type>HP</aixm:type> <aixm:certifiedICAO>NO</aixm:certifiedICAO> <aixm:privateUse>YES</aixm:privateUse> <aixm:controlType>CIVIL</aixm:controlType> <aixm:fieldElevation uom="FT">49</aixm:fieldElevation> <aixm:windDirectionIndicator>YES</aixm:windDirectionIndicator> <aixm:abandoned>NO</aixm:abandoned></pre> |
| type | |
| certifiedICAO | CodeYesNoType |
| privateUse | CodeYesNoType |
| controlType | CodeMilitaryOperationsType |
| fieldElevation | ValDistanceVerticalType |
| fieldElevationAccuracy | ValDistanceVerticalType |

OWS-9 CCI Aviation Architecture



Search by topic in the glossary



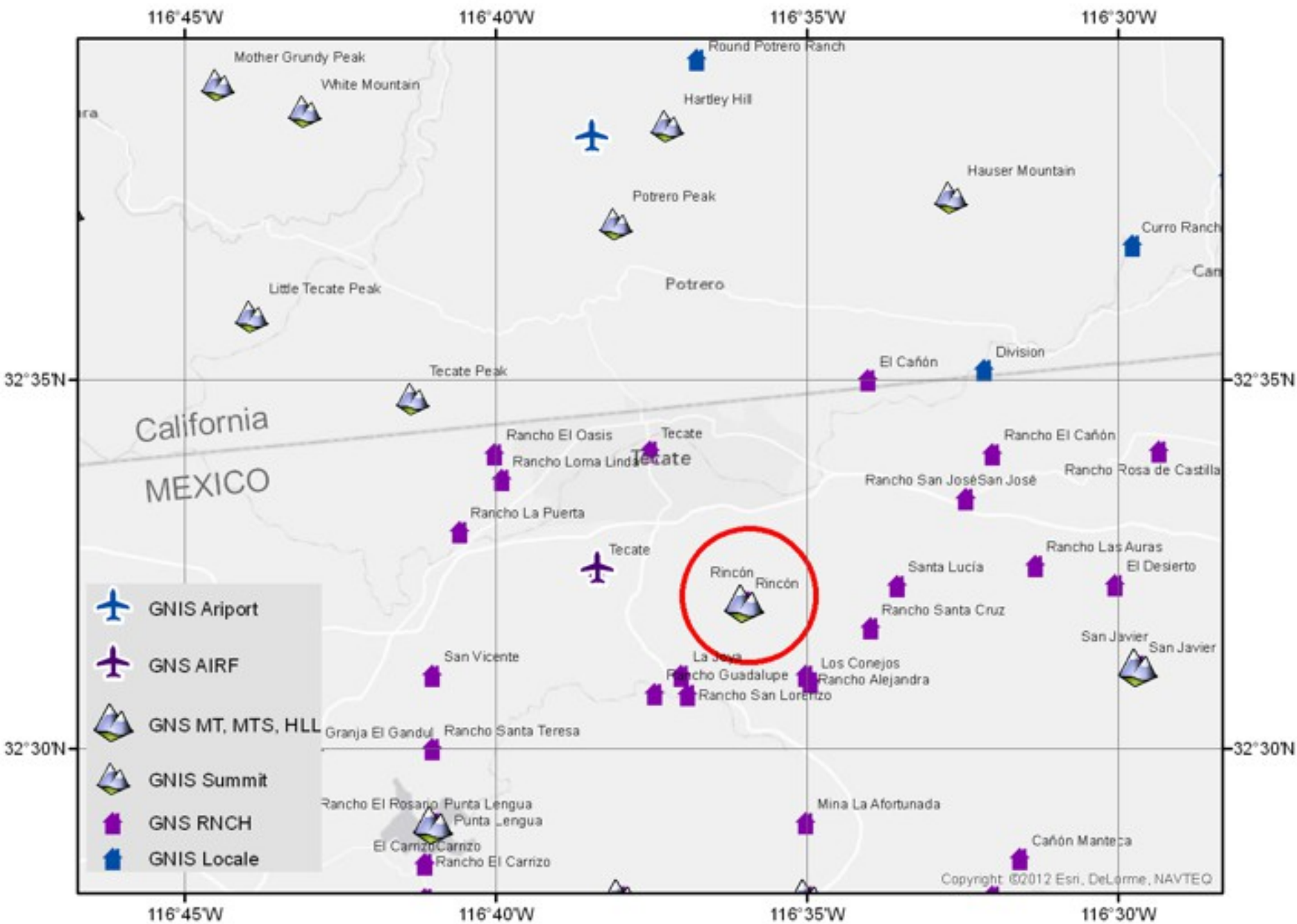
TaxiwayElement
T TS33

Timeslices: [B 1](#)
Surface properties: [CONC](#)
Extent: [ElevatedSurface](#)

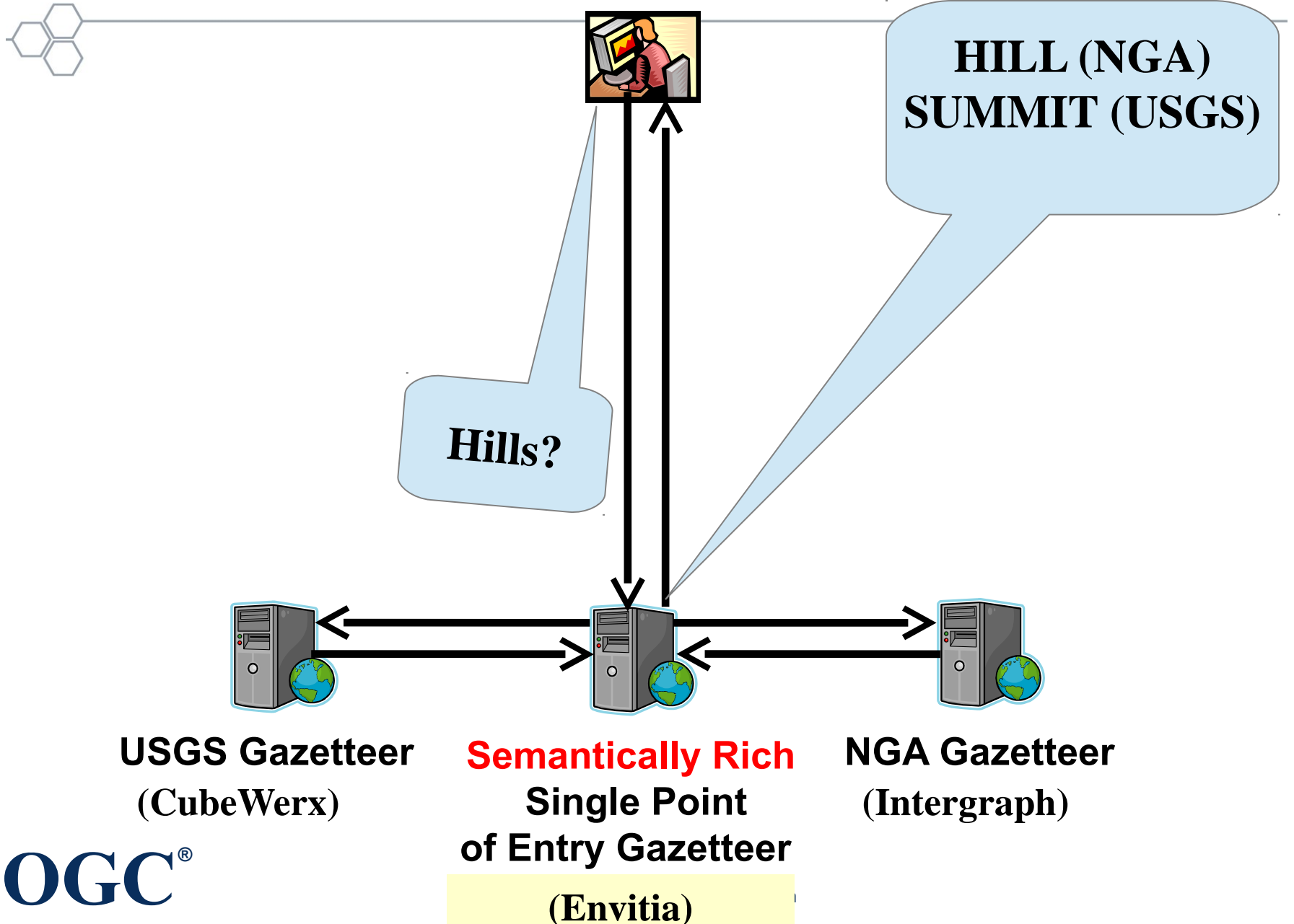
Id: TS_T TE33
Valid time: [2008-03-23T14:00:00.000](#)
Interpretation: SNAPSHOT
Sequence number: 0
Correction number: 0

High Speed Taxiway

CCI Geonames Demo



Single Point of Entry Gazetteer

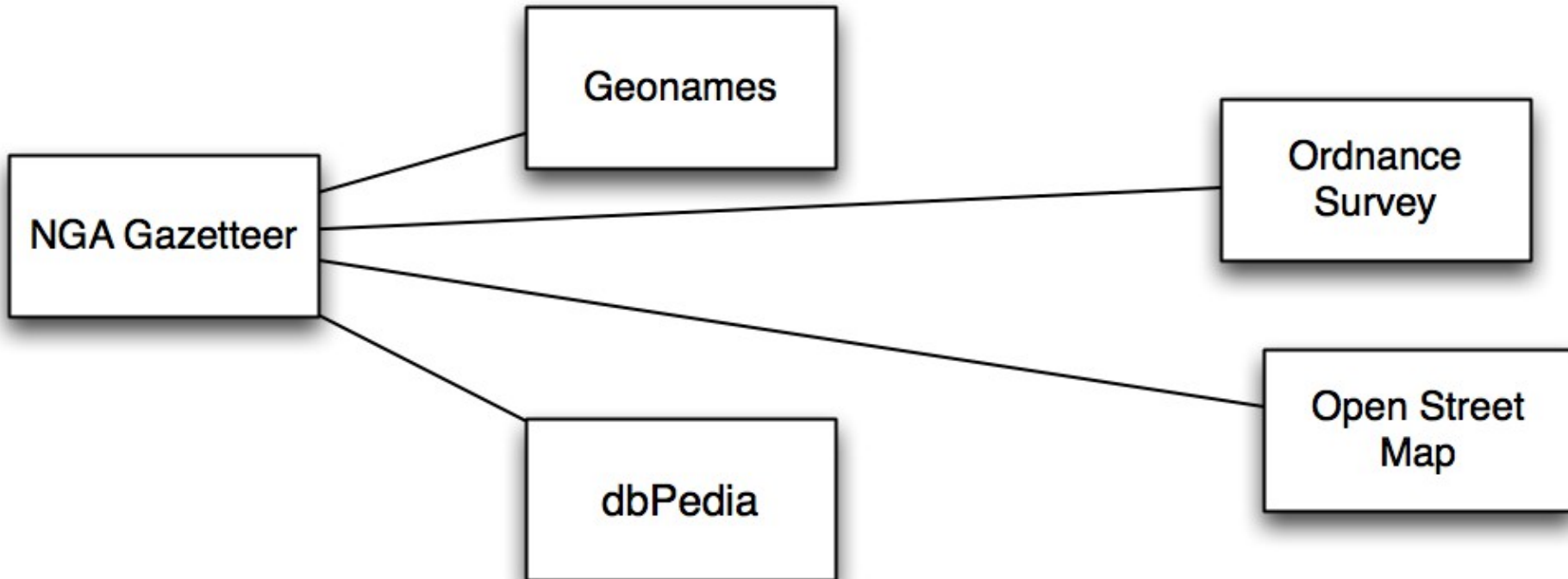


OWS 10 (2013-2014) Linked Data



Get more information about places

Get geometries



The Future: UML to OWL



Patterns and automatic conversion
from OGC models to OWL

Presented at the last Technical Committee Meeting



Hosted and Sponsored by ESA/ESRIN



ISO/TC 211 ontologies

86th OGC Technical Committee
Frascati, Italy
Jean Brodeur
25 September 2013



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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.

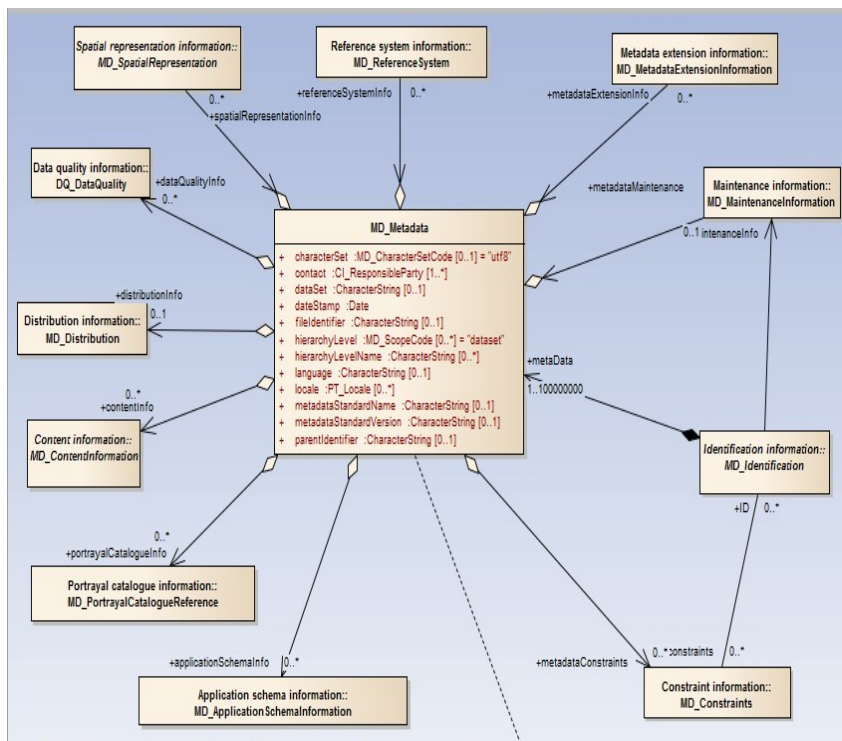
Generating the ISO/TC 211 harmonized ontology



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">
  <rdf:label>ISO 19115:2006 MetadataEntitySetInformation</rdf: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>
      <owl:Restriction>
        <owl:onProperty rdf:resource="&iso19115;MD_Metadata.fileIdentifier"/>
        <owl:allValuesFrom rdf:resource="xsd:string">
        </owl:Restriction>
      </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>
        <owl:Restriction>
          <owl:onProperty rdf:resource="&iso19115;MD_Metadata.language"/>
          <owl:allValuesFrom rdf:resource="xsd:string">
          </owl:Restriction>
        </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>
    </owl:Restriction>
  </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>
    <owl:Restriction>
      <owl:onProperty rdf:resource="&iso19115;MD_Metadata.characterSet"/>

```


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)**



The Future Future

A more comprehensive
Geospatial Ontology

Maybe a Working Group

Contact Information



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