



Enriching SOS services with Ontologies

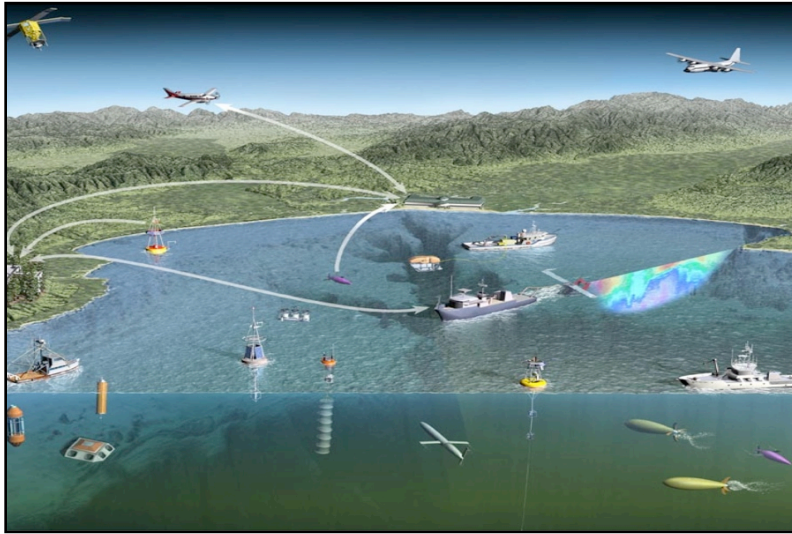
Presentation at

W3C Semantic Sensor Network Incubator Group
Meeting May 19, 2009

http://www.w3.org/2005/Incubator/ssn/wiki/Main_Page

Presenter: Luis Bermudez (bermudez@sura.org)

OGC Ocean Science Interoperability Experiment



World initiative to advance standards for advancing interoperability of ocean observing systems.



Phase I

- Explore Web Feature Service (WFS) and Sensor Observation Service (SOS)
- Advance SOS in the ocean community
- **Explore implementation about discovery of sensors and observations using semantic web technologies**

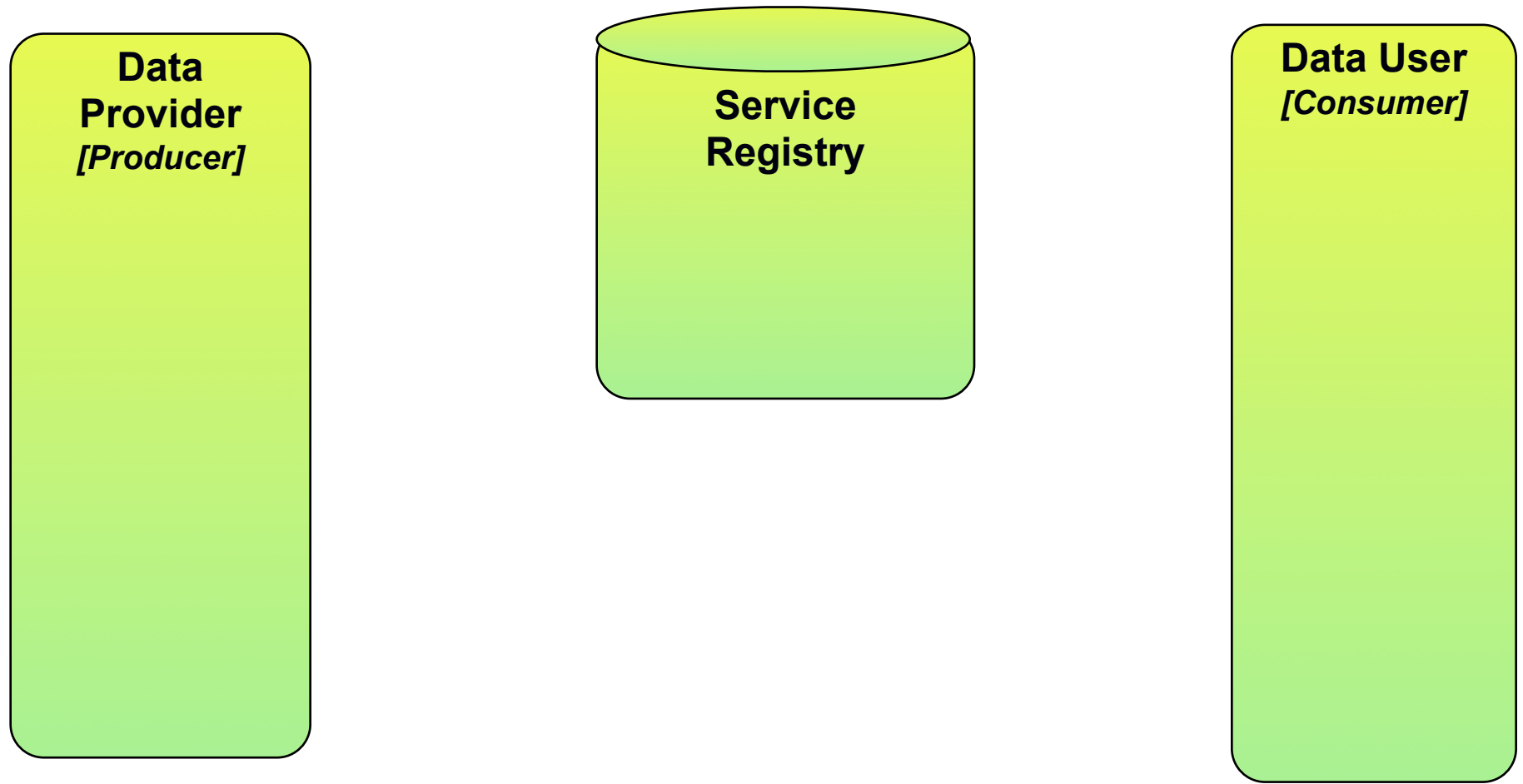
Use Cases

- Find sensors/systems in region of interest, including proximity to user-defined location, from a heterogeneous and distributed network of sensors /systems.
- Find sensors/systems with observations in desired time range.
- Return data within a user-defined time range for a specific sensor or system of interest.

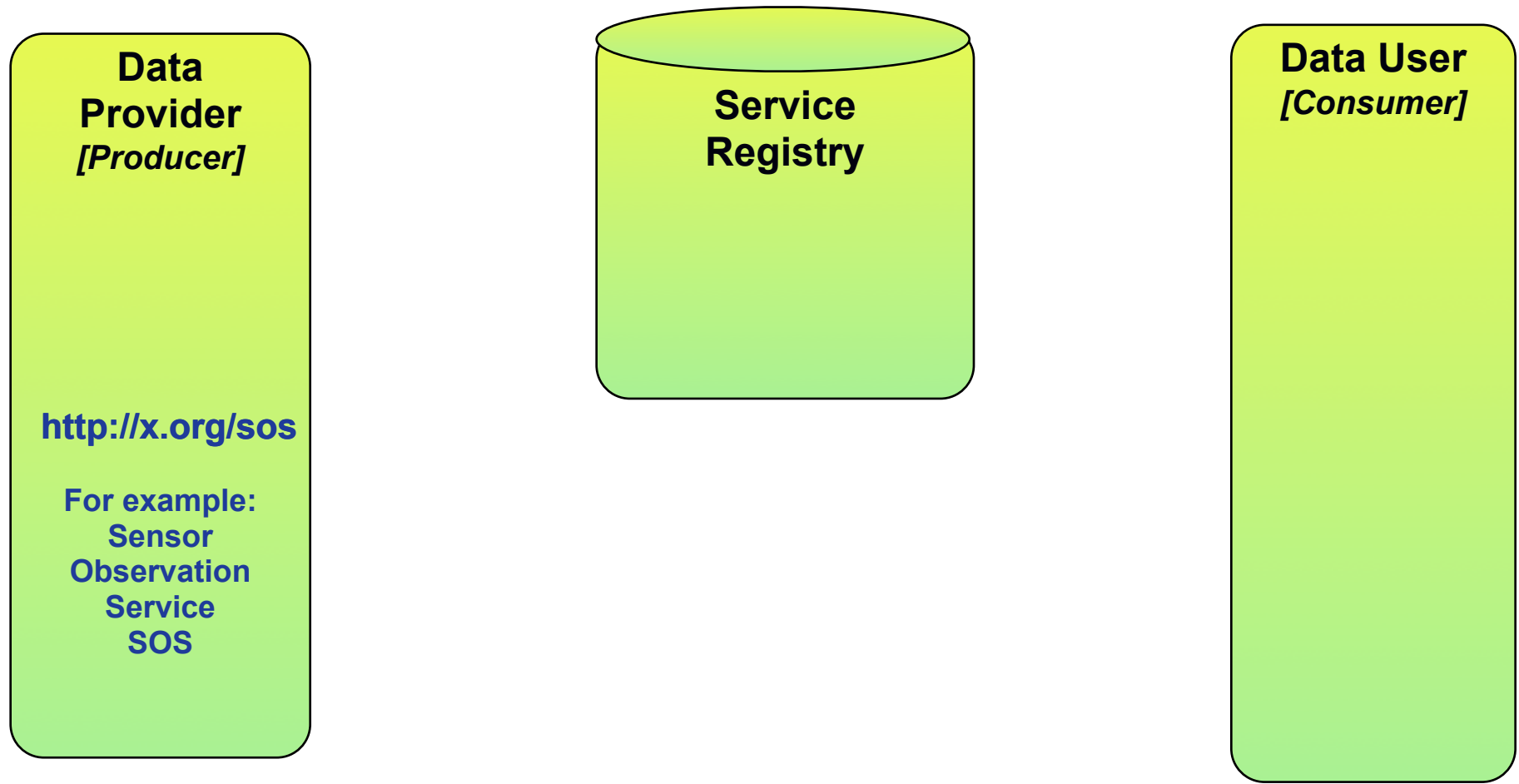
Use Cases (cont.)

- Get latest observation for a specific sensor/system.
- Get descriptions of the sensors/systems used to obtain the measurements.
- Return a description of the measurement processes, which could include quality control procedures.

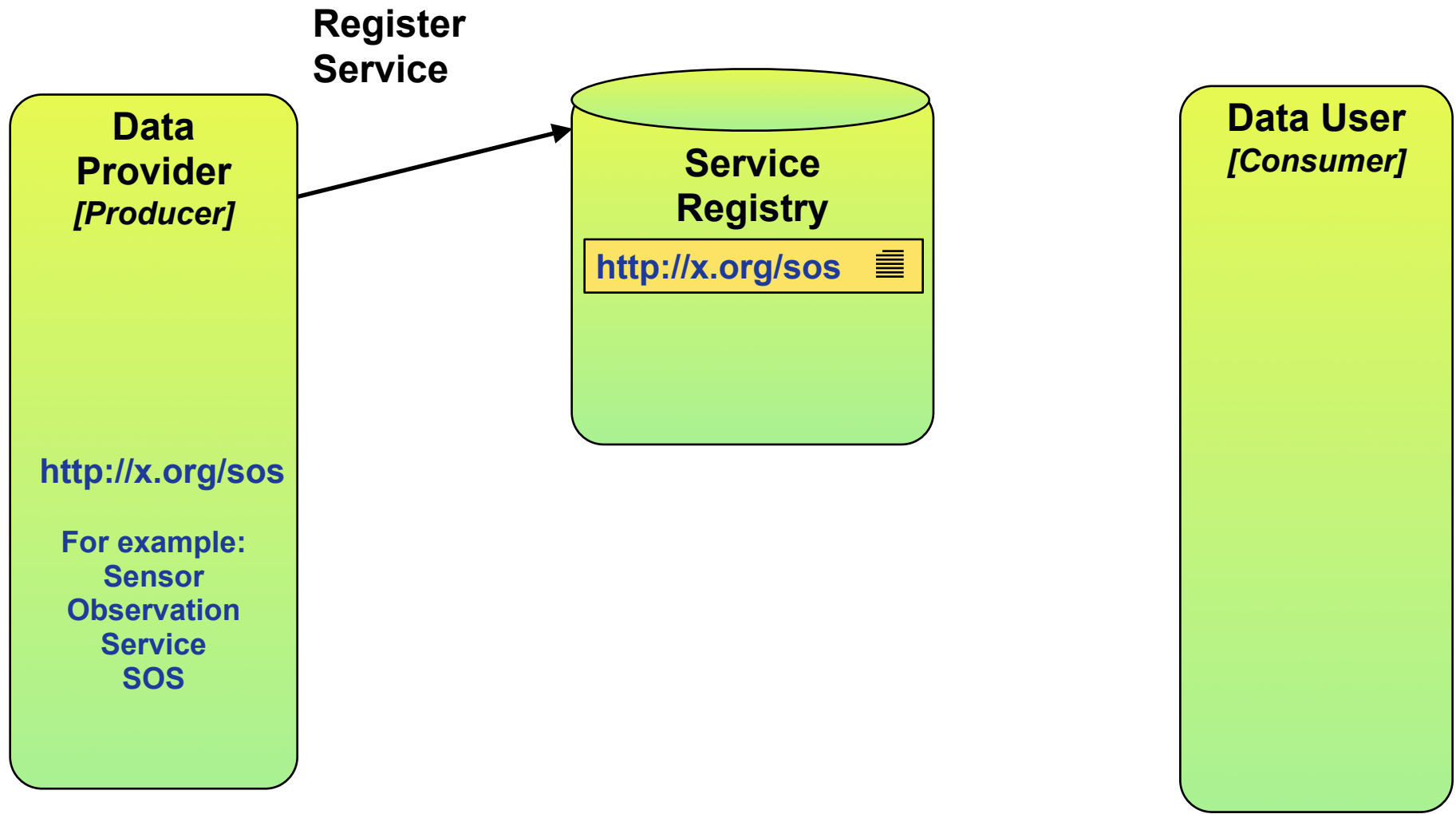
Service Oriented Architecture



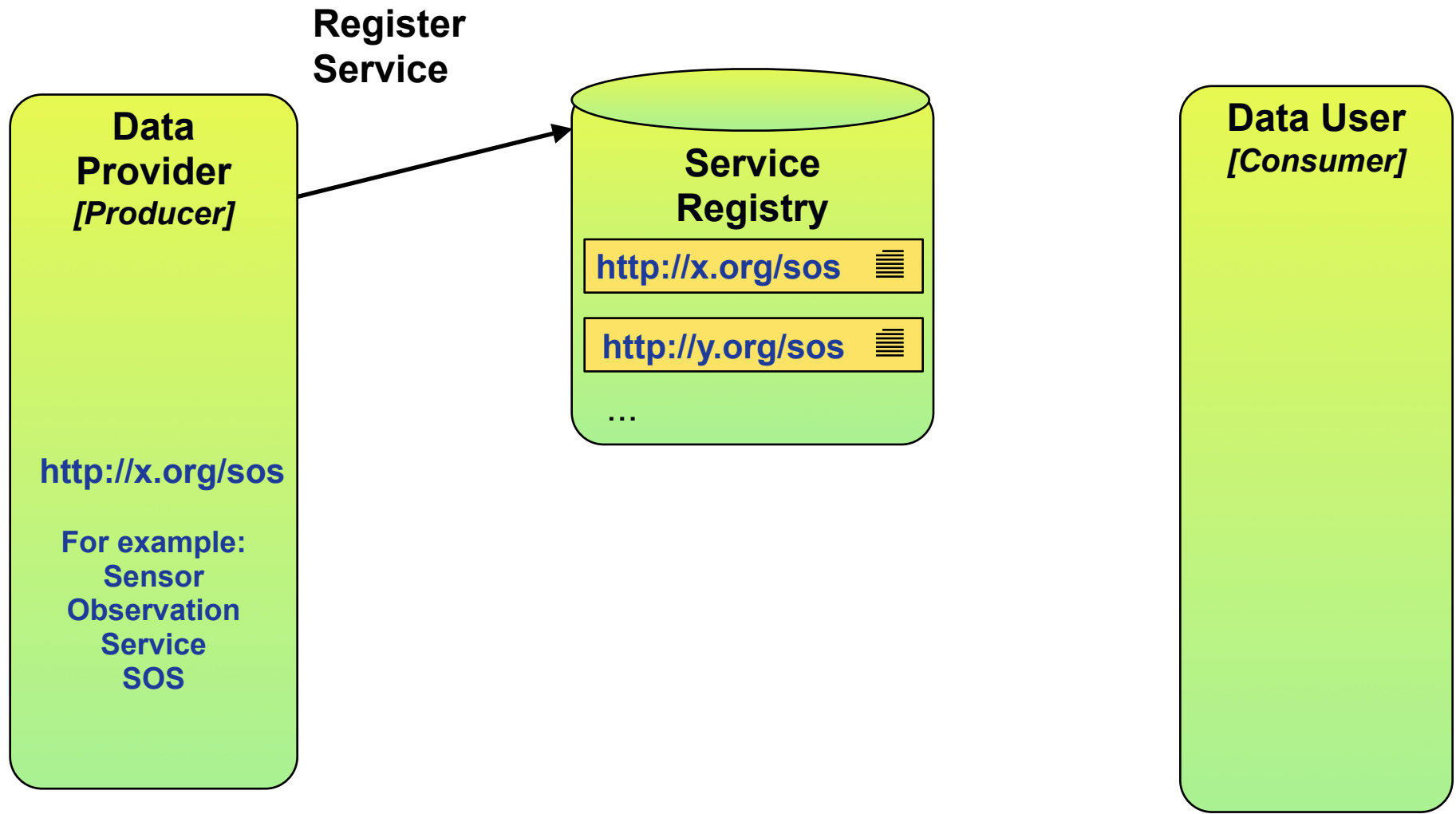
Service Oriented Architecture



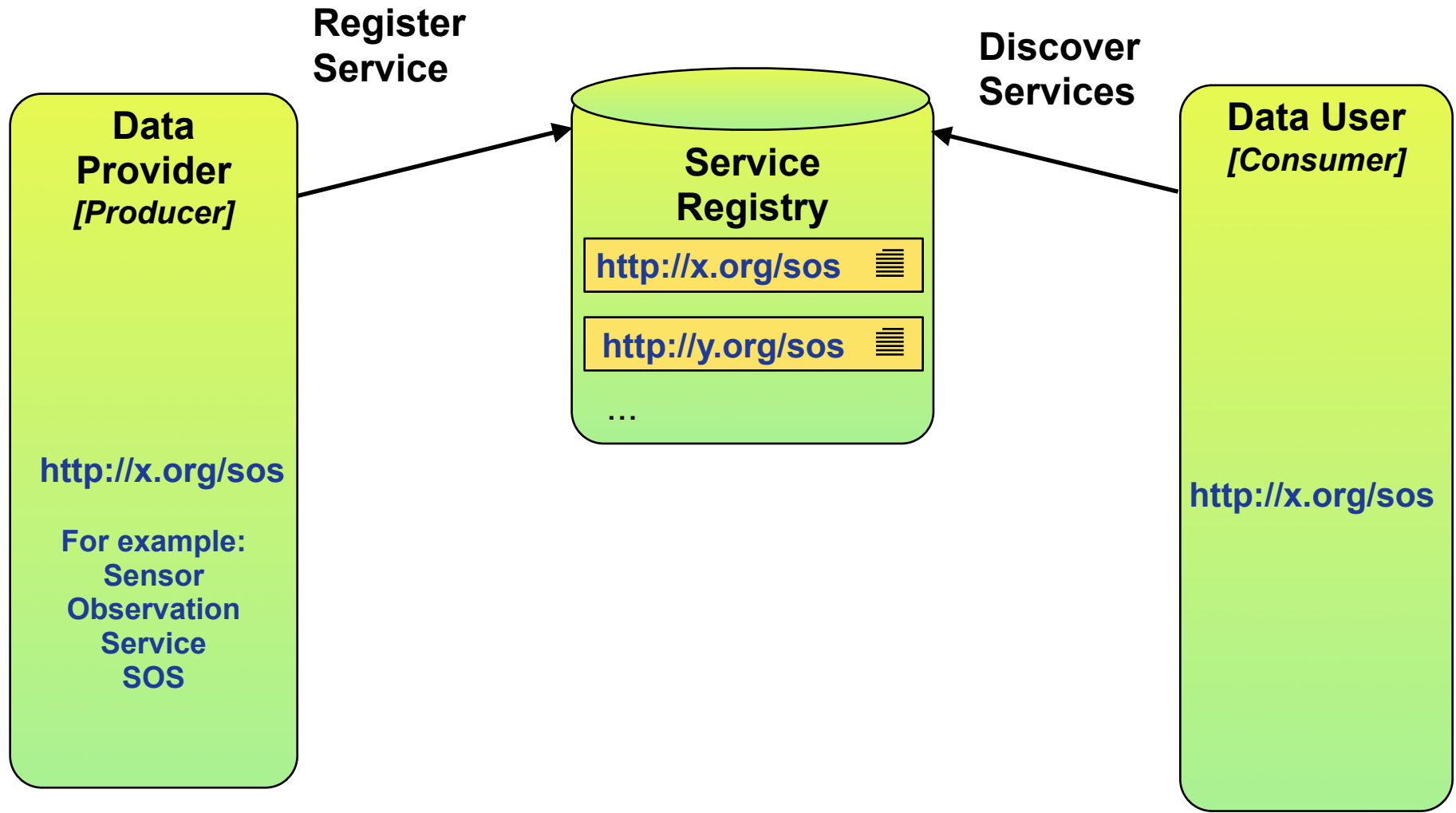
Service Oriented Architecture



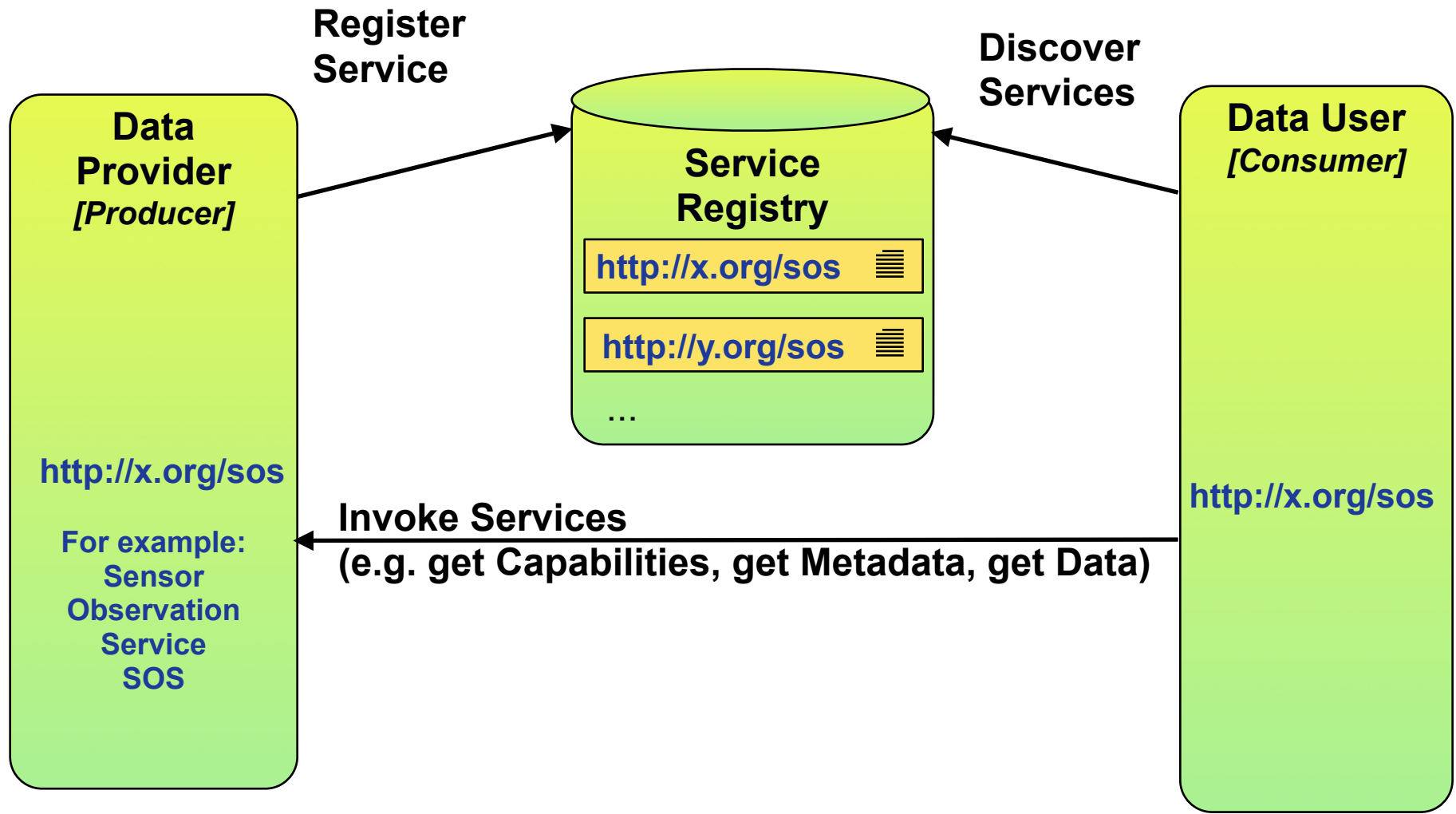
Service Oriented Architecture



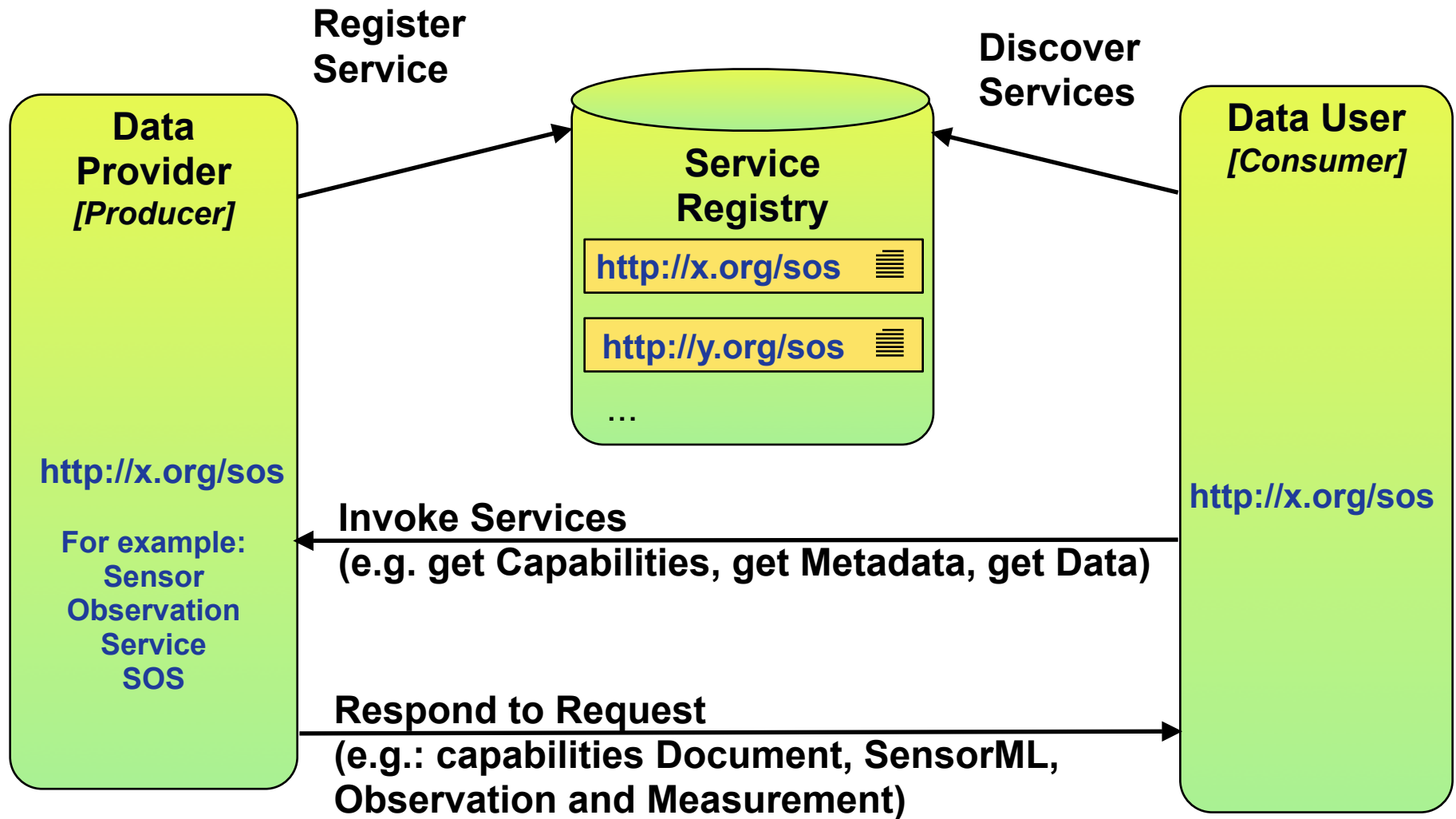
Service Oriented Architecture



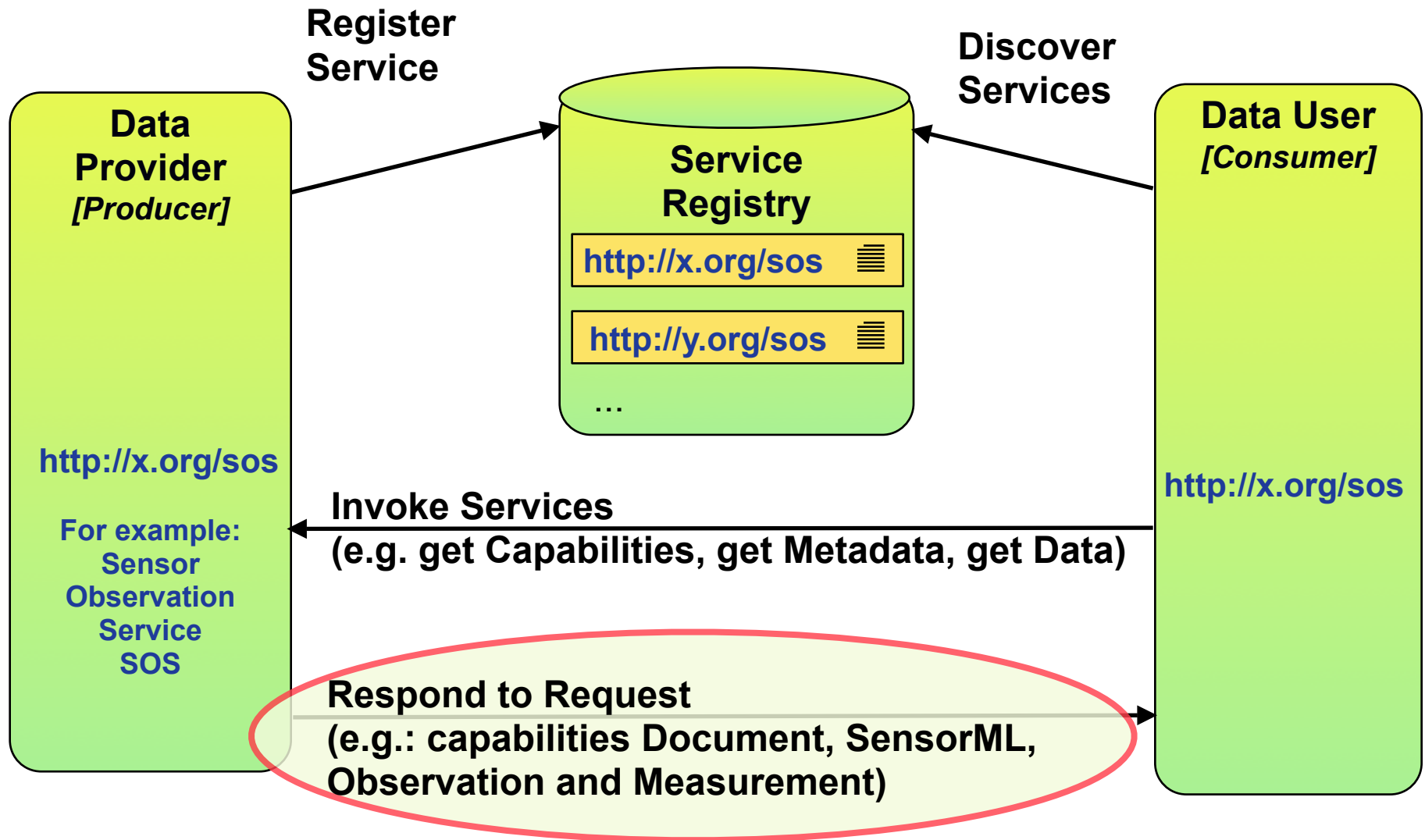
Service Oriented Architecture



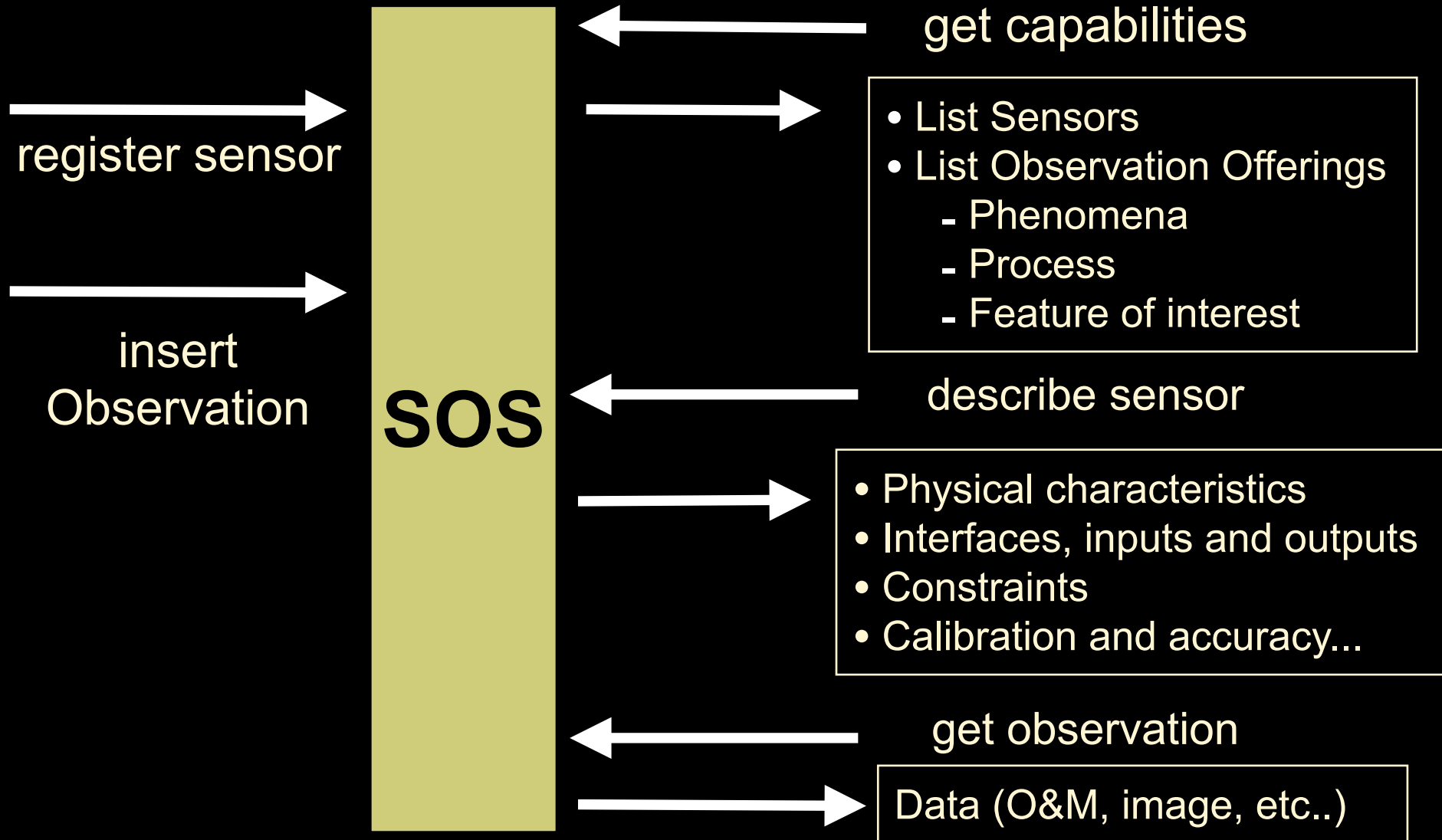
Service Oriented Architecture



Service Oriented Architecture



Sensor Observation Service



Sensor Observation Service

getObservation respond

```
</swe:field>
<swe:field name="longitude">
  <swe:Quantity definition=" ???? ">
    <swe:uom code="deg"/>
  </swe:Quantity>
</swe:field>
<swe:field name="depth">
  <swe:Quantity definition=" ???? ">
    <!-- 'm' is code for meters -->
    <swe:uom code="m"/>
  </swe:Quantity>
</swe:field>
<swe:field name="salinity">
  <swe:Quantity definition="???? ">
    <swe:uom code="????"/>
  </swe:Quantity>
```

Sensor Observation Service **describeSensor** response


```
<classification>
  <ClassifierList>
    <classifier name="Platform">
      <Term definition="???">
        <value></value>
      </Term>
    </classifier>
  </ClassifierList>
</classification>
```


Leverage MMI

Marine Metadata Interoperability

Help FAQ Co

MAIN NAVIGATION

- Home
-  MMI Guides
- Community
- Vocabularies & Standards**
- Metadata Tools
- Projects & Organizations
- Search MMI References
- Events
- Add Content to Site
- About MMI

Vocabularies & Standards References

Title▲	Description	Reference Type	Reference Topics
A Universal Ontology for Sensor Networks Data		Ontologies and Thesauri	Sensors, Instruments and Platforms Resource Discovery Convention Topics
ABCD: Access to Biological Data	A metadata standard for the exchange of	Content Standard	Parameter Description Science

UPCOMING EVENTS

NOW
International Symposium on Collaborative Technologies and Systems

MAY 20, 2009
EPA System of Reg Conference

MAY 21, 2009
GEOSS Sensor Web Workshop

MAY 24, 2009
2009 AGU Joint

<http://marinemetadata.org/>



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[View Ontology Metadata](#)

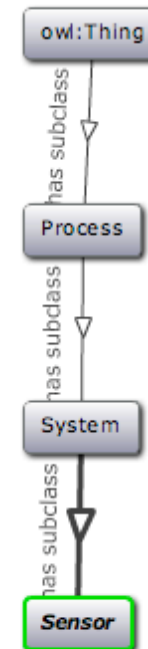
- [-] Process
 - [-] System
 - Sampler
 - Sensor**
 - ObservingSystem
- Feature
- Deployment
- [+] Property
- Platform

Sensor ([Link To Concept](#))

[Details](#) [Visualization](#) [Community Notes](#)

Show Hierarchy To Root (All Relationships) ▼

Full Version



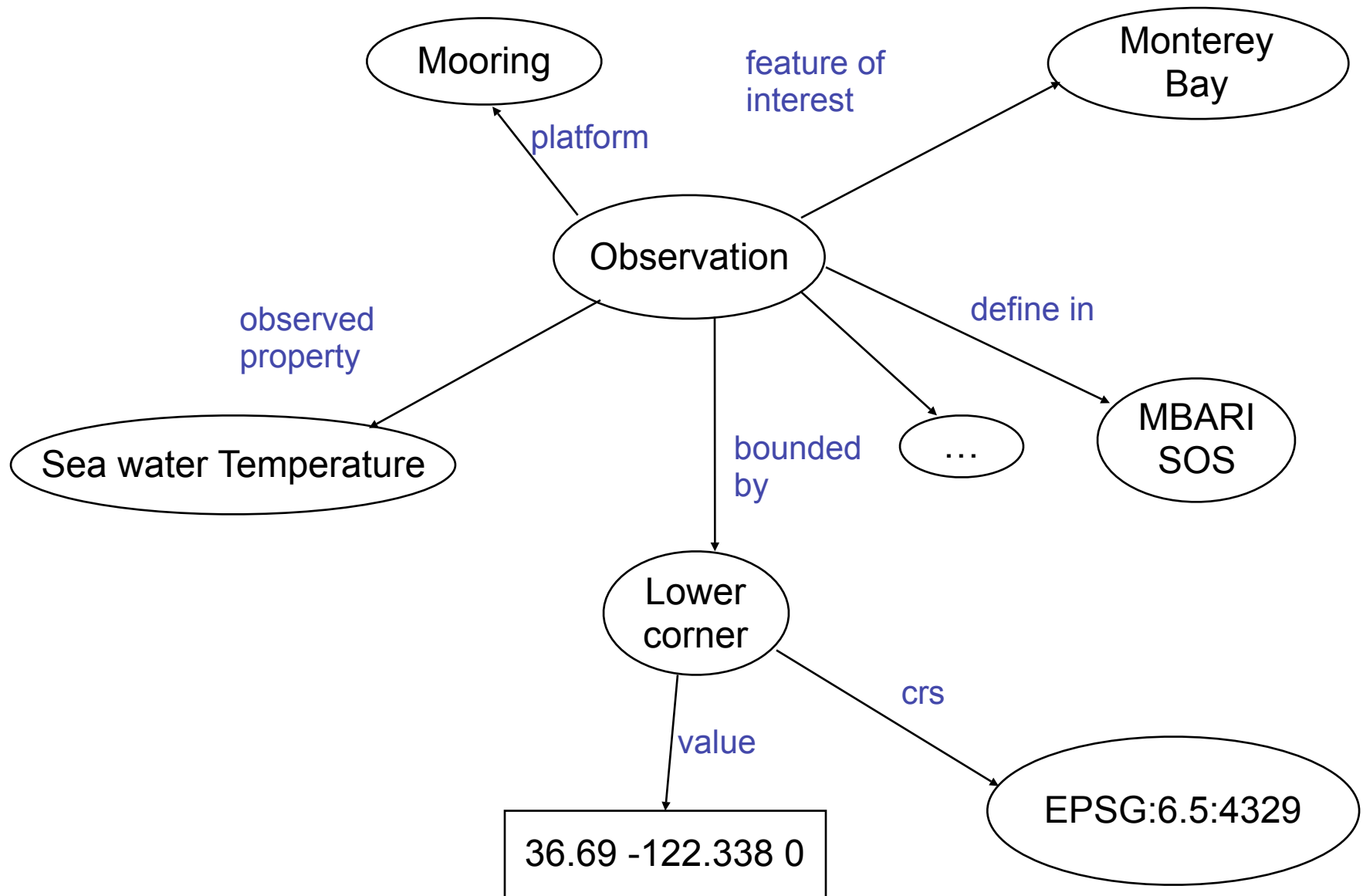
Use terminologies available at MMI

```
- <sos:ObservationOffering gml:id="mbari_m2">
  <gml:description/>
  <gml:name/>
  - <gml:boundedBy>
    - <gml:Envelope>
      <gml:lowerCorner srsName="urn:ogc:def:crs:EPSG:6.5:4329">36.69 -122.338 0</gml:lowerCorner>
      <gml:upperCorner srsName="urn:ogc:def:crs:EPSG:6.5:4329">36.69 -122.338 0</gml:upperCorner>
    </gml:Envelope>
  </gml:boundedBy>
  - <sos:time>
    - <gml:TimePeriod gml:id="mbari_m2_offeringTime">
      <gml:beginPosition>2006-03-30T20:30:13Z</gml:beginPosition>
      <gml:endPosition>2007-02-22T16:03:41Z</gml:endPosition>
    </gml:TimePeriod>
  </sos:time>
  <sos:procedure xlink:href="urn:org:mbari:mooring#M2"/>
  <sos:observedProperty xlink:href="http://marinemetadata.org/cf#sea_water_temperature"/>
  <sos:observedProperty xlink:href="http://marinemetadata.org/cf#conductivity"/>
  <sos:observedProperty xlink:href="http://marinemetadata.org/cf#sea_water_salinity"/>
  <sos:featureOfInterest xlink:href="urn:mmi.feature#bodyOfWater"/>
  <sos:responseFormat>application/com-xml</sos:responseFormat>
```

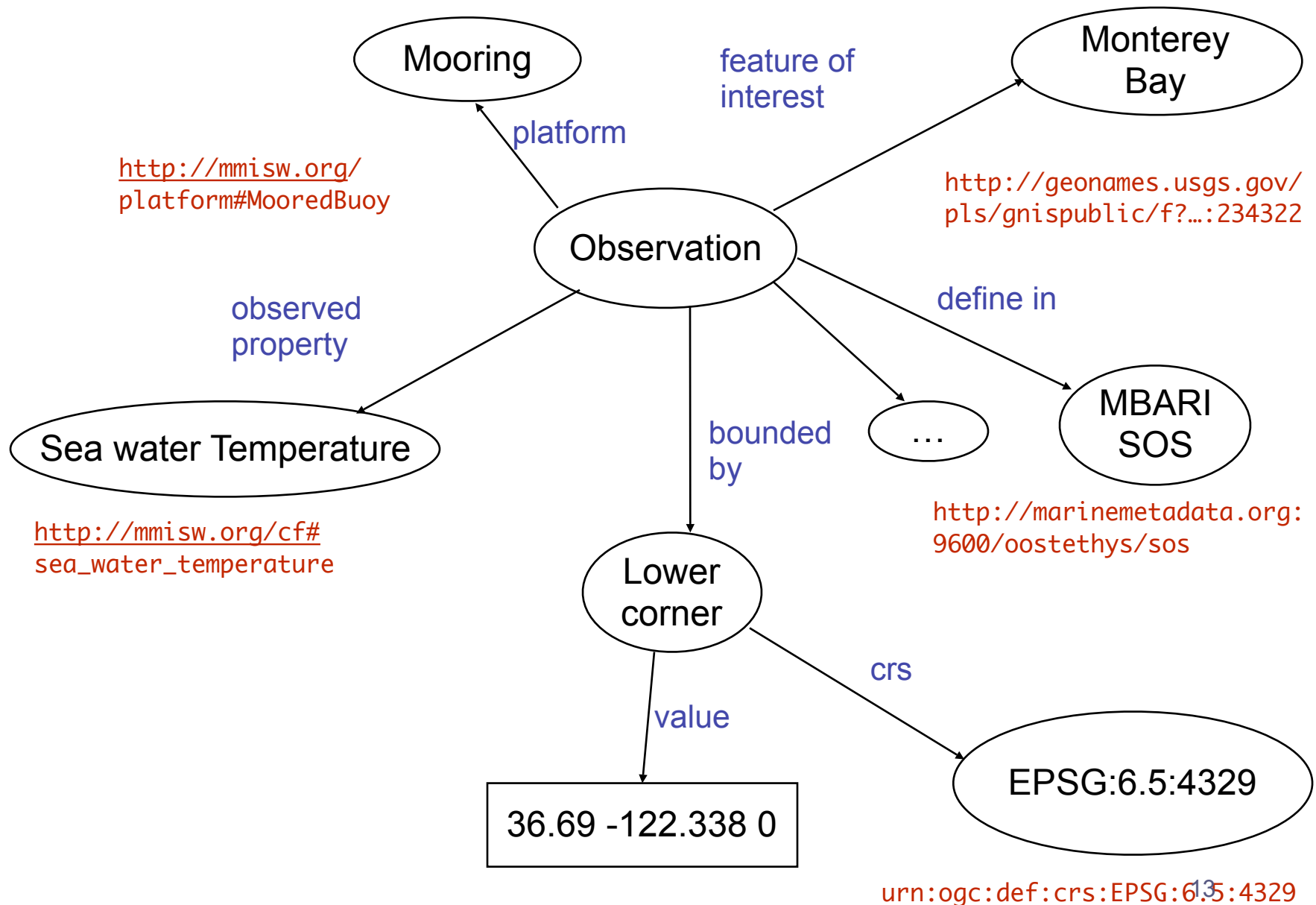
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      <gml:upperCorner srsName="urn:ogc:def:crs:EPSG:6.5:4329">36.69 -122.338 0</gml:upperCorner>
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  - <sos:time>
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      <gml:beginPosition>2006-03-30T20:30:13Z</gml:beginPosition>
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    </gml:TimePeriod>
  </sos:time>
  <sos:procedure xlink:href="urn:org:mbari:mooring#M2"/>
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  <sos:observedProperty xlink:href="http://marinemetadata.org/cf#sea_water_salinity"/>
  <sos:featureOfInterest xlink:href="urn:mmi.feature#bodyOfWater"/>
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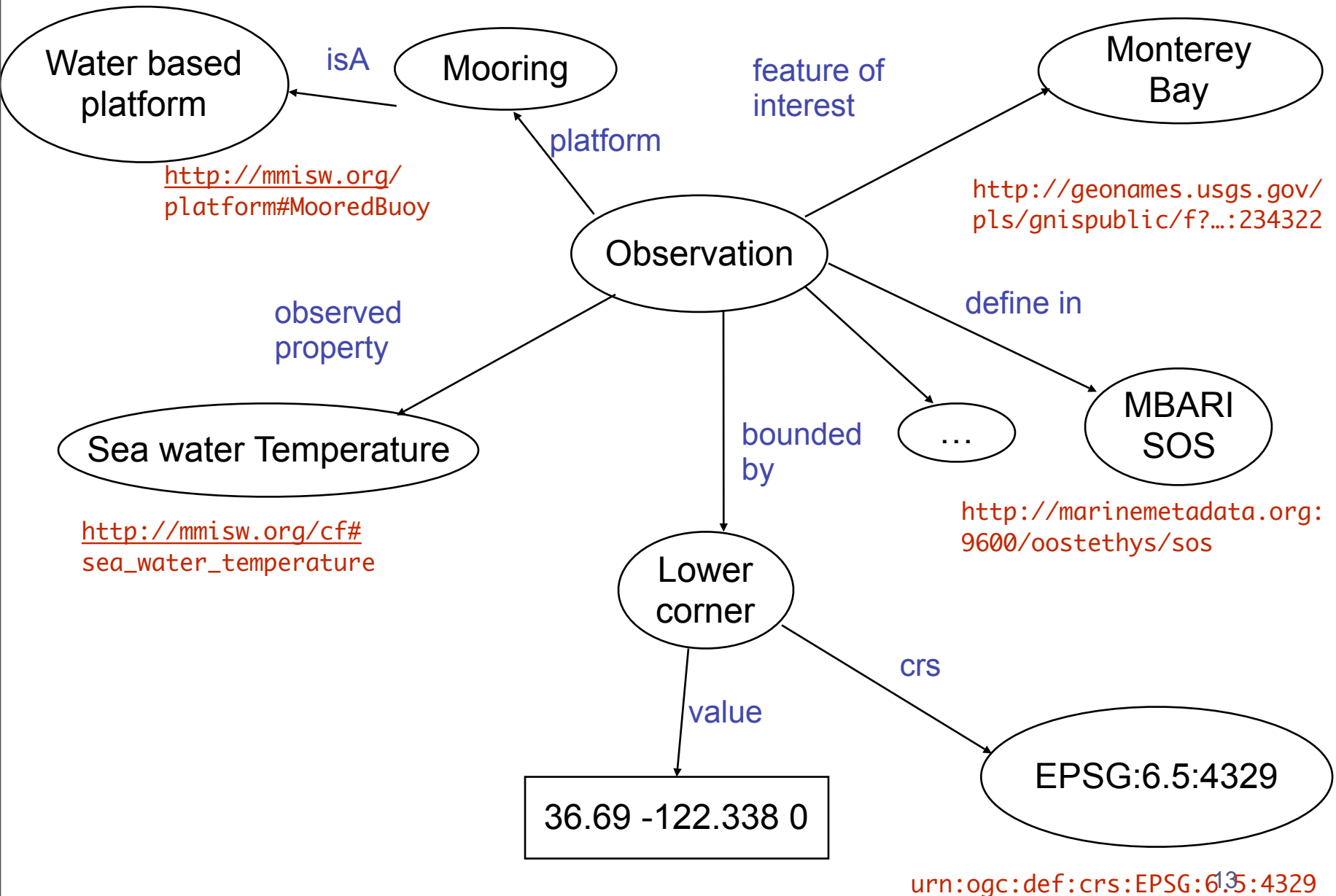
Rich graph for an observation



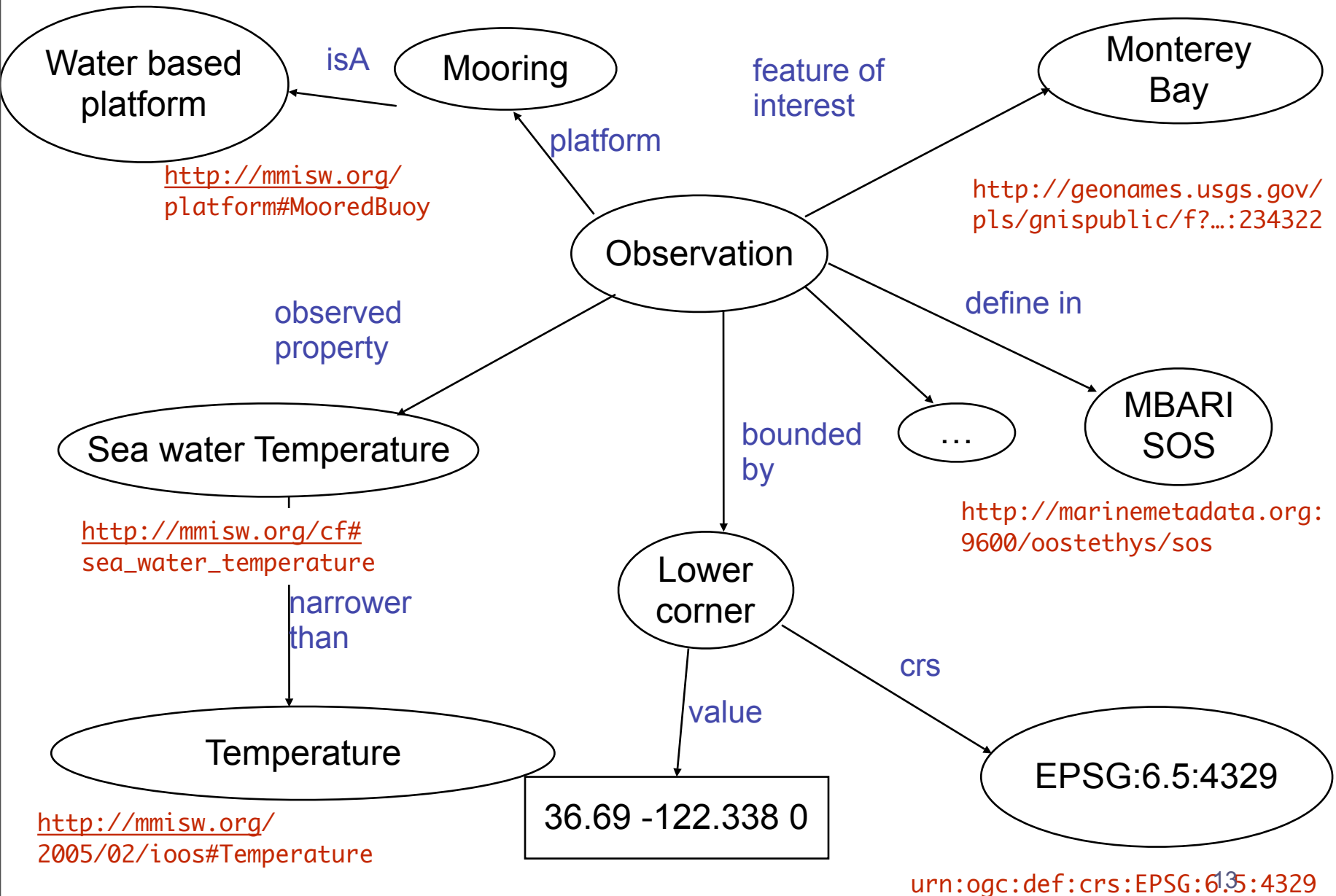
Rich graph for an observation



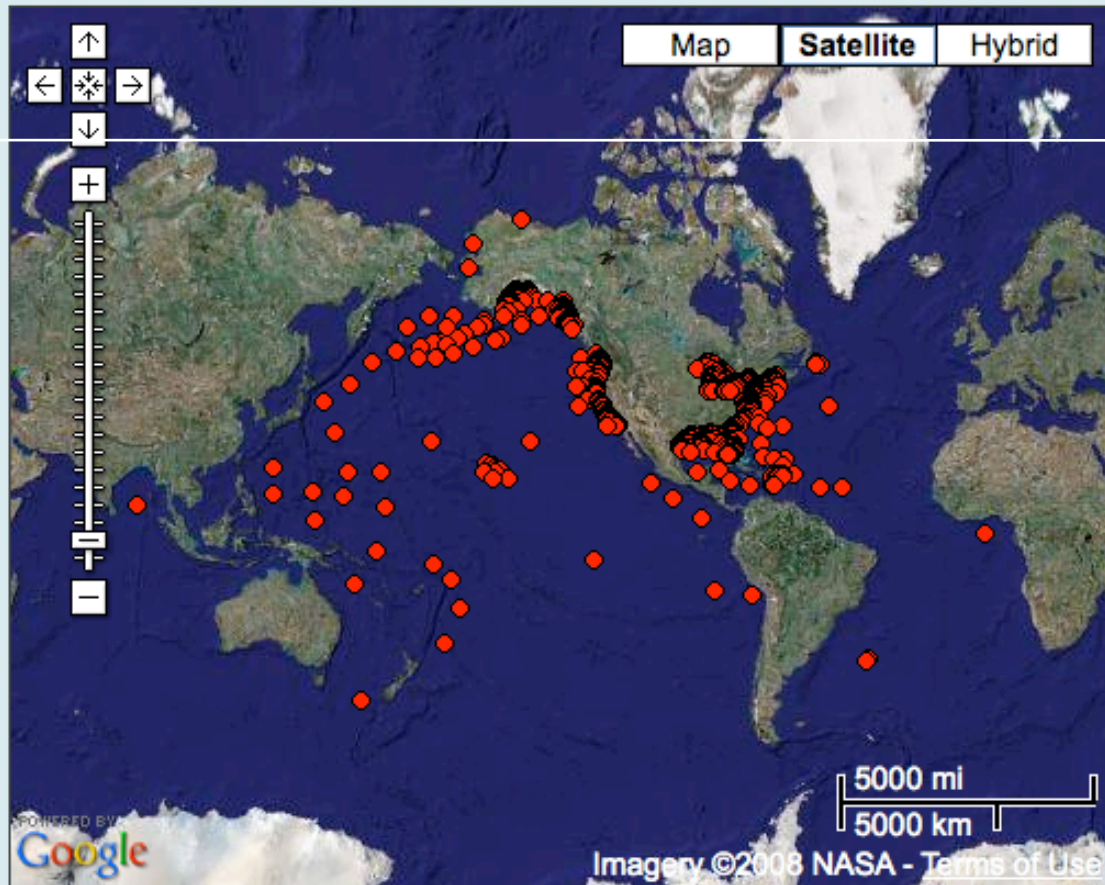
Rich graph for an observation



Rich graph for an observation



1033 Platforms reporting Click the station icons on the map for observations.



Facetted search

<http://openioos.org>

IOOS Variables:

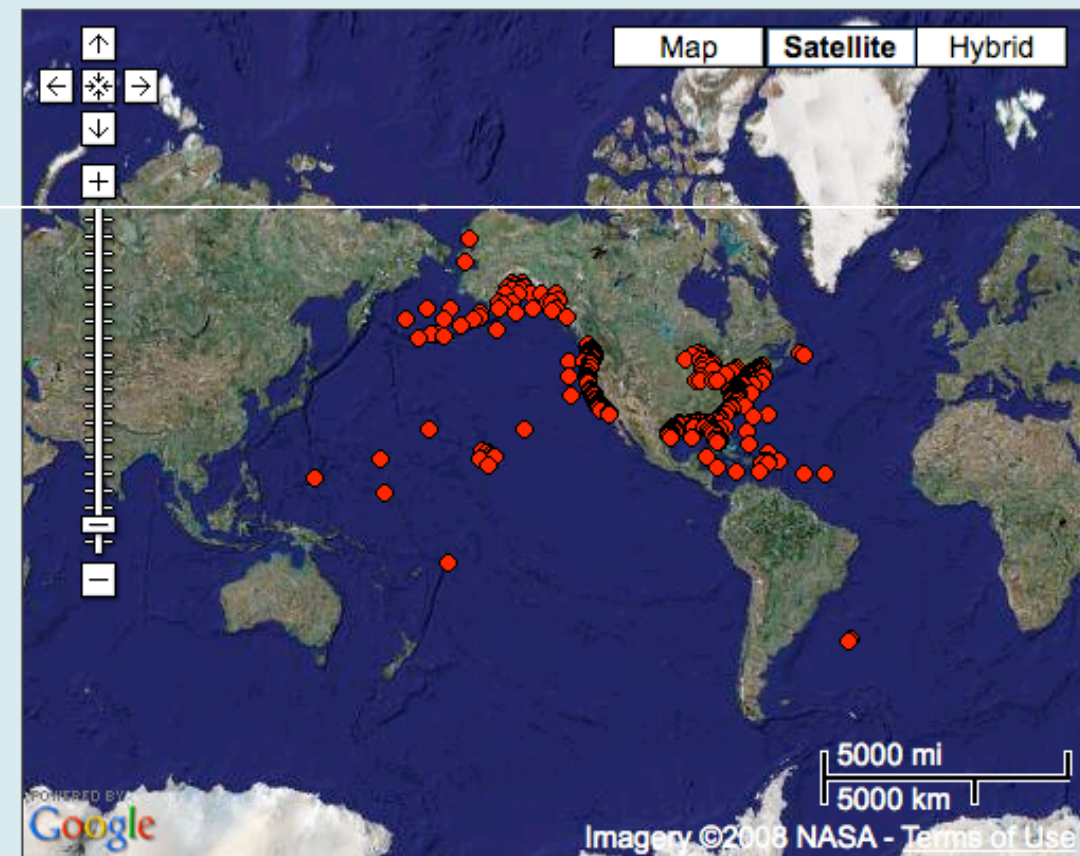
- All -

- All -
- Sea Water Temperature
- Water Level
- Waves
- Dissolved Oxygen
- Salinity
- Currents

All Variables:

- All Observed Properties -

382 Platforms reporting Click the station icons on the map for the la



Facetted search

<http://openioos.org>

IOOS Variables:

Sea Water Temperature

All Variables:

sea_water_temperature

Mapped to:

sea_water_temperature

Temperature

temperature

R_TEMP

watertemperature

WATER_TEMP

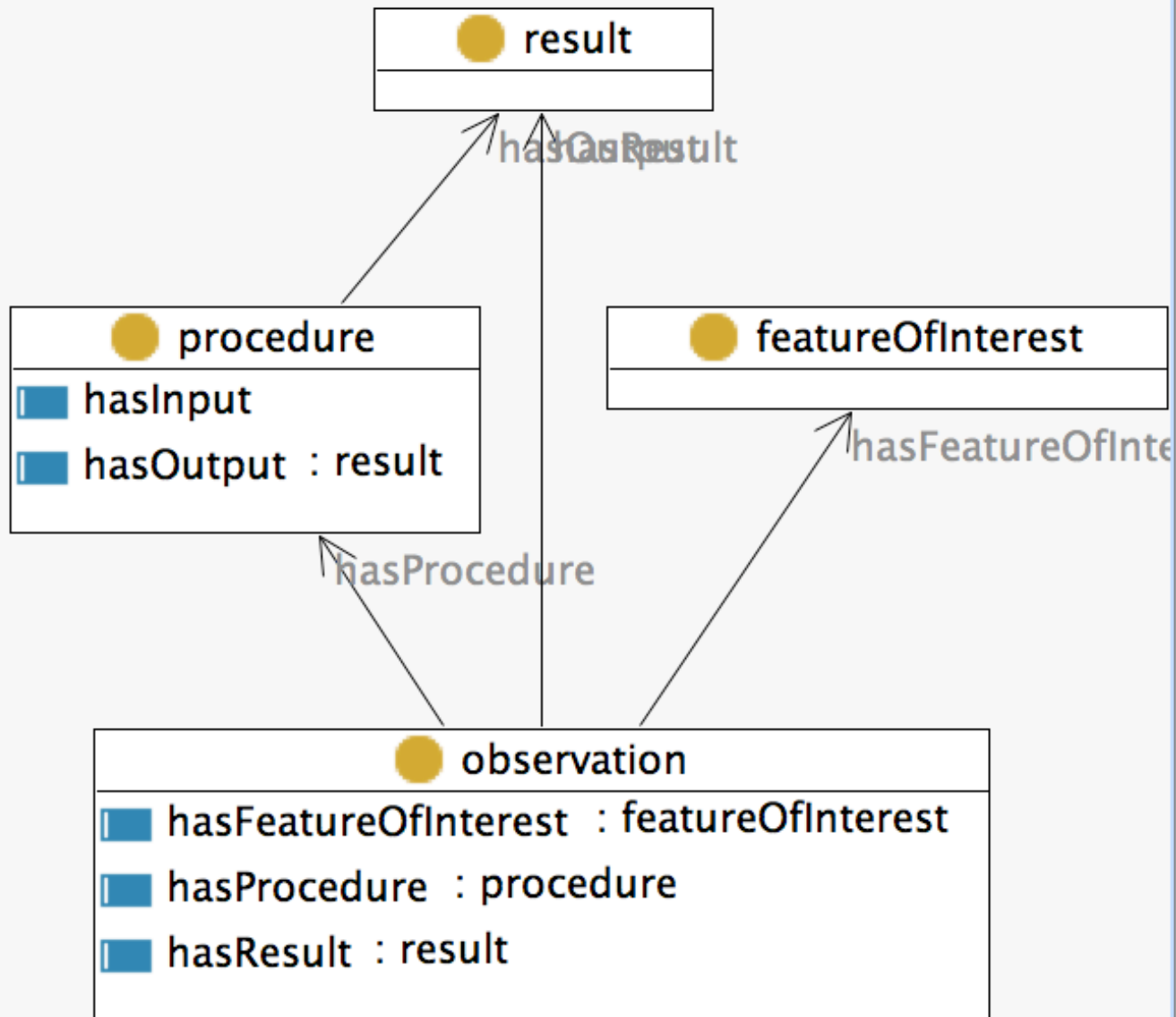
WaterTemperature

Sea_Surface_Temp

SST

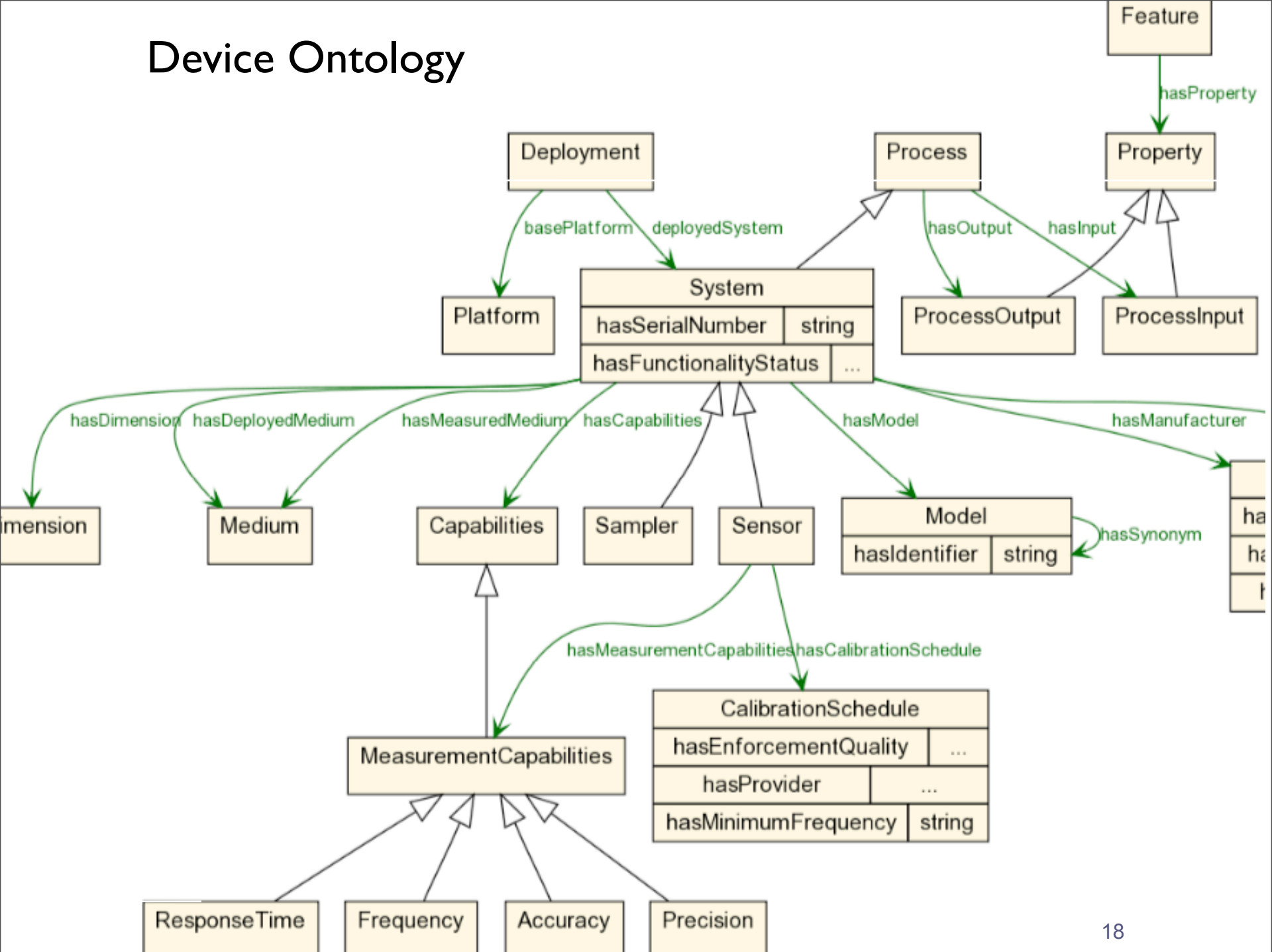
Next Steps

- Cleaning ontologies
- Improving services

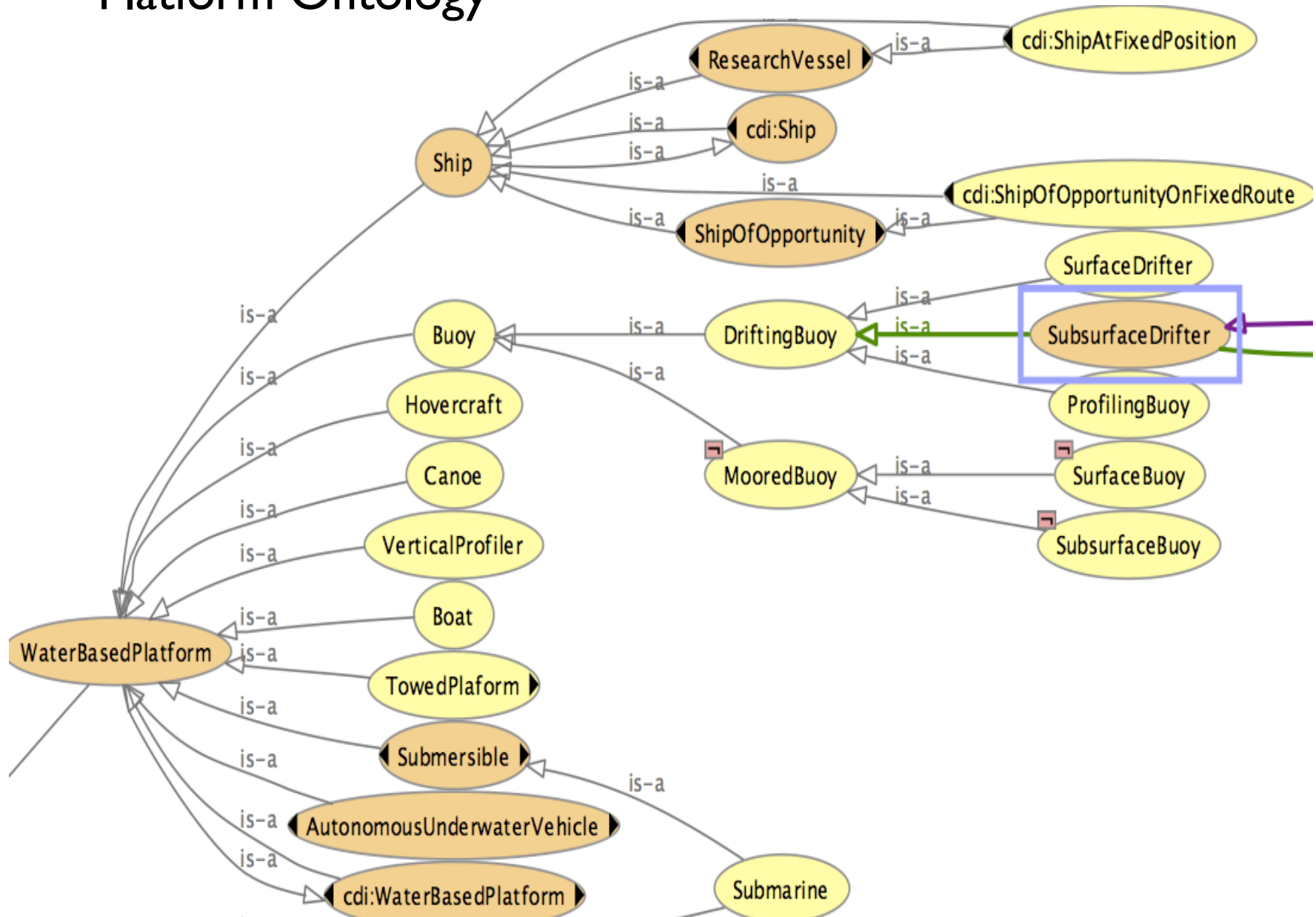


Observation Ontology


Device Ontology



Platform Ontology



Registry and Management of Ontologies



Marine Metadata Interoperability

Ontology Registry and Repository

alpha

Other MMI Ontology Projects

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Ontology Name	Format	Version	Author	Uploaded On	
Argo QA/QC Flags	OWL-DL	20081116T040146	Stephanie Watson	11/15/2008	Explore
Authority Vocabulary	OWL-DL	20090317T183911	MMI	03/17/2009	Explore
CDIP Term Vocabulary	OWL-DL	20081120T002506	CDIP	11/19/2008	Explore
CeNCOOS water monitoring subset and extension of CF parameter vocabulary	OWL-DL	20081119T231517	Dale Robinson	11/19/2008	Explore
cencoos-seadatanet test mapping	OWL-DL	20081115T205031	carlos rueda	11/15/2008	Explore

Registry and Semantic Services



Marine Metadata Interoperability

Ontology Registry and Repository alpha

Your SPARQL query:

Submit

SPARQL (Simple Protocol and RDF Query Language) is the standard query language for [RDF](#) (Resource Description Framework). More information [here](#).

Use this form to submit your SPARQL query against the [MMI Ontology Registry and Repository](#).

Both GET and POST methods are accepted.

<http://mmisw.org/ont/sparql.html>

Links and contact information

MMI: <http://marinemetadata.org>

Ontology Registry: <http://mmisw.org>

OOSTethys: <http://oostethys.org>

Luis Bermudez bermudez@sura.org