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

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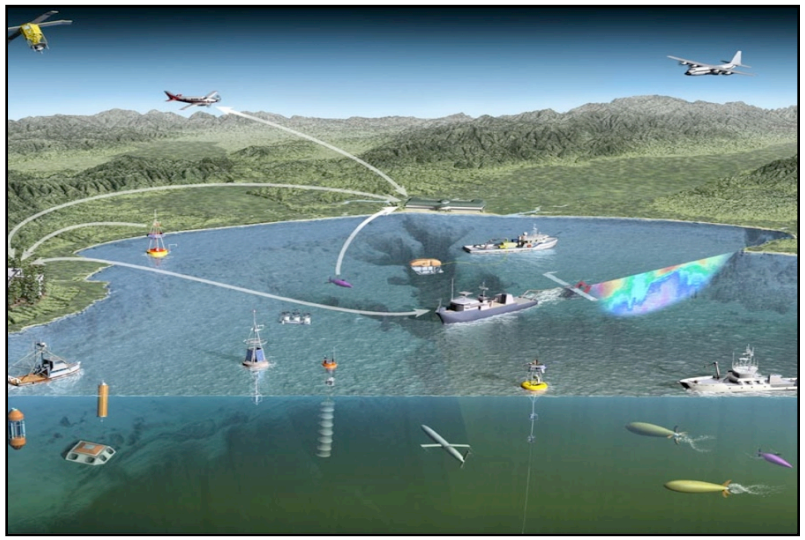
OGC Ocean Science Interoperability Experiment



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

OGC® Open Geospatial Consortium, Inc.

SURA Southeastern Universities Research Association

CAU

asa science. services. solutions.

UAH

Member Texas A&M System

MBARI

USGS science for a changing world

GoMOOS

NANOOS

Universitat Politècnica de Catalunya

COMPUSULT

SINTEF

Florida Fish and Wildlife Conservation Commission

INCOIS

IMOS

NOAA IOOS Integrated Ocean Observing System

Marine Metadata Interoperability

BOEING

ESONET

unidata

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**

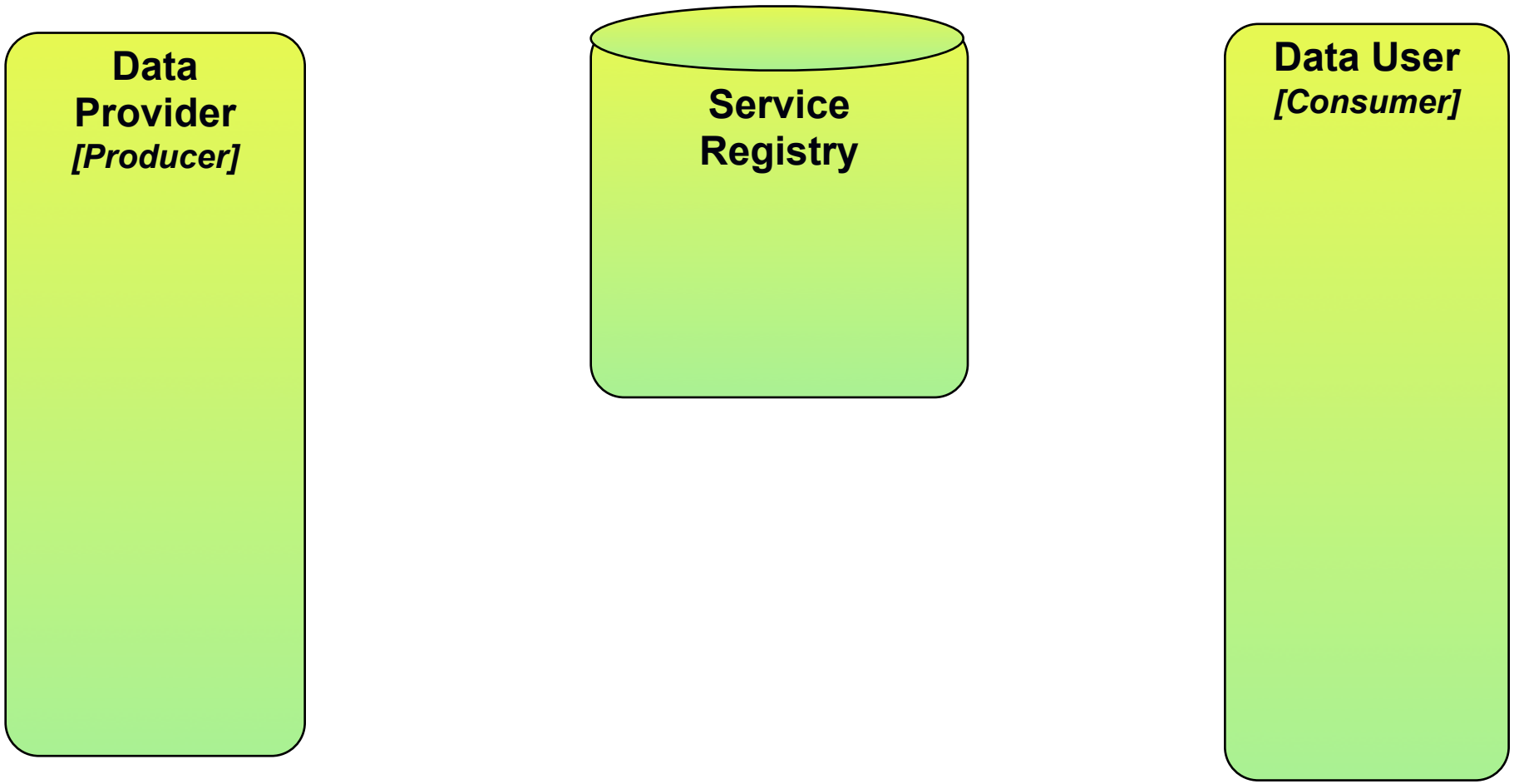
Use Cases

- 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



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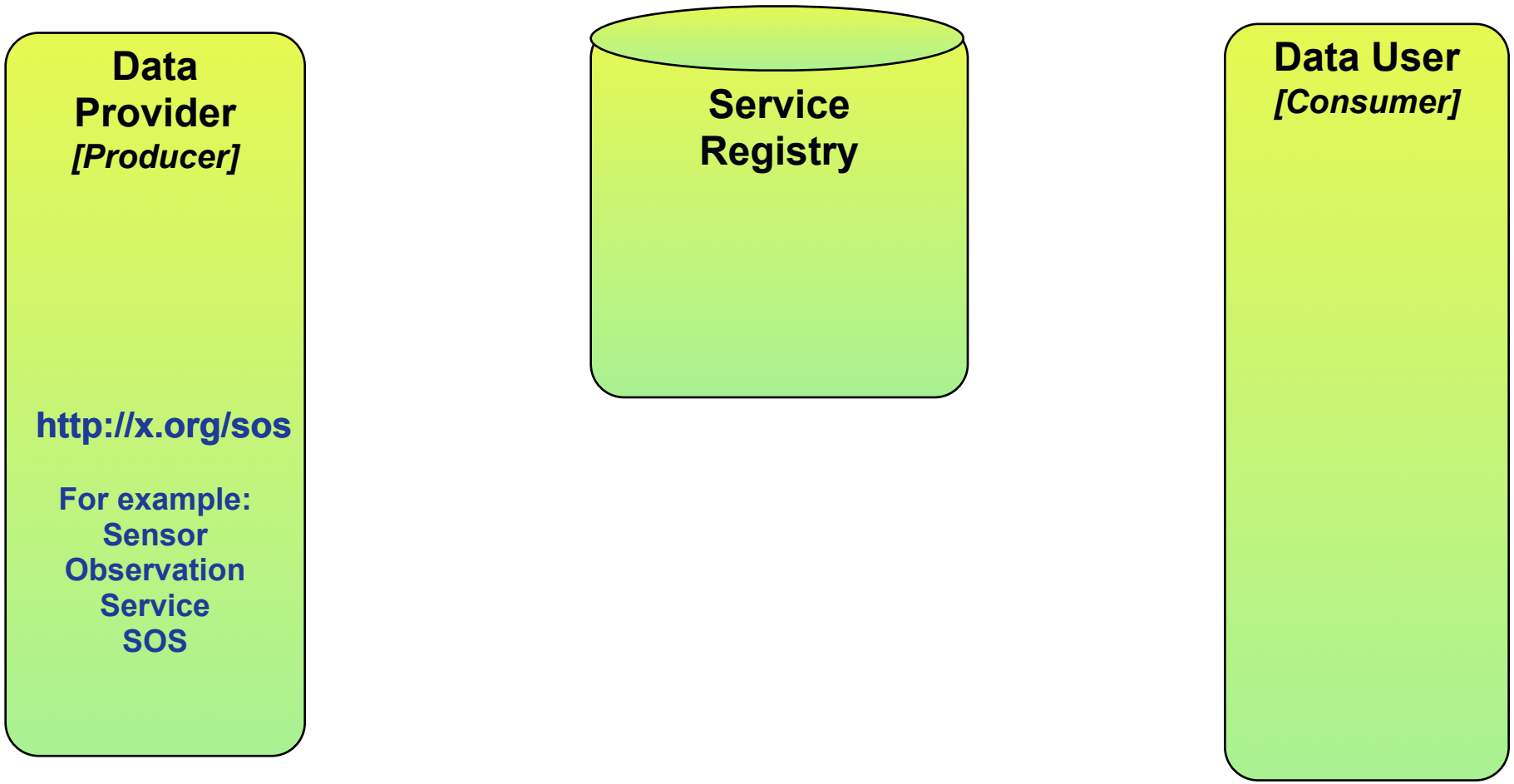
Service Oriented Architecture



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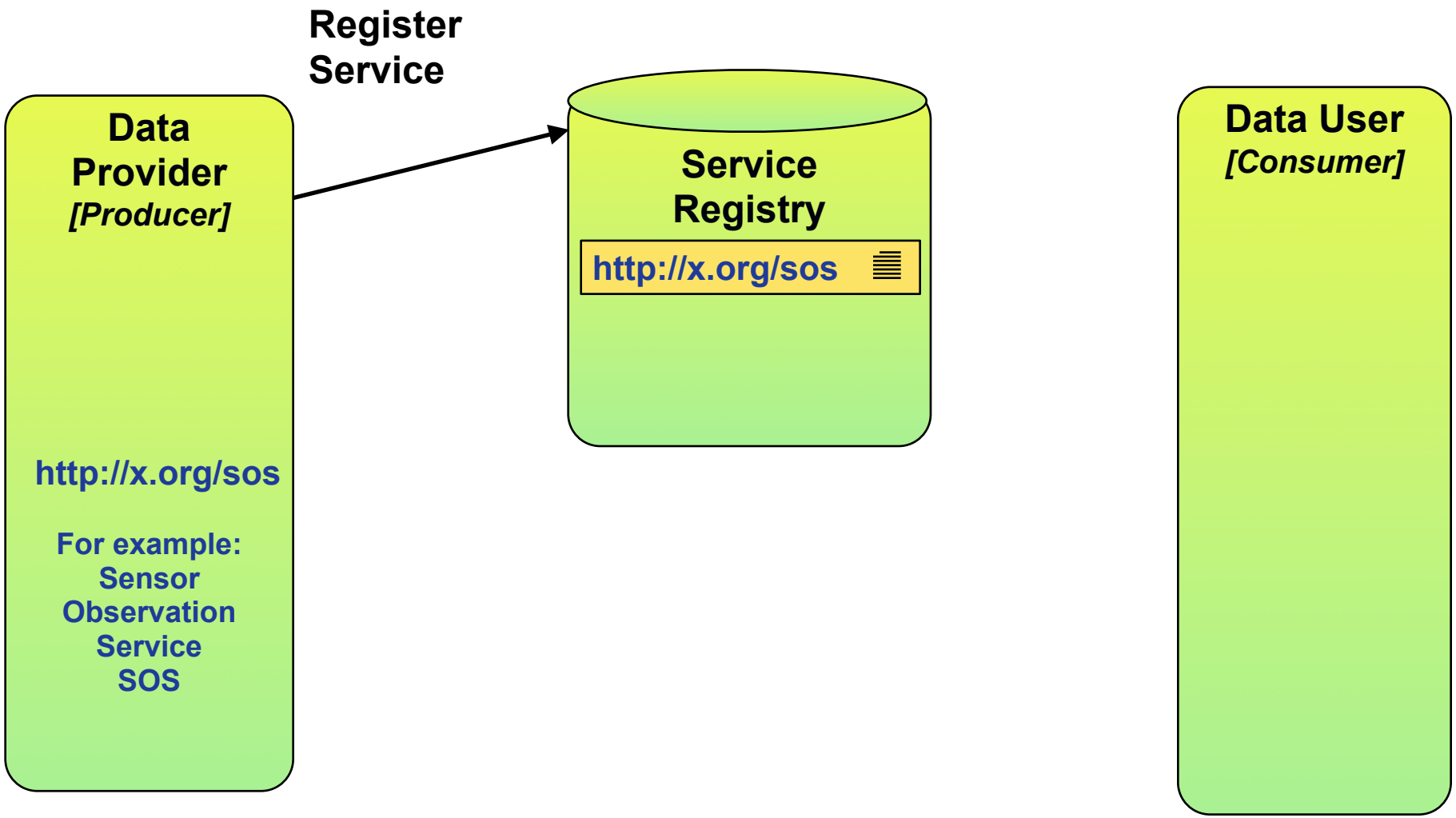

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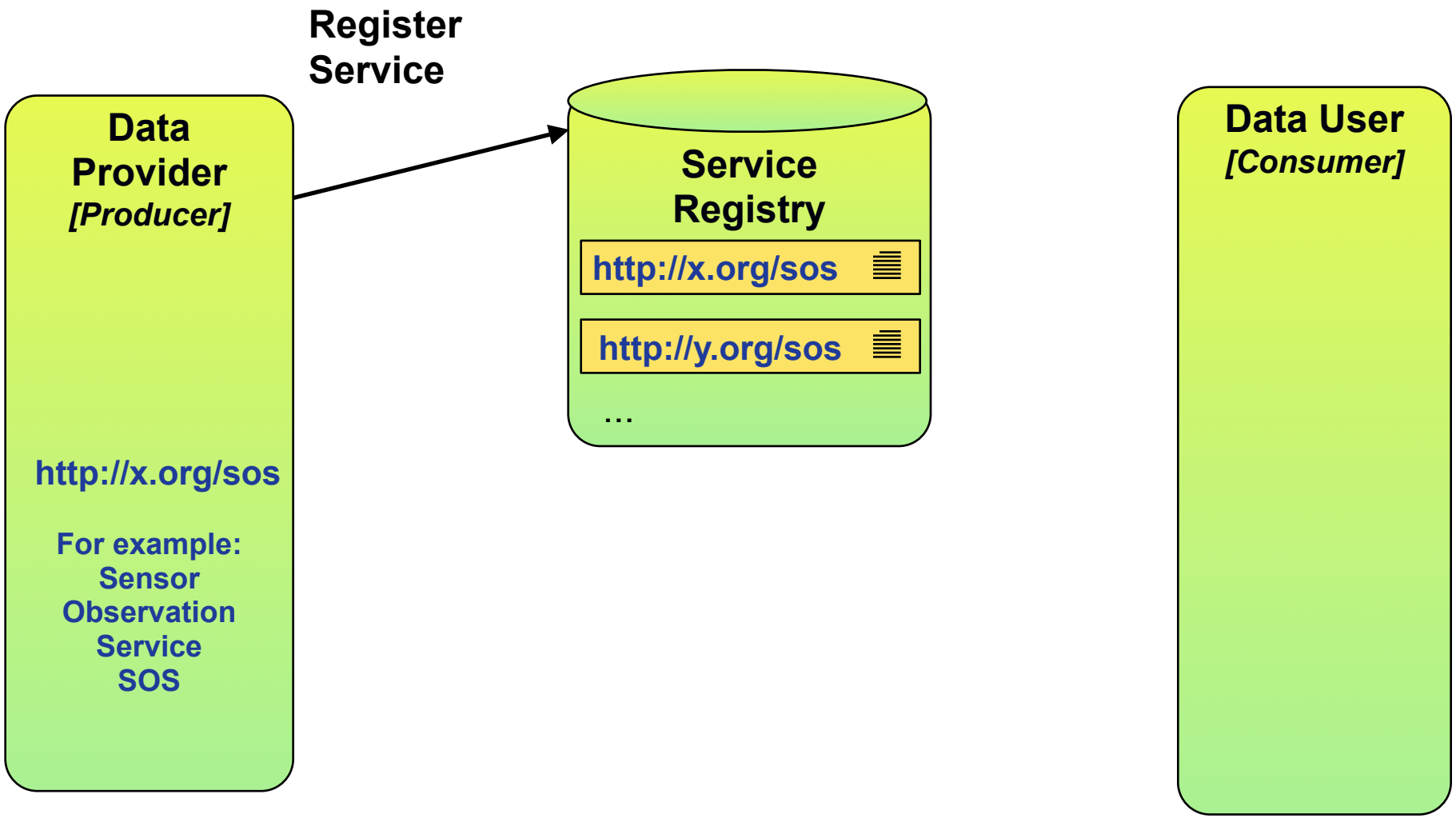

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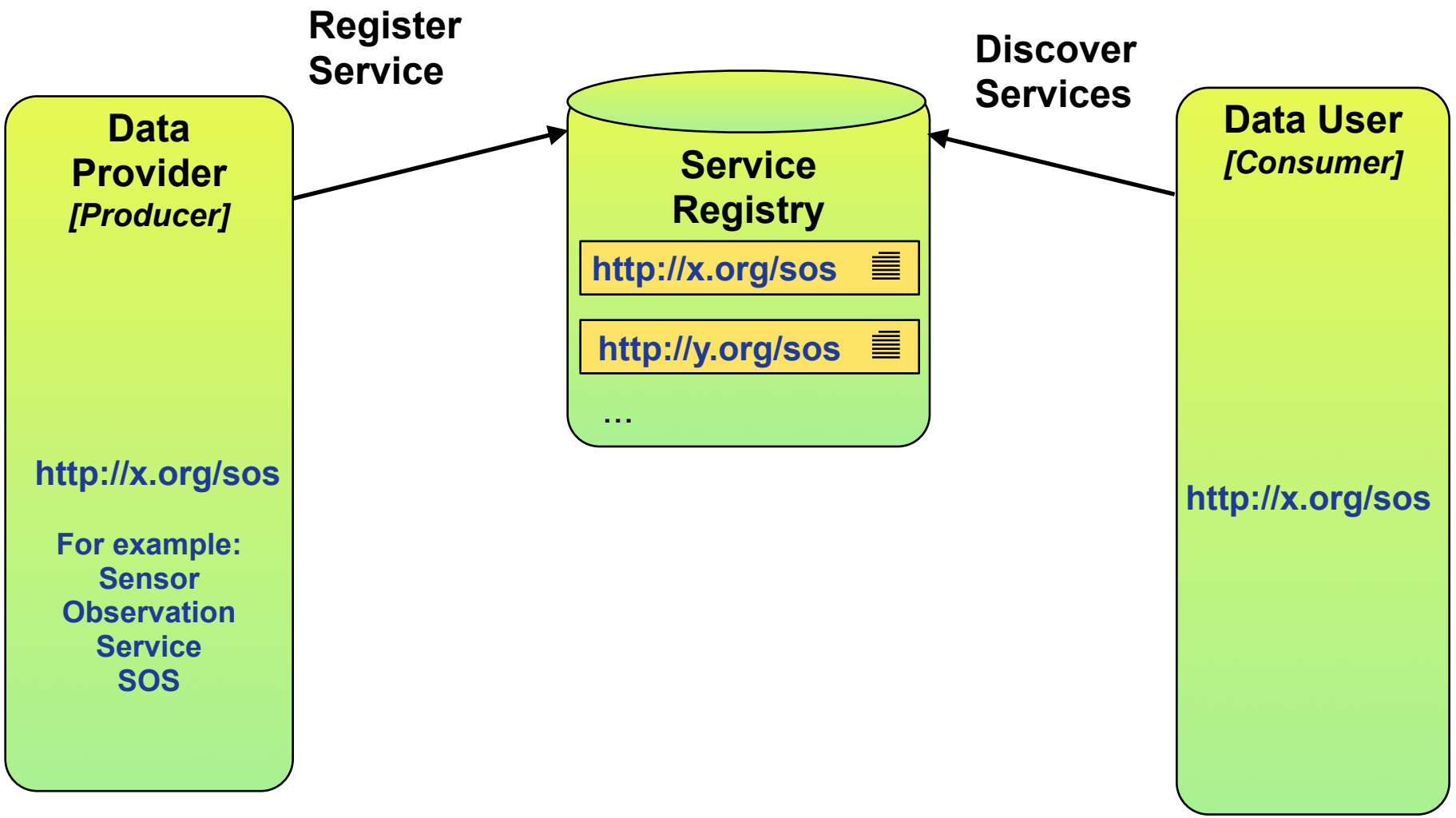
Service Oriented Architecture



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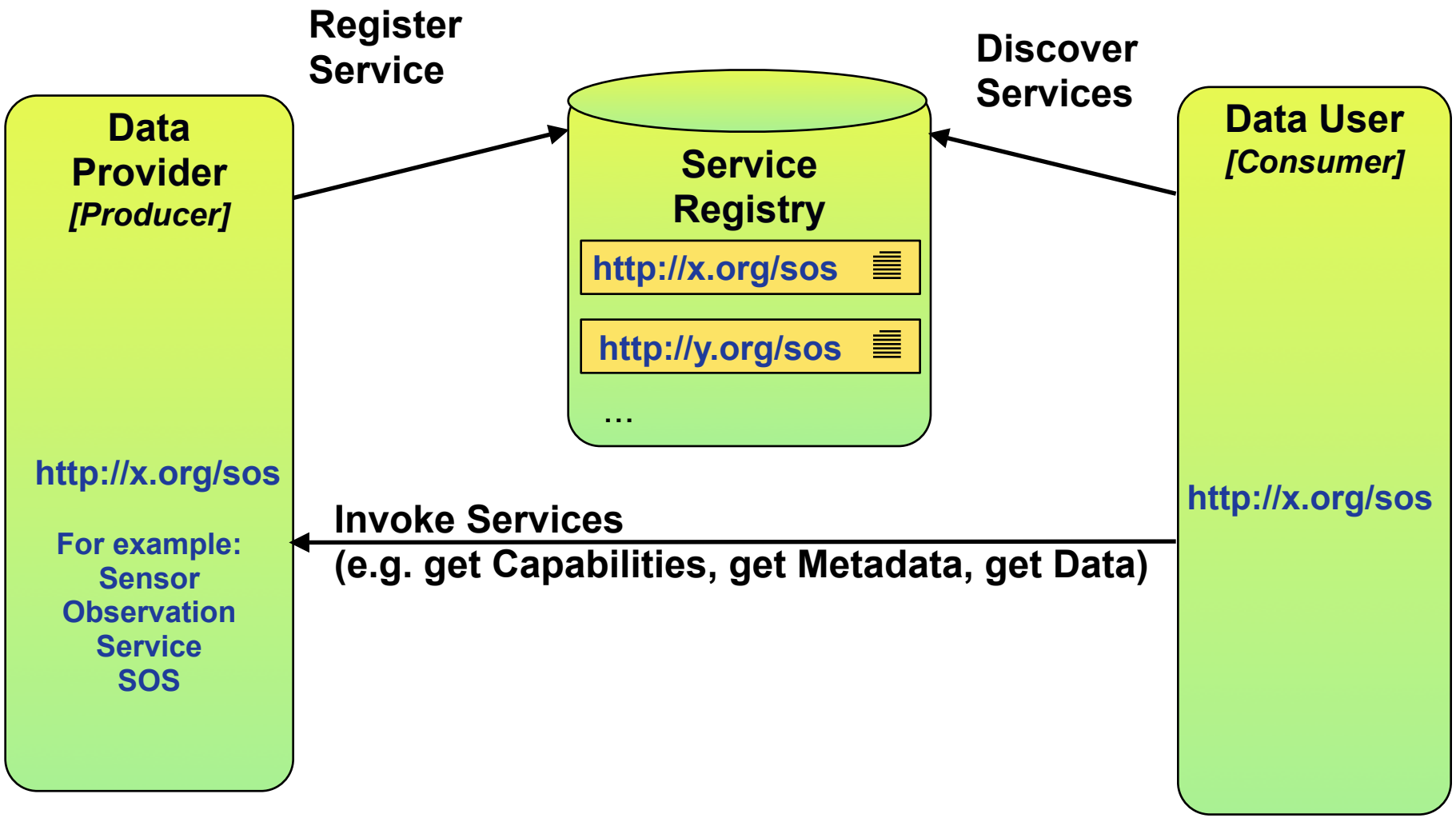

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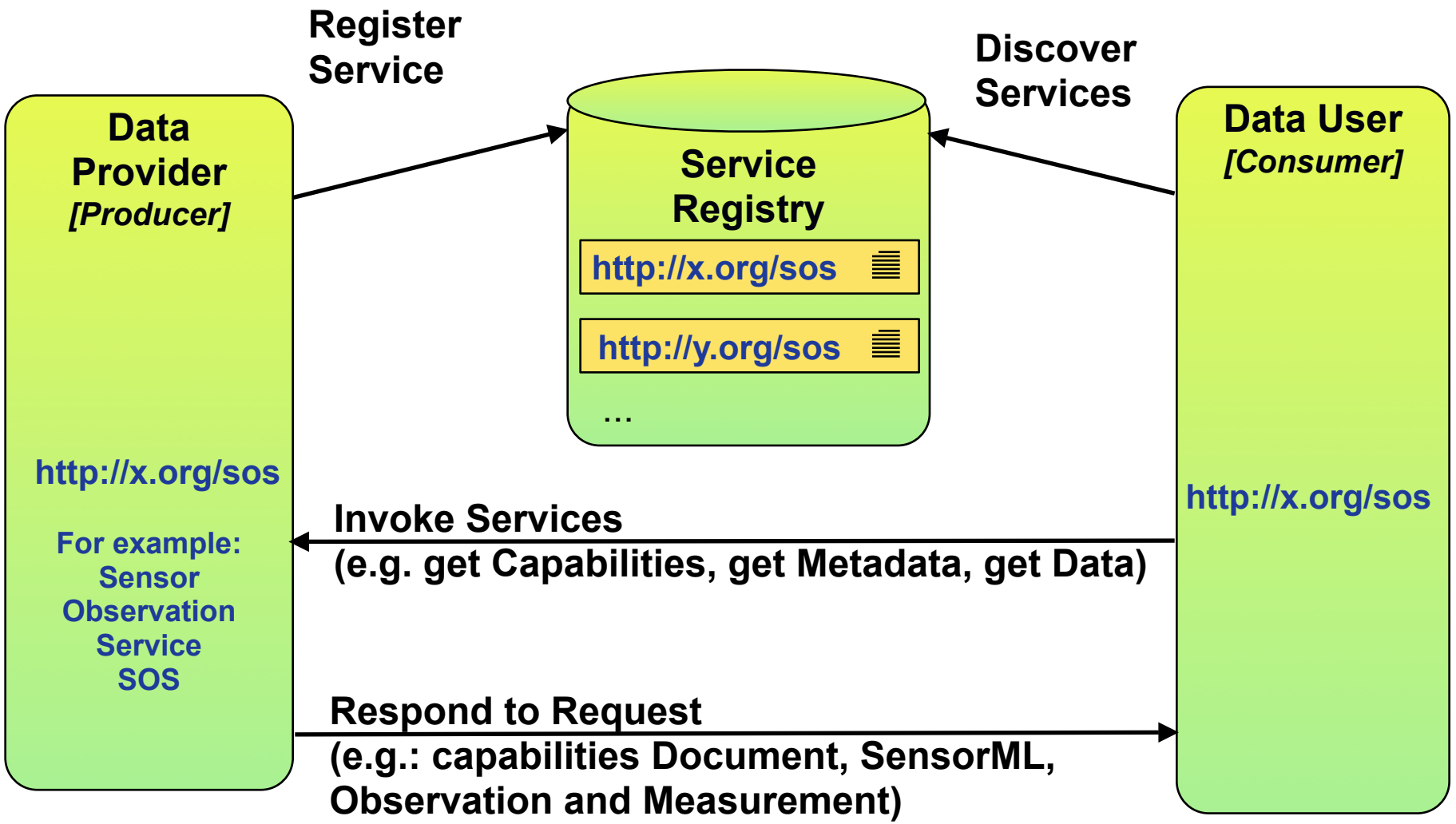
Service Oriented Architecture



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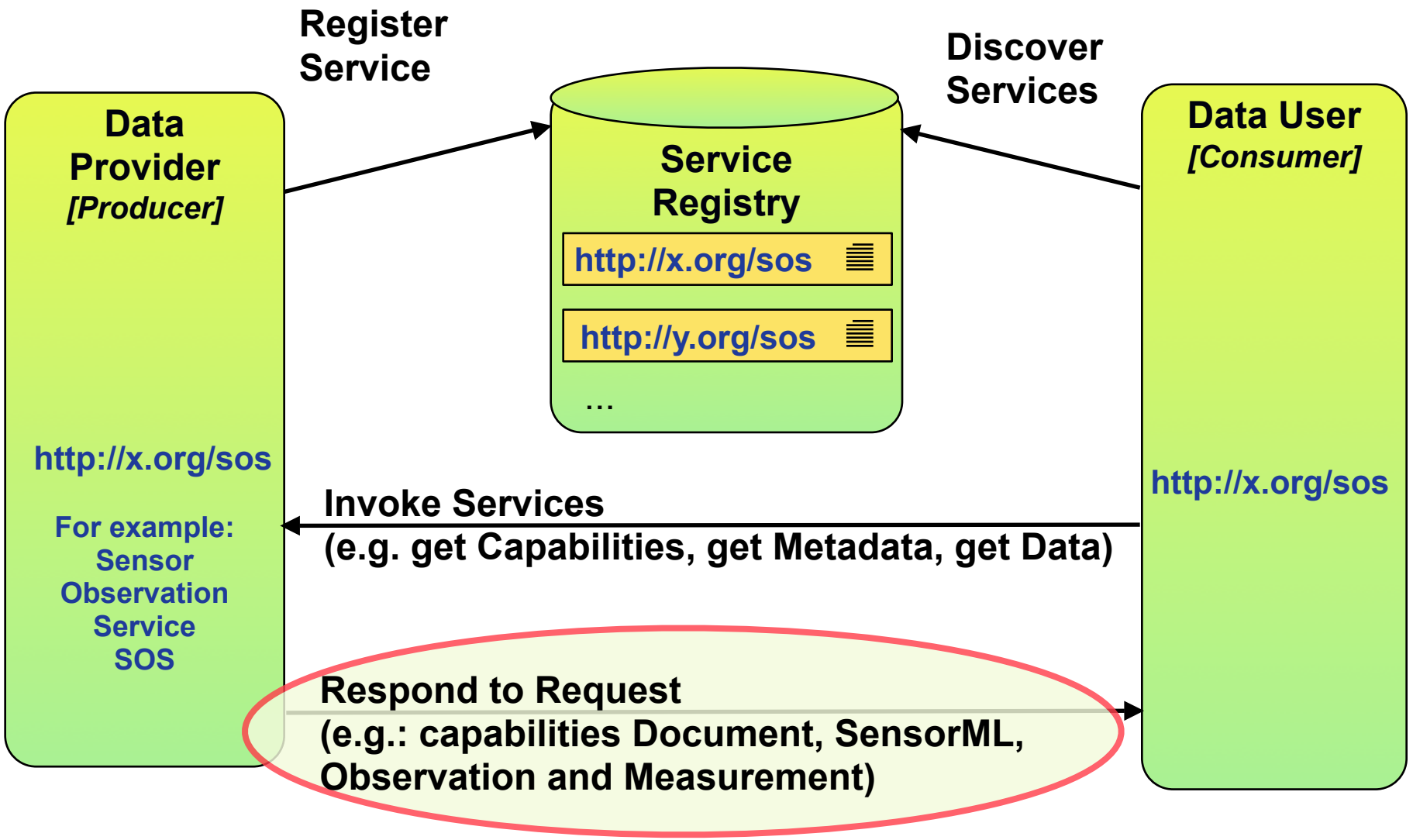
Service Oriented Architecture



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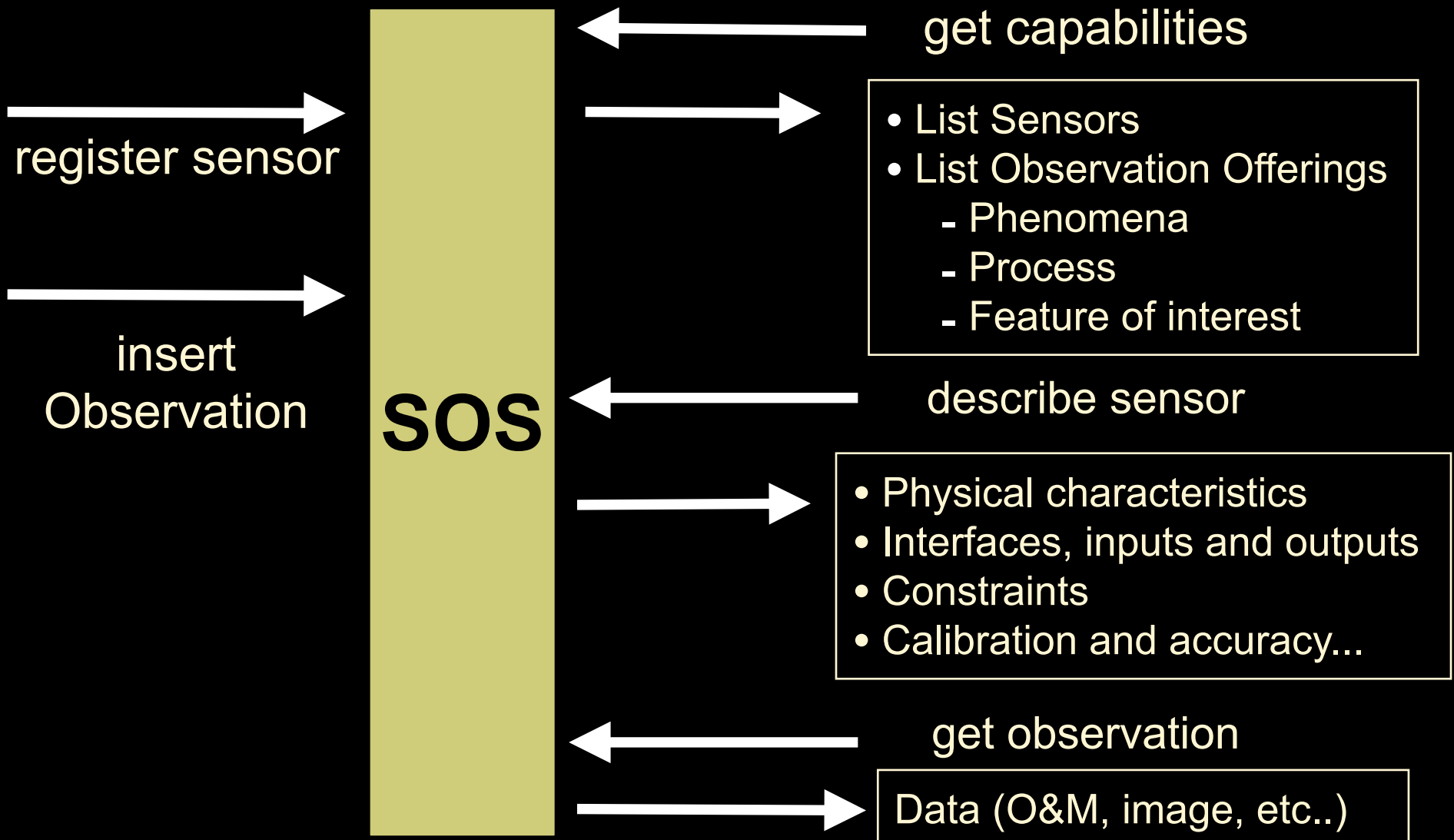
Sensor Observation Service



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">
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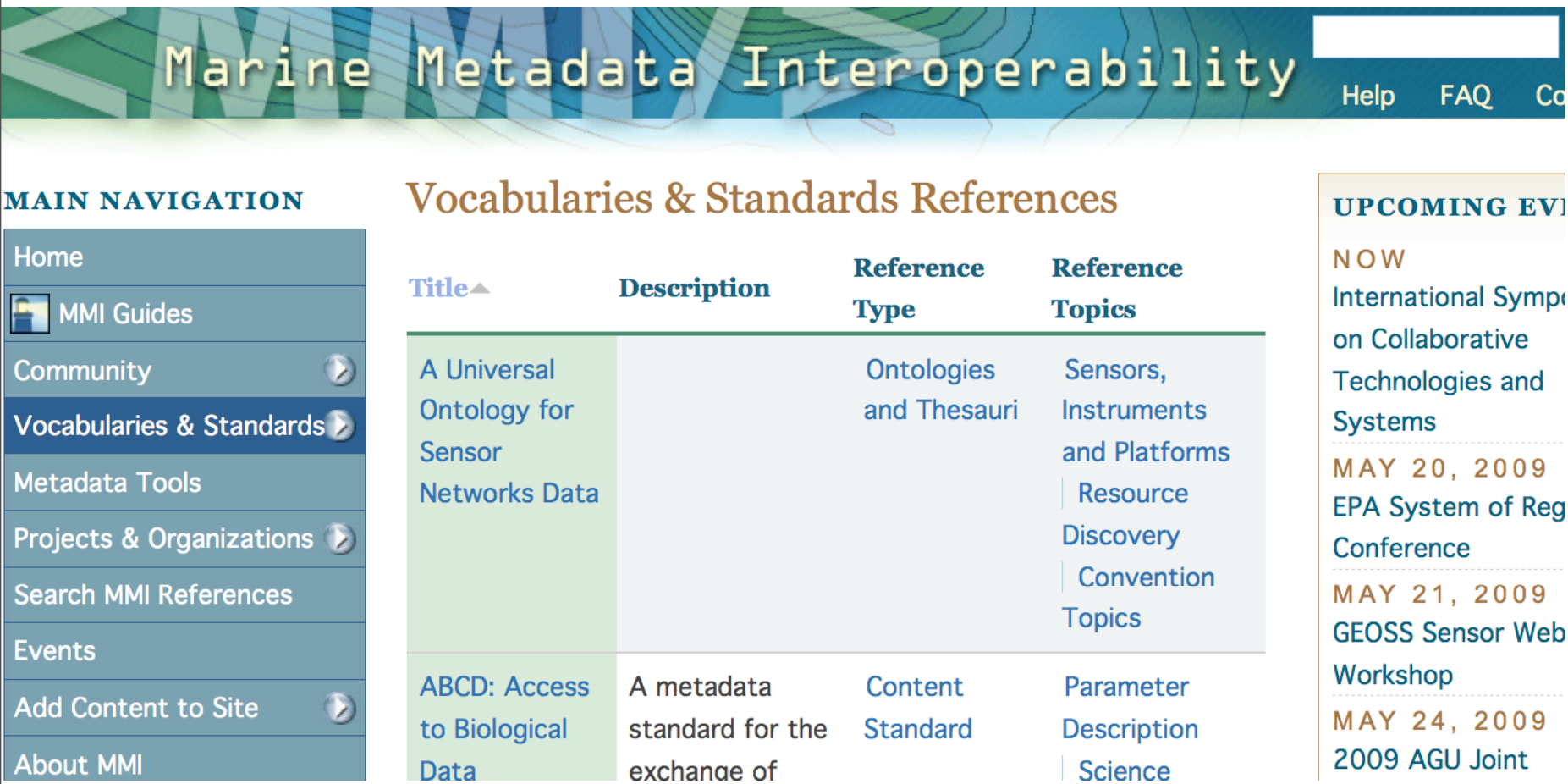
                <value></value>
            </Term>
        </classifier>
    </ClassifierList>
</classification>
```

Leverage MMI



http://marinemetadata.org/

Marine Metadata Interoperability

Ontology Registry and Repository

Sign In Register

Home | Browse | Search | Projects | device

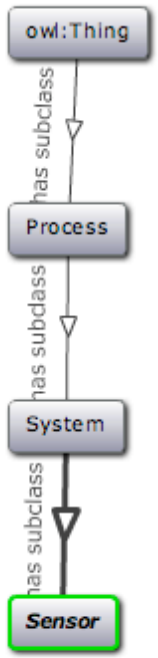
View Ontology Metadata

- 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

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- <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>
```

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>
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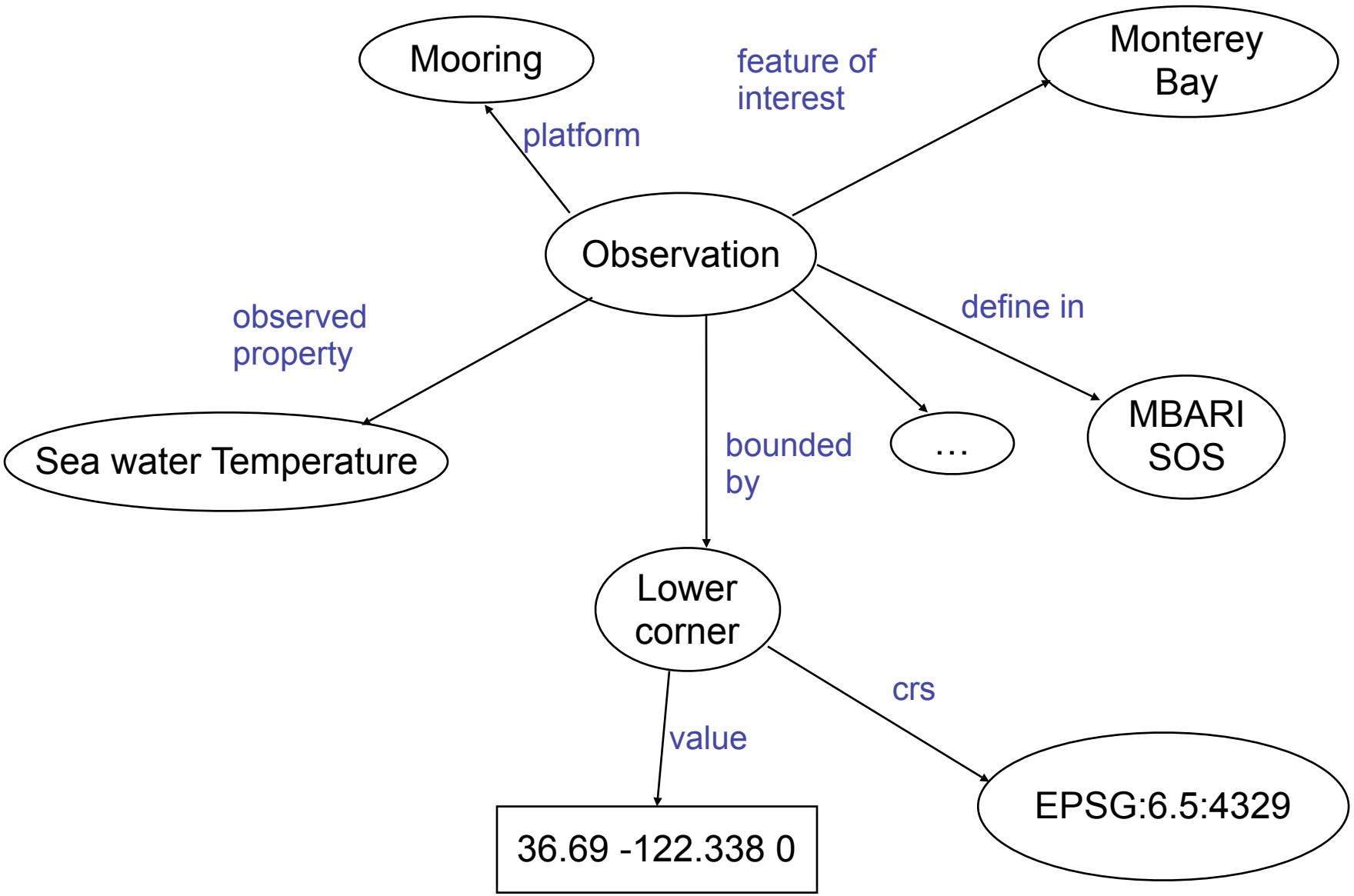
        <gml:endPosition>2007-02-22T16:03:41Z</gml:endPosition>
      </gml:TimePeriod>
    </sos:time>
    <sos:procedure xlink:href="urn:org:mbari:mooring#M2"/>
    <sos:observedProperty xlink:href="http://marinemetadata.org/cf#sea_water_temperature"/>
    <sos:observedProperty xlink:href="http://marinemetadata.org/cf#conductivity"/>
    <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>
```

Rich graph for an observation



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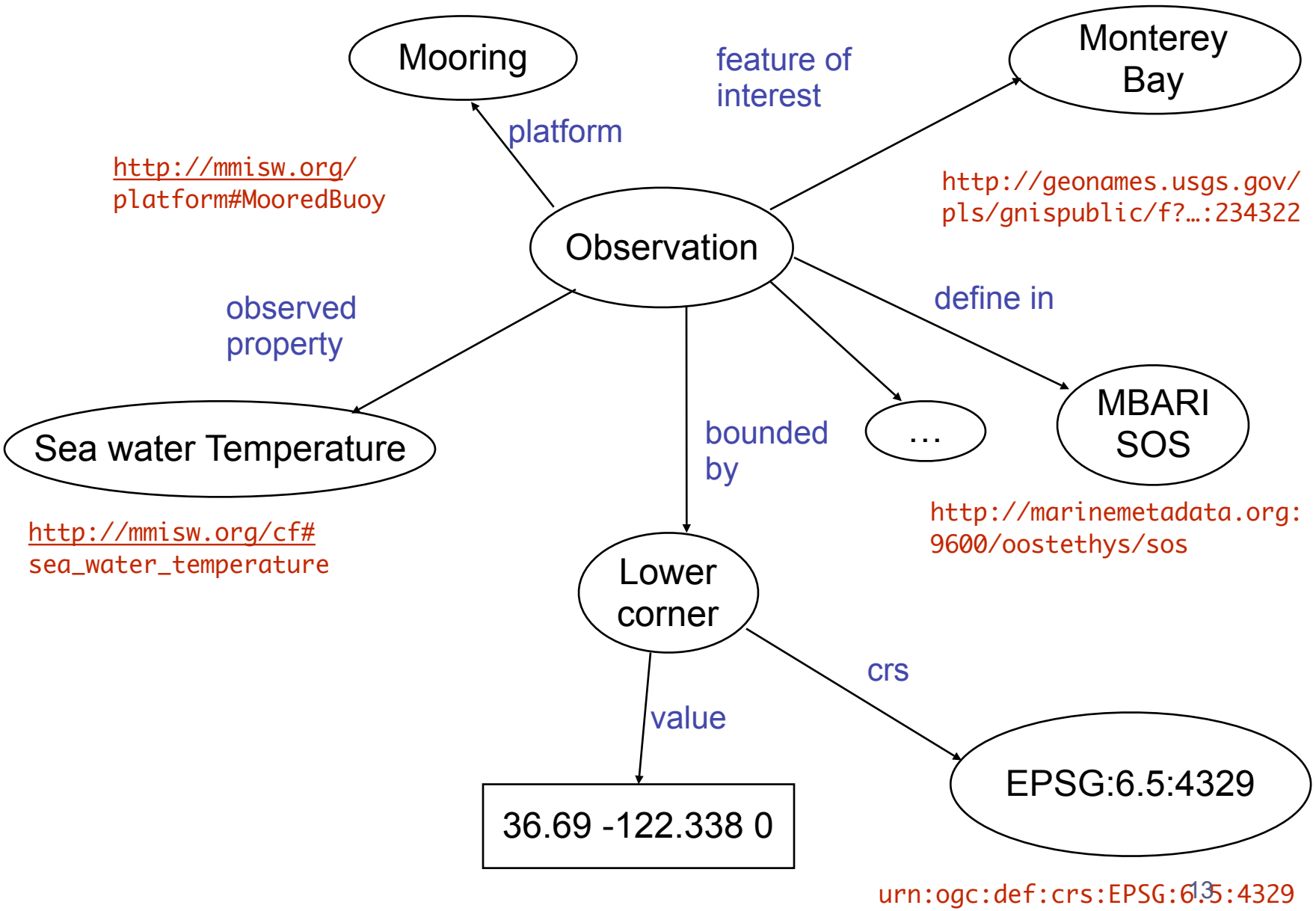
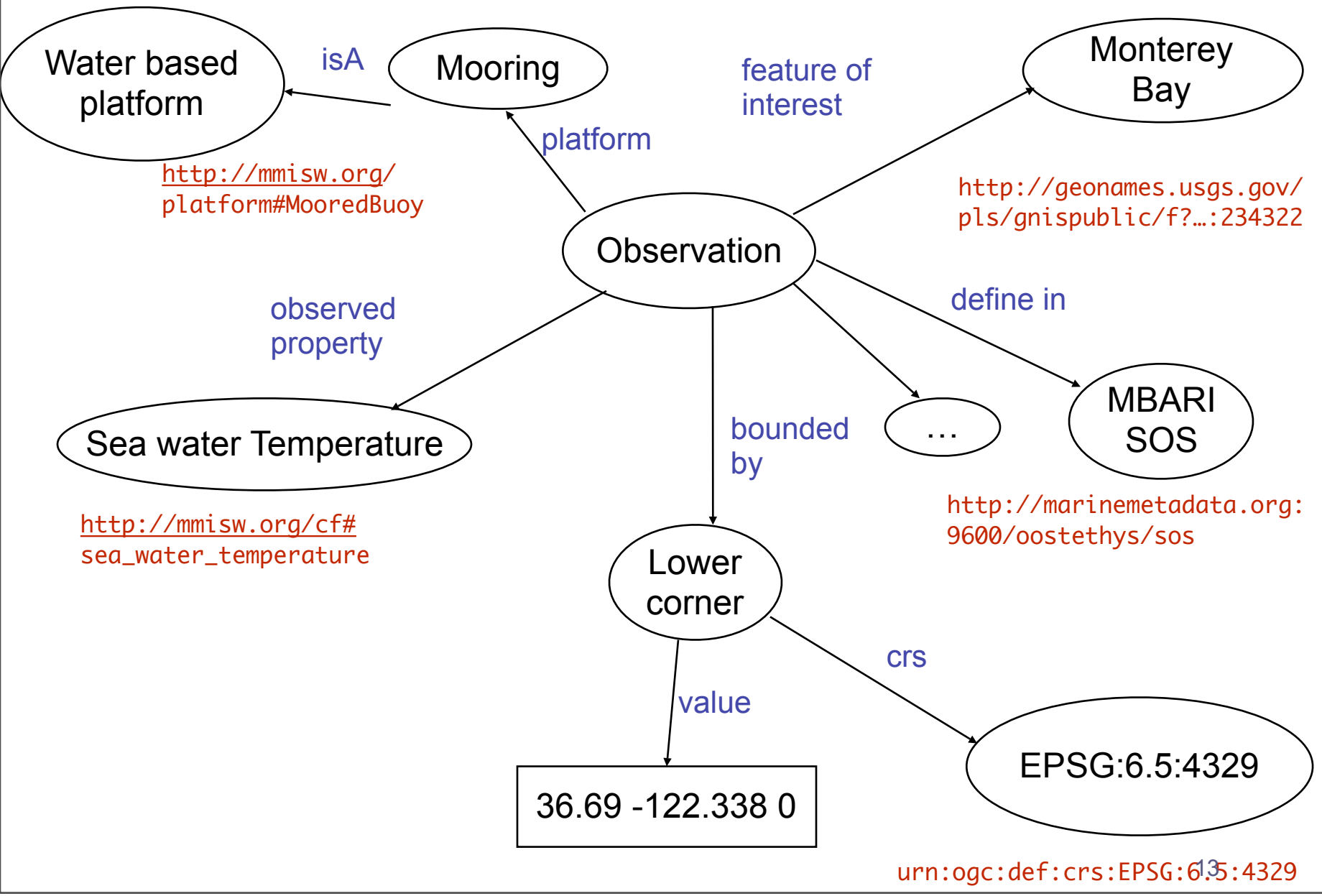
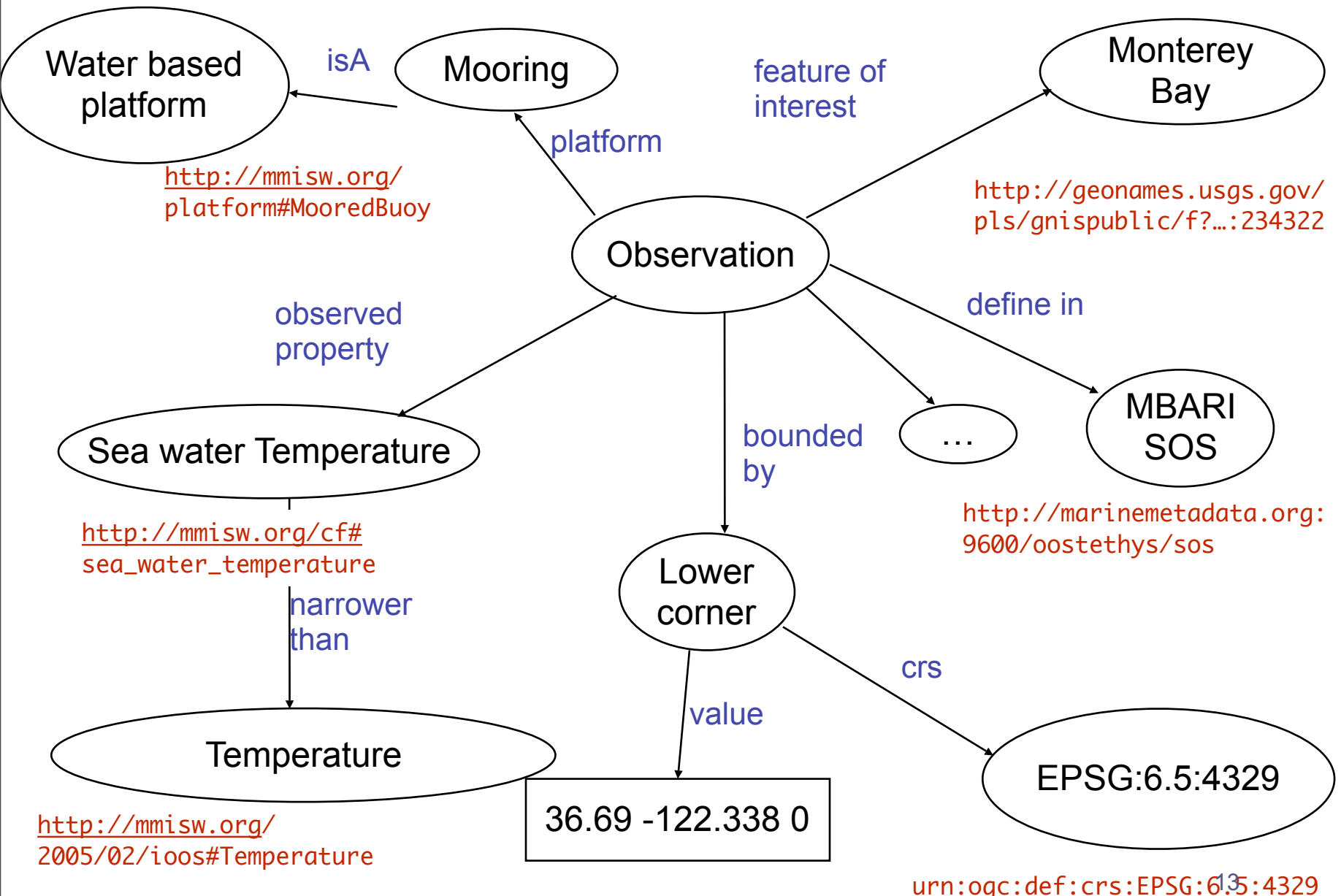
Rich graph for an observation

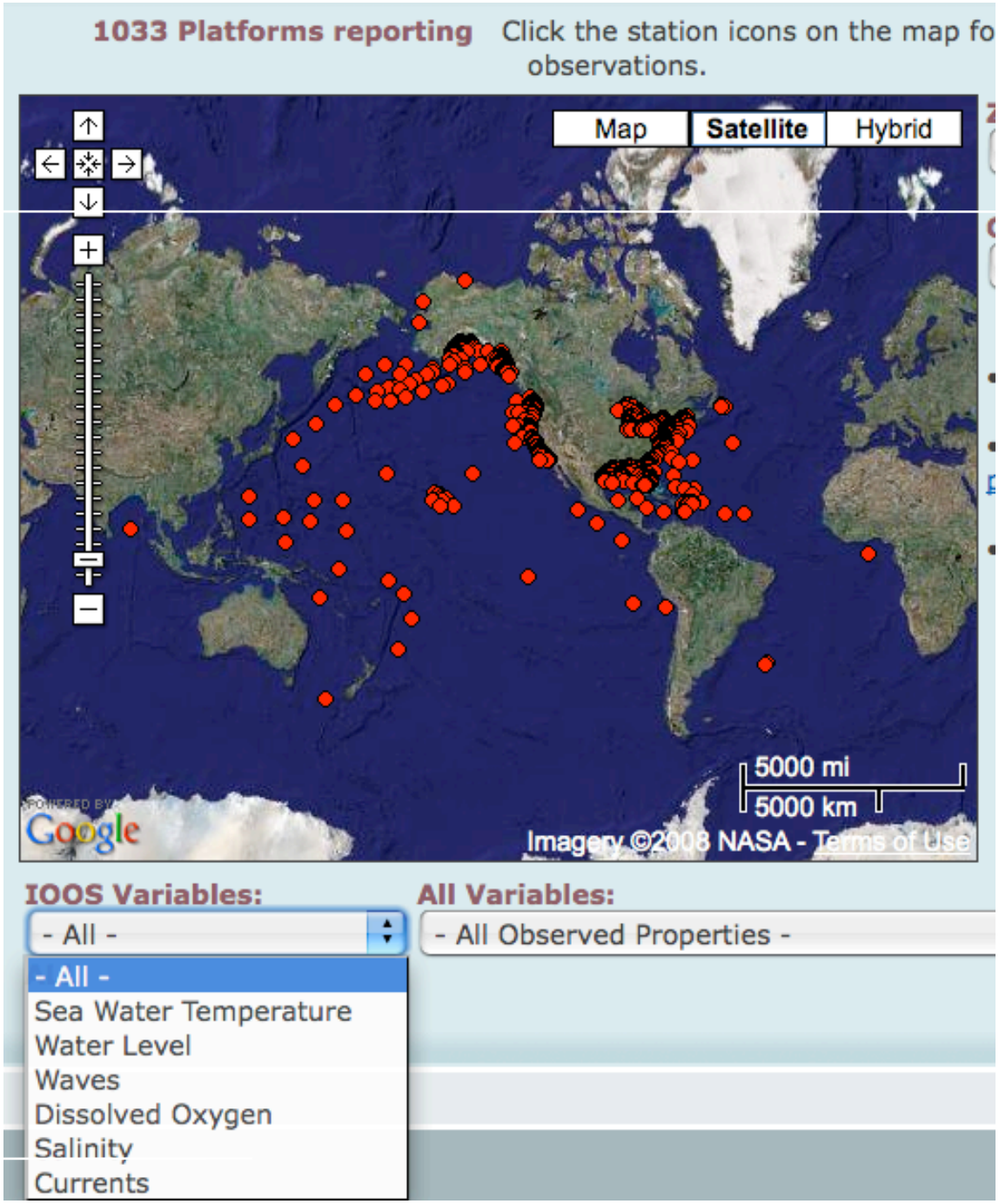


Rich graph for an observation



Rich graph for an observation





Facetted search

http://openioos.org

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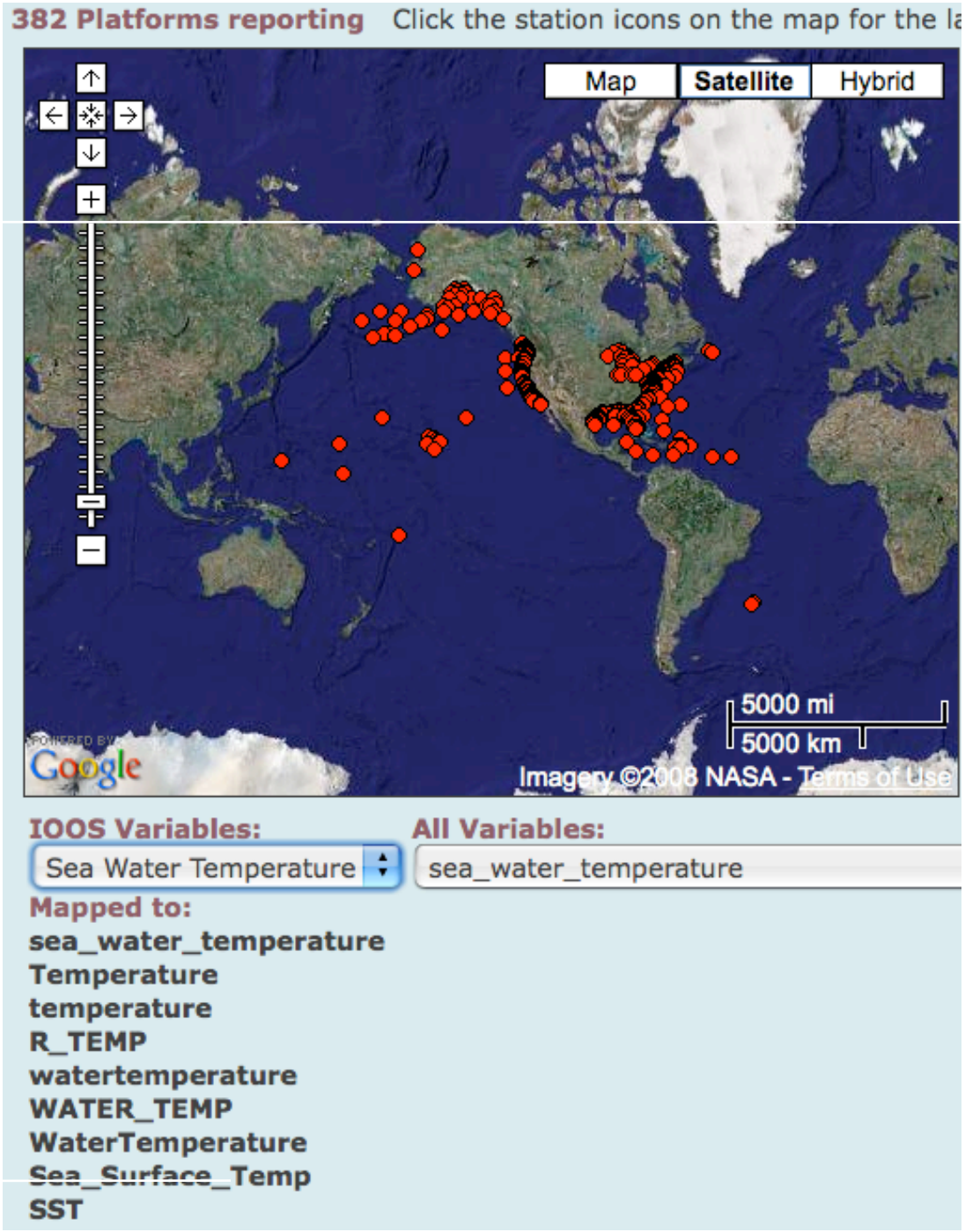

Facetted search

http://openioos.org

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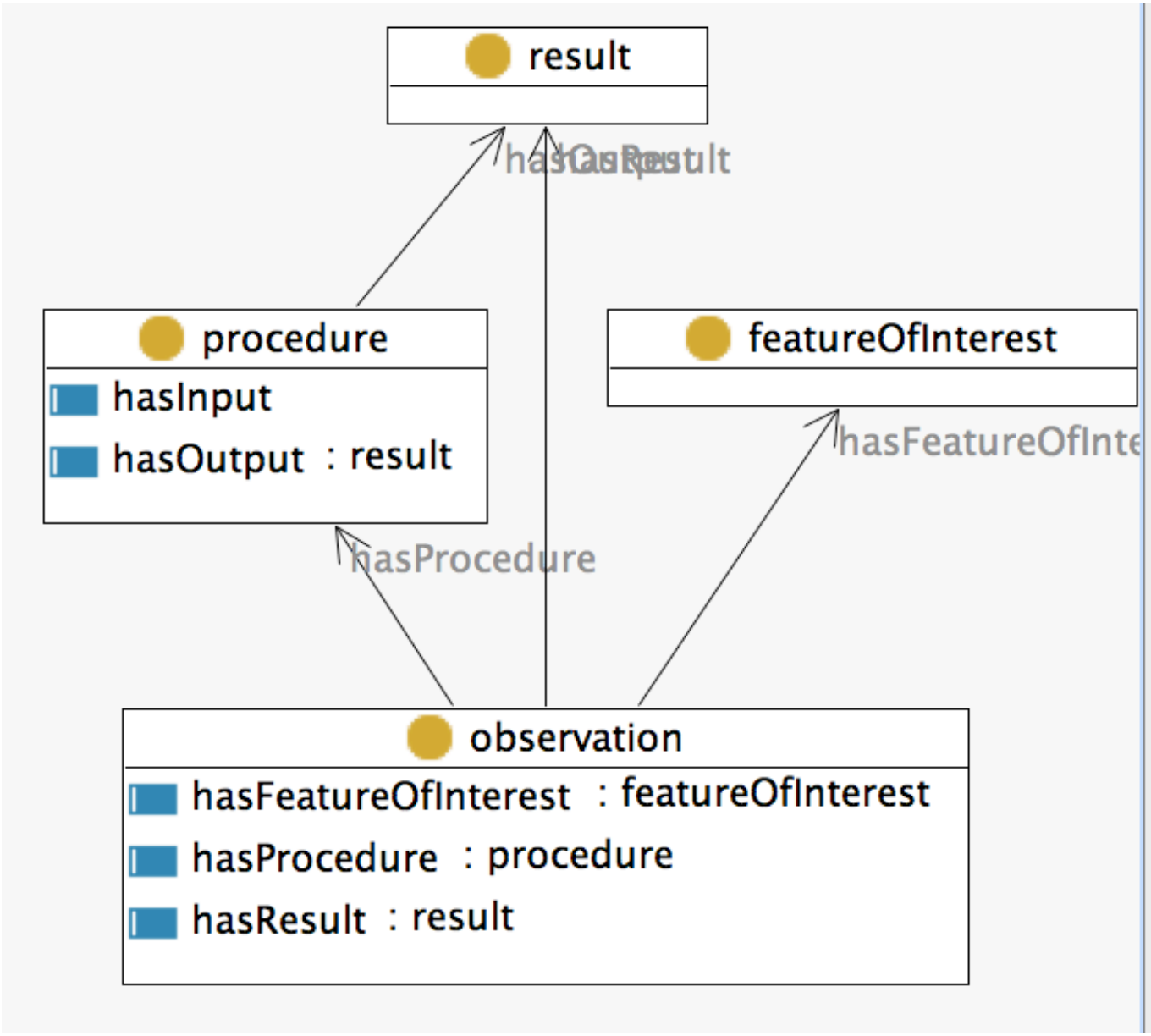
Next Steps

- Cleaning ontologies
- Improving services



Observation Ontology

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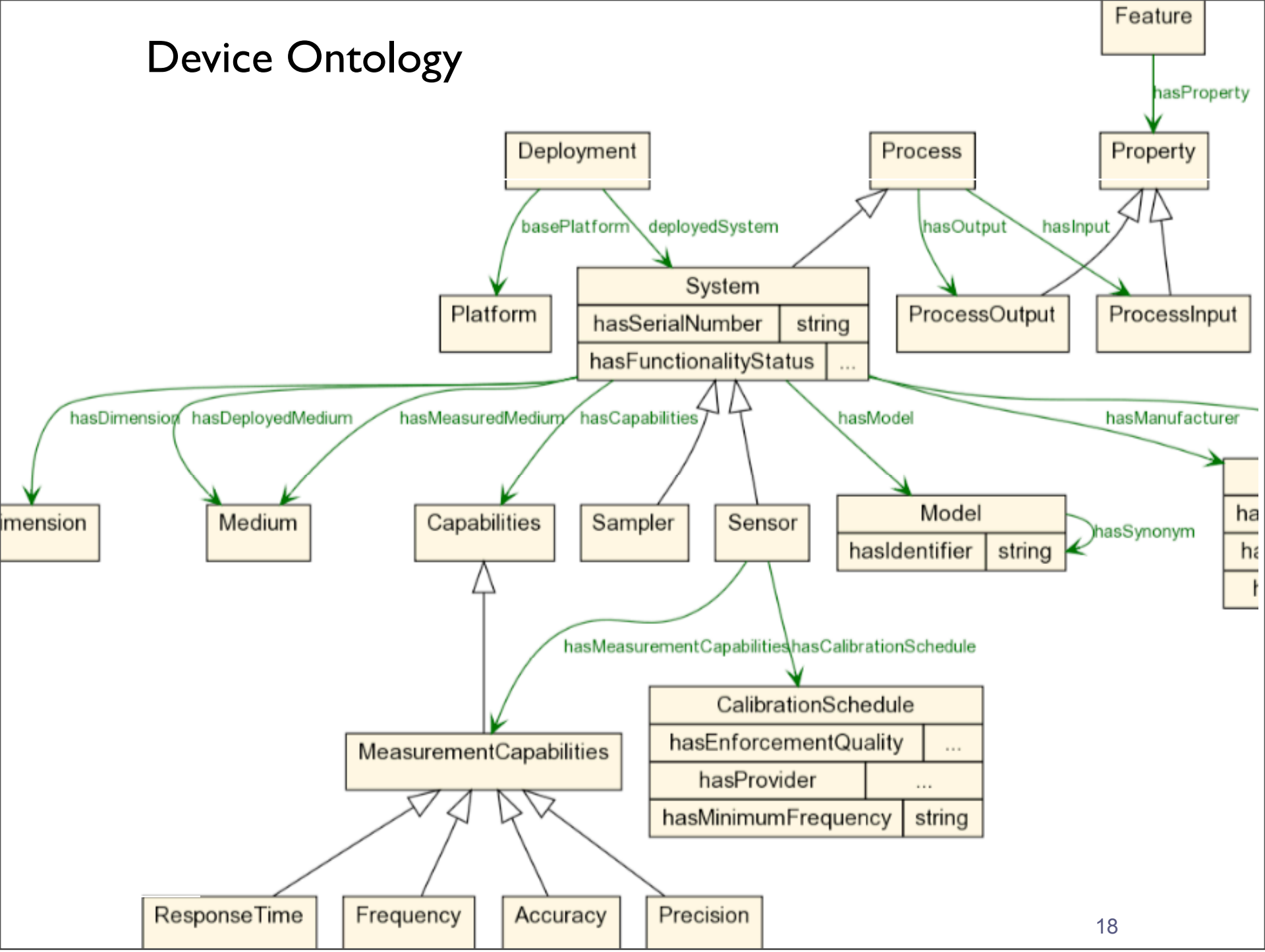
Device Ontology



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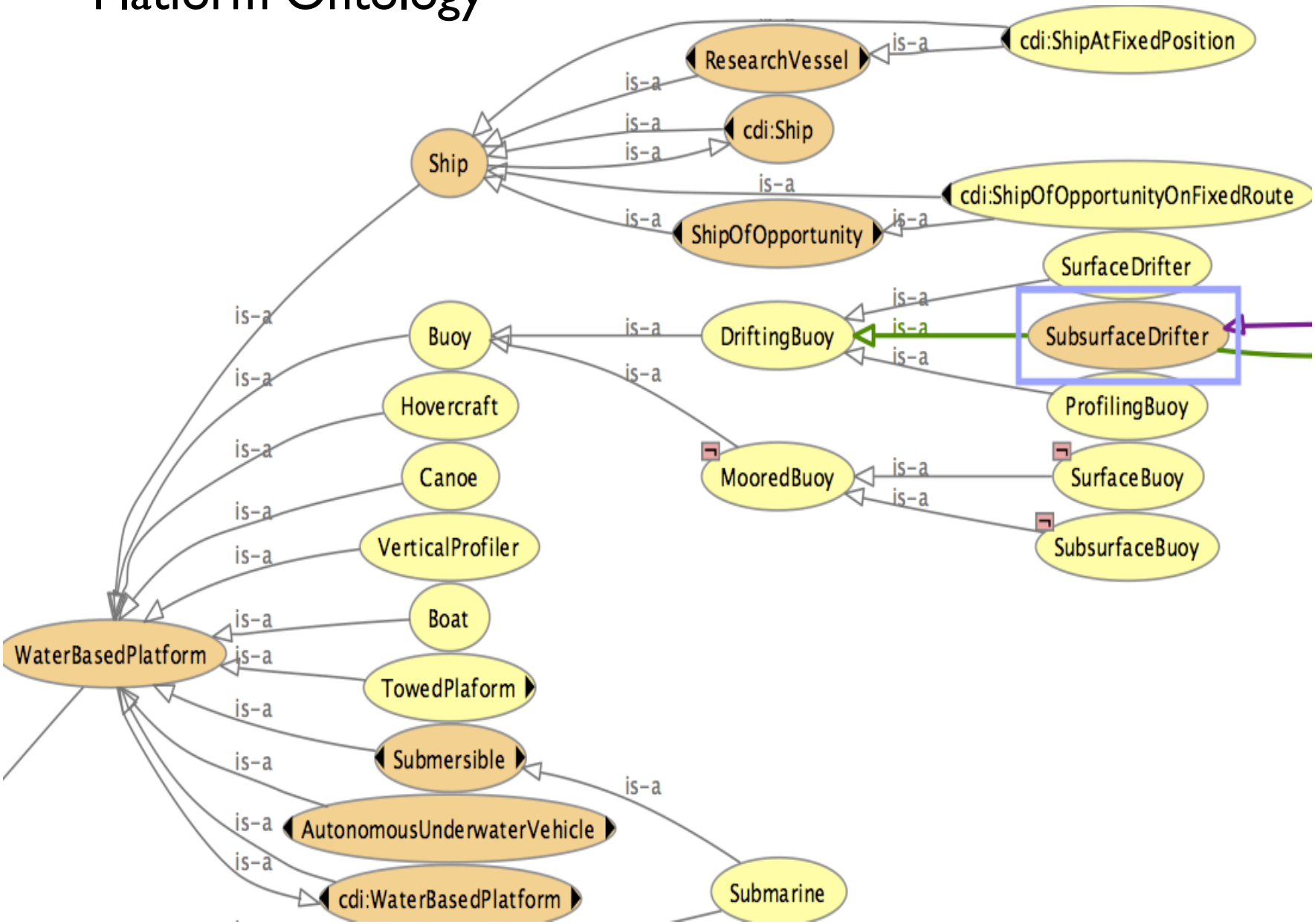
Platform Ontology



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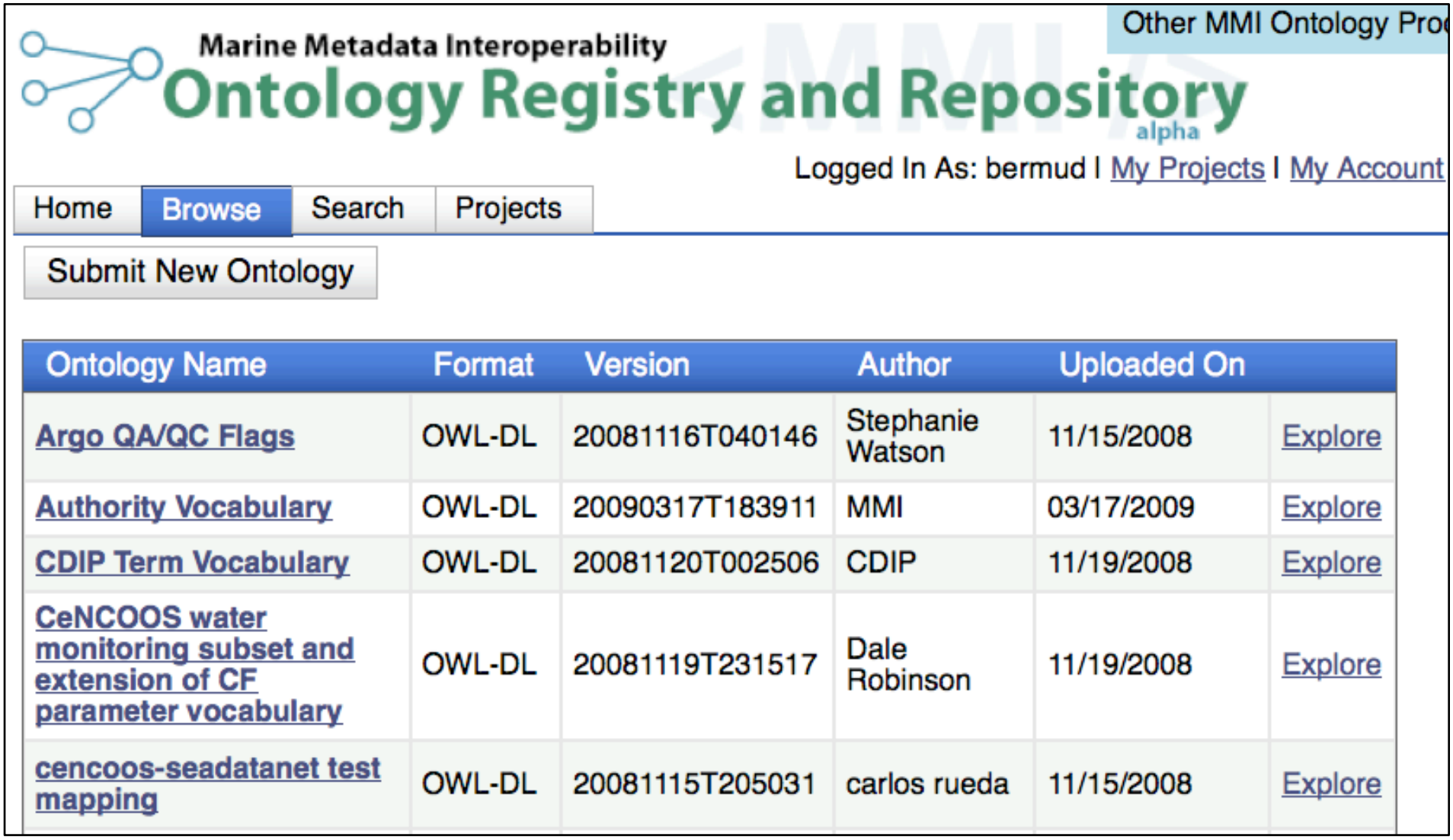
Registry and Management of Ontologies



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

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Registry and Semantic Services

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

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Links and contact information

MMI: http://marinemetadata.org
Ontology Registry: http://mmisw.org
OOSTethys: http://oostethys.org

Luis Bermudez bermudez@sura.org