OGC Sensor Web & Semantics

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March 2015

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Making location count.

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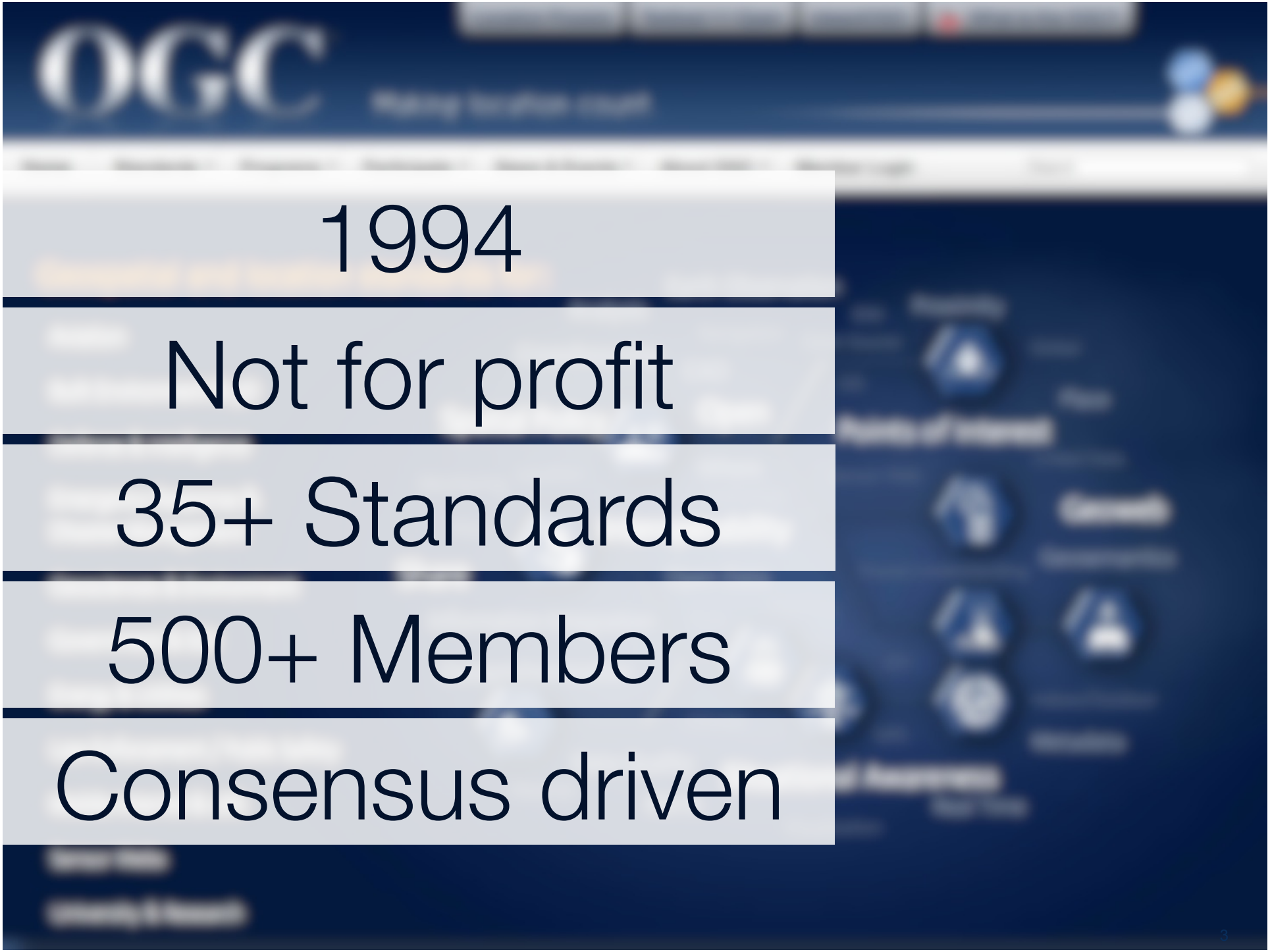
Geospatial and location standards for:

- Aviation
- Built Environment & 3D
- Defense & Intelligence
- Emergency Response & Disaster Management
- Geosciences & Environment
- Government & SDI
- Energy & Utilities
- Law Enforcement / Public Safety
- Mobile Internet & LBS
- Sensor Webs
- University & Research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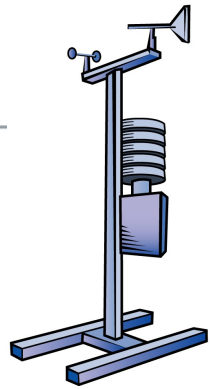
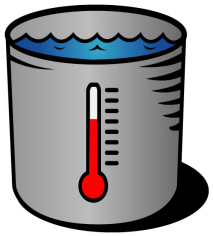
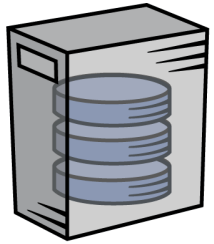
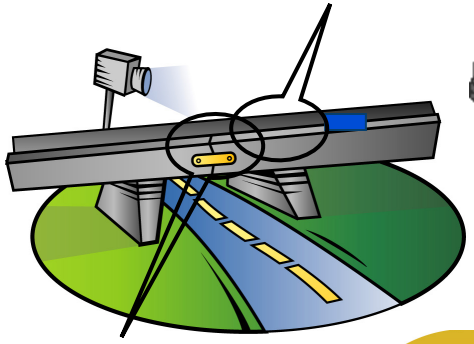
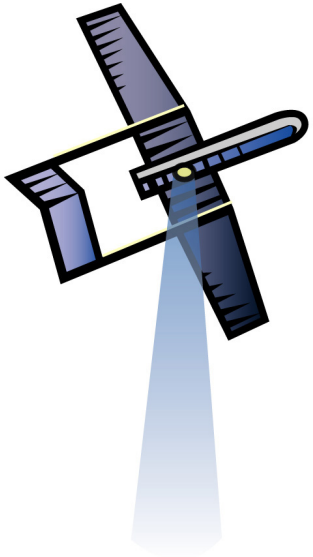
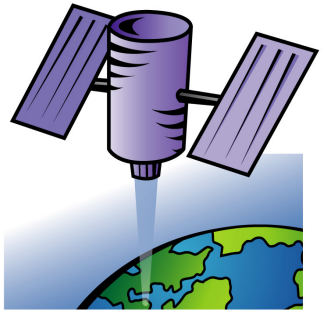
1994
Not for profit
35+ Standards
500+ Members
Consensus driven

OGC Sensor Web Enablement

- Sensors connected to and discoverable on the Web
- Sensors have position & generate observations
- Sensor descriptions available
- Services to task and access sensors
- Local, regional, national scalability
- Enabling the Enterprise

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Basic Requirements for Sensor Web

- Quickly discover sensors and sensor data (secure or public) that can meet my needs – location, observables, quality, ability to task
- Obtain sensor information in a standard encoding that is understandable by me and my software
- Readily access sensor observations in a common manner, and in a form specific to my needs
- Task sensors, when possible, to meet my specific needs
- Subscribe to and receive alerts when a sensor measures a particular phenomenon

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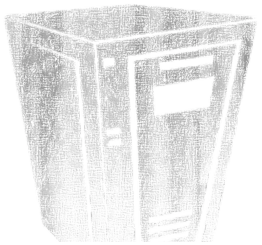
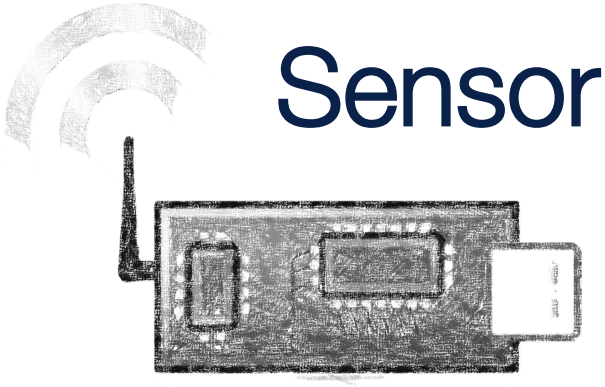
2 Services & 2 Encodings

O&M

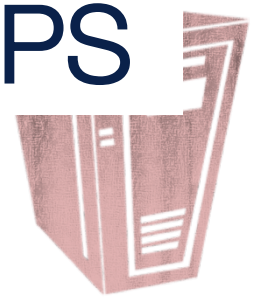


SOS

SensorML



SPS



SWE

- Developed in UML
- UML → XML mapping (fully automated)
  - UML Package
  - UML Classes
  - UML Attributes and Association Roles
  - UML Stereotypes

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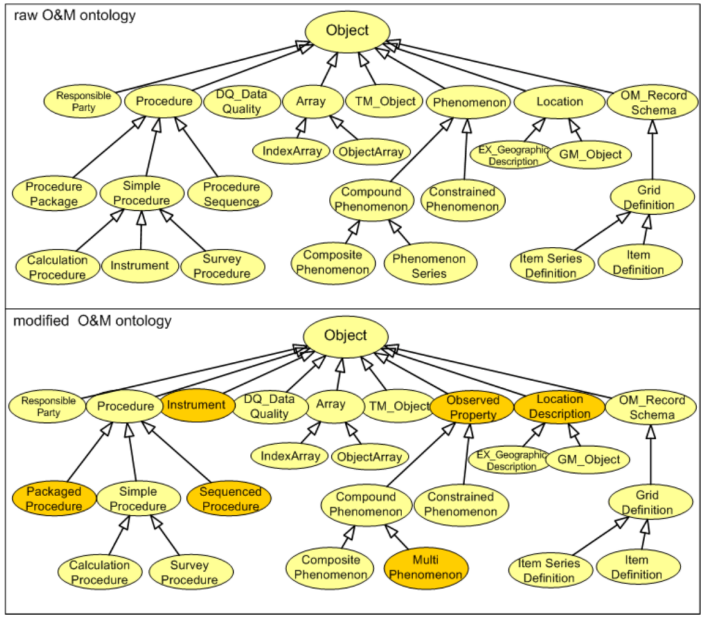
Semantic Representation

- ~2005 (Probst et al)
- Direct mapping from UML/ O&M to OWL/O&M
  - Issues with classes to concept modeling
  - Super/sub-class not always clear
  - Inconsistencies detected (feature representation/real thing)



Semantic Representation

- ~2013 (Cox)

UML is frame-based

- Attributes owned by classes
- Association-roles owned by classes
- property redefinition/refinement uncommon and complicated

RDF is open-world

- *Properties scoped to Ontology (namespace)*
- *Property re-use expected*
- *rdfs:subPropertyOf easy, commonly used*

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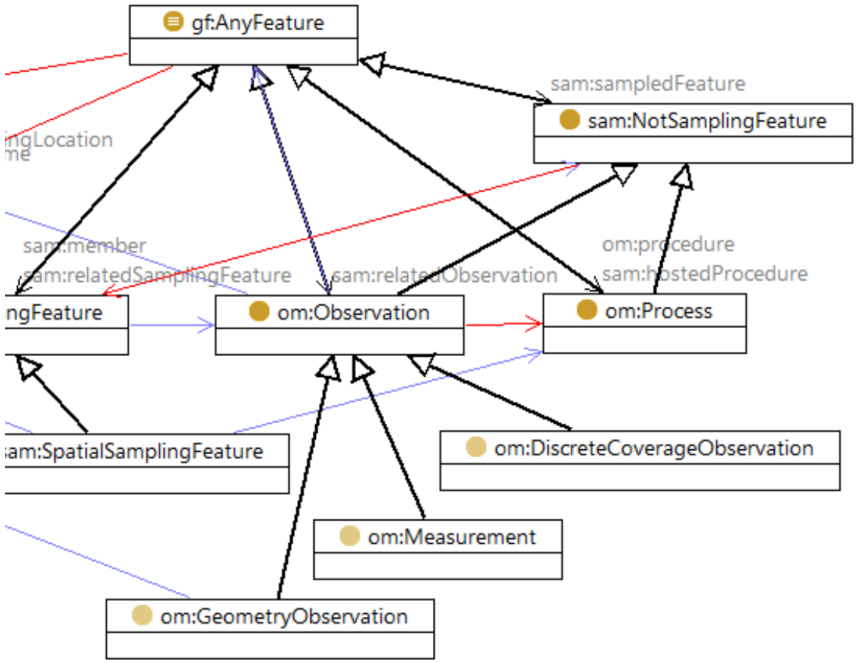
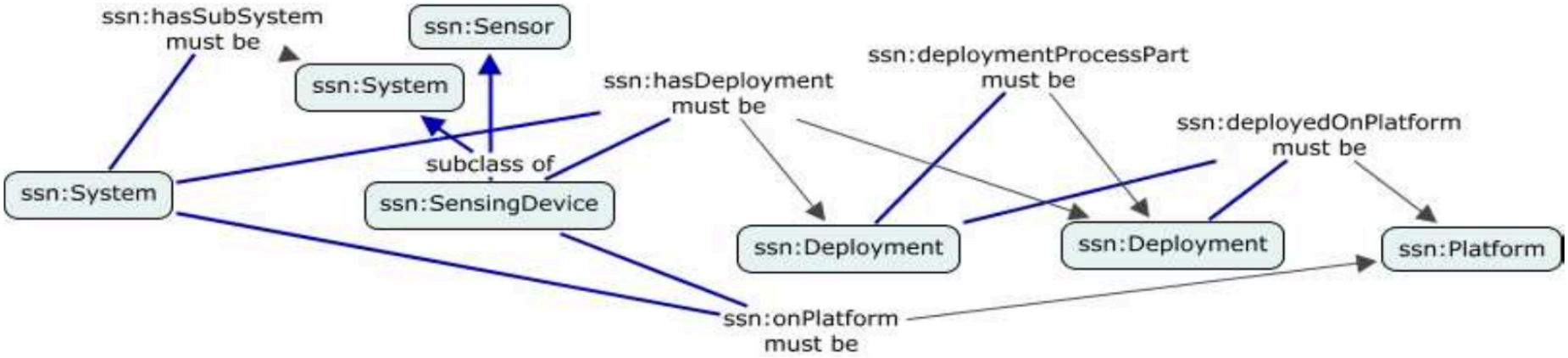
Semantic Representation

- ~2013 (Cox)
- O&M Integrated into ISO Framework
  - Basic Types (19103)
  - Geometry (19107)
  - Temporal (19108)
  - Feature (19109)
  - Metadata (19115)
  - Coverage (19123)
  - Metamodel (19150-2)



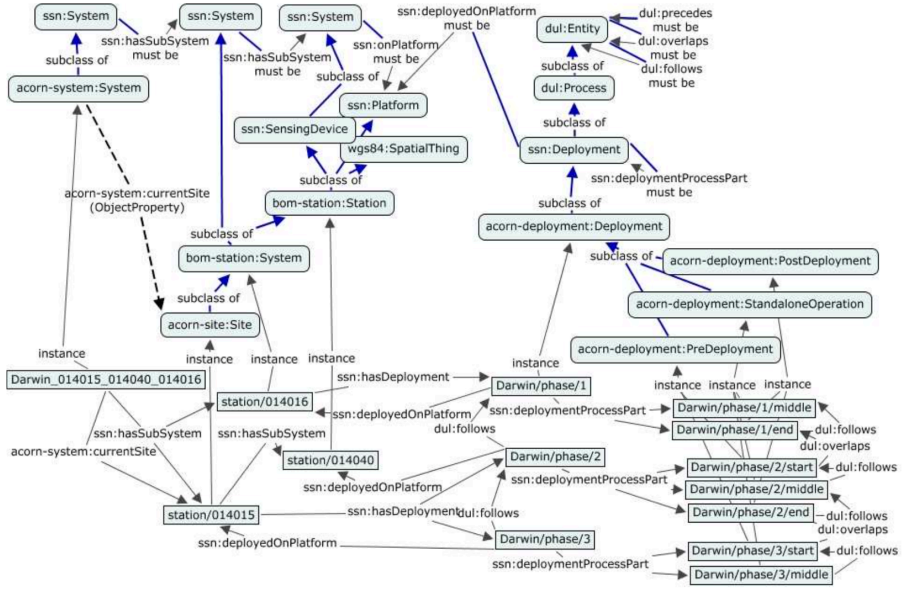
Semantic Sensor Network Ontology

- ~2005/11
- Four classes and several relationships for system, sensors and deployment information (phases and sites)



SSN → Linked Sensor Data Cube

- Australian Climate Observations Reference Network - Surface Air Temperature (ACORN-SAT) dataset
- Google's Linked-data API
- SSN Ontology + RDF Data Cube vocabulary



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Next Attempt: JSON-LD?

```
{
   "@context": {
      "featureOfInterest": {
         "@id": "http://ogc.org/FeatureOfInterest",
         "@type": "@id"
      },
      "procedure": {
         "@id": "http://ogc.org/Procedure",
         "@type": "@id"
      },
      "observedProperty": {
         "@id": "http://ogc.org/ObservedProperty",
         "@type": "@id"
      },
      "xsd": "http://www.w3.org/2001/XMLSchema#",
      "samplingTime": {
         "@id": "http://ogc.org/SamplingTime",
         "@type": "xsd:dateTime"
      },
      "result": {
         "@id": "http://ogc.org/Result",
         "@type": "xsd:double"
      }
   },
   "@id": "http://my.org/Observations/ff75eb34cf0022",
   "@type": "http://ogc.org/ObservationTypes/OM_Measurement",
   "featureOfInterest": "http://example.com/FeatureOfInterests/Waddensea",
   "procedure": "http://my.org/Sensors/g3",
   "observedProperty": "http://ogc.org/observedProperties/temperature", /*
   complexObs*/
   "samplingTime": "2015-01-27T17:43:12",
   "result": "11.3",
}
```

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