

Semantics for Practitioners

Lessons from the W3C/OGC Spatial Data on the Web Working Group



Image: <http://aoblogger.com/school-supply-pictures-clip-art.html>

Kerry Taylor, Research School of Computer
Science, ANU, Canberra

Lesson 1: Pairwise Disjoint Concepts



- People who get enough sleep
- Residents of Australia
- People who work in standards development

Standards Bodies



- OGC: Open Geospatial Consortium: heritage in spatial data; many standards including KML, GeoSPARQL, Observations and Measurements, Spatial Data Infrastructures
- W3C: Web standards body: including Web of Data, RDF, OWL, SPARQL, SHACL
- Linking Geospatial Data workshop in London March 2014

Lesson 2: Wanna join the W3C?



- ANU hosts the W3C membership office for Australia
- Participating in the W3C community gets you direct access to the issues and problems of the Web and potential impact for your research



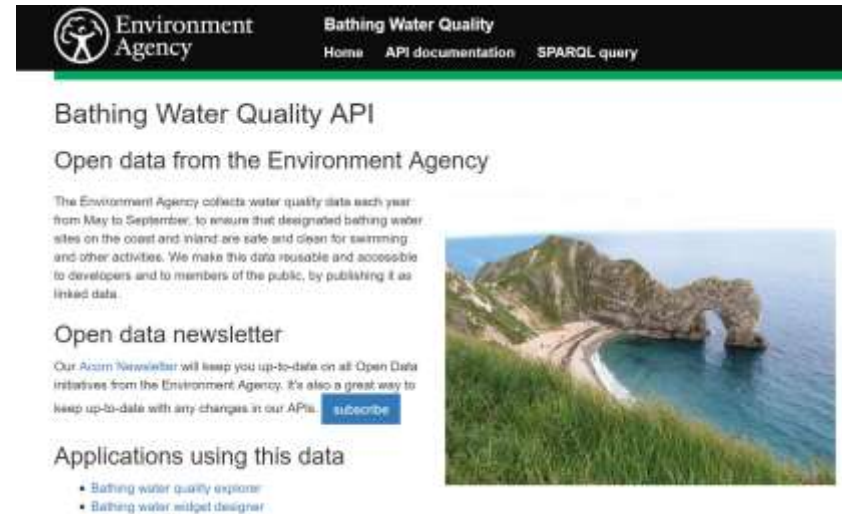
What we achieved

The image displays a collage of document thumbnails, each representing a technical report or standard. The documents are arranged in a grid-like fashion, overlapping slightly. Each thumbnail shows the title, authors, and a table of contents for a specific report. The reports are:

- Spatial Data on the Web Best Practices** (OGC W3C): W3C Working Group Note 28 September 2017. This document provides best practices for publishing and using spatial data on the web.
- Time Ontology in OWL** (OGC W3C): W3C Recommendation 19 October 2017. This document defines a time ontology in OWL.
- Semantic Sensor Network Ontology** (OGC W3C): W3C Recommendation 19 October 2017. This document defines a semantic ontology for sensor networks.
- Publishing and Using Earth Observation Data with the RDF Data Cube and the Discrete Global Grid System** (OGC W3C): W3C Working Group Note 28 September 2017. This document discusses the use of RDF Data Cube and DGG for earth observation data.
- QB4ST: RDF Data Cube extensions for spatio-temporal components** (OGC W3C): W3C Working Group Note 28 September 2017. This document defines extensions for spatio-temporal components in the RDF Data Cube.
- Overview of the CoverageJSON format** (OGC W3C): W3C Working Group Note 11 July 2017. This document provides an overview of the CoverageJSON format.

Spatial Data on the Web Best Practices

- For data publishers and tool developers, aiming at consumption by ordinary Web developers.
- Evidence to support best practices for *real* users, plus identified gaps in practice with advice.



The screenshot shows the 'Bathing Water Quality' page from the Environment Agency. The page features a navigation bar with links for 'Home', 'API documentation', and 'SPARQL query'. The main content includes a title 'Bathing Water Quality API', a sub-header 'Open data from the Environment Agency', and a paragraph explaining that the agency collects water quality data from May to September to ensure safety for swimming. Below this is a section for an 'Open data newsletter' with a 'subscribe' button. At the bottom, there is a section titled 'Applications using this data' with two bullet points: 'Bathing water quality explorer' and 'Bathing water widget designer'. A photograph of a coastal landscape with a natural rock archway is also visible on the right side of the page.

Why are traditional Spatial Data Infrastructures not delivering?

- Search engines can't find catalogue services
- Catalogues index metadata for experts, but where is the data?
- Non-standard query services
- Expectation of spatial expertise
- Governments have invested heavily in these, e.g. INSPIRE, GeoScience Australia

Spatial Things

- This was difficult – one of the first issues raised and one of the last resolved.
- What is a spatial thing? not a schema:Place, not an o&m:feature, not a w3cgeo:SpatialThing, not a geoSparql:spatialObject, not a dcterms:location,...
- *Spatial thing*: Anything with spatial [extent](#), (i.e. size, shape, or position) and is a combination of the real-world phenomenon and its abstraction (the [feature](#)). Examples are: people, places, or bowling balls.
- *Disjoint* from geometry or location--distinguish the geometry from the thing itself.
- *We do not say*: Distinguish the real thing from the info about the thing (NB [httpRange-14](#) issue). We say
... in most cases using a single URI for both [Spatial Thing](#) and the page/document is simpler to implement and meets the expectations of most end-users.

Linkability

Sources such as the Best Practices for Publishing Linked Data [[LD-BP](#)] assert a strong association between [Linked Data](#) and the [Resource Description Framework](#) (RDF) [[RDF11-PRIMER](#)]. Yet we believe that Linked Data requires only that the formats used to publish data support Web linking (see [[WEBARCH](#)] [section 4.4 Hypertext](#))...

...However, we must make clear to readers that there is no requirement for all publishers of [spatial data](#) on the Web to embrace the wider suite of technologies associated with the [Semantic Web](#); we recognize that in many cases, a Web developer has little or no interest in the toolchains associated with Semantic Web due to its addition of complexity to any Web-centric solution.

Lesson 3: The anti-RDF lobby is passionate and powerful



- [Best Practice 4](#): Use spatial data encodings that match your target audience

Spatial Relations and Ontologies (BP10)

- We identify topological, directional and distance relations.
- We propose an update to GeoSPARQL to standardise geometry, geometry versions, coord reference systems
- GeoSPARQL uses DE-9IM, RCC8 and *simple features* topological vocabularies

- We advise using *simple features* from GeoSPARQL

Equals — [geosparql:sfEquals](#)

Disjoint — [geosparql:sfDisjoint](#)

Touches — [geosparql:sfTouches](#)

Crosses — [geosparql:sfCrosses](#)

Within — [geosparql:sfWithin](#)

Contains — [geosparql:sfContains](#)

Intersects — [geosparql:sfIntersects](#)

Overlaps — [geosparql:sfOverlaps](#)

Lesson 4: Demand for spatial reasoning



- Spatial predicates have been implemented in RACER, Pellet, Stardog, (Oracle?), and thru PostGIS for SPARQL in Strabon and others
- This capability may become commercially important
- And temporal too

But spatial relations without geometry?

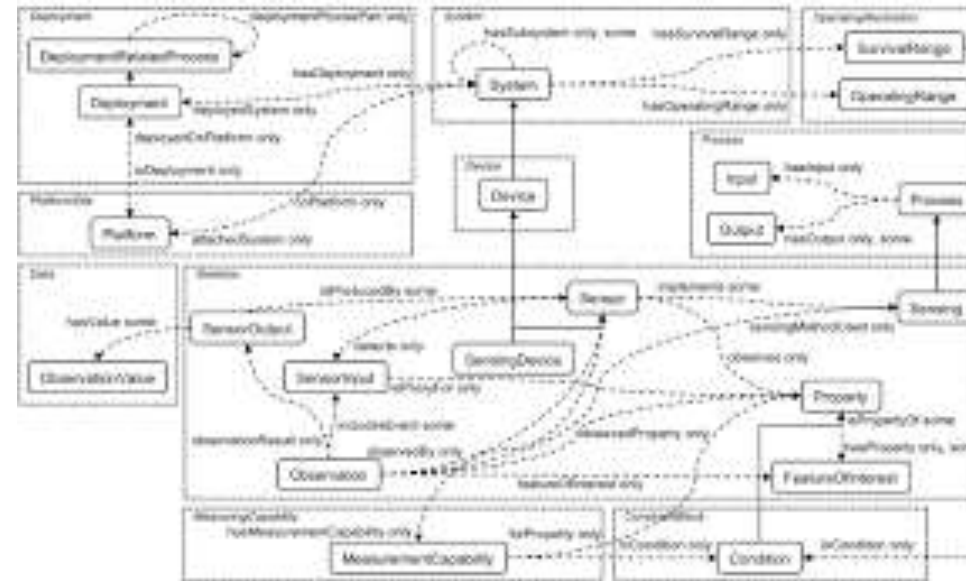
- Use owl:sameAs (carefully), geonames:nearby or foaf:based_near
- Or schema:sameAs or bbc:sameAs
- But *place* is a social construct that may be imprecise and opinionated: The Sahara, Renaissance Italy...
- We propose **samePlaceAs**
- Is ancient Byzantium the same place as modern Istanbul? What about the historic pub that was moved across the street to avoid demolition?
- Propose schema:samePlaceAs but ongoing...

Lesson 5: All equivalences are not equal



Semantic Sensor Networks (SSN)

- SSN was first published in 2012 by the W3C SSN-XG
- Modelling sensors, data, systems, and physical objects being observed.



Source: Compton et al 2012

What to do?

- Respond to “*its too hard to use*” by modularisation and simplification
- Weaken binding to Dolce Ultralite
- Extend in several ways... particularly *actuation*
- Tidy it up

So we have SSN/SOSA, + alignments

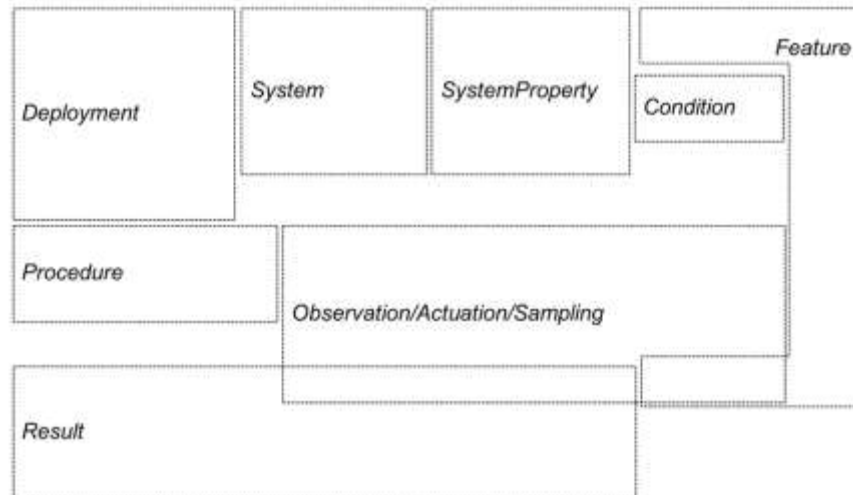


Figure 2 Overview of the SOSA/SSN ontology modules

Source: <https://www.w3.org/TR/vocab-ssn/>

Modularisation

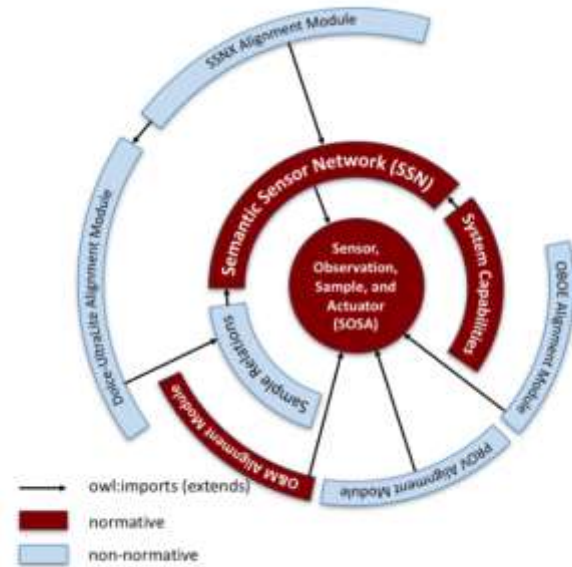


Figure 1 The SOSA and SSN ontologies and their vertical and horizontal modules.

- SOSA is the simple core
- SSN has changed to accommodate SOSA

<http://www.w3.org/ns/ssn/>
<http://www.w3.org/ns/sosa/>

Modularisation

- Most important is the new SOSA: the *simple* core
- Uses no formal reasoning; no subclasses
- No restrictions; only schema:domainIncludes + schema:rangeIncludes
- Also reduced scope, fewer classes and properties
- Adds a hasSimpleResult datatype property for recording measurements

e.g. `sosa:hasSimpleResult "12.4 m"^^cdt:length`

Constraints are filled in by SSN

- SSN *extends* by adding terms
- SSN *extends* by constraining interpretations
- Architecture is mirrored in the annotations
 - sosa narrative uses sosa terms but holds true for ssn context
 - ssn narrative uses extended terms and respects sosa narrative

Lesson 6: Ontologies are **not** modular



- Owl:import is not enough
- Namespace conventions are too constraining
- Theory on modular ontologies did not help
- Annotations are really important and we need better tooling

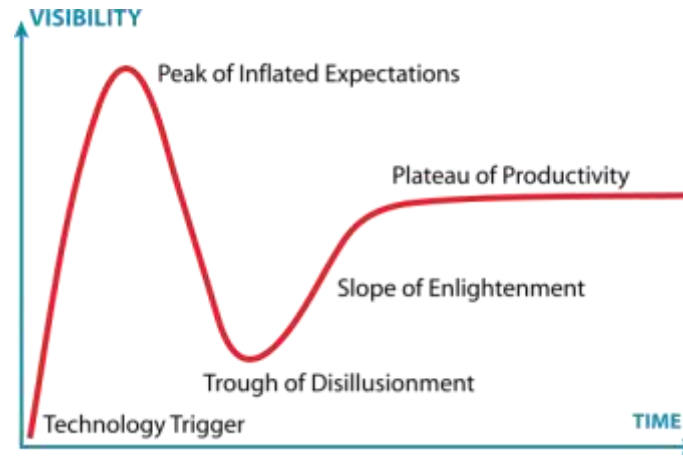
What's next?

- Spatial Data on the Web Interest Group, chaired by Jeremy Tandy and Linda van den Brink
- To address statistical data; deliver SSN Primer; moving objects; maintenance of all.

The screenshot shows the website for the Spatial Data on the Web Interest Group. The page layout includes a blue header with the W3C logo and navigation links. The main content area is titled "SPATIAL DATA ON THE WEB INTEREST GROUP" and contains introductory text, a "Shortcuts" section with links to GitHub, mailing lists, and the W3C site, and a "Meetings" section with a table of upcoming events.

Date	Meeting info
20 November 2017 20:00 UTC	Agenda (TBD) Minutes (TBD)
25 October 2017 19:00 UTC	Agenda Minutes

Lesson 7: It is not over yet ...



By Jeremy kemp at English Wikipedia, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=10547051>

Acknowledgements

- All the 88-ish members of the Spatial Data on the Web Working Group
- *Especially:* Ed Parsons, Phil Archer, Francois Daoust, Jeremy Tandy, Linda van den Brink, Armin Haller, Bill Roberts
- *Interpretations of the lessons are all mine; please don't blame my SDW colleagues!*