Australian National

Semantics for Practitioners

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

Image: http://laoblogger.com/school-supply-pictures-clip-art.html

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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?

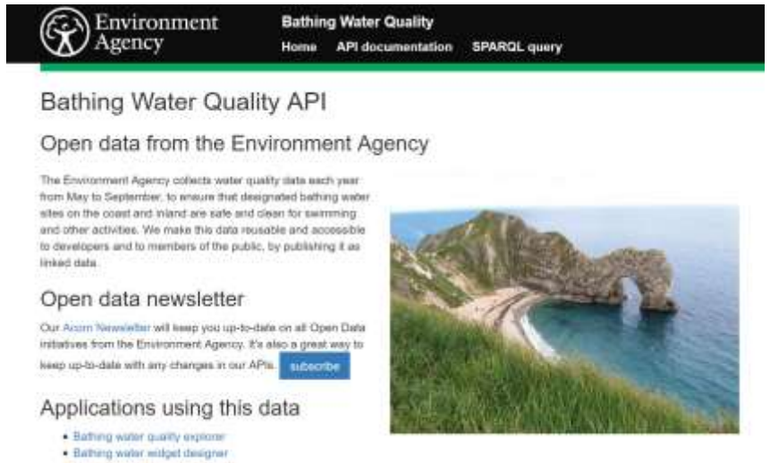
- ANU hosts the W3C membership office for Australia

- 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

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.



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?

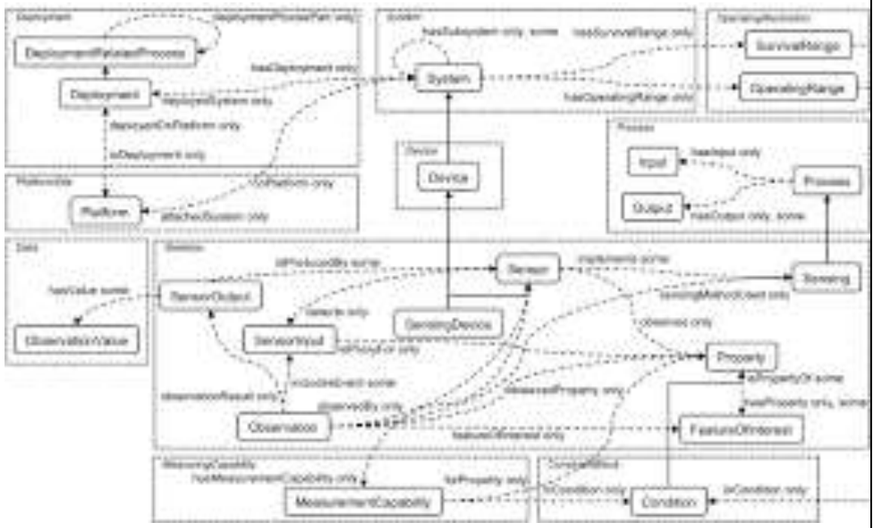
- Use owl:sameAs (carefully), geonames:nearby or foaf:based_near
- Or schema:sameAs or bbc:sameAs
- But *place* is a social construct that may be imprecise and opinionated: The Sahara, Renaissance Italy…

- 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

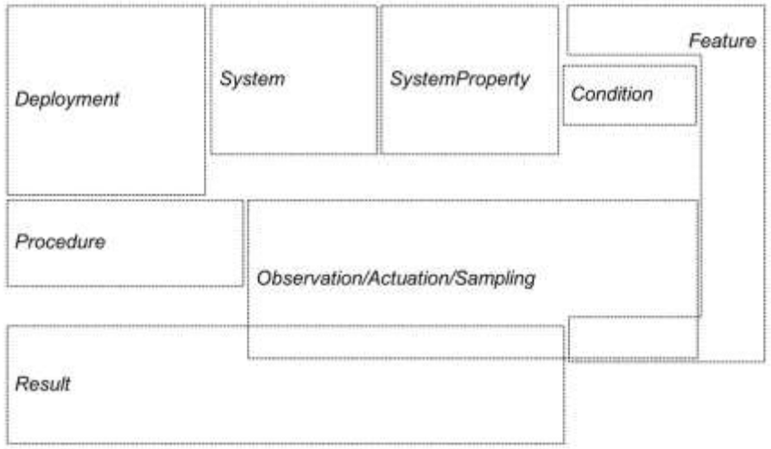


Figure 2 Overview of the SOSA/SSN ontology modules

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

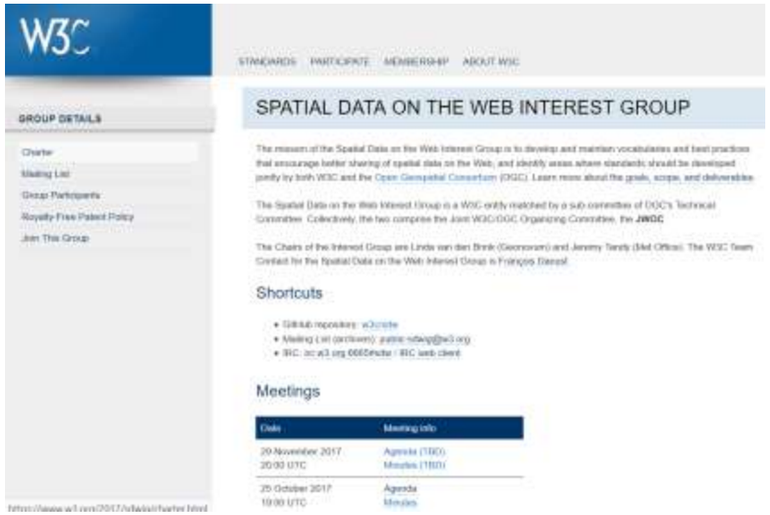
- SSN *extends* by adding terms
- SSN *extends* by constraining interpretations
- Architecture is mirrored in the annotations
  - sosa narrative uses sosa terms but holds true for ssn context
  - ssn narrative uses extended terms and respects sosa narrative

Lesson 6: Ontologies are **not** modular

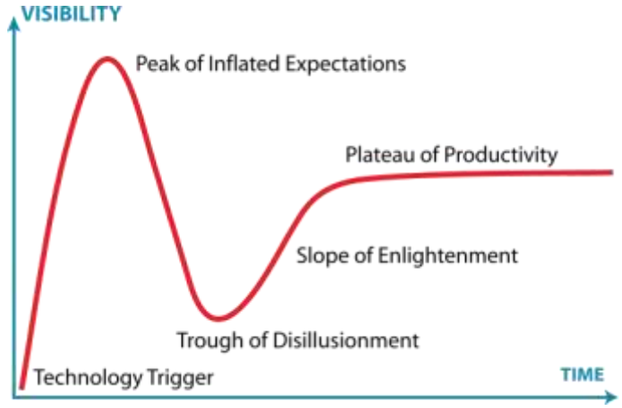
- Owl:import is not enough
- Namespace conventions are too constraining
- Theory on modular ontologies did not help
- Annotations are really important and we need better tooling

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.



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

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