

SDWWG: Spatial Data on the Web Working Group

WoT/ TF-TD, June 10 2015

Kerry Taylor

CSIRO, AUSTRALIAN BUREAU OF STATISTICS, AUSTRALIAN NATIONAL UNIVERSITY, UNIVERSITY OF MELBOURNE AND UNIVERSITY OF SURREY
www.csiro.au



What is linked data?

- A new data publishing and integration style influenced by successful Web principles and championed by Tim Berners-Lee



Why linked data?

- Focuses community agreement on what to call things, not on how to write them down (digitally)
 - Develop a *terminology*, or a *description* of concepts called an *ontology* or *vocabulary*
 - Formalised: founded on predicate logic theory
 - Uses sound and complete machine-interpreted logical reasoning
- Not tied to the lowest-common-denominator of the community
- Uses popular Web standards; links are everywhere
- Designed for in-situ data access by third party apps, mashups and web services
- Encodes metadata deeply connected with the data
- A Web scale distributed database
- “We have lots of portals..what we haven’t got to is to use my tool across a suite of resources” - RW

Example: lab.environment.data.gov.au

The screenshot shows a web browser window displaying the 'Search Results' page for the URL `http://lab.environment.data.gov.au/elda/api/data/acorn/climate/series/040004/date/`. The page features the 'data.gov.au' logo and a 'Linked Data API' header. Below the header, there are navigation links for 'json', 'plainhtml', 'rdf', 'text', 'ttl', and 'xml'. The main content area displays a record for station '19510207' with a 'Show Search Form' button. The record details include:

max temperature	27.0	🔍
min temperature	17.0	🔍
rainfall	0.5	🔍
class	Observation	
obsday	07	🔍
obsmonth	02	🔍
obsyear	1951	🔍
is primary topic of	19510207.html	

To the right of the record details is a 'View' section with a dropdown menu set to 'station' and a list of properties with star icons: max temperature, min temperature, rainfall, class, obsday, obsmonth, obsyear, and is primary topic of.

- 100 year climate observations, 61 million triples, Station Metadata included
- Use in any browser via Linked Data API (HTML)
- In Javascript via Linked Data API (JSON)
- In R via SPARQL
- 15 minute data coming soon



W3C and OGC collaborate for Spatial Data

World Wide Web Consortium

- Standards for the Web
- E.g. HTML, XML, Semantic Web and linked data



Open Geospatial Consortium

- Standards for geospatial data
- E.g. WMS, WFS, SWE, O&M, WaterML



CSIRO belongs to both

Members

- OGC and W3C members
- Chaired by myself and Ed Parsons of Google
- 64+ people, 37+ organisations, still growing
- Weekly teleconference, F2F Barcelona in March
- Oracle, MITRE, Google, Bosch, Yandex, NASA, Netage.nl
- Universities in Spain, Brazil, Greece, UK, Australia, US, Ireland, Germany, France
- UK Ordnance Survey, UK Met Office, Dutch Standards body, German National Library
- Strong Australian participation

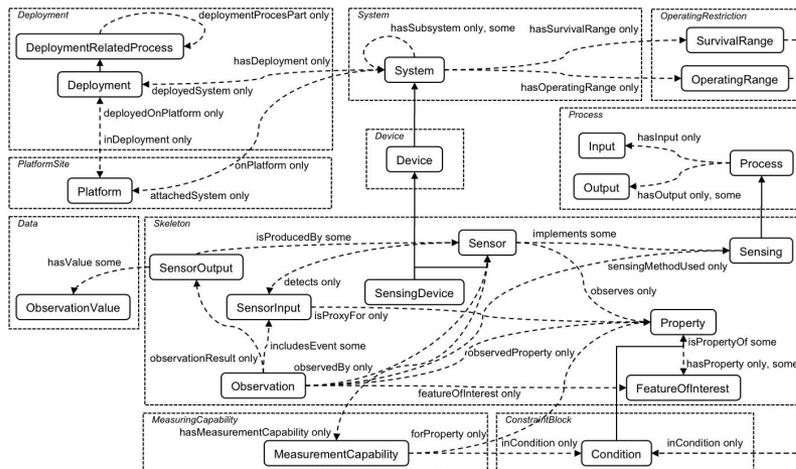
What we will do

- **Best Practices** (where there are too many choices)
- Spatial data encoding, relation vocabularies, identity, geometry and APIs
 - e.g. suburb IN Sydney
 - e.g. Socially governed “place”
 - e.g. “my house”
 - e.g. “Lake Lefroy”
 - e.g. “The Exxon Valdez oil spill”
- Not web mapping
- **OWL-time** standard
- Ontology for the Gregorian calendar plus temporal relationships
- Based on Allen’s interval calculus
- Very widely used
- Minor changes expected



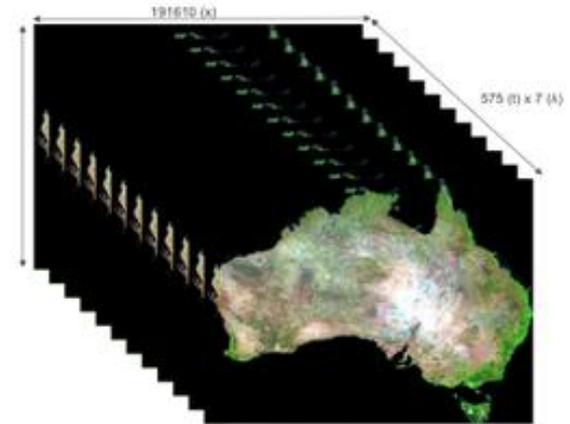
What we will do

- Semantic Sensor Networks ontology
- Used widely in environmental sensing and Internet of Things (and even satellite configuration).
- Often used with RDF streaming or CEP engines
- Develop to formal standard
- Mature, widely used, but an extensive wish list has developed



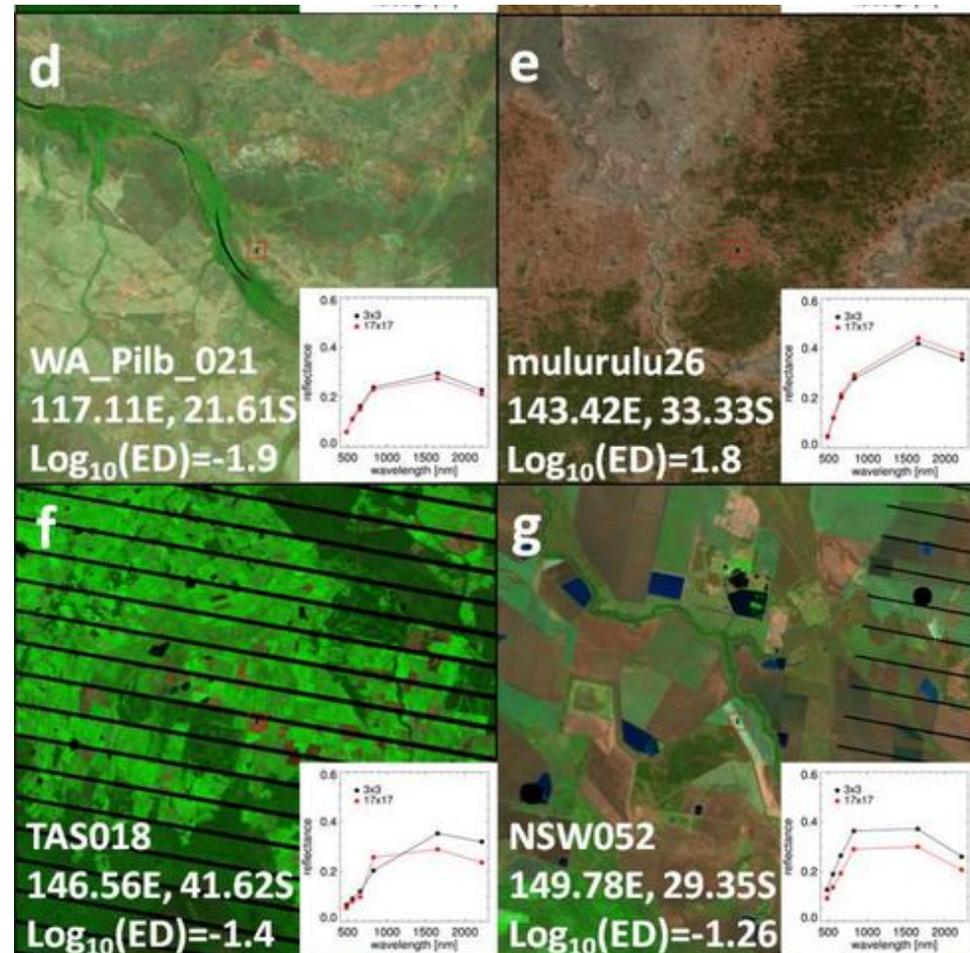
Coverage

- What does remote sensing look like as linked data?
- What about map layers, time series, water observations, images, LIDAR?
- Start with the W3C RDF “datacube”
- Can we handle the scale? Over 400 sensors launching in 10 years
- How will processing services be accessed?
- Offering convenience of access to scientists, government and entrepreneurs for wealth creation and sustainable development?
- What about provenance?
- What applications are envisaged?



Use Case (e.g Guershman et al, JRSE, to appear)

- To ensure Geospatial concepts, OWL-Time, SSN, Coverage, RDF datacube and PROV-O work seamlessly together.
- Say, develop a fractional coverage (vegetation) derived from soil type maps and MODIS, LANDSAT and Hyperion satellites calibrated with in-situ sensors.
- Enable this to be done on-line, with coverage results published back to the cube.
- Provenance from the sources is used, extended and fed back.
- Prepare for the onslaught.



What will it look like?

Search engines will understand it

 e best way to get to →

- What's the best way to get to London's Little Italy district from the airport at 2am on Saturday?

Clever IoT devices will use it



- “Your bus is running 10 minutes late. You still have time to finish that coffee before you go but I'll turn down the oven now so your dinner doesn't burn before you get home”

Smart Cities will use it

- Which Melbourne suburbs had the highest electricity consumption per household in January 2015 and what is the most recent median household income for those suburbs and the sitting MLA for the electorates containing those suburbs?

Scientists will use it

- Visualise the monthly fractional cover over Eastern Australia for the year to date correlated with the monthly maximum temperatures from the Bureau of Meteorology.

References

- Michael Compton, Payam Barnaghi, Luis Bermudez, Raul Garcia-Castro, Oscar Corcho, Simon Cox, John Graybeal, Manfred Hauswirth, Cory Henson, Arthur Herzog, Vincent Huang, Krzysztof Janowicz, W David Kelsey, Danh Le Phuoc, Laurent Lefort, Myriam Leggieri, Holger Neuhaus, Andriy Nikolov, Kevin Page, Alexandre Passant, Amit Sheth, Kerry Taylor, [The SSN ontology of the W3C semantic sensor network incubator group](#) Web Semantics: Science, Services and Agents on the World Wide Web, 17: 25–32, December 2012
- Laurent Lefort, Josh Bobruk, Armin Haller, Kerry Taylor, Andrew Woolf, *A Linked Sensor Data Cube for a 100 year homogenised daily temperature dataset*, Proc Semantic Sensor Networks (SSN-2012), CEUR-Proceedings 904, 2012
- Taylor, Kerry & Parsons, Ed, *Where Is Everywhere: Bringing Location to the Web*, IEEE Internet Computing, 19:2,83-87 2015
- The Charter (duplicated in OGC): <http://www.w3.org/2015/spatial/charter>
- The working wiki with use cases: www.w3.org/2015/spatial

AUTHOR:

Kerry Taylor

CSIRO and ABS

Canberra, Australia