

# Smart Cities

And open standards

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# How is a city smart?

- Citizens informed and in control
- Government informed and *just-enough* in control
- Environmentally and health-sensitive
- Safe
- Egalitarian access and participation
- Cost-efficient interactions



Source: city of Boston

- Continuous near-real-time localised data collection
- Linked and integrated data for integrated services
- Real-time intelligence and actionable information
- Services customised to context
- Public-private partnerships

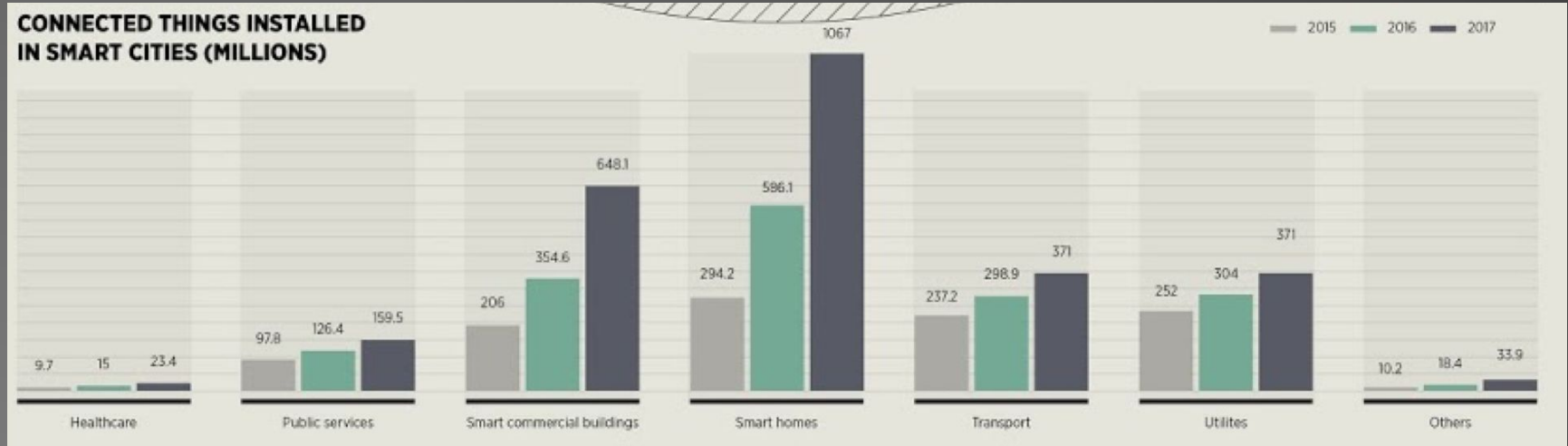
Adapted from P. Barnaghi, CityPulse

# My part in Standards for Smart Cities

- In 2006 I established the annual **International Semantic Sensor Networks** workshop series to investigate the role of semantics in sensed systems.
- In March 2009 I initiated the **W3C semantic sensor networks incubator group** to design a shared ontology, for semantic representation of sensors and sensor networks (**SSN**).
- In January the **Spatial Data on the Web Working Group** of the **OGC** and the **W3C** started work on ontologies and linked data

All the SDW deliverables are *critical* to smart cities.

# Growth of Smart Cities



Source: Gartner 2015 via raconteur.net

# CityPulse EU FP7: Smart Cities and Smart Data Analytics

Collection, publication, annotation and query of smart city datastreams, addressing quality concerns.

Adds social streams (Twitter) to cultural events, traffic, parking, pollution, weather,...

## KAT: Knowledge Acquisition Toolkit

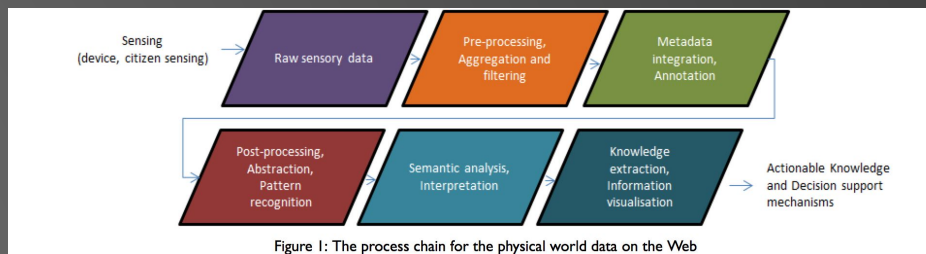
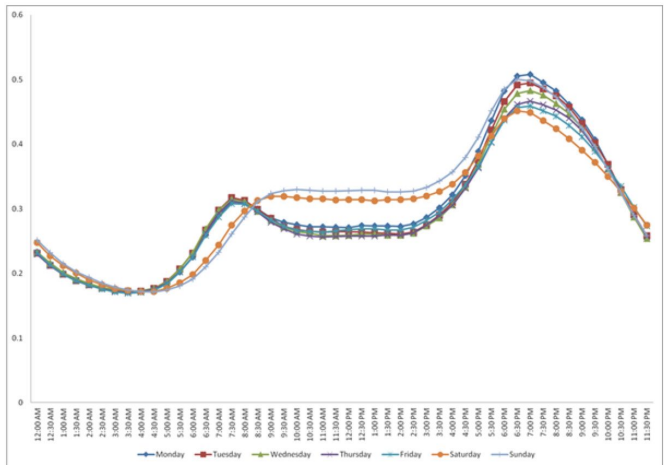


Figure 1: The process chain for the physical world data on the Web

Source: Barnaghi et al, IEEE Intelligent Systems 28(6)

# Australian Bureau of Statistics



source: data.gov.au

With the Australian Energy Market Operator (AEMO)

Aim to develop a strategic view of Electricity consumption in Australia to build a model for market planning and efficiency and government policy. e.g. consumption trends, dynamic charging models.

Using linked data methods for linking and analysing

- Smart-Grid Smart-City Customer Trial Data at unit record level
- Linked to meteorological data (now available as linked data, modelled with SSN, from Bureau of Meteorology)
- Socio-economic data (own data)

Contact: Ric Clarke (ABS)

# Australian Bureau of Statistics



With Bureau of Infrastructure, Transport and Regional Economics

Aim to understand pattern of movement of freight and utilisation of infrastructure for planning (roads, warehousing, fuel), productivity analysis, regional development

Using linked data methods for linking and analysing

- In-vehicle telematics from 10-20 freight haulers (SSN)
- Freight transactional data
- Regional socio-economic data

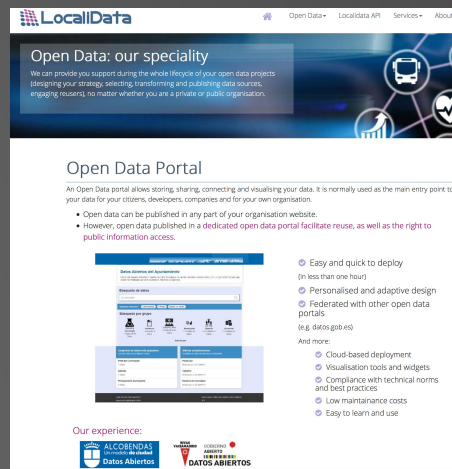
Contact: Ric Clarke (ABS)

# Spanish Smart Cities

Spanish standard UNE178301:2015 *Smart Cities. Open Data*, proposes SSN for air quality data.

- SSN used for Zaragoza open data pollen counts and air pollution.
- SSN used by transport authority in Madrid for travel card validations.

And a startup in Madrid  
Open data publishing for City Governments





# OGC/W3C Spatial Data on the Web

**69** people

**45** organisations

**50** use cases driving **56** requirements

**4** months since publishing draft UCR

**5** days since SSN kickoff

**9 days** to First Draft for Best Practice

- Use Cases and Requirements  
Consumer apps, crowdsourcing, discovery, IoT, e-science, provenance, remote sensing, govhack, agriculture, cultural heritage, transport, smart grids, taxation (intra-gov)...
- Best Practices for Spatial Data
- Semantic Sensor Networks
- Time (calendars and intervals)
- Coverage (time series and remote sensing)

# Semantic Sensor Networks

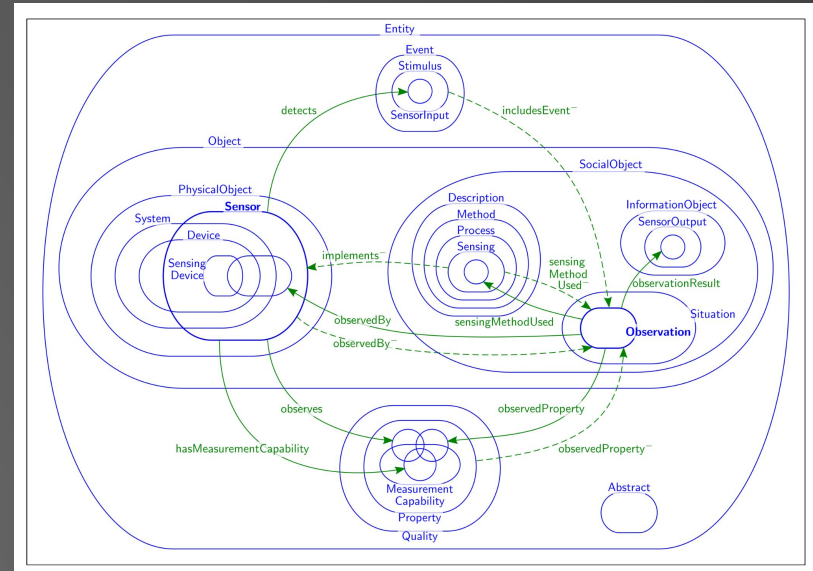
Not just a list of words...

OWL-DL ontology that is designed for use with machine-interpreted logical inference

Meaning is explicit in the conceptual model

Can be cut into little pieces for tiny devices and reconstructed for a holistic view

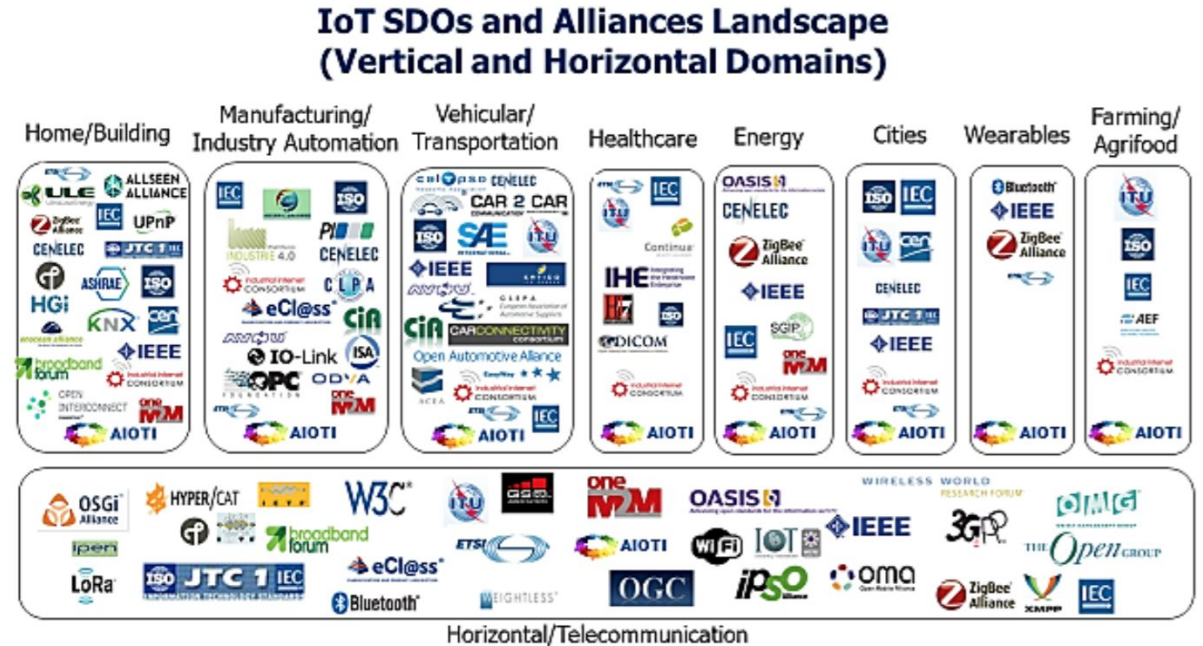
Widely used for linked open data, together with spatial, temporal and rule-based inference



source: Stapleton et al University of Brighton

# Standards and Architecture for the IoT

- EC Workshop on IoT Standardisation and Architecture
- IoT is developing rapidly through vertical silos
- Problems integrating sensors and devices within the Smart City infrastructure and vendor platforms due to lack of standardization.



Source: AIOTI WG3 (IoT Standardisation) – Release 2.0

# Australian Political Context

- Commonwealth responsibility for Government Digital Transformation and Open Data Policy has moved to PM&C.
- A new taskforce on innovation in PM&C will publish a new innovation agenda and an enlarged project on data policy to underpin Australia's economic future before Christmas.
- Commonwealth has launched a new program encouraging tech start-ups to use Government data to create new businesses: meeting of entrepreneurs in Sydney on Friday identified **business population or property, energy, transport and traffic, carbon**, as opportunities.

# What can Australian Government do?

- Demand innovation; assess the risk of \*not\* innovating

*As the largest single participant in the Australian economy, government has the duty to do more than role [sic] out variations on the same types of programs. Rather, it needs to do the harder job of stimulating and actively leading by example* Danny Davis, Latrobe Uni, The Drum, Thursday

- Support Standards Development
- Ramp up Australian Government Linked Data Working Group with project funding
- Build intelligent linksets of governed relations to/from/amongst governed data

# Thanks for listening!

Dr Kerry Taylor

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(I will be at ANU from Jan 2016)