# Semantic Sensor Network Ontology


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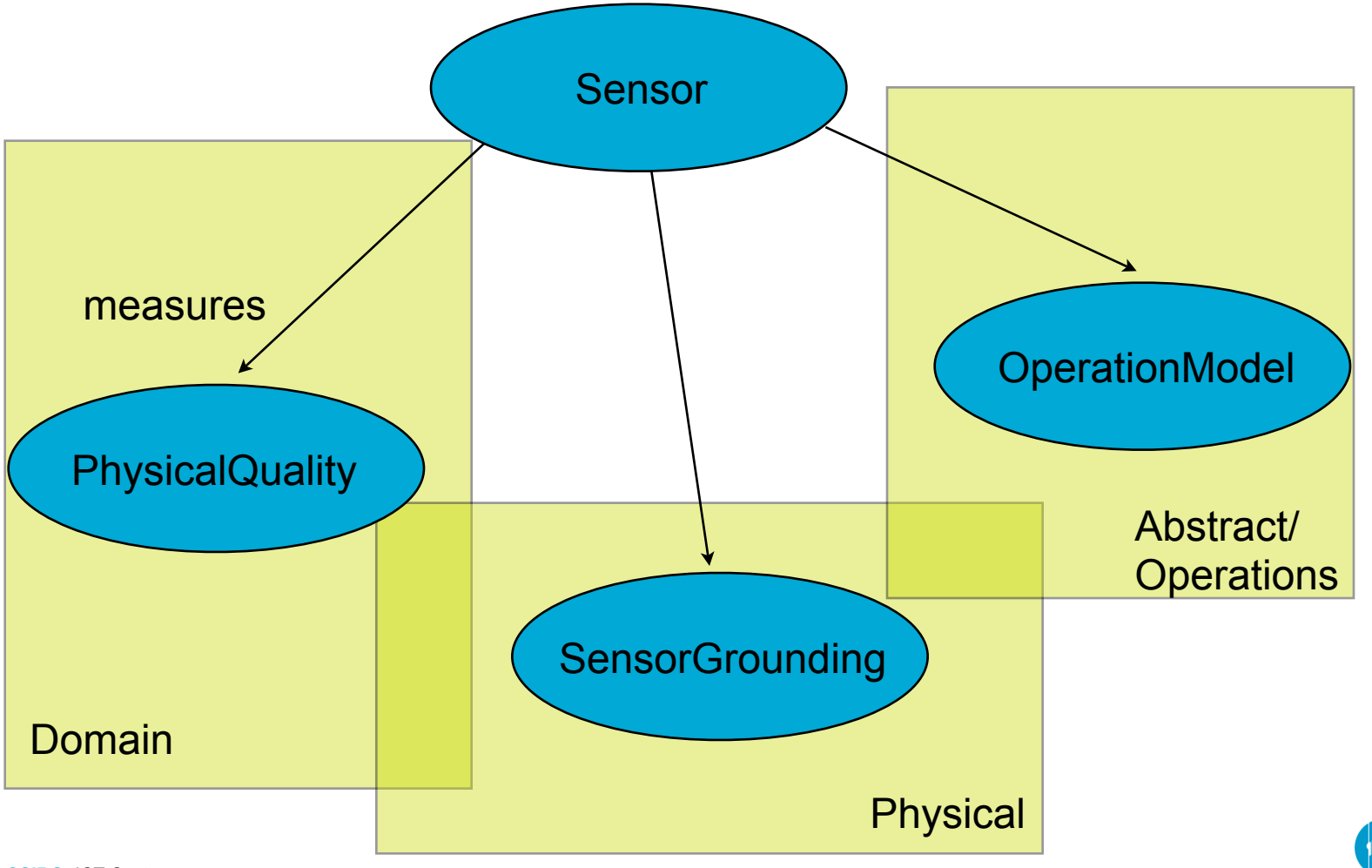
- An ontology about sensors could be
  - an ontology about sensing - all the concepts to do with sensing, all the types of sensing and what is sensed - like an upper ontology of sensing, or
  - an ontology in which to describe particular instances, or classes, of sensors - the functional, physical and measurement aspects - partly what's on the data sheet.
- Think a vocabulary for sensing Vs the MMI device ontology
- Both of course important and sensors in the latter can be automatically classified into the former.
- We are building one like the second option to
  - encode sensors, reason, task, plan, query, do provenance etc.
  - then linking in domain specific concepts, processing concepts, services, etc.
  - so the ontology needs to be general, extensible, 'plugable', reusable, etc.

# Ontology of Sensors

- Not realistically possible to encode concepts for every aspect of every possible sensor (some of it won't fit in in OWL anyway).
- So we've tried to build a core framework into which can be plugged a suitable domain ontology, suitable location ontology, a suitable uom ontology, etc.
- Has places for bits of, say, MathML, or whatever is appropriate, when describing, non-OWL concepts.
- Also want to have potential to capture multiple levels of detail or abstractions

- Currently has
  - sensors, features, operations, results, processes (simple and composite), inputs and outputs, accuracy, resolution, abstract and physical properties, metadata links, power, ...

# Structure


Sensor
measures
PhysicalQuality
OperationModel
Abstract/
Operations
SensorGrounding
Domain
Physical

# Grounding - Physical Aspects

- The SensorGrounding describes everything physical/tangible for the box that is the sensor and everything implementation/ concrete for its operations
  - location, mobility, range/field of sensing
  - platform
  - dimensions, materials, wires and connectors
  - calibrations
  - reference documentation and other metadata
  - power - source, consumption, batteries
  - operations - how to invoke, order of arguments, results specification
  - how to contact - network, radio, direct
- Operations are similar to OWL-S in that we separate the specification from the implementation details.

# Operations - Specification of operation processing and results

- A sensor may have a number of operations (described by OperationModel). Each can be described at an appropriate (or multiple) level of detail.
  - Result - specification in terms of inputs and conditions, accuracy, latency, resolution, effect (mathematical specification)
  - ResponseModel - the behaviour of the sensor in terms of physical stimulus and response
  - Process - description of process flow, more important when combining a number of sensors into a single sensing unit than for a single transducer, still can be important for provenance though.
- These are specifications of the processes, rather than individual runs.
- More than just single sensors is included by the definition of sensor - it can be extended to include all manner of larger macro instruments or models.

# Future work

- We can encode some important aspects of sensors, but lots more to do
- Accuracy
  - depends, for example, on magnitude of measurement and other environmental influences like temperature
  - not always as simple as ±3%, more often a function on influencing factors
  - question, is it enough to simply leave space for XML encoding the function? This doesn't then include any of the influencing factors in the ontology
- Response model, ranges, input/output, power ... are similar
- Units of measurement
  - need to decide on a system to record units against measurements
  - of course, want to keep the uom ontology separate
- More examples
- Use the ontology in our tool chain

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# Thank you

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