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Sensor Web Enablement - SWE

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Agenda

- Why do we need SWE?
- What are the required functions?
- SWE building blocks
 - Information model
 - Service model
- Scenario



Why do we need SWE?

Motivation

- Traditional services allowed to
 - request for maps (image)
 - Web Mapping Service
 - request for (binary) raster data
 - Web Coverage Service
 - request for vector data
 - Web Feature Service
- Lack of a generic framework for sensor data integration into SDIs

Objective

- Make all kind of sensors via the WWW
 - Discoverable
 - Accessible
 - Controllable
- Framework for a WWW-based sensor web
- Foundation for “plug-and-play” web-based sensor networks



What are the required functions?

Required functionality I

- Discovery
 - of sensor systems, observations and processes
- Determination
 - of sensor's capabilities and quality of measurements
- Access
 - to sensor parameters



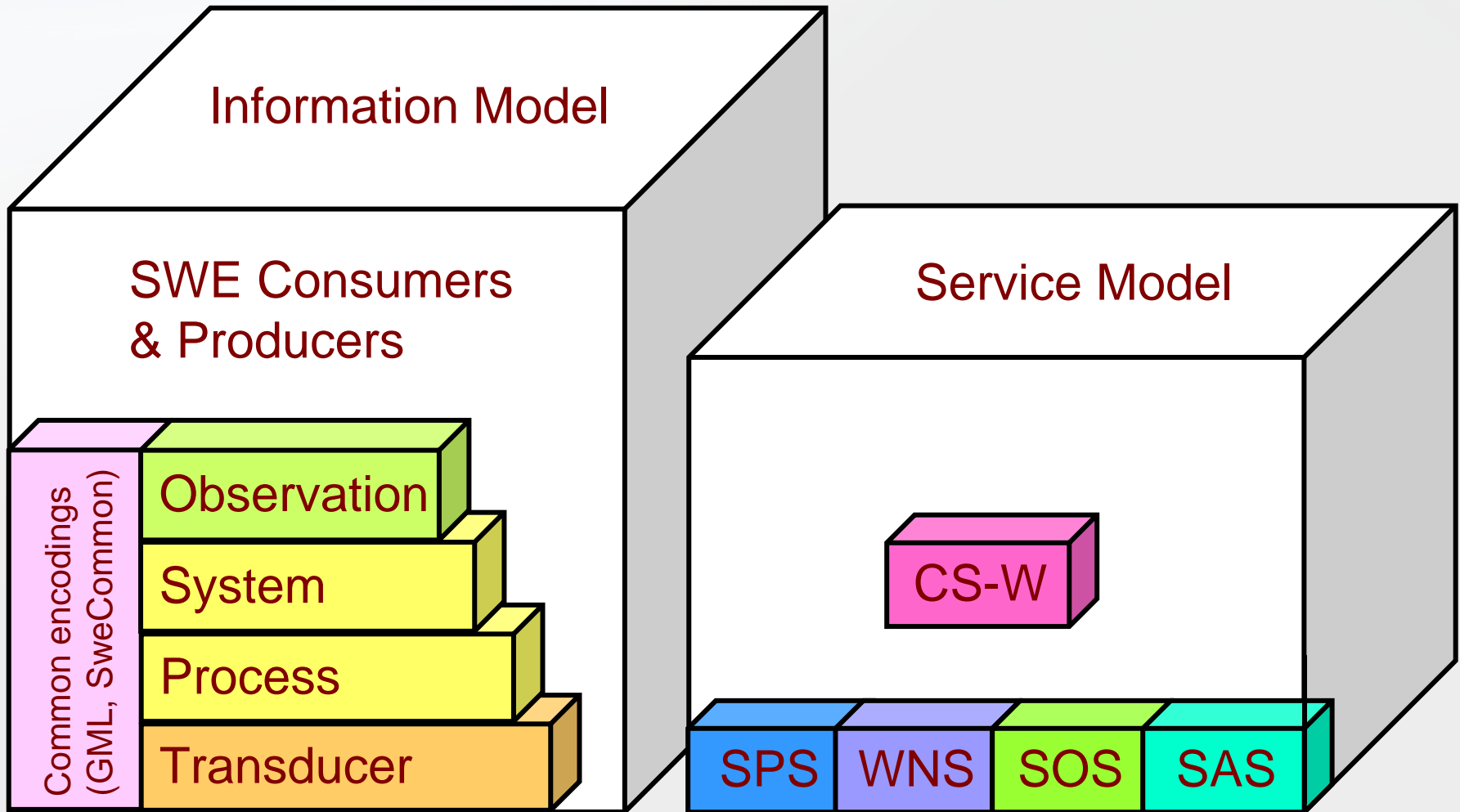
Required functionality II

- Retrieval
 - of real-time or time-series observations in standard encodings
- Tasking
 - of sensors to acquire observations of interest
- Subscription & publishing
 - to/of alerts to be issued by sensors



SWE building blocks

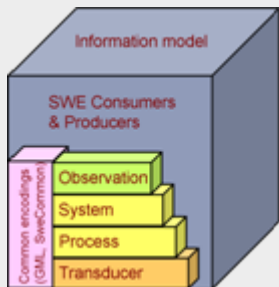
two models comprise the SWE architecture



Information Model – Transducer Markup Language

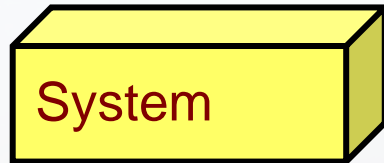


- Interface between the digital and the real world
- Actuator
 - Translates electronic signals to a phenomenon
- Sensor
 - Translates a phenomenon to data

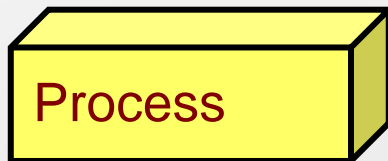


- link: <http://www.opengeospatial.org/standards/tml>

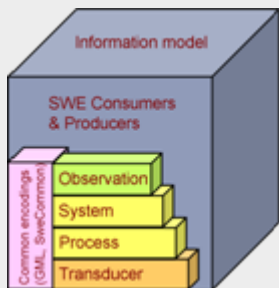
Information Model – Sensor Model Language



- Composite model of transducers and/or subsystems
- Enables the geo-location of comprising parts



- Transforms one or more inputs based on a given methodology to one or more outputs

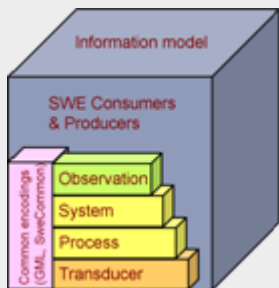


- link:
<http://www.opengeospatial.org/standards/sensorml>

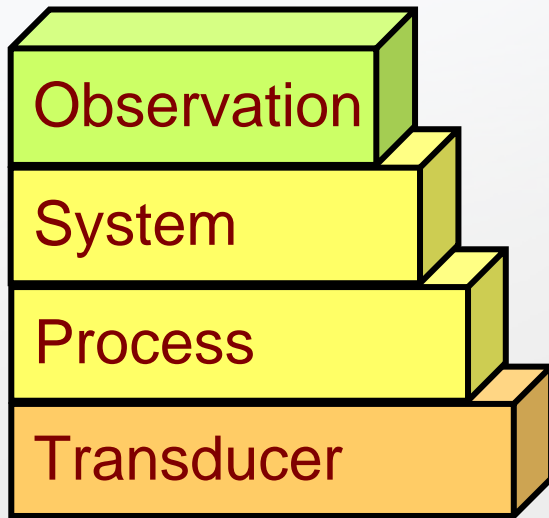
Information Model – Observation & Measurements



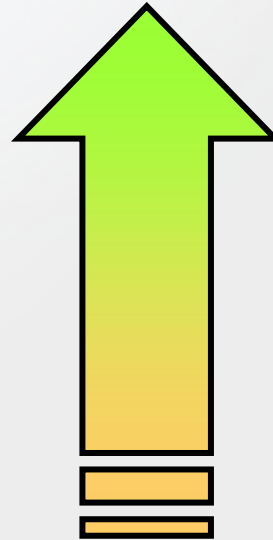
- Act of observing a phenomenon
- Produces an estimate of the value of the property
- Is an event
- Observable is a characteristic of a phenomenon subject to observation
- link: <http://www.opengeospatial.org/standards/om>



Information Model

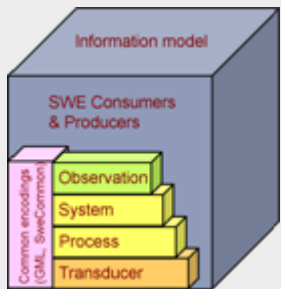


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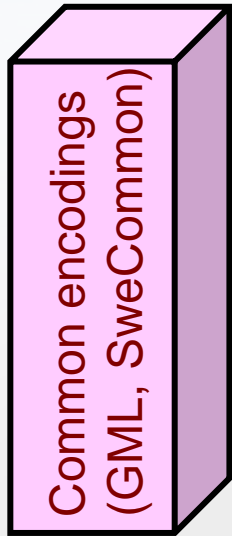


Increase of
information content

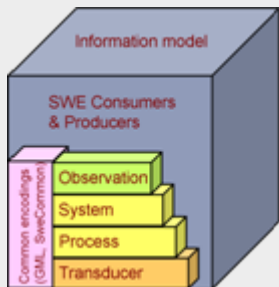
raw



Information Model – SweCommon



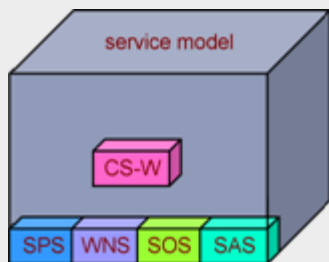
- SWE data stack uses common encodings
- SweCommon specifies
 - Description of data values
 - Encoding of data
 - Use of process inputs
 - Encoding of parameters
 - Observation results
- is based on GML
- link: specification contained in SensorML document



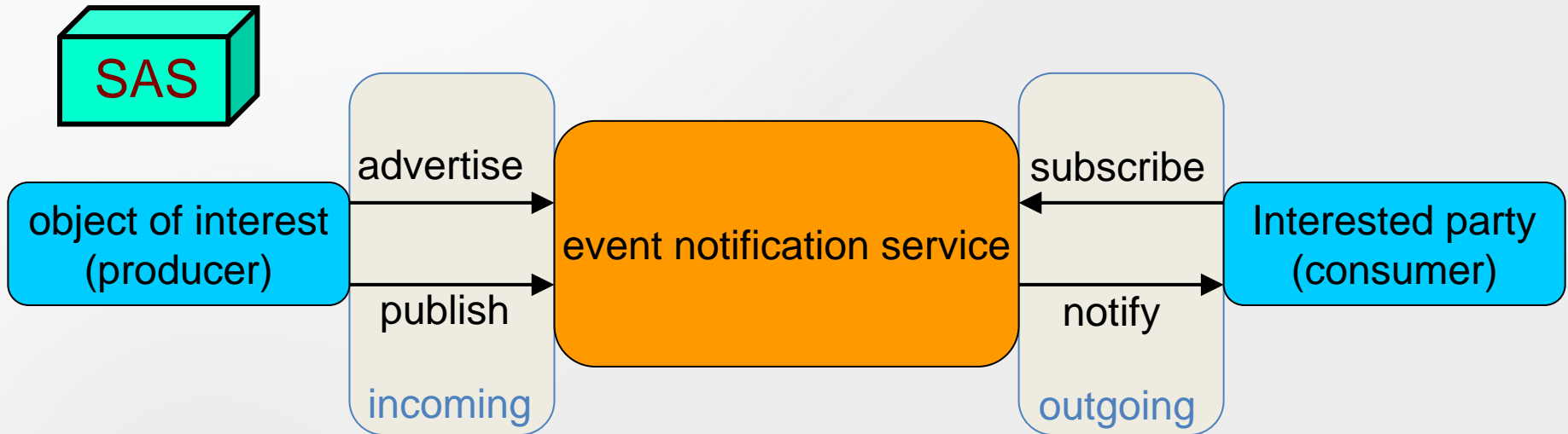
Service Model – Sensor Observation Service



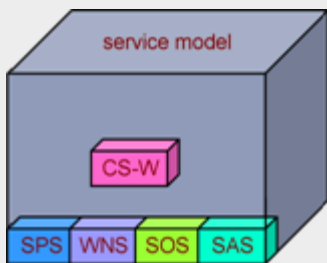
- Access to observation from sensors
 - Pull-based time-series
- Leverages
 - O&M for modeling sensor observations
 - SensorML for modeling sensor metadata
- Observation Offering
 - Analogous to WMS layer
 - Grouping of related observations
 - Geographical region
 - Sensor system
 - Phenomena being sensed
- link: <http://www.opengeospatial.org/standards/sos>



Service Model – Sensor Alert Service



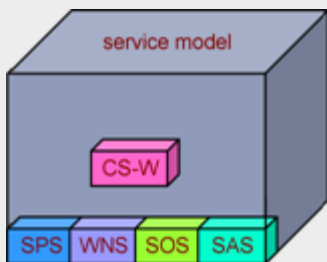
- Similar to event notification system
- Event-based
- Instead of regular request/response protocols such as HTTP, the XMPP protocol is used
- work in progress → not yet OGC 1.0 standard



Service Model – Sensor Planning Service



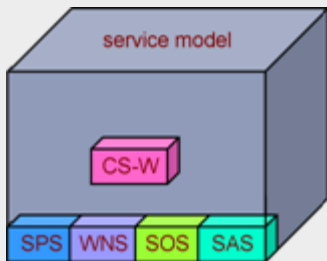
- Tasking of web resident sensors
 - Parameterization of:
 - sensors
 - simulations
 - Planning and executing of:
 - UAV
 - probe
 - robot
 - ...
- allows defining, checking, modifying and cancelling tasks
- does not archive the data itself → points to where the data can be accessed
- asynchronous communication with task client via WNS
- link: <http://www.opengeospatial.org/standards/sps>



Service Model – Web Notification Service

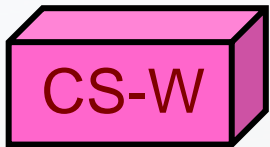


- Long-term actions require asynchronous communications between a user and corresponding service
- Protocol transducer HTTP →
 - E-mail
 - SMS
 - Instant message
 - Phone call
 - ...

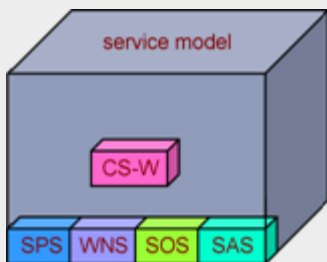


- work in progress → not yet OGC 1.0 standard

Service Model – Catalog Service Web



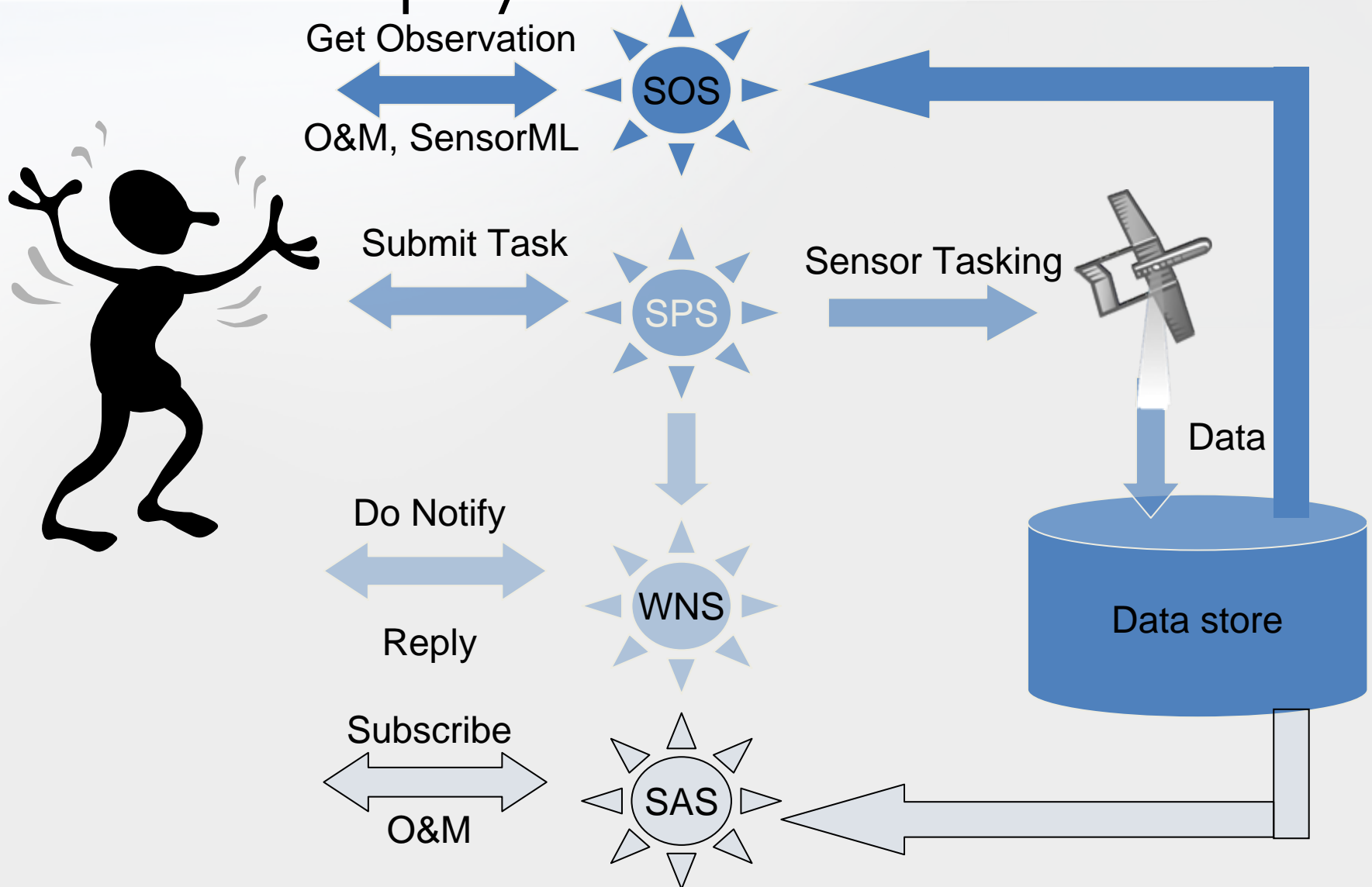
- Catalog for discovery of
 - Sensors
 - Phenomena
 - Services
 - Units of measure
- Definition of profiles is an open research topic → work in progress





Scenario

SWE - interplay



SWE – the big picture

