# OWS-3 SWE
# OGC Web Services, Phase 3
# Sensor Web Enablement

Presentation to SensorNet workshop at Fort Bragg

George Percivall
Executive Director, Interoperability Architecture
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percivall@opengeospatial.org

# What is OGC?

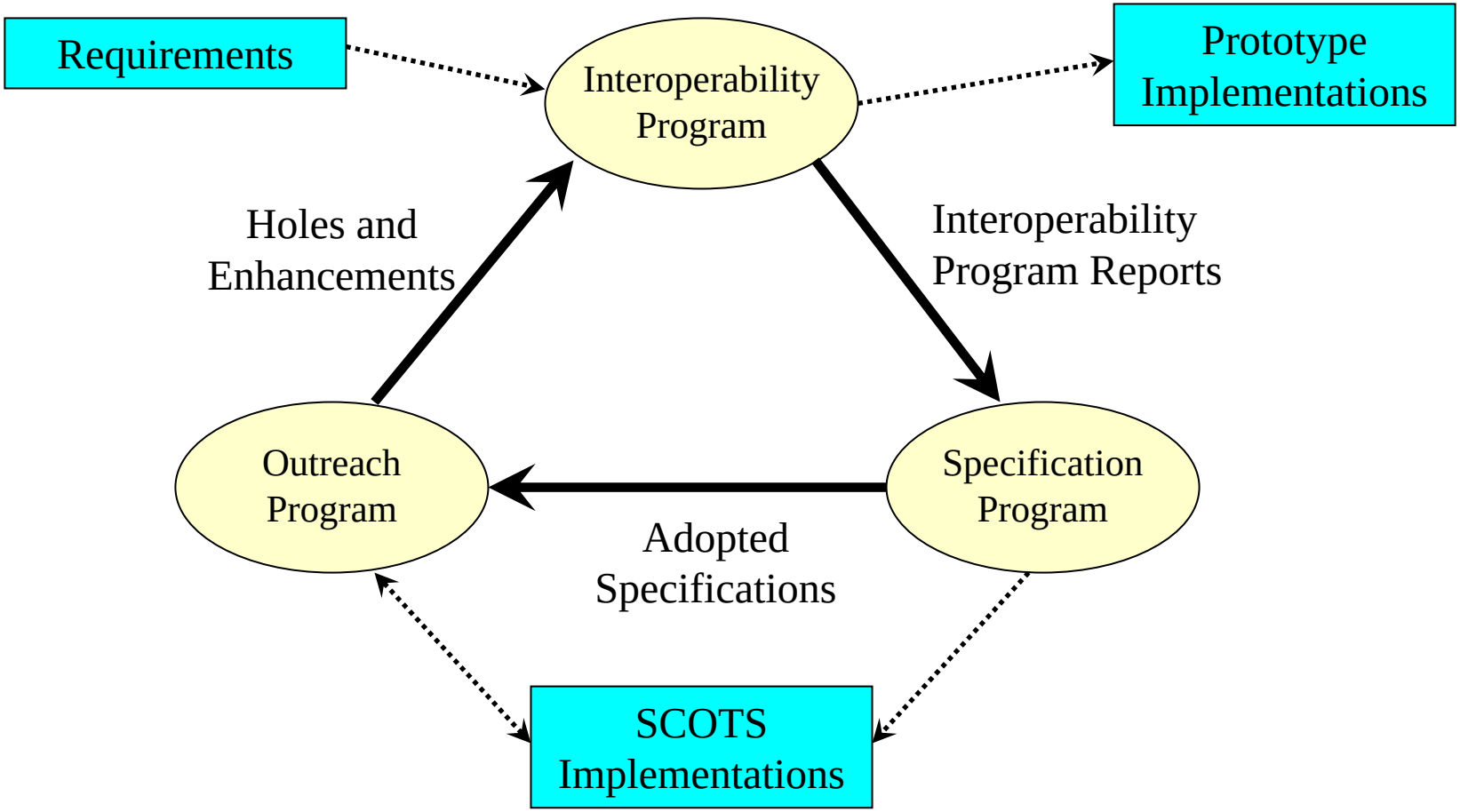
- **Open Geospatial Consortium (OGC)**
  - Not-for-profit, international voluntary consensus standards organization
  - Industry, government, and university members
  - Founded in 1994, with 8 Charter members

## Mission

***To lead the global development, promotion and harmonization of open standards and architectures that enable the integration of geospatial data and services into user applications and advance the formation of related market opportunities.***

# Iterative Development

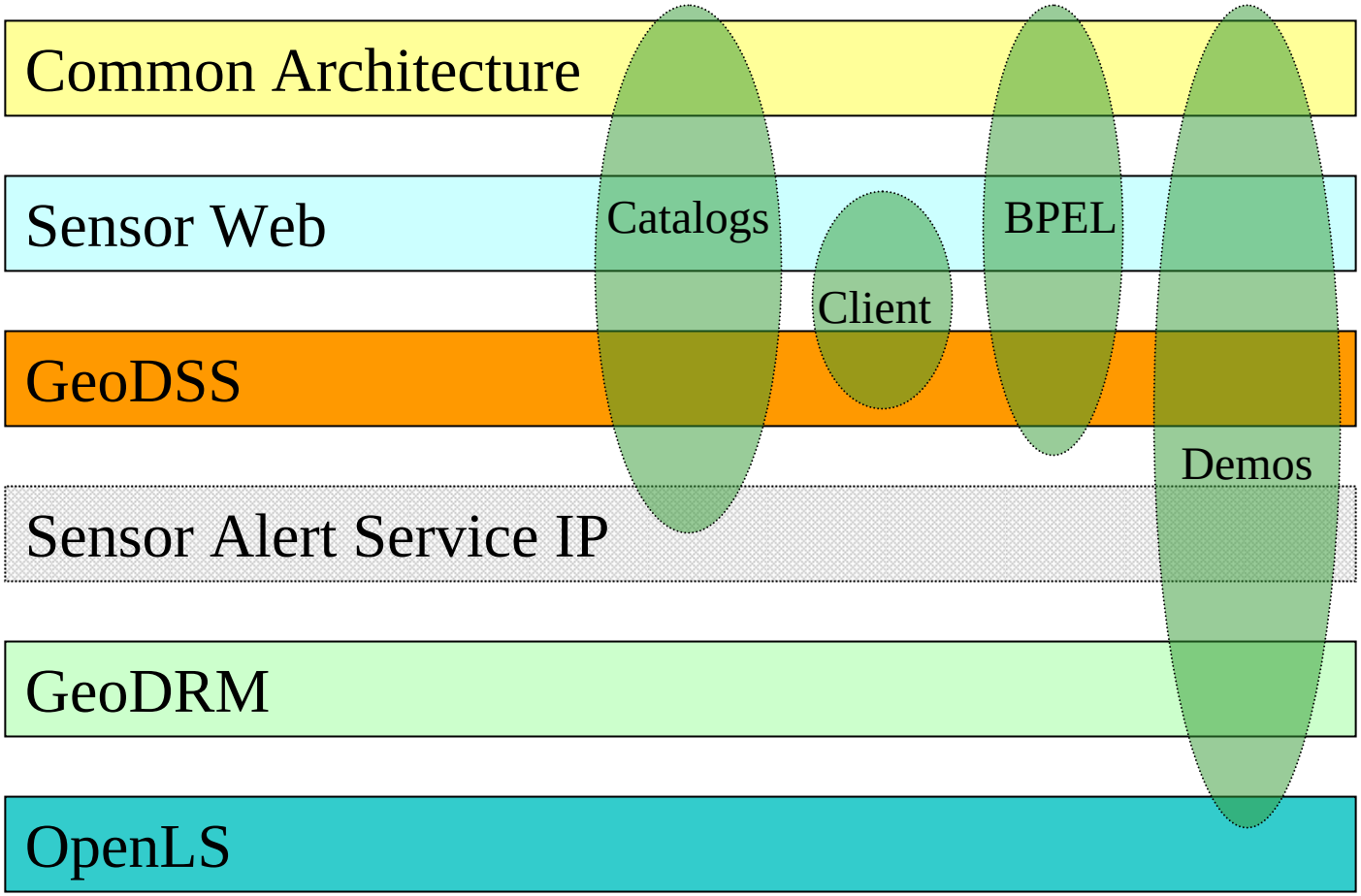
## Yielding Tested Specifications



# OWS-3 Objective

- OWS-3 participants will work collaboratively to extend the OGC baseline to enable an interoperable, multi-source decision support environment

# OWS-3 Organization



# OWS-3 Schedule

- Call for Sponsors---------- November 2004
- RFQ
  - Released ---------- February 11, 2005
  - Responses ---------- March 14, 2005
- Kickoff Meeting ---------- April 19-21, 2005
- Development and Testing - 6 months
- OWS-3 Demo ---------- October 2005
  - New York Demo ---------- Oct/Nov 2005
  - SWE Demo ---------- Oct/Nov 2005
- Reports to OGC TC ---------- November 2005

# OWS-3 Sponsors

- BAE Systems
- Ionic Enterprise
- GeoConnections (Canada)
- Lockheed Martin
- MAGIC Services Initiative
- National Aeronautic and Space Administration (NASA)
- National Technology Alliance (NTA)
- Oak Ridge National Laboratory (ORNL)
- NAVTEQ
- Questerra
- US Geological Survey (USGS)

*and other organizations.*

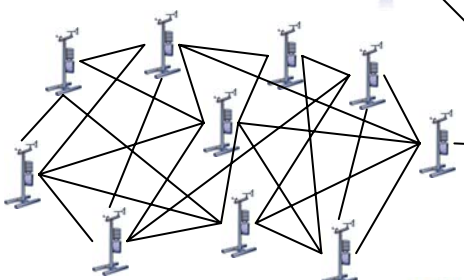
# SWE Operations Concept

**Constellations of heterogeneous sensors**

**Vast set of users and applications**

Satellite

Airborne



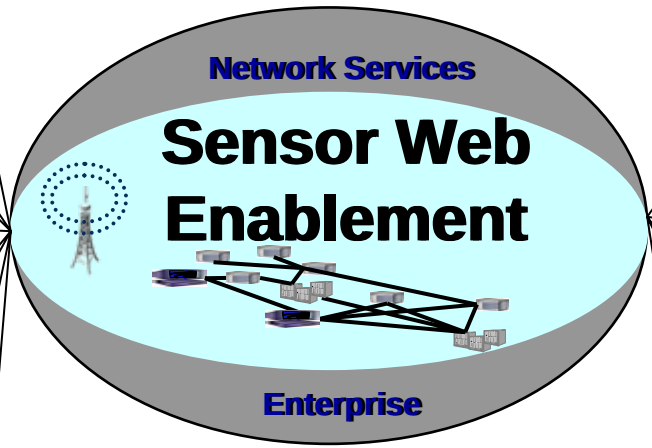
Weather

Surveillance

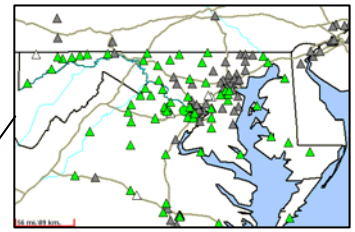
Chemical Detectors

Biological Detectors

Sea State




- Distributed self-describing sensors and related services
- Link sensors to network and network-centric applications and services
- Common XML encodings, information models, and metadata for sensors and observations
- Access observation data for value added processing and decision support applications
- Users on exploitation workstations, web browsers, and mobile devices



OGC

*Helping the World to Communicate Geographically*

# OWS-3 SWE Objectives

1. Integrate multiple, independent sensor and sensor support systems, allowing users to reach-out, access and use any sensor and any system.
   a) Quickly discover sensors and sensor data (secure or public) that can meet the users needs – location, observables, quality, ability to task
   b) Task sensors, when possible, to meet the users' specific needs
   c) Readily access sensor observations in a common manner, and in a form specific to the users' needs

2. Enable a standards-based "plug-and-play" sensor framework based on existing specifications (including integration of IEEE 1451 and TransducerML into the SWE framework).

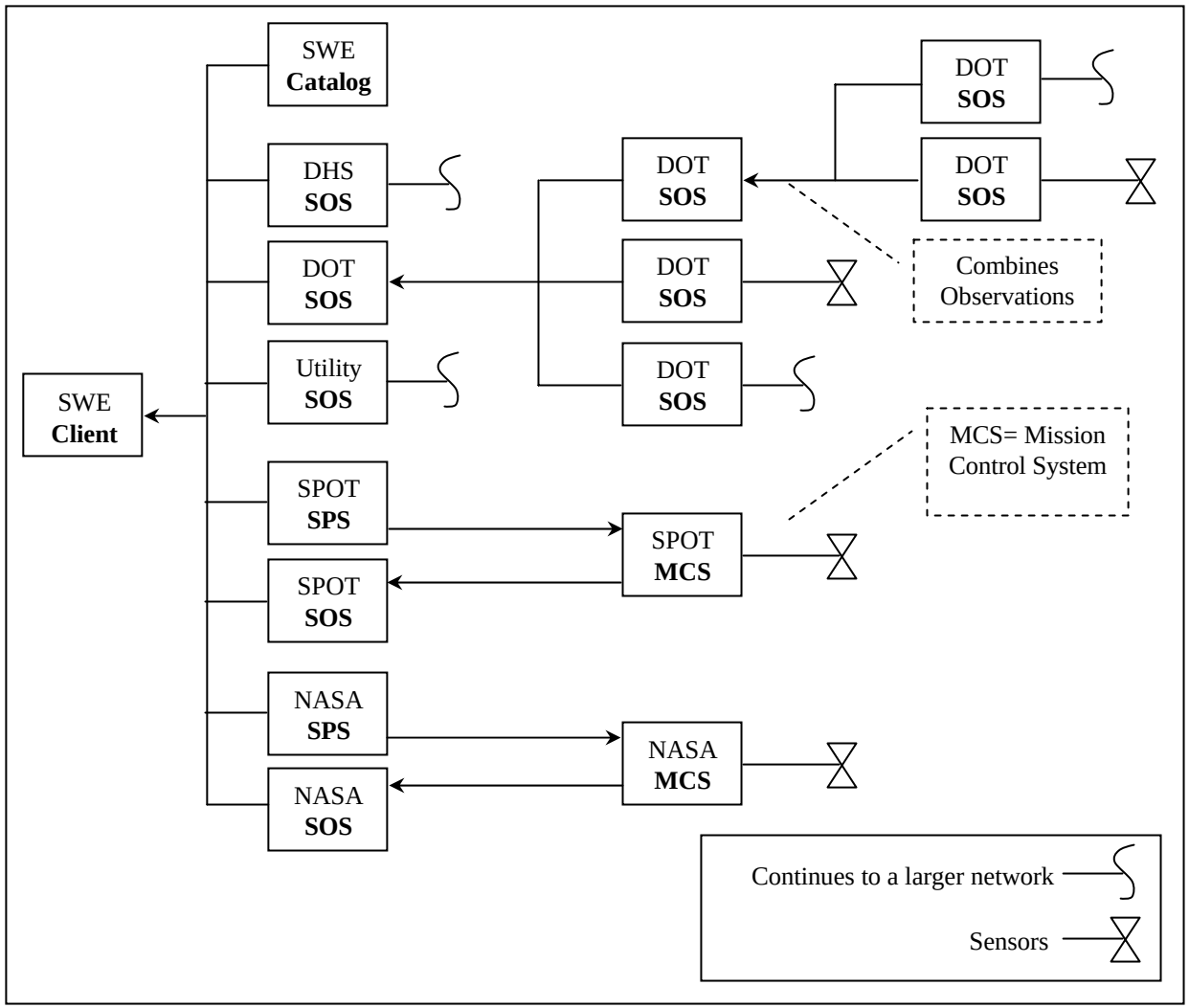
# SWE Components (for OWS-3)

- Information Model and Schema Development
- Sensor Planning Service
- Sensor Observation Service
- SWE Client
- SWE Airborne Demonstration

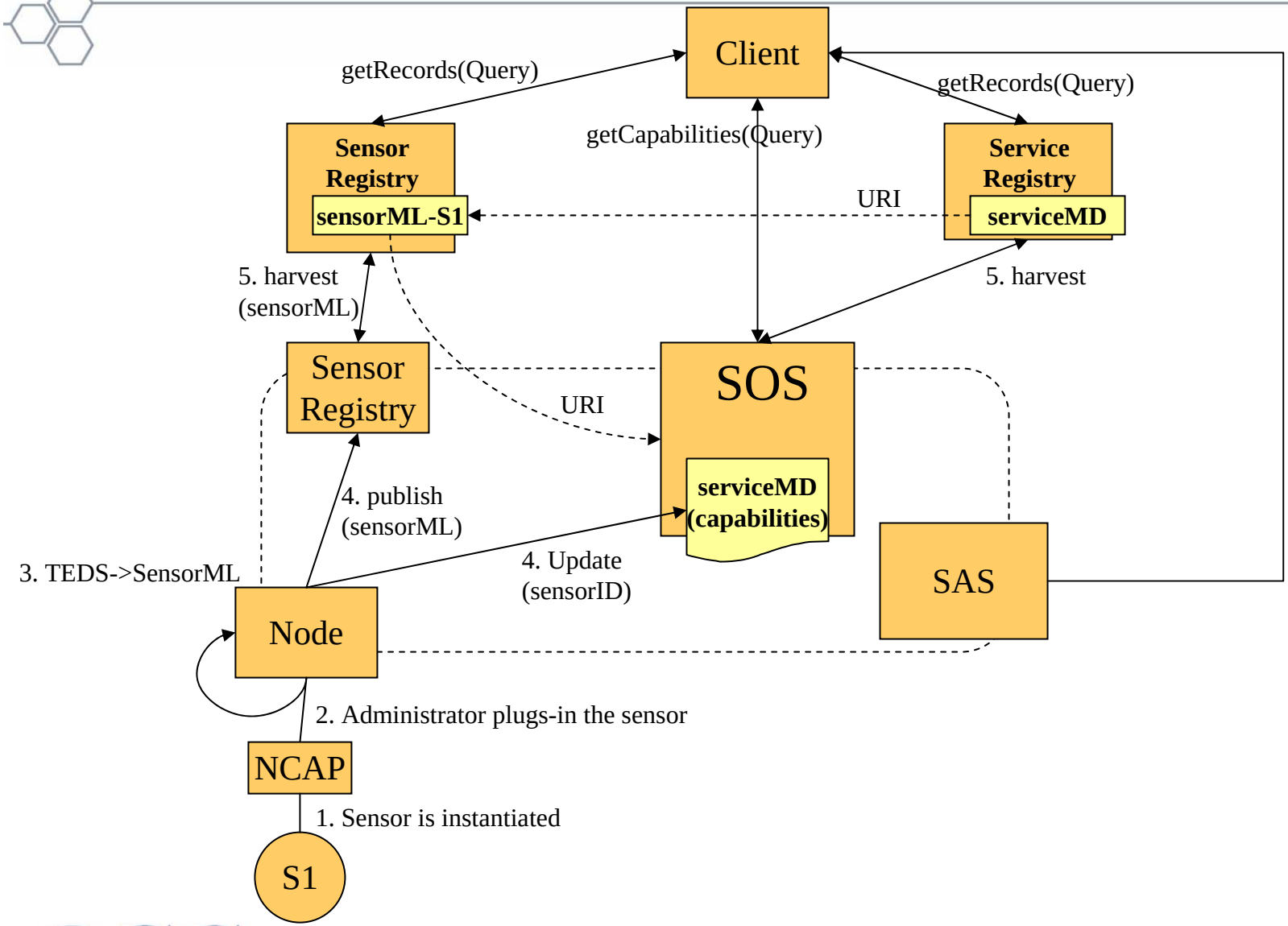
# SWE Participants and Workitems

- **SWE Information Engineering**
  - 3eTI (IEEE 1451)
  - CSIRO (GML, O&M, ISO 19130)
  - IRIS (TML)
  - Univ. Alabama Huntsville (UAH), (SensorML, ISO 19130)
  - Univ. Muenster IFGI (SPS messages)
  - ESA/Spot: in-kind
  - NGA: in-kind
  - NASA Ames: in-kind
- **Sensor Planning Service (SPS)**
  - Univ. Muenster IFGI
  - NASA Ames: in-kind
  - Spot/ESA: in-kind
- **Sensor Observation Service (SOS)**
  - 3eTI
  - IRIS
  - UAH
- **SWE Client**
  - York Univ./GeoTango
  - Univ. Alabama Huntsville (UAH)
- **SWE Demonstration**
  - 3eTI
  - UAH
  - IRIS
  - NASA Ames: in-kind
  - ESA/Spot: in-kind
  - SAS IE coordination

# SWE Components



# Example: Plug New Sensor into Network

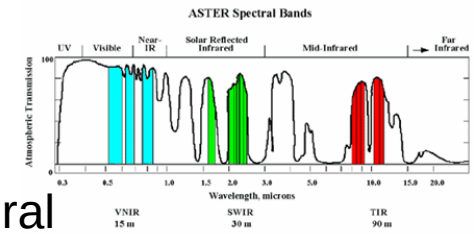


# SWE Information Model Elements

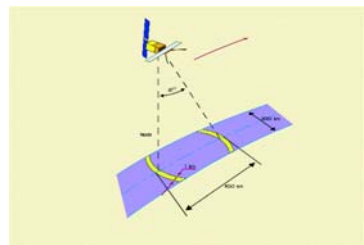
- Common Observation Model elements:
  - Sensor Markup Language (SensorML)
  - Transducer Markup Language (TML)
  - IEEE 1451 TEDS
  - ISO 19130 – Sensor and Data Model for Imagery and Gridded Data
  - Observation and Measurements (O&M)
- SWE Registry Models
  - Service Descriptions
  - Sensor Descriptions
  - Observation Dictionary
  - Units of Measure Dictionary
  - Tasking Dictionary
- Sensor Tasking Messages (STM)
  - Requirements Set
  - Target Set
  - Platform & Sensor Set
  - Special Collection Set
  - Exploitation Information Set
  - Collection Association Set

# Sensor Markup Language (SensorML) Elements

- Observation characteristics
  - Physical properties measured (e.g. radiometry, temperature, concentration, etc.)
  - Quality characteristics (e.g. accuracy, precision)
  - Response characteristics (e.g. spectral curve, temporal response, etc.)




- Geometry Characteristics
  - Size, shape, spatial weight function (e.g. point spread function) of individual samples
  - Geometric and temporal characteristics of sample collections (e.g. scans or arrays)



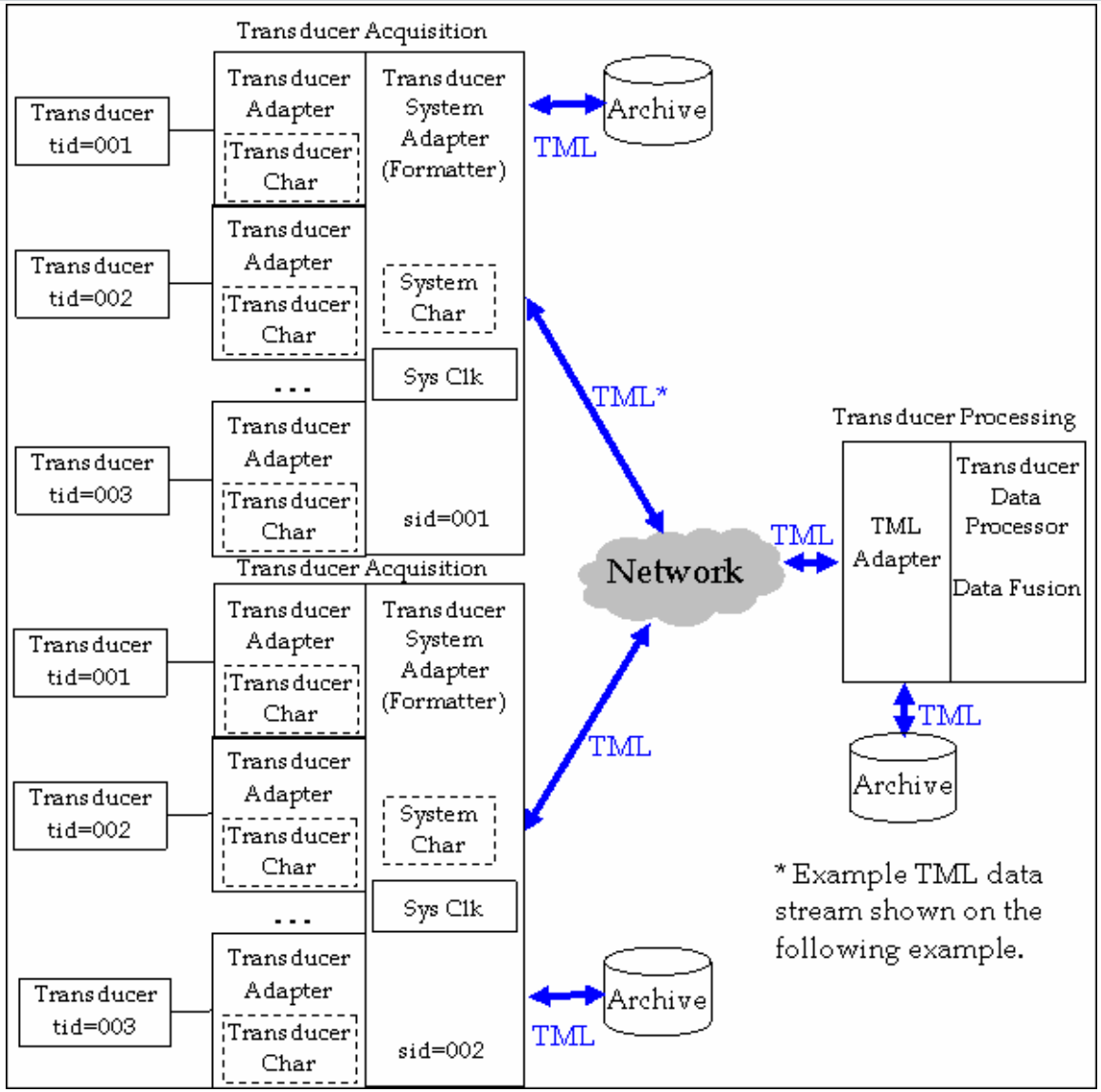
- Description and Documentation
  - Overall information about the sensor
  - History and reference information supporting the SensorML document

# Why SensorML?

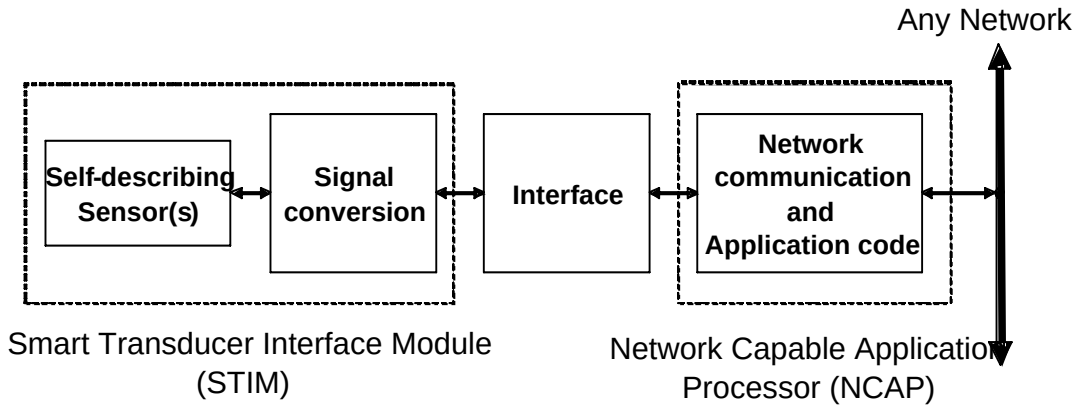
- Supports discovery of sensors and sensor services
- Allows for geolocation and processing without a priori knowledge of sensor (and without need for sensor-specific software)
- Provides the means by which sensors make themselves known on web and establish communication
- Provides qualification of observations (e.g. sensitivity, resolution, accuracy, etc.)
- Enables “plug-n-play” of sensors
- Enables intelligent, autonomous sensor web and real-time streaming of observations direct from sensors to client
- Supports definition of processing chains that can act or have acted on sensor products

# TransducerML

- A language for exchanging sensor data and metadata between a sensor system and a sensor processor based on XML.
- Sensor data requires little or no pre-processing.
- Metadata describes how to process associated data from any sensor.
- Sensor agnostic, uses a common model for describing all sensors.



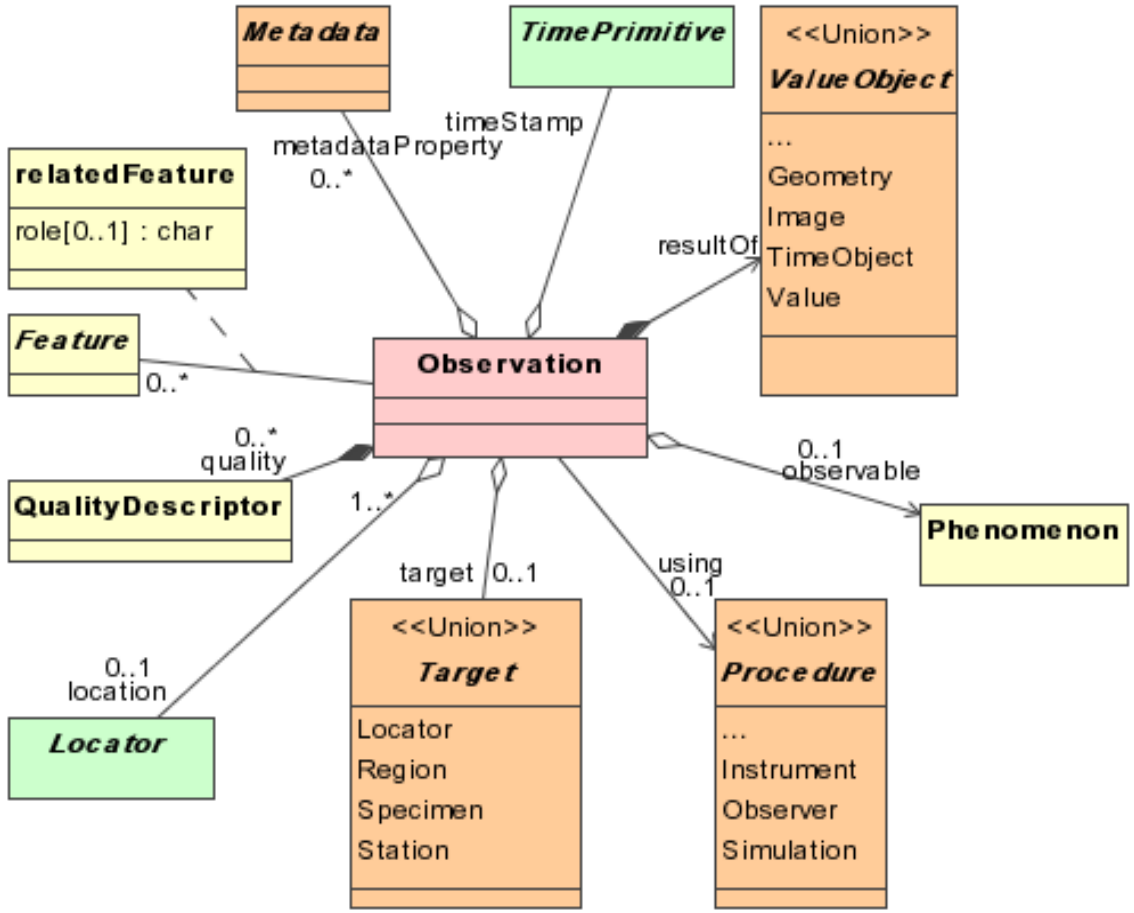
# IEEE 1451 Integrated Network Sensor Model



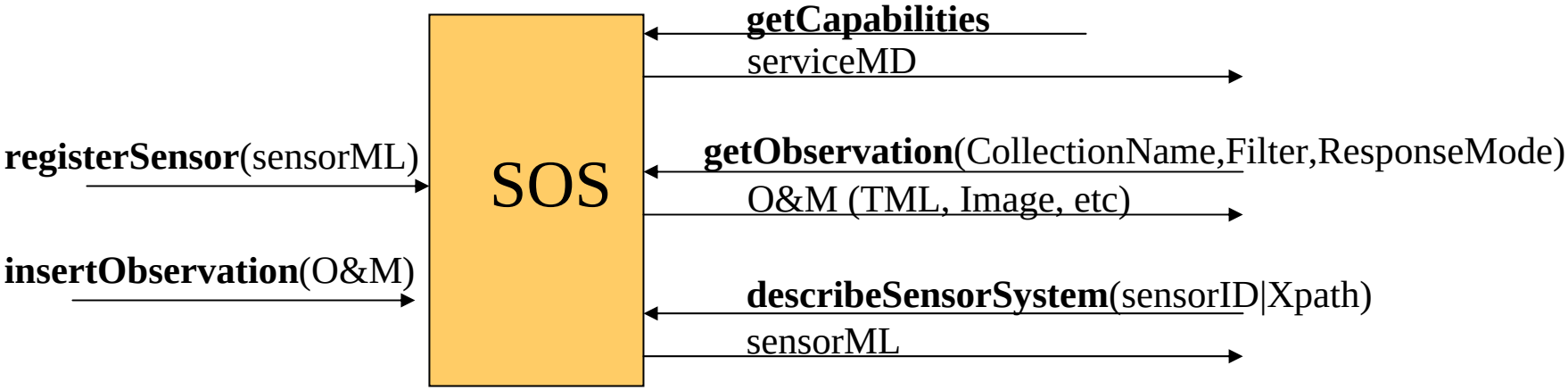

- **Transducer Electronic Data Sheet (TEDS)**: describes a transducer; stored in some form of electrically readable memory
- **Smart Transducer Interface Module (STIM)**: contains TEDS, logic to implement the transducer interface, the transducer(s) and any signal conversion or signal conditioning.
- **Network Capable Application Processor (NCAP):** performs network communications, STIM communications, data conversion functions, application functions, provides power to the STIM circuitry, may contain a controller and the interface to the broader network that may support other nodes, and from the TEDS, it knows how fast it can communicate with a STIM, how many channels a STIM contains, the data format of each STIM's transducer, what physical units are being measured, and how to convert the raw readings into corrected SI units, etc.

# Observations & Measurements

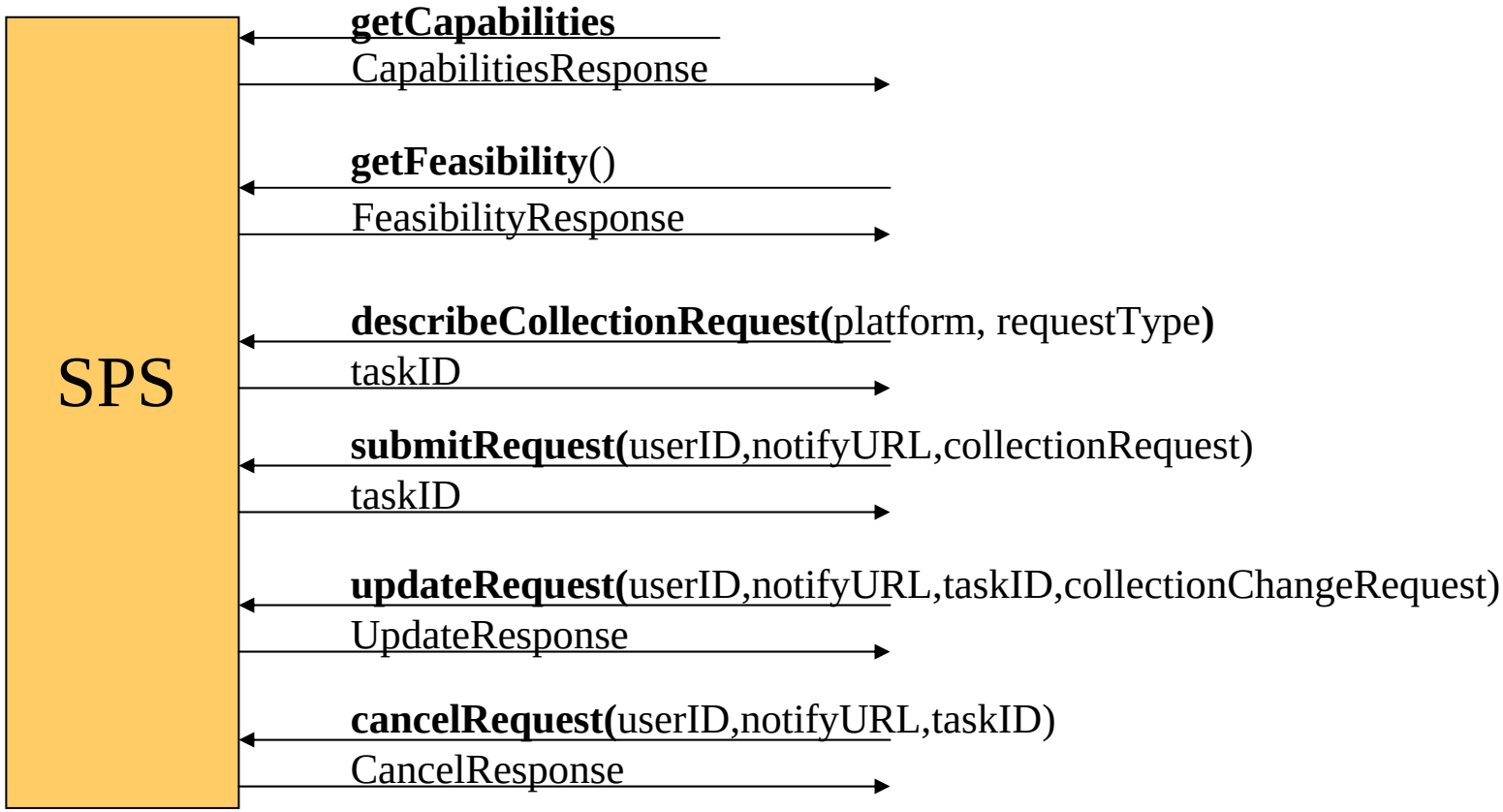
- Observation → Act of estimating a value of a phenomenon, involving a procedure, instrument or algorithm
- SWE has an information model for Observations
- Consistent with Measurement Theory
- Consistent with OGC GML and Feature Model



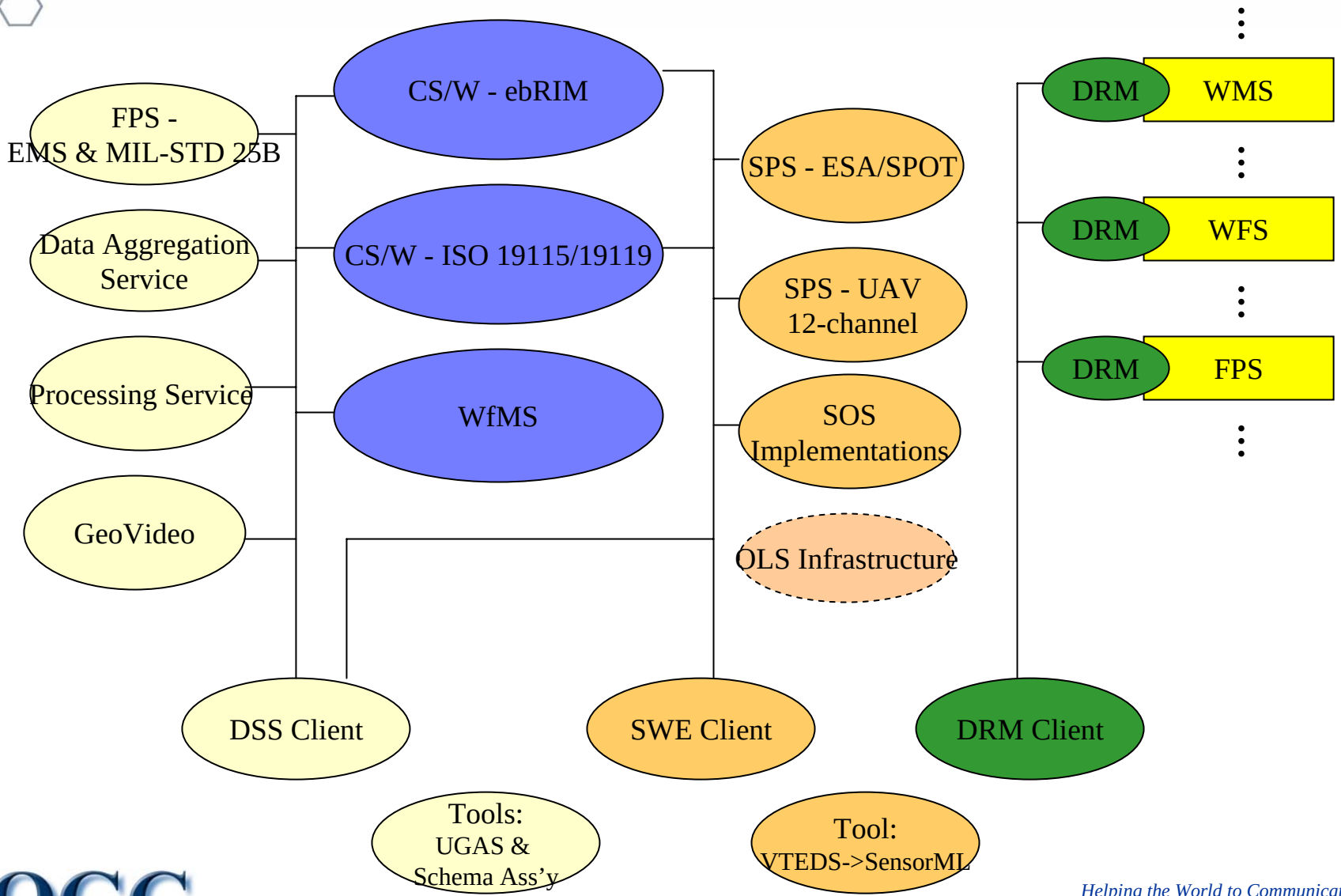
# Sensor Observation Service (SOS) Operations



# Sensor Planning Service (SPS) Operations



# OWS-3 Components and Connections



# OWS-3 Demonstrations

- OWS-3 demo
  - October, 2005, 6 months after start of work
  - Washington, DC location
  - Comprehensive demo of all clients and functionalities
  - Scenario based on wildfire breach of industrial storage facility and possible release of toxic or radiological agents
- GeoDSS GUARD Demo
  - Supported by NYC TV Channel 13 Studios
  - Focus on first responders, in an urban environment supporting GPS and wireless communications/connectivity
  - ~ 1 month after OWS-3 Demo
- SWE Airborne Demo
  - Date and location to be confirmed
  - Content detail and logistics TBD
  - ~ 1 month after OWS-3 Demo

# Questions?