Representación de ficheros SensorML & O&M en clientes Android atacando una base de datos XML para datos oceanográficos

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1. Introduction.
2. SWE Implementation.
3. O&M Files.
4. SOS Implementation.
6. Future work.
1. UTM.
2. Working framework.
3. Data flux.
5. Exploitation scenarios.
UTM
Marine Technology Unit

The Marine Technology Unit (UTM) belongs to the Department of Natural Resources of the Spanish Research Council (CSIC).
UTM Tasks

• Maintenance of scientific facilities on vessels and Antarctic stations.
• Technical assistance for expeditions.
• Maintenance, calibration and operating of technical and scientific equipment.
• Acquisition and filing of oceanographic data.
• Technological development in the marine and polar fields.
Research vessels are complex data acquisition systems, consisting of a large number of instruments and sensors producing complex observations for many different disciplines.

DATA and METADATA
Data flux

From the vessels to the data centers: a “road with interruptions”
Goals

1. To describe a **multidisciplinary** and **complex mobile** sensor system.
2. To be easily **integrated** with the onboard data acquisition systems.
3. To use the complex but incomplete most used **vocabularies** in marine disciplines.
4. To provide points of contact with the **data** and **metadata** services at the **Data Centers**.
5. To manage the **changes** in instrument set-up over the time.
1. What we want.
2. SensorML and Sml:history.
SWE Implementation - What
Sml:history can be used to capture any other event related with the vessel, as the “Eurofleets Events” reports. This history is also represented as a separated file and referenced through xlink:href.
SWE Layer – Global View

Independent SensorML files.

"underway data"

xlink:href

At History
1. Navigation system.
2. Types of observations and O&M codification.
   1. Survey.
   2. Time interval.
   3. Instant observation.
3. Om:result
SWE Layer - O&M Files

O&M is used to code the observations produced by every “underway” instruments.
SWE Layer - O&M Files

Three types of observations and SamplingFeature:

1. Time interval.
2. Specific instant.
3. Specific cruise or survey.
SWE Layer - O&M Codification

Om:featureOfInterest:
"Physical space where the vessel is at specific instant or during the track".
SWE Layer - O&M Files

http://www.utm.csic.es/SensorWeb/Descriptions/Features/

- Survey (SamplingFeature):
  Link to the navigation file of the survey.

```xml
<sams:SF_SpatialSamplingFeature xsi:schemaLocation="http://www.opengis.net/samplingSpatial/2.0 http://schemas.opengis.net/samplingfeature/2.0.xsd">
  <gml:metaDataProperty/>
  <gml:description>Vessel Track</gml:description>
  <gml:boundedBy>
    <gml:Envelope srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
      <gml:lowerCorner>-30.711 134.196</gml:lowerCorner>
      <gml:upperCorner>-30.702 134.205</gml:upperCorner>
    </gml:Envelope>
  </gml:boundedBy>
</sams:SF_SpatialSamplingFeature>
```
SWE Layer - O&M Files

- Time Interval (SamplingFeature):
  Track of the vessel is directly coded in GML.

```xml
<sams:SF_SpatialSamplingFeature xsi:schemaLocation="http://www.opengis.net/samplingSpatial/2.0 http://schemas.opengis.net/samplingSpatial/2.0.xsd">
  <gml:metaDataProperty/>
  <gml:description>Vessel Track</gml:description>
  <gml:boundedBy>
    <gml:Envelope srsName="http://www.opengis.net/def/crs/epsg/4326">
      <gml:lowerCorner>-30.711 134.196</gml:lowerCorner>
      <gml:upperCorner>-30.702 134.205</gml:upperCorner>
    </gml:Envelope>
  </gml:boundedBy>
  <sam:Sampler xlink:href="http://www.opengis.net/def/samplingFeatureType/OGC-OM/2.0/SF_SamplingCurve"/>
  <sam:sampledFeature xlink:title="Seawater volume measured along vessel track"/>
  <sam:relatedObservation xlink:href="SARMIENTO_TERMOSALINOMETER_FLUOROMETER_2012-11-02-00-00-00_2012-11-03-00-00-00"/>
  <sams:shape>
    <gml:LineString gml:id="pr1_ls1" srsName="urn:ogc:def:crs:EPSG::4326">
      <gml:pos>-30.711 134.205</gml:pos>
      <gml:pos>-30.710 134.204</gml:pos>
      <gml:pos>-30.709 134.203</gml:pos>
      <gml:pos>-30.708 134.201</gml:pos>
      <gml:pos>-30.706 134.196</gml:pos>
      <gml:pos>-30.703 134.197</gml:pos>
      <gml:pos>-30.702 134.199</gml:pos>
    </gml:LineString>
  </sams:shape>
</sams:SF_SpatialSamplingFeature>
```
• Instant observation (SamplingFeature):
  Track of the vessel directly coded in GML.

```xml
<sams:SF_SpatialSamplingFeature xsi:schemaLocation="http://www.opengis.net/samplingSpatial/2.0 http://schemas gml:id="SARMIENTO_sf_2012-11-02-00-00-00">  <gml:metaDataProperty/>
  <gml:description>Vessel Location</gml:description>
  <sam:type xlink:href="http://www.opengis.net/def/samplingFeatureType/OGC-OM/2.0/SF_SamplingPoint"/>
  <sam:sampledFeature xlink:title="Seawater volume measured at the vessel location"/>
  <sam:relatedObservation xlink:href="SARMIENTO_TERMOSALINOMETER_FLUOROMETER_2012-11-02-00-00-00"/>
  <sams:shape>
    <gml:Point gml:id="vessel_location_1" srsName="urn:ogc:def:crs:EPSG::4326">
      <gml:pos>-30.711 134.205</gml:pos>
    </gml:Point>
  </sams:shape>
</sams:SF_SpatialSamplingFeature>
```
SWE Layer - O&M Result

- `<om:featureOfInterest>`
  - `<gml:DynamicFeature gml:id="survey">`
    `--
      `The data source should be expressed as a <gml:history> element`
    `-->
    `<gml:DynamicFeature>`
  `</om:featureOfInterest>`
`<om:OM_Observation>`
1. Reasons.
2. What we want.
4. XML DB.
SOS implementation

Reasons:

- SOS 2.0 standard interfaces.
- Restrictions on the structure and contents of the SensorML files that can be registered.

Example:
In SOS 1.0 52ºN implementation a gml:MetaDataProperty body with an offering tag must be included in every output description.

- To use an existing data base structure as the main data storage for SOS.

The application was not meant to be an all-purpose SOS implementation.
SOS implementation

- getCapabilities
- getObservation
- describeSensor

O&M documents (instant, time interval and survey).

SensorML
SOS implementation

Three layer architecture

1. DATA ACCESS LAYER
   - Interface with the final user
   - OM:Result
   - SPARQL
   - XML
   - Vocabulary OWL
   - SensorML
   - O&M Instant Obs Template
   - O&M Time Interval Obs Template
   - O&M Survey Observation
   - JDBC & XQuery
   - JDBC

2. TRANSFORMATION LAYER
   - The business logic.
   - On the fly generates:
     - O&M Instant and Time Interval Observation files

3. SOS LAYER
   - When the cruise ends it generates:
     - Survey Observation O&M files.
     - ISO CSR and CDI.
     (At least the underway data).
Native XML database

• To store all the SensorML and O&M.

• To increase the flexibility to serve different profiles of SensorML and O&M.

• XQUERY.
Android App

UTM SWE
SWE Viewer - UTM

Last 24h vessel's track
Android App

- sml:SensorML
  - xsi:schemaLocation=http://www.opengis.net/sensorML/1.0.1 http://schemas.opengis.net/sensorML/1.0.1/sensorML.xsd
  - version=1.0.1
- sml:member
  - sml:System
    - gml:description
    - sml:identification
    - sml:classification
    - sml:validTime
    - sml:capabilities
    - sml:contact
    - sml:position
    - sml:inputs
    - sml:outputs
    - sml:components
      - sml:ComponentList
See all your apps.
Touch the Launcher icon.
· om:OM_Observation
  · gml:id=SARMIENTO_WEATHER_STATION_29S0
  · xsi:schemaLocation=http://www.opengis.net/om/2.0 http://schemas.opengis.net/om/2.0/observation.xsd http://www.opengis.net/swe/2.0 http://schemas.opengis.net/sweCommon/2.0/swe.xsd
· gml:description
· om:type
· om:phenomenonTime
· om:resultTime
· om:procedure
· om:parameter
· om:observedProperty
· om:featureOfInterest
· om:result
Android App

Last 24h Event List

Drag over the timeline to go forward/backward in time

- 2013-03-06T01:59:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T02:00:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T02:08:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T02:09:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T03:17:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
Last 24h Event List

Drag over the timeline to go forward/backward in time

- 2013-03-06T01:59:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T02:00:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T02:08:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T02:09:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T03:17:44Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T03:18:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T10:57:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T10:59:48Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T11:00:51Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T11:22:46Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T11:23:46Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T13:39:50Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T13:41:48Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T14:18:48Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T14:20:45Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T16:31:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
- 2013-03-06T16:32:47Z, comm_system, vsat_system, DQ, malfunction_detected, high_delay
Thank you very much