
Bridging the gap between data and metadata (Part 2): looking backward at what happened during a survey with the Eurofleets Automatic Reporting System (EARS)

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The problem

The Eurofleets EU FP7 project aims at bringing together the European research fleets to enhance their coordination and promote the cost effectiveness of their facilities. Among the many activities of the Project, a specific task was devoted to the development of a software tool intended to record and report what happens during a survey, aside the planned and actual data acquisition.

Automatic underway data acquisition as well as manual event logging had to be foreseen. The former takes care of the registration of data such as geographic positioning, echo sounding, or thermosalinograph values, while the latter takes care of events that can range, for example, from a sample taken over an observation made to any malfunction that might be identified during the cruise. In both cases it can be difficult to evaluate whether the recorded information pertain to metadata or to the actual data. For example recordings of sea-waves can be used to correct vertical positioning in VHR seismics but can be an observation in itself if used in a meteorological context. Sound speed in the water column can be used to calibrate multibeam surveys but, being related to temperature, salinity etc, can be used to detect water masses. In fact, the traditional rather strict separation between data and metadata reveals here its limits so that event logging becomes a bridge between the two words. Storing all events in a database, it is possible to produce survey events reports that can be used in the process of data discovery, for example, exploiting the identification and explanation of possible anomalies while defining the quality of data.

The implemented solution

To put all this in practice it was decided to leverage the possibilities of the Ifremer software CASINO+ (I) broadening its adoptability by any vessel in the project and (II) extending its

functionalities, to obtain a new system that has been named Eurofleets Automatic Reporting System (EARS).

Automatic event logging

The problems of adoptability were related to the fact that CASINO+ worked in tandem with another Ifremer system called TECHSAS for automatic data acquisition, which has not entered Eurofleets. It was necessary therefore to introduce a new set up where devices with serial outputs have been connected to serial-to-Ethernet boxes linked to a private network sensed by EARS. We proved that this configuration does not introduce delays so that data are correctly referenced in time and therefore in space. CASINO+ setting has been very flexible but at the expenses of simplicity. Therefore a Graphical User Interface has been developed to ease the creation of a catalogue of instruments where setups can be recalled easily from survey to survey but also exchanged across the fleets whenever the same devices are used.

Manual event logging

To handle manual events, a completely new paradigm was designed. It started from the very basic design of the concept of event, which has not been identified with a flat term, rather with the combination of seven components:

- **Subject:** refers to the domain in which the event takes place, for example a seismic system or a sediment sampler
- **Tool:** the device that produces the event, for example an anemometer or a Niskin bottle
- **Category:** describes the kind of event taking place, for example a malfunction, sampling, operation, or phase change
- **Action:** which is the actual task performed, for example start sampling, close bottle or start recording.
- **Comment:** which is a free text field that is left to the operator to enter more information like for example the visual description of a sediment sample
- **Actor:** is the person performing the action
- **Action_property:** any additional characteristic or parameter accompanying a given action for which the user needs to enter a value onboard e.g. volume of water centrifuged, installation height of a sensor or distance trawled.

This event structure is very flexible and allows a high variety of events to be stored together with a timestamp. For some of the concepts, the semantic framework of the Natural Environment Research Council (NERC) Vocabulary Server can be used. The controlled vocabulary for 'Action' and the relations between the terms of the different concepts are currently under development within the Eurofleets ontology governance.

Due to difficult sampling conditions and time constraints on board, the entry of manual events should be really easy to do. With one double-click or drag-and-drop, users can register an event using a personal, discipline-specific configuration tree. This tree shows a selection of tools to be used during the cruise with the possible actions. The configuration can be made in advance and re-used later on. Also the need for use outside on the deck for example, has been considered as

well as multilingualism. Developments during Eurofleets II aim to use the event ontology as input for EARS improving further user-friendliness.

Reporting

Once manual and automatic events are entered in the database, reporting is possible. EARS offers a two “resolution” automatically produced reporting output that has been named Ship Summary Report (SSR) and that is coded following SensorML OGC standard. The first level of SSR is very generic and reports only very basic information such as, for example, the position of a ship or its identification. The core SSR is queried from the Eurofleets EVIOR system which is intended to represent the current status of all the vessels participating in the Project.

At the same time the core SSR links to another document where all information from the database can be listed. This is the extended SSR allowing very detailed information retrieval to be done using for example XSLT.

EARS has been tested and proved to be capable of addressing the above mentioned issues, so that within the following Eurofleets 2 project it is planned to install it in most of the partner’s vessels.