

Ontology System for Survey Event characterization on Research Vessels

J. Sorribas (1), P. Diviacco (2), K. De Cauwer (3), M. P. Corre (4), and A. Busato (2)

(1) Unidad de Tecnología Marina (CSIC), Telemática, Spain (sorribas@cmima.csic.es)
 (2) Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Trieste, Italy (pdiviacco@ogs.trieste.it / abusato@ogs.trieste.it)
 (3) Management Unit of the North Sea Mathematical Models (MUMM), Brussels, Belgium (K.DeCauwer@mumm.ac.be)
 (4) Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER), Brest, France (mpcorre@ifremer.fr)



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MOTIVATION AND OBJECTIVES

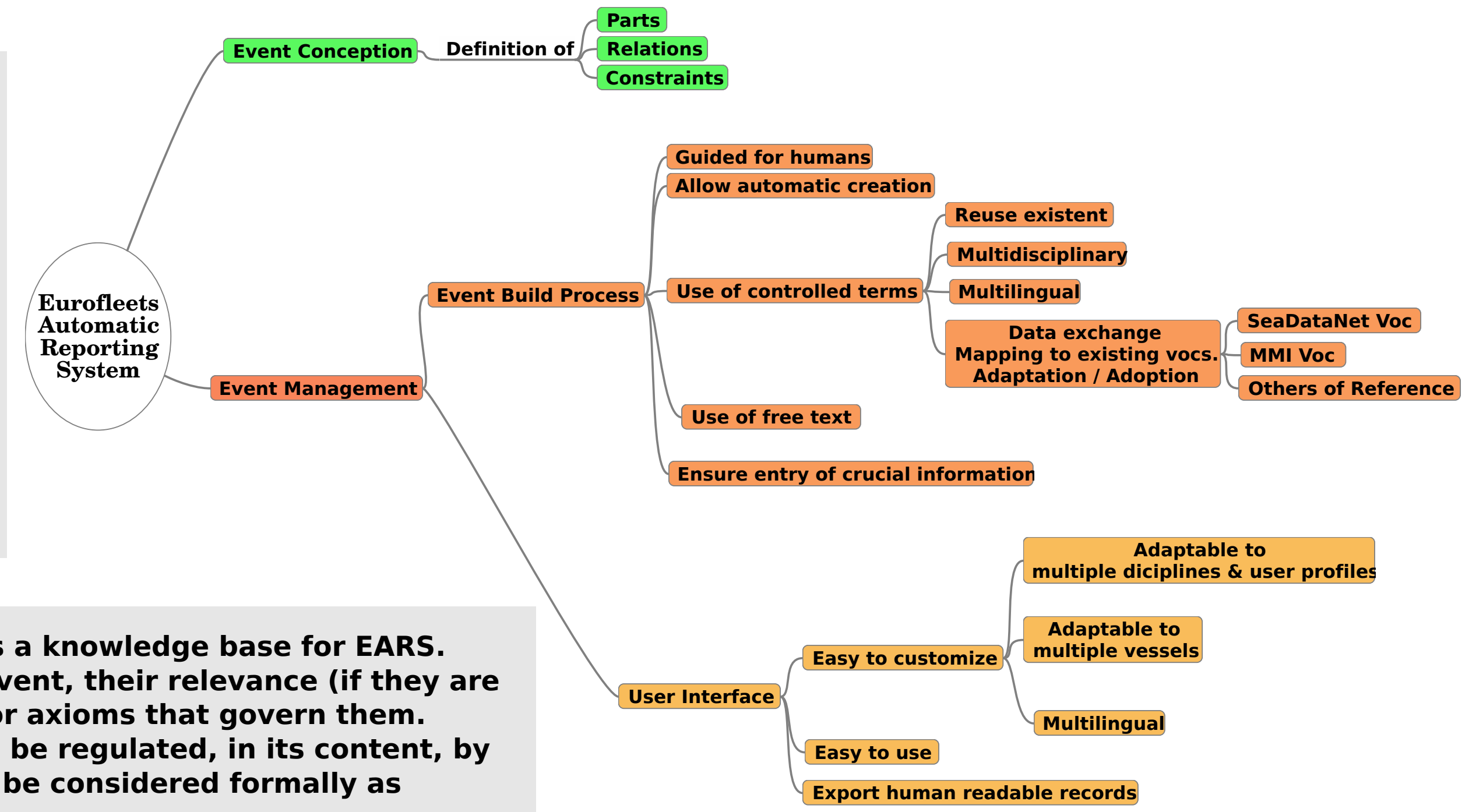
Processing and interpretation of marine data are often conditioned by unanticipated events or anomalies during acquisition. At the same time, basic information on a measurement or gear deployment like place and time, is often missing or inaccurate. In the perspective of an integrated European research vessels fleet where researchers and technicians should find familiar tools and procedures, it is important to develop a common software that could log, store and export all onboard events to data centers and international data dissemination initiatives.

The main goal is to set-up a tool (**EARS - EUROFLEETS Automatic Reporting System**) capable of recording any possible event during a cruise, ranging from a sample taken or an observation done to any malfunction occurring.

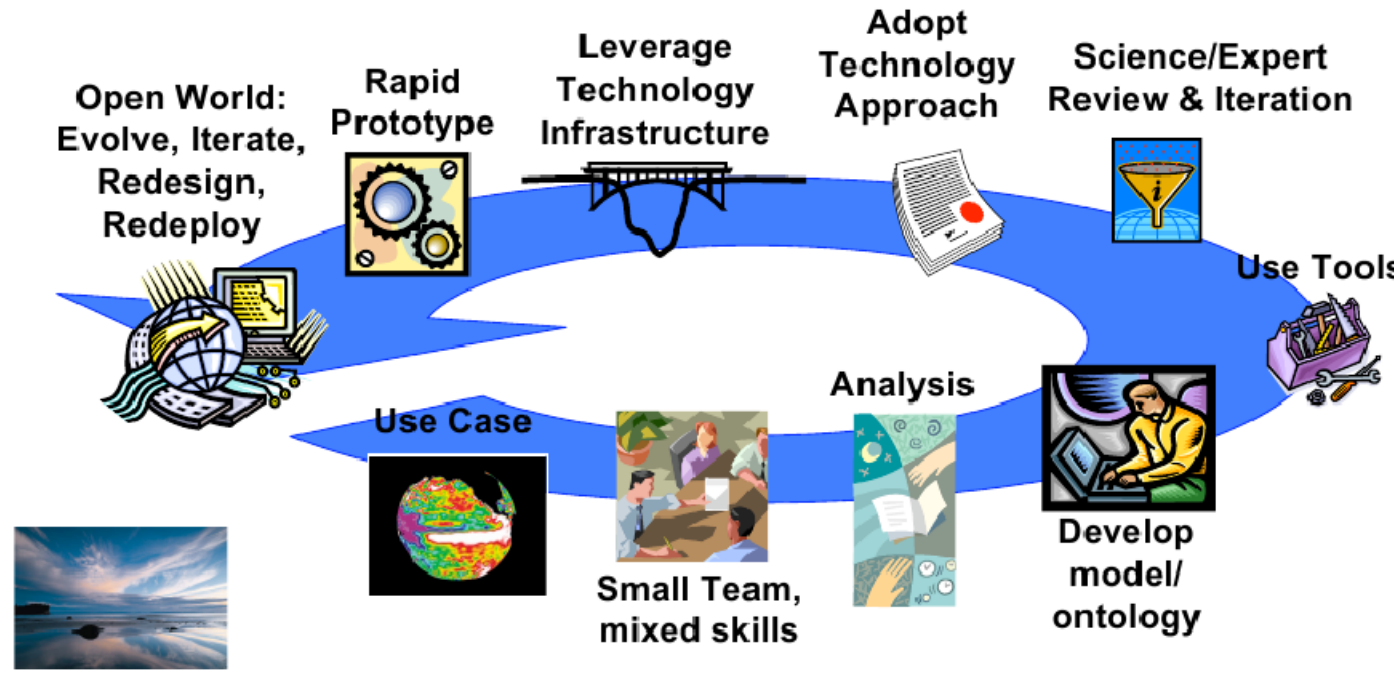
The event information forms a primordial step in the process of data quality control as it could assist in the understanding of anomalies and unexpected trends recorded in the acquired data sets. And, the possibility of automatically reporting metadata and data, will simplify the work of scientists and data managers with regards to data transmission.

A standardized description of events allows the introduction of a multilingual perspective.

The work presented consists of the development of an ontology system to be used as a knowledge base for EARS. It has been possible to identify the fundamental pieces of information that form an event, their relevance (if they are mandatory or not), the relationships between them (if existing) and the constraints or axioms that govern them. We have also identified which ones of these fundamental pieces of information, must be regulated, in its content, by a controlled set of terms. All this forms the conceptual model of our domain that can be considered formally as an ontology for marine survey events.



Methodology



"Semantic Web Methodology and Technological Development Process"
Benedict et al. (2007)

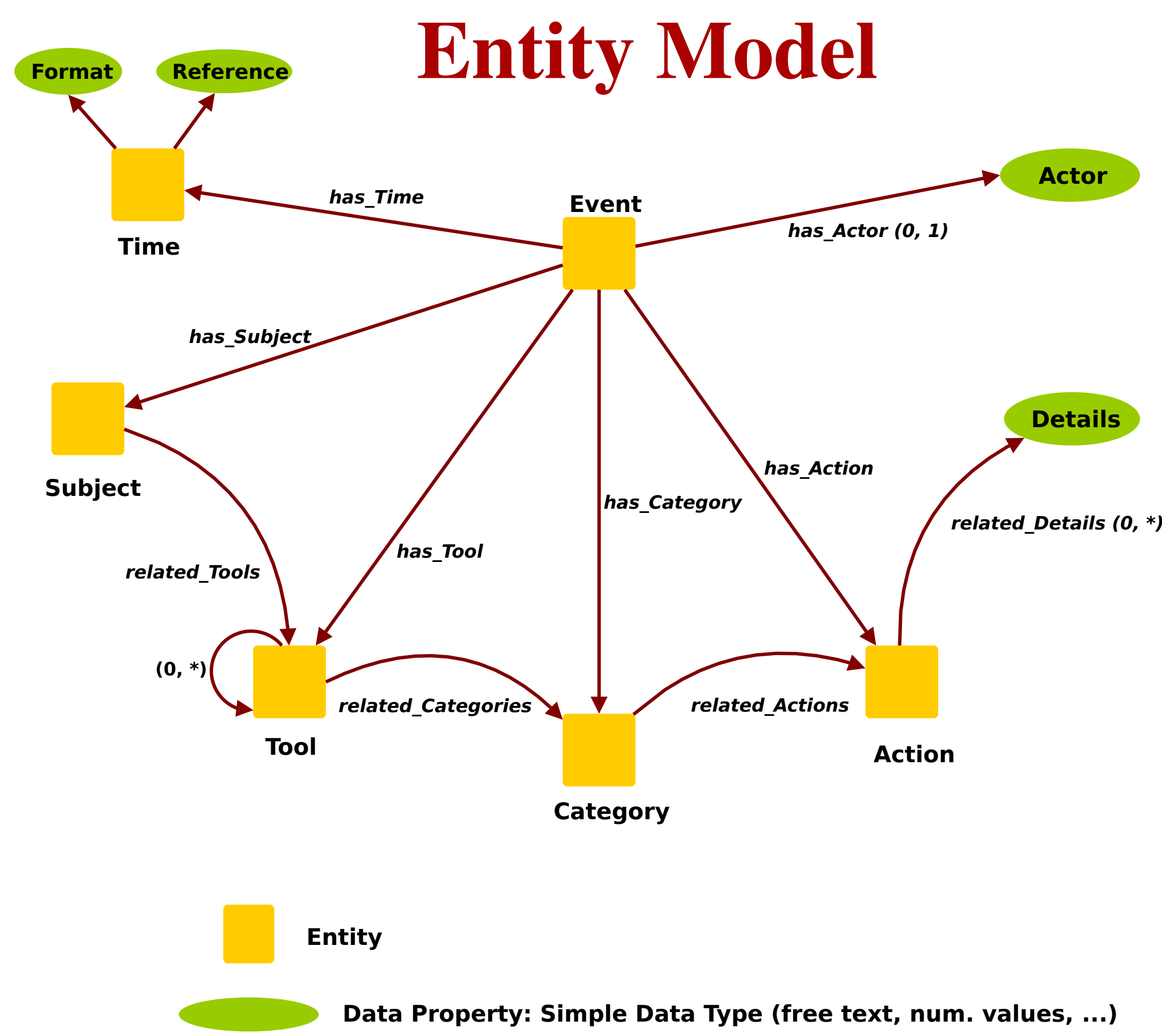
The construction of this knowledge base has been accomplished using a formal methodology to build applications and systems based on Semantic Web Services. The key of such methodology is to drive the development from the definition of use cases, meaning the analysis of our needs, separating the conceptual work from the implementation, and from the tools that will eventually be used to achieve it. Our work takes as references other international initiatives that built semantic frameworks for marine concepts, and also wants to incorporate well established controlled vocabularies used in the marine and environmental sciences.

■ ONTOLOGY ■

Instances

Instances of each entity forms the body of any Event as a comma separated values text.
The tree diagram shows relationships between some of them while GUI at bottom sketch the instantiation process with an ontology tool.

12/12/2010, 00:32:45, vessel, phase, track, stop, track_n° 23
11/07/2009, 10:14:23, navire , sondeur Simrad EM122, profil, début,
profil n° 1, Atalante
02/03/2011, 00:32:45, engin sous marin, Sondeur Reson 7125, profil,
début, profil n° 1, Victor



EVENT:
An event describes an action happening to a subject/tool at a given time by a certain actor at sea.
For example: closure of a water bottle by an operator.

SUBJECT:
Is the physical framework where the Event takes place.
It is related to the ship itself or to any system onboard.

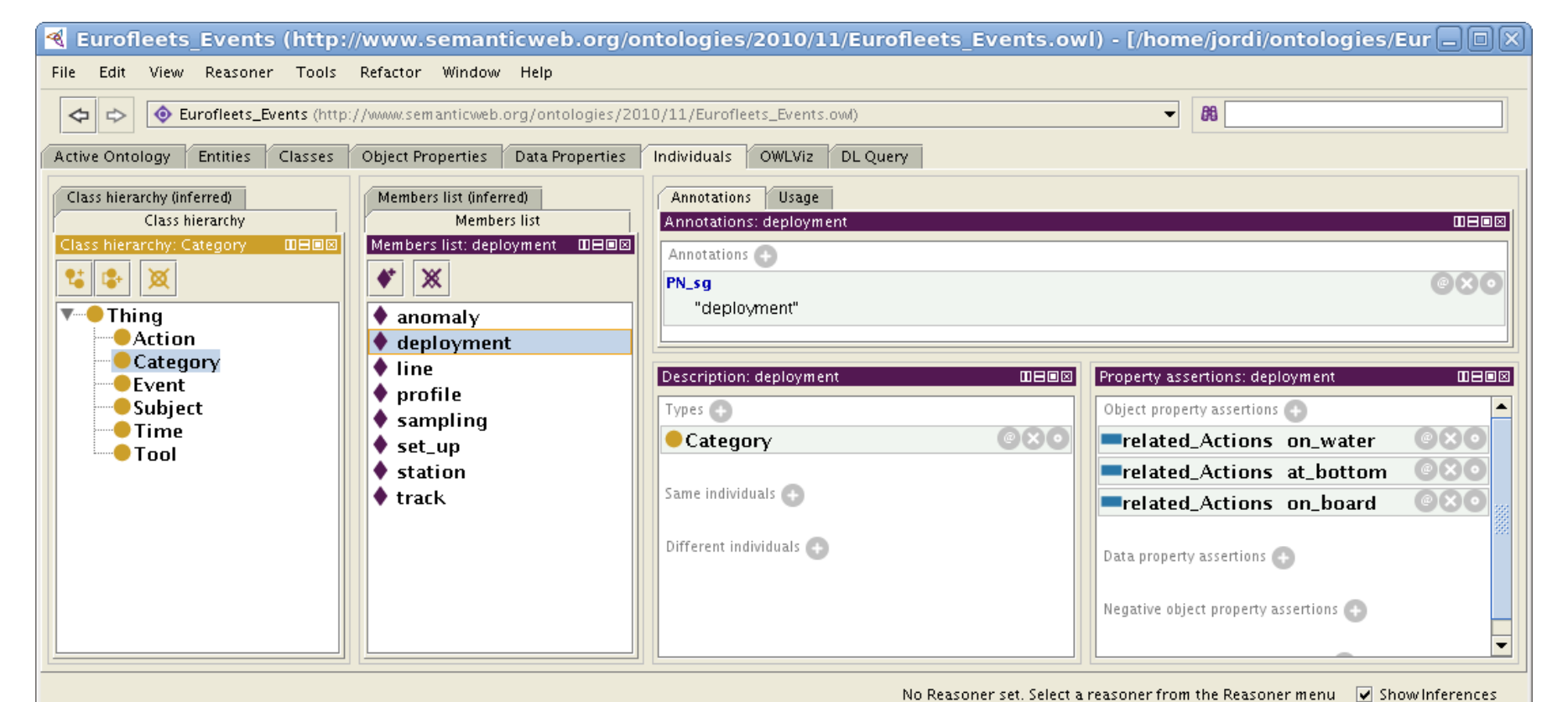
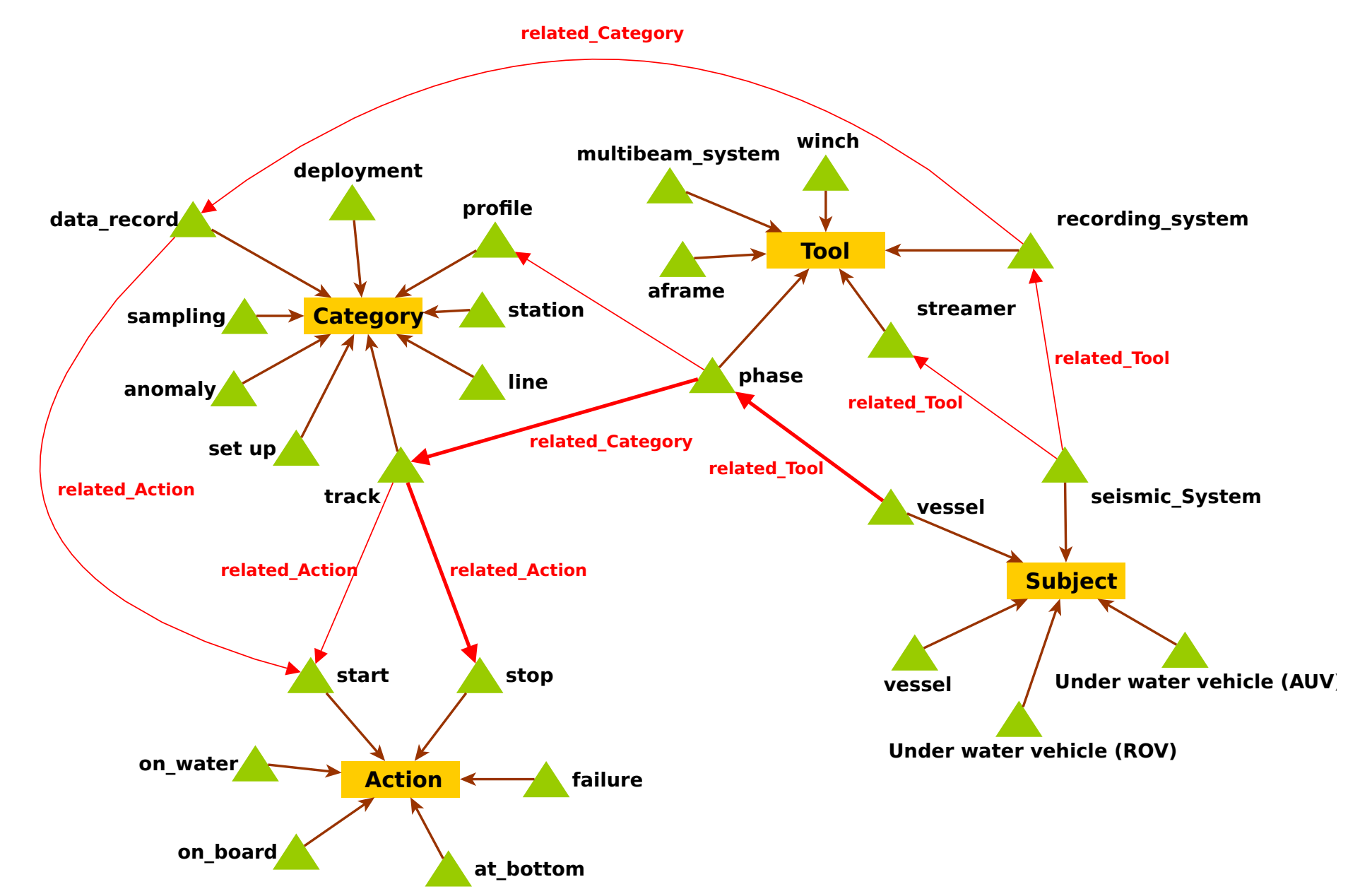
TOOL:
Defines the specific thing performing the event.
Tools are grouped by the subject they are linked to.
A tool can also be composed by different tools itself in order to allow granularity in the definition of the event.

ACTION
Define what is happening by a given tool.
For example: miss fire, put in water, start deployment, close bottle,
put on bottom, start profile, end track, start recording

CATEGORY:
Defines the type of the action happening during the event.
For example: anomaly, setup, operation.
Different Tools has different related Categories associated to them,
and every Category has a group of possible actions.

ACTOR:
Defines the person that fires up the Event.

DETAILS:
An extra info that used for a better description of the Event related with the Action



Uses and Queries

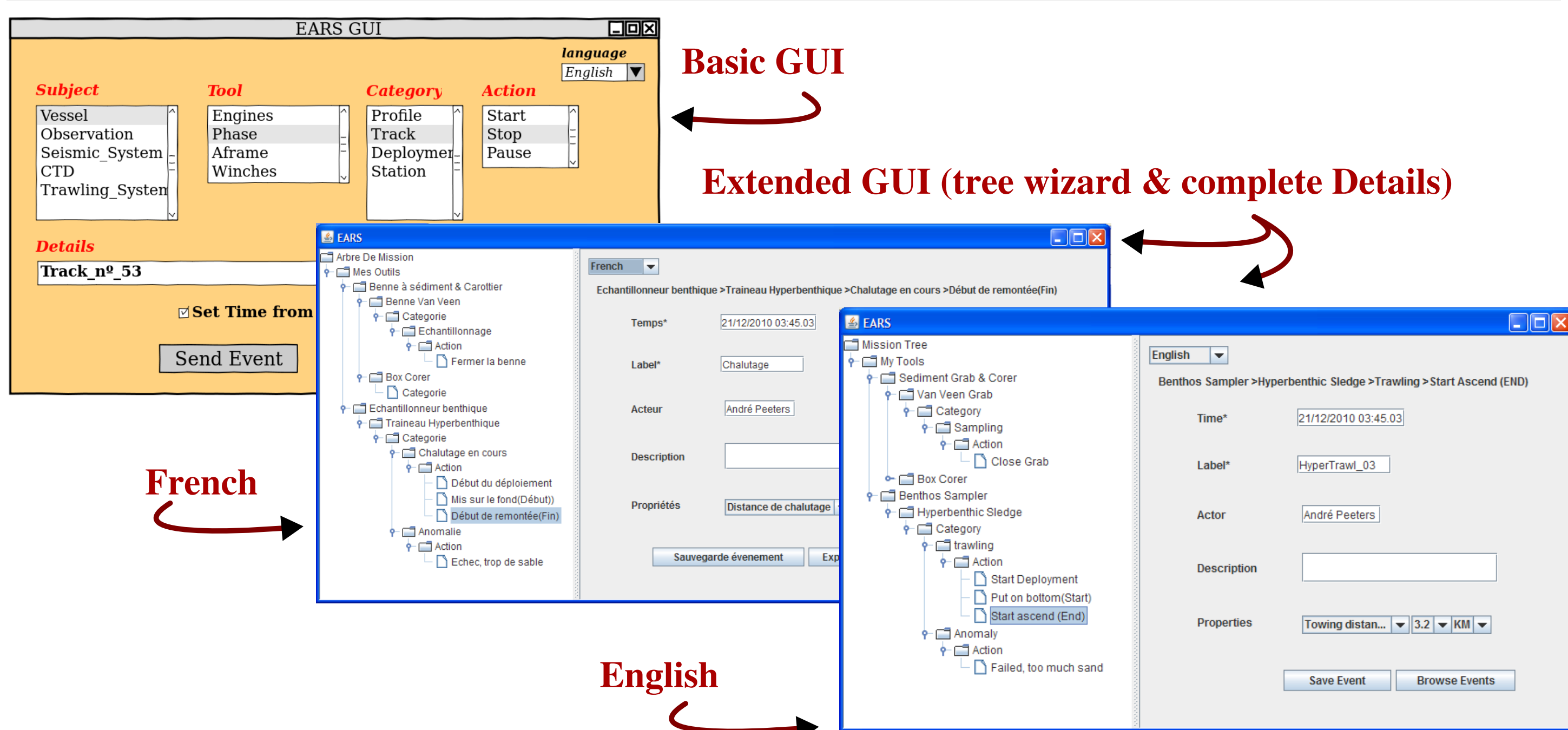
Our ontology has helped us to reach a common way to understand and use events inside the Eurofleets community, allowing us to systematically address such concept and to be rigorous in our approach to the shared and multilingual concepts.

The ontology has been used to build a smart user interface for the event recording process. Grouping concepts in categories with explicit relationships allows the construction of user choice boxes that change their contents based on previous user choices.

For example the possible actions for an event depend on the particular instrument subject of it.

Examples of queries to the ontology:

**** Show me the list of *Tools* related to the *Subject* "vessel" ****
**** Show me the "french term" of the Categrory "profile" ****



Mappings and Multilingual

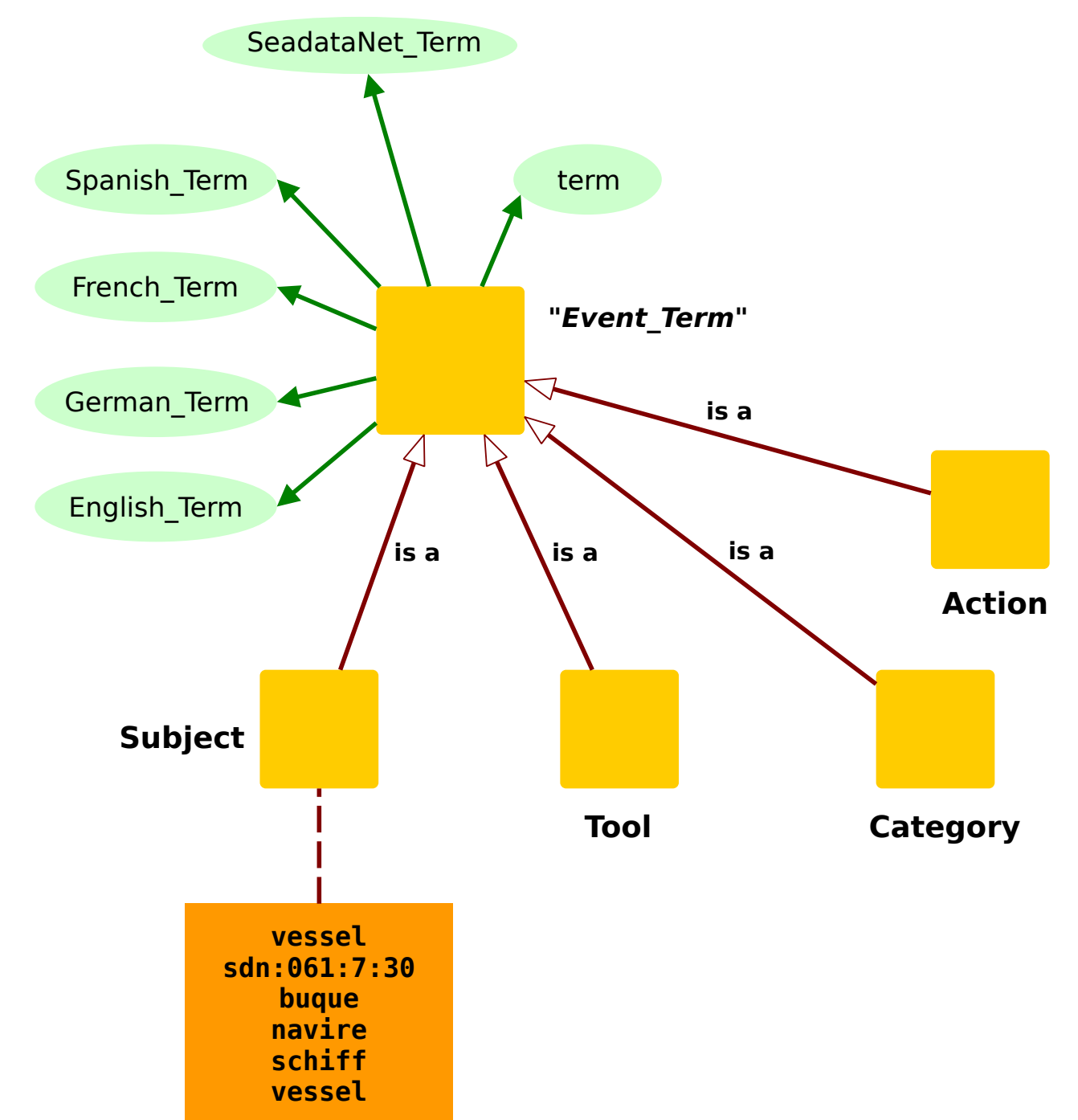
The ontology allows us to map concepts of other marine domain ontologies, enriching our domain knowledge and also providing us a formal way to develop a multilingual controlled vocabulary for our scenario that at same time incorporates existing ones like those of the SeaDataNet initiative or the Marine Metadata Interoperability Project.

<http://marinemetadata.org/>
http://seadatanet.maris2.nl/v_bodc_vocab/welcome.aspx

Mappings between other public ontologies like MMI can be solved by the way of definition of entity relations like "is a" or "same as" but still pending the mappings to non relational vocabularies as SeaDataNet or the multilingual approach.

We are exploring a solution based on the definition of a parent entity named "Event_Term" as a root of all of our entities subjected to the multilingual and mapping approach.

In the Event_Term entity we have defined data properties to store the mappings to external vocabularies and also the multilingual terms. When an instance of any of these entities is created (ex: vessel for a Subject) we have the possibility to assign its correspondence -if existing- to another vocabulary and to the different language translations.



This work is produced inside EUROFLEETS project framework as a part of the planned activities of the "Up to date software to facilitate TransNational Access" work package.

The FP7 EUROLLEETS project is an alliance of 24 marine research centres, fleets operators and SMEs across Europe with the view to work together and share resources, improving the quality and integration of marine research in Europe. Through its TransNational Access activity, EUROLLEETS will provide from 2011 all european scientists with free access to 18 high performing research vessels and associated equipment to conduct excellent marine research. This will also allow researchers to more easily share data and results, providing an overall boost to European research in this field.

Inside EUROFLETS project a specific work-package (WP10) is devoted to produce an innovative and standardized software portfolio for marine data acquired at sea by research vessels and underwater systems (from acquisition to transmission to data centers). One of its objectives is to promote a set of standards, best practices and experimental protocols to be used by all members of the Consortium. The implementation of such standards will serve to ensure the optimal use of marine research fleets and promote interoperability of equipment.

