Use case: ontology to support system verification process

Anne Monceaux[1,] Martine Callot[2]

[1] EADS France, Innovation Works, Rue Marius Terce, 31000 Toulouse, France
[2] EADS France, Innovation Works, 12 rue Pasteur - BP 76 - 92152 Suresnes Cedex France

OWL has been a W3C recommendation since 2004. Despite the growing number of reasonably mature technologies supporting this standard (ontology editors, database storage, bridge with reasoning facilities, etc.), OWL based technology is far to be commonly used for operational applications in industry. At least in our context where one important activity is about complex system engineering, relative little work has been done in applying OWL based technologies to the management of information. This is partly because the added value of using languages of high expressivity such as OWL is not demonstrated to practitioners[1]. This article is about applying OWL in a use case in system engineering area.
One nice definition of system engineering is provided in [2]. “System engineering is a robust approach to the design, creation and operation of systems. It encompasses the identification and quantification of the system goals, the creation of alternative system design concepts, performance of design trades, selection and implementation of the best design, verification that the design is properly built and integrated, and post-implementation assessment of how well the system meets the goals.” We are involved in a pilot that shall contribute at defining complex systems validation and verification (V&V) processes and at specifying some supportive methods and tools for that. Complex system is a term to refer to a ‘system of systems’, meaning that complex enough to be decomposed into sub-systems that are systems on their own; and that the system safety “cannot be shown solely by test and whose logic is difficult to comprehend without the aid of analytical tools”[1] . Due to multi-disciplinarily and project size, sub-systems may be engineered separately, and therefore a strong need exists to supervise, validate and verify that these sub-systems will be appropriately integrated so that the higher system desired behaviours will definitely be achieved.
So far the used technologies are relational databases for information repository building and some simulation facilities, for example for executing behaviour models such functional flow block diagram. In this context, we are interesting to investigate for what aspects and to which degree OWL based technologies can bring added value.
The (paper / presentation) is structured as follows. First we briefly explain a potential application of OWL in our context in section 2. In section 3, we share a first experience in building a (partial) system engineering ontology. *In section 4, we discuss identified difficulties that could lead to requirements for language extensions or modifications or technology improvements to meet our needs.*

References

[1] ARP4754 – Certification consideration for highly-integrated or complex aircraft systems. Systems Integration Requirements Task Group April 10, 1996
[2] Nasa System Engineering Handbook. SP-610S, June 1995.
[3] Reasoning support for ontology design
[4] The influence of architecture in engineering systems. *The ESD Architecture Committee*

[1] Another reason is that the real cost of making use of it is difficult to foretell. Application with low semantic capabilities but allowing efficient improvement of some existing and operational process is preferred (preferable?) over complex demonstrator that shows the full potential of OWL expressivity, but demands costly modelling activities (competence, time, maintenance) and process changes, and may take a long time to come up with an operational application.