

A Framework for Semantic Interoperability in the Military Domain

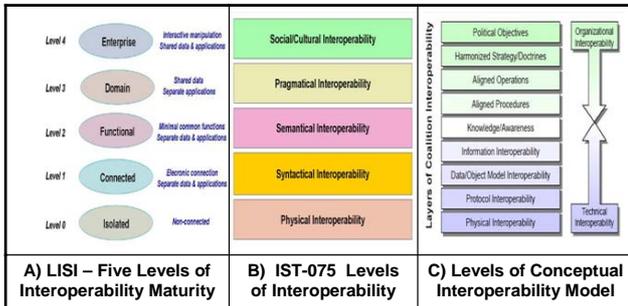
IST-075 is an international Research Task Group within NATO

Introduction

This poster is on behalf of the NATO RTO IST-075 Research Task Group on Semantic Interoperability. The group has representatives from 11 nations and was formed in September 2006. It will conclude at the end of 2009. The purpose is to explore solutions to NATO nations' need for semantically correct interoperability by means of knowledge based systems.

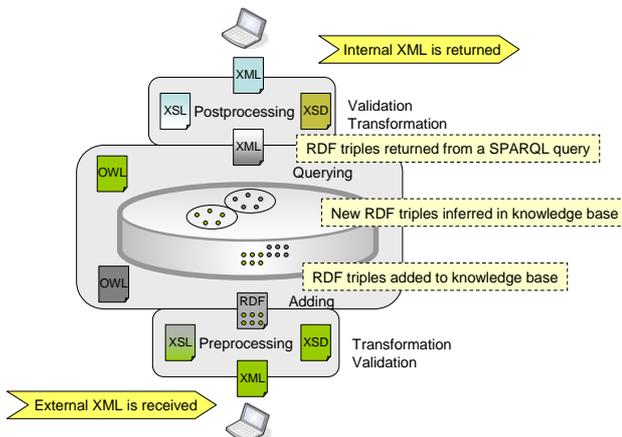
A preliminary version of the framework approach for Semantic Interoperability has previously been presented at a workshop held 24-25 September 2008 in The Hague, The Netherlands. The workshop topic was C2 and Decision Support-Information System Interoperability in NATO C4I context.

Interoperability is being defined in different ways and addresses different levels. Wikipedia describes Semantic Interoperability as "...the ability of two or more computer systems to exchange information and have the meaning of that information accurately and automatically interpreted by the receiving system". As illustrated in the figure below, physical and syntactic interoperability is assumed by IST-075.



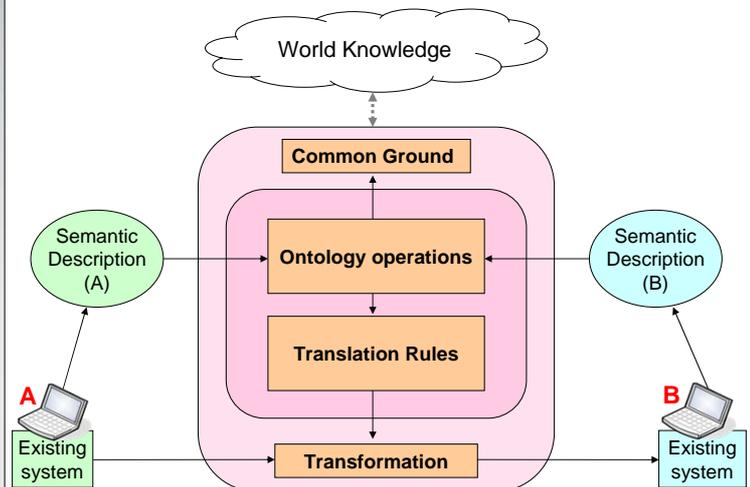
Technical Experiment

At the 2008 Semantic Technology Conference, FFI presented an experiment where ontology-driven translation between XML formats was successfully performed. The talk "Semantic Data Integration for Situational Information in the Military Domain" described the use of different mapping mechanisms like OWL, SPARQL CONSTRUCT, Jena rules and hybrid reasoning to implement the transformation. These principles have been built upon in order to justify the larger-scale and more conceptual framework proposed by IST-075.



Framework

The Framework for Semantic Interoperability proposed by IST-075 describes an information transfer from system A to system B, both being autonomous parties. In order for the information transferred from A to be received according to the semantics of B, a transformation is required. The rules of the transformation are defined by ontology operations based on the semantic descriptions exposed by A and B, and presumably bridged by "shared definitions". These definitions are labeled Common Ground in the figure below.



To prepare and conduct the physical information transfer, the following steps are performed:

- Describe and expose the semantic descriptions of each system
- Refer the local descriptions to previously described and shared concepts
- Align the descriptions (ontologies) of the two systems, using Common Ground
- Transform information according to rules from the aligned ontologies

The framework is task oriented, meaning that only the parts of the semantics of A and B that are necessary for this specific task, need to be aligned. Human interaction is required in those cases where the available "knowledge" (i.e. computer-processable representation of knowledge) is insufficient to bridge the necessary parts of A and B's descriptions. Also note that interoperability may not be achievable. Adequate availability and governance of Common Ground is a key success factor for the desired level of automation.

Further work

There are plans for a follow-up activity starting in 2010. Among the objectives for the new group are:

- Further definition of Common Ground
- Refinement of the internal framework operations
- Characterization of the policies and organizational procedures needed
- Further research on state-of-the-art tools and technologies
- Potentially build a prototype / demonstration utilizing the framework

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