Chapter 19
Streamlining Semantic Integration Systems

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EXECUTIVE SUMMARY

Yannis Kalfoglou and Bo Hu argue for the use of a streamlined approach to integrate semantic integration systems. The authors elaborate on the abundance and diversity of semantic integration solutions and how this impairs strict engineering practice and ease of application. The versatile and dynamic nature of these solutions comes at a price: they are not working in sync with each other neither is it easy to align them. Rather, they work as standalone systems often leading to diverse and sometimes incompatible results. Hence the irony that we might need to address the interoperability issue of tools tackling information interoperability. Kalfoglou and Hu also report on an exemplar case from the field of ontology mapping where systems that used seemingly similar integration algorithms and data, yield different results which are arbitrary formatted and annotated making interpretation and reuse of the results difficult. This makes it difficult to apply semantic integration solutions in a principled manner. The authors argue for a holistic approach to streamline and glue together different integration systems and algorithms. This will bring uniformity of results and effective application of the semantic integration solutions.

DOI: 10.4018/978-1-4666-2618-8.ch019
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If the proposed streamlining respects design principles of the underlying systems, then the engineers will have maximum configuration power and tune the streamlined systems in order to get uniform and well understood results. The authors propose a framework for building such streamlined system based on engineering principles and an exemplar, purpose built system, CROSI Mapping System (CMS), which targets the problem of ontology mapping.

THE NECESSITY FOR SEMANTIC INTEROPERABILITY

“We need interoperable systems.”

Time has long gone when manufacturers designed and assembled artefacts as stand-alone objects, ready to be used for whatever purpose they had been originally conceived. The necessity for more and more complex devices and the industrialisation/standardisation of manufacturing processes have led to the engineering of very specialised components that can be reused for a variety of component-based systems, which neither have been designed nor assembled by a sole manufacturer and for a unique purpose.

Analogously, in our information age, a similar phenomenon has occurred to the ‘‘manufacturing’’ of information technology (IT) artefacts. Originally, software applications, databases, and expert systems were all designed and constructed by a dedicated group of software or knowledge engineers who had overall control of the entire lifecycle of IT artefacts. But this time has gone too, as software engineering praxis is shifting from the implementation of custom-made, stand-alone systems to component-based software engineering (COTS, ERP, etc.). Databases are gradually deployed in distributed architectures and subsequently federated, and knowledge-based systems are built by reusing more and more previously constructed knowledge bases and inference engines. A compelling example on this front is SAP Business One™, which contains 14 core modules specialised in the immediate and long-term needs (e.g. customer relationship management, finance, purchasing, etc.) of small or medium-sized enterprises (SMEs). Individual SMEs then decide which fields of business activity they want to support and align the relatively independent modules into an integral framework. While accessing a raft of functionalities through one seemingly unified interface, the users normally are not aware of the underlying integration effort that seamlessly juxtaposes heterogeneous data from different units of an organisation and different business policies.

Moreover, the World Wide Web, and its ambitious extension the Semantic Web, has brought us an unprecedented global distribution of information in the form of hypertext documents, online databases, open-source code, terminological repositories
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