Supporting Collaboration through Semantic-based Workflow and Constraint Solving

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1 Introduction

This paper describes our efforts to provide a collaborative problem solving architecture driven by semantic-based workflow orchestration and constraint problem solving. These technologies are based on shared ontologies that allows two systems of very different natures to communicate, perform specialised tasks and achieve common goals. We give an account of our approach for the workflow assisted collaboration with constraint solving capabilities. We found that systems built with semantic (web) based technologies is useful for collaboration and flexible to enhance the system with specialised capabilities. However, much care must be exercised before correct semantics may be exchanged and collaborations occur smoothly.

2 Workflow Collaboration with Constraint Solving Capabilities

Our work is illustrated in a demonstration example. Consider solving a PC configuration problem in a virtual organisation that builds PC based on customer's individual requirements. Different departments in the organisation are located dispersedly, each may have certain overlapping of domain knowledge with another but also has specific non-overlapping local expertise – that may be data and/or work procedure related. They need to collaborate with each other to achieve common organisational goals - i.e. to build customer-tailored PCs. Three technologies are involved: FBPML[1] to provide process modelling and workflow technologies, KRAFT system[2] to provide specialised support for constraint problem solving and I-X system[3] to provide a user front-end to manage workflow execution.

In this example, the domain knowledge in the PC configuration is divided and stored in different departments: Sales and Technical. This domain knowledge is based on two individual ontologies: marketing and technical. As the two departments collaborates in their operations, their ontologies are partially shared. This mimics real-life situations where specialised expertise centres are often geographically disperse yet collaboration is required between them. The mapping of the underlying ontologies also provides a rich foundation for data that is being manipulated by workflow. In addition, domain knowledge are constrained using CIF (Constraint Interchange Format) that is RDF based. KRAFT based constraint language (Colan) and its counter part in FBPML are mapping into CIF and use CIF for communication between them.

In this experiment, two I-X Process Panels have been used to instantiate FBPML processes. It assists dynamic task execution, communication and collaboration with KRAFT System. The sales and technical units are each represented by the 'Edinburgh' and 'Aberdeen' I-X panels. The Edinburgh site needs to resolve a task that requires technical capabilities. The sales unit of Edinburgh passes this task to its technical counterpart in Aberdeen. As this problem may be resolved using Constraint Satisfaction Problem (CSP) solving technology, the Aberdeen site makes use of its local CSP solver, the KRAFT system, provided with the passed problem description from Edinburgh. After execution, the KRAFT system returns the solution (or acknowledge of failure) to the Aberdeen I-X panel, which returns the solution to the Edinburgh site. If a satisfactory solution was not found, the sales department may decide to find alternative answers through new enquiries.

3 Conclusions and Future Directions

Our work demonstrates a collaboration between two systems of very different natures: a workflow based (I-X and FBPML) and constraint solving systems (KRAFT). Our work has been successful in the defined task, but much mapping effort was needed in the earlier stages of the project as not all modelling concepts can be easily mapped, so practical solutions must be found. This echoes existing knowledge sharing and interoperability problems between any two or more potentially very different but partially overlapping systems that are well-known in the knowledge systems community. The ultimate goal of the Semantic Web is to provide ways of connecting arbitrary open systems to achieve non-trivial tasks using semantically rich knowledge. The *I-X-KRAFT "TIE"* is a small step towards this goal.

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