Editorial: Contract architectures and languages

Zoran Milosevic*

Deontik Pty Ltd., P.O. Box 110,
Toowong, QLD 4068, Australia
E-mail: zoran@deontik.com
*Corresponding author

Guido Governatori

NICTA,
Queensland Research Laboratory,
Brisbane, Australia
E-mail: guido.governatori@nicta.com.au

Claudio Bartolini

Hewlett Packard Labs,
1501 Page Mill Road – MS 1U 1126,
Palo Alto, CA 94304-1126, USA
E-mail: claudio.bartolini@hp.com

Biographical notes: Zoran Milosevic received his PhD in Computer Science from The University of Queensland, Brisbane, Australia. He is a Principal of Deontik Pty Ltd., a small consulting and software company specialising in business processes, business policies, complex events processing and enterprise architectures for large systems. He also works for the National e-health Transition Authority, Australia, contributing to the e-health interoperability architectures. In his previous role, he was a Principal Scientist at Distributed Systems Technology Centre (DSTC). He is the founder of *IEEE's Enterprise Distributed Object Computing (EDOC)* conference, a Fellow of the Australian Computer Society and a Senior Member of IEEE.

Guido Governatori received his PhD in Computer Science and Law at the University of Bologna in 1997. Since then, he has held academic and research positions at the Imperial College, Griffith University, Queensland University of Technology, the University of Queensland and NICTA. He has published more than 160 scientific papers in logic, artificial intelligence and database and information systems. His current research interests include modal and non-classical logics, defeasible reasoning and its application to normative reasoning and e-commerce, agent systems and business process modelling for regulatory compliance. He is a member of the editorial board of *Artificial Intelligence and Law*.

Claudio Bartolini manages the predictive IT analytics research group in HP Labs Palo Alto and Bristol. He has been with HP Labs since 1996 holding a variety of technical positions at Bristol and Palo Alto. He has published extensively and has been granted patents in the domains of IT service management and e-commerce. He has organised and taken part in the technical committee of many of the main academic conferences in IT service management and e-commerce. He holds an MSc E.E. from the University of Bologna, Italy and a PhD in Information Engineering from the University of Ferrara, Italy.

The inter-organisational and often cross-jurisdictional nature of e-business requires that organisations have a certain level of transparency and visibility into data, information and processes of their business partners. This transparency contributes to improved efficiency in terms of real-time commitment management, mitigating the risks of breaching contractual obligations, but also facilitating timely reaction to new business opportunities. Business contracts are business and legal artefacts established for the purpose of defining how businesses interact across boundaries of various types. They define cross-organisational processes and business policy stating mutual expectations of business partners.

In spite of their cross-organisational governance nature, contracts are still treated mostly as legal documents disconnected from other enterprise systems. Currently, there is inadequate e-business support for using contract information to manage cross-organisational interactions. In

addition, current support for the management of contracts themselves has an 'inward' focus, namely on internal enterprise data and processes. The cross-organisational interactions increasingly demand a more 'outward' perspective on enterprise contract management.

This special issue of the *International Journal of Business Process Integration and Management (IJBPIM)* is dedicated to various approaches for the expression of business contracts conditions and for the definition of architectures of IT systems supporting contract management. It is through solutions such as these that business contracts can become a first-class component of many e-business systems, thereby, providing the basis for more efficient, agile and evolving e-business. These solutions address different aspects of contract management including contract validation, negotiation, monitoring and enforcement.

This issue is based on selected papers presented at the Second Contract Architecture and Language (CoALa) Workshop held in conjunction with the 9th IEEE Enterprise Distributed Object Computing Conference, hosted by the University of Twente in the Netherlands on 19–23 September 2005. These five papers demonstrate the breadth of topics related to contract architecture and languages. There are five papers, each of which is concerned with a specific aspect of enterprise distributed computing.

The paper by Rotolo et al. presents an interesting approach to the positioning of the concept of trust in the context of e-business interactions. This positioning takes into account protection of trust in terms of the legal concept of *good faith*. Good faith can have two interpretations. *Objective good faith* is linked to the behaviour context of trust, relying on the correctness of one's behaviour with respect to a set of normative rules. *Subjective good faith* is related to situations where somebody's actions can violate other's rights without the performer being aware of it and is linked with the concept of belief. The paper provides a formal analysis of both of these interpretations through the satisfaction of the related correctness rules. This analysis is then incorporated into an extension of defeasible logic, in order to provide a computational framework to support analysis of trust and its satisfaction. The paper provides a valuable contribution to the formal consideration of trust and its legal counterpart of good faith as they represent an important element in regulating precontractual negotiation, contract execution and performance, and contract interpretation.

The paper by Kimbrough et al. proposes a logic-based approach to defining compositional semantics of business communication, the *formal language for business communication*. The aim is to provide an automated means of interpreting elements of communication such as for example the meaning of messages used in the EDI standards. The approach taken is based on the authors' analysis of complex sentences and their decomposition in terms of simpler sentences which in turn can be reduced to the predicates in the first order logic. The formalism is based on Kimbrough's disquotation theory, allowing for unpacking of embedded propositions. Examples of verbs that connect the main sentence and subordinate sentences are: 'that' (as in 'Galileo said that earth moves'), 'believes' (as in 'X believes that P'), 'intends' and other mentalistic concepts: 'promises', 'declares' and other speech act concepts, 'it is possible that', 'it is obligatory that', and other modal concepts, and so on. The authors propose an incremental approach to the formalisation of these elements of business communication and provide a number of business scenarios illustrating the use of their logic. One aim of the work reported in this paper is to allow a far larger number of individuals and organisations to participate in e-commerce, tackling what is known as the first trade problem. Both the semantics proposed and the prototype developed can be used to support various contract relates activities, in particular, contract terms validation and contract negotiation.

The paper by Governatori and Pham presents a contract formalism based on the use of *deontic* and *defeasible logic*. The combination of these two logics allows for formal representation of policies in contracts, in particular, the obligation policies and their violations. In addition, the proposed logic can be used to support reasoning about and the analysis of contract conditions, such as detecting inconsistencies in contracts. This is achieved through the use of normal and canonical representation of contract. The paper then describes how RuleML syntax can be used and extended to express the semantic constructs for contracts based on the proposed logic. The paper concludes with the description of the DR-CONTRACT system architecture, developed to facilitate parsing, analysing and exporting contracts representation into a form that is suitable for a human user or downstream contract monitoring facility to support run time monitoring of contracts.

The paper by Wang describes the *Contract Expression Language* (CEL). This language was designed to express contractual arrangements between different parties for the purposes of capturing and communicating contractual information and facilitating contract execution and enforcement by machines with respect to granted permissions, mandated obligations and stipulated prohibitions. The CEL is based on the ISO/IEC rights expression language. For multimedia content applications, CEL expressions can be used to ensure interoperable, consistent and predictable behaviours of distribution value chain participants in terms of their rights, obligations and prohibitions to express the declaration of distribution constraints and applicable regulations. The paper demonstrates the expressiveness and extensibility of the CEL by illustrating its compliance with the business collaboration framework for e-business transactions, developed by the Techniques and Methodology Group (TMG) of the United Nations Centre for Trade Facilitation and Electronic Business.

Finally, the survey paper by Tang et al. uses a contract metaphor, considered from computational perspective, to analyse several web service QoS management approaches.

Specifically, contracts are considered as a mechanism for driving the management configuration, deployment and implementation of web services and the associated QoS constraints. The paper uses the IBM's *monitor, analyse, plan and execute (MAPE)* model to position contracts and proposes a contract-based MAPE, referred to as C-MAPE, to compare several QoS management infrastructures.

In summary, the papers in this issue illustrate some of the current research areas pertinent to contract architecture and languages. Many challenges still remain to be addressed and new topics will emerge as the role of business contracts becomes more prominent in the context of cross-organisational business interactions. As this happens, it is increasingly important to better understand the issues associated with processes, policies and people involved in cross-organisational IT systems and use the semantics of contracts to architect flexible, adaptable and evolvable cross-organisational systems.