Matchmaking for Business Processes Based on Choreographies

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ABSTRACT

Web services have a potential to enhance B2B e-commerce over the Internet by allowing companies and organizations to publish their business processes on service directories where potential trading partners can find them. This can give rise to new business paradigms based on ad-hoc trading relations as companies, particularly small to medium scale, can cheaply and flexibly enter into fruitful contracts, for example through subcontracting from big companies by simply publishing their business processes and the services they offer. More business process support by the Web service infrastructure is however needed before such a paradigm change can materialize. A service for searching and matchmaking of business processes does not yet exist in the current infrastructure. We believe that such a service is needed and will enable companies and organizations to be able to establish ad-hoc business relations without relying on manually negotiated interorganizational workflows. This article gives a formal semantics to business process matchmaking based on finite state automata extended by logical expressions associated to states.

Keywords: finite service automata; service discovery; service oriented architectures; web services.

INTRODUCTION

Web services have a potential to enhance B2B e-commerce over the Internet by allowing companies and organizations to publish their business processes on service directories where potential trading partners can discover them. This can give rise to new business paradigms based on dynamic trading relations as companies, particularly small to medium scale, can cheaply and flexibly enter into fruitful contracts, for example, through subcontracting from big companies by simply publishing their business processes and the services they offer.

To date, loosely coupled business processes are quite rare. Either simple (stateless) Web services are used or the binding of Web services is done statically. While stateless services are not sufficient for implementing business processes, static
binding of services does not use the full potential of loosely coupled systems also known as service oriented architectures. Existing standards supporting brokering of Web services are UDDI (Ariba, 2000) and WS-Inspection (Ballinger et al., 2001). Both approaches are based on string comparisons, which are used for searching in classification schemes or t-models (like WSDL). This is not sufficient for business processes, especially if there does not exist any pre-negotiated and uniquely named frame contracts published by standardization organizations as, for example, RosettaNet.

Other service based infrastructures face the same issue. In particular, within the ebXML framework business partners can express their business capabilities (including their business processes) using trading partner profiles (CPPs) without providing any means to match these.

This article presents an approach to more precise service discovery using business process descriptions rather than individual messages. The next section illustrates limitations of existing approaches to service discovery by way of simple examples of compatible and incompatible business processes. The Approach section formalizes a more precise notion of business processes matching based on annotated finite state automata. The next section discusses at which level the introduced techniques can be deployed in existing service description frameworks, followed by a description of the implementation details including the complexity of the algorithms. The article concludes with a discussion of related work, conclusions and an outline of future work.

EXAMPLE

Figure 1 depicts two business processes involving two trading parties: a vendor \( v \) and a customer \( c \). Nodes represent the states of a business process; the end states are identified by a double circle. Edges represent state transitions, which are labeled with messages denoted as \( \text{from}\#\text{to}\#\text{message}\_\text{name} \), where \( \text{from} \) represents the message sender, \( \text{to} \) represents the message recipient, and \( \text{message}\_\text{name} \) is the name of the message.

Figure 1(a) shows the vendor business process, where the vendor expects to receive a purchase order (\( c\#v\#PO \) message, followed by a credit card payment (\( c\#v\#ccPay \) and finally sends back a de-

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**Figure 1:** (a) Vendor Message Sequence (b) Customer Message Sequence
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