Integration of B2B Logistics Using Semantic Web Services

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Abstract. In this paper, we present a case study about the integration of a new partner into a freight logistics chain using semantic web services. We do this in the context of conceptual architecture of the EU Semantic Web-enabled Web Services project [5]. The case study is based on the process of substituting one of our freight forwarders (ocean shipping) with another logistic partner. The result of substitution must be the same functionally as existed before the substitution. We present the service description requirements which we encountered during its development. We discuss our experiences in using OWL-S to describe the services.

Keywords: Logistics, Semantic Web Services, Enterprise Integration, SCM

1 Introduction

In a world where global outsourcing and business-to-business integration are commonplace in product manufacturing, logistics interactions are becoming more and more significant. The prices of logistic transportation are between 4.1% (Top performers) and 5.3% (on average) of the cost of product development, excluding the costs of inventory[1]; When this is also included, logistics costs can reach as high as 13.7%. In a $100 Billion industry such an overhead is significant. Hence the selection of the right logistics provider in terms of price competitiveness and efficiency becomes critical for any enterprise. In a B2B context, logistics interactions between parties are supported by the use of electronic message exchanges. There are 3 main messaging standards used to do this; The UN-Standard EDIFact (Electronic Data Interchange for Administration Commerce & Transport) [2], the US-Standard ANSI X.12 [3] and more recently, RosettaNet PIPs (Partner Interchange Processes) [4].

One logistic shipment can use several freight forwarders (This is known as a multi-leg shipment). Management of such a shipment can be complex: Goods must transit smoothly from one logistic provider to another, and the messages sent and received by the different parties must be coordinated. We consider a scenario in which there is a three-leg shipment taking place between a supplier in the UK and a manufacturing plant in Russia. Unexpectedly, logistics provider two (responsible for a shipment between Southampton and St. Petersburg) is unable to provide the required service.
and must be substituted. The logistics coordinator is responsible for locating a replacement and integrating it seamlessly into the logistics chain.

In this paper we present the service description requirements which we encountered during the development of this case study. We do this in the context of the SWWS conceptual architecture [5]. Figure 2 shows how our case study is organized within this architecture. In section 2, we discuss the knowledge representation requirements on the logistics service description at the business layer of the architecture. This is done in the context of a contract template, describing a set of possible logistics services. We also discuss how the discovery and pre-contractual conversations associated with the service are used to manipulate this contract template to come to an agreed definition of the service to be provided. In section 3, we discuss the requirements on the service description at the interaction layer of the architecture.

Fig. 1. Multi-leg Shipment

Fig. 2. Case study alignment with the EU SWWS Project Conceptual Architecture