Chapter XIII
Modeling Semantic Business Process Models

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ABSTRACT
Coupling of interorganizational business processes in electronic markets is a difficult and time-consuming task. In practice, business processes are geographically distributed, which makes it particularly difficult for business partners to coordinate their supply chains and customer relationship management with business units. By using formal description languages such as Petri Nets for modeling interorganizational business processes, purely syntactic composition problems of distributed business environments can be solved. However, the missing semantic representation of Petri Nets can hamper the interconnectivity of business processes. Usually, several business partners, even if they share similar demands, have their own specific vocabularies. By representing business processes with Petri Nets in combination with the Web ontology language (OWL), our approach provides flexibility, ease of integration, and a significant level of automation of loosely coupled business processes even if they do not share their respective vocabularies.

INTRODUCTION
Coupling of interorganizational business process models in electronic markets is a difficult and time-consuming task. The integration of different business partners into one single value creation chain demands enormous coordination activities. Business process models of different companies have to fit in another organizational environment and they have to complement each other. Furthermore, the rapid growth of electronic markets’ activities demands flexibility and automation of involved systems in order to facilitate...
the interconnectivity of business process models and to reduce communication efforts.

By using Petri Nets (Reisig & Rozenberg, 1998) for modeling interorganizational business process models, syntactic composition problems of distributed business environments can be solved. Moreover, Petri Nets obey an operational semantics that facilitates composition, simulation, and validation of business process models. However, a missing semantic representation of Petri Net elements can hamper the interconnectivity of business process models, which ensures flexible process interface composition. When enterprises decide to interconnect business process models, synonyms, homonyms, or similarly labeled process elements have to be identified to avoid misunderstandings.

Semantic markup of business process models and automated reasoning is required in order to ensure consistent process interconnectivity and to reduce coupling efforts. An efficient approach for improving business process model interconnectivity can be provided by metadata-descriptions of the related process elements. In order to reduce negotiation efforts, these metadata-descriptions should be interpretable by machines. A necessary prerequisite for machine-interpretable metadata and (semi-) automated system cooperation is the availability of detailed knowledge about the underlying business process models. Furthermore, not only the syntax but also the application semantics of business process describing metadata must be considered. The syntax defines the structure of data and can be represented in XML notation. The Petri Net Markup Language (PNML) (Weber & Kindler, 2003) is a popular proposal for an XML-based interchange format for Petri Nets. Semantic Web languages such as the Resource Description Framework (RDF) (Powers, 2003) and the Web Ontology Language (OWL) (McGuinness & van Harmelen, 2004) were proposed to make it particularly easy to model information in a machine-interpretable form. OWL is syntactically layered on RDF. Therefore, the syntax of OWL is the syntax of RDF/XML. OWL may enable automation of a variety of tasks currently being performed “manually” by human agents.

**Figure 1. Interorganizational business process**