Chapter 11
Enterprise Modelling and Model Integration

The aim of enterprise modelling is to support and improve the design, documentation, analysis and administration of business objects and operations based on adequate modelling techniques [FG98, SAB98]. For this purpose, domain-specific enterprise models shall provide the basis for communication between people with different professional backgrounds [Fra02]. This chapter presents how model transformation and integration techniques presented in Part III can be applied to automate and improve the modelling tasks within a distributed enterprise modelling framework. Sect. 11.1 describes the main aspects of enterprise modelling and presents the used enterprise modelling framework. Sect. 11.2 illustrates how the alignment of different domains within the framework can be specified by triple graph grammars. Sects. 11.3 and 11.4 demonstrate the application of model transformation and integration techniques to concrete domain models. Finally, Sect. 11.5 discusses the achievements, their relevance and related work. This chapter is based on the results of a research collaboration between Technische Universität Berlin, the University of Luxembourg and Credit Suisse, which were published in [BHE09c, BHEE10, BH10, Her11, Bra13].

11.1 Enterprise Modelling

Enterprise models provide representations of the structures, processes, resources, involved actors, executed functions, goals, and constraints relevant for the modelled enterprise. For this reason, enterprise modelling has to provide an agile modelling process, which is integrated across the different business functions [FG98]. An agile modelling process additionally reduces the required time frames for adapting the models according to change requests, which can occur quite frequently during the lifetime of an enterprise. Moreover, adequate modelling techniques should support the propagation of changes from one domain to others. This way, the knowledge and expertise of enterprise modellers can be focussed on their main domain, which is an
important requirement for decentralised and distributed models occurring especially in large multinational enterprises.

In order to master the high complexity of an enterprise in its whole, visual modelling techniques have been successfully applied. They provide intuitive notations and high abstraction capabilities. Clearly, visual models cannot replace all textual models in all domains. But still, where suitable, they often show high benefits. Furthermore, enterprise models are usually not only used for the design and documentation of enterprises, but also for the analysis and management of operations. In particular, process analysis concerns, e.g., the question whether certain business processes can be performed in a different but more suitable way, such that some goals can be achieved in an optimised way. In combination with formal abstract syntax definitions, visual modelling techniques can enable verified automated analyses, which can support error detection and thus quality assurance of the models.

In order to satisfy the requirements in enterprise modelling, we apply formal techniques based on graph and model transformation of Parts II and III, which provide powerful and efficient techniques for model transformation and integration. Their formal foundation ensures correct analysis results and the automated tool support provides efficient checks. The techniques provide the basis for an agile and decentralised modelling process, including distribution of models and efficient change propagation.

The integration of different enterprise models requires, on the one hand, the application of techniques that ensure certain quality and consistency requirements and, on the other hand, the application of techniques for setting up and maintaining a common understanding of the enterprise by the modellers. While this chapter applies suitable techniques for the first requirement based on the concepts in Part III, the common understanding is supposed to be set up and maintained based on sophisticated techniques in the area of ontology engineering [FG98].

The main domains of enterprise modelling can be captured by the enterprise modelling framework in Fig. 11.1, introduced by Brandt et al. [BHE09c, BH10, Bra13]. It shows different coordinates \((X, Y, Z)\) and each of them represents a container for several domain-specific models. For instance, coordinate \((S, B, M)\) repre-