Aspect Oriented Business Process Modelling with Precedence

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Abstract. Complexity is a major concern which is aimed to be overcome by people through modelling. One way of reducing complexity is separation of concerns, e.g. separation of business process from applications. One sort of concerns are cross-cutting concerns i.e. concerns which are scattered and tangled through one or several models. In business process management, examples of such concerns are security and privacy policies. To deal with these cross-cutting concerns, the aspect orientated approach was introduced in the software development area and recently also in the business process management area. The work presented in this paper elaborates on aspect oriented process modelling. It extends earlier work by defining a mechanism for capturing multiple concerns and specifying a precedence order according to which they should be handled in a process. A formal syntax of the notation is presented precisely capturing the extended concepts and mechanisms. Finally, the relevance of the approach is demonstrated through a case study.

Keywords: Business Process Modelling, BPMN, Aspect Oriented, Separation of concerns.

1 Introduction

The interest to business process management has increased considerably during the last decade. BPMN is one of the most widely spread notation of business process modelling. Business processes are associated with a set of requirements some of which also reflect different concerns. Examples of concerns are security and logging. Concerns are typically cross-cutting, i.e. they are relevant for several business processes. For example, Figure 1 shows four typical concerns from the banking domain that spans across four processes. In addition, concerns can also be reflected in several places in one same process, i.e. they are scattered through a process.

Traditionally, as can be seen from Figure 1, the concerns are modelled as an integral part of the processes. This often leads to complex, inflexible and less reusable solutions. The complexity is increased as the number of tasks in a process grows to cover both business logic and cross-cutting concerns. The solution
is not flexible as changes in a concern have to be reflected in multiple places. Reusability is not supported due to the lack of placeholders for the concerns that can be refereed to when relevant.

To address these issues the aspect oriented principle has been proposed. In essence, this is a separation of concerns, advocating the separation of cross-cutting concerns from the core business process logic (which for short will be called core concerns). Within the programming paradigm, this principle is realised in Aspect Oriented Programming (AOP) (see for instance AspecJ [2]). In the business process management paradigm the aspect oriented principle has been introduced only recently. Charfi et al. [9] elaborate on how the separation of concerns can be handled in business process modelling by extending the Business Process Modelling Notation (BPMN) with notions for aspect oriented process modelling. They also extend BPEL [8] with features for aspect oriented Web service composition. Another existing effort is seen as the work by Cappelli et al. on proposing a different notation for aspect oriented business process modelling [1].

However, when applying the existing approaches, we recognised that not all the concerns could be separated from a business process model, due to the fact that none of these approaches can capture multiple concerns with sequential order of execution. In this paper we take the advances from [9, 8] and extend the approach presented in [9]. The contributions are three-fold. Firstly, we define a requirement which is necessary for capturing multiple concerns in a process with specific orders. We called it precedence requirement and extend the findings in [9] to fulfil this requirement. Secondly, we provide a rigorous formalisation of our approach to precisely capture the extended concepts and mechanism. Finally, we study and examine the relevance of the extended aspect oriented modelling mechanism using a case study.

The remainder of the paper is organized as follows. In Section 2 we present a conceptualisation of aspect oriented business process modelling. This includes a set of requirements for designing aspect oriented process modelling paradigm, the concepts for aspect orientation in business process modelling, and a formalisation of the correspondingly extended mechanism. Section 3 demonstrates the approach through a case study. Section 4 discusses the limitations of the current findings. Section 5 presents an overview of the related work in the area. Finally, Section 6 concludes the paper and presents directions for future work.