Towards Real-Time Progress Determination of Object-Aware Business Processes

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Abstract. To stay competitive, companies need to continuously improve and evolve their business processes. In this endeavour, business process optimisations and improvements are key elements. In particular, the monitoring of business processes enables the early discovery of problems and errors already during process enactment. Two approaches can be pursued to achieve this: real-time, also called online monitoring, and offline monitoring. A subtask of real-time monitoring is to determine the current progress of a business process, which is particularly challenging if the latter is composed of loosely coupled, smaller processes that interact with each other, like object lifecycle processes in data-centric approaches to BPM, which result in large process structures. This position paper discusses the challenges of determining the progress of such object-aware processes in real-time and defines research questions that need to be investigated in further work.

Keywords: object-aware business process, process monitoring, progress determination, online/real-time monitoring

1 Introduction

Object-aware business processes consist of interacting objects whose relations are defined in a relational process structure [1]. Each object has attributes and a lifecycle process describing its behaviour [2], whereas coordination processes structure and control the interactions between multiple lifecycle processes, i.e., the overall business process [3]. Lifecycle processes comprise states (including exactly one start and at least one end state), and state transitions. Each state, in turn, consists of connected steps, where each step corresponds to an attribute update operation. Based on this information, electronic forms are auto-generated during lifecycle execution for each state. As an example, Figure 2 shows a lifecycle process with one decision step. In general, an object-aware business process is composed of multiple lifecycle processes of the same or different type, resulting in a dynamically evolving process structure during runtime. In this context, a variety of configurations and constellations of object-aware processes (i.e., lifecycle and coordination processes), running concurrently to each other, becomes possible [3]. Additionally, there are coordination constraints between objects that require interactions between the corresponding lifecycles. Due to

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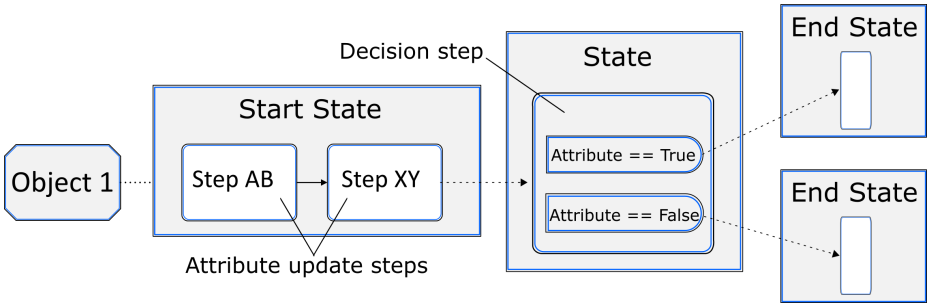

Fig. 1. Lifecycle structure in step-based view

this high complexity, there is no intuitive solution for monitoring and measuring the progress of an object-aware business process and the corresponding process structure respectively.

Several challenges to determine and define progress metrics in object-aware process management exist. First, no known measures for object-aware progress exists. Second, progress can be interpreted in different ways. Often, it is described as fundamental improvement through significant changes of the current status. In general, however, there is no broadly accepted definition of the term *progress*. Third, *measuring points* for determining the progress of an object-aware business process are missing. Fourth, to determine the progress the current execution status as well as the path yet to be taken (including all routing decisions) are required. Fifth, a time delay in the calculation of the progress or problems in estimating the execution path can occur. Thus, we need to define metrics for determining the progress of an object-aware process in all possible constellations. In addition, the progress of many individual processes (i.e., lifecycles and coordination process) needs to be properly merged to determine overall progress.

2 Related Work

In [4], an approach to measure the progress of activity-centric business models is discussed. An approach for monitoring processes and predicting their progress with data state transition events is presented in [5]. In turn, [6] improves progress in activity-centric processes using object state transition [5]. By contrast, no approaches exist for determining progress in object-aware business process management. Progress measurement of processes in other fields than BPM can be found, for example, in construction [7], software engineering [8], and software management [9].

3 Research Questions

As a first step towards the online progress calculation of an object-aware process, it must be possible to determine the progress of any snapshot of this process.

Moreover, the total progress of the object-aware process (i.e., the overall business process) is determined by the progress of its individual lifecycles. In a nutshell, any approach for determining the progress of an object-aware process needs to answer the following research questions:

Research Question 1	How can the progress of a single lifecycle process with its state-based view form be determined?
Research Question 2	How can the progress of the processing of a single state within a lifecycle process be measured?
Research Question 3	How can the progress of multiple, interacting (i.e., interrelated) lifecycles be determined?
Research Question 4	How does a coordination process affect the progress of an object-aware business process?

Research Question 1 considers single lifecycle processes in their abstracted (i.e., state-based) view, whereas Research Question 2 deals with determining the intra-state progress. Answering Research Questions 1 and 2 will enable us to fully determine the progress of a lifecycle. For example, for every lifecycle depicted in Figure 2, a progress between 0 (i.e., instantiation of a lifecycle) and 100 (i.e., execution of an end state and lifecycle completion) may be assigned. Research Question 3 extends progress determination to a full relational process structure consisting of multiple interacting lifecycle processes (see Figure 2). The latter form a large process structure whose overall progress needs to be determined. Research Question 4 considers the coordination (depicted as dashed arrows in Figure 2) of the relational process structure to refine Research Question 3. With Research Question 4 the total progress of object-aware business processes can be addressed. All four research questions need to be answered to be able to determine the total progress of an object-aware business process.

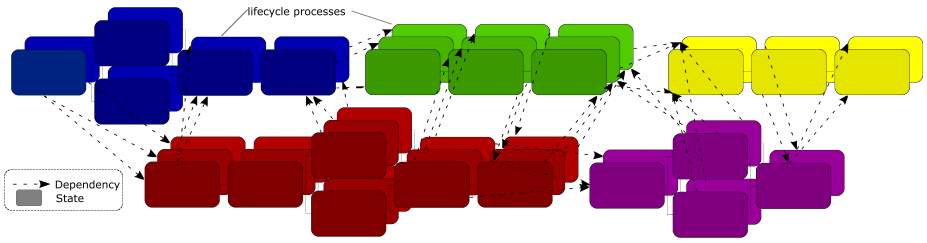

Fig. 2. Complex structure of an object-aware business process

4 Conclusions

This position paper discussed the challenges to be tackled when determining the progress of object-aware processes and the potentially very large lifecycle process structure emerging during their execution. As a major benefit of being able to determine the progress of object-based business processes, the real-time monitoring of the underlying large process structures becomes possible. Although just-in-time business scenarios are common in many business areas, contemporary business process management tools do not provide a sufficient and timely measurement of the progress of the emerging process structures. Due to the complex structure, research questions were addressed, which should be clarified in further work. Thereby, approaches based on graph theory can be considered for discussing the presented research questions. The results can be refined using event log data in combination with approaches from probability theory and machine learning. In this way, the results of decision steps as well as the total workload necessary of a process can be predicted to determine the progress more accurately.

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