Rigorous Semantics and Refinement for Business Processes (Abstract)*

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For the modelling of business processes it is necessary to integrate models for control flow, messaging, event handling, interaction, data management, and exception handling. In principle, all common business process models such as BPMN [14], YAWL [13], ARIS [11] or S-BPM [6] follow such an approach. Though it is claimed that the models have already reached a high level of maturity, they still lack rigorous semantics as pointed out in [1, 5, 15]. Furthermore, quite a few aspects such as data management, interaction and exception handling have only been dealt with superficially as pointed out in [12].

The first concern regarding rigorous semantics has been discussed in detail by Börger in [2] for BPMN, which led to an intensive investigation of BPMN semantics on the grounds of Abstract State Machines (ASMs, [4]), in particular for OR-synchronisation [3]. The monograph by Kossak et al. defines a rigorous semantics for a large subset of BPMN leaving out some ill-defined concepts [8].

The second concern can be addressed by means of horizontal refinement. On grounds of ASMs necessary subtle distinctions and extensions to the control flow model such as counters, priorities, freezing, etc. can be easily integrated in a smooth way [12]. Conservative extensions covering messaging can be adopted from S-BPM [6], while events in BPMN have been handled in [7]. For the event model it is necessary and sufficient to specify what kind of events are to be observed, which can be captured on the grounds of monitored locations in ASMs, and which event conditions are to be integrated into the model. Extensions concerning actor modelling, i.e. the specification of responsibilities for the execution of activities (roles), as well as rules governing rights and obligations lead to the integration of deontic constraints [10], some of which can be exploited to simplify the control flow [9]. In this way subtle distinctions regarding decision-making responsibilities in BPM can be captured.

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In the talk a glimpse of the rigorous, ASM-based semantics for business processes is presented. The focus is on the control flow with specific emphasis on priority handling. This is followed by a discussion of horizontal refinement focusing on the introduction of disruptive events and associated exception handling. A simplified example capturing the effects of external change to a running process is used for illustration.

References

1. Abramowicz, W., Filipowska, A., Kaczmarek, M., Kaczmarek, T.: Semantically enhanced business process modelling notation. In: Hepp, M., et al. (eds.) S-BPM. CEUR Workshop Proceedings, vol. 251. CEUR-WS.org (2007)
2. Börger, E.: Approaches to modeling business processes: a critical analysis of BPMN, workflow patterns and YAWL. Software & Systems Modeling 11(3), 305–318 (2012)
3. Börger, E., Sörensen, O., Thalheim, B.: On defining the behavior of OR-joins in business process models. Journal of Universal Computer Science 15(1), 3–32 (2009)
4. Börger, E., Stärk, R.: Abstract State Machines. Springer-Verlag, Berlin Heidelberg New York (2003)
5. Dumas, M., La Rosa, M., Mendling, J., Reijers, H.A.: Fundamentals of Business Process Management. Springer (2013)
6. Fleischmann, A., et al.: Subject-Oriented Business Process Management. Springer-Verlag, Berlin Heidelberg New York (2012)
7. Kossak, F., Illibauer, C., Geist, V.: Event-based gateways: Open questions and inconsistencies. In: Mendling, J., Weidlich, M. (eds.) Business Process Model and Notation, Lecture Notes in Business Information Processing, vol. 125, pp. 53–67. Springer, Berlin, Heidelberg (2012)
8. Kossak, F., et al.: A Rigorous Semantics for BPMN 2.0 Process Diagrams. Springer-Verlag (2014)
9. Natschläger, C., Kossak, F., Schewe, K.D.: BPMN to Deontic BPMN: A trusted model transformation. Journal of Software and Systems Modelling (2015), to appear
10. Natschläger-Carpella, C.: Extending BPMN with Deontic Logic. Logos Verlag, Berlin (2012)
11. Scheer, A.W.: ARIS - Business Process Modeling. Springer, Berlin, Heidelberg (2000)
12. Schewe, K.D., et al.: Horizontal business process model integration. Transacions on Large-Scale Data- and Knowledge-Centered Systems 18, 30–52 (2015)
13. ter Hofstede, A.M., et al. (eds.): Modern Business Process Automation: YAWL and its Support Environment. Springer, Heidelberg (2010)
14. Weske, M.: Business Process Management. Concepts, Languages, Architectures. Springer (2012)
15. Wong, P.Y., Gibbons, J.: A process semantics for BPMN. In: Liu, S., Maibaum, T., Araki, K. (eds.) Formal Methods and Software Engineering. Lecture Notes in Computer Science, vol. 5256, pp. 355–374. Springer, Berlin Heidelberg (2008)