A Compositional Approach for Complex Event Pattern Modeling and Transformation to Colored Petri Nets with Black Sequencing Transitions

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Abstract

Prioritized Colored Petri Nets (PCPNs) are a well-known extension of plain Petri nets in which transitions can have priorities and the tokens on the places carry data information. In this paper, we propose an extension of the PCPN model with *black sequencing transitions* (BPCPN). This extension allows us to easily model the ordered firing of the same transition using an ordered set of tokens on one of its precondition places. Black sequencing transitions are then presented as a shorthand notation in order to model the processing of a flow of events, represented by one of their precondition places. We then show how black sequencing transitions can be encoded into PCPNs, and their application to model Complex Event Processing (CEP), defining a compositional approach to translate some of the most relevant event pattern operators. We have developed MEdit4CEP-BPCPN, an extension of the MEdit4CEP tool, to provide tool support for this novel technique, thus allowing end users to easily define event patterns and obtain an automatic translation into BPCPNs. This can, in turn, be transformed into a corresponding PCPN, and then be immediately used in CPN Tools. Finally, a health case study concerning the monitoring of pregnant women is considered to illustrate how the event patterns are created and how the BPCPN and PCPN models are obtained by using the MEdit4CEP-BPCPN tool.

2012 ACM Subject Classification Information systems → Query languages for non-relational engines

Keywords and phrases Colored Petri Nets, CEP, EPL, Compositional Modeling, Model-Driven Development

Category Trabajos publicados recientemente: IEEE Transactions on Software Engineering

Related Version full version hosted on IEEE Xplorer
Classification Full Version: `https://ieeexplore.ieee.org/document/9376633` [1]

Funding This research was supported by the Spanish Ministry of Science, Innovation and Universities and the European Union FEDER funds under Grants RTI2018-093608-B-C32 and RTI2018-093608-B-C33, the JCCM project cofinanced with European Union FEDER funds, ref. SBPLY/17/180501/000276, and the UCLM group research grant with reference 2020-GRIN-28708.

References

1 V. Valero, G. Díaz, J. Boubeta-Puig, H. Macià and E. Brazález, "A Compositional Approach for Complex Event Pattern Modeling and Transformation to Colored Petri Nets with Black Sequencing Transitions," in IEEE Transactions on Software Engineering, doi: 10.1109/TSE.2021.3065584.