Petri Nets in Multi-Paradigm Modelling

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Abstract. Engineered systems today are characterized by an ever increasing complexity. This complexity is due to a large number of heterogeneous components as well as diverse concerns such as safety and energy efficiency by many stakeholders who develop these systems collaboratively.

Multi-paradigm Modelling (MPM) proposes to model every part and aspect of such complex systems explicitly, at the most appropriate level(s) of abstraction, using the most appropriate modelling formalism(s). This includes the explicit modelling of the often complex engineering workflows.

Petri Nets have proven to to be an appropriate "assembly language" for a whole class of problems. The talk starts from simple Place/Transition nets and shows how some extra constructs are needed to explicitly model time and fairness. As adding these constructs to a Petri Net is not intuitive and quite cumbersome and error prone, it is desirable to use an appropriate Domain-Specific Language (DSL) and map it onto Petri Nets. Some examples will be given of this and other uses of Petri Nets for MPM: a Power Window with heterogeneous components and safety requirements for analysis, a railway system with a continuous-time component and a non-deterministic environment for co-simulation analysis of rule-based model transformations, and enactment of workflow languages.