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A trace semantics for Petri nets (extended abstract). (English) [Zbl 1427.68199](#)

Kuich, Werner (ed.), Automata, languages and programming. 19th international colloquium, Wien, Austria, July 13–17, 1992. Proceedings. Berlin: Springer-Verlag. Lect. Notes Comput. Sci. 623, 595-604 (1992).

Summary: Our aim is to extend the semantic theory of elementary net systems [*M. Nielsen* et al., “Behavioural notions for elementary net systems”, *Distrib. Comput.* 4, No. 1, 45–57 (1990; [doi:10.1007/BF01783665](#)); *Theor. Comput. Sci.* 96, No. 1, 3–33 (1992; [Zbl 0759.68022](#))] to general Petri nets. In doing so, we expect to obtain a theory which would reflect our intuition that general Petri nets are more expressive than elementary net systems (and for that matter, 1-safe Petri nets). As a first step, we provide a semantics for Petri nets using the theory of trace languages due to *A. Mazurkiewicz* [*Lect. Notes Comput. Sci.* 255, 279–324 (1987; [Zbl 0633.68051](#))]. It turns out that in order to adequately treat the multiplicity of tokens in a Petri net, we must generalize the classical notions underlying trace languages along a number of directions. After doing so, it is easy to associate such a generalized trace language with each Petri net. We then characterize the class of trace languages – called PN-trace languages – that arise in this fashion. It turns out that the new trace languages can also be used to capture the behaviours of other models of concurrency. In particular, we characterize the general event structures of *G. Winskel* [*Lect. Notes Comput. Sci.* 255, 325–392 (1987; [Zbl 0626.68022](#))] and their stable subclass in terms of our trace languages. One pleasant consequence of our results is that in this framework, 1-safe Petri nets, event structures, and general Petri nets constitute a strictly ascending chain in terms of expressive power.

For the entire collection see [[Zbl 1369.68031](#)].

MSC:

[68Q85](#) Models and methods for concurrent and distributed computing (process algebras, bisimulation, transition nets, etc.)

[68Q55](#) Semantics in the theory of computing

Keywords:

[Petri net](#); [trace semantics](#)

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