

**Title:** IOPT Petri Net State Space Generation Algorithm with Maximal-Step Execution Semantics

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**Abstract:** This paper presents an algorithm to efficiently generate the state-space of systems specified using the IOPT Petri-net modeling formalism. IOPT nets are a non-autonomous Petri-net class, based on Place-Transition nets with an extended set of features designed to allow the rapid prototyping and synthesis of system controllers through an existing hardware-software co-design framework. To obtain coherent and deterministic operation, IOPT nets use a maximal-step execution semantics where, in a single execution step, all enabled transitions will fire simultaneously. This fact increases the resulting state-space complexity and can cause an arc "explosion" effect. Real-world applications, with several million states, will reach a higher order of magnitude number of arcs, leading to the need for high performance state-space generator algorithms. The proposed algorithm applies a compilation approach to read a PNML file containing one IOPT model and automatically generate an optimized C program to calculate the corresponding state-space.

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