Project DEVS:
A formal discrete-event plateform for distributed simulation of hybrid systems

https://www.laas.fr/projects/prodevs

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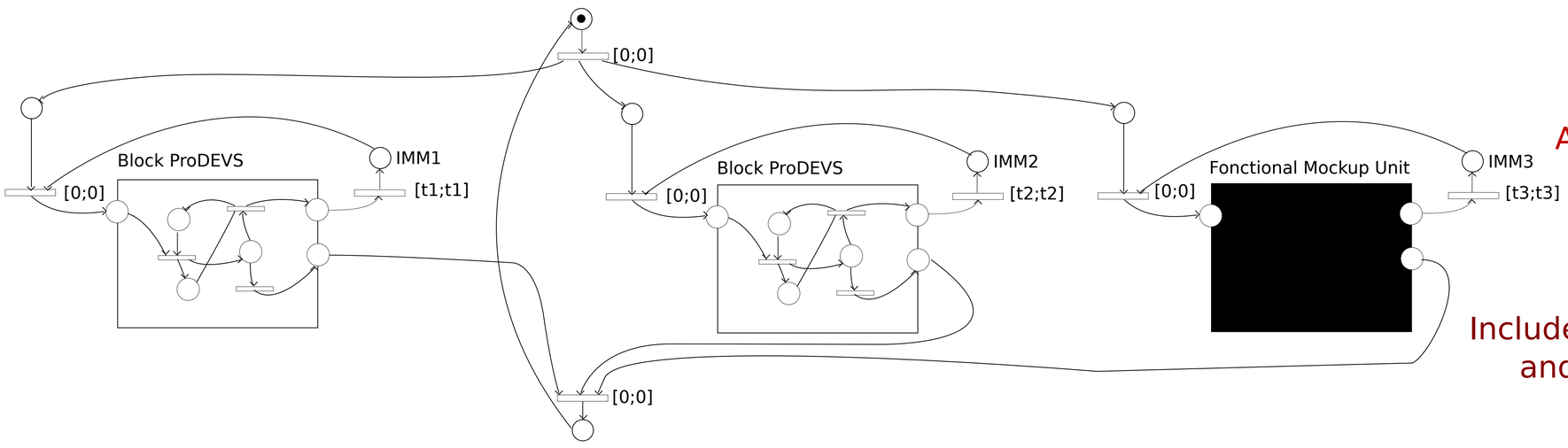
Build a model and choose a Model of Computation (i.e. execution semantic), our tool automatically generates a corresponding Time Petri Net (TPN) that preserves the semantic.



Semantic preservation is proven by bisimulation.

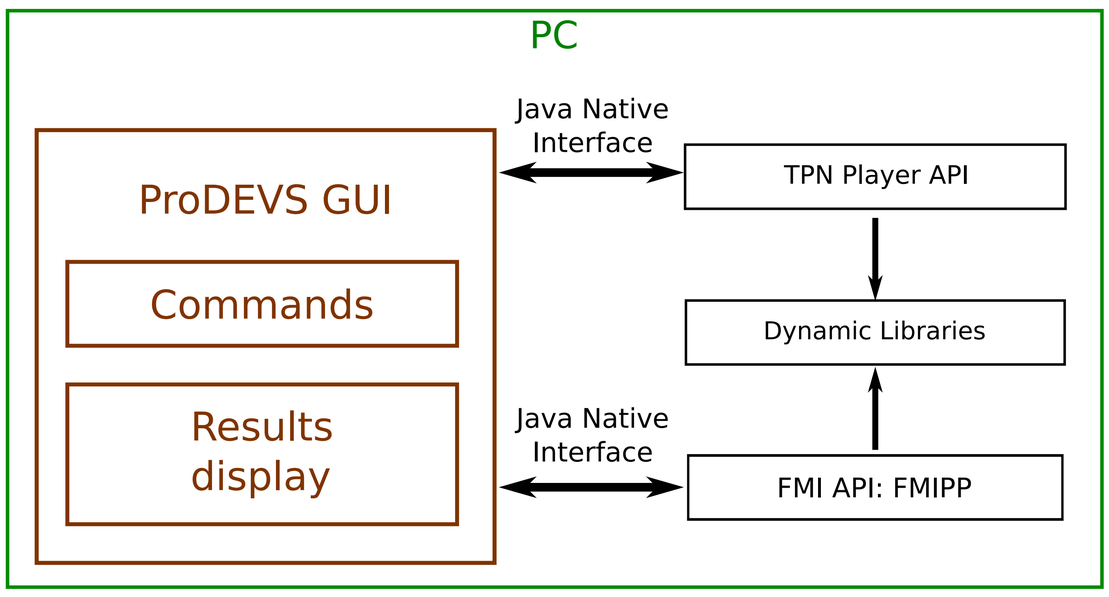
A unique discrete-event kernel for all classes of systems: discrete-time, continuous time and hybrid.

Includes a discrete-event model exchange and cosimulation master for Fonctional Mockup Interface (FMI).

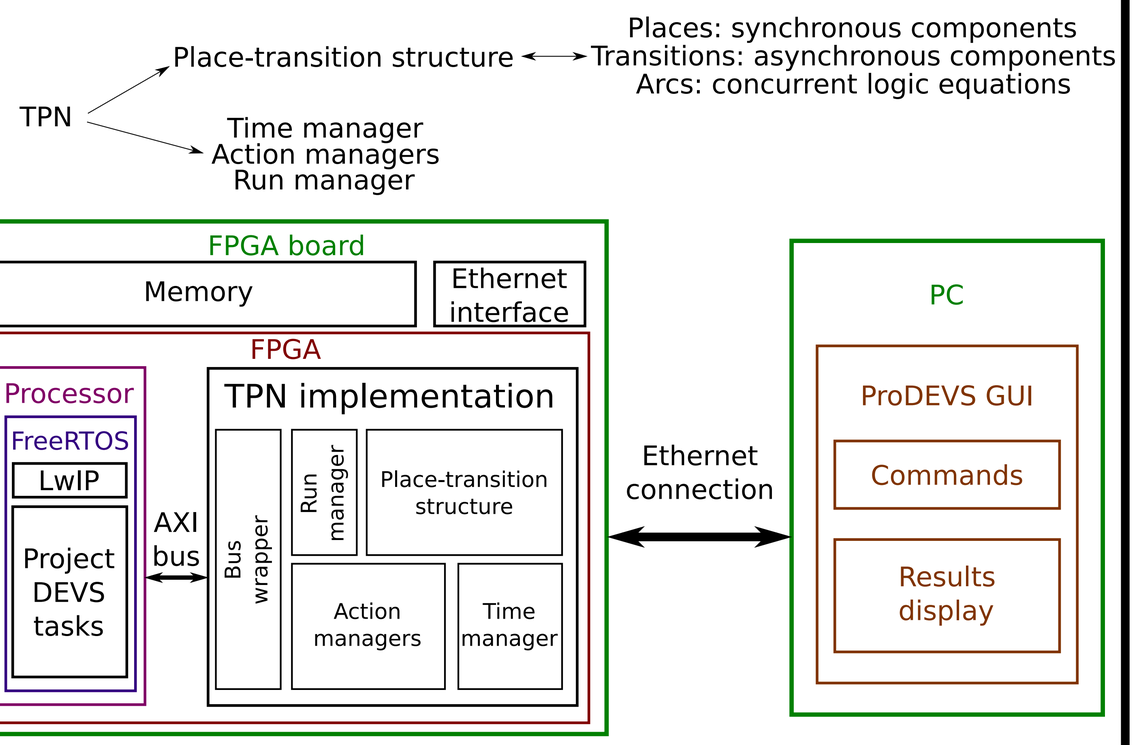
Then deploy the TPN model to a Software (windows, linux [rtai], GPU) or Hardware (FPGA, ASIC) platform for execution.

Software: TPN to C

TPN and FMU components are compiled into dynamic librairies

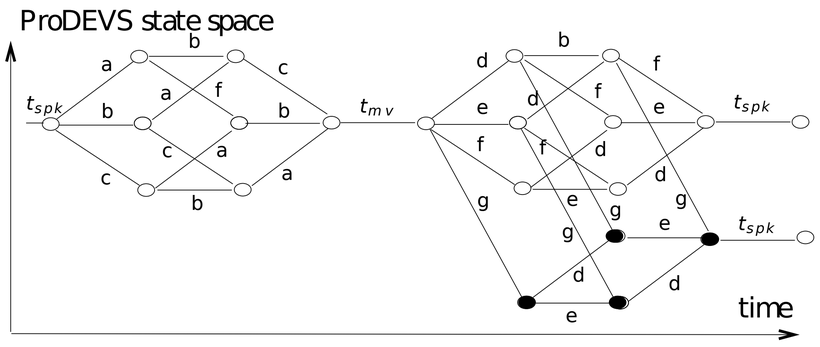


Hardware: TPN to VHDL

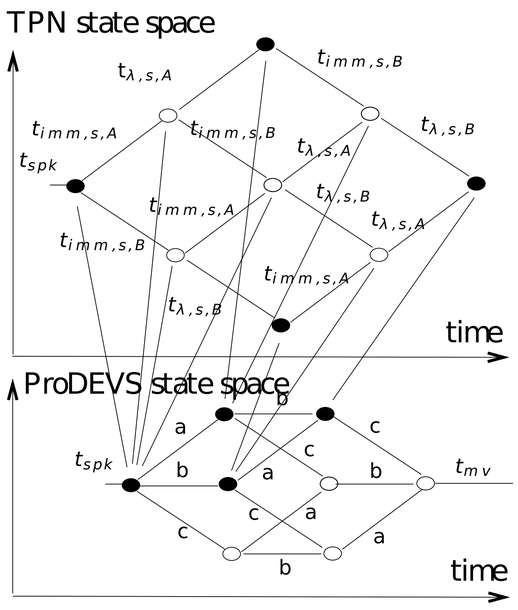


Semantic preservation

Semantic of our MoCs is written as a formal specification



We can build the state space of the generated TPN model then bisimilarity between the semantic of the TPN model and the semantic of your model with its MoC is ensured.



Hardware simulation: results and metrics

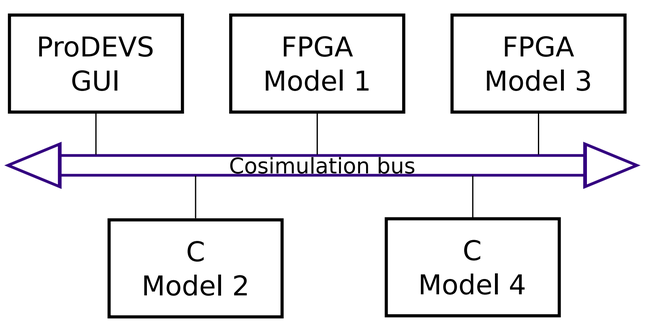
	Free-running hardware	Hardware with output reading	Software (java)
Simulator generation	660 s (11 min)	668 s (11 min)	3 s
Simulator execution	0.1 s	8.6 s	5195 s (1h16)
Total	660 s (11 min)	676 s (11 min)	5198 s (1h16)

8x8 toric Game of Life
Simulation to 100,000 time units
100 MHz FPGA design

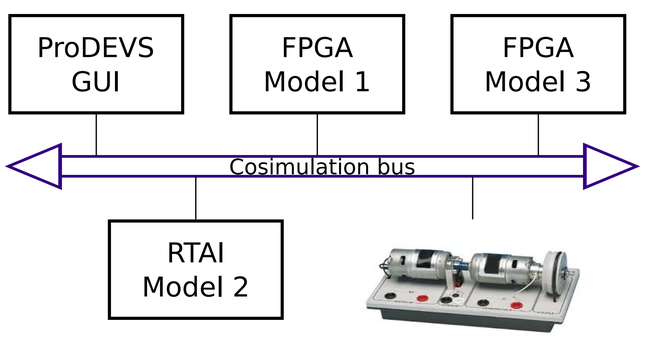
Work in progress

Mixed (software/hardware) platform and real time simulation for Virtual Prototyping, Rapid Prototyping or Hardware in the loop simulation

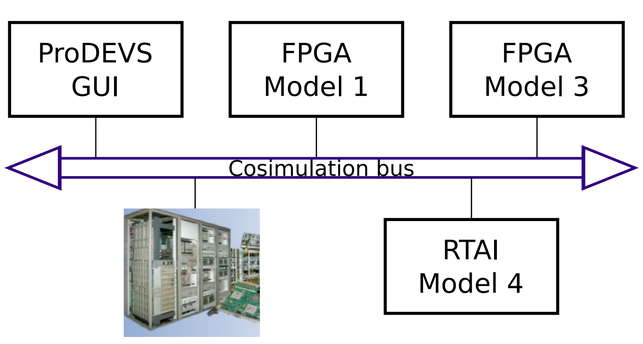
Virtual Prototyping (only models)



Rapid Prototyping (real plant with model of the controler)



Hardware in the loop (real controler with model of the plant)



The correct decomposition of the model is ensured by the theory of Petri Net with different blocks communicating through places.