
PIPE 2.7 Overview

a Petri Net Tool for Performance Modeling & Evaluation

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Outline

1. Petri Nets based tools
2. PIPE background
3. PIPE 2.7

Petri Nets based tools

- PN tool free of charge for academic use, GUI...
- TimeNet [*Zimmermann et al, 2006*]
- GretSPN [*Baarir et al, 2009*]
- Sharpe [*Trivedi et al, 2020*]

PIPE background

- open source, platform independent tool, implemented entirely in Java
- offers a full suite of analysis modules to check behavioral properties, produce performance statistics...
- How was it started ?
 - 2002/3 as an MSc Group Project in the Department of Computing at Imperial College London
 - 2007 PIPE 2.5 [*Bonet et al, 2007*]

PIPE 2.7: GUI

- XML/PNML
- Editor
 - Cut/copy/paste
 - Undo/redo
 - Labels
 - Quick editor mode
 - Shortcuts to all editor options
 - Zoom

PIPE 2.7: Modeling Power

- Places, immediate & timed transitions, arcs & tokens
- Rate and marking parameters
- Inhibitor arcs
- Capacity restriction of places
- Priority for immediate transitions
- Server Semantics for timed transitions
 - Single, multiple & infinite

PIPE 2.7: Simulation

- Animation mode and Token game
- Performance indexes:
 - Average number of tokens
 - New throughput of timed transitions
 - New token density probability
 - New utilization of places

PIPE 2.7: Modules

- Structural analysis
 - Minimal siphons & minimal traps
 - Place and transition invariant analysis
 - Reachability/coverability graph
 - Incidence & marking
- GSPN analysis
 - Average number of tokens
 - Utilization of places
 - Throughput of timed transitions
 - Token probability density

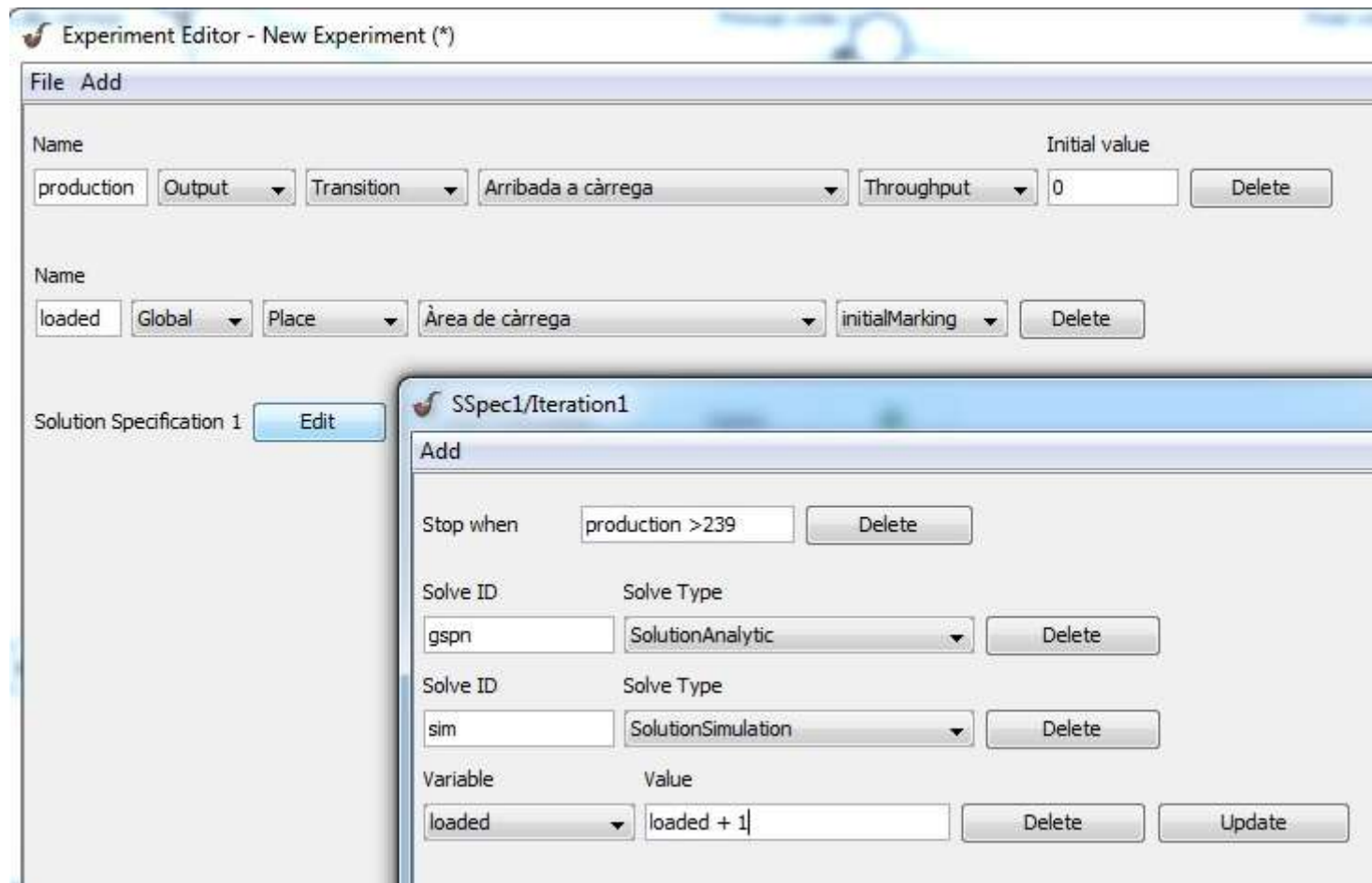
PIPE 2.7: Import/Export Transformations

- Export to graphical formats: Postscript & PNG.
- Export & import to TimeNET format
[*Zimmermann et al, 2006*]
- PMIF import using M2M transformation
[*Bonet&Lladó, 2012*]

PIPE 2.7: Experimenter

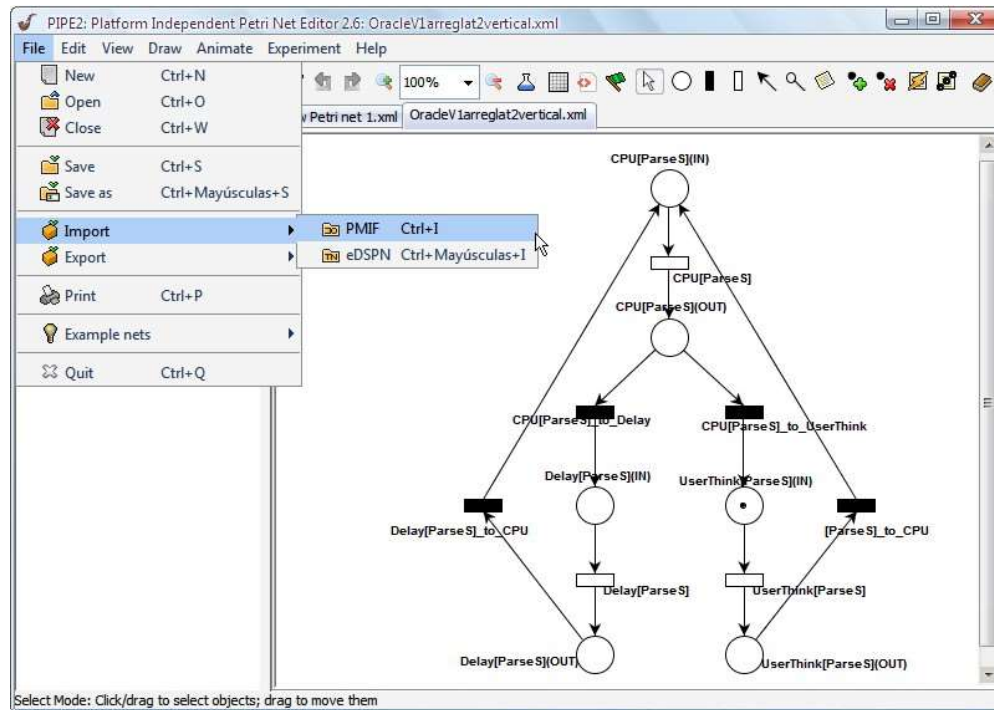
- Complains with the Experiment Schema Extension specification (Ex-SE)
[SmithLladoPuigjaner 2011]
- Ex-SE: a set of model runs and the output desired from them
- Experiment editing, validation and execution
- Results on xml format and Excel

PIPE 2.7: Experimenter



Case Study

- Oracle example [Smith 2008], with 3 servers (CPU, UserThink and Delay).



Average Number of Tokens on a Place

Place	Number of Tokens
CPU[ParseS](IN)	0,35196
CPU[ParseS](OUT)	0
Delay[ParseS](IN)	0,64804
Delay[ParseS](OUT)	0
UserThink[ParseS](IN)	0
UserThink[ParseS](OUT)	0

Throughput of Timed Transitions

Transition	Throughput
CPU[ParseS]	648,04083
Delay[ParseS]	648,04067
UserThink[ParseS]	0,00016

Current (and future) work

- Github license !!!
- Improving other related tools comparison
- Improving PMIF import
 - Drawing of nets
 - Allowing different scheduling policies
 - ...

PIPE 2.7

- ❑ Tool execution !!!