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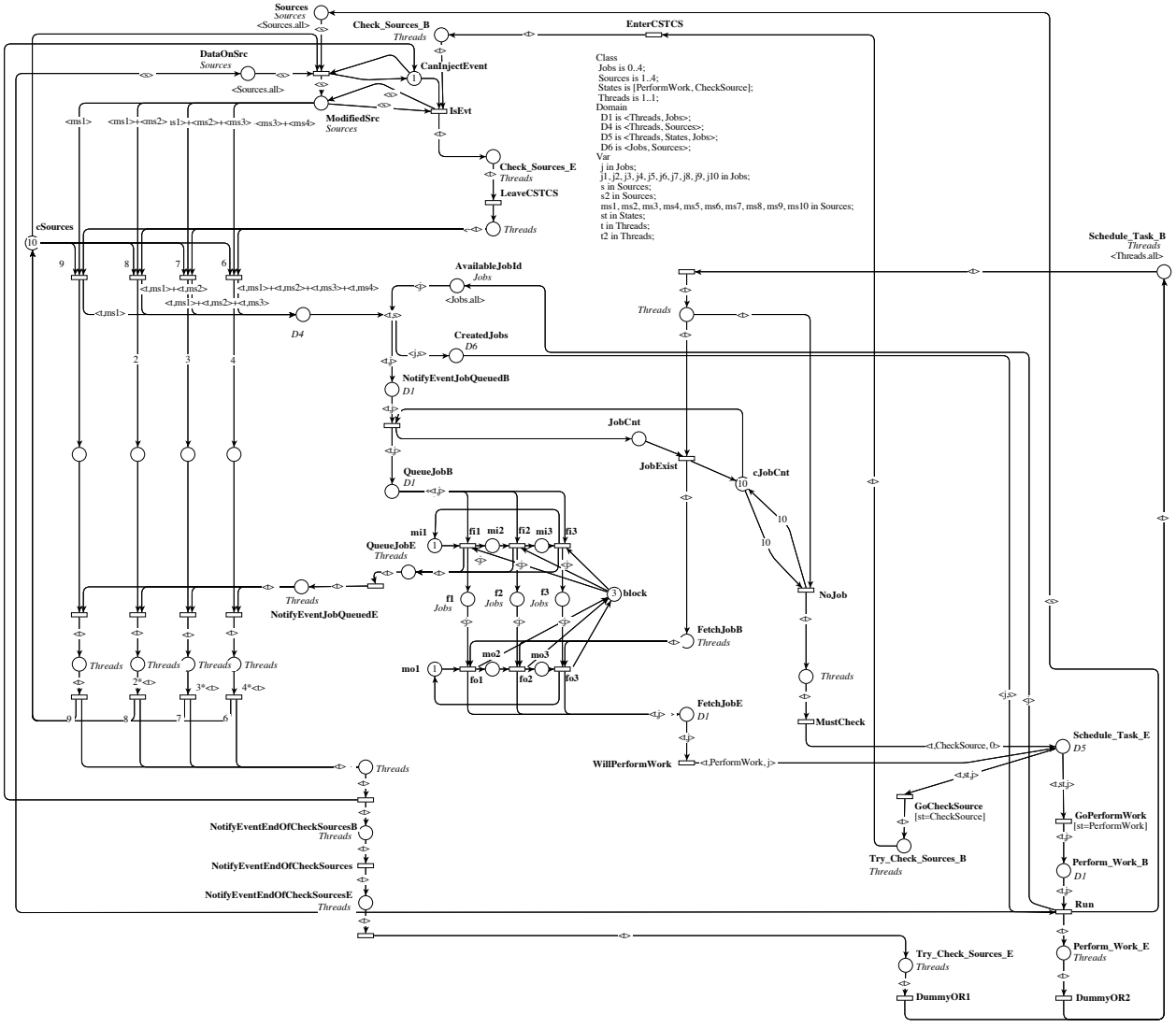
This form is a summary description of the model entitled "PolyORBNT" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models are given together with property files (possibly, one per model instance) giving a set of properties to be checked on the model.

Description

PolyORB is a middleware that was jointly developped at Telecom ParisTech and Université P. & M. Curie (LIP6) between 2000 and 2006. Its main characteristics is to be "schyzophrenic", that means it is able to support various protocols simultaneously. **PolyORB** was a research tool to investigate interoperability between several distribution models (message oriented, distributed objetcs, etc.). It was also experimented to elaborate high-critical dexecution infrastructure for distributed systems. Thus, to ensure reliability, some aspects of this middelware where architectured together with a formal modeling for verification purpose (see referenced paper). This model describes one of the **PolyORB** implementation that was proved to be deadlock-free as well as starvation-free.

This model implements a core component of **PolyORB** where all the concurrency is dealt with: the μBroker. It represents its monotasking implementation. Unfortunately, due to some loss of data during a disk crash, this model is not the final version of the work.



*Model of **PolyORB**'s μBroker in its monotasking implementation*

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References

The first reference presents the formal modeling of **PolyORB** while se second one is a link to its current distribution (this middelware is now supported by AdaCore).

- J. Hugues, Y. Thierry-Mieg, F. Kordon, L. Pautet, S. Baarir, and T. Vergnaud. On the Formal Verification of Middleware Behavioral Properties. *9th International Workshop on Formal Methods for Industrial Critical Systems (FMICS)*, Electornic Notes in Theoretical Computer Science (vol 133), pages 139-157, Elsevier, September 2004,
- http://www.adacore.com/polyorb.

Scaling parameter

Parameter name	Parameter description	Chosen parameter values
(J, S)	S, the maximum number of sources, and J, the maximum number of simultaneous jobs [(a)].	$((S = 05, J = 20))$, $((S = 10, J = 20))$, $((S = 05, J = 30))$, $((S = 10, J = 30))$, $((S = 05, J = 40))$, $((S = 10, J = 40))$, $((S = 05, J = 60))$, $((S = 10, J = 60))$, $((S = 05, J = 80))$, $((S = 10, J = 80))$

Size of the colored net model

number of places:	48
number of transitions:	38
number of arcs:	140

Size of the derived P/T model instances

Parameter	Number of places	Number of transitions	Number of arcs
$(S = 5, J = 20)$	349	1210	8824
$(S = 5, J = 30)$	489	1400	9764
$(S = 5, J = 40)$	629	1590	10704
$(S = 5, J = 60)$	909	1970	12584
$(S = 5, J = 80)$	1189	2350	14464
$(S = 10, J = 20)$	474	11760	111119
$(S = 10, J = 30)$	664	12050	112559
$(S = 10, J = 40)$	854	12340	113999
$(S = 10, J = 60)$	1234	12920	116879
$(S = 10, J = 80)$	1614	13500	119759

Structural properties

ordinary — *all arcs have multiplicity one* ..... ✗
simple free choice — *all transitions sharing a common input place have no other input place* ..... ✗ [(b)]
extended free choice — *all transitions sharing a common input place have the same input places* ..... ✗ [(c)]
state machine — *every transition has exactly one input place and exactly one output place* ..... ✗ [(d)]
marked graph — *every place has exactly one input transition and exactly one output transition* ..... ✗ [(e)]
connected — *there is an undirected path between every two nodes (places or transitions)* ..... ✓ [(f)]
strongly connected — *there is a directed path between every two nodes (places or transitions)* ..... ✓ [(g)]

(a) These parameters affect some color definition and thus do not impact the size of the model (in the colored version).
(b) see transitions **fi**$< i >$ – the net is not ordinary in all its 10 instances (see all aforementioned scaling parameter values).
(c) the net is not ordinary in all its 10 instances (see all aforementioned scaling parameter values).
(d) see transition **fi3** – the net is not ordinary in all its 10 instances (see all aforementioned scaling parameter values).
(e) see place **block** – the net is not ordinary in all its 10 instances (see all aforementioned scaling parameter values).
(f) stated by CÆSAR.BDD version 2.0 on all 10 instances (see all aforementioned scaling parameter values).
(g) stated by CÆSAR.BDD version 2.0 on all 10 instances (see all aforementioned scaling parameter values).

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source place(s) — *one or more places have no input transitions* ..... ✗ (h)
sink place(s) — *one or more places have no output transitions* ..... ✗ (i)
source transition(s) — *one or more transitions have no input places* ..... ✗ (j)
sink transitions(s) — *one or more transitions have no output places* ..... ✗ (k)
loop-free — *no transition has an input place that is also an output place* ..... ✗ (l)
conservative — *for each transition, the number of input arcs equals the number of output arcs* ..... ✗ (m)
subconservative — *for each transition, the number of input arcs equals or exceeds the number of output arcs* ..... ✗ (n)
nested units — *places are structured into hierarchically nested sequential units* (o) ..... ✗

Behavioural properties

safe — *in every reachable marking, there is no more than one token on a place* ..... ✗ (p)
dead place(s) — *one or more places have no token in any reachable marking* ..... ?
dead transition(s) — *one or more transitions cannot fire from any reachable marking* ..... ?
deadlock — *there exists a reachable marking from which no transition can be fired* ..... ✓ (q)
reversible — *from every reachable marking, there is a transition path going back to the initial marking* ..... ?
live — *for every transition t, from every reachable marking, one can reach a marking in which t can fire* ..... ?

Size of the marking graphs

Parameter	Number of reachable markings	Number of transition firings	Max. number of tokens per place	Max. number of tokens per marking
$(S = 5, J = 20)$	6.766×10^{8} (r)	?	?	≥ 58 (s)
$(S = 5, J = 30)$	3.439×10^{9} (t)	?	?	≥ 68
$(S = 5, J = 40)$	?	?	?	≥ 78
$(S = 5, J = 60)$	?	?	?	≥ 98
$(S = 5, J = 80)$	?	?	?	≥ 118
$(S = 10, J = 20)$	3.397×10^{10} (u)	?	?	≥ 68
$(S = 10, J = 30)$	1.631×10^{11} (v)	?	?	≥ 78
$(S = 10, J = 40)$	?	?	?	≥ 88
$(S = 10, J = 60)$	?	?	?	≥ 108
$(S = 10, J = 80)$	?	?	?	≥ 128

(h) stated by CÆSAR.BDD version 2.0 on all 10 instances (see all aforementioned scaling parameter values).
(i) stated by CÆSAR.BDD version 2.0 on all 10 instances (see all aforementioned scaling parameter values).
(j) stated by CÆSAR.BDD version 2.0 on all 10 instances (see all aforementioned scaling parameter values).
(k) stated by CÆSAR.BDD version 2.0 on all 10 instances (see all aforementioned scaling parameter values).
(l) see transition **NoJob** – confirmed by CÆSAR.BDD version 2.0 on all 10 instances (see all aforementioned scaling parameter values).
(m) see transition **IsEvt** – confirmed by PNML2NUPN 1.3.0 on all 10 instances (see all aforementioned scaling parameter values).
(n) see the transition in input of place **NotifyEventEndOfCheckSourcesB** – confirmed by PNML2NUPN 1.3.0 on all 10 instances (see all aforementioned scaling parameter values).
(o) the definition of Nested-Unit Petri Nets (NUPN) is available from http://mcc.lip6.fr/nupn.php
(p) in the initial marking, there exist 3 places containing between 3 and 10 tokens.
(q) checked by GreatSPN on December 2013; confirmed at MCC'2014 by Helena on all 10 colored instances, and by GreatSPN and Lola on all 10 P/T instances. Presence of deadlock is "normal" because the model is not the last version described in the referenced paper.
(r) computed with GreatSPN on December 2013, this is actually an estimation from the symbolic reachability graph.
(s) lower bound given by the number of initial tokens.
(t) computed with GreatSPN on December 2013, this is actually an estimation from the symbolic reachability graph.
(u) computed with GreatSPN on December 2013, this is actually an estimation from the symbolic reachability graph.
(v) computed with GreatSPN on December 2013, this is actually an estimation from the symbolic reachability graph.