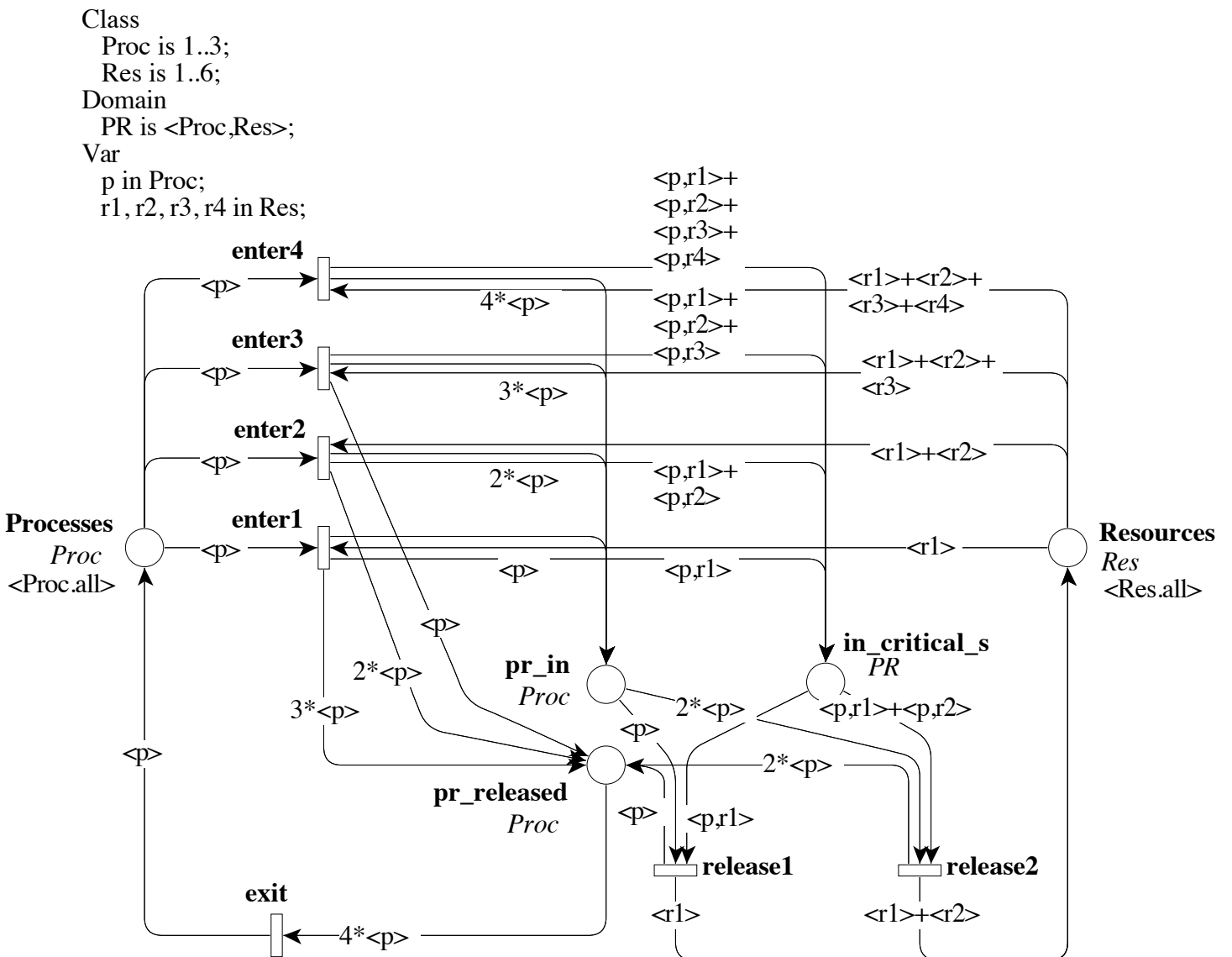


*This form is a summary description of the model entitled "Global Allocation Resource Management" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T 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

Management of resources with the declaration of all resources to be used in a critical section. when process p enters a critical section (transition enter) it locks all the resources needed to be used in the critical section (4 max). Then, it can release a subset of these resources, max 2 at a time (and then stay in the critical section) or exit the critical section, thus releasing all the remaining resources it locks.



## References

From a book on operating systems by Sacha Krakowiak. The model is presented and explained in the reference below:

1. M. Colange, L.-M. Hillah, F. Kordon, and P. Parutto. Extreme symmetries in complex distributed systems: The bag-oriented approach. In Large-Scale Complex IT Systems. Development, Operation and Management - 17th Monterey Workshop 2012, volume 7539 of Lecture Notes in Computer Science, pages 330–352. Springer, 2012.

## Scaling parameter

Parameter name	Parameter description	Chosen parameter values
(Cardinality of Proc and Res classes)	see description	$(n, 2 \times n)$ with $n \in \{3, 5, 6, 7, 9, 10, 11\}$

## Size of the colored net model

number of places: 5  
 number of transitions: 7  
 number of arcs: 29

## Size of the derived P/T model instances

Parameter	Number of places	Number of transitions	Number of arcs
$n = 3$	33	4791	38652
$n = 5$	75	56105	492760
$n = 6$	102	136662	1226388

## Structural properties

<b>ordinary</b> — all arcs have multiplicity one .....	X
<b>simple free choice</b> — all (different) transitions with a shared input place have no other input place .....	X (a)
<b>state machine</b> — every transition has exactly one input place and exactly one output place .....	X (b)
<b>marked graph</b> — every place has exactly one input transition and exactly one output transition .....	X (c)
<b>connected</b> — there is an undirected path between every two nodes (places or transitions) .....	✓ (d)
<b>strongly connected</b> — there is a directed path between every two nodes (places or transitions) .....	✓ (e)
<b>source place(s)</b> — one or more places have no input transitions .....	X (f)
<b>sink place(s)</b> — one or more places have no output transitions .....	X (g)
<b>source transition(s)</b> — one or more transitions have no input places .....	X (h)
<b>sink transitions(s)</b> — one or more transitions have no output places .....	X (i)
<b>loop-free</b> — no transition has an input place that is also an output place .....	✓ (j)
<b>conservative</b> — for each transition, the number of input arcs equals the number of output arcs .....	X (k)
<b>subconservative</b> — for each transition, the number of input arcs equals or exceeds the number of output arcs .....	X (l)
<b>nested units</b> — places are structured into hierarchically nested sequential units <sup>(m)</sup> .....	X

(a) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(b) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(c) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(d) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(e) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(f) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(g) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(h) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(i) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(j) stated by [CÆSAR.BDD](#) version 1.7 on all 3 instances (3, 5, and 6).

(k) stated by [PNML2NUPN](#) 1.3.0 on all 3 instances (3, 5, and 6).

(l) stated by [PNML2NUPN](#) 1.3.0 on all 3 instances (3, 5, and 6).

(m) the definition of Nested-Unit Petri Nets (NUPN) is available from <http://mcc.lip6.fr/nupn.php>

## Behavioural properties

- safe** — *in every reachable marking, there is no more than one token on a place* ..... ✗  
**deadlock** — *there exists a reachable marking from which no transition can be fired* ..... ✗<sup>(n)</sup>  
**reversible** — *from every reachable marking, there is a transition path going back to the initial marking* ..... ?  
**quasi-live** — *for every transition  $t$ , there exists a reachable marking in which  $t$  can fire* ..... ✓  
**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 reach-able markings	Number of tran-sition firings	Max. number of tokens per place	Max. number of tokens per marking
$n = 3$	6320 <sup>(o)</sup>	116 178 <sup>(p)</sup>	4 <sup>(q)</sup>	18 <sup>(r)</sup>
$n = 5$	1.0660E+8 <sup>(s)</sup>	?	?	$\geq 15$
$n = 6$	2.5725E+10 <sup>(t)</sup>	?	?	$\geq 18$
$n = 7$	8.5698E+12 <sup>(u)</sup>	?	?	?
$n = 9$	2.1185E+18 <sup>(v)</sup>	?	?	?

<sup>(n)</sup> checked by the Crocodile tool in 2012, see reference 1; confirmed at MCC'2014 by GreatSPN, Lola, PNXDD, and Tapaal on one P/T instance ( $N = 3$ ).

<sup>(o)</sup> computed at MCC'2013 by GreatSPN, ITS-Tools, Marcie, and PNXDD; confirmed at MCC'2014 by GreatSPN on the colored net instance, and by GreatSPN, Marcie, PNMC, PNXDD, Stratagem, and Tapaal.

<sup>(p)</sup> computed at MCC'2014 by MArchie.

<sup>(q)</sup> computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.

<sup>(r)</sup> computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.

<sup>(s)</sup> computed at MCC'2013 by ITS-Tools; confirmed at MCC'2014 by GreatSPN on the colored net instance.

<sup>(t)</sup> computed at MCC'2013 by ITS-Tools; confirmed at MCC'2014 by GreatSPN on the colored net instance.

<sup>(u)</sup> computed at MCC'2014 by GreatSPN on the colored net instance.

<sup>(v)</sup> computed at MCC'2014 by GreatSPN on the colored net instance.