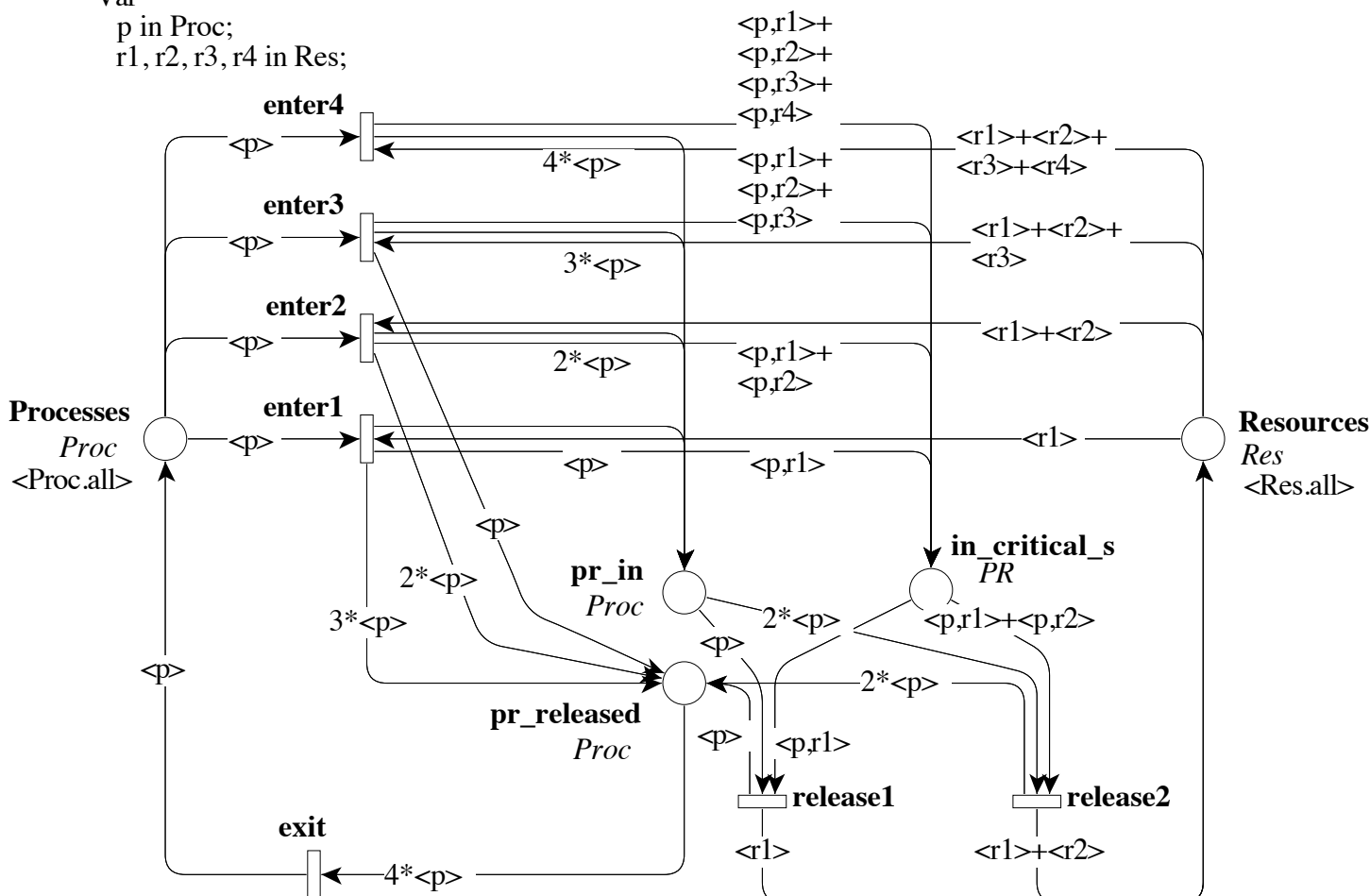


*This form is a summary description of the model entitled "Global Allocation Resource Management" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T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

Class  
 Proc is 1..3;  
 Res is 1..6;  
 Domain  
 PR is <Proc,Res>;  
 Var  
 p in Proc;  
 r1, r2, r3, r4 in Res;



## 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

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

(a) the net is not ordinary in all its 2 instances (3 and 5).  
 (b) the net is not ordinary in all its 2 instances (3 and 5).  
 (c) the net is not ordinary in all its 2 instances (3 and 5).  
 (d) the net is not ordinary in all its 2 instances (3 and 5).  
 (e) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (3 and 5).  
 (f) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (3 and 5).  
 (g) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (3 and 5).  
 (h) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (3 and 5).  
 (i) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (3 and 5).  
 (j) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (3 and 5).  
 (k) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (3 and 5).  
 (l) stated by [PNML2NUPN](#) 1.3.0 on all 2 instances (3 and 5).  
 (m) stated by [PNML2NUPN](#) 1.3.0 on all 2 instances (3 and 5).  
 (n) 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* ..... X  
**deadlock** — *there exists a reachable marking from which no transition can be fired* ..... X<sup>(o)</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>(p)</sup>	116 178 <sup>(q)</sup>	4 <sup>(r)</sup>	18 <sup>(s)</sup>
$n = 5$	1.0660E+8 <sup>(t)</sup>	?	?	$\geq 15$
$n = 6$	2.5725E+10 <sup>(u)</sup>	?	?	$\geq 18$
$n = 7$	8.5698E+12 <sup>(v)</sup>	?	?	?
$n = 9$	2.1185E+18 <sup>(w)</sup>	?	?	?

<sup>(o)</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>(p)</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>(q)</sup> computed at MCC'2014 by MArcie.

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

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

<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'2013 by ITS-Tools; confirmed at MCC'2014 by GreatSPN on the colored net instance.

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

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