

This form is a summary description of the model entitled “Three-Module Ring” 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

- Comment from the submitter: The Petri net is a nice example for a safe Petri net with a reasonably large state space. It originally models a hardware circuit.
- Original description: The net models a three-module ring architecture. The communication architecture contains as many channels as there are modules. It tests the occurrence of global deadlock arising from a local one. It uses pausable clocking scheme on arbitrated input and output channels.

References

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Scaling parameter

This model is not parameterized.

Size of the model

number of places: 139
number of transitions: 87
number of arcs: 410

Structural properties

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

(a) 105 arcs are not simple free choice, e.g., the arc from place “P10” (which has 2 outgoing transitions) to transition “T30” (which has 3 input places).

(b) transitions “T30” and “T32” share a common input place “P10”, but only the former transition has input place “P3”.

(c) 82 transitions are not of a state machine, e.g., transition “T1”.

(d) 60 places are not of a marked graph, e.g., place “P10”.

(e) stated by [CÆSAR.BDD](#) version 1.7.

(f) stated by [CÆSAR.BDD](#) version 1.7.

(g) stated by [CÆSAR.BDD](#) version 1.7.

(h) stated by [CÆSAR.BDD](#) version 1.7.

(i) stated by [CÆSAR.BDD](#) version 1.7.

(j) stated by [CÆSAR.BDD](#) version 1.7.

loop-free — no transition has an input place that is also an output place	✗ ^(k)
conservative — for each transition, the number of input arcs equals the number of output arcs	✗ ^(l)
subconservative — for each transition, the number of input arcs equals or exceeds the number of output arcs	✗ ^(m)
nested units — places are structured into hierarchically nested sequential units ⁽ⁿ⁾	✗

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	? ^(o)
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 graph

number of reachable markings:	9.0265×10^{11} ^(p)
number of transition firings:	$9.6628E \times 10^{12}$ ^(q)
max. number of tokens per place:	1 ^(r)
max. number of tokens per marking:	61 ^(s)

^(k) 21 transitions are not loop free, e.g., transition “T17”.

^(l) 56 transitions are not conservative, e.g., transition “T11”.

^(m) 27 transitions are not subconservative, e.g., transition “T11”.

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

^(o) found to be false at MCC’2014 by GreatSPN.

^(p) computed at MCC’2013 by ITS-Tools, Marcie, and PNXDD; confirmed at MCC’2014 by GreatSPN, Marcie, PNMC, and PNXDD.

^(q) computed at MCC’2014 by Marcie.

^(r) confirmed at MCC’2014 by GreatSPN, Marcie, and PNMC.

^(s) computed at MCC’2014 at Marcie and PNMC.