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This form is a summary description of the model entitled "BugTracking" 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

The bug tracking system manages software bug reports. It has five principals and eight types of messages (bug report, closed, fix-again, fix, must-fix, more-information, pending, and verified). The provenance specification, given as an automaton with nine states, encodes the flow of events leading from a bug report to a bug fix. While the original system violated the specification because a message was sent to an incorrect channel, the property holds for the new system.

The initial model [1] was translated to a coverability problem in a Petri net in [2], then used as one of the benchmarks for the tool Petrinizer in [3]. Models found in [4] where converted to PNML thanks to an ITS-Tools [5] library.

The source model has an initial marking ($l_0 \geq 1$) constraint rather than a single initial marking, this is used in the MCC to scale the model up.

References

1. J. Janak. Bug tracking systems. Master's thesis, Masaryk University, Brno, 2009
2. R. Majumdar, R. Meyer, and Z. Wang. Static provenance verification for message passing programs. In SAS, volume 7935 of Lecture Notes in Computer Science, pages 366–387. Springer, 2013.
3. J. Esparza, R. Ledesma-Garza, R. Majumdar, P. J. Meyer, and F. Niksic. An smt-based approach to coverability analysis. In CAV, volume 8559 of Lecture Notes in Computer Science, pages 603–619. Springer, 2014
4. Klara J. Meyer, Petrinizer repository, https://github.com/meyerphi/petrinizer.
5. Y. Thierry-Mieg, Homepage of ITS-tools https://lip6.github.io/ITSTools-web/

Scaling parameter

Parameter name	Parameter description	Chosen parameter values
V, M	V is a variant (q3 and q8) q3 is apparently buggy and the second is a corrected version, M is the number of tokens in place **l0**.	(q3, 2), (q3, 4), (q3, 8), (q3, 16), (q3, 32), (q3, 64), (q3, 128), (q3, 256), (q8, 2), (q8, 4), (q8, 8), (q8, 16), (q8, 32), (q8, 64), (q8, 128), (q8, 256)

Size of the model

Although the model is parameterized, its size does not depend on parameter values.

number of places:	754
number of transitions:	27370
number of arcs:	136172

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]

[a] 80640 arcs are not simple free choice, e.g., the arc from place "l1" (which has 72 outgoing transitions) to transition "t2" (which has 2 input places).
[b] transitions "t2" and "t3" share a common input place "l1", but only the former transition has input place "x0_BUG_REPORT_q0".

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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)
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* ..... ✗ (o)
dead place(s) — *one or more places have no token in any reachable marking* ..... ✓ (p)
dead transition(s) — *one or more transitions cannot fire from any reachable marking* ..... ✓ (q)
deadlock — *there exists a reachable marking from which no transition can be fired* ..... ?
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* ..... ?

(c) 27360 transitions are not of a state machine, e.g., transition "t2".
(d) 754 places are not of a marked graph, e.g., place "l0".
(e) stated by CÆSAR.BDD version 3.7 on all 16 instances (2 versions × 8 values of M).
(f) from place "l0" one cannot reach place "ch0_BUG_REPORT_q0".
(g) there exist 216 source places, e.g., place "ch0_BUG_REPORT_q0".
(h) there exist 2 sink places, e.g., place "l33".
(i) stated by CÆSAR.BDD version 3.7 on all 16 instances (2 versions × 8 values of M).
(j) stated by CÆSAR.BDD version 3.7 on all 16 instances (2 versions × 8 values of M).
(k) 1296 transitions are not loop free, e.g., transition "t2".
(l) 26712 transitions are not conservative, e.g., transition "t74".
(m) 792 transitions are not subconservative, e.g., transition "t74".
(n) the definition of Nested-Unit Petri Nets (NUPN) is available from http://mcc.lip6.fr/nupn.php
(o) stated by CÆSAR.BDD version 3.7 on all 16 instances (2 versions × 8 values of M).
(p) stated by CÆSAR.BDD version 3.7 on all 16 instances (2 versions × 8 values of M).
(q) stated by CÆSAR.BDD version 3.7 on all 16 instances (2 versions × 8 values of M).

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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
V=q3, M=2	?	?	?	≥ 11 [r]
V=q3, M=4	?	?	?	≥ 13 [s]
V=q3, M=8	?	?	?	≥ 17 [t]
V=q3, M=16	?	?	?	≥ 25 [u]
V=q3, M=32	?	?	?	≥ 41 [v]
V=q3, M=64	?	?	?	≥ 73 [w]
V=q3, M=128	?	?	?	≥ 137 [x]
V=q3, M=256	?	?	?	≥ 265 [y]
V=q8, M=2	?	?	?	≥ 11 [z]
V=q8, M=4	?	?	?	≥ 13 [aa]
V=q8, M=8	?	?	?	≥ 17 [ab]
V=q8, M=16	?	?	?	≥ 25 [ac]
V=q8, M=32	?	?	?	≥ 41 [ad]
V=q8, M=64	?	?	?	≥ 73 [ae]
V=q8, M=128	?	?	?	≥ 137 [af]
V=q8, M=256	?	?	?	≥ 265 [ag]

[r] lower bound given by the number of initial tokens.
[s] lower bound given by the number of initial tokens.
[t] lower bound given by the number of initial tokens.
[u] lower bound given by the number of initial tokens.
[v] lower bound given by the number of initial tokens.
[w] lower bound given by the number of initial tokens.
[x] lower bound given by the number of initial tokens.
[y] lower bound given by the number of initial tokens.
[z] lower bound given by the number of initial tokens.
[aa] lower bound given by the number of initial tokens.
[ab] lower bound given by the number of initial tokens.
[ac] lower bound given by the number of initial tokens.
[ad] lower bound given by the number of initial tokens.
[ae] lower bound given by the number of initial tokens.
[af] lower bound given by the number of initial tokens.
[ag] lower bound given by the number of initial tokens.