Description

This model is the biggest one (in terms of places and transition) of a collection of 1386 Petri nets that were derived from industrial business process models that were provided by IBM. The Petri nets have workflow structure (unique source and sink place) and can be checked for soundness (marking the source place, does the CTL formula “AGEF sink” hold). More information on the models can be found in the referenced paper.

The soundness check is an ideal challenge for the model checking contest, because it can be performed by checking a CTL formula or by checking the short-circuited net for liveness and boundedness. This allows for generic as well as Petri net-specific approaches.

References


Scaling parameter

This model is not parameterized.

Size of the model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of places</td>
<td>273</td>
</tr>
<tr>
<td>Number of transitions</td>
<td>179</td>
</tr>
<tr>
<td>Number of arcs</td>
<td>572</td>
</tr>
</tbody>
</table>

Structural properties

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

(a) stated by CÆSAR.BDD version 1.7.
(b) stated by CÆSAR.BDD version 2.6.
(c) 144 transitions are not of a state machine, e.g., transition “callToProcess.s00003859.inputCriterion.s00001053”.
(d) 34 places are not of a marked graph, e.g., place “alpha”.
(e) stated by CÆSAR.BDD version 1.7.
(f) from place “callToProcess.s00001108.input.s00001066” one cannot reach place “alpha”.
(g) place “alpha” is a source place.
(h) there exist 10 sink places, e.g., place “callToProcess.s00001108.output.s00001077”.
source transition(s) — one or more transitions have no input places ...................................................X (i)
sink transitions(s) — one or more transitions have no output places ...................................................X (i)
loop-free — no transition has an input place that is also an output place ........................................X (k)
conservative — for each transition, the number of input arcs equals the number of output arcs ........X (l)
subconservative — for each transition, the number of input arcs equals or exceeds the number of output arcs ...X (m)
nested units — places are structured into hierarchically nested sequential units (n) ..................................X

Behavioural properties

safe — in every reachable marking, there is no more than one token on a place ......................................X (o)
deadlock — there exists a reachable marking from which no transition can be fired ..................................✓ (p)
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: 1.551 \times 10^{16} (q)
number of transition firings: 2.0113 \times 10^{17} (r)
max. number of tokens per place: 7 (s)
max. number of tokens per marking: 60 (t)

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(i) stated by CÆSAR.BDD version 1.7.
(j) stated by CÆSAR.BDD version 1.7.
(k) stated by CÆSAR.BDD version 1.7.
(l) 141 transitions are not conservative, e.g., transition “callToProcess.s00003859.inputCriterion.s00001053”.
(m) 72 transitions are not subconservative, e.g., transition “callToProcess.s00003859.outputCriterion.s00001055”.
(n) the definition of Nested-Unit Petri Nets (NUPN) is available from http://mcc.lip6.fr/nupn.php
(o) firing transition “merge.s00001162.activate.s00001065” puts a token in place “merge.s00001162.activated” although this place already has a token in the current marking.
(p) confirmed at MCC’2014 by Lola and Tapaaal.
(q) computed at MCC’2013 by Marcie and PNXDD; confirmed at MCC’2014 by Marcie.
(r) computed at MCC’2014 by Marcie.
(s) computed at MCC’2014 by Marcie.
(t) computed at MCC’2014 by Marcie.