This form is a summary description of the model entitled “SharedMemory” 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

This model is an example extracted from a paper on GreatSPN. It models a system composed of \( P \) processors, each one with a local memory. Each processor can access its local memory using a dedicated local bus and the other memories using a unique shared bus. The processor accessing a remote memory have priority on those accessing their own memory. It is assumed that external access request causes preemption of the owner processor eventually accessing its local memory.

References

http://dblp.uni-trier.de/rec/bibtex/conf/pnpm/ChiolaF89

Scaling parameter

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Parameter description</th>
<th>Chosen parameter values</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P )</td>
<td>( P ) is the number of processors. Initial markings of places Active and Memory are impacted.</td>
<td>5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000, 50000, 100000</td>
</tr>
</tbody>
</table>

Size of the colored net model

- number of places: 6
- number of transitions: 5
- number of arcs: 16
Size of the derived P/T model instances

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number of places</th>
<th>Number of transitions</th>
<th>Number of arcs</th>
</tr>
</thead>
<tbody>
<tr>
<td>P = 5</td>
<td>41</td>
<td>55</td>
<td>200</td>
</tr>
<tr>
<td>P = 10</td>
<td>131</td>
<td>210</td>
<td>800</td>
</tr>
<tr>
<td>P = 20</td>
<td>461</td>
<td>820</td>
<td>3200</td>
</tr>
<tr>
<td>P = 50</td>
<td>2651</td>
<td>5050</td>
<td>20000</td>
</tr>
<tr>
<td>P = 100</td>
<td>10301</td>
<td>20100</td>
<td>80000</td>
</tr>
<tr>
<td>P = 200</td>
<td>40601</td>
<td>80200</td>
<td>320000</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
- source transition(s) — one or more transitions have no input places
- sink transitions(s) — one or more transitions have no output places
- loop-free — no transition has an input place that is also an output place
- conservative — for each transition, the number of input arcs equals the number of output arcs
- subconservative — for each transition, the number of input arcs equals or exceeds the number of output arcs
- nested units — places are structured into hierarchically nested sequential units

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
- 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

*Note: Some properties are marked with an asterisk (*) to indicate that they are not applicable or are not confirmed for certain parameter values.*
Size of the marking graphs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number of reachable markings</th>
<th>Number of transition firings</th>
<th>Max. number of tokens per place</th>
<th>Max. number of tokens per marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P = 5$</td>
<td>1 863 (^r)</td>
<td>10395 (^s)</td>
<td>1 (^t)</td>
<td>11 (^u)</td>
</tr>
<tr>
<td>$P = 10$</td>
<td>1.8305E+6 (^v)</td>
<td>1.9486E+7 (^w)</td>
<td>1 (^x)</td>
<td>21 (^y)</td>
</tr>
<tr>
<td>$P = 20$</td>
<td>4.451E+11 (^z)</td>
<td>9.1974E+12 (^aa)</td>
<td>1 (^ab)</td>
<td>41 (^ac)</td>
</tr>
<tr>
<td>$P = 50$</td>
<td>5.870E+26 (^ad)</td>
<td>?</td>
<td>1 (^ae)</td>
<td>101 (^af)</td>
</tr>
<tr>
<td>$P = 100$</td>
<td>1.701E+51 (^ag)</td>
<td>?</td>
<td>1 (^ah)</td>
<td>201 (^ai)</td>
</tr>
<tr>
<td>$P = 200$</td>
<td>3.524E+99 (^aj)</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>$P = 500$</td>
<td>3.02E+243 (^ak)</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

(^r) computed at MCC’2013 by Alpina, GreatSPN, ITS-Tools, Marcie, Neco, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC’2014 by Helena on the colored net instance, and by GreatSPN, Marcie, PNMC, PNXDD, Stratagem, and Tapaal on the P/T net instance.  
(^s) computed at MCC’2014 by GreatSPN, Marcie, PNMC, and Tapaal.  
(^t) confirmed at MCC’2014 by GreatSPN, Marcie, PNMC, and Tapaal.  
(^u) confirmed at MCC’2014 by GreatSPN, Marcie, PNMC, and Tapaal.  
(^v) computed at MCC’2013 by Alpina, GreatSPN, ITS-Tools, Marcie, Neco, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC’2014 by GreatSPN, Marcie, PNMC, PNXDD, and Stratagem. 
(^w) computed at MCC’2014 by Marcie.  
(^x) confirmed at MCC’2014 by GreatSPN, Marcie, and PNMC.  
(^y) confirmed at MCC’2014 by GreatSPN, Marcie, and PNMC.  
(^z) computed at MCC’2013 by ITS-Tools, Marcie, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC’2014 by Marcie, PNMC, PNXDD, and Stratagem. 
(^aa) computed at MCC’2014 by Marcie.  
(^ab) confirmed at MCC’2014 by Marcie and PNMC.  
(^ac) confirmed at MCC’2014 by Marcie and PNMC.  
(^ad) computed at MCC’2013 by ITS-Tools; confirmed at MCC’2014 by PNMC.  
(^ae) computed at MCC’2014 by PNMC.  
(^af) computed at MCC’2014 by PNMC.  
(^ag) computed at MCC’2013 by ITS-Tools; confirmed at MCC’2014 by PNMC.  
(^ah) computed at MCC’2014 by PNMC.  
(^ai) computed at MCC’2014 by PNMC.  
(^aj) computed at MCC’2013 by ITS-Tools.  
(^ak) computed at MCC’2013 by ITS-Tools.