This form is a summary description of the model entitled "MedleyA" 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.
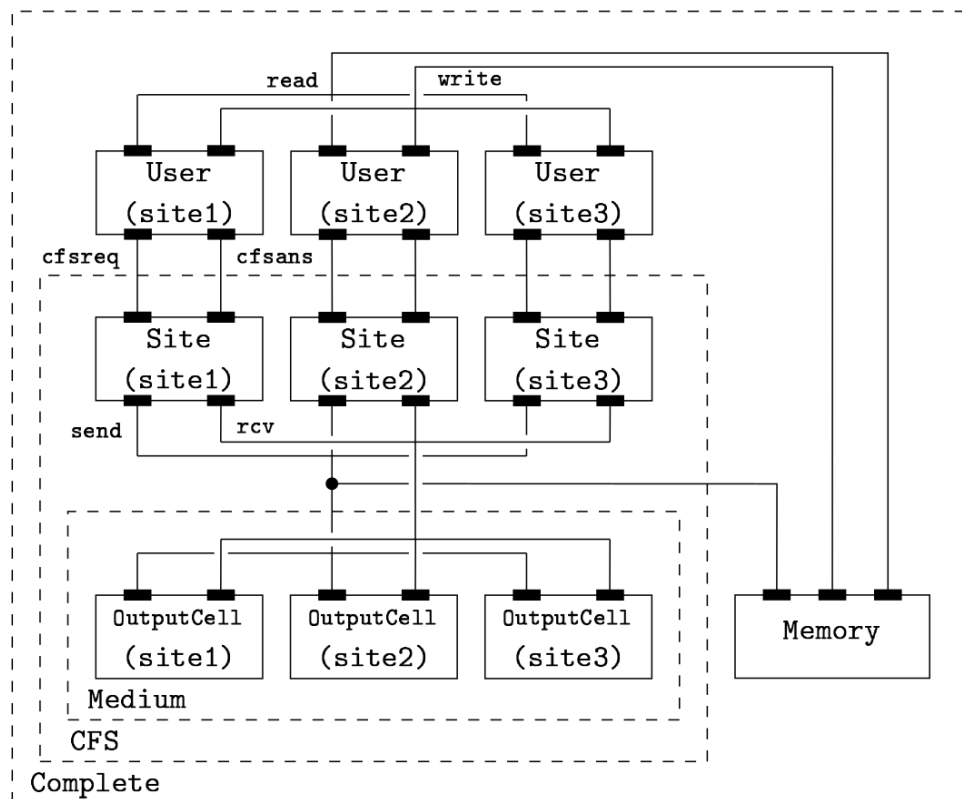
Description

This model gathers a collection of NUPNs generated from six demo examples of the CADP toolbox:

- systolic circuits computing a convolution product

- the REL/rel distributed algorithm

- the CFS cluster file system

- the HAVi leader election protocol

- a Computer Integrated Manufacturing architecture

- a turntable drilling system

These examples have been expressed in LOTOS or in LNT, a modern language that can be translated to LOTOS automatically. Each LOTOS specification (either written by hand or generated automatically) was then translated an interpreted Petri net using the CADP toolbox. A P/T net was than obtained by stripping out all data-related information (variables, types, assignments, guards, etc.) from the interpreted Petri net, leading to a NUPN (Nested-Unit Petri Net) model translated to PNML using the CÆSAR.BDD tool.

We kept only the NUPNs whose marking graphs had more than one million states, discarding other NUPNs that were considered too simple for the Model Checking Contest. This led to a collection of 23 NUPNs, which we ordered by increasing number of places.

Overview of the Cluster File System

Model: MedleyA
Type: P/T Net
Origin: Academic

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References

The source LNT and LOTOS files modelling the systolic convolution product are available from http://cadp.inria.fr/ftp/demos/demo_04.

The source LNT and LOTOS files modelling the REL/rel distributed algorithm are available from http://cadp.inria.fr/ftp/demos/demo_08.

The source LNT and LOTOS files modelling the CFS cluster file system are available from http://cadp.inria.fr/ftp/demos/demo_25.

The source LNT and LOTOS files modelling the HAVi leader election protocol are available from http://cadp.inria.fr/ftp/demos/demo_27.

The source LNT and LOTOS files modelling the Computer Integrated Manufacturing architecture are available from http://cadp.inria.fr/ftp/demos/demo_34.

The source LNT and LOTOS files modelling the turntable drilling system are available from http://cadp.inria.fr/ftp/demos/demo_39.

Scaling parameter

Parameter name	Parameter description	Chosen parameter values
N	N is the instance number	from 1 to 23

Size of the model

Parameter	Number of places	Number of transitions	Number of arcs	Number of units	HWB code
$N = 1$	61	53	210	24	3–20–46
$N = 2$	69	168	765	13	3–11–34
$N = 3$	108	100	272	17	9–9–45
$N = 4$	115	107	300	17	9–9–43
$N = 5$	115	257	1160	30	3–25–61
$N = 6$	124	118	372	25	7–13–60
$N = 7$	145	287	1240	17	5–10–43
$N = 8$	147	312	1378	17	5–10–43
$N = 9$	147	315	1583	19	5–11–47
$N = 10$	149	340	1721	19	5–11–47
$N = 11$	150	478	2705	33	4–25–74
$N = 12$	172	166	466	25	7–13–65
$N = 13$	173	159	401	19	7–10–53
$N = 14$	184	178	492	33	10–17–80
$N = 15$	192	475	1522	13	5–7–38
$N = 16$	196	392	1186	13	5–7–38
$N = 17$	248	591	2764	13	5–7–44
$N = 18$	252	543	2436	13	5–7–44
$N = 19$	272	586	2889	41	7–25–86
$N = 20$	273	518	1795	19	6–10–55
$N = 21$	306	298	700	39	10–20–97
$N = 22$	307	740	3829	41	7–25–89
$N = 23$	378	614	1969	19	6–10–55

Structural properties

ordinary — *all arcs have multiplicity one* .... ✔

simple free choice — *all transitions sharing a common input place have no other input place* .... ✘ [a]

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[a] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).

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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)
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* .... ? (r)
reversible — *from every reachable marking, there is a transition path going back to the initial marking* .... ? (s)
live — *for every transition t, from every reachable marking, one can reach a marking in which t can fire* .... ? (t)

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[b] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[c] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[d] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[e] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[f] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[g] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[h] stated by CÆSAR.BDD version 3.7 to be true on 9 instance(s) out of 23, and false on the remaining 14 instance(s).
[i] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[j] stated by CÆSAR.BDD version 3.7 to be true on 3 instance(s) out of 23, and false on the remaining 20 instance(s).
[k] stated by CÆSAR.BDD version 3.7 to be true on 19 instance(s) out of 23, and false on the remaining 4 instance(s).
[l] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[m] stated by CÆSAR.BDD version 3.7 on all 23 instances (23 values of N).
[n] the definition of Nested-Unit Petri Nets (NUPN) is available from `http://mcc.lip6.fr/nupn.php`
[o] safe by construction – stated by the CÆSAR compiler.
[p] stated by CÆSAR.BDD version 3.7 to be true on 3 instance(s) out of 23, false on the remaining 11 instance(s), and unknown on the remaining 9 instance(s).
[q] stated by CÆSAR.BDD version 3.7 to be true on 5 instance(s) out of 23, false on the remaining 9 instance(s), and unknown on the remaining 9 instance(s).
[r] stated by CÆSAR.BDD version 3.7 to be true on 10 instance(s) out of 23, false on the remaining 3 instance(s), and unknown on the remaining 10 instance(s).
[s] stated by CÆSAR.BDD version 3.7 to be false on 10 instance(s) out of 23, and unknown on the remaining 13 instance(s).
[t] stated by CÆSAR.BDD version 3.7 to be false on 11 instance(s) out of 23, and unknown on the remaining 12 instance(s).

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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
$N = 1$	1.50099e+07 [u]	?	1	20
$N = 2$	1.08222e+06 [v]	?	1	$\in [9, 11]$ [w]
$N = 3$	1.78827e+08 [x]	?	1	9
$N = 4$	4.3674e+07 [y]	?	1	9
$N = 5$	$\geq$ 3.07008e+09 [z]	?	1 [aa]	$\in [13, 25]$ [ab]
$N = 6$	2.10713e+07 [ac]	?	1	13
$N = 7$	6.3107e+07 [ad]	?	1	$\in [6, 10]$ [ae]
$N = 8$	3.17792e+07 [af]	?	1	$\in [6, 10]$ [ag]
$N = 9$	2.29916e+08 [ah]	?	1	$\in [8, 11]$ [ai]
$N = 10$	9.49448e+07 [aj]	?	1	$\in [7, 11]$ [ak]
$N = 11$	$\geq$ 1.62316e+09 [al]	?	1 [am]	$\in [13, 25]$ [an]
$N = 12$	1.37111e+09 [ao]	?	1	13
$N = 13$	7.40115e+06 [ap]	?	1	10
$N = 14$	$\geq$ 8.04698e+09 [aq]	?	1 [ar]	17
$N = 15$	2.01815e+07 [as]	?	1	7
$N = 16$	3.54506e+07 [at]	?	1	7
$N = 17$	$\geq$ 9.50489e+07 [au]	?	1 [av]	7
$N = 18$	$\geq$ 1.1051e+08 [aw]	?	1 [ax]	7
$N = 19$	$\geq$ 1.65754e+10 [ay]	?	1 [az]	$\in [11, 25]$ [ba]
$N = 20$	$\geq$ 4.13988e+09 [bb]	?	1 [bc]	$\in [8, 10]$ [bd]
$N = 21$	$\geq$ 1.93218e+17 [be]	?	1 [bf]	20
$N = 22$	$\geq$ 1.15976e+09 [bg]	?	1 [bh]	$\in [9, 25]$ [bi]
$N = 23$	$\geq$ 3.75499e+10 [bj]	?	1 [bk]	$\in [8, 10]$ [bl]

[u] stated by CÆSAR.BDD version 3.7.
[v] stated by CÆSAR.BDD version 3.7.
[w] upper bound given by the number of leaf units.
[x] stated by CÆSAR.BDD version 3.7.
[y] stated by CÆSAR.BDD version 3.7.
[z] stated by CÆSAR.BDD version 3.7.
[aa] stated by the CÆSAR compiler.
[ab] upper bound given by the number of leaf units.
[ac] stated by CÆSAR.BDD version 3.7.
[ad] stated by CÆSAR.BDD version 3.7.
[ae] upper bound given by the number of leaf units.
[af] stated by CÆSAR.BDD version 3.7.
[ag] upper bound given by the number of leaf units.
[ah] stated by CÆSAR.BDD version 3.7.
[ai] upper bound given by the number of leaf units.
[aj] stated by CÆSAR.BDD version 3.7.
[ak] upper bound given by the number of leaf units.
[al] stated by CÆSAR.BDD version 3.7.
[am] stated by the CÆSAR compiler.
[an] upper bound given by the number of leaf units.
[ao] stated by CÆSAR.BDD version 3.7.
[ap] stated by CÆSAR.BDD version 3.7.
[aq] stated by CÆSAR.BDD version 3.7.
[ar] stated by the CÆSAR compiler.
[as] stated by CÆSAR.BDD version 3.7.
[at] stated by CÆSAR.BDD version 3.7.
[au] stated by CÆSAR.BDD version 3.7.
[av] stated by the CÆSAR compiler.
[aw] stated by CÆSAR.BDD version 3.7.
[ax] stated by the CÆSAR compiler.
[ay] stated by CÆSAR.BDD version 3.7.
[az] stated by the CÆSAR compiler.
[ba] upper bound given by the number of leaf units.
[bb] stated by CÆSAR.BDD version 3.7.

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[bc] stated by the CÆSAR compiler.

[bd] upper bound given by the number of leaf units.

[be] stated by CÆSAR.BDD version 3.7.

[bf] stated by the CÆSAR compiler.

[bg] stated by CÆSAR.BDD version 3.7.

[bh] stated by the CÆSAR compiler.

[bi] upper bound given by the number of leaf units.

[bj] stated by CÆSAR.BDD version 3.7.

[bk] stated by the CÆSAR compiler.

[bl] upper bound given by the number of leaf units.

generated on June 16, 2024