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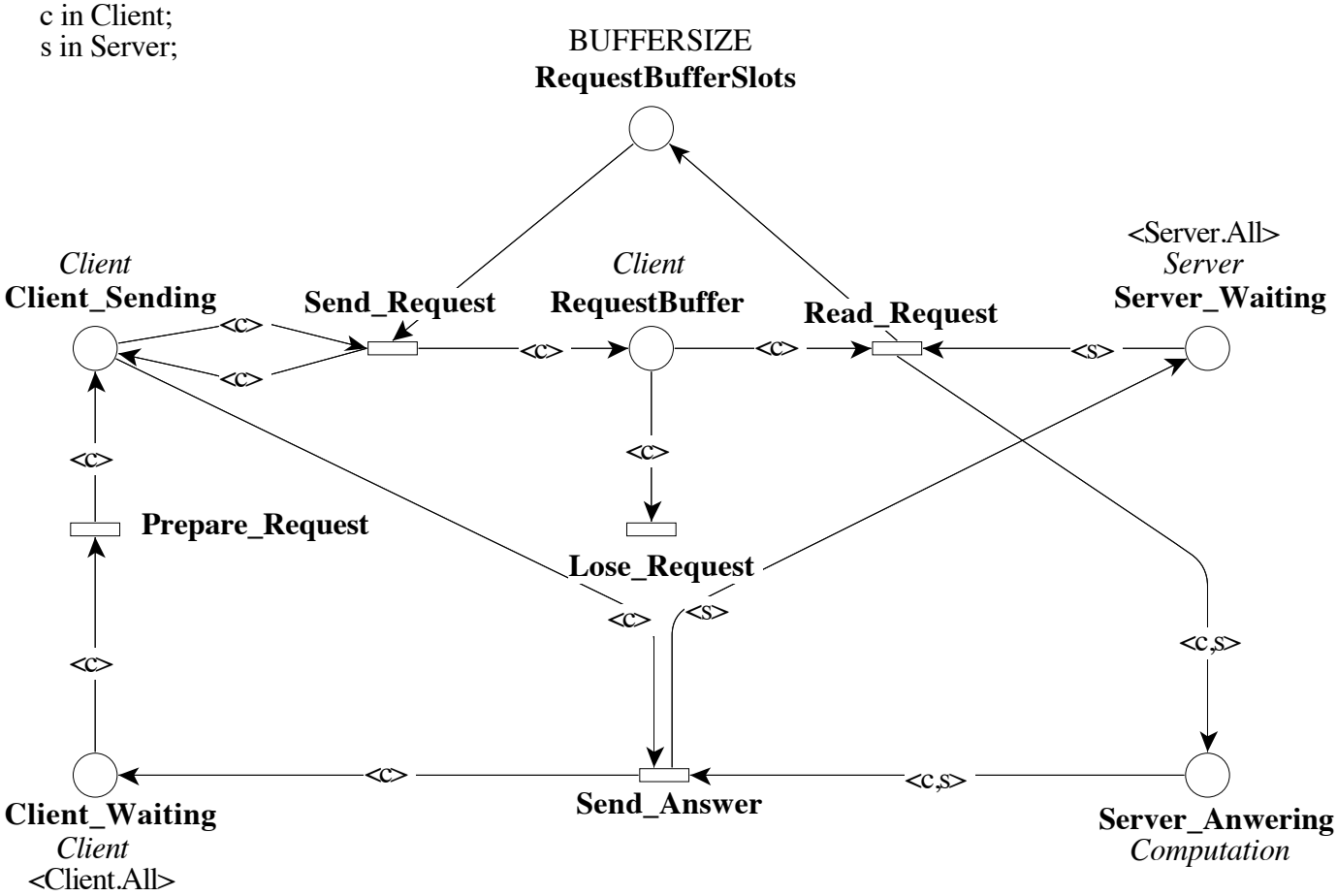
This form is a summary description of the model entitled "Client/Server with Repetitions" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models are given together with property files (possibly, one per model instance) giving a set of properties to be checked on the model.

Description

This Petri net models a client/server application with NCLIENTS clients and NSERVERS servers. Communication from clients to servers is not reliable, with requests stored in a buffer of size BUFFERSIZE. Communication from servers to clients are reliable. A client send its message until it receives an answer.

The interesting point is that place RequestBuffer is not 1-bounded. This model can thus be used to assess how model checkers behave for colored non-safe nets.

Class
  Client is 1..NCLIENTS;
  Server is 1..NSERVERS;
Domain
  Computation is <Client,Server>;
Var
  c in Client;
  s in Server;



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Scaling parameter

Parameter name	Parameter description	Chosen parameter values
n	To set only one parameter, we set a parameter n and compute model parameters with: NCLIENTS=n^2, NSERVERS=n, BUFFERSIZE=n	2, 3, 4, 5, 7, 10

Size of the model

Parameter	Number of places	Number of transitions	Number of arcs
(NCLIENTS, NSERVERS, BUFFERSIZE)	1 + 3*NCLIENTS + NSERVERS + NCLIENTS*NSERVERS	3*NCLIENTS + 2*NCLIENTS*NSERVERS	7*NCLIENTS + 8*NCLIENTS+NSERVERS
n	$n^3 + 3n^2 + n + 1$	$2n^3 + 3n^2$	$8n^3 + 7n^2$
$n = 2$	23	28	92
$n = 3$	58	81	279
$n = 4$	117	176	624
$n = 5$	206	325	1175
$n = 7$	498	833	3087
$n = 10$	1311	2300	8700

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]
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] ..... ✗

[a] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[b] stated by CÆSAR.BDD version 2.6 on all 6 instances (2, 3, 4, 5, 7, and 10).
[c] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[d] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[e] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[f] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[g] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[h] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[i] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[j] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10); transition "Lose_Request" is a sink transition.
[k] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[l] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[m] stated by CÆSAR.BDD version 1.7 on all 6 instances (2, 3, 4, 5, 7, and 10).
[n] the definition of Nested-Unit Petri Nets (NUPN) is available from http://mcc.lip6.fr/nupn.php

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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* ..... ?
live — *for every transition t, from every reachable marking, one can reach a marking in which t can fire* ..... ?

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
$n = 2$	7424 [s]	37 088 [t]	2 [u]	8 [v]
$n = 3$	1.3408E+8 [w]	1.2939E+9 [x]	3 [y]	15 [z]
$n = 4$	3.0948E+13 [aa]	?	4 [ab]	24 [ac]
$n = 5$	?	?	?	35 [ad]
$n = 7$	?	?	?	63 [ae]
$n = 10$	?	?	?	120 [af]

[o] stated by CÆSAR.BDD version 2.0 on all 6 instances (2, 3, 4, 5, 7, and 10).
[p] stated by CÆSAR.BDD version 3.3 to be false on 3 instance(s) out of 6, and unknown on the remaining 3 instance(s).
[q] stated by CÆSAR.BDD version 2.0 to be false on 2 instance(s) out of 6, and unknown on the remaining 4 instance(s).
[r] confirmed at MCC'2014 by Helena on all 6 colored instances, and by Lola and Tapaal on all 6 P/T instances.
[s] computed at MCC'2013 by Alpina and ITS-Tools; confirmed at MCC'2014 by GreatSPN and Helena on the colored net instance, and by GreatSPN, Marcie, PNMC, PNXDD, Stratagem, and Tapaal on the P/T net instance.
[t] computed at MCC'2014 by Helena on the colored net instance, and by Marcie on the P/T net instance.
[u] computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.
[v] number of initial tokens, because the net is sub-conservative.
[w] computed at MCC'2013 by Alpina and ITS-Tools; confirmed at MCC'2014 by GreatSPN on the colored net instance, and by GreatSPN, Marcie, PNMC, PNXDD, and Stratagem.
[x] computed at MCC'2014 by Marcie.
[y] computed at MCC'2014 by GreatSPN, Marcie, and PNMC.
[z] number of initial tokens, because the net is sub-conservative.
[aa] computed at MCC'2014 by GreatSPN on the colored net instance, and by PNMC on the P/T net instance.
[ab] computed at MCC'2014 by PNMC.
[ac] number of initial tokens, because the net is sub-conservative.
[ad] number of initial tokens, because the net is sub-conservative.
[ae] number of initial tokens, because the net is sub-conservative.
[af] number of initial tokens, because the net is sub-conservative.