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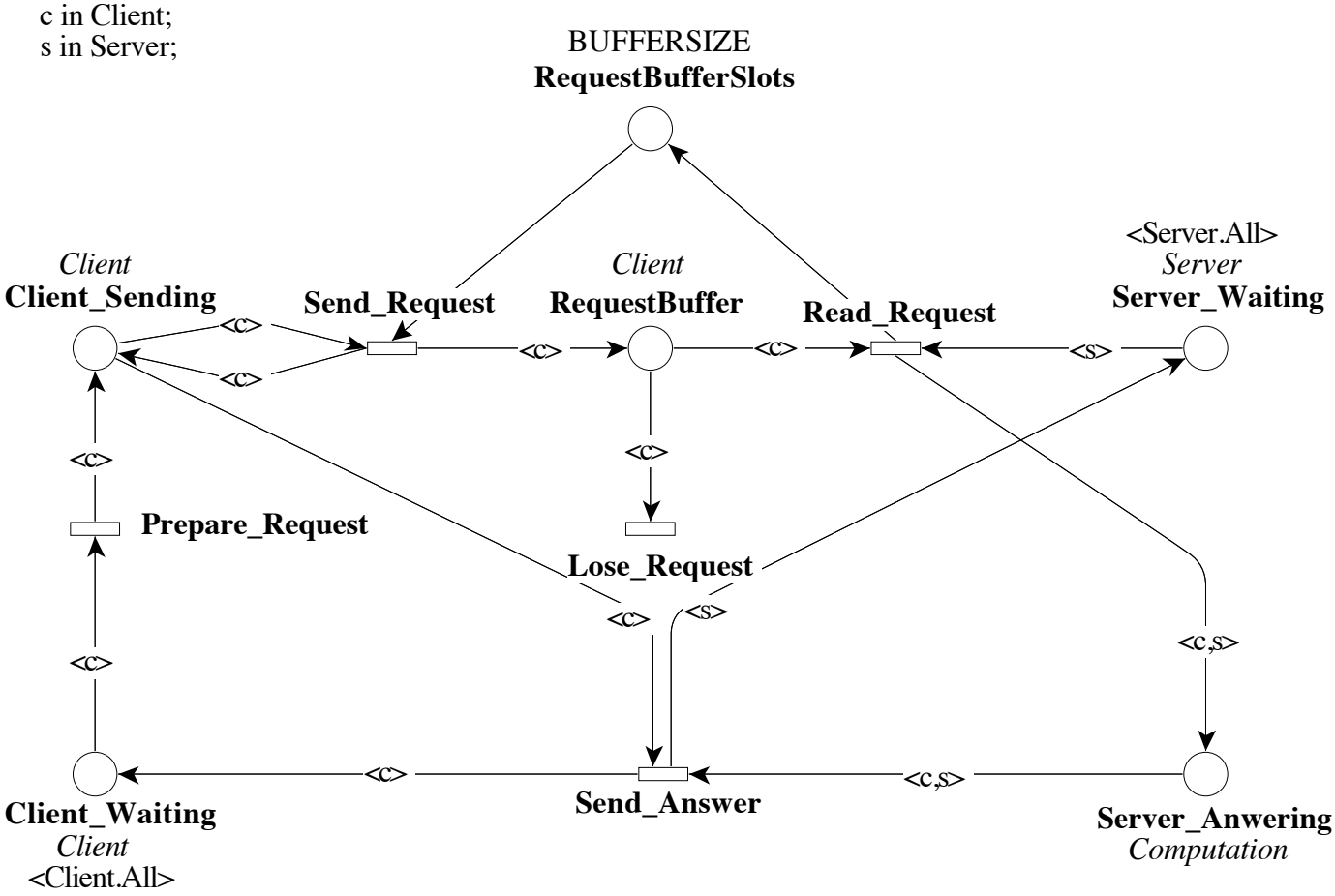
This form is a summary description of the model entitled "Client/Server with Repetitions" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models 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]
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* ..... ? [q]
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 [r]	37 088 [s]	2 [t]	8 [u]
$n = 3$	1.3408E+8 [v]	1.2939E+9 [w]	3 [x]	15 [y]
$n = 4$	3.0948E+13 [z]	?	4 [aa]	24 [ab]
$n = 5$	?	?	?	35 [ac]
$n = 7$	?	?	?	63 [ad]
$n = 10$	?	?	?	120 [ae]

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