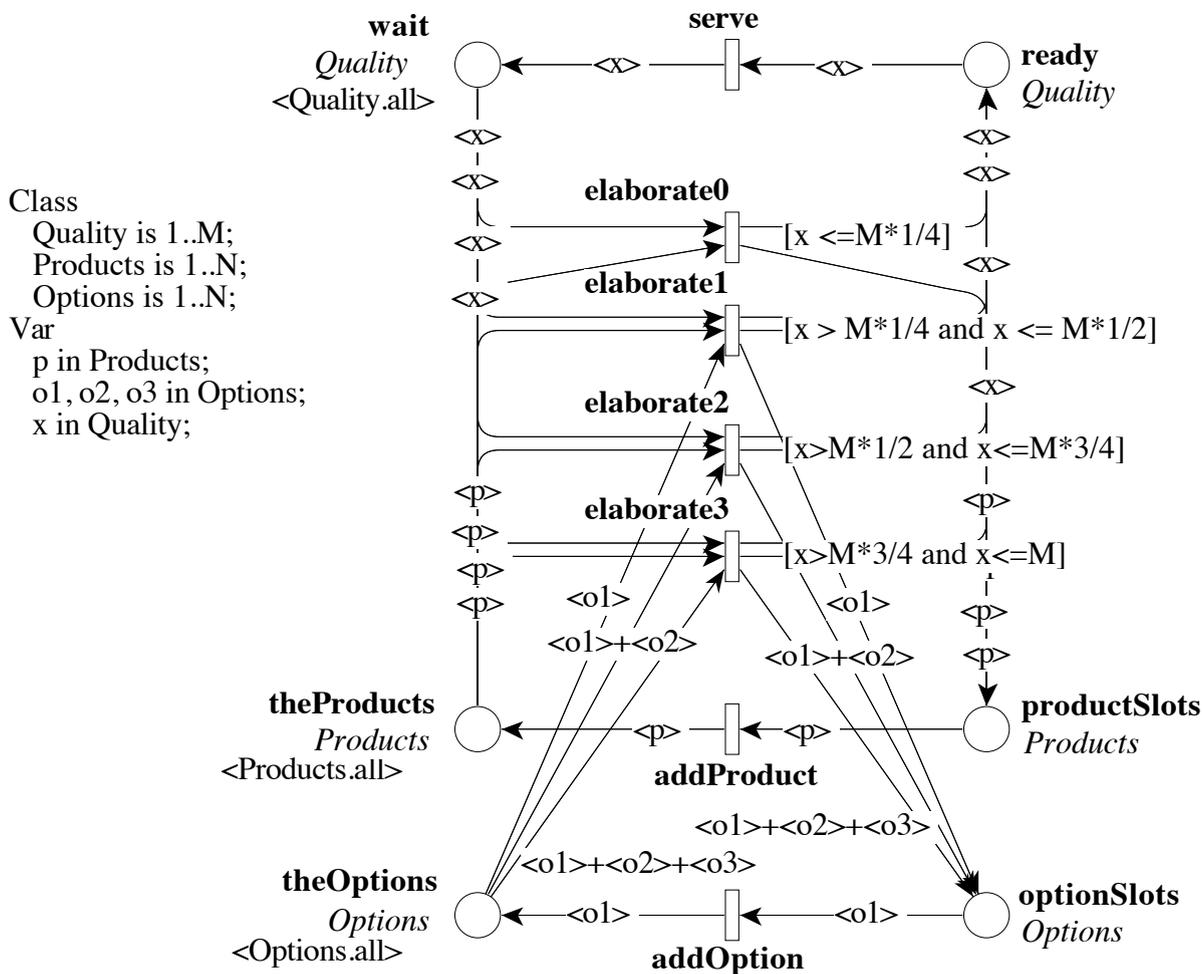


This form is a summary description of the model entitled "A hot drink vending machine" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models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

## Description

A Symmetric net modeling a simple hot drink vending machine. This model handles cycles of elaborations of a hot drink (*Products*). Each type of elaboration (modelled by the *elaborateX* transitions) carries a set of options (*Options*) for the product. For *elaborate0* the set of options is empty. Products and options are restaured from the places *productSlots* and *optionSlots*.

Each type of elaboration has an intrinsic quality level range (*Quality*), which is associated with the service. The cardinal of the set of quality levels is  $M = 4 \times N$ ,  $N$  being the number of products.



Graphical representation of the model

## References

Model adapted from: R. Muschecvici, J. Proença, and D. Clarke. *Modular Modelling of Software Product Lines with Feature Nets*. In 9<sup>th</sup> International Conference on Software Engineering and Formal Methods (SEFM), volume 7041 of LNCS, pages 318–333. Springer, 2011

## Scaling parameter

Parameter name	Parameter description	Chosen parameter values
$N$	Number of products	2, 10

## Size of the colored net model

number of places: 6  
 number of transitions: 7  
 number of arcs: 28

## Size of the derived P/T model instances

Parameter	Number of places	Number of transitions	Number of arcs
$N = 2$	24	72	440
$N = 10$	120	111160	1026520

## Structural properties

**ordinary** — *all arcs have multiplicity one* ..... no  
**simple free choice** — *all transitions sharing a common input place have no other input place* ..... no <sup>(a)</sup>  
**extended free choice** — *all transitions sharing a common input place have the same input places* ..... no <sup>(b)</sup>  
**state machine** — *every transition has exactly one input place and exactly one output place* ..... no <sup>(c)</sup>  
**marked graph** — *every place has exactly one input transition and exactly one output transition* ..... no <sup>(d)</sup>  
**connected** — *there is an undirected path between every two nodes (places or transitions)* ..... yes <sup>(e)</sup>  
**strongly connected** — *there is a directed path between every two nodes (places or transitions)* ..... yes <sup>(f)</sup>  
**source place(s)** — *one or more places have no input transitions* ..... no <sup>(g)</sup>  
**sink place(s)** — *one or more places have no output transitions* ..... no <sup>(h)</sup>  
**source transition(s)** — *one or more transitions have no input places* ..... no <sup>(i)</sup>  
**sink transitions(s)** — *one or more transitions have no output places* ..... no <sup>(j)</sup>  
**loop-free** — *no transition has an input place that is also an output place* ..... yes <sup>(k)</sup>  
**conservative** — *for each transition, the number of input arcs equals the number of output arcs* ..... yes <sup>(l)</sup>  
**subconservative** — *for each transition, the number of input arcs equals or exceeds the number of output arcs* ..... yes <sup>(m)</sup>  
**nested units** — *places are structured into hierarchically nested sequential units* <sup>(n)</sup> ..... no

## Behavioural properties

**safe** — *in every reachable marking, there is no more than one token on a place* ..... yes <sup>(o)</sup>  
**dead place(s)** — *one or more places have no token in any reachable marking* ..... ?  
**dead transition(s)** — *one or more transitions cannot fire from any reachable marking* ..... ?

(a) the net is not ordinary in all its 2 instances (2 and 10).  
 (b) the net is not ordinary in all its 2 instances (2 and 10).  
 (c) the net is not ordinary in all its 2 instances (2 and 10).  
 (d) the net is not ordinary in all its 2 instances (2 and 10).  
 (e) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (2 and 10).  
 (f) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (2 and 10).  
 (g) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (2 and 10).  
 (h) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (2 and 10).  
 (i) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (2 and 10).  
 (j) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (2 and 10).  
 (k) stated by [CÆSAR.BDD](#) version 1.7 on all 2 instances (2 and 10).  
 (l) stated by [PNML2NUPN](#) 1.3.0 on all 2 instances (2 and 10).  
 (m) stated by [PNML2NUPN](#) 1.3.0 on all 2 instances (2 and 10).  
 (n) the definition of Nested-Unit Petri Nets (NUPN) is available from <http://mcc.lip6.fr/nupn.php>  
 (o) the colored nets are safe; the unfolded place-transition nets are deemed to be safe too, although they contain many arcs whose valuation (“inscription” in PNML) is greater than one.

**deadlock** — *there exists a reachable marking from which no transition can be fired* ..... no <sup>(p)</sup>  
**reversible** — *from every reachable marking, there is a transition path going back to the initial marking* ..... yes  
**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 reach-able markings	Number of tran-sition firings	Max. number of tokens per place	Max. number of tokens per marking
$N = 2$	1 024 <sup>(q)</sup>	7680 <sup>(r)</sup>	1 <sup>(s)</sup>	12 <sup>(t)</sup>
$N = 10$	$1.153 \times 10^{18}$ <sup>(u)</sup>	?	?	60 <sup>(v)</sup>

<sup>(p)</sup> confirmed at MCC'2014 by Helena on one colored instance ( $N = 2$ ), and by Cunf, GreatSPN, Lola, PNXDD, and Tapaal on the corresponding P/T instance.

<sup>(q)</sup> computed at MCC'2013 by Alpina, ITS-Tools, Marcie and PNXDD; 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.

<sup>(r)</sup> computed at MCC'2014 by Helena on the colored net instance, and by Marcie on the P/T net instance.

<sup>(s)</sup> computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.

<sup>(t)</sup> number of initial tokens, because the net is conservative.

<sup>(u)</sup> computed at MCC'2013 by Marcie.

<sup>(v)</sup> number of initial tokens, because the net is conservative.