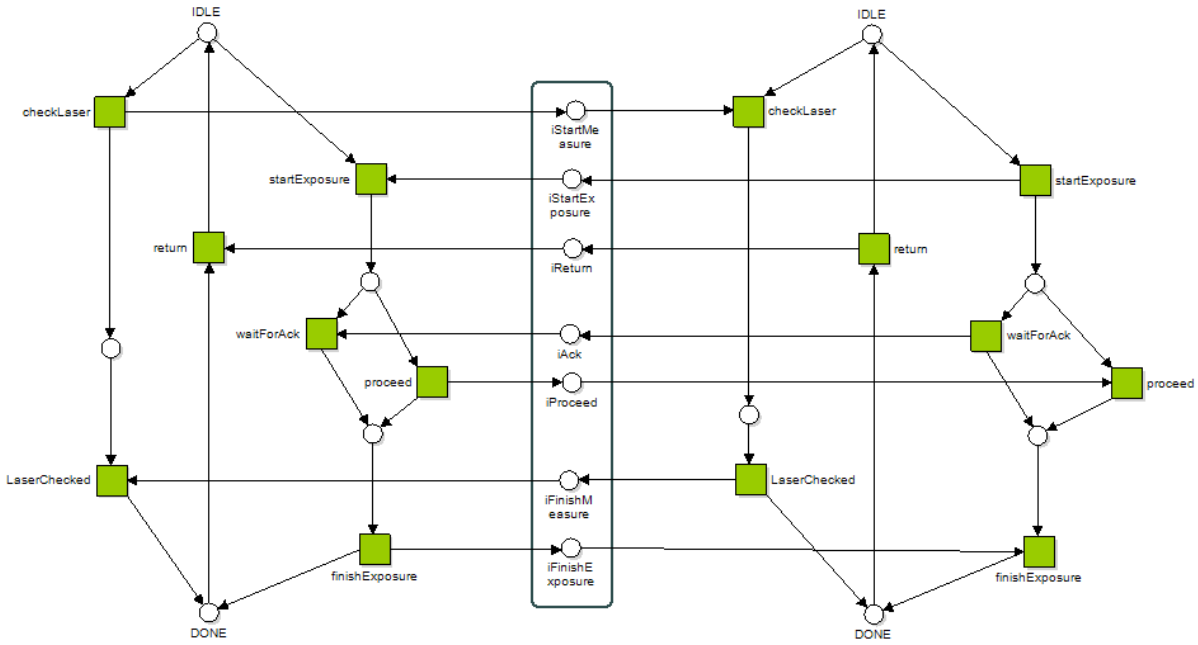
Component-based Systems Modeling and Analysis

Module 2: Assignments

1 Understanding Choice and Leg Properties

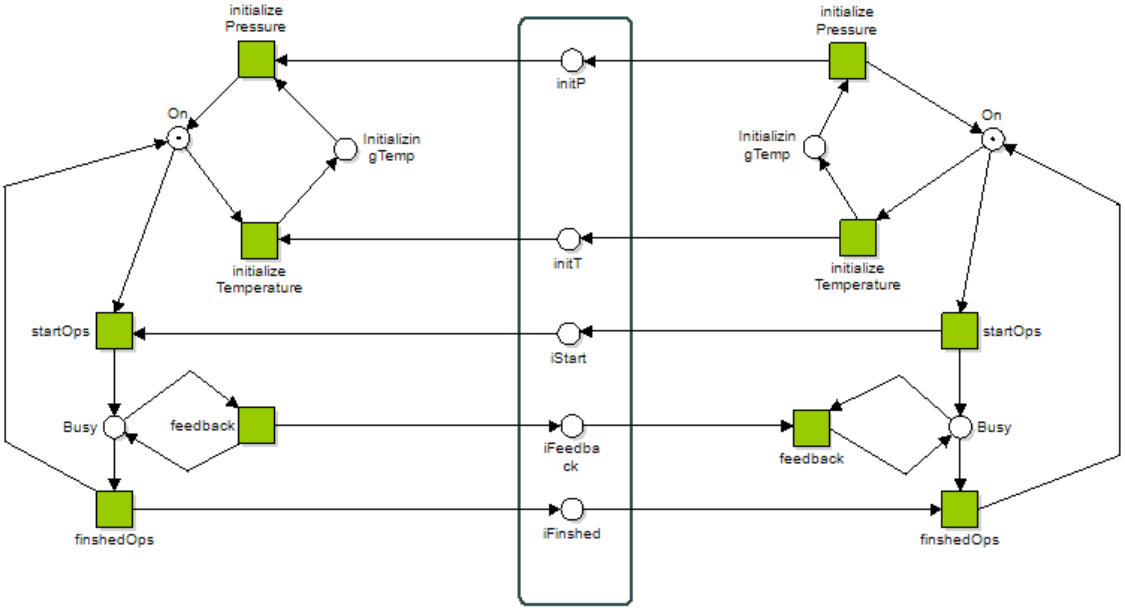
1) In folder Module2Exercises, you will find a file named *ChoicePropertyViolations.pnml*. Open it with Yasper.



2) Study the model (model on the left is server and model on right is client) and spot the violations of the choice property. Check by simulation or PnAT that they indeed do not weakly terminate because of deadlocks. How many deadlocks are possible?

3) Try to fix the problem by adhering to the choice property. The constraint you have is that you can only add new events but not modify the existing ones. After making the changes verify that the problems are indeed no longer present and that the model is weakly terminating.

4) In the folder Module2Exercises, you will find a file named *LegPropertyViolations.pnml*. Open it with Yasper.

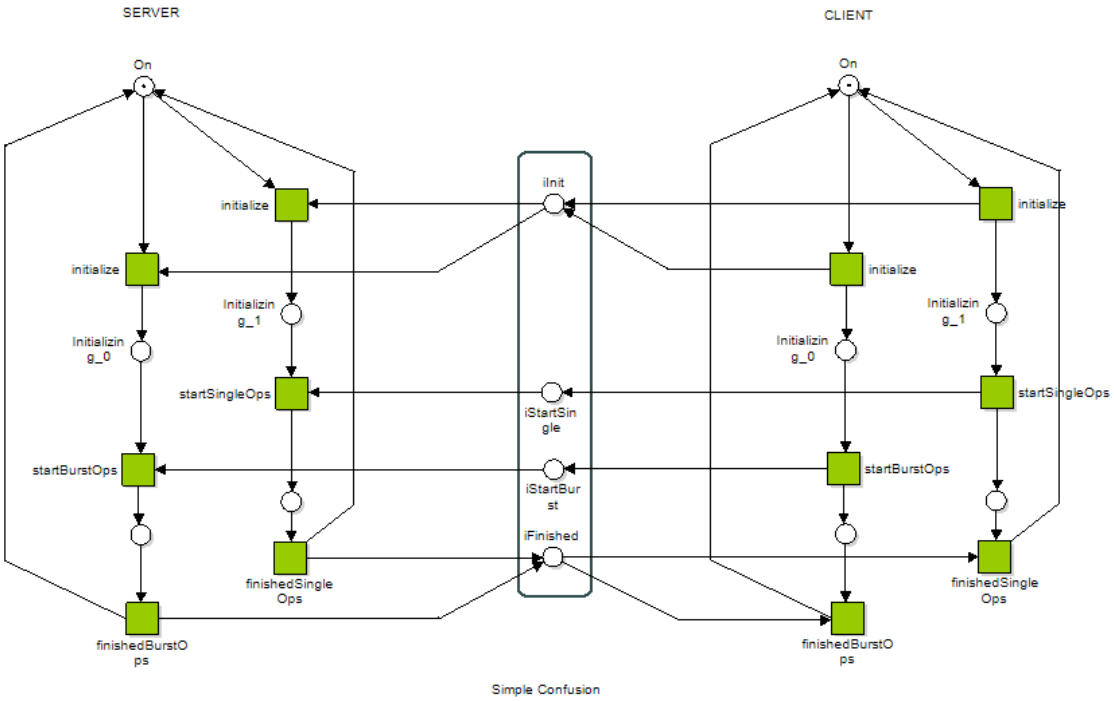


5) Study the model and spot the leg property violations. How many violations are there?

6) How would you resolve the leg violations?
Hint: Are acknowledgements missing? What are the other possibilities?

2 Understanding Confusion

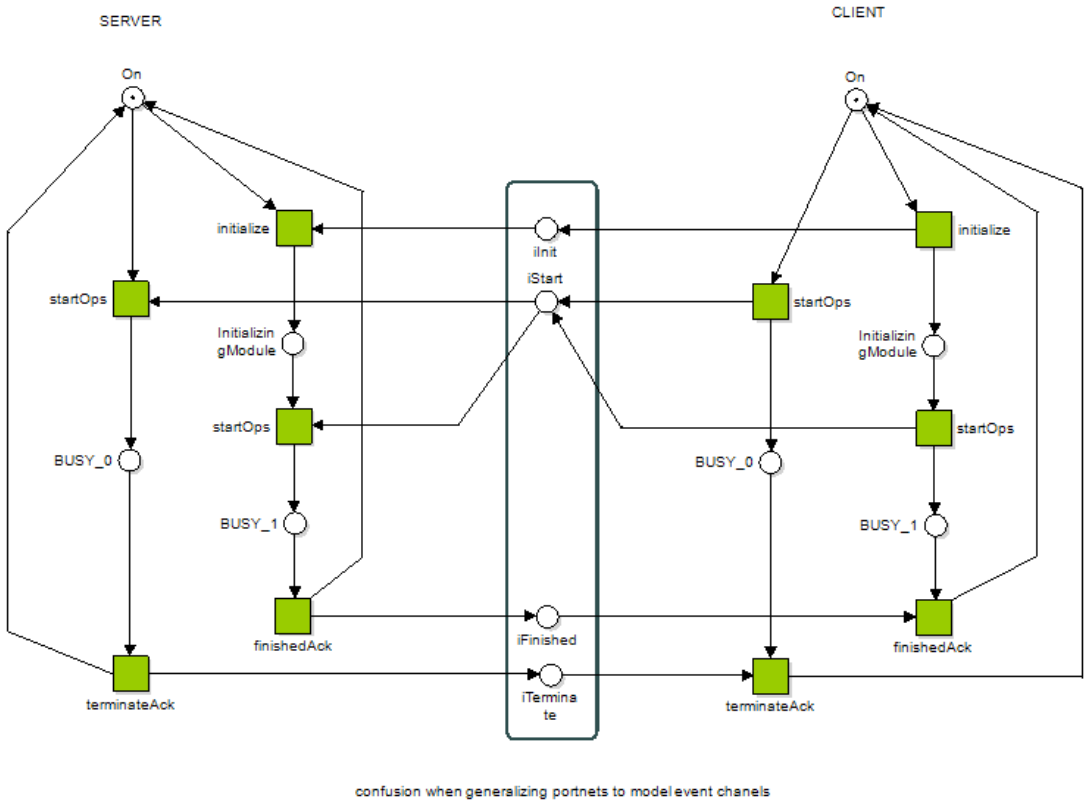
1) In Models folder, you will find a file named *SimpleConfusion.pnml*. Open it in Yasper.



2) Observe the confusion caused by the transition *initialize*. This leads to a deadlock. How would you resolve this? There are two possible solutions.

   First try to solve the problem without modifying the interface places.
   Hint: What do you think about the location where the choice is made?

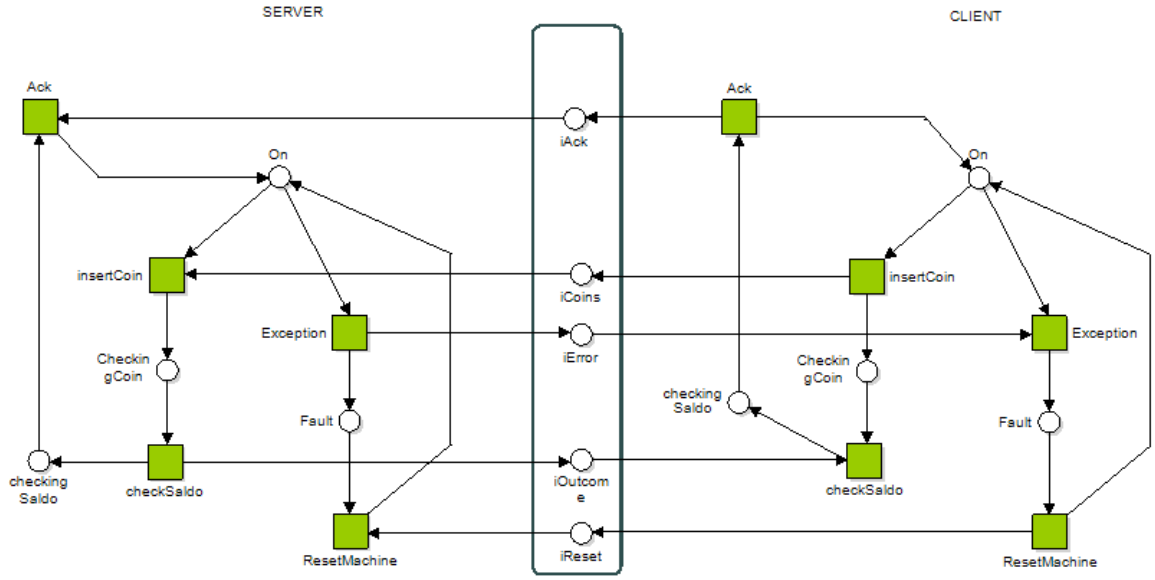
   Next reason about how modifying (adding or removing) existing interface places can resolve the problem?
   Hint: Remember one of the Port net restrictions of the Portnet structure?



3) Now open a file named *Confusion.pnml* in Yasper. This is yet another example of a confusion leading to a deadlock. How would you resolve the problem?
Hint: Can an acknowledgement at the right place save the day?

3 Identify and Resolve Problems with the Coffee Machine

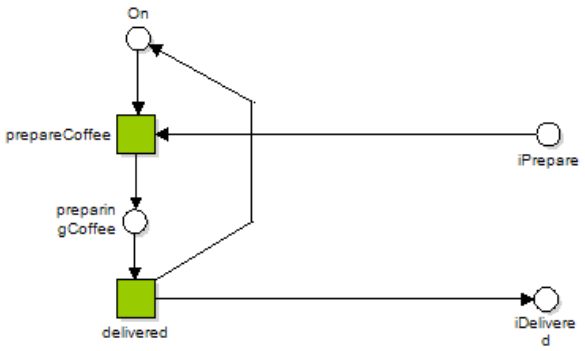
1) Open the file *SimpleCoffeeMachineWithProblems.pnml* in Yasper.



2) Study the model and try to spot the problem by visual inspection. This is a commonly occurring pattern in practice! How would you resolve it?
Hint: Diamonds? Think about the solution taking into context the functionality as well. Should new events be introduced or existing ones further generalized?

3) If all went well, you managed to make the model weakly terminate. Otherwise, open the model *ResolvingChoiceWithDiamonds.pnml* from the solutions folder.
Now delete the transition Ack. Why does it not weakly terminate anymore? What class of problem does it belong to? Resolve the problem by adding the transition Ack back to the model again.

4) We will now add the possibility to order coffee in our machine!
Open model *AddFeature.pnml* using Yasper. The model describes a feature: order coffee, which should be possible from the state ON.



Reason about how you will add this feature to the coffee machine model without disturbing the weak termination property.
Hint: What additional possibilities should be considered in the states: preparingCoffee and Fault?
Validate your reasoning by adding this feature to the coffee machine model and check that it is weakly terminating again.