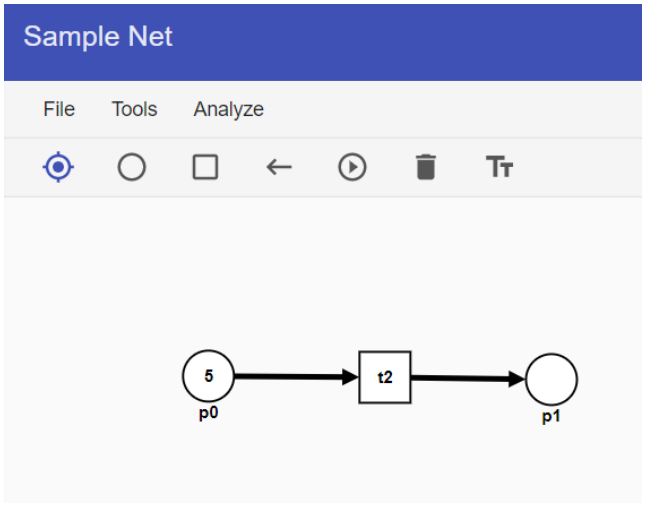
Lab: Process Modelling with Petri Nets and BPMN

The aim of this lab is to practice modelling processes and various process features/properties such as parallelism/concurrency, decision, synchronization and deadlock using Petri Nets and BPMN.

Petri Nets

We will use an online Petri nets modelling and simulation tool APO to the tasks.

Launch the browser and visit the APO website https://apo.adrian-jagusch.de/ to see the following GUI:



You can use the tool bar icons to:

 move elements

 create places

 create transitions

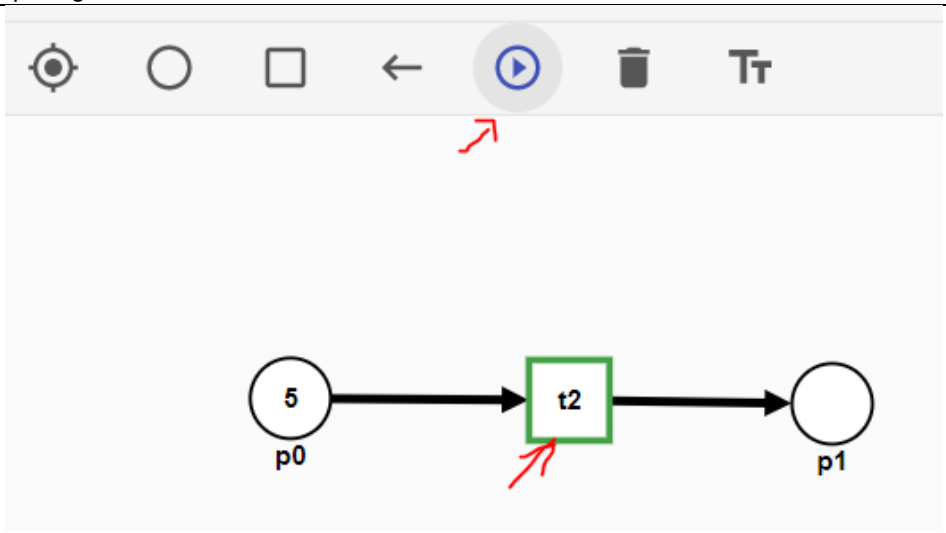
 create arcs/flows

 put tokens into places / start simulation

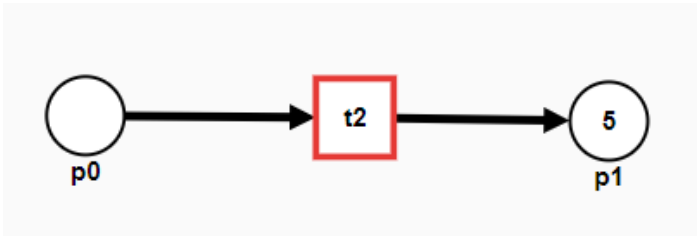
 delete elements

 add lables/names to elements

As seen in the following figure, if you click the ‘token’ icon, then in this model Transition t2 is enabled (turns green) and you can click it to fire/execute this transition.



As there are 5 tokens in p0, t2 can fire maximally 5 times (click 5 times, every time remove a token from p0 and put a token into p1) and then t2 becomes not firable (turns red, see below)



Task 1: Season transition system

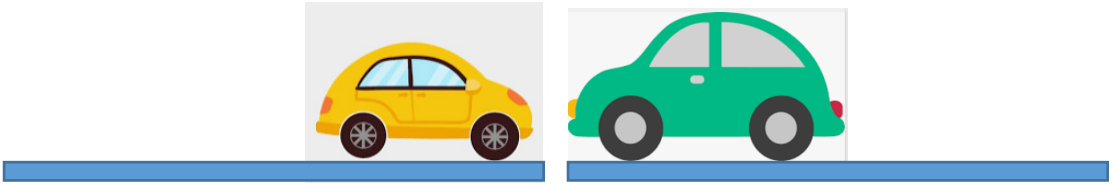
1.1 Use Petri nets to model the transition of seasons from spring to summer to autumn to winter, and then back to spring.

1.2 Modify your system to accommodate both hemispheres: that is, North hemisphere and South hemisphere change seasons concurrently and synchronously. When North is Spring, South should be Autumn, etc.

Task 2: Deadlock on a single lane bridge

You might have seen the following traffic sign before entering a single lane bridge. This means the vehichle on the other side has the priority in case two viechicles arrive at the opposites of the bridge at the same time.

Otherwise we will meet the following deadlock situation:



Use Petri nets to model the system and give the Marking that represents the deadlock situation.

Task 3: Synchronised traffic lights

Use Microsoft Edge (as we need to run .swf files) to visit http://www.informatik.uni-hamburg.de/TGI/PetriNets/introductions/aalst/

Study the "Two Traffic Lights" example to see how the two tranffic lights are controlled so that they never turn green at the same time.

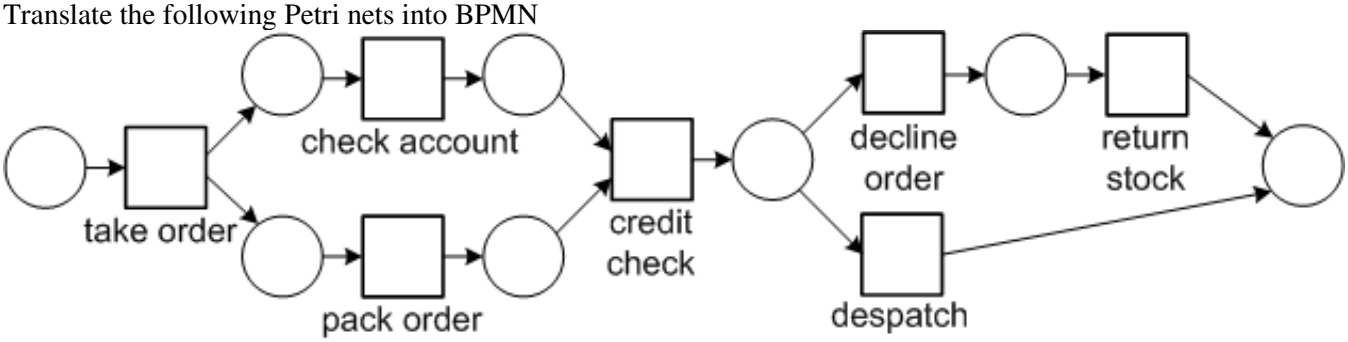
First please model this example in APO, then modify the example so that the two traffic lights turns green *alternatively*.

BPMN

For BPMN, we will use the online editor https://bpmn.io/

Task 4: From Petri nets to BPMN

Translate the following Petri nets into BPMN



Task 5: Pizza Restraunt Business Scenario

Use BPMN to model the following business scenario in a Pizza restraunt:

In a Pizza Restraurant we have customer, waiter, and chef. The business process starts when a customer enters the restraurant; then the customoer place the order to the waiter; then customer waits while waiter passes the order to the chef to prepare the pizza; after the pizza is prepared, chef will ask waiter to bring the pizza to customer. For every 10 minutes, if the pizza is not ready, customer asks the waiter until pizza is received, and then customer eat the pizza and finish the process.

Challenge Task

Translate Task 5 BPMN into Petri nets and model and simulate it using APO. How about there are two customers in the Pizza restraurant? Use APO to simulate the situation.