Petri Net (RDP)

A PN is composed of two elements: PLACEs and TRANSITIONs

The squares are used to represent the states of the system, the transitions of events whose occurrence causes state changes.

Places act as discrete state variables. They take integer values represented by marks or tokens.

The occurrence of an event corresponds, in the model, to the crossing of a transition, and therefore a change of state.

Validation rule: = transition crossing rule

A transition is validated if all of its entry places contain at least one token (a mark).

Shooting Rule:

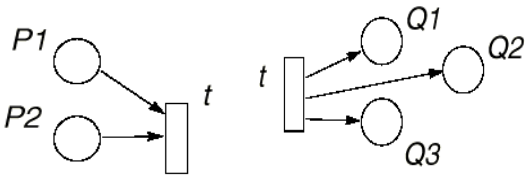
Firing a Validated Transition:

1. Remove a token from all the entrance places of the transition,
2. Add a token to all exit places in the transition.

Pre Condition and Post Condition:

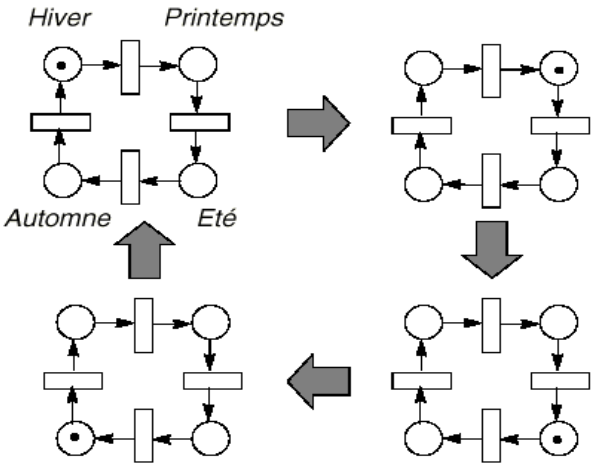
The ***precondition*** is represented by P1 and P2:

The ***post condition*** is represented by Q1, Q2 and Q3:



Satisfying the condition materialized by a token

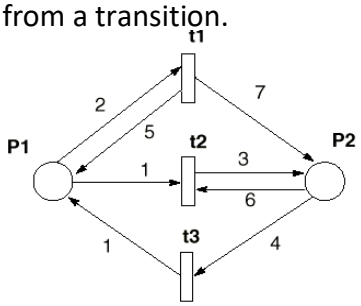
Example: Construct a RN that models the 4 seasons and their evolution



Incidence Matrices*

Represent the tokens needed for a transition / resulting from a transition.

Example:



$$\begin{array}{c} \\ P1 \\ P2 \end{array} \begin{array}{c} \begin{array}{ccc} t1 & t2 & t3 \end{array} \\ \begin{bmatrix} 2 & 1 & 0 \\ 0 & 6 & 4 \end{bmatrix} \end{array}$$

$$\begin{array}{c} \\ P1 \\ P2 \end{array} \begin{array}{c} \begin{array}{ccc} t1 & t2 & t3 \end{array} \\ \begin{bmatrix} 5 & 0 & 1 \\ 7 & 3 & 0 \end{bmatrix} \end{array}$$

Marking Vector*

Represents the number of chips in each place at a given time t

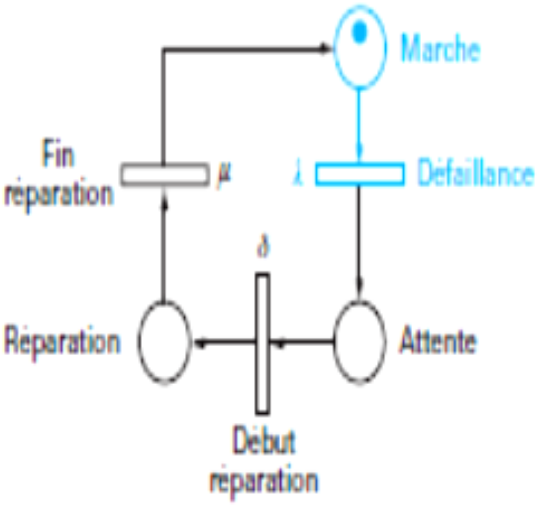
Stochastic Petri Nets for Dependability Modeling*:

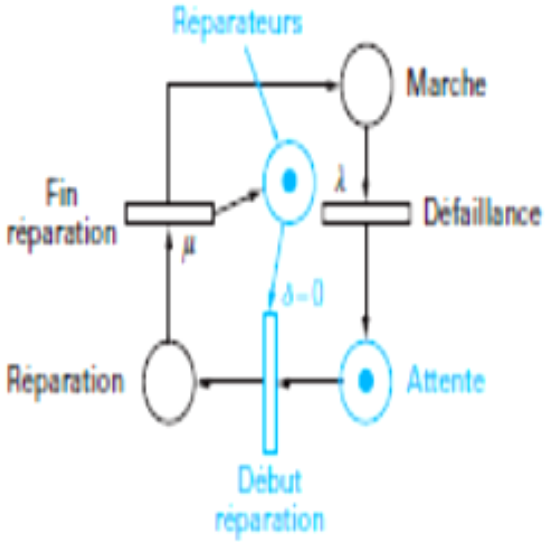
A repairable system with a single component can be modeled as follows:

Case 1: Without the repairer or with an unlimited repairer

Case2: With a repairer at a capacity = 1.

The first tokens represent the initial state





The model changes if we consider two repairers or one repairer with a capacity of two or two dependent components or cold redundancy (replacement).....