Task

A beverage vending machine accepts only 2-euro or 1-euro coins and does not allow another coin to be inserted if it has already accepted at least 2 euros (so someone can insert first 1 euro and then 2 more euros). When the user has placed in the vending machine coins of EUR 2 or more can either buy a 1,5 L soft drink worth EUR 2 or a 0,75 L soft drink worth EUR 1. When the user has placed EUR 1 worth of coins in the vending machine, they may purchase a soft drink of 0,75 L with a value of EUR 1. The vending machine only allows the purchase of one product and after the choice of the product, the customer will first receive his change and then the purchase will be completed and then the vending machine will be ready to serve the next customer.

In case the vending machine does not have a product chosen by the customer or does not have the appropriate change, it displays "the purchase cannot be made" and returns the amount paid by the customer. Caution: the customer's selection must be made before the check for availability of products and change, rather than the availability determining the selection, which would be considered an error (i.e., because the seller has, for example, only 0,75 L soft drinks the customer then always chooses what is available)

For the purposes of the simulation, assume that the probability of the customer to choose a soft drink of 1,5 L or 0,75 L when he has imported 2 euro or more is 2/3 to choose a soft drink 1,5 L and 1/3 for a 0,75 L soft drink respectively. If the customer has put in only 1 euro, he always chooses a 0,75 L soft drink.

Assume that, regardless of what each customer wants to buy, he can enter the following amounts: a) a 2-euro coin with probability ½, b) a 1-euro coin with probability ¼, c) a 1-euro coin and a 2-euro coin with probability ¼. Caution: we assume that there is no way that someone could put in 2 1-euro coins or any other combination (e.g. two 2-euro coins, or 3 1-euro coins, etc.).

In the implemented system, put corresponding counters that record, at each step of the simulation:

> a. The total number of 2-euro coins present in the vending machine
>
> b. The total number of 1-euro coins present in the vending machine
>
> c. The total number of 1,5 L soft drinks present in the vending machine
>
> d. The total number of 0,75 L soft drinks present in the vending machine

In the implemented system, put corresponding counters to record, after the end of the simulation:

> e. The cases of customers who bought 1.5 L soft drinks.
>
> f. The cases of customers who bought 0,75 L of soft drinks.
>
> g. The total number of cases where the vending machine displays "the purchase cannot be carried out"

Assume that initially the seller has 0 €2 coins and 10 €1 coins plus 50 soft drinks of each type.
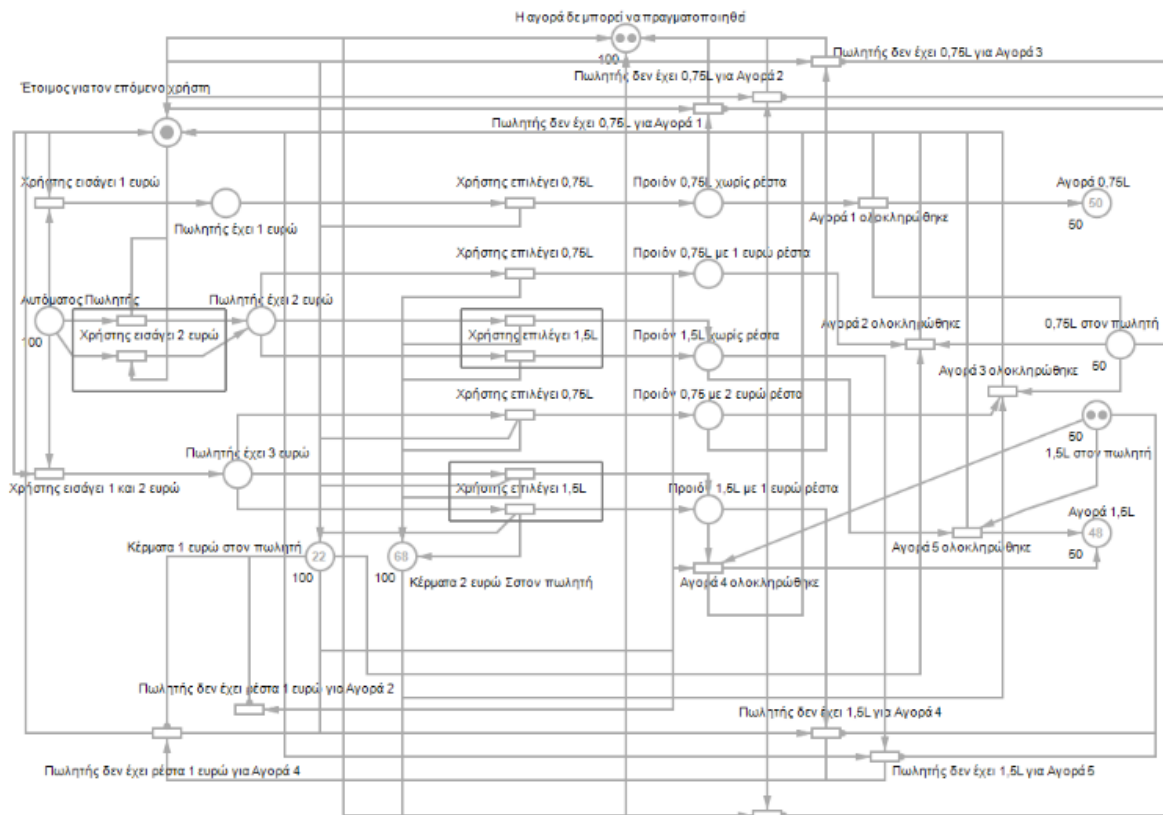
Implement the system in the HPetriSim tool by setting the number of simulations to 100 simulations (this is a good check to see if the results are consistent with the probabilities you have been given).

Solution

Petri Network
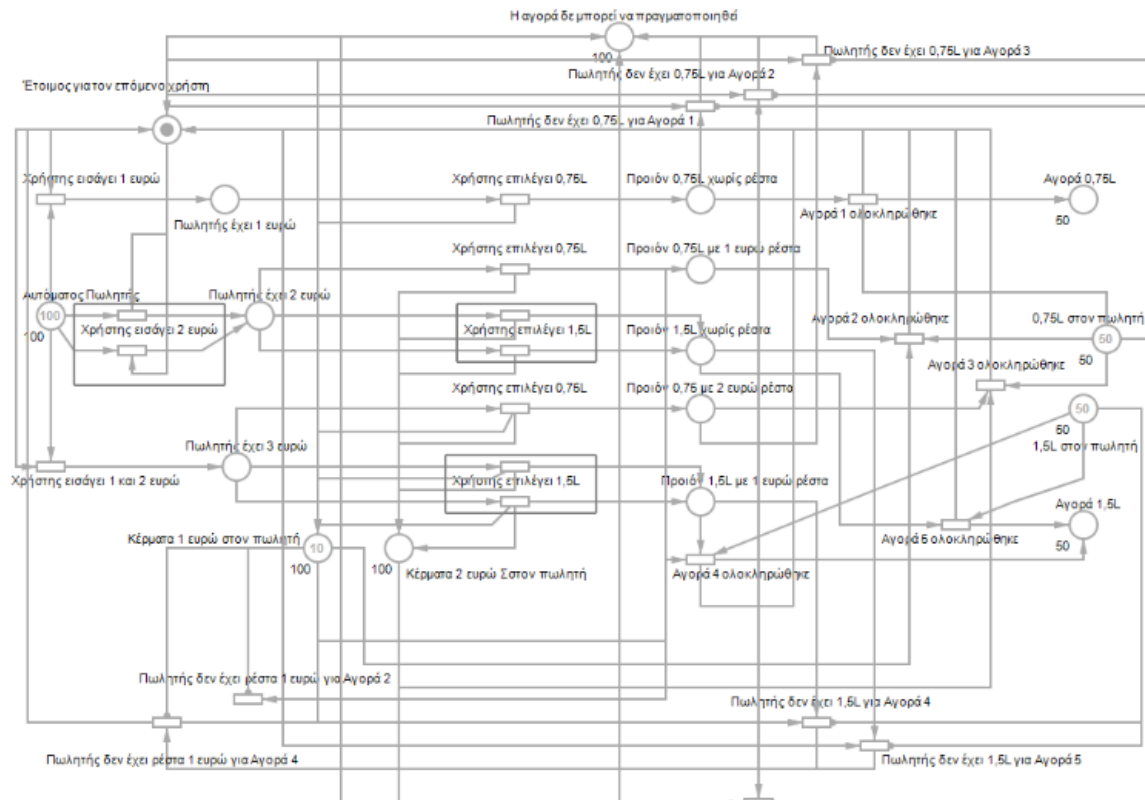
Result

The system works properly and does what the task requires. Personally, I have tested all the scripts and have not found any problems. As we can see in the second image, 50 0.75L and 48 1.5L purchases have been made, while 2 could not be made. The 1L and 2L change to the seller is 22 and 68 respectively.

Names:

Purchase 1 => User put 1 euro, bought product of 0.75L, no change, 1 euro added to vending machine, one 0.75L product was removed from vending machine and was added to the counter "Purchase 0,75L".

Purchase 2 => User put 2 EUR, bought product 0,75L, has 1 EUR change, added 2 EUR to vending machine, removed one product 0,75L from vending machine, removed 1 EUR from seller and added to the counter "Purchase 0,75L".

Purchase 3 => User put 1 euro and then 2 euro, bought product 0,75L, has change 2 euro, added 1 euro to vending machine, removed one product 0,75L from vending machine and added to 0,75L was taken from the vending machine and added to the counter "Purchase 0,75L".

Purchase 4 => User put 1 euro and then 2 euro, bought product of 1,5L, has change of 1 euro, added 2 euro to the vending machine, removed a 1,5L product from the vending machine and added to the counter "Purchase 1,5L".

Purchase 5 => User put 2 EUR, bought product 1,5L, no change, added 2 EUR to the vending machine, removed one product 1,5L from the vending machine and added to the counter "Purchase 1,5L".