

Case Study: Automatic management system for stock market investments

The case study concerns a typical automatic management system for stock market investments, which consists of four participants: the online stock market system and three investors, A_1 , A_2 and A_3 . Here, the resource will be the stocks of a company that the investors want to buy just in case the price falls below an established limit, which the investors fix previously by means of subscriptions, i.e., an investor subscribes to the resource (the stocks) with a certain guard (the value of the stocks he/she want to pay for it). The lifetime will be determined by the stock market system and the resource price will be fluctuating to simulate the rises/drops of the stock. Notice that we do not take into account the stock buy process since our aim is to model an investors' information system. Thus, the participants will be notified when their bids hold or the resource lifetime expires. Let us consider the choreography $C = (O_{sys}, O_1, O_2, O_3)$, where $O_i = (PL_i, Var_i, A_i, A_{f_i}, \mathcal{A}_{e_i})$, $i=sys,1,2,3$; $Var_{sys} = \{at, vEPR, \}$, $Var_1 = \{v_1\}$, $Var_2 = \{v_2\}$, $Var_3 = \{v_3\}$, $A_{f_i} = exit$. Variable v_{EPR} serves to temporarily store the value of the resource property before being sent; v_1 , v_2 and v_3 are variables used for the interaction among participants, and, finally, at is used to control the period of time in which the auction is active. In this example, we consider a period of 10 time units. Suppose $s_{0_{sys}}$, s_{0_1} , s_{0_2} and s_{0_3} are the initial states of O_{sys} , O_1 , O_2 and O_3 , respectively, and all the variables are initially 0:

```
Asys = assign(1001, vEPR); assign(10, at); CreateResource(EPR, 15, 1100, empty);
      while(actualTime() <= at, Abid)
Abid = getProp(EPR, vEPR); assign(vEPR + bid(), vEPR); setProp(EPR, vEPR); wait(1, 2)
A1 = wait(1, 2); subscribe(O1, EPR, value < 1000, Acond1); pick((pl1, buy, v1, empty), empty, 10)
A2 = wait(1, 2); subscribe(O2, EPR, value < 1010, Acond2); pick((pl2, buy, v2, empty), empty, 10)
A3 = wait(1, 2); subscribe(O3, EPR, value < 990, Acond3); pick((pl3, buy, v3, empty), empty, 10)
Acond1 = getProp(EPR, vEPR); invoke(pl1, buy, vEPR)
Acond2 = getProp(EPR, vEPR); invoke(pl2, buy, vEPR)
Acond3 = getProp(EPR, vEPR); invoke(pl3, buy, vEPR)
```

Here, the function *bid* is used to increase/decrease the stocks value simulating the fluctuation of the stocks price.