Agent Systems and Applications

JADE Homework – Grocery Delivery System

Scenario:

The client wants to order the grocery delivery to her/his home. Initially, he/she doesn't know any kind of platform that provides this service, so first, the client must search for possible options (e.g., Bolt, Uber Eats, etc.). Each of these deliverers is in contact with different markets from which they can pick up the groceries. Each market may have its own pricing for the food items. When given a particular order, the deliverer doesn't have to rely on a single market, but can pick up individual items from different places – e.g., in case when not all of them are available at one place. For the sake of simplicity, let's assume that the grocery deliverer follows the pattern:

1. Initially, it tries to select all the items from the market that have the **largest number** of them available
   e.g.
   Order: [milk, coffee, rice]
   Market1: [milk, coffee]
   Market2: [coffee]
   Market3: [rice]
   Deliverer will start by picking up *milk* and *coffee* from ***Market1,*** and then pick up *rice* from ***Market3***

2. If there is more than one market that offers the same amount of items, the deliverer will choose the one that has the **lowest price**
   e.g.
   Order: [milk, coffee, rice]
   Market1: [milk (5zl), coffee (30zl)] (total 35zl)
   Market2: [coffee (25zl), rice (3zl)] (total 28zl)
   Market3: [rice (4zl)] (total 4zl)
   Deliverer will start by picking up *rice* and *coffee* from ***Market2,*** and then pick up *milk* from ***Market1***

3. If it is not possible to select all of the items from one place, the deliverer will repeat logic from step 1 and 2 for the missing items
   e.g.
   Order: [milk, coffee, rice]
   Market1: [milk (5zl), coffee (30zl)]
   Market2: [coffee (25zl), rice (3zl)]
   Market3: [rice (4zl)]
   Market4: [milk (2zl)]
   Deliverer will start by picking up *rice* and *coffee* from ***Market2,*** and then pick up *milk* from ***Market4***

Each of the deliverers that can complete the order, proposes to the client the final cost of the delivery (**final cost = price for groceries set by markets + additional fee set by deliverer**). In case the deliverer cannot pick up all items, the client must also be informed. Finally, the client picks up one of the deliverers, pays the price, and waits for the order.

The goal of the homework is to **create an agent system in JADE** that simulates the described scenario.

Tasks:

1. (4 pts) Create three agents: *DeliveryAgent*, *ClientAgent,* and *MarketAgent* that will represent the participants of the scenario
   a. (0.5 pt) Passing necessary parameters to each of the agents
   b. (0.5 pt) Registering *DeliveryAgent* service in *DF*
   c. (2.0 pt) Registering *MarketAgent* service in *DF* and establishing connection with *DeliveryAgents* (**HINT:** You can use properties of the *ServiceDescription* and the ability of registering multiple services by one agent)

d. (1.0 pt) Searching for available *DeliveryAgents* in *DF* by a *ClientAgent*

2. (6 pts) Create the communication between the agents
   (**HINT:** Look into *Contract Net Protocol*: http://www.fipa.org/specs/fipa00029/index.html)
   a. (0.5 pt) Sending order details from *ClientAgent* to *DeliveryAgents*
   b. (1.5 pt) Communication between *DeliveryAgent* and *MarketAgents* to estimate the price of the order (must happen **before** responding to the *ClientAgent*)
   c. (1.0 pt) Implementation of the price calculation behaviour in *DeliveryAgent*
   d. (1.5 pt) Communicating *DeliveryAgent* responses to the *ClientAgent* and the process of selecting the final *DeliveryAgent* by *ClientAgent*
   e. (1.5 pt) Completing the transaction by sending the money from *ClientAgent* to *DeliveryAgent* and awaiting order completion and confirmation from *DeliveryAgent*