MOBILE AGENT IN E-COMMERCE

Mohamed Elkobaisi
Academy of Graduate Studies, Benghazi, Libya

Keywords: Mobile Agent, E-commerce.

Abstract: Agent can be enhancing company modelling as well as to offer new techniques for developing intelligent applications. The key aspects of e-commerce agents are their autonomy, their mobility, their abilities to perceive, reason, and act in their surrounding environments, as well as the capability to cooperate with other agents to solve complex problems. Autonomy of agents involves adaptability to engage in negotiations governed by mechanisms not known in advance, while their mobility entails such negotiations taking place at remote locations. This paper aims at combining adaptability with mobility, by describing of agents appearing in the system and their basic interactions. Furthermore, this paper discusses the reasons why use of mobile agents within suggested system.

1 INTRODUCTION

Fundamentally, the system represents a distributed marketplace that hosts e-Suppliers and allows e-Buyers to “visit” them to purchase products. There are six different agents involved in the system which are (Supplier, Storehouse, Seller, Monitor, Buyer, and Registration Agent “RA”). The conceptual architecture of the system illustrating proposed types of agents and their interactions in a particular configuration is shown in Figure 1.

Let us now describe each agent appearing in that figure and their functionalities. Supplier and the Buyer agents represent system “users” — merchants that sell products and buyers who want to purchase them. Buyer agents (Visitors) have the option to negotiate with the Suppliers, to bid for products and to choose the Supplier from which to make a purchase. The first step in the system, Buyer agents register with the Registration agent (RA) and await user requests. RA is work as librarian that makes the system easier and faster for buyer and supplier because in the large companies and enterprises "The time is money". Similarly, Supplier agents create Monitor agents and register them with the RA. Furthermore, each Supplier agent registers there all products that are available in its e-store (an initial list of available products). In this way, the RA store information (addresses and identifiers) about all Supplier, Monitor and Buyer agents existing in the system, and store information about available products, see also (Trastour,2002). The following Sequence diagram explains the interactions among Human Buyer, Buyer Agent, RA, and Supplier agent, see figure (2). On the other hand, on supply side, Supplier agents are responsible for creating Seller agents (one for each product to be sold), each Seller agents playing exactly the same role.

Buyer agents seek to the best possible offer matching user-specified requirements. Buyer agents engage in price negotiations and gathers offers and decides where from to attempt at making an actual

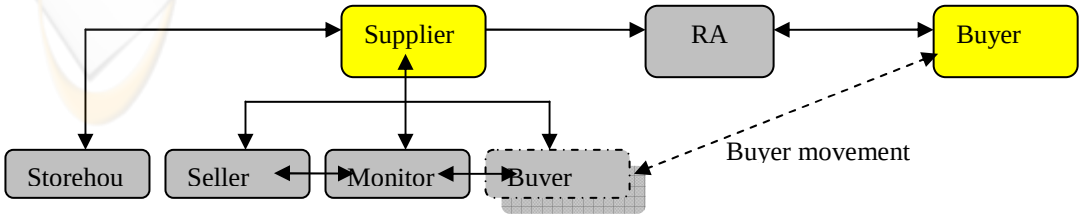


Figure 1: Architectural of the System.

Elkobaisi M. (2006).
MOBILE AGENT IN E-COMMERCE.
In *Proceedings of the Eighth International Conference on Enterprise Information Systems - SAIC*, pages 177-180
DOI: 10.5220/0002440101770180

purchase or decides that purchase that would satisfy its user cannot be made. Finally, in addition to agents proposed, Storehouse agents, also created by Supplier agents (one such agent for every e-store in the system). Storehouse agents are responsible for: management of products available for sale, and management of reserved products, see figure (3).

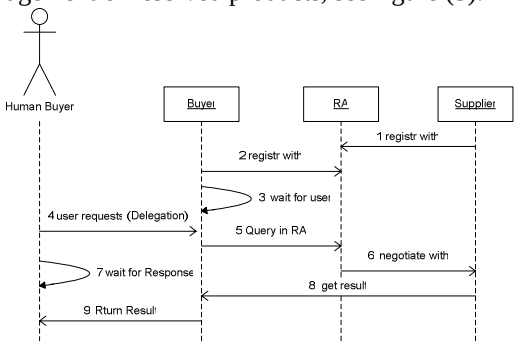


Figure 2: Sequence diagram for system interactions.

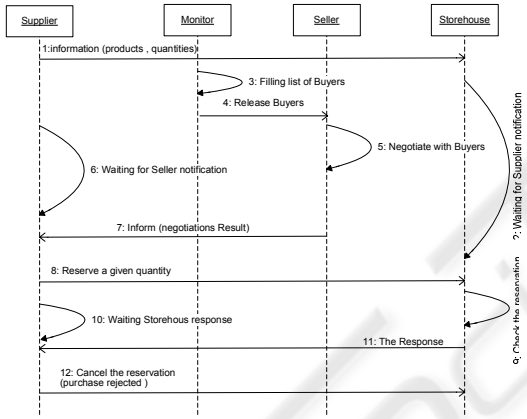
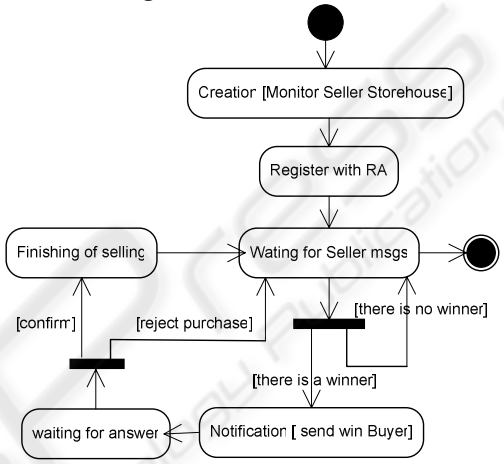


Figure 3: Sequence Diagram for supplying state.

2 THE ELEMENTS OF THE SYSTEM

Supplier Agent:
The Supplier agent acts as the representative of the "user". The Supplier agent creates Monitor agent, a Storehouse agent and Seller agents. The creation of the Storehouse agent involves passing information about goods that are available for sale, while creation of the Monitor and Seller agents involves providing them with information that are to be used in price negotiations. After creation, the Supplier agent supervises negotiations and the product flow. If they were successful, Seller agent informs the Supplier agent, which asks the Storehouse agent to reserve a given quantity of a particular product (for a specific amount of time). The events can then proceed according to three different cases. (1) If the winning Buyer confirms purchase the Supplier asks the Storehouse agent to check the reservation. If the reservation did not expire then the Supplier informs the Buyer agent about acceptance of transaction. (2) If the reservation has expired, then the Supplier agent sends a rejection message to the Buyer agent. (3) If the Buyer agent rejects purchase and informs the Supplier agent about it, the Supplier agent asks the Storehouse agent to cancel the reservation.



Figures 4: State diagram of the Supplier agent.

Monitor agent:
The Supplier agents cooperate directly with Monitor agents that: (1) Interact with Buyer agents: Admit them to the negotiations and provide them with important information about current negotiation. (2) In suitable moments release Buyer agents to appropriate Sellers. (3) Creates and update a register list that contains all current Buyer agents. The state diagram of the Monitor agent is presented in Figure 5 (the high level of Monitor functionality) and continued in Figure 6 (detailing prepare to negotiation). When an appropriate number of Buyer agents have registered, the Monitor passes their identifiers to the Seller agents and thus allows the negotiation to start. As soon as this step is completed, the Monitor cleans the list of registered Buyer agents and the admission/monitor process is restarted (assuming that the Seller agent is still alive). When new Buyer agents are delivered, a list of currently registered Buyer agents are put into a buffer "Buffer registration list". These agents have to be serviced first.

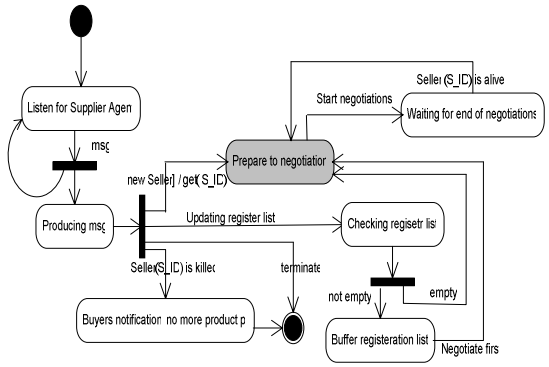


Figure 5: State diagram of the Monitor agent.

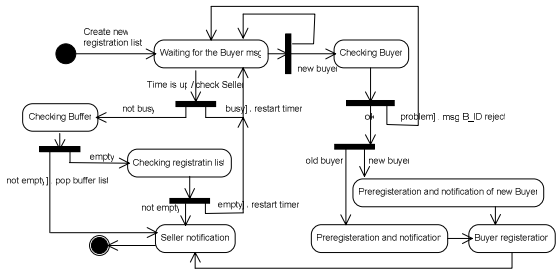


Figure 6: State diagram (Prepare to Negotiation).

Finally, in a special case when a given product has been sold-off and will not be replenished, the *Supplier* agent terminates the *Seller* responsible for selling it and the Monitor informs awaiting *Buyer* agents about this fact.

Storehouse Agent:

The Supplier agent interacts directly also with the Storehouse agent. In the early stages of its functioning the Storehouse agent is supplied (through messages from the Supplier agent) with information about products and their quantities. Then the Storehouse agent awaits notifications from the Supplier agent. The Supplier agent notifies the Storehouse agent about: (1) Registration of new products for sale. (2) Product reservations.

(3)Purchase confirmations.

(4)Purchase terminations. If reserved products whose reservation time has expired are found, these reservations are cancelled, reserved products are added to the pool of products available for sale and the Supplier agent is informed about a new amount of available commodities. Note that the information about cancelled reservation is provided to the Supplier agent only when a purchase is requested by the Buyer agent and the Supplier agent is checking if a transaction can be completed. Finally, if quantity of some product becomes 0, the Storehouse agent informs about it the Supplier agent, which may decide to terminate the corresponding Seller agent. In this case it informs about it both the RA and the Storehouse agents, see figures (5, 6).

Seller agent:

Finally, Seller agent is the last agent working on the supply side of the system that appears to be a simple. This simplicity comes form the fact it has no complex interactions. Note that not all negotiations have to end by establishing a winner and the system is able to handle such an event.

At the same time, all data about negotiations is sending to the Supplier agent that collects and analyses them. Obviously, another aspect of autonomy involves “intelligence” that can be understood as capability to reason over past experiences and domain knowledge in order to maximize utility.

Finally, the final stage in the system called “Sale finalization” which includes such actions as payment and delivery no represent in the system.

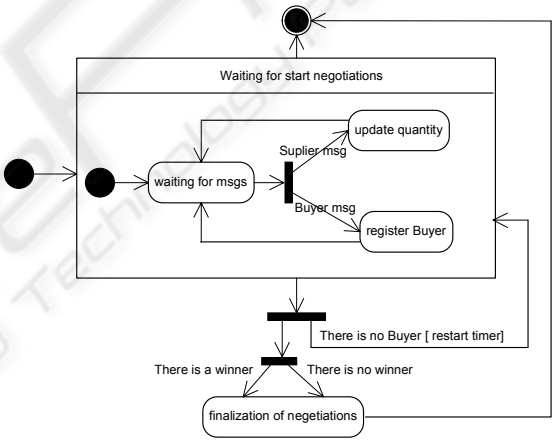


Figure 7: State diagram of the Seller agent.

Buyer agent:

Finally, on the purchasing side, the Buyer agent (that is a mobile) listens for orders from the customer and, to fulfill them:

(1) Queries the RA which stores sell the requested product. (2) Communicates with the Monitor agent see Figures (5, 6) to obtain entry to the negotiations.

(3) Manages the process of making purchases on behalf of the customer, then the Buyer agent informs the customer about the results of price negotiations.

For a specific amount of time and when the wait-time is over the Buyer agent enters a complex state:

- Attempt to complete a selected purchase.
- Cancel the existing reservations and re-engage in price negotiations (thus awaiting a better opportunity).

- Declare the purchase impossible and notify the customer accordingly, see figure (8).
When the attempt at completing a purchase is successful, then the Buyer agent sends messages to customer. The situation is slightly more complicated when the attempt was unsuccessful and purchase was not deemed impossible. Then the Buyer agent cancels current reservations and return to price negotiations.

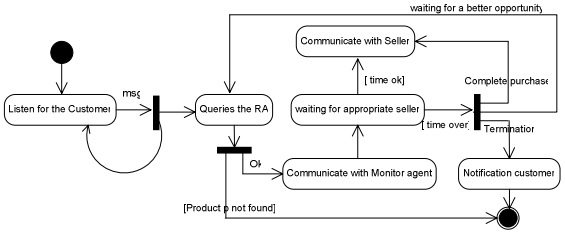


Figure 8: State diagram of the Buyer agent.

3 WHY MOBILE AGENT IN THE SYSTEM?

Scripts The agent mobility in E-commerce system plays an important role and provides significant benefits. Let us start by considering someone who, sitting behind a slow Internet connection (which is not an uncommon situation), tries to participate in an E-auction (Bejar & Juan, 2001). In this case it is almost impossible to be sure that ones bid:
(1) Reaches E-auction server in time (Tamma et al 2002). (2) Is sufficiently large to outbid opponents that have been bidding while connected over a fast link (information about auction progress as well as our responses may not be able to reach their destinations sufficiently fast). Here, network-caused delays can be significant for the outcome of negotiations (purchase of the desired product may be prevented).
Obviously, problems described here can be avoided if an agent representing user is located at the same server where the negotiations take place with assume that an agent is capable of autonomously completing the requested task (Artikis et al, 2001); resulting in offers being made fast enough to efficiently participate in price negotiations.

4 CONCLUSION

This paper discusses ecommerce agent system that uses mobile agent technologies for implementing flexible automated negotiations. After presenting an overview of the proposed system by using UML diagrams, the attention is focused on questions involved in agent mobility. I have argued that agent mobility is the most optimal solution for the e-commerce model considered here. Finally I have discussed why there is no simple solution to the problem of finding the optimal offer when multiple agents negotiate prices within multiple e-stores and thus why this solution is as optimal as any other.

REFERENCES

Trastour, D., Bartolini, C., and Preist, C. 2002. *Semantic Web Support for the Business-to-Business E-Commerce Lifecycle*. In: Proceedings of the WWW'02: International WorldWide Web Conference, Hawaii, USA, ACM Press, New York,USA.

Bejar, J., and Juan, A., 2002. *To bid or not to bid agent strategies in electronic auction games*. In Frank Dignum and Ulises Cortes, editors, Agent-Mediated Electronic Commerce III — Current Issues in Agent Based Electronic Commerce Systems, Germany.

Tamma, V., Wooldridge, M., Dickinson, I., 2002. *An Ontology Based Approach to Automated Negotiation.* In: Proceedings AMEC'02: Agent Mediated Electronic Commerce, LNAI 2531, Springer-Verlag 2002, 219–237.

Artikis, F. Guerin, and J. Pitt 2001. *Integrating interaction protocols and internet protocols for agent-mediated E-commerce.* In Frank Dignum and Ulises Cortes, editors, Agent-Mediated Electronic Commerce III — Current Issues in Agent Based Electronic Commerce Systems, Germany.