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A Meeting Infrastructure to Support E-Commerce

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Abstract

This paper presents a research project that deals with designing a meeting infrastructure, as a software platform to support e-commerce's transactions. Instead of interacting remotely and hence, relying on the network's state, the providers and consumers that are involved in such transactions interact locally and in a safe environment. The meeting infrastructure is flexible. It could be structured in different ways, by supporting for example alliances and groups to be set up.

Introduction

With the rapid development of information technologies, eg. the Internet, e-commerce is, currently, attracting the attention of several academical and industrial organizations [Gini, 1999; IBM, 2000]. The main purpose of these organizations' work is to leverage the traditional relationships that exist between sellers and buyers. To this end, new advanced technologies and techniques, such as software agents [Jennings et al. 1998] and strategies for negotiation and cooperation, that could support both sellers and buyers are developed and experimented. In this paper, sellers are viewed as providers of services and buyers as consumers of services. Generally, chronology of transactions in e-commerce goes through five steps, namely meeting, declaration, agreement, performance, and revision. The meeting step allows consumers and providers to identify each other. The declaration step consists of advertising needs and services. The agreement step specifies the clauses of using the services. These clauses constitute the contracts between the consumers and providers. Finally, the performance step consists of carrying out the contracts. However, in order to overcome unpredicted situations during the performance step, a contract could be revized. This revision step means going back to the agreement step.

The Broker

In an environment that consists of several providers of services, potential consumers have to be able to discover these providers and select the appropriate ones. The selection strategy could be based on different criteria, such as minimizing the cost of the required services. Currently, the most common approach to connect providers and consumers consists of inserting an intermediate level between them. Generally, specific types of intelligent components, called Brokers, are associated with this level. In fact, a Broker receives from the providers their advertisements of services and from the consumers their requests of services. Subsequently, the Broker matches these advertisements to appropriate requests. We assume that all participants, namely providers, consumers, and Brokers, agree on a common communication language. Minimal language includes structures for offering services, responding to offers, negotiating, and invoking services.

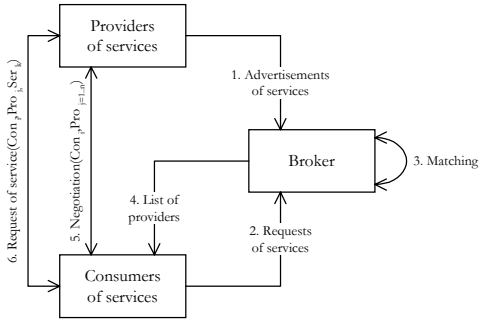
Figure 1 presents a Broker-based environment. In the same figure, numbers correspond to the operations chronology. Despite the major role the Broker plays, for instance receiving both advertisements and requests and then, matching them, the Broker could become a bottleneck in this environment. In fact, the Broker takes part to all the interactions that drive into the identification of the providers according to the consumers' requests. Therefore, the well functioning of these consumers and providers rely mainly on the Broker's state. In addition, certain drawbacks could be associated with the Broker:

- The Broker could not negotiate on behalf of all the providers/consumers of services. Each provider/consumer has its negotiation strategy that meets its needs and expectations. In case the Broker is involved in negotiations, it should be enhanced with appropriate mechanisms that allow this Broker to negotiate on

behalf of either consumers or providers. However, improving the Broker's functionalities means increasing its workload and probably, causing its overwhelming. In Figure 1, once the list of potential providers is returned to a consumer (Con_i), this consumer sends remote messages, regarding its intention to negotiate, to all these providers (Negotiation(Con_i,$Pro_{j=1...n}$)). The exchange of messages could "take time", before the consumer and a particular provider reach an agreement about a service. Next, a remote request invoking this service is sent to the provider (Request-of-service(Con_i,Pro_j,Ser_k)).

- The functioning of a broker-based environment depends mainly on the network's state. Several remote messages, concerning advertisements, requests, and negotiations are needed before providers and consumers reach agreements about the appropriate services. Therefore, the network has to be fully reliable and efficient.
- According to the number of messages that could be exchanged, the security issue of these exchanges has to be dealt with seriously. This issue is very crucial during negotiations. For instance, a provider could know the offers of its competitors.

Figure 1 Broker-based environment

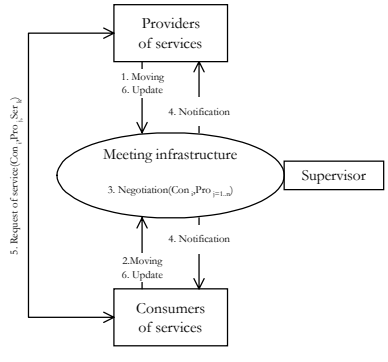


The Meeting Infrastructure

In order to overcome the multiple drawbacks presented above, a solution consists of introducing a Meeting Infrastructure (MI) as a support platform to the negotiations between providers and consumers. The MI could be considered as a virtual marketplace in which consumers and providers could meet and exchange their messages locally. The exchange should focus on services' identification and negotiation. Acting as a Supervisor, an intelligent component could head and manage this infrastructure. For instance, the Supervisor could monitor the interactions that could happen within the MI and hence, could ensure that there are no illegal transactions. In addition, the Supervisor could charge the providers and consumers for using the MI.

Figure 2 presents a meeting infrastructure-based environment. In order to be operational, this environment's components, namely providers and consumers of services, have to move to the MI. Thus, these components have to be enhanced with mobility mechanisms [Lange and Oshima, 1999]. Instead of allowing consumers and providers to move, an alternative could consist of creating agents, i.e. delegates, that would act on behalf of these providers and consumers. Each agent would be associated with either a consumer or a provider, called in that case the agent parent. After their generations by their parents, the agents would be shipped to the MI. Next, they would be authenticated for security reasons and then, installed by the Supervisor. In the MI, the agent of each provider could be associated with a business card, viewed as its profile, that could be offered to the consumers' agents. This card could contain different types of information, such as contact address, offered services, required costs, etc. In order to manage the MI functioning efficiently, the providers could be gathered together into different groups, according to these providers' specialities. Specialities, such as selling woods and selling mutual funds, are related to the types of services. The purpose of constituting groups is to speed up and facilitate the search operation of the appropriate providers for the consumers. The supervisor could be the facilitator.

Figure 2 MI-based environment

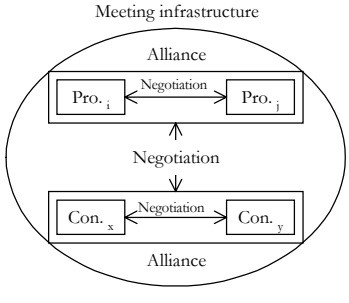


In the MI-based environment, remote interactions for requesting services would only occur after reaching agreements between providers' agents and consumers' agents. Agents should inform their respective parents

about these agreements, through notification messages (cf. Figure 2). As long as they are authorized, the agents could remain in the MI by carrying out other operations, for example monitoring the events that could interest their parents. However, the parents should update their agents' profile regularly with diverse information, eg. new needs to satisfy, new negotiation strategies to follow, new services to look for, etc.

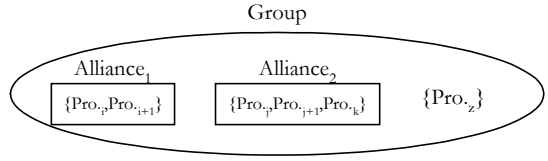
It is interesting to note the different types of interactions that could take place in the MI. In addition to the provider-consumer interaction, two types of interactions exist, namely provider-provider and consumer-consumer (cf. Figure 3). In the provider-provider interaction, it could occur that different providers decide to constitute alliances in order to join forces and hence, to offer the same services. To set up alliances, a pre-meeting stage is required. This stage allows the providers to interact with each other and find if they have similar interests. In an alliance of type providers, a challenging issue to deal with is how to distribute the incoming "money" of the offered service between all these providers. Normally, specific rules should regulate the internal functioning of an alliance. Such rules allow for instance, to designate the alliance's responsible and to determine distribution and contribution rates. In the consumer-consumer interaction, it could occur that different consumers decide to get together in order to request the same service and probably, to ask for a discount. In an alliance of type consumers, a challenging issue to deal with is how to share the cost of the required service on all these consumers. As with the providers, the same approach of setting up alliances should apply to consumers.

Figure 3 Types of interaction in a MI



It is important to make the difference between an alliance and a group, as explained previously. The competitive behavior makes this difference. In an alliance, components do not compete. The collective effort goes beyond the individual effort. The opposite happens in a group, where components could compete against each other. Figure 4 presents how a group could be structured in different ways: $Alliance_1$ with $Providers_{i,i+1}$, $Alliance_2$ with $Providers_{j,j+1,k}$, and finally $Provider_z$.

Figure 4 Example of a group



In a MI-based environment, the security could be improved. For instance, the Supervisor would be in charge of the security. In fact, consumers and providers (or their respective agents) interact locally, within a secure place. To this end, providers and consumers of services should be checked before being authorized to enter the MI. Furthermore, each consumer and provider could have a visa that contains several types of information such as visa's expiration date. Additional constraints that improve the infrastructure's security could be added, among them limiting the presence duration in the MI and defining opening and closing hours.

Summary

Regarding the implementation strategy of the meeting infrastructure, Gossip application from Tryllian (www.tryllian.com) seems to be an excellent candidate. Gossip is used to develop mobile components, called agents, that are able to roam communication networks. These networks contain several servers, designated by meeting points, which could be viewed as meeting infrastructures. In Gossip, each meeting point contains one or several rooms where agents could live. A room could be associated with the group structure.

In this paper, we described how e-commerce field could be the object of further research efforts. For instance, the meeting infrastructure approach could be used to simulate financial marketplaces.

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• The different aspects presented in this article are those of the main author and should not be interpreted as representing the official policies of DREV.