Chapter 4
Multi-Agent Active Services for Online Social Networks

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ABSTRACT

This chapter has the goal of showing how multi-agent systems can be a suitable means for supporting the development and the composition of services in dynamic and complex environments. In particular, the chapter copes with the problem of developing services in the field of social networks. After an introduction on the relationships between multi-agent systems, services, and social networks, the chapter describes how multi-agent systems can support the interaction and the collaboration among the members of a social network through a set of active services.

INTRODUCTION

One of the main challenge of multi-agent systems was to become the main means to support legacy systems interoperability and to facilitate the realization of scalable distributed systems (Genesereth, 1997; FIPA, 2013). However, in the last decades, service-oriented technologies had an impressive progress and seem to have good chances to compete with multi-agent systems as main means for the development of scalable and interoperable systems. The problem of such technologies is that they cannot provide the autonomy of agents together with their social and proactive capabilities of agents. As a result, the realization of flexible adaptive distributed systems may be difficult.

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An integration of multi-agent systems with service-oriented technologies seems be the most suitable solution for the realization of scalable and interoperable distributed applications (see, for example, Greenwood & Calisti, 2004; Huhns et al., 2005).

However, in some application areas, multi-agent systems can be considered a suitable means for directly providing services. Social networks represent one of these areas. Indeed, social networks and multi-agent systems have many similarities and the members of a social network often interact with the other members as agents in a multi-agent system. Hence, it is possible to envisage, for the next future, networks of humans and agents, where agents provide services aimed at improving the exchange of information and the collaboration among members.

This chapter describes the relationships between multi-agent and service oriented systems and shows how multi-agent systems can be the means for providing dynamic and customizable services in social networks.

BACKGROUND

Agent, software agent and multi-agent system are terms that find their way in a number of research areas, including artificial intelligence, databases, operating systems and computer networks literature, as well as in several application areas, including business process management, network management, power systems control and space exploration (Pěchouček & Mařík, 2008; Bordini, 2009). Although there is no universally accepted definition for the term agent (Genesereth & Ketchpel, 1994; Wooldridge & Jennings, 1995; Russell & Norvig, 2003), all definitions agree that an agent is essentially a special software component that is:

- **Autonomous:** As it should operate without the direct intervention of humans or others and should have control over its actions and internal state.
- **Social:** As it should cooperate with humans or other agents in order to achieve its tasks.
- **Reactive:** Because it should perceive its environment and respond in a timely fashion to changes that occur in the environment.
- **Pro-Active:** As it should not simply act in response to its environment, but should also be able to exhibit goal-directed behavior by taking the initiative.

Moreover, some definitions assert that if necessary an agent can be:

- **Mobile:** Showing the ability to travel between different nodes in a computer network.
- **Truthful:** Providing the certainty that it will not deliberately communicate false information.
- **Benevolent:** Always trying to perform what is asked to it.
- **Rational:** Always acting in order to achieve its goals, and never to prevent its goals being achieved.
- **Able to Learn:** Adapting itself to fit its environment and to the desires of its users.

Agents may operate in dynamic and uncertain environments, making decisions at run-time. Moreover, agents take advantage of their social ability to exhibit a flexible coordination that makes them able to cooperate in the achievement of a global goal and compete in the distribution of resources and tasks. Coordination among agents can be handled with a variety of approaches, including negotiation, contracting, organizational structuring and multi-agent planning.