

Mobile Agents: State of the Art and Research Opportunities

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The notion of mobile agent, a software component that is able to migrate autonomously among the hosts of a distributed system, is enjoying wide popularity as a novel abstraction for structuring distributed applications.

A number of advantages are usually claimed for mobile agents, including the potential for a more efficient use of communication resources, improved fault tolerance, support for disconnected operations, and in general enhanced flexibility.

Mobile agent enthusiasts often wonder why, despite all these advantages, this concept has not yet made it into the mainstream of distributed systems. Their explanations often put the blame on the immaturity of the technology, especially as far as security is concerned. On the other hand, mobile agent critics often complain about the lack of evidence supporting the claimed advantages. Indeed, scientifically sound evaluations providing strong quantitative or qualitative support for mobile agents are extremely rare.

The advent of Java, and the ease by which a mobile agent system can be crafted in such language, paradoxically makes matters even worse, giving another argument to detractors of mobile agents. A recent census reports the existence of more than 70 mobile agent systems—a surprising anomaly for such a young research field. A closer look reveals how very few among these systems bear innovative ideas, while the rest are essentially stereotypical in nature. Even worse, many are designed in a way that disregards or even hampers many of the aforementioned advantages.

It is true that the research area concerned with mobile agents is still in its early stage, and hence a lot of issues still need to be tackled. By the same token, however, this research area is no longer in its infancy: a lot of work has been disseminated since the appearance of the term in 1994. Hence, we are at a point where it is meaningful to ask ourselves what we have accomplished, what opportunities we have missed, and what are meaningful directions in the future of this research area.

The goal of this talk is to contribute some reflections around these questions, with the ultimate intent to help reshape the agenda for mobile agent research.