

IEEE FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS Standards Committee (FIPA SC)

Working Group: Mobile Agents

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Problem Statement

The concept of mobile agents provides an easy to grasp and apply design paradigm for distributed multi-agent systems. In addition, it has been proven by research in the last few years that mobile agents can provide significant quantitative advantages compared to other design paradigms regarding network load and processing time in the area of distributed information gathering and access to distributed services, in particular when agents are applied on mobile devices. Moreover, mobile agents provide an advantageous concept for agent deployment at remote agent servers, even if those agents are not mobile themselves.

The wide-spread application of mobile agents has been retarded so far because of the lack of commonly accepted standards that cover the most important challenges of mobile agents, that is, code and data relocation, communication and tracking, infrastructure management, interoperability, and security. Both available standards, MASIF and FIPA, only partially cover these areas.

The primary goal of this working group is to resume work on standards for mobile agents. Existing specifications will be improved and extended and latest research results and experiences from existing implementations will be incorporated. Along with specification proposals, the working group will develop reference implementations of protocols in the form of software components for agent toolkits.

Objective

Starting from existing specifications for agent mobility and including experiences acquired during implementation and evaluation of existing prototypes and applications, the working group will define new specifications for communication interfaces and network protocols for efficient, reliable, and secure

- code and data relocation

- location tracking and location transparent communication
- infrastructure management in the form of overlay networks for agent server discovery and dynamic definition of itineraries
- interoperability between different mobile agent toolkits on run-time level

The working group will propose minimal required specifications that account for ongoing research and development and are open to future improvements. For example, regarding code and data relocation, the working group will avoid defining one specific migration technique but will propose generic protocols that allow the implementation of various migration techniques. Consequently, we aim at exchanging mobile code between different mobile agent platforms by means of these migration protocols. This leads to interoperation at run-time level and allows the combination of various agent toolkits with their specific advantages. Specifications will be accompanied by reference implementations in the form of toolkit independent software components.

Documents Generated

Documents to be generated are grouped in the areas defined above. For each area, we expect to have a self-contained specification ready in the following steps and time frame:

- Experimental IEEE FIPA Mobile Agents Specifications by June 2006
- Reference implementation developed by October 2006.
- Standard IEEE FIPA Mobile Agent Specification by December 2006.

Technology

- Extend existing MASIF and FIPA 87 specifications for code and data relocation with a more general mobility model that allows for various migration techniques, for example based on ideas presented in Kalong¹.
- Define low-level API and network protocol for various location tracking strategies (central directory approach, forwarding pointer approach, etc.).
- Add sophisticated solutions for mobile agents security problems (malicious agents and malicious agencies) as new protocol layers on top of code and data relocation protocols and location tracking protocols, based on ideas presented in Semoa (www.semoa.org).
- Low-level API for run-time interoperability, based on experiences with Jade (jade.tilab.com), Semoa (www.semoa.org), and Tracy (www.mobile-agents.org).
- Low-level API and network protocol for Peer-to-Peer agent system infrastructure (region or domain) management.

¹P. Braun and W. Rossak: Mobile Agents – Basic Concepts, Mobility Models, and the Tracy Toolkit. Morgan Kaufmann Publishers, 2005.

Plan for Work and Milestones

- The working group will be created and define a charter and first work agenda in September 2005. Setting up communication infrastructure, such as Web page/Wiki and mailing lists.
- Call for participation sent by end of September 2005.
- Participants are invited to contribute and revise the charter and work agenda and propose first ideas for the specification outline by end of November 2005.
- First technical meeting of the working group in December 2005. Finalization of the charter and work agenda, develop draft of the specification outline.
- Distribute preliminary specification by April 2006. Determine open issues and possible solutions.
- Second technical meeting in June 2006. Finalization and publication of an experimental specification that is ready for implementation by the submitters.
- Publication of the reference implementation, October 2006.
- Publication of the standard specification, December 2006.

Dependencies

- FIPA specification 87
- MASIF (OMG)
- Other working groups that focus on architectures, agent foundation, agent communication, agent infrastructure, and network protocols.

Participants

Submitters

- Peter Braun (Swinburne University of Technology, Melbourne, Australia)
- Bill Buchanan (Napier University, Edinburgh, UK)
- Ulrich Pinsdorf (Fraunhofer Society, Darmstadt, Germany)
- Wilhelm Rossak (Friedrich Schiller University Jena, Germany)²

²Will attend Budapest meeting

Supporters

Confirmed on 19 August 2005

- Michael Berger (Siemens AG, Munich, Germany)
- Walter Binder (Swiss Federal Institute of Technology, Lausanne, Switzerland)
- Christian Erfurth (Friedrich Schiller University Jena, Germany)
- Ahmed Karmouch (University of Ottawa, Canada)
- Ryszard Kowalczyk (Swinburne University of Technology, Melbourne, Australia)
- Shonali Krishnaswamy (Monash University, Melbourne, Australia)
- Seng Loke (Monash University, Melbourne, Australia)
- Edmundo Madeira (UNICAMP - University of Campinas, Brazil)
- Kazutaka Matsuzaki (National Institute of Informatics, Tokyo, Japan)
- Volker Roth (OMG Labs, Omaha, USA)
- Arkady Zaslavsky (Monash University, Melbourne, Australia)
- Tryllian Solutions B.V., The Netherlands
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