

Evolution of Middleware: Towards Agents

Distributed Systems Sistemi Distribuiti

Andrea Omicini
andrea.omicini@unibo.it

Dipartimento di Informatica – Scienza e Ingegneria (DISI)
ALMA MATER STUDIORUM – Università di Bologna a Cesena

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Towards Seamless Agent Middleware

The first question

- How are we going to *implement the paradigm shift*, under the heavy weight of legacy?

Mainstreaming Agent Technologies

[Omicini and Rimassa, 2004]

- Observing the state of agent technologies nowadays
- Focussing on agent middleware
- Devising out a possible scenario

The Technology Life-Cycle

A successful technology from conception to abandon

- First ideas from research
- Premiere technology examples
- Early adopters
- Widespread adoption
- Obsolescence
- Dismissal

Often, however, this does not happen

- New technologies fail without even being tried for real
- Which are the factors determining whether a technology will either succeed or fail?

Dimensions of a Technology Shift

Technology scenario has at least three dimensions

- Programming paradigm
 - new technologies change the way in which systems are conceived
- Development process
 - new technologies change the way in which systems are developed
- Economical environment
 - new technologies change market equilibrium, and their success is affected by market situations

3-D space for a success / failure story

- What will determine the success / failure of agent-based technologies?

The Programming Paradigm Dimension

Pushing the paradigm shift

- Evangelists gain space on media
- Technological geeks follow soon
- Drawbacks
 - too much hype may create unsupported expectations
 - perceived incompatibility with existing approaches
 - possible dangers for conceptual integrity

Middleware for the paradigm shift

- Technology support to avoid unsupported claims
- Seamlessly situated agents vs. wrapper agents
 - communication actions towards agents
 - pragmatism actions towards objects
- This allows agents to be used in conjunction with sub-systems adopting different component models

The Development Process Dimension

Accounting for real-world software development

- Availability of development methods & tools is critical
 - No technology is to be widely adopted without a suitable methodological support
- Day-by-day developer's needs should be accounted, too

Agent-Oriented Software Engineering Methodologies

- Adopting agent-based metaphors and abstractions to formulate new practises in software engineering
- Current state of AOSE methodologies
 - early development phases are typically well-studied
 - later phases are not, neither the tools, nor the fine-print details

The Economical Environment Dimension I

Innovation has to be handled with care

- Stakeholders of new technologies may enjoy advantages of early positioning
- However, they often focus too much on *novelty* and *product*, rather than on *benefits* and *service*
 - “We are different” alone does not help much
 - software is a quite peculiar product: nearly zero marginal cost, and almost infinite production capability

The Economical Environment Dimension II

Agent-Oriented Middleware & Infrastructures

- Promoting agent-oriented technologies through integration with existing object-oriented middleware & infrastructures
- Creating a no-cost space for agent technologies
- Notions like e.g. *ontology* or *coordination as a service* [Viroli and Omicini, 2006], which are made available to components of any sort
 - where (agent) technologies are no longer “sold” as whole packages
 - whose choice do not require any design commitment
 - where however agents represent the most effective choice for most components
- allow agent metaphors to add their value to existing systems with no assumption on the component model

References



Omicini, A. and Rimassa, G. (2004).

Towards seamless agent middleware.

In *IEEE 13th International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises (WET ICE 2004)*, pages 417–422, 2nd International Workshop “Theory and Practice of Open Computational Systems” (TAPOCS 2004), Modena, Italy. IEEE CS. Proceedings.



Viroli, M. and Omicini, A. (2006).

Coordination as a service.

Fundamenta Informaticae, 73(4):507–534.

Special Issue: Best papers of FOCLASA 2002.

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