

Towards Seamless Agent Middleware

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Presentation Outline

- *The role of middleware in mainstreaming Agent Technology*
- *Seamlessly situated agents*
- *The JADE example*

The Role of Agent Middleware

- *Mainstreaming Agent Technology*
 - *Where we are now is an open problem...*
- *3 Dimensions of Technology Transfer*
 - *Conceptual Paradigm*
 - *Development Process*
 - *Economical Environment*

The Role of Agent Middleware

- Middleware *helps technology transfer*
 - *A reification of a programming paradigm*
 - *middleware conveys semantics through executability*
 - *Middleware adoption results in boilerplate code*
 - *that can be generated (OMG MDA)*
 - *tool integration naturally follows*
 - *Middleware can lower technology adoption costs*
 - *both licensing and learning costs*

Agent Integration

- *Middleware is all about integration and connection among the system parts*
 - *Vertical integration $OS \Leftrightarrow MW \Leftrightarrow APP$*
 - *Horizontal integration $APP \Leftrightarrow APP$ and $MW \Leftrightarrow MW$*
- *2 main agent traits relates to integration*
 - *Sociality (integration with its agent peers)*
 - *Situatedness (integration with the environment)*

Sociality vs. Situatedness

- *Sociality is very well supported by the ACL linguistic connector*
 - *Speech Act Theory, Intentional Stance, ...*
- *The same does not hold for situatedness*
 - *Speech acts require two language-capable peers*
 - *The environment has a lot of passive, service-level components (artifacts?)*

Modelling the Environment

- *1st option: introduce agent wrappers*
 - *thus reducing situatedness to sociality*
 - *use of ACL to interact with artifacts*
- *2nd option: artifact-specific integration*
 - *each portion of the environment has its own way to affect the agent and of being affected by the agent*
 - *a linguistic representation can be given anyway*
 - *use of ACL to talk about artifacts*

Seamless Agent Middleware

- *What is an Seamless Agent Middleware?*
 - *an agent middleware technology that allows to set the situatedness/sociality balance wherever it suits the application most*
- *With respect to using agent wrappers*
 - *this means that you never have to*
 - *but this means also that you always can*

A Paradigmatic Example

- *The interaction / coordination dimension*
 - *ACL only: coordination-is-sociality.*
 - *Pheromons only: coordination-is-situatedness.*
- *Relating to Activity Theory*
 - *Co-ordination / Co-operation / Co-construction*
 - *Subjective & Objective Coordination*
 - *subjective co-ordination overseeing and/or reconfiguring objective co-operation*

The JADE Case

- *Evolution of JADE*
 - *steadily brought the platform towards seamless middleware*
 - *First versions of JADE: the whole JVM was used for the MAS infrastructure*
 - *Since JADE 2.4, JADE-as-library with the In-Process Interface*
 - *JADE within Web and J2EE applications*
 - *Upcoming version: MAS + Services = Apps*