A Generic Simulation Service for Distributed Multi-Agent Systems

Lars Braubach
Alexander Pokahr
Universität Hamburg

Outline

Motivation
Approach
Realization
Example
Conclusion

Introduction

DFG-SPP 1083 (2000-2006)
„Intelligent Agents in Real-World Business Applications“
11 projects, 22 institutes (business/computer science)

SPP Focus:
- Domains: Manufacturing/Hospital Logistics
- Use and further develop agent technology that can be used in real-world industrial applications
- Build up and test a superordinated scenario for each domain (Agent.Hospital/Enterprise)

Agent.Hospital/Enterprise

Coupling the prototype agent systems

- Technical level
  - Platform interoperability (through FIPA-compliance)
- Application level
  - Superordinated process flows
  - Shared ontologies
  - Gateway agents providing service interfaces

Problems:
- Inconsistent handling of local time (event-based simulation, time driven simulation, no simulation)
- Heterogenous agent platforms
- Irregularily focussed time periods (from minutes to weeks)
- Existing systems cannot be completely rebuilt

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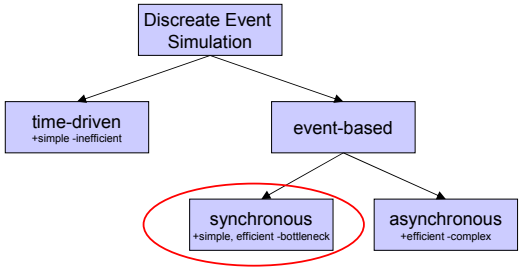
Possible Approaches



- MABS is similar to process-oriented simulation

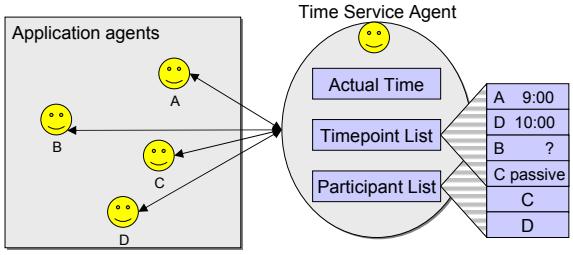
Time Service Component

Time Service

- Controls the time progress in the system
- Is designed as agent
  - Uses an event-based, synchronous control mechanism
  - Considers the special requirements of MAS (esp. the agent's autonomy)
  - Exhibits a FIPA-compliant interface and is therefore interoperable and reusable

Time Service Operation Scheme

- Agents possess local times
- Synchronize with the global time



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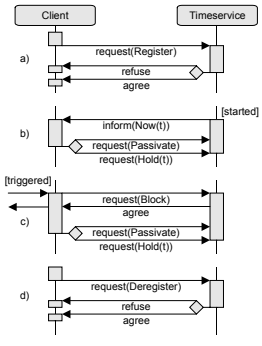
Time Service Protocol / Ontology

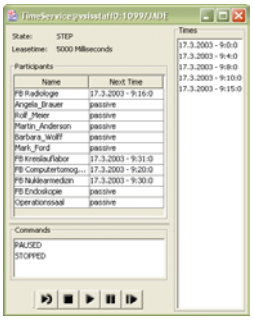


Registration
- Register (participant)
- Deregister (participant)

Requests
- Hold (participant, time)
- Passivate (participant)
- Block (participant)

Time
- Now (time)
- Absolute Timepoint (date, daytime)
- Duration (length, unit)

Time Service Interface



Command Interface
- FIPA-Request Protocol
- Init/Start/Stop
- Pause/Step/Slow

User Interface
- Shows participants/ event list
- List of passed time points
- Allows to execute commands

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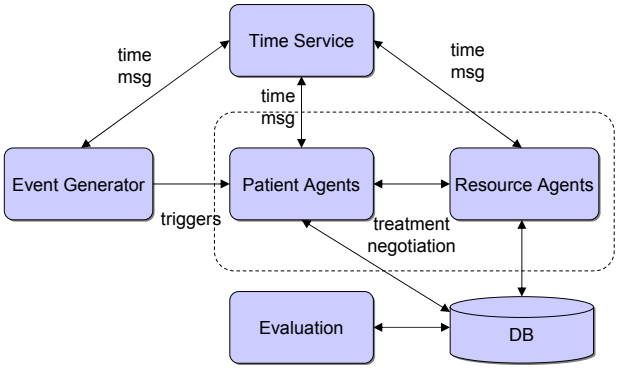
The MedPAge Project

MedPAge: Medical Path Agents

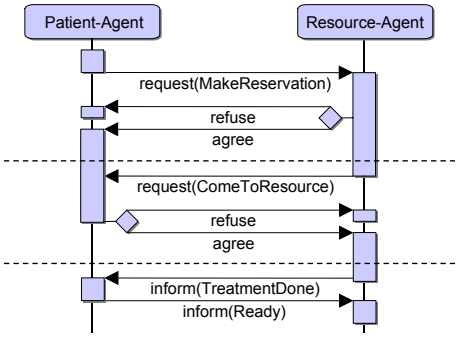
- Patient Scheduling based on Clinical Pathways
- Decentralized Coordination between Patient- and Resource-Agents
- Evaluation and Comparison of Coordination Strategies:
  - First-Come, First-Served (FCFS)
  - Current Hospital Practice (Status-Quo)
  - Market-based Negotiation (MedPaCo)

http://vsis-www.informatik.uni-hamburg.de/projects/medpage/

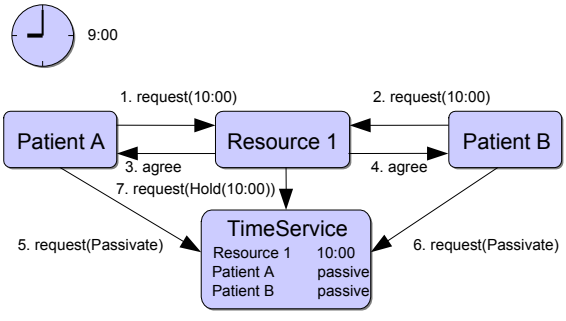
MedPAge Evaluation Environment



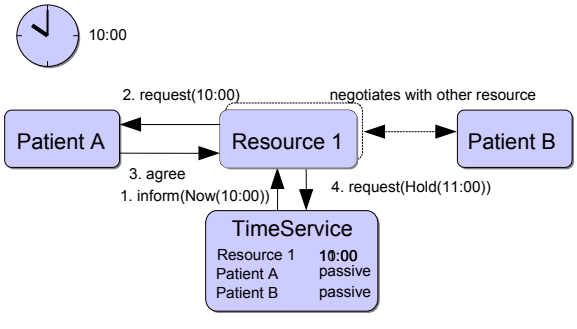
Status-Quo Protocol



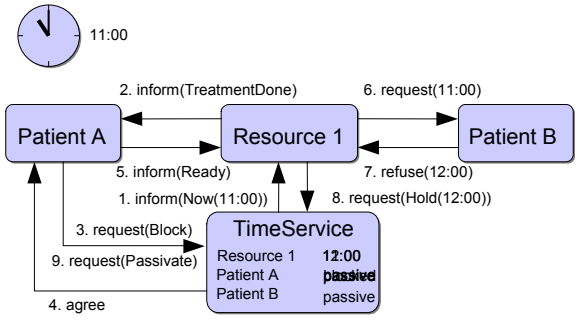
Example Scenario (1)



Example Scenario (2)



Example Scenario (3)



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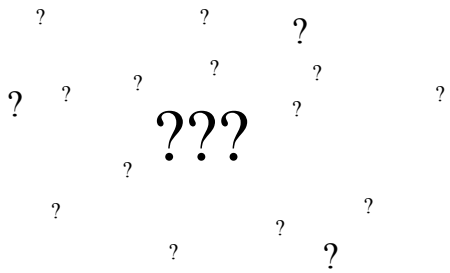
Time Service

- Simulation and Testing of (distributed) MAS
- Addresses the requirements of Agent.Hospital/Enterprise
- Synchronous event-based simulation with centralized global clock
- FIPA-compliant service and command interface
- Implementation in Jadex (BDI extension for JADE)
- Tested as part of MedPAge project
- Outlook: Integration into Agent.Hospital/Enterprise

Questions



Hospital Logistics Projects (2002-2004)

- **AGIL** (Berlin/Ulm): Emergency health care
- **ADAPT** (Würzburg/Ilmenau): Clinical trials, appointment scheduling (SeSAm)
- **ASAinlog** (Hohenheim/Potsdam): Electronic patient record (Konnektorenansatz)
- **MedPAge** (Mannheim/Hamburg): Appointment scheduling on basis of clinical pathways
- **Policy Agents** (Trier/Aachen): Appointment scheduling on basis of personal policies
- **EMIKA** (Freiburg/Freiburg): Transport service and signalling