



# A commercially-proven agent-oriented design and development methodology

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# Agenda

- Product characteristics
- Methodology
  - Requirements
  - Essential elements
- Projects and Proofs-of concept
  - Descriptions
  - Problem characteristics
- Achievements
- Future work
- Conclusions



# Agentis AESS - product characteristics

- Implementation of BDI concepts
  - See A. S. Rao and M. P. Georgeff.  
“Modelling rational agents within a BDI-architecture”.
- Based on dMARS
  - See Mark d'Inverno, David Kinny, Michael Luck, Michael Wooldridge.  
“A Formal Specification of dMARS”.
- Implemented using strict J2EE technology
- Complete life-cycle support
- Implemented using NetBeans IDE
- Automated deployment to commercial application servers



# Methodology requirements

- Use BDI concepts
- Start with familiar analysis artefacts
- Clear transformation sequence from familiar design to agent concepts
- Retain agent autonomy but avoid asynchronous execution
- Clear transformation sequence from agent design to development artefacts supported by product
- Keep open possibility of future better support for agent design



# Methodology essentials

- Analysis
  - Use Cases
  - Service / Goal
  - Dependency
  - Layers of Abstraction
  - Business schema
- Design
  - Agent / Package
  - Data definition package
  - Agent / Session Bean mapping
- Development
  - Comprehensive automated unit-testing
  - Continual integration
  - Early visibility
  - Fagan's inspections
  - Z specifications



# Projects and Proofs-of-concept

- Service Capability Engine
  - On-line optimised service selection for an international freight agency
- Controle Temps Réel de la Fraude
  - Real-time analysis of credit cards transactions looking for patterns of fraudulent behaviour
- Loan Portal
  - On-line evaluation of different loan proposals to find that best suited to a client's individual circumstances and needs
- Logistics Optimisation
  - Real-time re-routing of truck operations to mitigate the effects of breakdowns and other failures
- RFID Passenger Handling
  - Non-intrusive monitoring of passenger movements through the tracking of RFID tags

# Problem characteristics

- Choice between different solutions not provided by mathematical analysis
  - All potential solutions must be evaluated, ideally in parallel
- Either
  - Same data evaluated through different algorithms
- Or
  - Different sub-sets of data evaluated through the same algorithm

Requires a design technique that leads naturally to a programmatic solution which allows for the potential parallel execution of its different parts within concurrent execution units

The methodology is effective for all classes of problem. However, it yields its most obvious benefits where the problem solution requires the potential for parallel execution

# Achievements

- Projects and Proofs of Concept
  - Service Capability Engine
  - Controle Temps Réel de la Fraude
  - Loan Portal
  - Logistics Optimisation
  - RFID Passenger Handling
- Project characteristics
  - Diverse application domains
  - Varied size and duration
  - Mixed cultural and language backgrounds
  - Minimal use of deep technical skill

High quality solutions  
High design and development productivity



# Future Work

- Product
  - Inter-agent communication
    - Messaging
    - RMI
    - Web Services
    - Worker Threads
  - Agents / roles
    - Static
    - Dynamic
- Methodology
  - Inter-agent protocol
    - Negotiation
  - Inter-agent performance
  - SPLIT / JOIN logic
  - Error-handling
    - User errors
    - System errors
  - Role assumption



# Conclusions

- BDI agent technology can be used successfully to address problems in enterprise-grade application systems
- Performance supports high-throughput real-time transaction systems
- Delivered systems have low incidence of faults
- Methodology can be taught to average IT professionals
- Methodology can be applied to a wide variety of application domains
- Methodology and tools give high design and development productivity



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