Deploying a Distributed Symposium Planner Through Rule Responder

Benjamin Craig
Harold Boley

Institute for Information Technology
National Research Council, Canada
Fredericton, NB, Canada

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Overview of Rule Responder

- Rule Responder is an experimental multi-agent system for collaborative teams and virtual communities on the Web.
- Supports rule-based collaboration between the distributed members of such a virtual organization.
- Members of each virtual organization are assisted by semi-automated rule-based agents, which use rules to describe the decision and behavioral logic.
- Implemented on top of a Mule-based Service Oriented Architecture (SOA).
Use Case: Symposium Planner

- RuleML-20xy Symposia
  - An organizational agent acts as the single point of entry to assist with the symposium:
    - Currently, query answering about the symposium
    - Ultimately, preparing and running the symposium
  - Personal agents have supported symposium chairs since 2007 (deployed as Q&A in 2008)
    - General Chair, Program Chair, Panel Chair, Publicity Chair, etc.
Organizational Agents

- The organizational agent represents the goals and strategies shared by each committee chair.
- It contains rule sets that describe the policies and regulations of the RuleML Symposium.
- Delegates incoming queries to the chair’s PAs.
Personal Agents

- A personal agent assists a single chair of the symposium, (semi-autonomously) acting on his/her behalf.
- Each personal agent contains a rule-base FOAF-like profile.
- It contains a FOAF*-like **fact** profile plus FOAF-extending **rules** to encode selected knowledge of its human owner.

* The Friend of a Friend (FOAF) project: [http://www.foaf-project.org](http://www.foaf-project.org)
External Agents

- External agents exchange messages with the RuleML-2008 OA.
  - They submit queries and receive answers
- End users, as external agents, interact with the OA using a Web (HTTP) interface to the Symposium Planner
- Support for simultaneous external agents
  - Many EAs can communicate with the OA
Infrastructure - Overview
Reaction RuleML

- Reaction RuleML is a branch of the RuleML family that supports actions and events.
- When an external agent submits a query to the Symposium planner, a Reaction RuleML message must be used.
- In general, when any two agents communicate, Reaction RuleML messages are sent through the ESB.
  - Our ESB implementation is MULE.
Communication Middleware

- **Mule** Enterprise Service Bus (ESB)
  - Mule* is used to create communication end points at each personal and organizational agent of Rule Responder
  - Mule supports various transport protocols (e.g. HTTP, JMS, SOAP)
  - Rule Responder currently uses HTTP and JMS as transport protocols

* Mule – The open source SOA infrastructure: [http://mulesource.com](http://mulesource.com)
Current Rule Engines

- **Prova**: Prolog + Java
- **OO jDREW**: Object Oriented Java Deductive Reasoning Engine for the Web
Prova

- Prova is mainly used to realize the organizational agents of Rule Responder
- It implements Reaction RuleML for agent interaction (event-condition-action rules)
OO jDREW

- OO jDREW is used to realize the personal agents of Rule Responder
  - Deployed as Java Servlets

- It implements Hornlog RuleML for agent reasoning (Horn logic rules)
Online Use Case Demo

- Rule Responder:  
  [http://responder.ruleml.org](http://responder.ruleml.org)

- RuleML-2007/RuleML-2008 Symposia:  

- Personal agents:  
  Supporting all Chairs

- Organizational agent:  
  Supporting Symposium as a whole
Conclusion

- Rule Responder was implemented & tested for various use cases ([http://responder.ruleml.org](http://responder.ruleml.org)) and deployed for RuleML-2008 Q&A.
- Its organizational agents delegate external queries to topic-assigned personal agents.
- It couples rule engines [OO jDREW](http://www.oojrew.org) & [Prova](http://www.prova.org) via Mule middleware and [RuleML 0.91](http://www.ruleml.org) XML interchange format.