SymposiumPlanner-2011: Querying Two Virtual Organization Committees

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What is SymposiumPlanner?

- Is a series of Rule Responder instantiations for the Q&A sections of the official websites of the RuleML Symposia since 2007
  - Organizational Agent (OA) filters and delegates of incoming queries
  - External Agent (EA) acts as the interface to the organizational agent, i.e. as the single point of entry to support the symposium organization
  - Personal Agents (PAs) assist symposium chairs
Organizational Agents

- Represents goals and strategies shared by each member of the Symposium organization.
- Contains rule sets that describe the policies, regulations, opportunities, and expertise of its organization.
- Manages the roles of each personal agent via a Role Assignment Matrix.

Personal Agents

- Act in a rule-based manner on behalf of symposium chairs.
- Work on a profile of FOAF-like facts and FOAF-extending rules that encode ‘routine’ knowledge of symposium chairs.
VO Internetbasierte Geschäftssysteme

Role Assignment Ontology

Metatopics
- General Chair
- Program Chair
- Challenge Chair
- Publicity Chair
- Liaison Chair

Personal Agents
- General Chair
- Program Chair
- Challenge Chair
- Publicity Chair
- Liaison Chair

Topics
- Sponsoring
- Press Release
- Challenge
- Demos
- Media Partners
- Sponsors
- Registration
- Visa Letter
- Submissions

Properties:
- Responsible
- Accountable

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SymposiumPlanner 2011 Architecture

- **One super-OA:** OA@SymposiumPlanner-2011
- **Two sub-OAs:** OA@IJCAI 2011 and OA@BRF 2011
- Each agent consists of internal or external knowledge sources.
- **Reaction RuleML** messages are transported via the ESB to the appropriate agent with different transport protocols
Communication Middleware

- **Mule Enterprise Service Bus (ESB)**
  - Is used to create communication end points at each Personal and Organizational Agent
  - Provides a highly scalable and flexible application messaging framework to communicate synchronously or asynchronously
  - Supports a variety of transport protocols (including HTTP, JMS, JDBC, SOAP, etc.)
  - Is based on a *staged event-driven architecture* (*SEDA*)

Rule Engine: Prova

- Is both a rule language and a rule engine
- Tight integration of Java and Semantic Web technologies
- Is used to realize the organizational agents of SymposiumPlanner system
Prova: Messaging Reaction Rules

- **Send a message**
  \[sendMsg(XID,Protocol,Agent,\text{Performative},[\text{Predicate}\mid Args]\mid Context)\]

- **Receive a message**
  \[rcvMsg(XID,Protocol,Agent,\text{Performative},[\text{Predicate}\mid Args]\mid Context)\]

- **Receive multiple messages**
  \[rcvMulti(XID,Protocol,Agent,\text{Performative},[\text{Predicate}\mid Args]\mid Context)\]

- **XID** is the conversation identifier
- **Protocol**: protocol e.g. self, jms, esb etc.
- **Agent**: denotes the target or sender of the message
- **Performative**: pragmatic context, e.g. FIPA Agent Communication
- **[Predicate\mid Args]** or Predicate(Arg\_1,\ldots,Arg\_n): Message payload

**Example**

\[getTracks(XID,Track):-\]

\[
% \text{look-up responsible agent (Program Chair) from RAM}
\text{assigned}(XID,\text{Agent},\text{ruleml2011ATijcai\_ProgramChair},\text{ruleml2011ATijcai\_responsible}),
\]

\[
% \text{send the query to personal agent}
\text{sendMsg}(XID,\text{esb},\text{Agent}, "query", \text{getTrack}(Track)),
\]

\[
% \text{receive answers multiple times}
\text{rcvMulti}(XID,\text{esb},\text{Agent}, "answer", \text{substitutions}(Track)).
\]
Access to External Data Sources
(Prova query built-ins)

- **File Input / Output**
  
  ```
  ..., fopen(File,Reader), ...
  ```

- **XML (DOM)**
  
  ```
  document(DomTree,DocumentReader) :- XML(DocumenReader),...
  ```

- **SQL**
  
  ```
  ..., sql_select(DB,cla,[pdb_id,"1alx"],[px,Domain]).
  ```

- **RDF**
  
  ```
  ..., rdf(http://...,"rdfs",Subject,"rdf_type","gene1_Gene"),...
  ```

- **XQuery**
  
  ```
  ..., XQuery = 'for $name in StatisticsURL//Author[0]/@name/text() return $name', xquery_select(XQuery,name(ExpertName)),...
  ```

- **SPARQL**
  
  ```
  ..., sparql_select(SparqlQuery,...
  ```

Reaction RuleML

- Is a branch of the RuleML family that supports actions and events
- Works as interchange language between agents, where Reaction RuleML messages are sent through the ESB
- The ESB carries RuleML queries (requests), answers (results), and rule bases to/from agents
Example Reaction RuleML Message

```
<RuleML xmlns="http://www.ruleml.org/0.91/xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.ruleml.org/0.91/xsd
http://ibis.in.tum.de/research/ReactionRuleML/0.2/rr.xsd"
xmls:ruleml2011="http://ibis.in.tum.de/projects/paw#">  
  <Message mode="outbound" directive="query-sync">  
    <oid> RuleML-2011-IJCAI </oid>  
    <protocol> esb </protocol>  
    <sender> User </sender>  
    <content>  
      <Atom>  
        <Rel> getContact </Rel>  
        <Ind> ruleml2011ATijcai_GeneralChair </Ind>  
        <Var> Contact </Var>  
      </Atom>  
    </content>  
  </Message>  
</RuleML>
```

User Clients

- Ways of issuing queries:
  - Follow a menu to create and fill HTML forms
  - Or use Attempto Controlled English
    (a rich subset of standard English designed to serve as knowledge representation language)

*Attempto Project: http://attempto.ifi.uzh.ch/site/*
Queries Defined by Organizational Agent Interfaces

- Describe public interfaces of rule functions with an XML file
- Translate interfaces descriptions to HTML forms
- Construct Reaction RuleML queries with interface descriptions and parameter values

Issue Query with Attempto Controlled English

Example:

"Who are the authors of 'Rule-based Distributed and Agent Systems'?"

```xml
<DRS domain="">
  <Question>
    <query obj="A" question="who" sentid="1" tokid="1"/>
    <relation obj1="C" rel="of" obj2="string('Rule-based Distributed and Agent Systems')" sentid="1" tokid="5"/>
    <object ref="C" noun="author" struct="countable" unit="na" numrel="geq" num="2" sentid="1" tokid="4"/>
    <predicate ref="B" verb="be" subj="A" obj="C" sentid="1" tokid="2"/>
  </DRS>
  </Question>
</DRS>
```
Example Rule Function Interface Description

```
<signature agent="SymposiumPlannerSystem">
  <meta>
    <Atom>
      <Rel iri="dc:description"/>
      <Data xsi:type="xs:string">decide whether can submit a paper</Data>
    </Atom>
  </meta>
  <qualification>
    <Atom><Rel iri="http://reaction.ruleml.org/ns/signature/Public-Signature"/></Atom>
  </qualification>
  <oid><Ind>submission</Ind></oid>
  <Expr>
    <Fun mode="+" meta="User's Contact Information">contact</Fun>
    <Var mode="+" meta="User's FirstName" default="Mark">FirstName</Var>
    <Var mode="+" meta="User's LastName" default="JBoss">LastName</Var>
    <Var mode="+" meta="User's Country" default="USA">Country</Var>
    <Var mode="+" meta="User's Email" default="markDOTjbossATgmailDOTcom">Email</Var>
    <Expr>
      <Var mode="+" type="string" meta="Paper Title" default="Rules and Automated Reasoning">Title</Var>
      <Var mode="+" type="string" meta="Paper Type" default="Full Paper" candidates="Demo Paper;Full Paper">SubmissionCategory</Var>
    </Expr>
    <Var mode="+" type="string" meta="Paper Keywords, please separate by semicolon." default="rules; reasoning">Keywords</Var>
  </Expr>
</signature>
```

Online Demo
Online Demo

- http://de.dbpedia.org/redirects/ruleml/ACE2
  ReactionRuleML/

Analysis

- SEDA decomposes the processes of Q&A in SymposiumPlanner with event-driven stages connected by explicit queues.
- SEDA maximizes throughput and exhibits higher performance and more robust behavior under load than traditional service designs.
- SymposiumPlanner can process users' queries reasonably and prevent resources from being overcommitted when demand exceeds agent processing capacity.
Conclusion

- Adapted to organize the both installments of RuleML 2011 Symposium
  - Created three OAs to bring clarity in system operations
- Access to external data sources (e.g. Semantic Web DogFood, FOAF profiles) and ontologies (responsibility assignment matrix ontology) from the rule-based agents
- Provides a more powerful user Client
  - Template-based Configurable Web Forms
  - Attempto Controlled English (translation into Reaction RuleML)

Questions?