Arbeitsgruppe CSW Corporate Semantic Web

Freie Universität Berlin

INNOPROFILE UNTERNEHMEN REGION
Die BMBF-Innovationsinitiative Neue Länder

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

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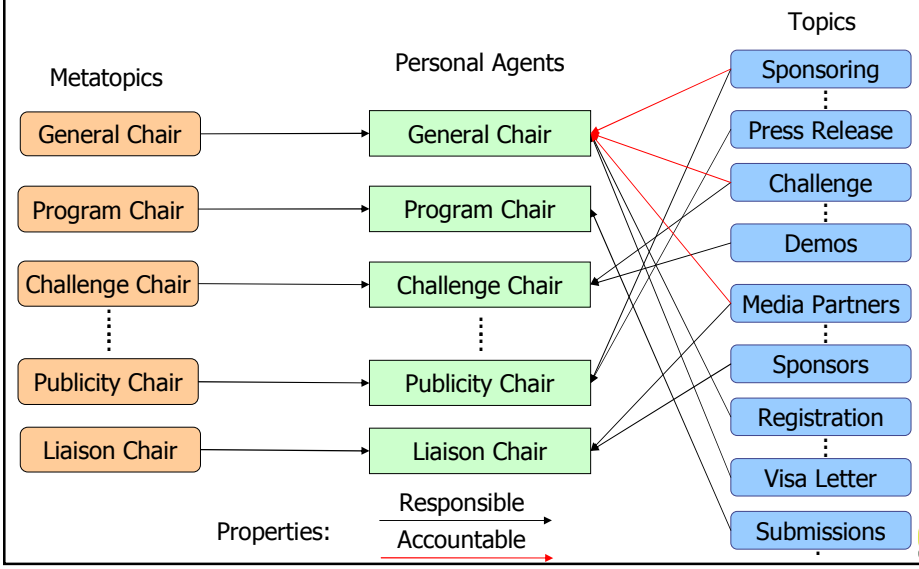
Organizational Agents

- 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

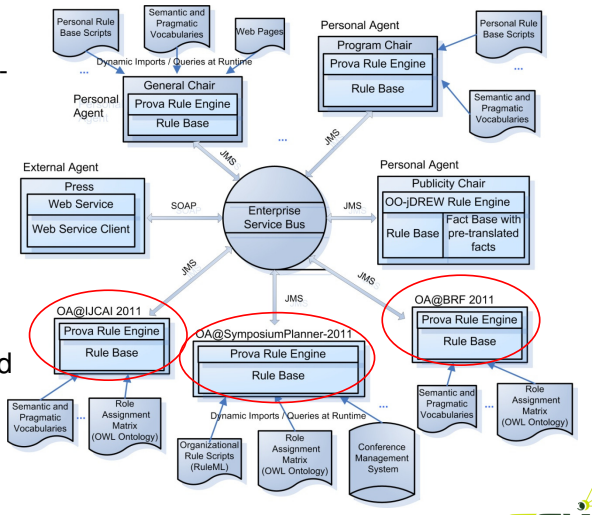
- Act in a **rule-based manner** on behalf of symposium chairs
- Work on a profile of FOAF-like **facts** and FOAF-extending **rules** that encode 'routine' knowledge of symposium chairs

Role Assignment Ontology



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,Performative,[Predicate|Args]|Context)
- Receive a message
rcvMsg(XID,Protocol,Agent,Performative,[Predicate|Args]|Context)
- Receive multiple messages
rcvMult(XID,Protocol,Agent,Performative,[Predicate|Args]|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|Args]* or Predicate(Arg_1,..,Arg_n): Message payload

Example

```
getTracks(XID,Track):-

    % look-up responsible agent (Program Chair) from RAM
    assigned(XID,Agent,ruleml2011ATijcai_ProgramChair,ruleml20
  11ATijcai_responsible),

    % send the query to personal agent
    sendMsg(XID,esb,Agent, "query", getTrack(Track)),

    % receive answers multiple times
    rcvMult(XID,esb,Agent, "answer", 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"
 xmlns:ruleml2011="http://ibis.in.tum.de/projects/paw#">
    <Message mode="outbound" directive="query-sync" >
        <oid> <Ind> RuleML-2011-IJCAI </Ind> </oid>
        <protocol> <Ind>esb</Ind> </protocol>
        <sender> <Ind>User</Ind> </sender>
        <content>
            <Atom>
                <Rel>getContact</Rel>
                <Ind> ruleml2011ATijcai_GeneralChair </Ind>
                <Var>Contact</Var>
            </Atom>
        </content>
    </Message>
</RuleML>
```

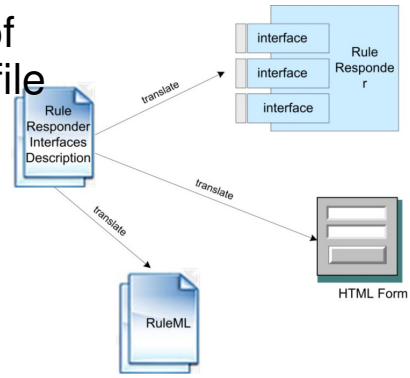
User Clients

- 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

ACE Text —(Attempto Parsing Engine (APE))→ Discourse Representation Structure **(DRS)** —(XML Parser)→ Reaction RuleML Message

Example:

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

→

```
<DRS domain="">
  <Question>
    <DRS domain="A B C">
      <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>
```

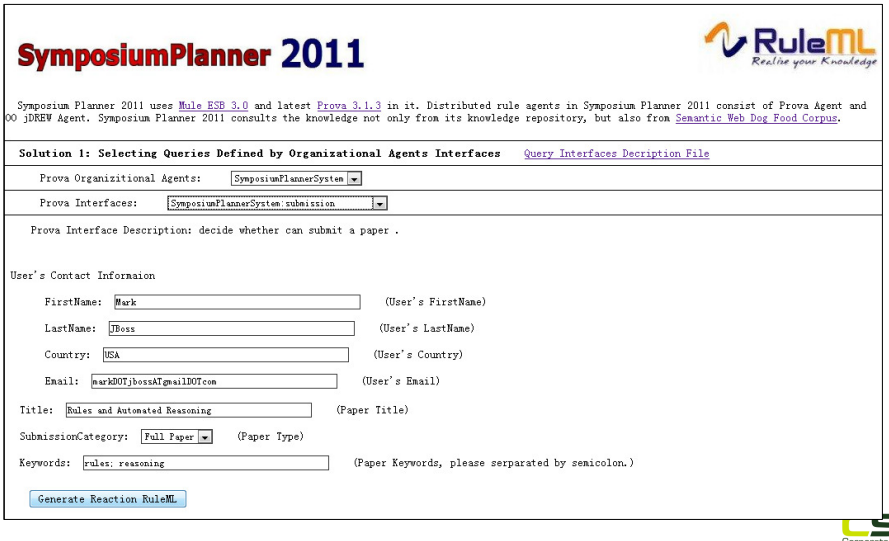
→

```
<Atom>
  <Rel>getAuthorsOfPaper</Rel>
  <Ind>'Rule-based Distributed
and Agent Systems'</Ind>
  <Var>author</Var>
</Atom>
```

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 Informaion">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" candiates="Demo Paper;Full
    Paper">SubmissionCategory</Var>
<Var mode="+" type="string" meta="Paper Keywords, please serparated by semicolon." default="rules;
    reasoning">Keywords</Var>
</signature>
```

Online Demo



Online Demo

- http://de.dbpedia.org/redirects/ruleml/ACE2ReactionRuleML/

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)

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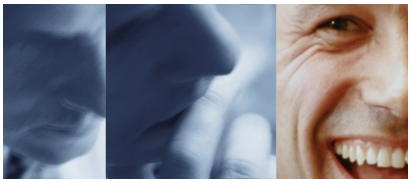

Questions?

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