Java Rules Engine
Drools & iLog

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AGENDA

> Motivation
> What is Rules Engine and BRMS?
  – (Business Rules Management Systems)
> Marketplace (Rules Engine Providers)
> JBoss Drools and iLog Side-by-Side
> Rules Engine and SOA
> Rules Engine and CEP (Complex Event Processing)
> Two Projects I implemented using Rules Engine
  – Car Leasing Loan Origination at JPMorgan Chase (Using iLog)
  – Shipment Routing at Union Pacific Railroad (CLIPS)
Techi Speak – Technical Context

• Business Rules Engine (BRE)
• Inference Engine (IE)
• Reasoning Engines (RE)
• Expert Systems (ES)
• Artificial Intelligence (AI)

• headache producing engine (HPE) 😊
What I Want To Do is:

- **Sell a rental upgrade with a ticket to** **blue man**
  - *(because I just got them at a very discounted price)*

- Forward Joe’s workflow items to a reviewer team.
  - *(Joe misunderstood the guidelines)*

- Oil tanker accident in Alaska → sell stocks of Oil companies based in Alaska

- Reroute all tomatoes shipments to New Orleans
  - *(They are partying there with tomatoes throwing contest)*

- I want these changes online tomorrow morning.
- Not again all these people, developers, QA, PM, deployment, administrators .. and ...

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**JAZOON09**

THE INTERNATIONAL CONFERENCE ON JAVA TECHNOLOGY
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**wega INFORMATIX**

**Sun Microsystems**
Solution ... S.V.P

Rules Engine

For Example
Many More ... Rule Engines

Lots of implementations: Vendors, Open Source, Research, Java, etc.

ILOG
http://www.ilog.com/
Haley Systems
http://haley.com/
Blaze Advisor
http://www.fairisaac.com/ficx/
Jess
http://www.jessrules.com/jess
PegaRules
http://www.pega.com/
Versata
http://www.versata.com/
InRule Technology
http://www.inrule.com/
BizTalk (Microsoft)
http://www.microsoft.com/biztalk
Gensym Corporation
http://www.gensym.com/
Artemis Alliance Inc.
http://www.artemisalliance.com/
NxBRE
http://nxbre.org/

Drools JBoss
http://www.jboss.org/drools
Witmate
http://witmate.com
Simple Rule Engine
http://sourceforge.net/projects/sdsre/
Idiom : Business rules engine
http://www.idiomsoftware.com
Jaxlab Rules Engine
http://www.jaxlab.com/rulesengine
QuickRules BRMS
http://www.yasutech.com/
RuleBurst
http://www.ruleburst.com/
JLisa – A Rule Engine for Java
http://jlista.sourceforge.net/
The Java Business Rules Community
http://javarules.org/
OpenRules
http://openrules.com/
Visual Rules
http://www.visual-rules.de/

OFBiz Rule Engine
Mandarax
Algernon
TyRuBa
JTP Java Theorem Prover.
JEOPS
InfoSapient
RDFExpert
Jena 2
Euler
Pellet OWL Reasoner.
Prova
SweetRules
JShop2
OpenLexicon
Hammurapi Rules
MINS Reasoner
Zilonis
JCHR
Esper
mProlog
OpenL Tablets
Jamoch
Termware
Take
**Definition: Rules Engine**

A **business rules engine** is a **software system** that helps manage business rules.

**Core Idea:** Treat business logic as business data.

The business rules may come from:

- **legal regulation**
  
  ("An employee can be fired for any reason or no reason but not for an illegal reason")

- **company policy**
  
  ("All customers that buy more than $100 at one time will receive a 10% discount")

- **other sources.**
Rules Engine Explained ...

Rule Engine provides more than an Engine to execute rules ... it stores, versions, secures, etc ... therefore ... it is a Business Rules Management System (BRMS)
BOM vs. XOM

BOM = Business Object Model
Account, customer, shipment, order, lineitem etc

XOM = Execution Object Model
It is the Runtime representation of BOM.
Java Value Object, EJB, XML Document
Account, customer, shipment, order, lineitem etc
Overview Diagram: iLog From Vendor
## Side-by-Side: JBoss Drools & IBM iLog

<table>
<thead>
<tr>
<th>Core Capabilities</th>
<th>iLog</th>
<th>Drools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algorithm</td>
<td>RETE</td>
<td>RETE</td>
</tr>
<tr>
<td>Java</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Eclipse Plug-In</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>BRMS</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Web Editor</td>
<td>Team Server</td>
<td>Guvnor</td>
</tr>
<tr>
<td>Test Server</td>
<td>Scenario Manager</td>
<td>Guvnor</td>
</tr>
<tr>
<td>Rule Templates</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Java XOM (Execution Object Model)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Custom/Business Language</td>
<td>Rule Verbalization</td>
<td>Pluggeable Dialects</td>
</tr>
</tbody>
</table>
Business Rules Format

when <conditions>
then <actions>

Examples:

<table>
<thead>
<tr>
<th>when</th>
<th>then</th>
</tr>
</thead>
<tbody>
<tr>
<td>an honest Politician</td>
<td>logically assert Hope</td>
</tr>
<tr>
<td>exists</td>
<td></td>
</tr>
<tr>
<td>Hope exists</td>
<td>print &quot;Hurrah!!! Democracy Lives&quot;</td>
</tr>
<tr>
<td>Hope does not exist</td>
<td>print &quot;Democracy is Doomed&quot;</td>
</tr>
<tr>
<td>account.balance</td>
<td>higher withdraw amount</td>
</tr>
<tr>
<td>dispense cash</td>
<td></td>
</tr>
</tbody>
</table>

Most Business Rule Engines (BRE) are based on Charles Forgy's **Rete algorithm**

**Execution Object Model (XOM)**
Web-based BRMS (Drools)
Web-based BRMS - iLog

Content

[definitions]
if
    the yearly repayment of the loan [±] is more than the yearly income of the borrower * 0.3 [±]
then
    add 'Too big Debt-To-Income ratio [±] to the messages of the loan'
    reject the loan
[else]
Rule set, Package, BOM and Rule Flow

Rule set 1  Rule set 2  
Rule Package 1

Rule set 3  Rule set 4  Rule set 5  
Rule Package 2

Rule Flow

Custome r  Order  
BOM Package 1

Custome r EJB  Order XML-Doc  
XOM Package 1

Sample Rule Flow
Advanced Features - 1

Custom, Higher Level or Business Language

> The ability to define higher level (business-specific) language

- JPMorganChase verbiage
  - The positive portfolio value under runs asset provision request

- Citibank verbiage
  - Balance request offsets secured value

- What is meant
  - Loan request > account balance
Advanced Features - 2
Rule Security

- Rule editing can be secured on statement level

Content

```
[definitions]
if
  the yearly repayment of the loan [±] is more than the yearly income of the borrower
  \[ \times 0.3 \] [±]
then
  add \[ Too big Debt-To-Income ratio [±] \] to the messages of the loan \[ \times \]
  reject the loan \[ \times \]
[else]
```

Branch Manager
- Can add a new branch

Car Loans Program Manager
- Can add/remove condition

Customer Account Manager
- Can only modify ratio value
How to Invoke iLog from Java

// (1) prepare the connection to the Rules Engine

String sessionType = IlrRuleSessionProviderFactory.SIMPLE_RULESESSION_PROVIDER;
IlrRuleSessionProvider provider = new IlrRuleSessionProviderFactory.Builder(sessionType).build();
IlrStatelessRuleSession session = provider.createStatelessRuleSession();

// (2) prepare a new request String
rulesetPath = "/miniloanruleapp/miniloanrules";

IlrSessionRequest request = new IlrSessionRequest(rulesetPath);
request.getSessionDescriptor().enableTrace();

// (3) set the ruleset parameters in the request
HashMap map = new HashMap();
map.put("loan", loan);
map.put("borrower", borrower);
request.getExecutionSettings().setParameters(map);

// (4) execute the rulesession and get the response for this request
IlrSessionResponse response = session.executeRules(request);

// (5) transfer the information from the response back to the JSF Bean
retrieve output parameter state
loan = (Loan) response.getExecutionResult().getOutputParameters().getObjectValue("loan");
Rules Engine and SOA

> Monitoring of SLAs (Service Level Agreements).
  - Compliance and Non-compliance

> Enforcement of contract terms by denying business or reward compliance by increasing work order to specific provider

> Business Process Routing.
  - Decision steps can invoke a web service and let Rules Engine make the decision. More capable than attribute-based routing.
Rules Engine and CEP

> CEP = Complex Event Processing

> Almost all vendors, I know, have a CEP Engine (IBM, TIBCO, BEA/Oracle, Jboss, Webmethods, etc.

> CEP detects the occurrence of events based on a defined event patterns by correlating events by time, existence and/or attributes

> JBoss utilizes its Drools Rules Engine to define patterns and detect them at runtime

> I know TIBCO uses a Rules Engine in CEP Engine

> One can assume/deduct that Oracle/Weblogic, IBM, etc use Rule Engine in their CEP Platforms.
Projects I implemented using Rules Engine

> Autoleasing Loan Origination at JPMorganChase
  – Using iLog

> Shipment routing Union Pacific Railroad
  – Using (CLIPS)
Car Leasing Loan Origination at JPMorgan Chase

> Business Case
- Banks don’t quote or approve loans on Saturdays. 60% of cars in US are sold on Saturdays. Car dealerships have their own programs. Solution is be used by 200 Banks and over 12000 car dealerships.
- Need a quote engine to quote on behalf of banks

> Solution
- iLog Rules Engine. 12 Rules Templates, 200 Rules Sets, EJB, Value Object
- New Rules are entered on 8PM, deployed midnight, ready for business 8AM
- Wrong quotes
  - JPMorgan Chase will pay difference. Penalty for wrong quotes
- Car Buyers are guarantied minimum 10 financing options to choose from.
Shipmenst Routing at Union Pacific Railroad

> Business Case

- ConAgra Foods
  - wants to reduce loss perishable food (fruits, fresh dairy etc)
  - wants to better supply goods to stores based on demand (Nebraska is running low on Watermelons. There lots of melons going to California)
- Union Pacific
  - wants to increase their profit and increase use of intermodal (Rail and Truck).
  - Union Pacific wants to respond better to flash floods in Arizona.

> Solution

- CLIPS Rules Engine. 8 Rules Templates, 80+ Rules Sets, Value Object, XML-Castor
- Web Frontend provided to ConAgra.
- Rules dialect to provide business language.
Want to Hear More about Rule Engines

> Google for iLog or JBoss Drools

> Download iLog and do the Quick Start thingy.

> Talk to me (Raed Haltam) …

  – raed.haltam@wega-informatik.ch
3. Enter the following URL in a browser:
http://localhost:8080/miniloan
The Miniloan application is displayed:

![Mini Loan Application Image]

4. Click Validate Loan. The results of the validation are:

   The loan is rejected
   The yearly repayment is 39597
   Messages:
   Too big Debt-To-Income ratio