

# 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)* } Sales Campaign
- Forward Joe's workflow items to a reviewer team.
  - *(Joe misunderstood the guidelines)* } Workflow
- Oil tanker accident in Alaska -> sell stocks of Oil-companies based in Alaska } Stock Trading
- Reroute all tomatoes shipments to New Orleans
  - *(They are partying there with tomatoes throwing contest)* } Supply Chain

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

# Solution ... S.V.P

## Rules Engine

For Example



Changing the rules of business

# 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.pegacom/>

## 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.idiomssoftware.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://jlisa.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

Zionis

JCHR

Esper

mProlog

OpenL Tablets

Jamoch

Termware

Take

**JAZZ00N09**

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# 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")

or

other sources.

# Rules Engine Explained ...

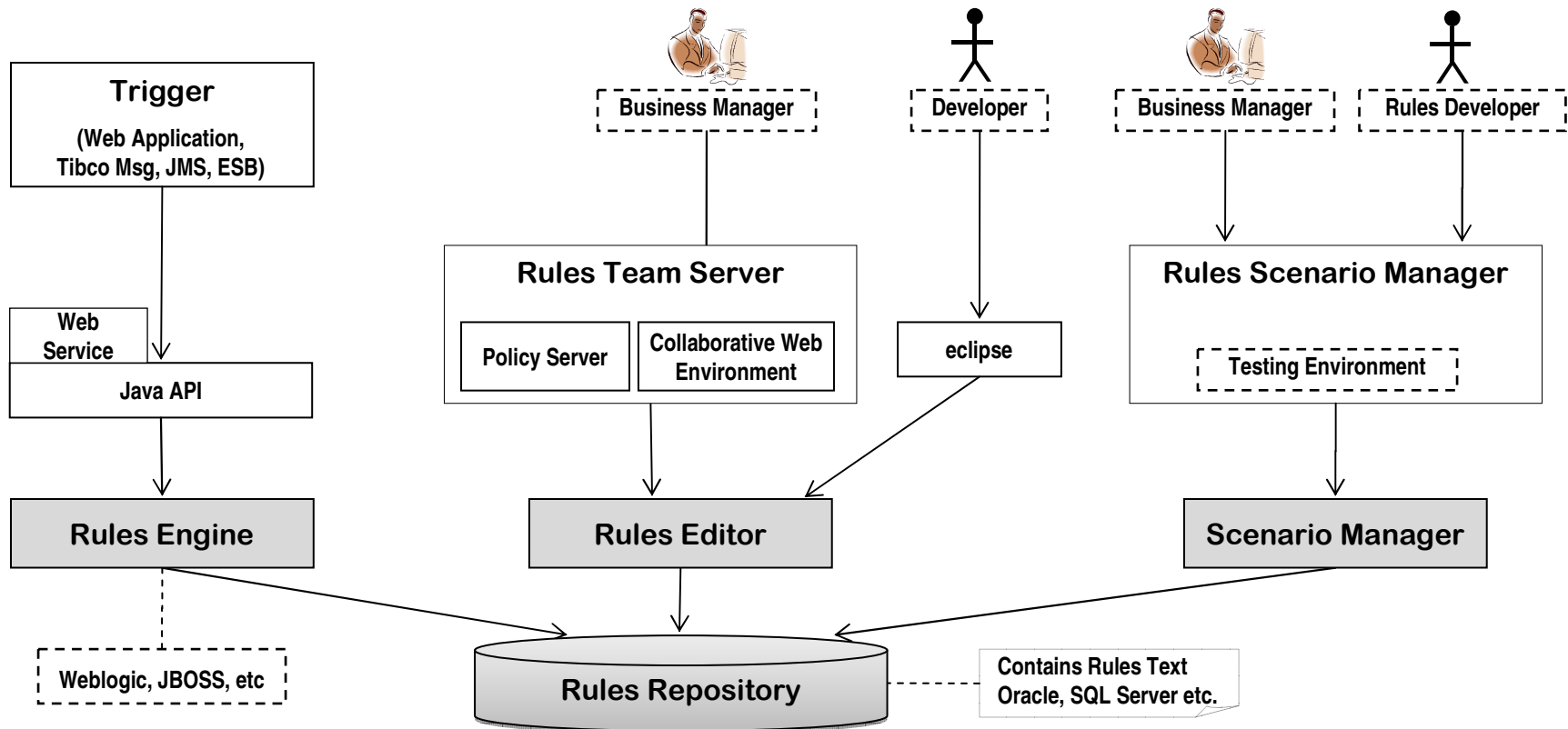
Rule Engine provides more than an Engine to execute rules

... it stores, versions, secures, etc

... therefore ... it is a Business Rules Management System (BRMS)

Business Object Model (BOM)

Execution Object Model (XOM)



## BOM vs. XOM

### **BOM = Business Object Model**

Account, customer, shipment, order, lineitem etc

### **XOM = Execution Object Model**

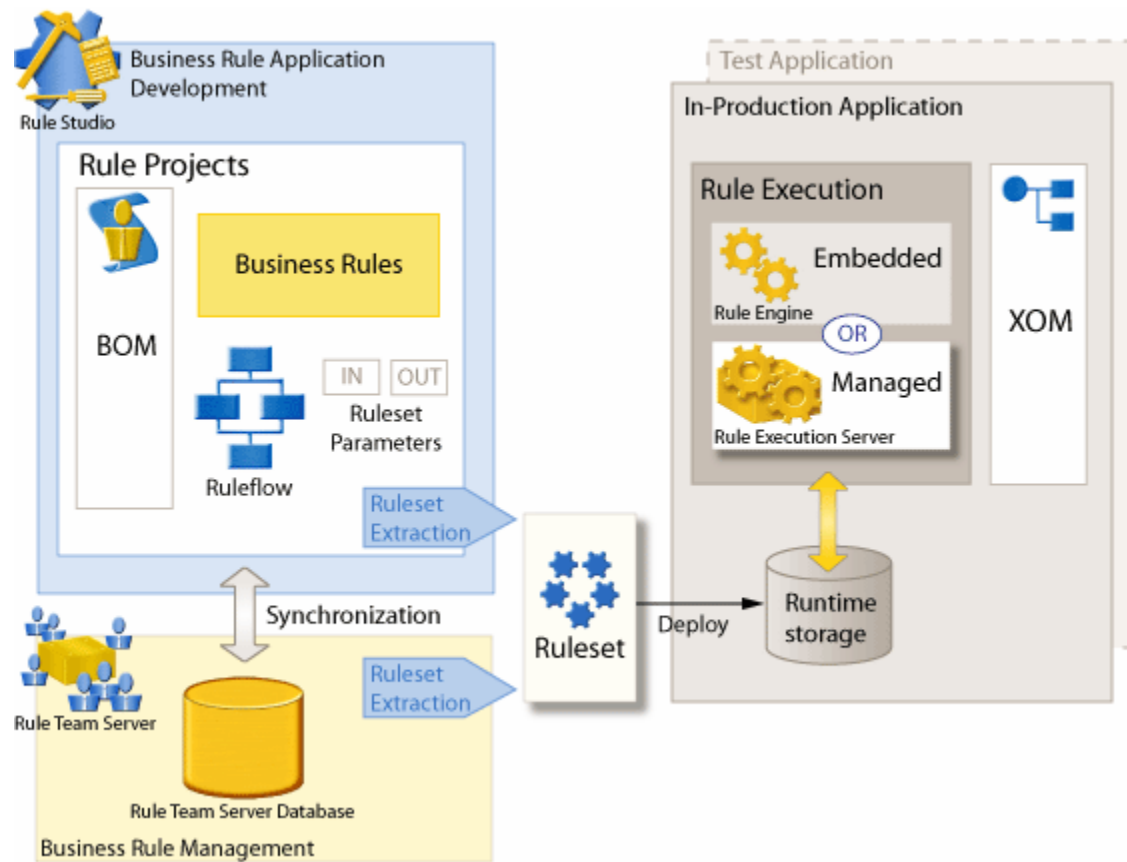
It is the Runtime representation of BOM.

Java Value Object, EJB, XML Document

Account, customer, shipment, order, lineitem etc

# Overview Diagram: iLog

**From Vendor**



# Side-by-Side: JBoss Drools & IBM iLog

Core Capabilities



	iLog	Drools
<b>Algorithm</b>	RETE	RETE
<b>Java</b>	Yes	Yes
<b>Eclipse Plug-In</b>	Yes	Yes
<b>BRMS</b>	Yes	Yes
<b>Web Editor</b>	Team Server	Guvnor
<b>Test Server</b>	Scenario Manager	Guvnor
<b>Rule Templates</b>	Yes	Yes
<b>Java XOM</b> (Execution Object Model)	Yes	Yes
<b>Custom/Business Language</b>	Rule Verbalization	Pluggable Dialects

# Business Rules Format

```

when
    <conditions>
then
    <actions>
  
```

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

Examples:	when	an honest Politician exists	when	account.balance higher	Execution Object Model (XOM)
	then	logically assert Hope		withdraw amount	
	when	Hope exists	then	dispense cash	
	then	print "Hurrah!!! Democracy Lives"			
	when	Hope does not exist			
	then	print "Democracy is Doomed"			

# Web-based BRMS (Drools)

JBoss Business Rules Management System - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://localhost:8080/drools-jbrms/org.drools.brms.JBRMS/JBRMS.jsp#Rules

**JBoss Rules**

Info Find and edit rules.

Rules Explore Rule\_2 MyDT Rule\_1

Packages

Deployment

Admin

Status: **[Draft]** Save changes Copy Archive

IF

Person

age less than or equal to 42

age greater than 21

Board [b]

There is no Board

cost greater than 1200

THEN

Set [b] cost 1200

(options)

View source Validate

<documentation>

**Rule\_1**

Categories: Finance HR/Awards/QAS

Modified on: Thu 10 May 2007 03:16:47 PM EST  
by: michael  
Note: whoops  
Version: 5  
Created on: Thu 10 May 2007 10:49:41 AM EST  
Created by: michael  
Format: brxml

Package: DemoPackage

Subject: \_\_\_\_\_

Type: \_\_\_\_\_

External link: \_\_\_\_\_

Source: \_\_\_\_\_

Version history

Done

# Web-based BRMS - iLog

New | Details | **Edit** | Delete | Copy | Lock

	Name	Status	Priority
<input checked="" type="checkbox"/>	minimum income	New	

**Content** Editor

```
[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]
```

New | Details | Edit | Delete | Copy | Lock | Unlock | History | Help

Display by 10

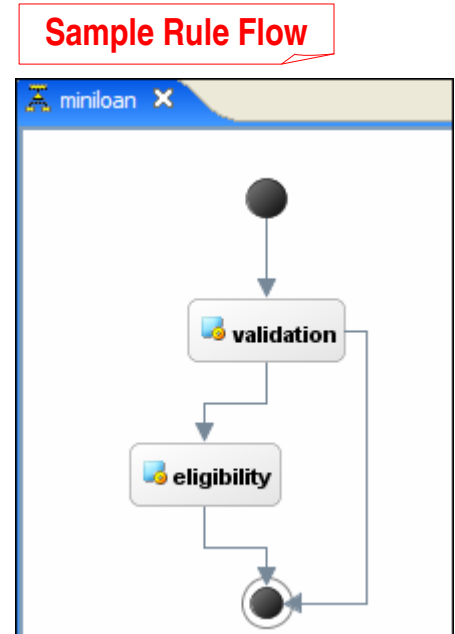
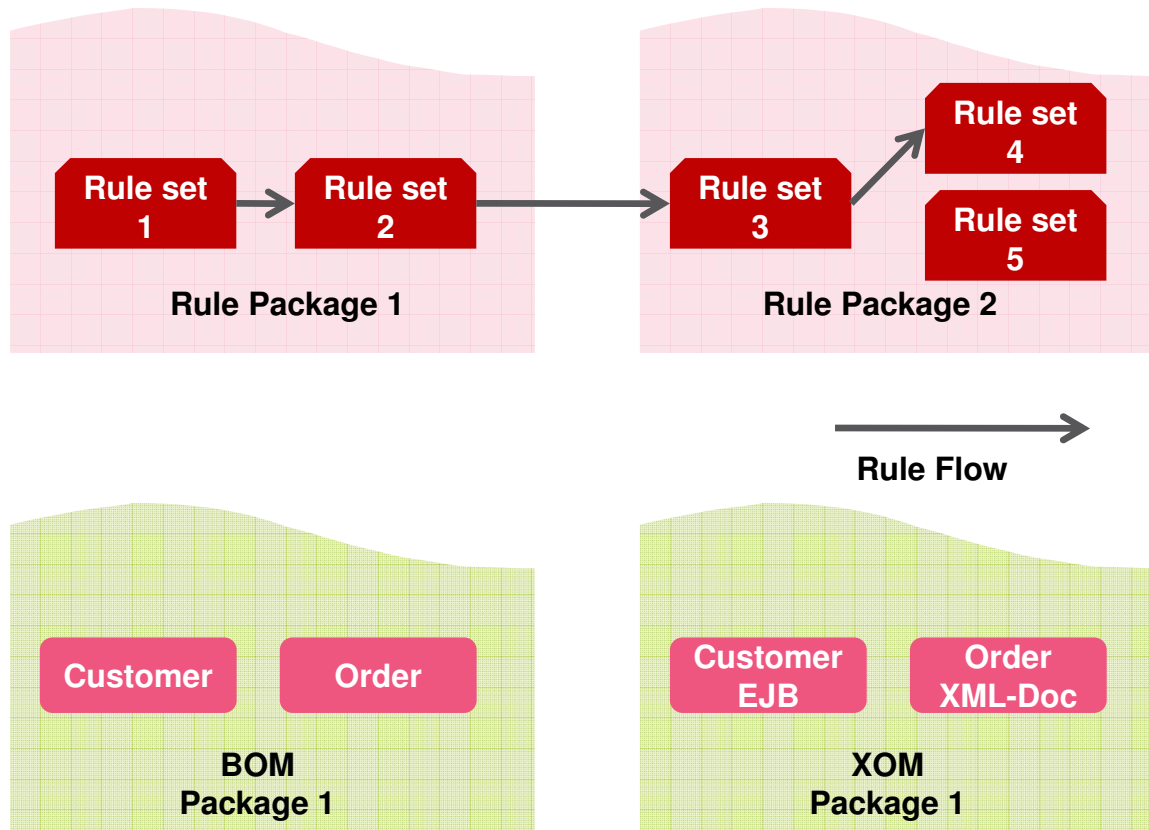
	Name	Status	Priority	Last Changed By	Last Changed On
<input checked="" type="checkbox"/>	maximum amount	New		rtsAdmin	5/29/07 10:19 AM

1 Result

**Rule Preview**

```
if
  the amount of 'the loan' is more than 1000000
then
  add "The loan cannot exceed 1,000,000" to the messages of 'the loan' ;
  reject 'the loan' ;
```

# Rule set, Package, BOM and 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 * ▾ 0.3 [±] ✘
  then
    add ▾ Too big Debt-To-Income ratio [±] to the messages of the loan ✘
    reject the loan ✘
  [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 = IlrRuleSessionFactory.SIMPLE_RULESESSION_PROVIDER;

IlrRuleSessionProvider provider = new IlrRuleSessionFactory.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");
```

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# 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 guaranteed minimum 10 financing options to choose from.

# Shipment 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](mailto:raed.haltam@wega-informatik.ch)

# Mini Loan App – iLog get started

3. Enter the following URL in a browser:  
`http://localhost:8080/miniloan`  
The Miniloan application is displayed:



The screenshot shows a web application titled "iLOG JRules Quick Start - Miniloan Application". Below the title is a tab labeled "Miniloan Validation". The main content area contains two tables: "Borrower Information" and "Loan Information".

Borrower Information		Loan Information	
Name:	Joe	Amount	500000
Yearly Income:	80000	Duration (months)	240
Credit Score:	600	Yearly Interest Rate (%)	0.05

Below the tables is a button labeled "Validate Loan".

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
```

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