Introduction to Drools

Seattle Code Camp V3.0
January 26-27, 2008
Redmond, WA

Presenter: Kelvin Meeks
International Technology Ventures, Inc.

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

A short bio…

- Founder of Bellevue, WA based International Technology Ventures, Inc. (since 2001)

- Currently consulting to a State level government agency to lead their SOA and Enterprise Service Bus initiative.

- Previous distributed enterprise application consulting experience includes engagements with Citibank Australia, Bank of Tokyo, Legal & General, Merrill Lynch, Safeco, United Airlines, AT&T, American Honda Motor Company, and clients in Argentina, Canada, Bermuda, Malaysia, Lebanon, Pakistan, Turkey, the Caribbean, Mexico, Germany, Poland, Thailand, and England.

- Previously:
  - Director of Professional Services, Haydrian, Inc.
  - CTO, Assessments.com
  - Development Manager, Mercata, Inc.
  - Manager, AT&T Solutions Systems Integration Division
  - Integration Architect, ALLTEL

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Forrester
Trends: Business Rules Platforms 2008

http://www.forrester.com/Research/Document/Excerpt/0,7211,44374,00.html

- “Three key trends are driving the market for business rules platforms. “
  - “First, vendors are bearing down on ***"authoring" tools and processes that allow businesspeople to directly create and maintain business rules***. “
  - “Second, the independent vendors are **adding *prebuilt rules applications*** to drive growth and distinguish themselves from IBM, Microsoft, Oracle, SAP, and other platform vendors that now offer business rules. “
  - “Third, a new wave of ***market consolidation*** is beginning as major platform suppliers make their bets on this crucial technology.”
- “For application development professionals, these trends will yield better tools for collaboration with businesspeople and a wider range of choices from a stronger roster of vendors. “

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools Success Stories

http://blog.athico.com/search?q=success+stories

- "We are using Drools VERY successfuly around 3 years (We started with version 2.x). And it has being so usefull that now we have a very big system running on ***more than one customer in telecom market.***
- Currently we do have a server running around 300 rules, where we assert millions of facts at once. The objective is to guide and rate telecom usage events. We are able to apply those ***300 rules over 20 Milion facts*** and get results (Guided and Rated) around 1 hour(Note: First we have to read many binary files, perform a charset conversion on data, load it in our object model, assert objects in working memory, apply around 200 rules to enrich the data, assert again in a new working memory, and rate the events accessing external RDBMS databases - caching results of course)."
- "We tested several deployment and architecture variants (esp. for batch processing), with <100 Rules and <10 facts for each data-row within our batches, but a few million rows. Worked out fine."
- "We deployed a Drools based solution to a client in the pharmaceutical distribution world (Fortune 100 company :-). We used Drools to power the decisions an interactive voice ordering system. A small number of rules initially but growing constantly based on user metrics. System has been running for a couple of years now.“
- Cisco: Active Network Abstract project
  - http://labs.jboss.com/blog/cisco_ana_uses__drools

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Primary sources for this presentation

- http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

- Authors:
  - **Mark Proctor**
  - **Michael Neale**
  - **Michael Frandsen**
  - **Sam Griffith Jr.**
  - **Edson Tirelli**
  - **Fernando Meyer**
  - **Kris Verlaenen**

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Rule Engines – Example Uses

- Account Management/Personalization
- Behavior Scoring
- Product/Service Recommendation
- Underwriting (Lending/Insurance)
- Diagnostic Analysis
- Technical Support Problem Resolution
- Business Process/Workflow
- Data Validation/Formatting
- Regulatory Compliance
- E-commerce Order Processing
- Call Center/CRM
- Fraud Detection
- Benefits Analysis
- Manufacturing Process
- Claims Processing

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools: What is it?

- **Drools** is a forward chaining inference based rule engine, more correctly known as a production rule system, using an enhanced implementation of the Rete algorithm.
- Source: http://en.wikipedia.org/wiki/Drools
- Rete: latin for "net" meaning network.

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

A Short History

- 2001: Started by **Bob McWhirter**
  - (Drool 1.0 never released)
- **Mark Proctor** became the project lead during the 2.0 development cycle (at Codehaus) and moved the project to a final 2.0 release
- 2005:
  - Drools federated into JBoss Enterprise Middleware System (JEMS)
- 2006:
  - JBoss acquired by Red Hat
- 2007:
  - JBoss Rules 4.0 is a rewrite with a full and enhanced Rete implementation with GUI tooling.
- 2008:
  - Drools-4.0.4, released Jan. 15th, 2008
  - Drools 5.0 anticipated end of Q1

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools 5.0

- End of Q1 2008 (?)
  - source: http://blog.athico.com/2008/01/debugging-processes-in-jboss-drools-50.html
- Per Mark Proctor, via IRC exchange…
  - "…graphical debug tool for Drools processes"
  - "unified rules, processes and cep"
  - "processes and cep as first class citizens"
  - "Perf"
  - "BRMS will have integrated QA testing"
- See Mark Proctor's Javapolis presentation
  - http://blog.athico.com/2007/12/drools-solver-javapolis-2007-slides.html

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Licenses, Licenses, Licenses…

JBoss Rules	Apache License v.2.0
JBoss Portal Forums	GNU General Public License v.2
JBoss Transactions JTS	GNU General Public License v.2
JBoss Cache	Sleepycat License
BPEL extension for JBoss jBPM	Common Public License v.1
Everything else…?	GNU Lesser General Public License v. 2.1

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools 4.0 Features

- Language Expressiveness Enhancements
  - New Conditional Elements: from, collect, accumulate and forall
  - New Field Constraint operators: not matches, not contains, in, not in, memberOf, not memberOf
  - New Implicit Self Reference field: this
  - Full support for Conditional Elements nesting, for First Order Logic completeness.
  - Support for multi-restrictions and constraint connectives && and ||
  - Parser improvements to remove previous language limitations, like character escaping and keyword conflicts
  - Support for pluggable dialects and full support for MVEL scripting language
  - Complete rewrite of DSL engine, allowing for full l10n
  - Fact attributes auto-vivification for return value restrictions and inline-eval constraints
  - Support for nested accessors, property navigation and simplified collection, arrays and maps syntax
  - Improved support for XML rules

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools 4.0 Features

- Core Engine Enhancements
  - Native support for primitive types, avoiding constant autoboxing
  - Support for transparent optional Shadow Facts
  - Rete Network performance improvements for complex rules
  - Support for Rule-Flows
  - Support for Stateful and Stateless working memories (rule engine sessions)
  - Support for Asynchronous Working Memory actions
  - Rules Engine Agent for hot deployment and BRMS integration
  - Dynamic salience for rules conflict resolution
  - Support for Parameterized Queries
  - Support for halt command
  - Support for sequential execution mode
  - Support for pluggable global variable resolver

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools 4.0 Features

- IDE Enhancements
  - Support for rule break-points on debugging
  - WYSIWYG support for rule-flows
  - New guided editor for rules authoring
  - Upgrade to support all new engine features

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools 4.0 Features

- Business Rules Management System - BRMS
  - New BRMS tool
  - User friendly web interface with nice WEB 2.0 ajax features
  - Package configuration
  - Rule Authoring easy to edit rules both with guided editor (drop-down menus) and text editor
  - Package compilation and deployment
  - Easy deployment with Rule Agent
  - Easy to organize with categories and search assets
  - Versioning enabled, you can easily replace yours assets with previously saved
  - JCR compliant rule assets repository

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

The Rule Engine

“Dubito ergo cogito; cogito ergo sum.
(I doubt, therefore I think; I think therefore I am)”
- Rene Descartes

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Naïve Algorithms…

source: http://en.wikipedia.org/wiki/Rete_algorithm

- Each rule is checked against the known facts in a Knowledge Base…firing that rule if necessary…
- Then moving on to the next rule…
- Then looping back to the first rule when finished…
- Very slow.

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

RETE Algorithm

source: http://en.wikipedia.org/wiki/Rete_algorithm

- Pronounced ‘REET’, ‘REE-tee’, or in Europe, ‘re-tay’
- Invented by Dr. Charles Forgy (1974-79) of Carnegie Mellon University.
  - http://citeseer.ist.psu.edu/context/505087/0
- A Production Rule System's Inference Engine is stateful and able to enforce truthfulness - called Truth Maintence
- Builds a network of nodes
  - Each node is a pattern occurring on the left-hand-side (LHS)
  - Each node has a memory of facts which satisfy that pattern
- New facts propagate along the network
  - – nodes are annotated when the fact matches a pattern
    - When a fact (or combination of facts) causes all the patterns for a given rule to be satisfied
      - A leaf node is reached, and the corresponding rule is triggered.

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Characteristics

source: http://en.wikipedia.org/wiki/Rete_algorithm

- Reduces or eliminates certain types of redundancy through node sharing;
- Stores partial matches when performing joins between different fact types;
  - (helps avoid complete re-evaluation)
  - System need only evaluate deltas to working memory
- Allows for efficient removal of memory elements when facts are retracted from working memory.

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Performance Characteristics

source: http://en.wikipedia.org/wiki/Rete_algorithm

- Sacrifices memory for speed
- Speed can be several orders of magnitude over naïve implementations
- Very large complex systems tend to run into memory consumption problems

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

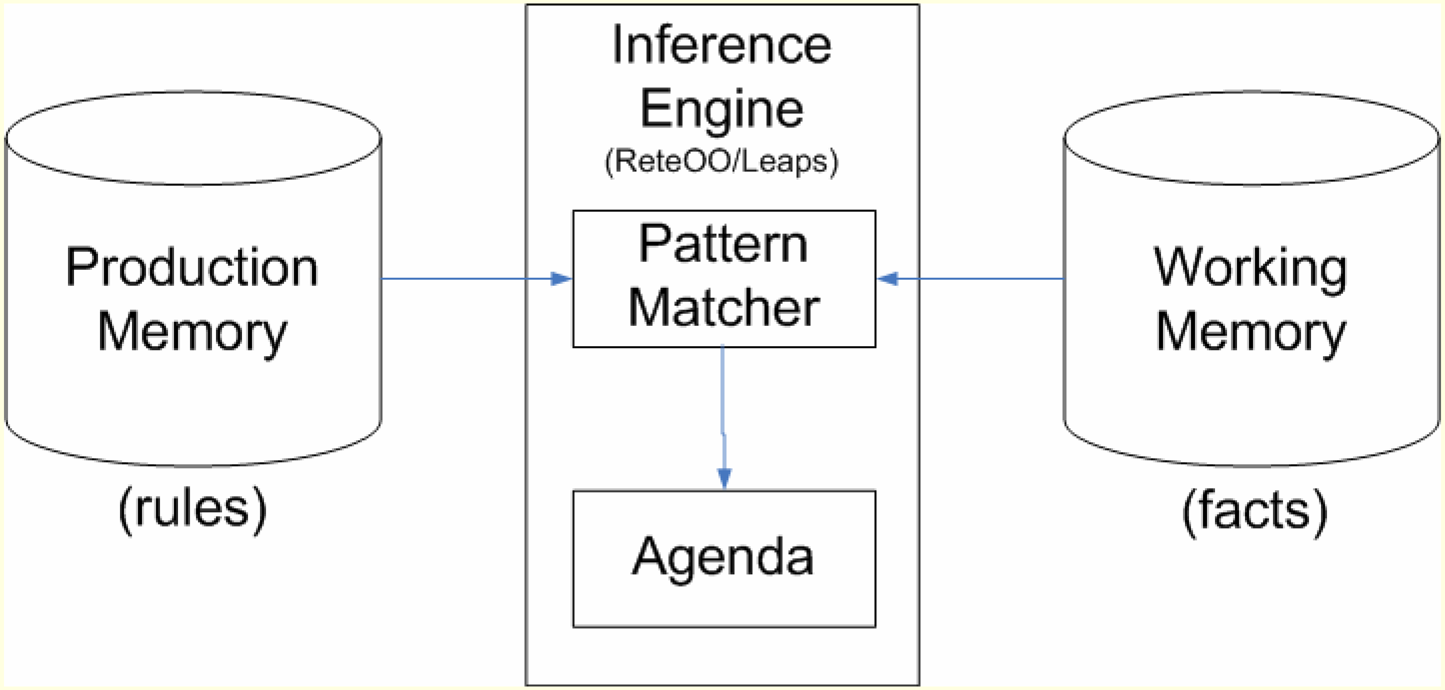
Node Processing

- Rete Nodes
  - root
  - 1-input
  - 2-input
  - Terminal

- Match-Resolve-Act cycle

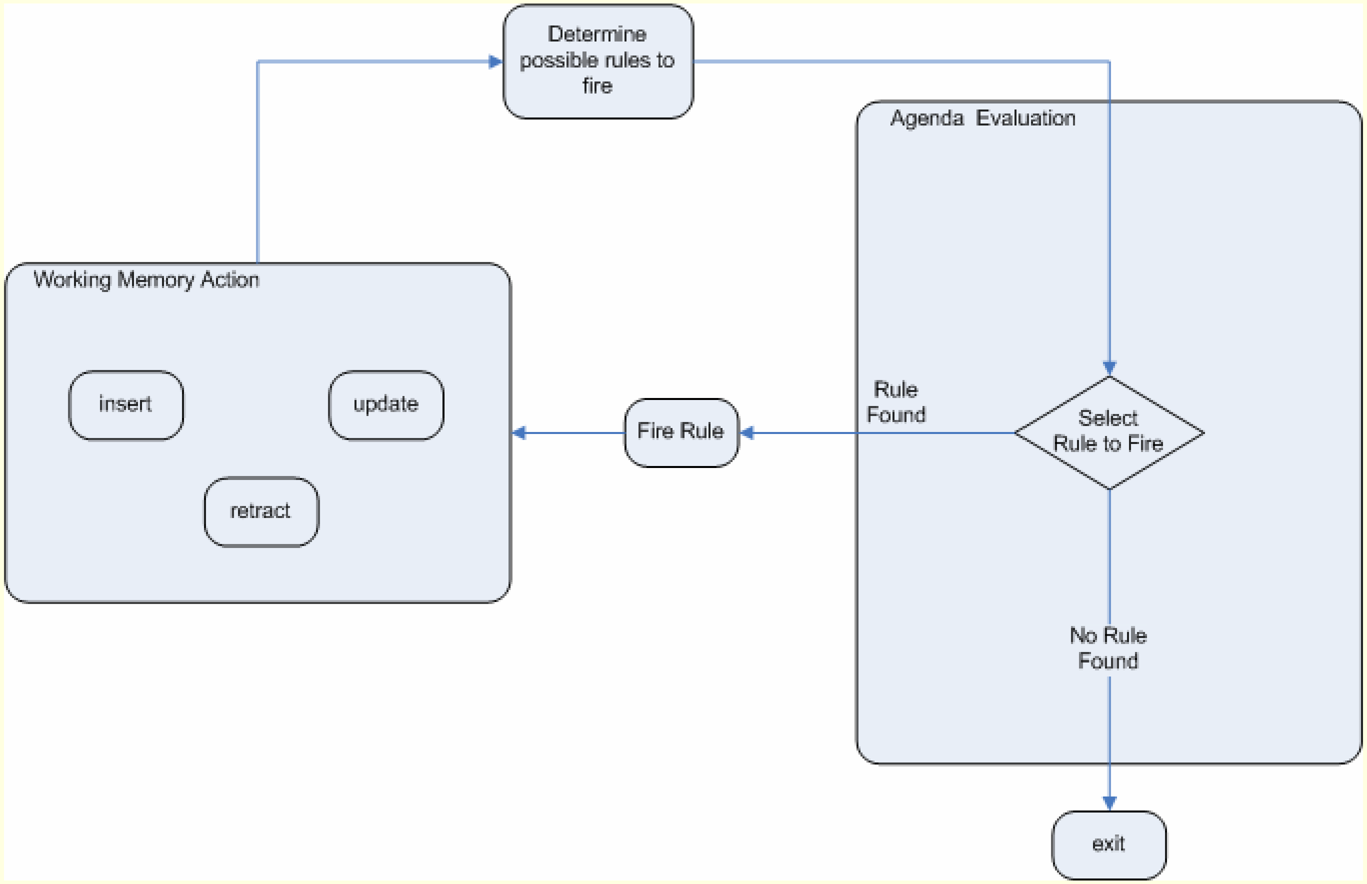
sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Basic Rete Network



sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Two-Phase Processing



sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Production Rule

- A Production Rule is a two-part structure using First Order Logic for knowledge representation.
  - when
    - <conditions>   (aka LHS)
  - then
    - <actions>   (aka RHS)

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Pattern Matching

- Matching new or existing facts against Production Rules is called Pattern Matching (performed by the Inference Engine)
- A number of algorithms are used for Pattern Matching by Inference Engines:
  - Linear
  - **Rete**
    - **Drools ReteOO**
  - Treat
  - Leaps
    - (use to be supported [in Drools?] but was removed due to poor maintenance)

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Production Rule Systems

- Methods of execution:
  - Forward Chaining
    - “Data-driven”
  - Backward Chaining
    - “Goal-driven”

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

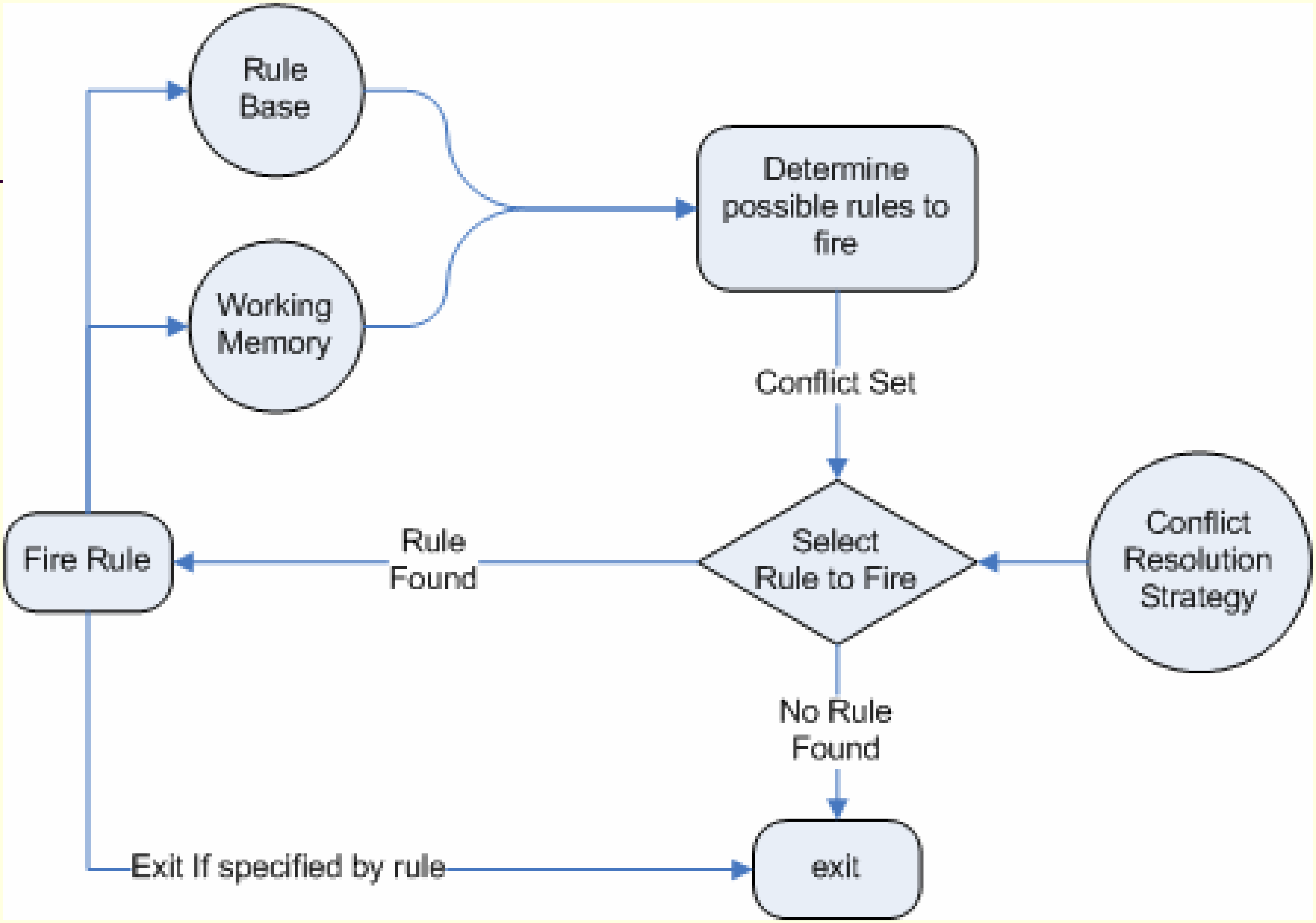
Forward Chaining

- Facts are asserted into the working memory which results in one or more rules being concurrently true and scheduled for execution by the Agenda

- Starts with a fact, it propagates, and we end in a conclusion.

- Drools 4.0 is a Forward Chaining engine…
  - Next major release to include Backward Chaining support (?)

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

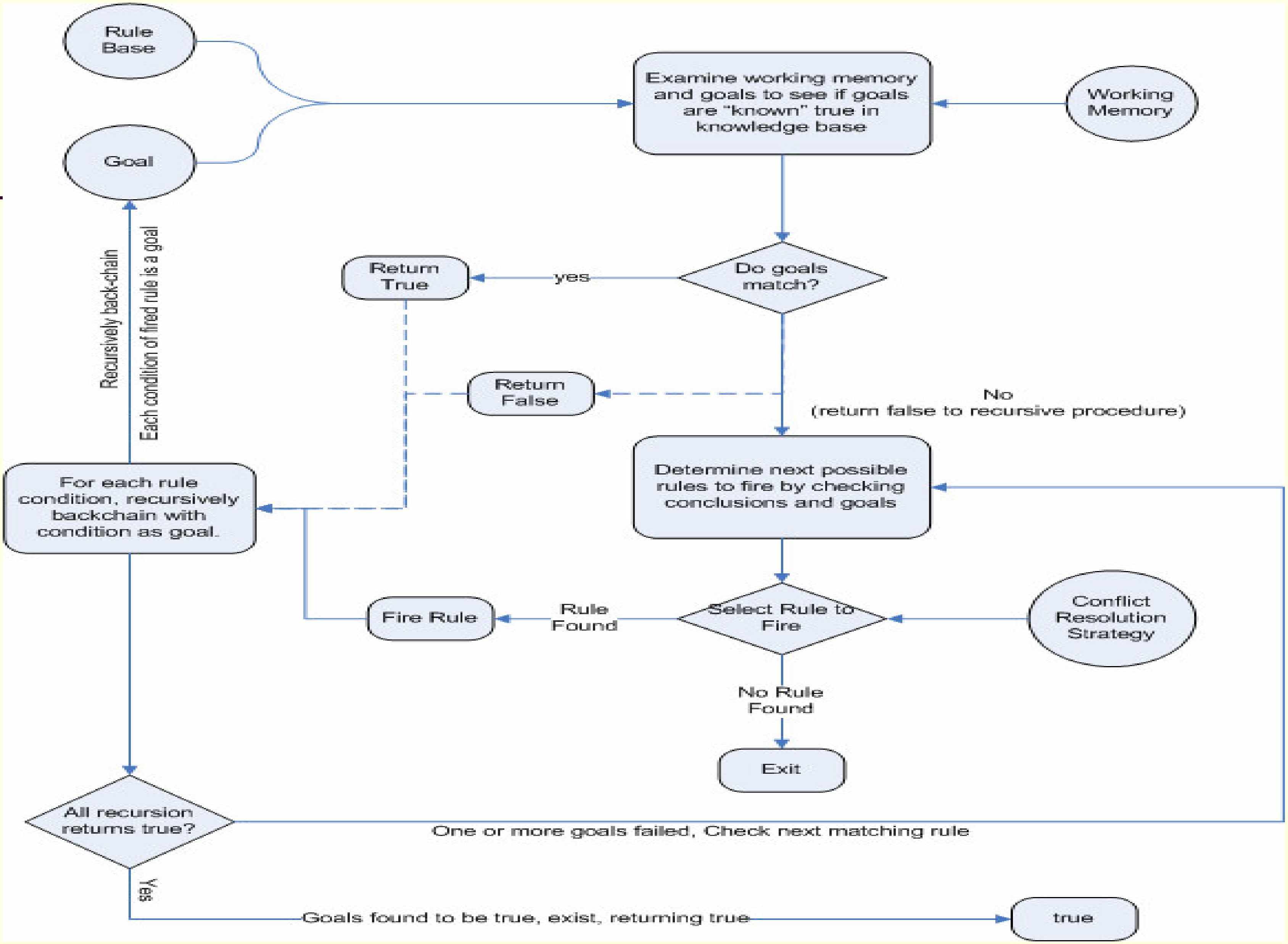


sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Backward Chaining

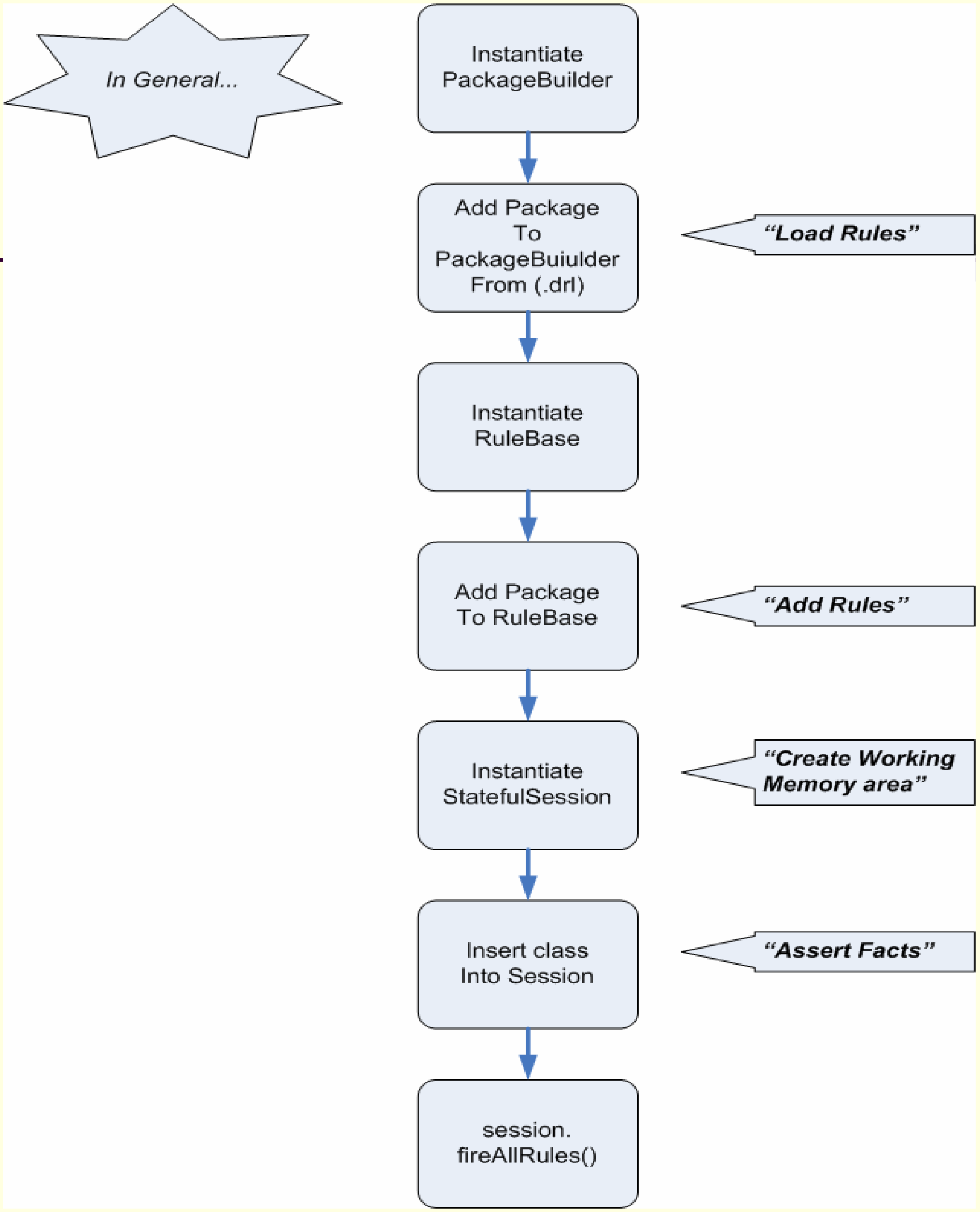
- Starts with a conclusion which the engine tries to satisfy.
- If it can't it then searches for conclusions that it can, known as 'sub goals', that will help satisfy some unknown part of the current goal
- Continues this process until either the initial conclusion is proven or there are no more sub goals.
- (e.g. Prolog)

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html


Rule Base
Goal
Examine working memory and goals to see if goals are "known" true in knowledge base
Working Memory
Recursively back-chain
Each condition of fired rule is a goal
Return True
yes
Do goals match?
Return False
No (return false to recursive procedure)
For each rule condition, recursively backchain with condition as goal.
Determine next possible rules to fire by checking conclusions and goals
Fire Rule
Rule Found
Select Rule to Fire
Conflict Resolution Strategy
No Rule Found
Exit
All recursion returns true?
One or more goals failed, Check next matching rule
Yes
Goals found to be true, exist, returning true
true

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

General Flow…


In General…
Instantiate PackageBuilder
Add Package To PackageBuiulder From (.drl)
"Load Rules"
Instantiate RuleBase
Add Package To RuleBase
"Add Rules"
Instantiate StatefulSession
"Create Working Memory area"
Insert class Into Session
"Assert Facts"
session. fireAllRules()

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Installation

“There's a way to do it better - find it.”
- Thomas A. Edison

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Downloads

- Maven (for building Drools from source)
  - http://maven.apache.org/

- Drools
  - http://labs.jboss.com/drools/downloads.html
  - Drools Source
  - Drools Binary
  - Drools BRMS
  - Drools Eclipse Workbench
  - Drools Examples

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Eclipse Plugin Installation

- Update Site (Eclipse 3.3)
  - http://downloads.jboss.com/drools/updatesite3.3/
- Requires
  - Eclipse 3.2 or greater,
  - Eclipse GEF 3.2 or greater
    - http://europa-mirror1.eclipse.org/tools/gef/update-site/releases/

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Primary Drools Jars

- drools-core.jar
- drools-compiler.jar
- drools-jsr94.jar
- drools-decisiontables.jar

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

JBRMS JSF Dependencies

source: http://wiki.jboss.org/wiki/Wiki.jsp?page=JBRMSjsfdependencies

- **Installing BRMS in Tomcat 6.0.x**
  - 1. Tomcat now includes his own el-api.jar, remove this jar from brms WEB-INF/lib (in the war)
  - 2. Follow the instructions below installing the jsf jar on your apache-tomcat-6.0.X/lib directory
- **Installing JavaServer Faces Technology in the Application Server (Jetty, Tomcat)**
  - 1. Download the Application Server.
  - 2. Follow the installation instructions provided with the Application Server.
  - 3. Download the JavaServer? Faces Technology implementation JAR files from **http://download.jboss.org/drools/dependencies/jboss_jsf_libs.zip**
  - 4. Archive or remove (if it exists) the the old JavaServer? Faces Technology release JAR files located in the lib directory of your Application Server installation. These JAR files are jsf-api.jar and jsf-impl.jar.
  - 5. Unzip the jboss_jsf_libs file and copy the all the files from the lib directory of your lib directory of your Application Server installation. If you have paths to these files already set in your environment, make sure to update the paths to point to the new JAR files in the lib directory of the Application Server installation.
- (I have successfully installed JBRMS on Glassfish V2)

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Decision Tables

“If you would be a real seeker after truth, it is necessary that at least once in your life you doubt, as far as possible, all things.”

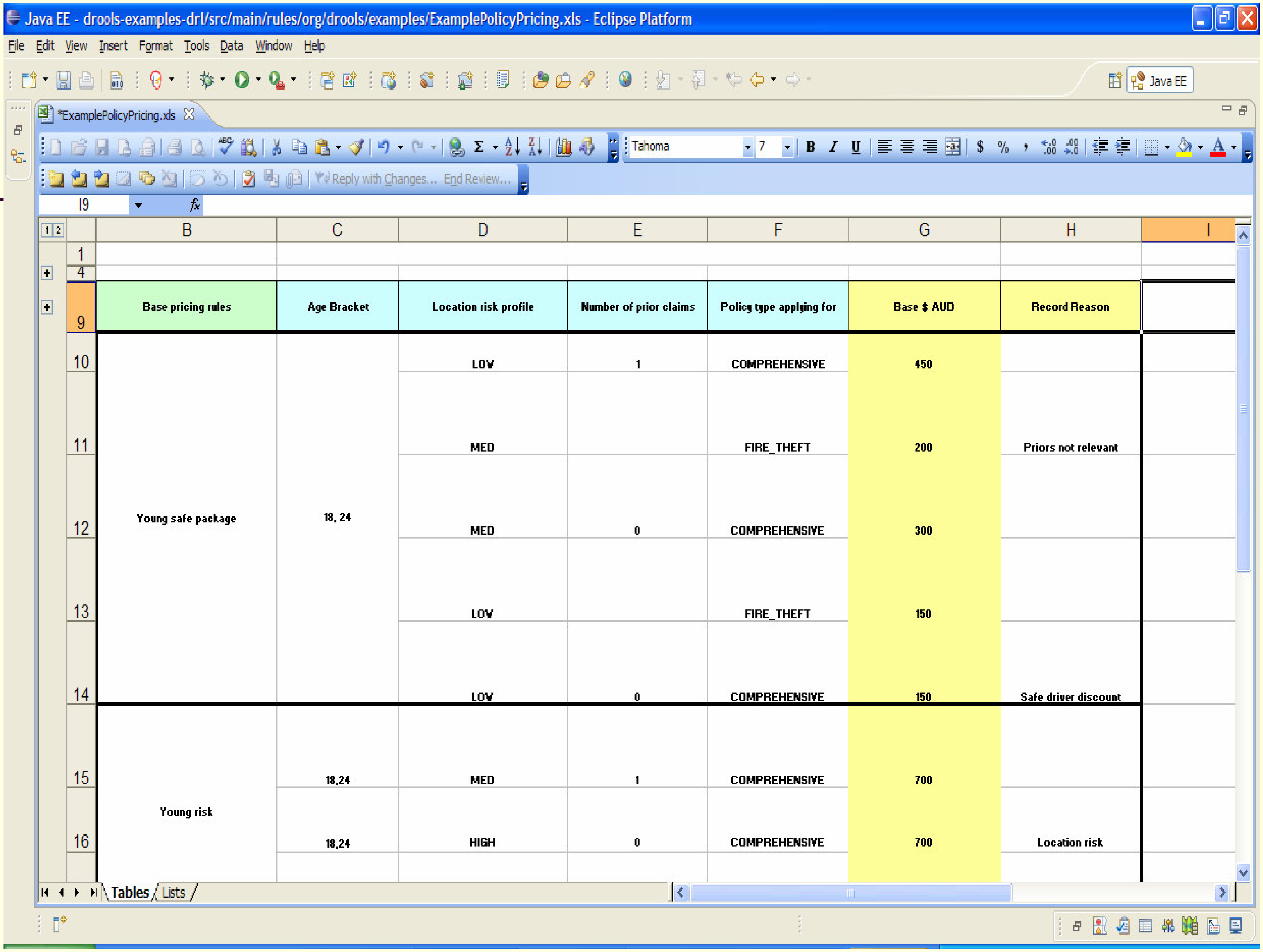
- Rene Descartes

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Spreadsheet-based Rules (optional)

- Decision tables are a way of representing conditional logic in a concise way.
- Supports managing rules in a Spreadsheet format (Excel, OpenOffice, Calc, and CSV)
- Expressed as rule templates + data ➔ Generated Rule
- Each Row results in a Rule
- Each Column may be a Condition, or Action.

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html



Java EE - drools-examples-drl/src/main/rules/org/drools/examples/ExamplePolicyPricing.xls - Eclipse Platform
File
Edit
View
Insert
Format
Tools
Data
Window
Help
Java EE
*ExamplePolicyPricing.xls
Tahoma
7
Reply with Changes...
End Review...
I9
Tables
Lists

	B	C	D	E	F	G	H
1							
4							
9	Base pricing rules	Age Bracket	Location risk profile	Number of prior claims	Policy type applying for	Base $ AUD	Record Reason
10	Young safe package	18, 24	LOW	1	COMPREHENSIVE	450	
11			MED		FIRE_THEFT	200	Priors not relevant
12			MED	0	COMPREHENSIVE	300	
13			LOW		FIRE_THEFT	150	
14			LOW	0	COMPREHENSIVE	150	Safe driver discount
15	Young risk	18,24	MED	1	COMPREHENSIVE	700	
16		18,24	HIGH	0	COMPREHENSIVE	700	Location risk

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

The Rule IDE (Eclipse Plugin)

Discontent is the first necessity of progress.

- Thomas A. Edison

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Workbench Features

- Textual/graphical rule editor
- RuleFlow graphical editor
- Guided editor (rule GUI)
- Wizards…
  - Help you quickly create a new "rules" project
  - Create a new rule resource
  - Create a new Domain Specific language
  - Create a new decision table, guided editor, ruleflow
- A domain specific language editor
- Rule validation

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Views

- Working Memory View
- Agenda View
- Global Data View
- Audit View
- Rete View

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

The Rule Language

“Logic: The art of thinking and reasoning in strict accordance with the limitations and incapacities of the human misunderstanding.”

- Ambrose Bierce

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Writing Rules

- Rules are written using First Order Logic, or predicate logic, which extends Propositional Logic.

- “DRL.g” is the Antlr3 grammar for the rule language

- Rule File
  - **package** *package-name*
  - *imports*
  - *globals*
  - *functions*
  - *queries*
  - *rules*

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Rule Format

- rule “<name>”
  - <attribute> <value>
    - when
      - <LHS>
    - then
      - <RHS>
- end

- (Quotes on Rule names are optional if the rule name has no spaces)

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Reserved Words

- rule
- query
- when
- then
- end
- Null
- and
- or
- not
- exists
- collect
- accumulate
- from
- forall
- true
- false
- eval

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Reserved Words (*)

(* see documentation)

- package
- function
- global
- import
- template
- attributes
- enabled
- salience
- duration
- init
- Action
- reverse
- result
- contains
- excludes
- memberOf
- matches
- in
- date-effective
- date-expires
- no-loop
- auto-focus
- activation-group
- agenda-group
- dialect
- rule-flow-group

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Comments

- rule "Testing Comments"
- when
  - # this is a single line comment
  - // this is also a single line comment
  - eval(true) # this is a comment in the same line
- then
  - // this is a comment inside a semantic code block
  - # this is another comment in a code block
  - /* this is a multi-line comment in the left hand side of a rule */
- end

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

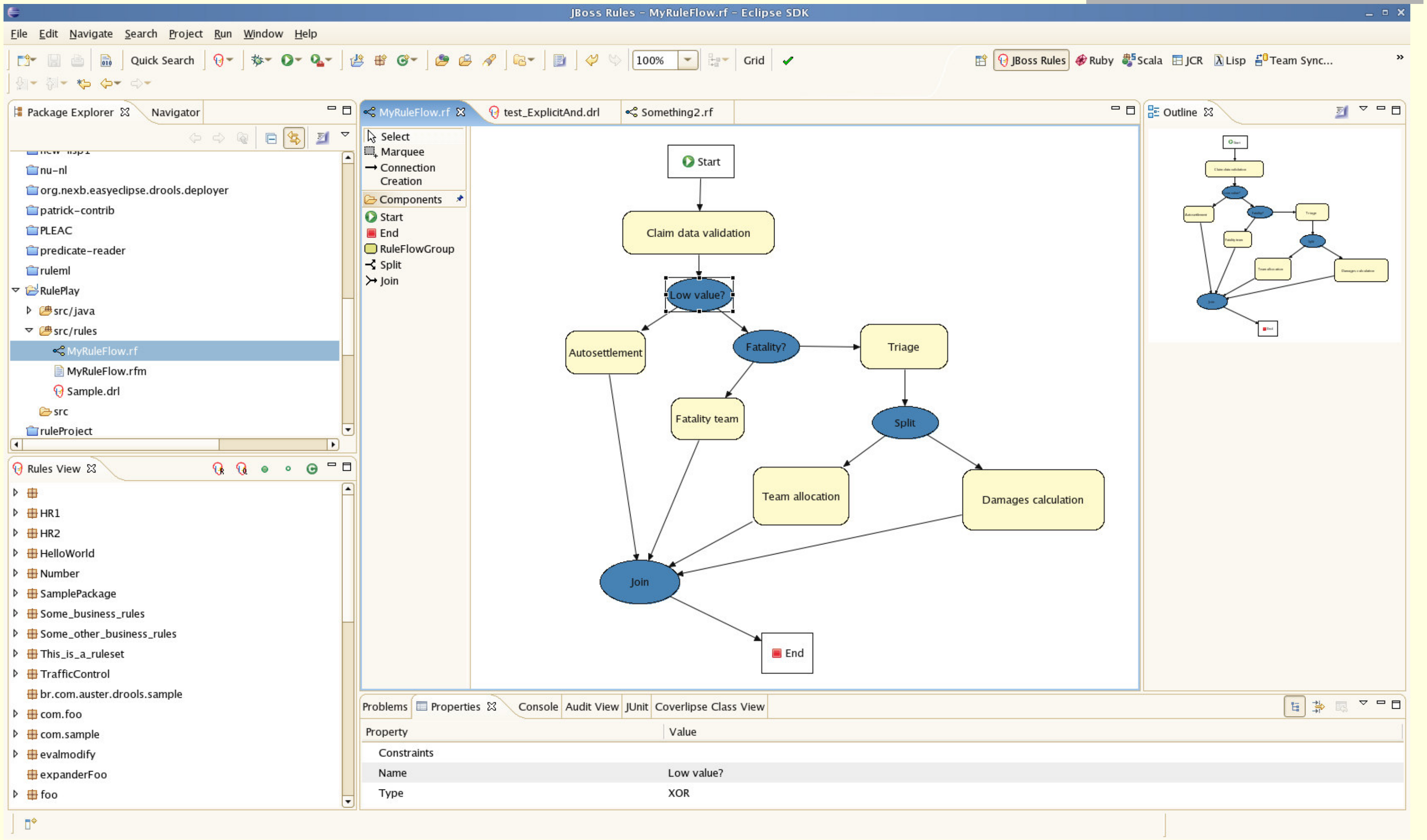
Doman Specific Languages

- Example Mapping:
- [when]This is {something}=Something(something=={something})

- Rename the extension of your rules file from ".drl" to ".dslr" when using DSLs

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Rule Flow



Property	Value
Constraints	
Name	Low value?
Type	XOR

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Deployment

"Being busy does not always mean real work. The object of all work is production or accomplishment and to either of these ends there must be forethought, system, planning, intelligence, and honest purpose, as well as perspiration. Seeming to do is not doing."

- Thomas A. Edison

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

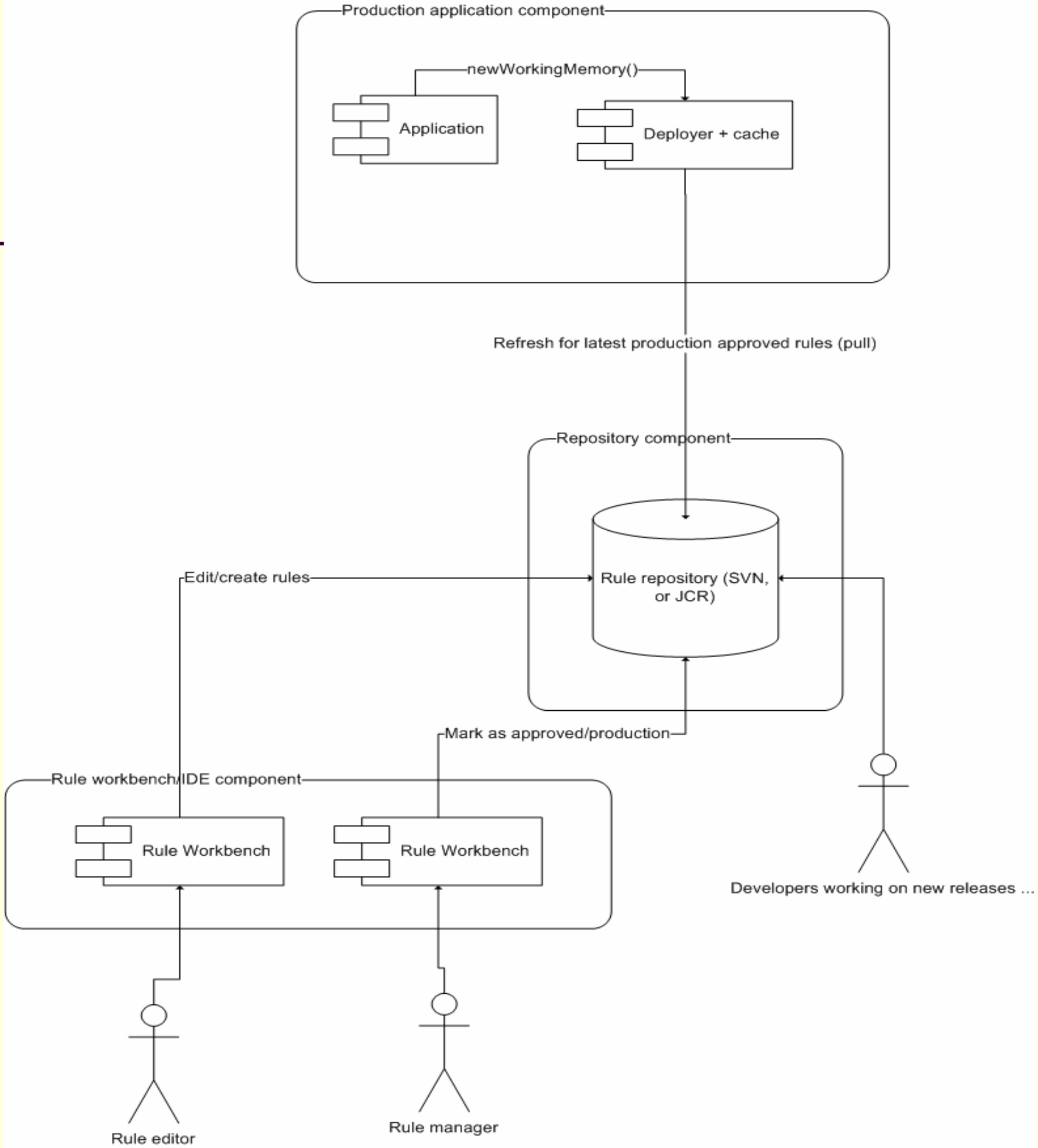
Deploying Rules

- The recommended way of deploying depends on how you are managing your rules.

- Create serialized "Package" objects of your rules.
  - BRMS (using RuleAgent)
  - drools-ant task

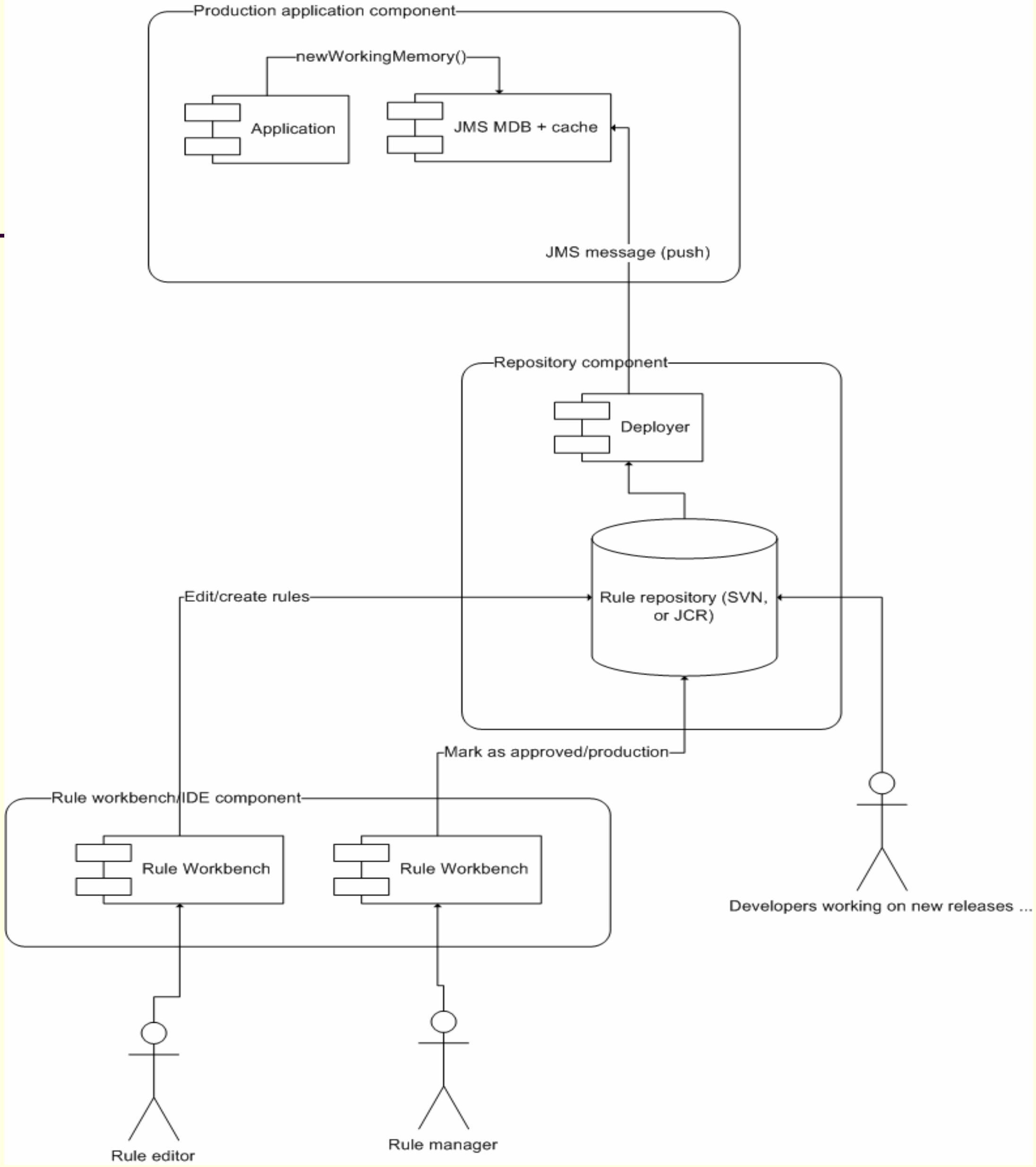
sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Pull Style


Production application component
newWorkingMemory()
Application
Deployer + cache
Refresh for latest production approved rules (pull)
Repository component
Rule repository (SVN, or JCR)
Edit/create rules
Mark as approved/production
Rule workbench/IDE component
Rule Workbench
Rule Workbench
Developers working on new releases ...
Rule editor
Rule manager

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Push Style



sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Testing

“I have not failed. I've just found 10,000 ways that won't work.”
- Thomas A. Edison

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Debugging

- You can debug rules during the execution of your Drools application
- Drools breakpoints are only enabled if you debug your application as a Drools Application
- Select the "Debug As >" and select Drools Application

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

FIT for rules - ? -

- **FIT for rules**
  - http://fit-for-rules.sourceforge.net/
  - (Built on FIT *http://fit.c2.com*)
  - Fit based framework for testing rules (systems that use a rules engine such as ILog JRules or Drools).
  - For test driven rule-set development.
  - Makes use of the JSR-94 rule engine API.

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Performance Tuning

"I find my greatest pleasure, and so my reward, in the work that precedes what the world calls success."

- Thomas A. Edison

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Rule Set Size Matters…

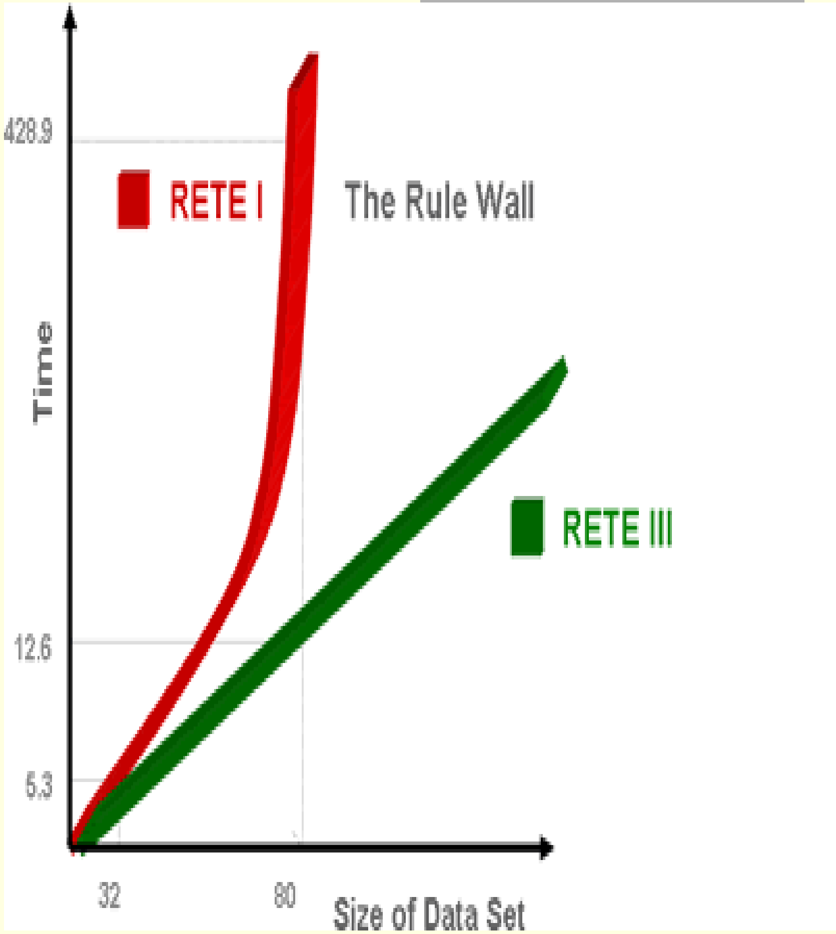
- In general
  - 1-500 - small
  - 500-2000 - medium
  - 2000+ - large
  - 10,000 - extremely large

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

The Rule Wall ?

source: http://www.edmblog.com/weblog/2005/09/what_is_rete_ii.html

- "Rete III is the most advanced commercially-available inference engine, benchmarking more than 300% faster than its competitors."
- Drools Documentation:
  - "Other Rete based engines also have marketing terms for their proprietary enhancements to Rete, like RetePlus and Rete III. It is important to understand that names like Rete III are purely marketing where, unlike the original published Rete Algorithm, no details of the implementation are published. This makes questions such as "Does Drools implement Rete III?" nonsensical"



sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Tuning Strategies

source: drools-4.0.4\src\documentation\manual\en\Chapter-Performance_Tuning\Section-Performance.xml

- Cache the RuleBase instances (or the rule packages) and only update rules as needed
- Index BetaNode memories by the “mother” attribute
  - (enabled by default in Drools)
- Re-arrange constraints
  - write your rules in a way that the most restrictive constraints are declared before the less restrictive ones in your rule
- Re-sequencing of Rules
- Scale hardware
- Partitioning
  - Different JVMs or Servers

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Java Rule Engine API

“Man is a reasoning rather than a reasonable animal.”

- Alexander Hamilton

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools JSR94 compliance

- Drools provides an implementation of the Java Rule Engine API (known as JSR94), which allows for support of multiple rule engines from a single API.
- JSR94 does not deal in anyway with the rule language itself
- W3C is working on the Rule Interchange Format (RIF) and the OMG has started to work on a standard based on RuleML
- JSR94 standard represents the "least common denominator" in features across rule engines - this means there is less functionality in the JSR94 api than in the standard Drools api

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS

Business Rule Management System

"*Because a thing seems difficult for you, do not think it impossible for anyone to accomplish.*"
- Marcus Aurelius

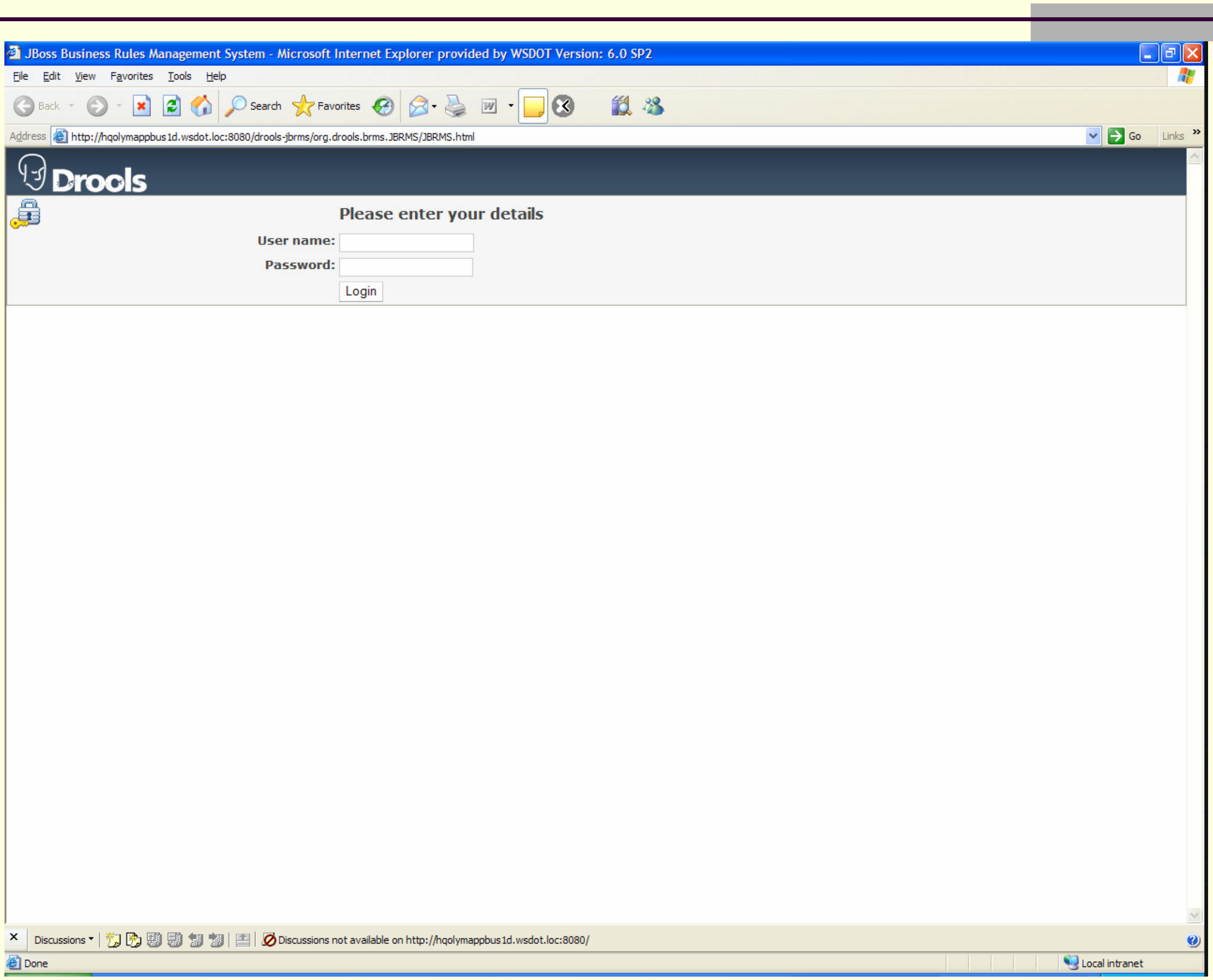
sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS Features

- Multiple types of rule editors (GUI, text)
- Version control (historical assets)
- Categorization
- Build and deploy
- Store multiple rule "assets" together as a package

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS Logon



JBoss Business Rules Management System - Microsoft Internet Explorer provided by WSDOT Version: 6.0 SP2

Address http://hqolymappbus1d.wsdot.loc:8080/drools-jbrms/org.drools.brms.JBRMS/JBRMS.html

Please enter your details

User name:

Password:

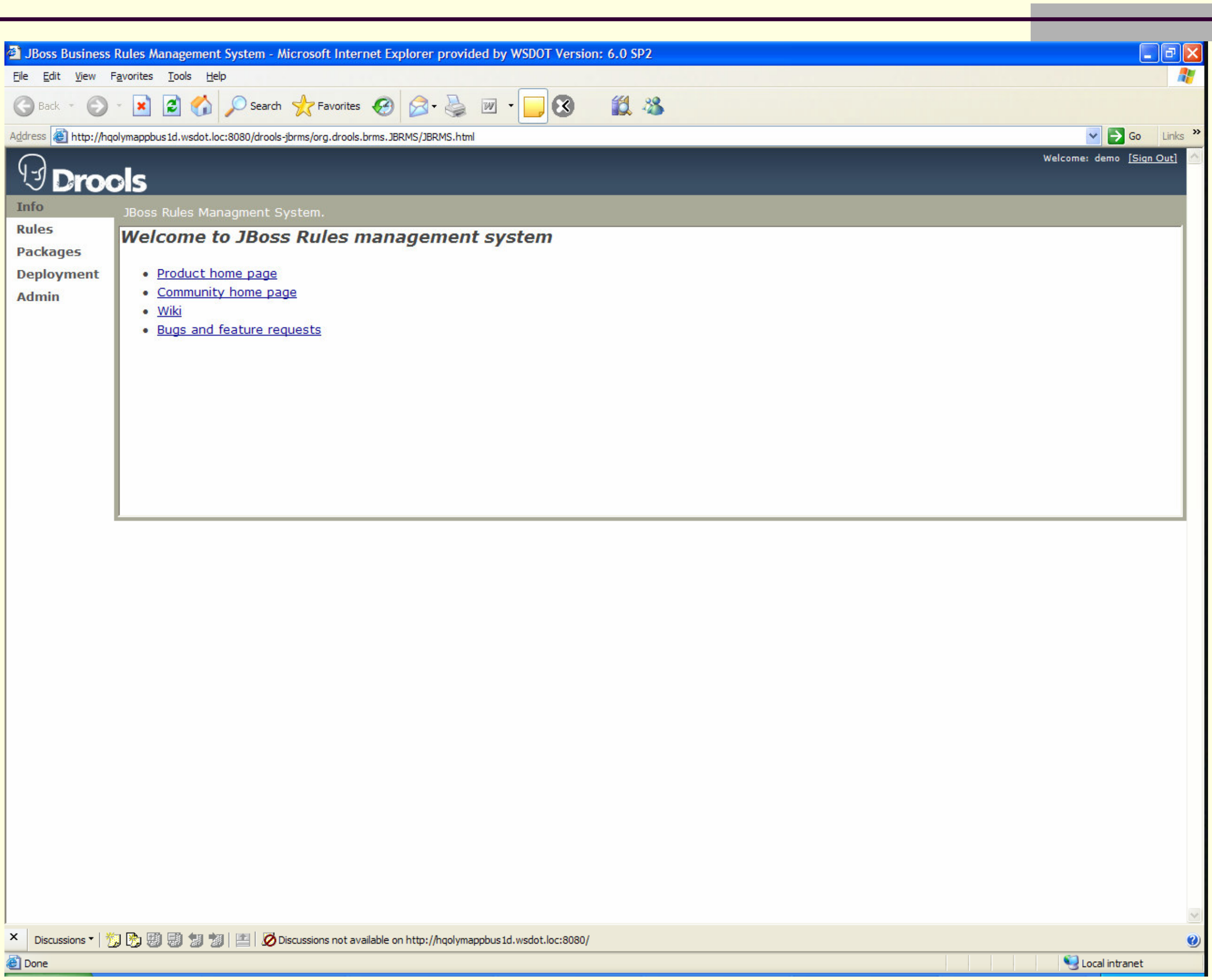
Login

Discussions not available on http://hqolymappbus1d.wsdot.loc:8080/

Seattle Code Camp V3.0 - Introduction to Drools

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS Home



JBoss Business Rules Management System - Microsoft Internet Explorer provided by WSDOT Version: 6.0 SP2
File Edit View Favorites Tools Help
Back Search Favorites
Address
Go Links
Drools
Info
Rules
Packages
Deployment
Admin
Discussions
Done
Local intranet

http://hqolymappbus1d.wsdot.loc:8080/drools-jbrms/org.drools.brms.JBRMS/JBRMS.html

Welcome: demo [Sign Out]

JBoss Rules Managment System.

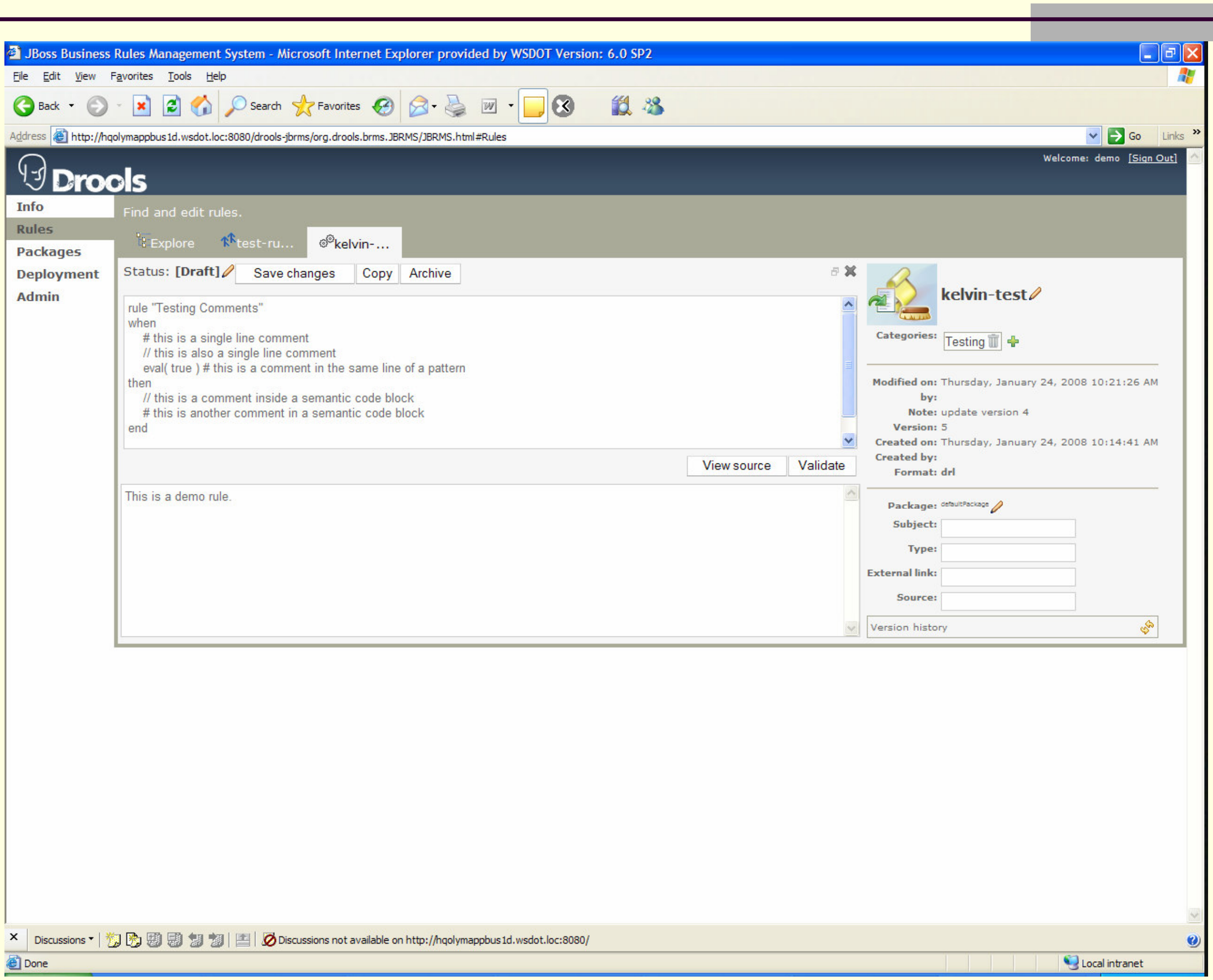
Welcome to JBoss Rules management system

- Product home page
- Community home page
- Wiki
- Bugs and feature requests

Discussions not available on http://hqolymappbus1d.wsdot.loc:8080/

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS Rule Editor



JBoss Business Rules Management System - Microsoft Internet Explorer provided by WSDOT Version: 6.0 SP2
File Edit View Favorites Tools Help
Back
Search
Favorites
Address http://hqolymappbus1d.wsdot.loc:8080/drools-jbrms/org.drools.brms.JBRMS/JBRMS.html#Rules
Go
Links
Drools
Welcome: demo [Sign Out]
Info
Rules
Packages
Deployment
Admin
Find and edit rules.
Explore
test-ru...
kelvin-...
Save changes
Copy
Archive
View source
Validate
Version history
Discussions
Discussions not available on http://hqolymappbus1d.wsdot.loc:8080/
Done
Local intranet

Status: **[Draft]**

```
rule "Testing Comments"
when
    # this is a single line comment
    // this is also a single line comment
    eval( true ) # this is a comment in the same line of a pattern
then
    // this is a comment inside a semantic code block
    # this is another comment in a semantic code block
end
```

This is a demo rule.

kelvin-test

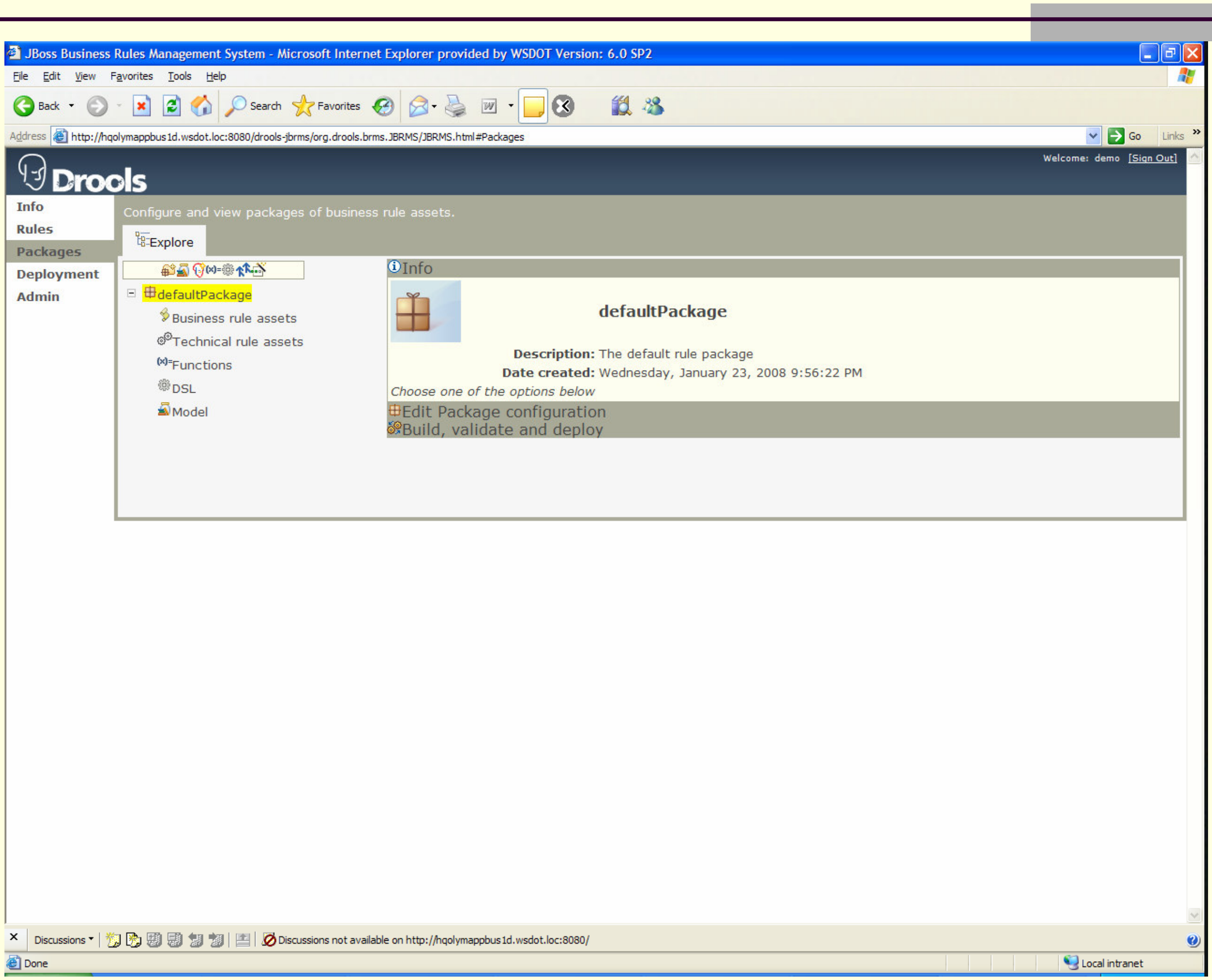
Categories: Testing

Modified on: Thursday, January 24, 2008 10:21:26 AM
by:
Note: update version 4
Version: 5
Created on: Thursday, January 24, 2008 10:14:41 AM
Created by:
Format: drl

Package: defaultPackage
Subject:
Type:
External link:
Source:

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS Package Management



JBoss Business Rules Management System - Microsoft Internet Explorer provided by WSDOT Version: 6.0 SP2

Address http://hqolymappbus1d.wsdot.loc:8080/drools-jbrms/org.drools.brms.JBRMS/JBRMS.html#Packages

Welcome: demo [Sign Out]

Configure and view packages of business rule assets.

defaultPackage

Description: The default rule package

Date created: Wednesday, January 23, 2008 9:56:22 PM

Choose one of the options below

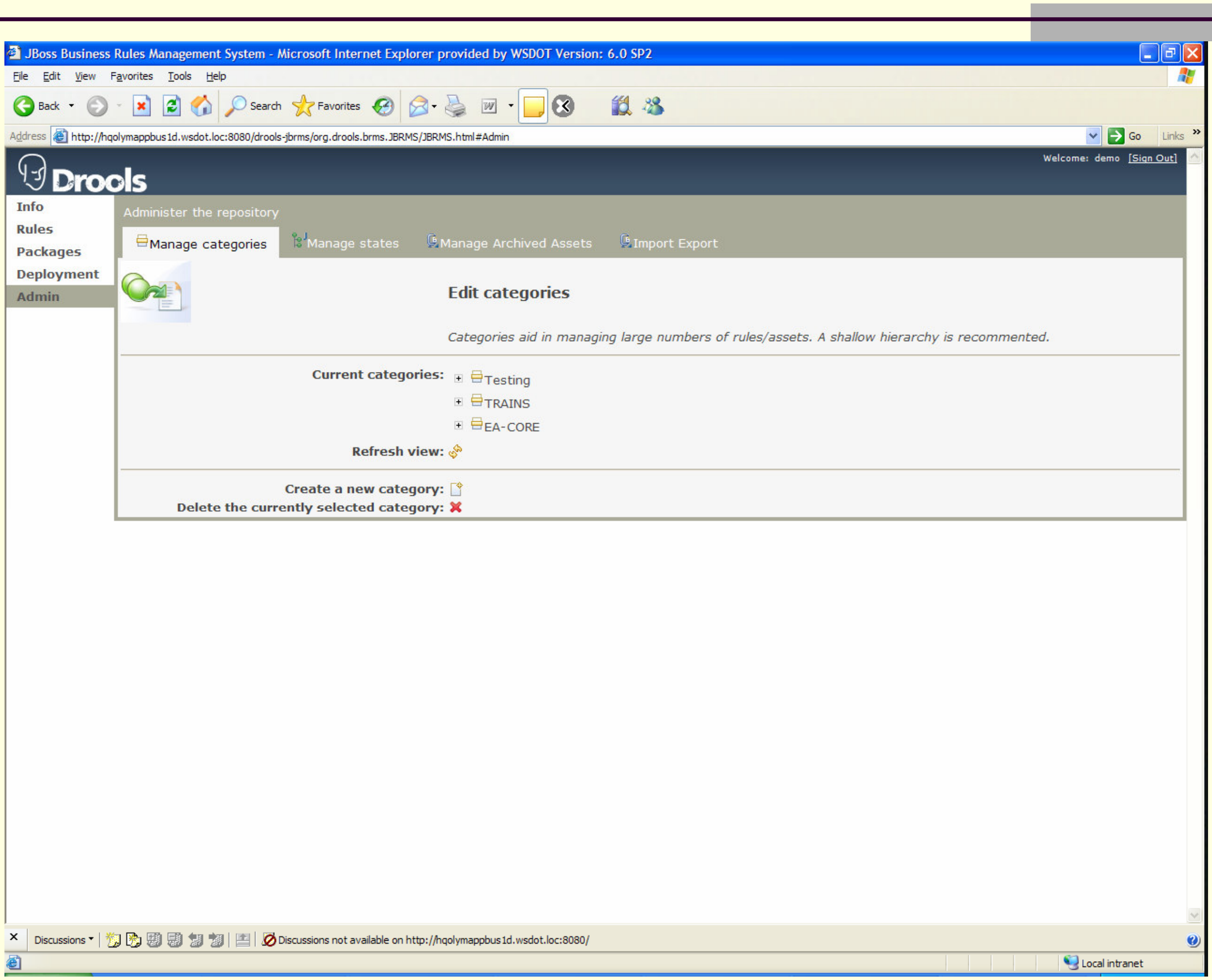
Edit Package configuration

Build, validate and deploy

Discussions not available on http://hqolymappbus1d.wsdot.loc:8080/

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS Categories



http://hqolymappbus1d.wsdot.loc:8080/drools-jbrms/org.drools.brms.JBRMS/JBRMS.html#Admin

Administer the repository

Edit categories

Categories aid in managing large numbers of rules/assets. A shallow hierarchy is recommended.

Current categories: Testing, TRAINS, EA-CORE

Refresh view:

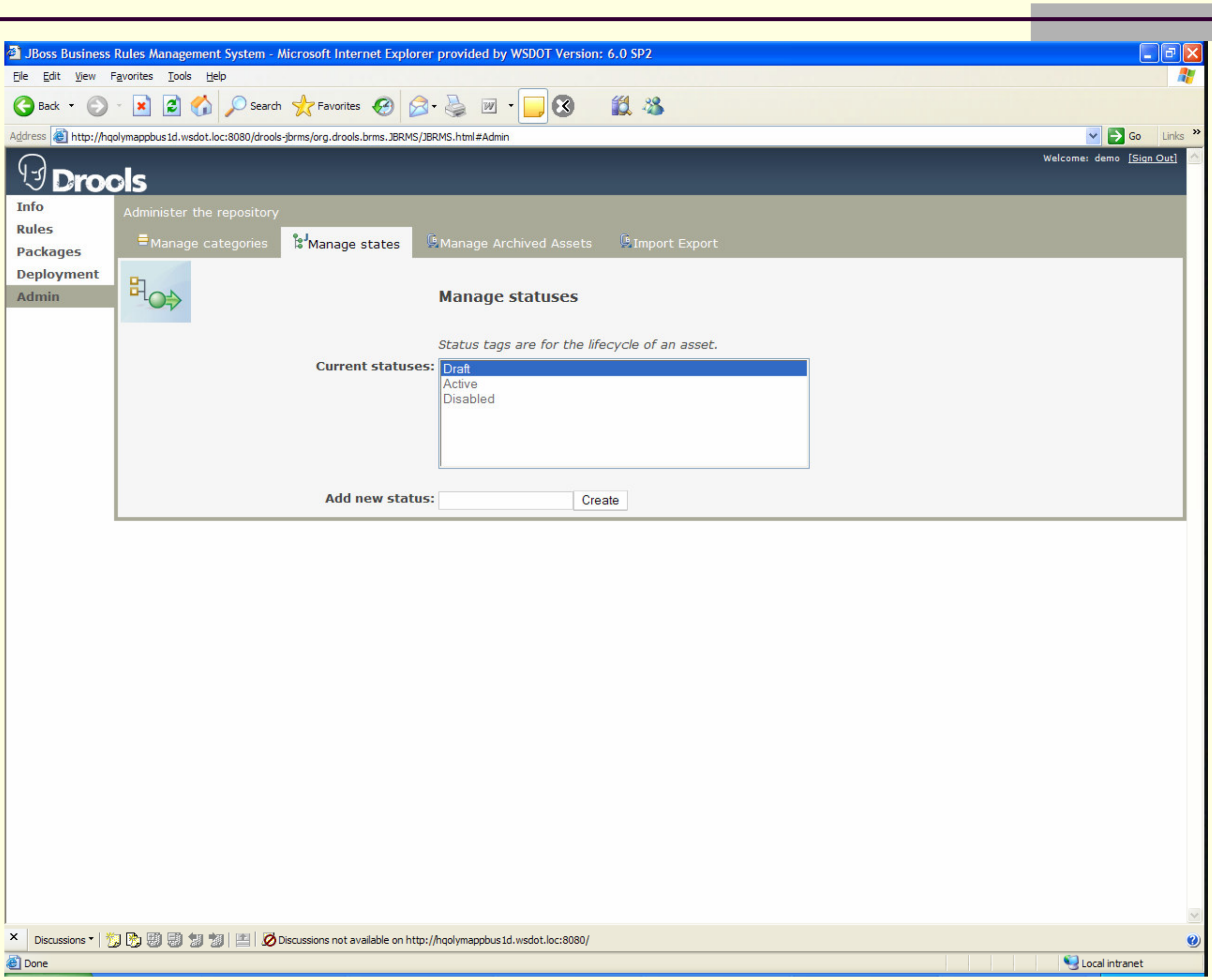
Create a new category:

Delete the currently selected category: ✖

Discussions not available on http://hqolymappbus1d.wsdot.loc:8080/

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS Manage Statuses



http://hqolymappbus1d.wsdot.loc:8080/drools-jbrms/org.drools.brms.JBRMS/JBRMS.html#Admin

Administer the repository

Manage statuses

Status tags are for the lifecycle of an asset.

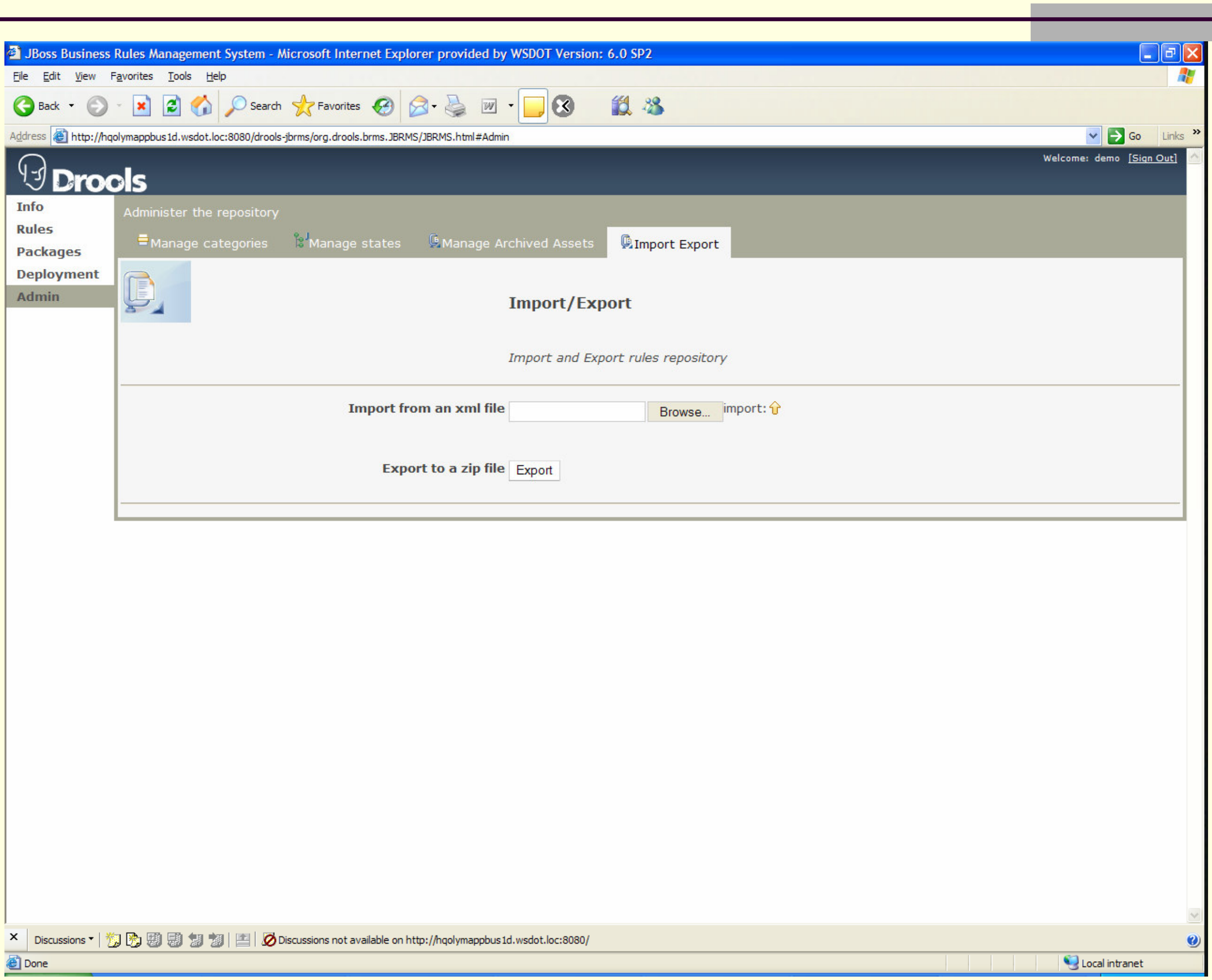
Current statuses:
Draft
Active
Disabled

Add new status:

Discussions not available on http://hqolymappbus1d.wsdot.loc:8080/

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

BRMS Import/Export



JBoss Business Rules Management System - Microsoft Internet Explorer provided by WSDOT Version: 6.0 SP2
File Edit View Favorites Tools Help
Back
Search
Favorites
Address http://hqolymappbus1d.wsdot.loc:8080/drools-jbrms/org.drools.brms.JBRMS/JBRMS.html#Admin
Go
Links
Drools
Welcome: demo [Sign Out]
Info
Rules
Packages
Deployment
Admin
Administer the repository
Manage categories
Manage states
Manage Archived Assets
Import Export

Import/Export

Import and Export rules repository

Import from an xml file Browse... import:

Export to a zip file Export

Discussions
Discussions not available on http://hqolymappbus1d.wsdot.loc:8080/
Done
Local intranet

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Demo Examples

"Anything that won't sell, I don't want to invent. Its sale is proof of utility, and utility is success."

- Thomas A. Edison

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Demos

- Create New Drools Project
- Demo Programs (from drools-4.0.4-examples.zip)
  - Example1.java
  - Example2.java
  - Example3.java
  - Example4.java
  - Example5.java
  - Example6.java
  - HelloWorldExample.java
  - FibonacciExample.java
  - PricingRuleDTExample.java (using Decision Table)

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Summary

“Opportunity is missed by most people because it is dressed in overalls and looks like work.”
- Thomas A. Edison

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Advantages of a Rule Engine

- Declarative Programming
- Allows you to say "What to do" not "How to do it".
- Logic and Data Separation
- Speed and Scalability
- Centralization of Knowledge
- Tool Integration
- Explanation Facility
- Understandable Rules

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Drools Web Resources

- Drools
  - http://labs.jboss.com/drools/
- Drools Blog
  - http://blog.athico.com/
- JBoss Rules (commercial site)
  - http://www.jboss.com/products/rules

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Business Rule Community

- Rule Interchange Format (RIF) Working Group
  - http://www.w3.org/2005/rules/wiki/RIF_Working_Group

- Business Modeling & Integration Domain Task Force
  - http://bmi.omg.org/

- Business Rules Community
  - http://www.brcommunity.com/index.php

- Enterprise Decision Management Blog
  - http://www.edmblog.com/

- LinkedIn Group: Model Driven Architecture
  - http://www.linkedin.com/e/gis/50539/04809C3A2E89

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Additional Web Resources

- Business Rules Process Management
  - http://pvhaley.wordpress.com/2007/12/20/business-rules-process-management/
- Does your bad Java code need help? (from Rules and Flow)
  - http://www.oreillynet.com/onjava/blog/2007/10/does_your_bad_java_code_need_h.html
- Building Enterprise Services with Drools Rule Engine
  - http://www.onjava.com/pub/a/onjava/2007/01/17/building-enterprise-services-with-drools-rule-engine.html
- Using Drools in Your Enterprise Java Application
  - http://www.onjava.com/lpt/a/6160
- Enterprise Drools: Multiple Deployments of Business Rules
  - http://www.firstpartners.net/whitepapers/multiple-enterprise-drools-deployments.pdf

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

…More References

- JSR 94: JavaTM Rule Engine API (Final Release)
  - http://jcp.org/aboutJava/communityprocess/final/jsr094/index.html
- "Rete: A Fast Algorithm for the Many Pattern/ Many Object Pattern Match Problem,“ Charles L. Forgy, Artificial Intelligence 19 (1982)
- RuleML: The Rule Markup Initiative
  - http://www.ruleml.org/
- Some Guidelines For Deciding Whether To Use A Rules Engine
  - http://www.jessrules.com/jess/guidelines.shtml
- The Forrester Wave™: Business Rules Platforms, Q1 2006
  - www.haley.com/members/pdf/**WaveReport**.pdf
- Worldwide Business Rules Management Systems 2006 - 2010
  - http://www.fairisaac.com/NR/rdonlyres/AEADF660-561E-45CE-BE5D-EF921A32DB64/0/IDC_203654EBRMSExcerpt1006.pdf

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Other Rule Engines

- Other Open Source Rule Engines…
  - http://java-source.net/open-source/rule-engines
  - http://www.manageability.org/blog/stuff/rule_engines/view
  - Jess (by Ernest Friedman-Hill at Sandia National Laboratories)
    - http://www.jessrules.com/jess/index.shtml

- Haley (acquired by RuleBurst, Nov. 2007)
  - http://www.haley.com/

- ILOG Rules
  - http://www.ilog.com/products/rules/

- Fair Isaac Blaze Advisor
  - http://www.fairisaac.com/fic/en/product-service/product-index/blaze-advisor/

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

2008 Business Rule Events

- European Business Rules Conference (June 16-18, 2008)
  - http://www.eurobizrules.org/default.lynkx?id=13
- 11th Annual Business Rules Forum™ (October 26-30, 2008)
  - http://www.businessrulesforum.com/register.php

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html

Thank You.

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  - 206-910-7748

sources: http://downloads.jboss.com/drools/docs/4.0.4.17825.GA/html/index.html