Drools5 Integration
Helper 1.3.0 user guide

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Presentation

This user guide defines what is Drools5-integration-helper and how to use it.

More information regarding the project can be found at http://www.javaforge.com/project/DroolsHelp. Also, javadoc and maven site are part of the various downloadable files.

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```

Drools5 Integration Helper

Drools5 Integration Helper is a set of java classes, maven plugin and maven archetype to deal with Drools5 (and specifically with Drools Expert [http://www.jboss.org/drools/drools-expert.html] and Drools Guvnor [http://www.jboss.org/drools/drools-guvnor.html]).

This project provide three main artifacts:

- One java library to provide various integration to interface from java to drools.

    - Support of drools call thru interface in stateless mode.
    - Support of drools call thru interface in statefull mode.
    - Support of drools interface integration into spring [http://www.springsource.org/documentation].
    - Support of drools annotation on classes.
        - Support of field updated based on annotations.
        - Support of usage of condition on method.
- One Maven [http://maven.apache.org/] plugin to validate and compile drools files and support additional annotations..
    - Support of validation of drools source file.
    - Support of compilation of drools source file.
    - Support of instrumentalization of class file.
- One Maven [http://maven.apache.org/] archetype to produce ready to use Maven 2 project.
    - Support generation of a Maven 2 project with both classes and interfaces approach.
    - Support generation of a Maven 2 project that use JUnit 4 [http://www.junit.org/] tests as example.

Drools5 Integration Helper is provided as ready to use Maven artifact. No IDE integration is provided as no IDE integration is needed for **Drools5 Integration Helper** itself. IDE integration regarding Drools can be provided by the IDE related to drools.

Drools5 Integration Helper require Java 6.

This library uses log4j library [http://logging.apache.org/log4j/1.2/index.html] to log and provides access to log4j from drools rules.

The main idea behind **Drools5 Integration Helper** is to provide tools that allow access to the power of rule engine, without having to care about how to interface with this type of engine. To do so, **Drools5 Integration Helper** focus on providing a way to provide this interface by only say "here I like to be interfaced with drools" and not "here I like to do so and so to access to drools". So, almost all usage of **Drools5 Integration Helper** are to be done in declarative way (using annotation for example).

Installation

The various artifacts of Drools5 Integration helper are integrated into the maven central repository, starting from version 1.3.0. No specific configuration is needed to use them.

Note that potentially some dependencies may not be available in central. In this case, the jboss repository [http://repository.jboss.org/maven2/] may be add to your list of repositories.

It is possible to download them manual and install them.

This chapter describe how to download and then install all the required file into maven local or remote repository. For readers with good Maven skill, this chapter is potentially useless. Also it is not strictly required to use this installation procedure, if you can have access to the central repository.

All artifacts have **org.boretti.drools.integration** as groupId, except for the examples that have groupId **org.boretti.drools.integration.examples**. Examples can't be get from the Maven central repo. There are available from the SVN and in the documents part of the site.

Download

All artifacts can be downloaded from http://www.javaforge.com/proj/doc.do?doc_id=73466.

All in one download

All artifacts are available in a single zip file.

Per files download

It is possible to download separately all file.

Installation in local maven repository

All maven artifacts can be install in the local repository. The various file are named like 'artifactId'-'version'.'extension' or 'artifactId'-'version'-'classifier'.'extension'

The plugin maven-install-plugin can be used to install each artifact into your local repository:

```
mvn install:install-file  -Dfile=path-to-your-artifact-file \
                          -DgroupId=org.boretti.drools.integration \
                          -DartifactId=your-artifactId \
                          -Dversion=version \
                          -Dpackaging=extension
```

or

```
mvn install:install-file  -Dfile=path-to-your-artifact-file \
                          -DgroupId=org.boretti.drools.integration \
                          -DartifactId=your-artifactId \
                          -Dversion=version \
                          -Dclassifier=classifier
                          -Dpackaging=extension
```

Installation in remote maven repository

All maven artifacts can be deploy in a remote maven repository. The various file are named like 'artifactId'-'version'.'extension' or 'artifactId'-'version'-'classifier'.'extension'

The plugin maven-deploy-plugin can be used to install each artifact into a remote repository:

```
mvn deploy:deploy-file -Durl=file://C:\m2-repo \
                       -DrepositoryId=some.id \
                       -Dfile=your-artifact \
                       [-DgroupId=org.boretti.drools.integration] \
                       [-DartifactId=your-artifact] \
                       [-Dversion=version] \
                       [-Dpackaging=extension] \
                       [-Dclassifier=classifier] \
```

Chapter 2. Java Library - Drools5 Integration Helper Library

Introduction

The artifact **org.boretti.drools.integration**:**drools5-integration-helper-library** provides the following support:

- A set of annotations and enumeration to make an interface as **drools interface**.
- A set of classes that provide a way to instantiate these interfaces, directly or from Spring.
- A set of annotations and enumeration to make a class as **drools class**.

All the Classes, Annotations, Enumerations and Interfaces are part of the following package (or sub-packages) : org.boretti.drools.integration.drools5. The sub-package annotations contains all the annotations that can be used. The sub-package exceptions contains all the exceptions that can be thrown by this library. Finally the sub-package implementation contains all the stuff that provide the core implementation for this library. Classes and interfaces of this sub-package must not be used as they are reserved for internal implementation of the library and the definition of these classes, interfaces and methods may change without notice.

This chapter describe how to use this library. The javadoc is available as part of the downloadable files.

This library can be add as a maven dependency by using:

```
<dependency>
   <groupId>org.boretti.drools.integration</groupId>
   <artifactId>drools5-integration-helper-library</artifactId>
   <version>1.3.0</version>
</dependency>
```

This dependency will indirectly reference the various drools dependencies.

Two various approaches are provided to interfaces with Drools. They both are complementary way of defining this interface.

- The first one is based on usage of an annotated interface. In this case, we can say it is a service oriented way of thinking. The drools file is exposed as classical java method, by an interface.
- The second one is based on usage of an annotated class. This can be done in two different ways.
  - By using annotations on field. In this case it is possible to have field auto-computed by drools.
  - By using annotations in method. In this case, these annotations can define pre and post-condition that will be evaluated by using drools.

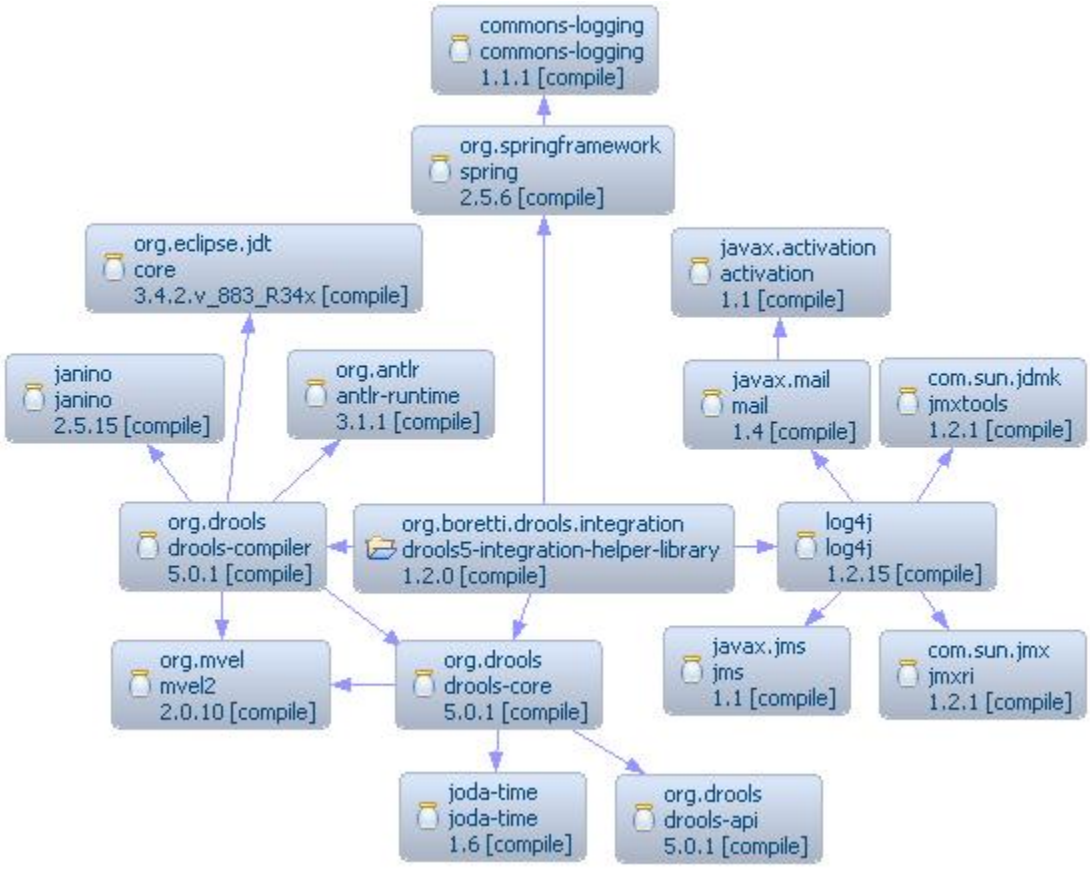
  Theses both ways will require class instrumentalization.

These both approaches cover different types of use case and can be use in the same java program without problem.

Drools resources can be get from the resource available by using the class loader, but also from an URL. These URLs can point to drools resources exposed by Drools Guvnor. Drools Guvnor usage is out of scope of this document.

Dependencies

Figure 2.1. View of the runtime dependencies



There are four main dependencies for the library:

log4j	This is the classical *log4j* library.
spring	This is a dependency to the *spring* library to support the spring integration.
drools-core	This is a dependency to the *drools-core* library. It is the main dependency for drools.
drools-compiler	This is a dependency to the *drools-compiler* library. This dependency provides the feature to compile Drools file.

DroolsInterface

Interface(s)

DroolsInterface is the first main concept behind this library. The goal of a DroolsInterface is to provides a way to call Drools rules from java, without having to care about the Drools interfacing.

To achieve this goal, the developer can define an *interface* and annotate it with the annotation @DroolsService:

```
package foo;

import org.boretti.drools.integration.drools5.annotations.DroolsService;

@DroolsService
public interface MyName {
        /*... */
}
```

This annotation make this interface as a DroolsInterface. This annotation support two attributes:

type — can be SOURCE or COMPILED or XML.

- *SOURCE* is to be used to define that this class will be based on a drools source file.
- *COMPILED* (default) is to be used to define that this class will be based on a drools compiled file (using the maven plugin).
- *XML* is to be used to define that this interface will be based on a drools XML file.

resourceName — is to be used to define the resource name to be used to load the rules. If this is unset or null or empty, the default resource name used will be the interface with .drl extension for source and .cdrl for compiled.
The resourceName must point a valid resource. Resource are found using the classic getResourceAsStream from the Class object that is this interface or by reading an url (http://XXX or file://XXX).

Both type and resourceName can be override at execution, by passing others value with creating the concrete instance of the interface.

Method(s)

Developer must of course add several method definition to this interface. Every method will be use to call the rules that are behind this interface, except for the special case defined later in this document. The parameter of the method will be pass (depending of the annotation @DroolsParameter) to the rule engine. if the method define a return type other that void, the return value will be the first fact that match this type or all if the type is an array.

By default, methods are execution method. A special case is for method that are setter and that have an annotation @DroolsVariable. These methods can be used to inject additional object to the drools context.

@DroolsVariable and @DroolsMethod are incompatible and can't be used on the same method. This constraint is not checked at compile time, but only at execution time.

Session

Optionally, method can be annotated with the annotation @DroolsMethod. This annotation supports several attributes, one is session. This attribute can have the following value:

NONE — (default also when both @DroolsMethod and @DroolsVariable are not used). In this case, the execution of the drools is done in purely stateless mode.

In case a session exists at time this method is call, the session is not impacted by this call. This type of call are fully thread safe.

NEW — In this case, the execution will first discard any existing drools session, and then create a new one. Then a fireAll will be trigger.
The generated concrete class doesn't provide in security regarding threading. It is the responsability of the caller of the concrete interface.

END — In this case, a session must existing before. A fireAll will be trigger and then the session will be discard. In case no session exists, an IllegalArgumentException exception is thrown.
The generated concrete class doesn't provide in security regarding threading. It is the responsability of the caller of the concrete interface. In case no session exists at this time, an error is raised.

JOIN — In this case, if a session exists, this session will be used ; if not, the execution will be done in stateless mode.
The generated concrete class doesn't provide in security regarding threading. It is the responsability of the caller of the concrete interface.

REQUIRE — In this case, a session must exists before execution. In case no session exists, an IllegalArgumentException exception is thrown.

The generated concrete class doesn't provide any security regarding threading. It is the responsability of the caller of the concrete interface. In case no session exists at this time when a session is required, an error is raised.

Activation Group

Activation Group is a new attribute of the @DroolsMethod annotation. Currently this attribute is not used.

Setter Methods

The setter method must be named setXXX, must have exactly one parameter and a void return type. Also, the annotation @DroolsVariable is mandatory. This annotation support one attribute, global. By default this attribute is false. The logic of passing the field to drools is the following:

global=false — In this case, the variable is stored internally in the interface when the setter is called. When called with null, the variable is removed. At time a new stateless session or a new statefull session is created, this variable is added to the fact.

global=true — In this case, the variable is stored internally in the interface when the setter is called. When called with null, the variable is removed. At time a new stateless session or a new statefull session is created, this variable is added to the global list. The field name is used as the name for the global variable in drools.
Drools may produce error in case a global is defined on java side and not on drools side.

Calling a setter method when a session is already existing doesn't impact the existing session. The change of field will only be applyed for the new session.

Asynchronous methods

A method (not a setter) can be asynchronous. To do so, it is required to use a Future as a return value. The call will then be asynchronous (executed in a separated Thread) and the Future will be available to have access to the response.

Parameter(s)

Parameters of the various methods may be annotated with the annotation @DroolsParameter. This annotation support one attribute: handling. This attribute can have the following value:

NONE	(default, also when annotation is not used). In this case, the parameter is simply pass to the drools.
IGNORED	In this case, the parameter is ignored and not pass to drools.
TOFLAT1	In this case, if the parameter is an array or a Collection, all items of the array or the Collection will be pass to drools and not the parameter itself.
TOFLATALL	In this case, if the parameter is an array or a Collection, all items of the array or the Collection will be pass to drools and not the parameter itself, and recursively for all items.
GENERICDEFINITION	In this case, it is assumed the parameter is a Class parameter to be used for the return type. The goal is to support generic.

```
public <T> T myMethod(
   @DroolsParameter(handling=GENERICDEFINITION)
   Class<T> clazz,
   /*...*/
);
```

This will ensure the method returns the right type of object at runtime. This parameter is not pass to drools. It is only used to support generic.

Drools5-Integration-Helper supports null parameters, but not for a GENERICDEFINITION parameter.

Return value

Methods that are not setter can have a return type. If the return type is void, nothing is returned. If the returned value is an array, then all objects in drools that match this type (that are the same class or a sub class) are returned. It is also possible to use a Future as a return value. In this case, the execution of the method is asynchronous.

In case the return type is not an array and several object match the expected type, only the first one found will be returned. As the order of fact is not determined, in this case, there is no way to know which object will be returned.

In case the return type is an array, the order of the object in this array can be different between two consecutive calls.

Generic

Return type can be generic, but in this case the GENERICDEFINITION logic must be used to inform drools5-Integration-Helper about the real type. In any case, before using generic type in rule, it is better to make an analysis before using generic in drools, as the result can be very difficult to predict.

Future

Using a return type of Future (java.util.concurrent.Future) marks the method as asynchronous method. For readability it is better to add a specific text at the end of the name of the method, for example like Async.

For the Future usage, there are two use cases:

```
public Future<String> myMethod(/*...*/);
```

In this case, the generic part of the Future is clearly defined. Drools5-Integration-Helper will return a Future that will return a String from drools.

```
public <T> Future<T> myMethod(
   @DroolsParameter(handling=GENERICDEFINITION) Class<T> clazz,
   /*...*/);
```

In this case, the generic part of the Future is defined by the clazz parameter.

Primitive types

A special note on primitive type is required. For example, if we have the following interface:

```
@DroolsService(type=SOURCE,resourceName="/drools.drl")
private interface PrimitifInterface {
        public boolean testBoolean1(boolean in);

        public Boolean testBoolean2(boolean in);

        public boolean testBoolean3(Boolean in);

        public Boolean testBoolean4(Boolean in);
}
```

In this case, if the rule file do nothing, what is asserted as parameter will be used for the return value. Even if both Boolean and boolean are used, both Boolean and boolean are accepted as matching for each others.

DroolsClass

Class(s)

Any class can be transform into automated drools class.

To achieve this goal, the developer can define a *class* and annotate it with the annotation @DroolsService:

```
package foo;

import org.boretti.drools.integration.drools5.annotations.DroolsService;

@DroolsService
public class MyName {
        /*... */
}
```

This annotation make this class as a DroolsClass. This annotation support two attributes:

type can be SOURCE or COMPILED or XML.

- *SOURCE* is to be used to define that this class will be based on a drools source file.

- *COMPILED* (default) is to be used to define that this class will be based on a drools compiled file (using the maven plugin).
- *XML* is to be used to define that this interface will be based on a drools XML file.

resourceName — is to be used to define the resource name to be used to load the rules. If this is unset or null or empty, the default resource name used will be the class with .drl extension for source and .cdrl for compiled.
The resourceName must point a valid resource. Resource are found using the classic getResourceAsStream from the Class object that is this interface or by reading an URL (http://XXX or file://XXX).

The class must be instrumented using the maven plugin. Missing this step will produce classes that are not integrating the drools interfacing.

Both resourceName and type can be override by use special annotated parameter in the constructor.

Field(s)

The class will contains several fields. The field can have tree states:

@DroolsGenerated — With this annotation, the field is marked as generated thru drools. In this case, the Maven plugin will add a call to the drools engine in the getter of this field, when needed. The call will pass one single object to drools : this. It is the responsability of the drools rule to set the field.

@DroolsIgnored — With this annotation, the field is marked as not generated thru drools and that setting this field will not trigger a rerun of the drools rule.

Not annotated — Without annotation, the field is marked as not generated thru drools but that changing this field must trigger drools execution. In this case, the Maven plugin will add a piece of code to mark the execution of drools as required.

```
package foo;

import org.boretti.drools.integration.drools5.annotations.DroolsService;
import org.boretti.drools.integration.drools5.annotations.DroolsIgnored;
import org.boretti.drools.integration.drools5.annotations.DroolsGenerated;

@DroolsService
public class MyName {
        @DroolsIgnored
        private String ignoredField;

        private String sourceField;

        @DroolsGenerated
        private String generatedField;

        /* ... put here the various getter and setter */
}
```

Only access to the field thru the getter and setter are instrumented. Direct access to the field will not trigger or use recomputation.

Constructor(s)

By default, all constructors are instrumented at compile time to have additional code to initialize the rule base. The parameter of the constructor can use two special annotations:

@DroolsResourceName	Must be use zero or one time in the constructor and must be use on a String parameter. It marks the parameter as an injection of the resourceName.
@DroolsResourceType	Must be use zero or one time in the constructor and must be use on a DroolsServiceType parameter. It marks the parameter as an injection of the serviceType.

When at least one of these two annotations are used, the resourceName and/or resourceType will be override by using the received value. Only overriding at construction time is supported.

Wrong usage of this annotations (for instance @DroolsResourceName on a Boolean parameter) will be reported as a warning in the logs of the maven plugin execution.

It is not required to have a default constructor or a constructor without any override parameter.

Multiple constructors usage.

A class can have several constructors. All constructors will be instrumented by the maven plugin. But what happen if a constructor use an other one (classical approach) ?

Two different cases are interesting to be study. The first one is with constructor that doesn't override the drools resource(s). and the second one with override of the drools location.

Multiple constructors without Drools override

Let's take an example:

```
public constructor() {
   /* ... */
}

public constructor(String arg) {
   this();
   /* ... */
}

public constructor(String arg0,boolean arg1) {
   this(arg);
   /* ... */
}
```

We have several constructors, with zero, one, or two parameters. The zero-parameter constructor use the implicit call to super(). All others constructors first call the constructor with parameter-1 parameters. None of the various constructors use resource override.

In this case, all constructor will have additional code to configure the drools Rule. This code will be added just after the call to the parent constructor (for the first method) or just after the call to the other constructor (for the two last methods). The side effect is that the drools Rule object will be constructed several time, event if only the one from the most outside constructor will be used.

Multiple constructors with Drools override.

Let's take an example:

```
public constructor() {
   /* ... */
}

public constructor(@DroolsResourceName String resourceName) {
   this();
}
```

In this case, we have one default constructor and one additional constructor that just call the default constructor, but use a resource override.

In this case, all constructor will have additional code to configure the drools Rule. This code will be added just after the call to the parent constructor (for the first method) or just after the call to the other constructor (for the last method). The side effect is that the drools Rule object will be constructed several time, event if only the one from the most outside constructor will be used. It will ensure that the used Rule object will be the one with the override parameter. But, in all this, with this approach, the Rule object with default value will be constructed.

The fact that with this approach the object with default will be constructed in any case can be a potential issue, for example when the resource with default value is not available, because this will make fail the inner constructor and indirectly the outer constructor, before construction of the Rule object with overrided value.

How to avoid the unnecessary construction of the rule data

As we can see in the previous section, depending on how the constructor are used, we may have several construction of the rules object, when only one is required. It can have performance issues and also unwanted errors.

It exists a workaround to avoid (or limit) this issue. To do so, the call to this must be removed and a internal private initialization method is defined. This method is call and not the other constructor:

```
public constructor(/*...*/) {
   init(/*...*/);
}

public constructor(@DroolsResourceName String resourceName) {
   init(/*...*/);
}

private final void init(/*...*/) {
   /*...*/
}
```

Drools Execution

Drools is called :

- The first time a field annotated with @DroolsGenerated is getted.
- Every time a field annotated with @DroolsGenerated is getted, just after a none annotated field is set.

All executions are done in purely stateless mode. Drools5-integration-helper doesn't care about multi-threading access. Developer must use synchronized getter and setter if needed.

DroolsCondition

Idea

In some cases it can be interesting to define conditions related to a method. This is an approach similar to the Programming by Contract model. The goal is to annotated a method to define pre-condition and post-condition.

The class must be instrumented using the maven plugin. Missing this step will produce classes that are not integrating the drools interfacing.

Condition definition

PreCondition

PreCondition can be defined by using the @DroolsPreCondition annotation. This annotation support several attributes:

type — can be SOURCE or COMPILED or XML.

- *SOURCE* is to be used to define that this class will be based on a drools source file.
- *COMPILED* (default) is to be used to define that this class will be based on a drools compiled file (using the maven plugin).
- *XML* is to be used to define that this interface will be based on a drools XML file.

resourceName — is to be used to define the resource name to be used to load the rules.
The resourceName must point a valid resource. Resource are found using the classic getResourceAsStream from the Class object that is this interface or by reading an url (http://XXX or file://XXX).

error — is to be used to define the error that can be throw in case of error. This must be a Class object that extends Error.

```
Class<? extends Error> error();
```

Methods with this annotations will contains, at the start of the method, an evaluation of the drools rules defined in the annotation. this and all parameters of the method will be passed as fact. The rule must insert an concrete instance of an Error (based on the attribute error) in case the precondition are not meet.

PostCondition

PostCondition can be defined by using the @DroolsPostCondition annotation. This annotation support several attributes:

type — can be SOURCE or COMPILED or XML.

- *SOURCE* is to be used to define that this class will be based on a drools source file.
- *COMPILED* (default) is to be used to define that this class will be based on a drools compiled file (using the maven plugin).

- *XML* is to be used to define that this interface will be based on a drools XML file.

resourceName — is to be used to define the resource name to be used to load the rules.
The resourceName must point a valid resource. Resource are found using the classic getResourceAsStream from the Class object that is this interface or by reading an url (http://XXX or file://XXX).

error — is to be used to define the error that can be throw in case of error. This must be a Class object that extends Error.

```
Class<? extends Error> error();
```

onException — is to be used to mark that throw instruction must be considered as to be marked for post condition check. Default is false

Methods with this annotations will contains, before each (X)return, an evaluation of the drools rules defined in the annotation. this and all parameters of the method will be passed as fact. The rule must insert an concrete instance of an Error (based on the attribute error) in case the postcondition are not meet.

If onException is set to true, all athrow (throw instruction at java level) are also preceded by the postcondition.

In the current implementation, post condition can only have access to the state of the argument and this at time of the evaluation. No access to old value (before execution of the method) are not available.

Exception throwing

In case error is inserted into the drools fact, the error will be thrown by the system. As it is required to extends Error, it is not required to explicitly use throws feature on the method.

Static methods

Static methods are not supported.

DroolsProvider

Once the developer has define the drools interface, a way to create concrete instance is required.

Only **Drools Interface** requires direct usage of the DroolsProvider. **Drools Class** doesn't need special instantiation but these classes will only internally the DroolsProvider.

This can be achieve using the DroolsProvider class. This class provides several methods.

Getting concrete instance from interface

```
public <T> T getService(Class<T> clazz)
```

or

```
public <T> T getService(Class<T> clazz,
                        String resourceName)
```

or

```
public <T> T getService(Class<T> clazz,
```

```
                                String resourceName,
                                DroolsServiceType serviceType)
```

It is possible to pass the interface to this method to create a new concrete instance. This method return a new interface for all usage.

In case a Class, a not annotated (or wrongly annotated) Interface is used it will generate an error.

All concrete instance of the interface returned by this method will implements T and also the interface DroolsInterface. When casting explicitly to DroolsInterface this concrete class, it is possible to get manually the current session (for statefull execution) or the RuleBase related to this interface.

The two additional parameters can be used to override the resourceName and serviceType that are defined at interface level.

Getting RuleBase from interface or class

```
public <T> RuleBase getRuleBase(Class<T> clazz)
```

or

```
public <T> RuleBase getRuleBaseOverride(Class<T> clazz,
                                        String resourceName)
```

or

```
public <T> RuleBase getRuleBaseOverride(Class<T> clazz,
                                        DroolsServiceType resourceType)
```

or

```
public <T> RuleBase getRuleBaseOverride(Class<T> clazz,
                                        String resourceName,
                                        DroolsServiceType resourceType)
```

This method returns a new RuleBase object, based on the annotation of the received interface or class. Usage of this method is normally not needed for end-user. This method is used by the classes that have been annotated @DroolsService to get the rules.

Getting RuleBase from type and resource

```
public <T> RuleBase getRuleBase(
   Class<T> clazz,
   DroolsServiceType type,
   String resourceName)
```

This method returns a cachable RuleBase object, based on the received parameter. Usage of this method is normally not needed for end-user. This method is used by the classes that have been annotated to support pre-condition.

Running pre-condition

```
public static <T> void runPreCondition(
   Class<T> clazz,
   DroolsServiceType type,
   String resourceName,
```

```
   Class<? extends Error> error,
   Object reference,
   Object args[])
```

This method run a precondition and produce an error if needed. Usage of this method is normally not needed for end-user. This method is used by the classes that have been annotated to support pre-condition.

Running post-condition

```
public static <T> void runPostCondition(
   Class<T> clazz,
   DroolsServiceType type,
   String resourceName,
   Class<? extends Error> error,
   Object reference,
   Object args[])
```

This method run a postcondition and produce an error if needed. Usage of this method is normally not needed for end-user. This method is used by the classes that have been annotated to support post-condition.

Spring Integration

It is possible to have an integration with Spring using the DroolsBeanFactory class. To do so, the developer must:

1. Define the annotated interface. To do so, it is just required to have a standard interface that is annotated with @DroolsService.

2. Register the bean in spring bean configuration:

```
<bean
   id="Drools1"
   class="org.boretti.drools.integration.drools5.DroolsBeanFactory">
      <property
         name="droolsInterface"
         value="foo.MyPackage"
          />
</bean>
```

This will provide a Bean that is a DroolsInterface and implements the provided interface. This BeanFactory use the DroolsProvider to create the concrete instance of the interface.

In case some setter (method named setXXX, with exactly one parameter, annotated with @DroolsVariable) are also annotated with @Autowired (from Spring), the DroolsBeanFactory will try to inject into this setter a Bean with the same type that is the parameter. The required attribute is not checked.

The object created by this BeanFactory are not singleton. Spring will take care of creating singleton if needed.

Exceptions

The Drools5-Integration-Helper-Library classes can throw exception. All specific exceptions are in the package org.boretti.drools.integration.drools5.exceptions. The parent Exception is DroolsError which extends Error. These exceptions are related to the following main categories of problem:

- Invalid objects. For example, not annotated interface passed to the DroolsProvider class.
- Access to drools file error. For example, resource with the drools rule not found.
- Compilation error. For example, the source drools file is not valid.

Also, the IllegalArgumentException may be thrown for null parameter or invalid session state.

Logging

The log4j library [http://logging.apache.org/log4j/1.2/index.html] is used to provide logging functionalities for the various classes. All the logger name are based on the class name.

Some very low level informations are logged in debug mode. Errors are logged before been thrown.

The global droolsLogger is added to every working memory. This is an instance of org.apache.log4j.Logger that can be used for logging from drools. The name of this logger is based on the name class of the Interface or Class annotated with @DroolsService.

This field must be declared in drools file :

```
global org.apache.log4j.Logger droolsLogger;
```

Configuration of the log4j library is out of scope of Drools5-Integration-Helper.

Summaries

Annotations

Table 2.1. Summary of the annotations

Annotation	Scope	Description	Attributes
@DroolsGenerated	on field	Mark this field as auto-generated.	N/A
@DroolsIgnored	on field	Mark this field as not part ofdrools source field.	N/A
@DroolsMethod	on method(interface)	Mark this method as drools method.(optional usage)	session
@DroolsParameter	on parameter(interface)	Add additional information for the parameter(optional usage)	handling
@DroolsPostCondition	on method	Mark this method as using post-condition.	type, resourceName, error, onException
@DroolsPreCondition	on method(class)	Mark this method as using pre-condition.	type,resourceName,error
@DroolsResourceName	on parameter(constructor)	Mark this parameter as resource Name injector	

@DroolsResourceType	on parameter(constructor)	Mark this parameter as resource type injector	
@DroolsService	on interface	Mark this interface as Drools interface.	type,resourceName
@DroolsVariable	on method(interface)	Mark this method as variable injectionmethod	global

Enumerations

Table 2.2. Summary of the enumerations

Enumeration	Description	Values
DroolsParameterHandling	Definition of the parameter handling for the method of the interface.	GENERICDEFINITION, IGNORED, NONE, TOFLAT1, TOFLATALL
DroolsServiceType	Definition of the type of the drools source	COMPILED, SOURCE, XML
DroolsSessionType	Definition of the session handling for the method of the interface.	END, JOIN, NEW, NONE, REQUIRE

Classes

Exceptions and Errors are listed in a separated table

Table 2.3. Summary of the classes

Name	Description
DroolsBeanFactory	The Spring BeanFactory to support dynamic creation of Proxy from Spring.
DroolsProvider	The class to be used to get Proxy for any interface.

Interfaces

Table 2.4. Summary of the interface

Name	Description
DroolsInterface	This interface is automatically implemented by all Proxies generated bythe classes DroolsBeanFactory and DroolsProvider

Errors and Exceptions

- ClassCastDroolsError
- CompilationDroolsError
- DroolsError

- IncompatibleAnnotationDroolsError
- IODroolsError
- MalformedURLDroolsError
- NotAClassDroolsError
- NotAnInterfaceDroolsError
- NotAnnotatedClassDroolsError
- NotAnnotatedInterfaceDroolsError
- XMLDroolsError

Performance

Performance of drools itself is out of scope. Drools5-Integration-Helper add a small footprint to a direct usage of drools. Initialization of Proxy and classes are the most consuming operation (because of the need to load resource, parse resource, etc). So it is a very good idea to avoid recreating object if it is not needed.

Also, pre-condition and post-condition usage require passing all the arguments of the method to drools. This is an operation that can consume time.

In case log4j logging for the drools5-Integration-Helper classes are set to debug, it can have a severe impact on the performance. So, debug log level for these classes should be avoid in production environment. Depending of the type of appender used, usage of the debug level can be 5 time slower that without.

Chapter 3. Maven plugin - Drools5 Integration Helper Maven Plugin

Introduction

A maven plugin **drools5-integration-helper-maven-plugin** is provided. Plugin prefix is drools5. The plugin can be used by adding this section in the plugin section:

```
<plugin>
 <groupId>org.boretti.drools.integration</groupId>
 <artifactId>drools5-integration-helper-maven-plugin</artifactId>
 <version>1.3.0</version>
 <extension>true</extension>
</plugin>
```

The extension section is needed because of the additional packaging provided by the plugin.

The plugin is used when

- One of the provided packaging is used.
- One or several goal(s) are listed to be used.

Please refer to the site (part of the artefacts) for the standard plugin documentation. Also, the plugin exposes the help goal.

Plugin has been tested with Maven 2.0.10 and Maven 2.2.1.

Drools Packaging

This maven 2 plugin provides several packaging that extends standard packaging:

drools	This packaging is a synonym of the jar-drools packaging.
jar-drools	This packaging is the same one that the packaging jar, but in addition, the various goals of this plugin are executed during the compile, process-class, test-compile and process-test-class phase.
ejb-drools	This packaging is the same one that the packaging ejb, but in addition, the various goals of this plugin are executed during the compile, process-class, test-compile and process-test-class phase.
ejb3-drools	This packaging is the same one that the packaging ejb3, but in addition, the various goals of this plugin are executed during the compile, process-class, test-compile and process-test-class phase.
rar-drools	This packaging is the same one that the packaging rar, but in addition, the various goals of this plugin are executed during the compile, process-class, test-compile and process-test-class phase.
par-drools	This packaging is the same one that the packaging par, but in addition, the various goals of this plugin are executed during the compile, process-class, test-compile and process-test-class phase.

war-drools	This packaging is the same one that the packaging war, but in addition, the various goals of this plugin are executed during the compile, process-class, test-compile and process-test-class phase.

The packaging can be used in the following way:

```
<project
   xmlns="http://maven.apache.org/POM/4.0.0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                       http://maven.apache.org/maven-v4_0_0.xsd">
        <modelVersion>4.0.0</modelVersion>
        <groupId>${groupId}</groupId>
        <artifactId>${artifactId}</artifactId>
        <packaging>jar-drools</packaging>
        <version>${version}</version>
```

Is is not required to use these packaging to use the maven plugin. The various goals can be called manually.

All the previous packaging add the following goals:

compile	drools-copy-validate, drools-compile.
process-classes	drools-postprocessor.
test-compile	drools-copy-validate-test, drools-compile-test.
process-test-classes	drools-postprocessor-test.

Report goal are not part of the executed goal. It must be call manually.

Validation Drools Goals

Theses two goals are related to validation of the Drools files. Drools files can be used for the main code of the artifact or for the tests. Is it why there is two goals.

drools-copy-validate

This goal is executed by default in phase compile. It work in the following way:

1. For each file with extension .drl in folder src/main/drools:
    1. Validate that the file is valid regarding drools compiler.
    2. Copy the file into target/classes. The folder hierarchy is the same in the target/classes folder.
2. For each file with extension .xml in folder src/main/drools:
    1. Validate that the file is valid regarding drools compiler.
    2. Copy the file into target/classes. The folder hierarchy is the same in the target/classes folder.

configuration

This goal supports the following configuration items:

outputDirectory	Where to copy files. Default is into target/classes

inputDirectory	From where to read source files. Default is from src/main/drools
extension	Extension for source files. Default is .drl
xmlExtension	Extension for xml source files. Default is .xml
reportDirectory	The folder into which reports of execution must be wrote.
reportFile	The file name for the report file.

Notes

This goal handle both Drools Source files and XML sources file at the same time. It is necessary to ensure there is no none Drools XML file in the drools source file.

drools-copy-validate-test

This goal is executed by default in phase test-compile. It work in the following way:

1. For each file with extension .drl in folder src/test/drools:
    1. Validate that the file is valid regarding drools compiler.
    2. Copy the file into target/test-classes. The folder hierarchy is the same in the target/test-classes folder.
2. For each file with extension .xml in folder src/test/drools:
    1. Validate that the file is valid regarding drools compiler.
    2. Copy the file into target/test-classes. The folder hierarchy is the same in the target/test-classes folder.

configuration

This goal supports the following configuration items:

outputDirectory	Where to copy files. Default is into target/test-classes
inputDirectory	From where to read source files. Default is from src/test/drools
extension	Extension for source files. Default is .drl
xmlExtension	Extension for xml source files. Default is .xml
reportDirectory	The folder into which reports of execution must be wrote.
reportFile	The file name for the report file.

Notes

This goal handle both Drools Source files and XML sources file at the same time. It is necessary to ensure there is no none Drools XML file in the drools source file.

Compilation Drools Goals

Theses two goals are related to compilation of the Drools files. Drools files can be used for the main code of the artifact or for the tests. Is it why there is two goals. Both drools source files and drools XML source files will be compiled.

drools-compile

This goal is executed by default in phase compile. It work in the following way:

1. For each file with extension .drl in folder src/main/drools:
    1. Compile the file using drools compiler.
    2. Write the resulting compiled file into target/classes. The folder hierarchy is the same in the target/classes folder. The file will have .cdrl extension.
2. For each file with extension .xml in folder src/main/drools:
    1. Compile the file using drools compiler.
    2. Write the resulting compiled file into target/classes. The folder hierarchy is the same in the target/classes folder. The file will have .cdrl extension.

configuration

This goal supports the following configuration items:

outputDirectory	Where to copy compiled files. Default is into target/classes
inputDirectory	From where to read source files. Default is from src/main/drools
extension	Extension for source files. Default is .drl
xmlExtension	Extension for xml source files. Default is .xml
compiledExtension	Extension for compiled files. Default is .cdrl
reportDirectory	The folder into which reports of execution must be wrote.
reportFile	The file name for the report file.

Notes

This goal handle both Drools Source files and XML sources file at the same time. It is necessary to ensure there is no none Drools XML file in the drools source file.

drools-compile-test

This goal is executed by default in phase test-compile. It work in the following way:

1. For each file with extension .drl in folder src/test/drools:
    1. Compile the file using drools compiler.
    2. Write the resulting compiled file into target/test-classes. The folder hierarchy is the same in the target/test-classes folder. The file will have .cdrl extension.
2. For each file with extension .xml in folder src/test/drools:
    1. Compile the file using drools compiler.

2. Write the resulting compiled file into target/test-classes. The folder hierarchy is the same in the target/test-classes folder. The file will have .cdrl extension.

configuration

This goal supports the following configuration items:

outputDirectory	Where to copy compiled files. Default is into target/test-classes
inputDirectory	From where to read source files. Default is from src/test/drools
extension	Extension for source files. Default is .drl
xmlExtension	Extension for xml source files. Default is .xml
compiledExtension	Extension for compiled files. Default is .cdrl
reportDirectory	The folder into which reports of execution must be wrote.
reportFile	The file name for the report file.

Notes

This goal handle both Drools Source files and XML sources file at the same time. It is necessary to ensure there is no none Drools XML file in the drools source file.

PostProcessing Drools Goals

Theses two goals are related to instrumentalization of the Drools classes. Drools files can be used for the main code of the artifact or for the tests. Is it why there is two goals.

In case these goals are runned twice, on the same classes, the second time, the classes will not be instrumented as they already are.

The code instrumentalization is based on ASM [http://asm.ow2.org/].

drools-postprocessor

This goal is executed by default in phase process-classes. It work in the following way:

1. For each class files that match patterns in folder target/classes:
    1. Check if the class is candidate to instrumentalization.
    2. If the class is candidate, instrumentalizate it.
    3. Replace the file of the class with the instrumentalized one.

configuration

This goal supports the following configuration items:

inputDirectory	From where to read class files. Default is from target/classes.
extension	Extension for source files. Default is .class

includes	List of file inclusion patterns
excludes	List of file exclusion patterns
reportDirectory	The folder into which reports of execution must be wrote.
reportFile	The file name for the report file.

Notes

Filtering classes can be usefull to avoid this plugin inspecting all the classes (which can take time).

drools-postprocessor-test

This goal is executed by default in phase process-test-classes. It work in the following way:

1. For each class files that match patterns in folder target/test-classes:
    1. Check if the class is candidate to instrumentalization.
    2. If the class is candidate, instrumentalizate it.
    3. Replace the file of the class with the instrumentalized one.

configuration

This goal supports the following configuration items:

inputDirectory	From where to read class files. Default is from target/test-classes.
extension	Extension for source files. Default is .class
includes	List of file inclusion patterns
excludes	List of file exclusion patterns
reportDirectory	The folder into which reports of execution must be wrote.
reportFile	The file name for the report file.

Notes

Filtering classes can be usefull to avoid this plugin inspecting all the classes (which can take time).

Report Goal

A special report goal is available to integrate the reporting of goals execution in the generated site.

drools-report

This goal will inspect each report file and add it to the site. To do so, it will:

1. For each reports files:
    1. Load it into memory.

2. Write recursively the comments from the report file into the site.

configuration

This goal supports the following configuration items:

reportInputDirectory	This is the source folder that contains the generated logs from the execution of the various goals.
reportOutputDirectory	This is the destination folder that will contains the resulted site.

Results

This plugin will list all the report file and display all the log of each file. If an entry contains other entries, they will be displayed also.

Figure 3.1. Example of report

Logging of maven plugin execution

Every goal of this plugin have two special parameters:

reportDirectory	This is the folder where the logging of the execution are stored.
reportFile	This is the file name that will be used by the plugin to store his logging information.

These logging information are based on an XML logging.

Here is an example of this log:

```
<droolsGoalExecutionLogs>
 <logs>
  <action>postprocessor</action>
  <comments>
   Class defined by file XXXXX has been rewritten by the plugin
  </comments>
  <fileName>XXXXX</fileName>
  <logs>
   <action>postprocessor</action>
```

```
 <comments>
  DroolsService annotation found. Field annotation will be used.
 </comments>
 <fileName>XXXXX</fileName>
 <timestamp>1258403938343</timestamp>
</logs>
<logs>
 <action>postprocessor</action>
 <comments>
  Constructor instrumentalization ()V
 </comments>
 <fileName>XXXXX</fileName>
 <timestamp>1258403938359</timestamp>
</logs>
<logs>
 <action>postprocessor</action>
 <comments>
  Method instrumentalization getField1/()Ljava/lang/String;
 </comments>
 <fileName>XXXXX</fileName>
 <timestamp>1258403938375</timestamp>
</logs>
...
```

This can be usefull to check what has been modified in the class files.

Chapter 4. Maven Archetype - Drools5 Integration Helper Archetype

Introduction

It is possible to automatically generated a basic Maven project that integrate all the Drools5-Integration-Helper features. To do so, a Maven archetype is provided. This archetype provides the following stuff:

- Maven 2 project, with references to the required libraries and plugin.
- Example of Annotated interfaces.
- Example of Annotated classes.
  - Using Field oriented annotations.
  - Using PreCondition oriented annotations.
- Example of JUnit for the two previous entries.

Presentation of what is an archetype is out of the scope of this document. Please refer to Maven Archetype plugin [http://maven.apache.org/plugins/maven-archetype-plugin/] for more information on the archetype plugin.

Usage

The creation of the Maven 2 project is based on the maven-archetype-plugin. It is possible to use the following call, from a terminal:

```
mvn \
   archetype:generate \
   -DarchetypeGroupId=org.boretti.drools.integration \
   -DarchetypeArtifactId=drools5-integration-helper-archetype \
   -DarchetypeVersion=1.3.0
```

The system will then ask you several questions (like package name for example). You must reply to the various questions and then a default Maven project, based on the archetype, will be created. This archetype is directly usable.

Example of usage

For example, it is possible to use the previous command:

```
[INFO] Scanning for projects...
[INFO] Searching repository for plugin with prefix: 'archetype'.
[INFO] ------------------------------------------------------------------------
[INFO] Building Maven Default Project
[INFO]    task-segment: [archetype:generate] (aggregator-style)
[INFO] ------------------------------------------------------------------------
[INFO] Preparing archetype:generate
[INFO] No goals needed for project - skipping
```

```
[INFO] Setting property: classpath.resource.loader.class => 'org.codehaus.plexus.v
[INFO] Setting property: velocimacro.messages.on => 'false'.
[INFO] Setting property: resource.loader => 'classpath'.
[INFO] Setting property: resource.manager.logwhenfound => 'false'.
[INFO] [archetype:generate]
[INFO] Generating project in Interactive mode
[WARNING] No archetype repository found. Falling back to central repository (http:
[WARNING] Use -DarchetypeRepository=<your repository> if archetype's repository is
Define value for groupId: :
```

Here input grpid

```
Define value for artifactId: :
```

Here input artifactid

```
Define value for version:  1.0-SNAPSHOT: :
```

Here input 1.0-SNAPSHOT

```
Define value for package:  grpid: :
```

Here input package

```
Confirm properties configuration:
groupId: grpid
artifactId: artifactid
version: 1.0-SNAPSHOT
package: package
 Y: :
```

Finally confirm the data you input

```
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESSFUL
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 25 seconds
[INFO] Finished at: Sun Nov 15 12:46:56 CET 2009
[INFO] Final Memory: 8M/15M
[INFO] ------------------------------------------------------------------------
```

The resulting folder will be named *artifactid*. It will contains a single pom.xml file. A *src* folder will be created. It will contains the *main* and *test* folder. You will then have a *drools* folder for the drools file, a *java* folder for the java source.

Chapter 5. Examples

Presentation

Drools5-Integration-Helper can be use in various ways to achieve similar goals. In the following section we will discuss how to achieve this goal (interfacing with drools business rules) from java, using the various approaches .

Additional examples are available as part of the special group *org.boretti.drools.integration.examples*.

We will use the same problem as a basis for all the examples:

The problem

We must develop a logic, based on business rule, to allow (or disallow) access to credit for customer of a bank.

Basically, in all solutions, we will have the following entities:

- A drools file defining how to compute the fact a customer is allowed to have or not access to credit.
- A class defining the customer.

The computation is based on the sex (a boolean value), the age (an int value) and the fact the customer is unemployed (boolean).

Examples using interface

General idea

The general idea is to have a interface that directly delegate computation of the credit status. To do so, the Customer class, a dedicated interface, the drools file and usage of the Maven plugin are required.

Implementation

Java Source

Customer.java

The class Customer defines the various field and getter/setter like in the standard way. Only fields that are not computed are defined.

```
package example1;

public class Customer {
        private String name;

        private String prenom;

        private boolean sexe;

        private int age;
```

```
private boolean chomeur;

/**
 * @return the name
 */
public String getName() {
        return name;
}

public Customer(String name, String prenom, boolean sexe, int age,
                boolean chomeur) {
        super();
        this.name = name;
        this.prenom = prenom;
        this.sexe = sexe;
        this.age = age;
        this.chomeur = chomeur;
}

/**
 * @param name the name to set
 */
public void setName(String name) {
        this.name = name;
}

/**
 * @return the prenom
 */
public String getPrenom() {
        return prenom;
}

/**
 * @param prenom the prenom to set
 */
public void setPrenom(String prenom) {
        this.prenom = prenom;
}

/**
 * @return the sexe
 */
public boolean isSexe() {
        return sexe;
}

/**
 * @param sexe the sexe to set
 */
public void setSexe(boolean sexe) {
        this.sexe = sexe;
}
```

```
        /**
         * @return the age
         */
        public int getAge() {
                return age;
        }

        /**
         * @param age the age to set
         */
        public void setAge(int age) {
                this.age = age;
        }

        /**
         * @return the chomeur
         */
        public boolean isChomeur() {
                return chomeur;
        }

        /**
         * @param chomeur the chomeur to set
         */
        public void setChomeur(boolean chomeur) {
                this.chomeur = chomeur;
        }

}
```

CustomerEvaluator.java

This interface define that it is possible to compute the credit check regarding a Customer. The annotation is used to define the drools file.

```
package example1;

import org.boretti.drools.integration.drools5.annotations.DroolsService;

@DroolsService(resourceName="/example1/Customer.cdrl")

public interface CustomerEvaluator {
        public boolean checkCredit(Customer customer);
}
```

Drools file

The drools file must use the various information regarding the Customer to compute the value. A boolean value is asserted into the workingMemory.

```
package example1;

global org.apache.log4j.Logger droolsLogger;
```

```
rule "Good sexe"
when
        c:Customer(sexe == true,chomeur == false)
then
        insert(true);
end

rule "Wrong sexe good age"
when
        c:Customer(sexe == false,chomeur == false,age>45)
then
        insert(true);
end

rule "Wrong customer 1"
when
        c:Customer(chomeur == true)
then
        insert(false);
end

rule "Wrong customer 2"
when
        c:Customer(sexe == false, age<=45)
then
        insert(false);
end
```

Maven integration

The pom.xml file must reference the drools helper library and the plugin. Using the packaging jar-drools ensure the drools goals to be executed automatically.

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                            http://maven.apache.org/maven-v4_0_0.xsd">
        <modelVersion>4.0.0</modelVersion>
        <groupId>
           org.boretti.drools.integration.test
        </groupId>
        <artifactId>
           drools5-integration-helper-maven-plugin-test9
        </artifactId>
        <packaging>jar-drools</packaging>
        <version>1.3.0</version>

        <dependencies>
                <dependency>
                        <groupId>
                           org.boretti.drools.integration
                        </groupId>
                        <artifactId>
```

```
                        drools5-integration-helper-library
                    </artifactId>
                    <version>1.3.0</version>
                </dependency>
                <dependency>
                    <groupId>junit</groupId>
                    <artifactId>junit</artifactId>
                    <version>4.4</version>
                    <scope>test</scope>
                </dependency>
            </dependencies>

            <build>
                <plugins>
                    <plugin>
                        <groupId>
                            org.apache.maven.plugins
                        </groupId>
                        <artifactId>
                            maven-compiler-plugin
                        </artifactId>
                        <configuration>
                            <source>1.6</source>
                            <target>1.6</target>
                        </configuration>
                    </plugin>
                    <plugin>
                        <artifactId>
                            drools5-integration-helper-maven-plugin
                        </artifactId>
                        <groupId>
                            org.boretti.drools.integration
                        </groupId>
                        <version>1.3.0</version>
                        <extensions>true</extensions>
                    </plugin>
                </plugins>
            </build>
        </project>
```

Usage

The user must create an instance of the Subscriber class and then get a reference to the CustomerEvaluator interface. To do so, it is possible to use the following call for example new DroolsProvider().getService(CustomerEvaluator.class). Then it is possible to just call the method exposed by the concrete implementation of the interface.

Examples using class

General idea

The general idea is to have a class that directly delegate computation of the field containing the credit status. To do so, only the Customer class, the drools file and usage of the Maven plugin are required.

Implementation

Java Source

The class Customer defines the various field and getter/setter like in the standard way. Fields that are not part of the credit check are annotated with @DroolsIgnored. The field generated by the drools is annotated with @DroolsGenerated. The annotation @DroolsService references the drools file.

```
package example1;

import org.boretti.drools.integration.drools5.annotations.DroolsService;
import org.boretti.drools.integration.drools5.annotations.DroolsGenerated;
import org.boretti.drools.integration.drools5.annotations.DroolsIgnored;

@DroolsService(resourceName="/example1/Customer.cdrl")
public class Customer {

	//This field must not trigger field recomputation
	@DroolsIgnored
	private String name;

	//This field must not trigger field recomputation
	@DroolsIgnored
	private String prenom;

	private boolean sexe;

	private int age;

	private boolean chomeur;

	//This field is generated using drools
	@DroolsGenerated
	private boolean creditAllowed;

	/**
	 * @return the name
	 */
	public String getName() {
		return name;
	}

	public Customer(String name, String prenom, boolean sexe, int age,
			boolean chomeur) {
		super();
		this.name = name;
		this.prenom = prenom;
		this.sexe = sexe;
		this.age = age;
		this.chomeur = chomeur;
	}

	/**
```

```
 * @param name the name to set
 */
public void setName(String name) {
        this.name = name;
}

/**
 * @return the prenom
 */
public String getPrenom() {
        return prenom;
}

/**
 * @param prenom the prenom to set
 */
public void setPrenom(String prenom) {
        this.prenom = prenom;
}

/**
 * @return the sexe
 */
public boolean isSexe() {
        return sexe;
}

/**
 * @param sexe the sexe to set
 */
public void setSexe(boolean sexe) {
        this.sexe = sexe;
}

/**
 * @return the age
 */
public int getAge() {
        return age;
}

/**
 * @param age the age to set
 */
public void setAge(int age) {
        this.age = age;
}

/**
 * @return the chomeur
 */
public boolean isChomeur() {
        return chomeur;
}
```

```
        /**
         * @param chomeur the chomeur to set
         */
        public void setChomeur(boolean chomeur) {
                this.chomeur = chomeur;
        }

        /**
         * @return the creditAllowed
         */
        public boolean isCreditAllowed() {
                return creditAllowed;
        }

        /**
         * @param creditAllowed the creditAllowed to set
         */
        public void setCreditAllowed(boolean creditAllowed) {
                this.creditAllowed = creditAllowed;
        }
}
```

Drools file

The drools file contains the logic to compute the creditAllowed value. This file is implicitly call to compute the creditAllowed. This drools file must set the creditAllowed.

```
package example1;

global org.apache.log4j.Logger droolsLogger;

rule "Reset"
        salience 2
when
        c:Customer()
then
        c.setCreditAllowed(false);
end

rule "Good sexe"
        salience 1
when
        c:Customer(sexe == true,chomeur == false)
then
        c.setCreditAllowed(true);
end

rule "Wrong sexe good age"
        salience 1
when
        c:Customer(sexe == false,chomeur == false,age>45)
then
```

```
        c.setCreditAllowed(true);
end
```

Maven integration

The pom.xml file must reference the drools helper library and the plugin. Using the packaging jar-drools ensure the drools goals to be executed automatically.

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                       http://maven.apache.org/maven-v4_0_0.xsd">
        <modelVersion>4.0.0</modelVersion>
        <groupId>
           org.boretti.drools.integration.test
        </groupId>
        <artifactId>
           drools5-integration-helper-maven-plugin-test8
        </artifactId>
        <packaging>jar-drools</packaging>
        <version>1.3.0</version>

        <dependencies>
                <dependency>
                        <groupId>
                           org.boretti.drools.integration
                        </groupId>
                        <artifactId>
                           drools5-integration-helper-library
                        </artifactId>
                        <version>1.3.0</version>
                </dependency>
                <dependency>
                        <groupId>junit</groupId>
                        <artifactId>junit</artifactId>
                        <version>4.4</version>
                        <scope>test</scope>
                </dependency>
        </dependencies>

        <build>
                <plugins>
                        <plugin>
                                <groupId>
                                   org.apache.maven.plugins
                                </groupId>
                                <artifactId>
                                   maven-compiler-plugin
                                </artifactId>
                                <configuration>
                                        <source>1.6</source>
                                        <target>1.6</target>
                                </configuration>
                        </plugin>
```

```
                        <plugin>
                                <artifactId>
                                   drools5-integration-helper-maven-plugin
                                </artifactId>
                                <groupId>
                                   org.boretti.drools.integration
                                </groupId>
                                <version>1.3.0</version>
                                <extensions>true</extensions>
                    </plugin>
                </plugins>
        </build>
</project>
```

Usage

With this approach, it is only necessary to instantiate the object. Every time a field that is use to compute the credit access is modified, the system will ensure the credit access field is recomputed at next access (in getter method). Everything is transparent at runtime.

Examples using condition

General idea

In this approach the check to know if the customer is allowed to have credit is not done in a dedicated method or thru a field, but but defining that there are some preconditions to be checked before granting (and giving) the credit.

So, only a Customer class and rules (and maven usage) are required. For the completude of the solution, a dedicated Error is also defined.

Implementation

Java Source

Customer class

This class have several field and one method annotated with @DroolsPreCondition.

```
package conditions;

import org.boretti.drools.integration.drools5.annotations.DroolsPreCondition;

public class Customer {
        private String name;

        private String prenom;

        private boolean sexe;

        private int age;
```

```
private boolean chomeur;

/**
 * @return the name
 */
public String getName() {
        return name;
}

public Customer(String name, String prenom, boolean sexe, int age,
                boolean chomeur) {
        super();
        this.name = name;
        this.prenom = prenom;
        this.sexe = sexe;
        this.age = age;
        this.chomeur = chomeur;
}

/**
 * @param name the name to set
 */
public void setName(String name) {
        this.name = name;
}

/**
 * @return the prenom
 */
public String getPrenom() {
        return prenom;
}

/**
 * @param prenom the prenom to set
 */
public void setPrenom(String prenom) {
        this.prenom = prenom;
}

/**
 * @return the sexe
 */
public boolean isSexe() {
        return sexe;
}

/**
 * @param sexe the sexe to set
 */
public void setSexe(boolean sexe) {
        this.sexe = sexe;
}
```

```
		/**
		 * @return the age
		 */
		public int getAge() {
			return age;
		}

		/**
		 * @param age the age to set
		 */
		public void setAge(int age) {
			this.age = age;
		}

		/**
		 * @return the chomeur
		 */
		public boolean isChomeur() {
			return chomeur;
		}

		/**
		 * @param chomeur the chomeur to set
		 */
		public void setChomeur(boolean chomeur) {
			this.chomeur = chomeur;
		}

		@DroolsPreCondition(resourceName="/Customer-conditions-pre.cdrl",error=UnA
		public void doCredit(float howMany) {
			System.err.println("Credit granted :"+howMany);
		}

	}
```

Error class

```
	package conditions;

	public class UnAuthorizedError extends Error {
		public UnAuthorizedError() {}

		public UnAuthorizedError(String msg) {
			super(msg);
		}

		public UnAuthorizedError(String msg,Throwable cause) {
			super(msg,cause);
		}
	}
```

Drools file

This file define the business rule. In case credit can't be allowed, an Error is inserted.

```
package conditions;

global org.apache.log4j.Logger droolsLogger;


rule "Wrong customer 1"
when
        c:Customer(chomeur == true)
then
        insert(new UnAuthorizedError("Chomeur are not allowed"));
end

rule "Wrong customer 2"
when
        c:Customer(sexe == false, age<=45)
then
        insert(new UnAuthorizedError("Bad sex with age under 45 are not allowed"))
end
```

Maven integration

The pom.xml file must reference the drools helper library and the plugin. Using the packaging jar-drools ensure the drools goals to be executed automatically.

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                            http://maven.apache.org/maven-v4_0_0.xsd">
        <modelVersion>4.0.0</modelVersion>
        <groupId>
           org.boretti.drools.integration.test
        </groupId>
        <artifactId>
           drools5-integration-helper-maven-plugin-testXXX
        </artifactId>
        <packaging>jar-drools</packaging>
        <version>1.3.0</version>

        <dependencies>
                <dependency>
                        <groupId>
                           org.boretti.drools.integration
                        </groupId>
                        <artifactId>
                           drools5-integration-helper-library
                        </artifactId>
                        <version>1.3.0</version>
                </dependency>
                <dependency>
                        <groupId>junit</groupId>
                        <artifactId>junit</artifactId>
                        <version>4.4</version>
                        <scope>test</scope>
                </dependency>
```

```
        </dependencies>

        <build>
                <plugins>
                        <plugin>
                                <groupId>
                                   org.apache.maven.plugins
                                </groupId>
                                <artifactId>
                                   maven-compiler-plugin
                                </artifactId>
                                <configuration>
                                        <source>1.6</source>
                                        <target>1.6</target>
                                </configuration>
                        </plugin>
                        <plugin>
                                <artifactId>
                                   drools5-integration-helper-maven-plugin
                                </artifactId>
                                <groupId>
                                   org.boretti.drools.integration
                                </groupId>
                                <version>1.3.0</version>
                                <extensions>true</extensions>
                    </plugin>
                </plugins>
        </build>
</project>
```

Usage

The class Customer can be used directly. When the method doCredit is call, the rules will be run priori to the execution of the method itself.