

Oracle®Business Rules markup with R2ML

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Abstract

This proposal describes how to markup your Oracle®Business Rules with R2ML which allows you to exchange and/or convert rules with the R2ML Translator¹ to other languages e.g. F-Logic, Jess, RuleML, Jena2 or SWRL.

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¹<http://oxygen.informatik.tu-cottbus.de/translator>

1 Markup of facts

Facts in Oracle®Business Rules are called atoms in R2ML. These appear only as nested elements of the `r2ml:conditions` and `conclusion` element. Atoms which are nested in the `r2ml:conditions` element correspond to facts that are inside of the parenthesis (...) after the `if` statement in Oracle®Business Rules. All facts that are written inside of { ... } after the `if` statement corresponding to the atom nested inside of the `r2ml:conclusion` element.

1.1 r2ml:ObjectClassificationAtom

Conditions in Oracle®Business Rules sometimes containing facts that define an object of a class. To markup things like that with R2ML we have to use the `r2ml:ObjectClassificationAtom`. Let's have a look at example 1-3.

```
rule driverAge{
  if (fact Driver d1 && d1.age < 16)
  {
    println("Invalid Driver");
  }
}
```

(example 1-3)

To markup the fact `Driver d1` in R2ML we write the following three lines.

```
<r2ml:ObjectClassificationAtom r2ml:classID="Driver">
  <r2ml:ObjectName r2ml:objectID="d1"/>
</r2ml:ObjectClassificationAtom>
```

We give the attribute `r2ml:classID` of the element `r2ml:ObjectClassificationAtom` the class name as value. In our example it's the class "Driver". Nested inside of these element we define the name of the object of this class. Therefore we use an `r2ml:ObjectName` element and set the object name as value for the attribute `r2ml:objectID`. For example 1-3 we have to use the value "d1".

1.2 r2ml:DatatypePredicateAtom

If we want to markup the fact `d1.age < 16` in R2ML then we have to use at first an `r2ml:DatatypePredicateAtom` for the comparison "<" of the two terms. The first term is "d1.age". For this term we have to use an `r2ml:AttributeFunctionTerm`, because `age` is an attribute of the object `d1`.

Since everything has a type in R2ML we have to use a `r2ml:TypedLiteral` with the attribute `r2ml:datatypeID="xs:Integer"` to describe that our value 16 is of the type integer. Now let's have a look at the complete R2ML markup.

```
<r2ml:DatatypePredicateAtom r2ml:datatypePredicateID="swrlb:lessThan">
  <r2ml:dataArguments>
    <r2ml:AttributeFunctionTerm r2ml:attributeID="age">
      <r2ml:contextArgument>
        <r2ml:ObjectName r2ml:objectID="d1"/>
      </r2ml:contextArgument>
    </r2ml:AttributeFunctionTerm>
    <r2ml:TypedLiteral r2ml:lexicalValue="16"
      r2ml:datatypeID="xs:Integer"/>
  </r2ml:dataArguments>
</r2ml:DatatypePredicateAtom>
```

As you see in the code snippet, we use the SWRL built-in function `lessThan` as value of the `r2ml:datatypePredicateID` inside of the element `r2ml:DatatypePredicateAtom`. Please have a look at SWRL² in order to use these functions with it's proper syntax. Nested in `r2ml:dataArguments` we have the two terms which are the parameter for the comparison.

Be aware that you don't forget to specify the namespace for SWRL. Normally, namespace declarations should appear in the `r2ml:DerivationRule` element in order that the namespace could be used for all nested elements and attributes.

1.3 `r2ml:DataOperationTerm`

If we want to markup method or function calls to an object, for example `cust.SpentInLastMonths(3)`, than we have to use the `r2ml:DataOperationTerm` element.

```
rule goldCust {
  if (fact Customer cust && cust.SpentInLastMonths(3) > 500 ){
    assert (new GoldCustomer(cust: cust));
  }
}
```

(example 1-5)

The markup of `cust.SpentInLastMonths(3) > 500` can you see in the following lines.

²<http://www.w3.org/Submission/SWRL/>

```

<r2ml:DatatypePredicateAtom r2ml:datatypePredicateID="swrlb:greaterThan">
  <r2ml:dataArguments>
    <r2ml:DataOperationTerm r2ml:operationID="SpentInLastMonths">
      <r2ml:contextArgument>
        <r2ml:ObjectName r2ml:objectID="cust"
          r2ml:classID="Customer"/>
      </r2ml:contextArgument>
      <r2ml:arguments>
        <r2ml:TypedLiteral r2ml:lexicalValue="3"
          r2ml:datatypeID="xs:Integer"/>
      </r2ml:arguments>
    </r2ml:DataOperationTerm>
    <r2ml:TypedLiteral r2ml:lexicalValue="500"
      r2ml:datatypeID="xs:Integer"/>
  </r2ml:dataArguments>
</r2ml:DatatypePredicateAtom>

```

As you can see above, we use the `r2ml:DataOperationTerm` as a parameter inside of the `r2ml:dataArgument` element of `r2ml:DatatypePredicateAtom`.

If you've declared the class `Customer` with an `r2ml:ObjectClassificationAtom` before (in example 1-3) than you could drop the attribute `r2ml:classID` from the `r2ml:ObjectName` element.

2 Examples

It's always good to have a look at complete examples. In the following you find the markup of some examples of the *Oracle® Business Rules Language Reference 10g Release 3* marked up in R2ML version 0.4 .

2.1 Example (1-3)

```
<?xml version="1.0" encoding="UTF-8"?>
<r2ml:RuleBase
  xmlns:r2ml="http://www.rewerse.net/I1/2006/R2ML"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.rewerse.net/I1/2006/R2ML
http://oxygen.informatik.tu-cottbus.de/R2ML/0.4/R2ML.xsd">
<r2ml:DerivationRuleSet>
  <r2ml:DerivationRule r2ml:ruleID="DR020"
    xmlns:swrlb="http://www.w3.org/2003/11/swrlb">
    <r2ml:Documentation>
      <r2ml:RuleText r2ml:textFormat="plain">
        If a someone is a driver and it's age is less then 16 years
        then he is an "invalid driver".
      </r2ml:RuleText>
      <dc:creator>Marco Pehla</dc:creator>
      <dc:contributor>Adrian Giurca</dc:contributor>
      <dc:title>Driver Age Rule (example 1-3)</dc:title>
      <dc:source>
        Oracle Business Rules Language Reference 10g Release 3
      </dc:source>
      <dc:date>17-10-2006</dc:date>
      <r2ml:SourceCode r2ml:language="Oracle Business Rules"><![CDATA[
rule driverAge{
  if (fact Driver d1 && d1.age < 16)
  {
    println("Invalid Driver");
  }
}
]]></r2ml:SourceCode>
    </r2ml:Documentation>
    <r2ml:conditions>
      <r2ml:ObjectClassificationAtom r2ml:classID="Driver">
        <r2ml:ObjectName r2ml:objectID="d1"/>
      </r2ml:ObjectClassificationAtom>
```

```

<r2ml:DatatypePredicateAtom
  r2ml:datatypePredicateID="swrlb:lessThan">
  <r2ml:dataArguments>
    <r2ml:AttributeFunctionTerm r2ml:attributeID="age">
      <r2ml:contextArgument>
        <r2ml:ObjectName r2ml:objectID="d1"/>
      </r2ml:contextArgument>
    </r2ml:AttributeFunctionTerm>
    <r2ml:TypedLiteral r2ml:lexicalValue="16"
      r2ml:datatypeID="xs:Integer"/>
  </r2ml:dataArguments>
</r2ml:DatatypePredicateAtom>
</r2ml:conditions>
<r2ml:conclusion>
  <r2ml:GenericAtom r2ml:predicateID="println">
    <r2ml:arguments>
      <r2ml:TypedLiteral r2ml:lexicalValue="Invalid Driver"
        r2ml:datatypeID="xs:String"/>
    </r2ml:arguments>
  </r2ml:GenericAtom>
</r2ml:conclusion>
</r2ml:DerivationRule>
</r2ml:DerivationRuleSet>
</r2ml:RuleBase>

```

2.2 Example (1-5)

```

<?xml version="1.0" encoding="UTF-8"?>
<r2ml:RuleBase xmlns:r2ml="http://www.rewerse.net/I1/2006/R2ML"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.rewerse.net/I1/2006/R2ML
  http://oxygen.informatik.tu-cottbus.de/R2ML/0.4/R2ML.xsd"
  xmlns:examples="http://oxygen.informatik.tu-cottbus.de/R2ML/examples">
  <r2ml:DerivationRuleSet>
    <r2ml:DerivationRule r2ml:ruleID="DR020"
      xmlns:swrlb="http://www.w3.org/2003/11/swrlb">
      <r2ml:Documentation>
        <r2ml:RuleText r2ml:textFormat="plain">
          If a customer that spends more than 500 dollars in a three
          month period than he is a 'gold' customer.
        </r2ml:RuleText>
        <dc:creator>Marco Pehla</dc:creator>
        <dc:contributor>Adrian Giurca</dc:contributor>
      </r2ml:Documentation>
    </r2ml:DerivationRule>
  </r2ml:DerivationRuleSet>
</r2ml:RuleBase>

```

```

<dc:title>goldCust Rule (example 1-5)</dc:title>
<dc:source>
Oracle Business Rules Language Reference 10g Release 3
</dc:source>
<dc:date>17-10-2006</dc:date>
<r2ml:SourceCode r2ml:language="Oracle Business Rules"><![CDATA[
rule goldCust {
  if (fact Customer cust && cust.SpentInLastMonths(3) > 500 ) {
    assert (new GoldCustomer(cust: cust));
  }
}
]]></r2ml:SourceCode>
</r2ml:Documentation>
<r2ml:conditions>
<r2ml:ObjectClassificationAtom r2ml:classID="Customer">
  <r2ml:ObjectName r2ml:objectID="cust"/>
</r2ml:ObjectClassificationAtom>
<r2ml:DatatypePredicateAtom
  r2ml:datatypePredicateID="swrlb:greaterThan">
<r2ml:dataArguments>
  <r2ml:DataOperationTerm r2ml:operationID="SpentInLastMonths">
    <r2ml:contextArgument>
      <r2ml:ObjectName r2ml:objectID="cust"/>
    </r2ml:contextArgument>
    <r2ml:arguments>
      <r2ml:TypedLiteral r2ml:lexicalValue="3"
        r2ml:datatypeID="xs:Integer"/>
    </r2ml:arguments>
  </r2ml:DataOperationTerm>
  <r2ml:TypedLiteral r2ml:lexicalValue="500"
    r2ml:datatypeID="xs:Integer"/>
</r2ml:dataArguments>
</r2ml:DatatypePredicateAtom>
</r2ml:conditions>
<r2ml:conclusion>
  <r2ml:ObjectClassificationAtom r2ml:classID="GoldCustomer">
    <r2ml:ObjectName r2ml:objectID="cust"/>
  </r2ml:ObjectClassificationAtom>
</r2ml:conclusion>
</r2ml:DerivationRule>
</r2ml:DerivationRuleSet>
</r2ml:RuleBase>

```

References

- [1] Oracle®Business Rules, "*Language Reference 10g Release 3*",
<http://www.oracle.com/technology/products/ias/>